HAMILTON®

[MPE]^2

User's Manual

P/N 95541-01, Revision E

Contents

1 About

1.1 About this Manual

This manual describes the components, functionality and use of the Monitored Multi-Flow Positive Pressure Evaporative Extraction module, or the [MPE]². This revision of the manual includes information on the components and operation of the new Evaporator and Reagent Fill Modules. It is intended to help users program and operate the [MPE]² correctly and safely.

All efforts have been made to ensure the accuracy of the contents of this manual. However, should any errors be detected, Hamilton Company would greatly appreciate being informed of them, but can assume no responsibility for any errors in this manual or their consequences.

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NIMBUS® is a registered trademark of Hamilton Company.

VANTAGE Liquid Handling System® is a registered trademark of Hamilton Company.

The Microlab® STAR™, STAR^{PLUS}, STAR^{LET}, NIMBUS®, NIMBUS HD, and VANTAGE Liquid Handling System® will be referred to as STAR, NIMBUS, and Microlab VANTAGE for the remainder of this manual.

1.2 Intended Use of the [MPE]²

The [MPE]² is designed to automate applications like Solid-Phase Extraction (SPE). The device's dual elevator system transports a filter plate to an air manifold, applies pressure to the plate via an air pump, and forces liquid through the filter plate into a collection plate or liquid waste. All processes, including conditioning, washing, adding samples, and collecting eluate are completely automated without the need for user interaction.

In addition to the SPE functionality, the [MPE]² can function as an evaporator or plate dryer through the use of an optional drying manifold and inline air heater module. The [MPE]² can be integrated into NIMBUS, STAR, and Microlab VANTAGE platforms or used as a benchtop device. When used without an instrument, the [MPE]² is programmed using VENUS and an HSL driver.

1.3 Product Identification

The Product Identification label is located on the back of the Logistics Module, shown in Figure 1–1.

Figure 1–1: Locating the product identification label

CE	EC Declaration of Conformity The CE marking is the manufacturer's declaration that allows sale of product in the EU that the produce meets the requirements of the applicable EC directives. It is a mandatory conformity marking for certain products sold within the European Economic Area (EEA). In the United States, electronic device manufacturers need to meet the same sort of requirements to get FCC approval.

	Product Certification The CSA C/US mark signifies that the product is certified for both the U.S. and Canadian markets, to the applicable U.S. and Canadian standards.
	CHINA-RoHS All Electronic Information Products (EIP). Extensive list published which includes many products not covered by EU RoHS such as radar attached to aircraft or ships, medical equipment, measurement instruments, some production equipment, batteries and most types of components. The number is the Environmentally Friendly (safe use) Period or EFUP, denoting the number of years before any substance is likely to leak out into the environment. Orange is preferred but any prominent color may be used.
	WEEE (Waste of Electrical and Electronic Equipment) This directive represents recycling, sorting and handling of product. The symbol for separated collecting of electrical and electronic equipment shows a crossed out bin on wheels.

1.4 Disposal

1.4.1 Americas/Pacific Rim

After the life cycle of the [MPE]² has ended, disposal must be considered. The customer is responsible for proper disposal of electronic devices per local regulations.

1.4.2 European

WEEE Declaration

Recycling of Hamilton's [MPE]² devices in accordance to EC directive WEEE.

The European Community requires from manufacturers to organize the disposal and Waste of Electrical and Electronic Equipment (WEEE). For this reason, Hamilton Bonaduz AG took part in an initiative to organize the disposal of [MPE]² products through a European disposal network called RENE. RENE is the largest recycling network for the disposal of electronic equipment in Europe.

The mission of RENE is a European-wide, WEEE-compliant, high quality recycling for electrical and electronic equipment through a dense network with both innovative and SMB-sized partner companies. As a consequence, Hamilton Bonaduz AG gets a turn-key-solution that includes all processes from treatment of incoming orders over collection, logistics and recycling down to reporting and the according management of material flows.

Hamilton offers a WEEE process in collaboration with Toolpoint and RENE AG:

- Request for the collection of the Hamilton instrument via Toolpoint Home Page (www.toolpoint.ch).
- Completion of the decontamination confirmation form
- Preparation for transport: packing
- Activation of the recycling order
- Archiving of the decontamination confirmation
- Disposal of instrument

Responsibilities	
Ordering Party	Decontamination Preparation for transport Note: The cost for decontamination and preparation for shipment is paid by the ordering party. On request, Hamilton offers to take care of that part of the recycling process.
RENE	Transport Disposal
Toolpoint	Registration Invoice the disposal to Hamilton
Hamilton Company	Organize the disposal in accordance with the WEEE directive

Recycling process

1. **Request the disposal of the instrument.** Access to the order registration is given by the toolpoint homepage www.toolpoint.ch.

   ☒ Recycling ☒ Order registration form

2. **Complete the decontamination form.** Once the form has been completed, the request for disposal is automatically activated and transferred to Toolpoint. The confirmation of the order will be sent to the registered contact person.

3. **Decontaminate the instrument.** The ordering party is responsible for decontamination. It is mandatory to sign the decontamination form and send an electronic copy to Toolpoint. Toolpoint forwards the documentation to RENE, which is in charge with the disposal of the instrument.
4. **Pack and prepare the instrument for shipping.** Instruments with a weight of over 30 kg need to be fixed on a euro pallet. Instruments below 30 kg can be packed in a cardboard or plastic box. A signed copy of the decontamination form needs to be added to the outer part of the shipping box or instrument.

2 Safety

2.1 Safety Symbols

The general Warning symbol indicates the possibility of damaging the instrument or compromising the results of a method.

The Electrical Hazard symbol indicates the presence of electrical components that can be harmful to the operator if handled incorrectly.

The Mechanical Hazard symbol indicates the presence of moving mechanical parts that can be harmful to the operator if handled incorrectly.

The Hazardous Materials symbol indicates the presence of materials that are toxic or otherwise harmful to the operator if handled incorrectly.

The Biohazard symbol indicates the presence of biological samples that can be harmful to the operator if handled incorrectly.

The Hot Surface symbol indicates the presence of a heated surface that can be harmful to the operator if handled incorrectly.

2.2 Operation

WARNING: When using the [MPE]², Good Laboratory Practices (GLP) must be observed. Suitable protective clothing, safety glasses, and protective must be worn.

WARNING: If working with biohazardous samples, observe and carry out the maintenance procedures, paying particular attention to cleaning and decontamination. Wear gloves when handling the pipetting arm, the carriers, containers, and tips. Avoid touching tips discarded into the waste bin. Any surfaces on which liquid is spilled must be decontaminated.

WARNING: The user is obligated to validate all methods.

WARNING: If the instrument crashes and is not user recoverable, refer to section 11.2 to view the warranty.

WARNING: Refer to the warranty in section 11.2 if at any time the instrument has lost accuracy or precision in any motion axis.

WARNING: Keep hands, hair, and loose clothing away from the [MPE]² while it is running.

2.3 Maintenance

WARNING: If the [MPE]² becomes contaminated with biohazardous or chemical material, clean it in accordance with the maintenance procedures given in section 7.5.

2.4 Programming

WARNING: Perform test runs first with tap water and then with the final liquids prior to routine use. The method programmer should supervise the run.

WARNING: Before using any newly-created or modified methods for routine test purposes, they must be validated according to laboratory protocols.

2.5 Electrical

WARNING: For reasons of data security and integrity, use of an uninterrupted power supply (UPS) is recommended, since a loss of power may cause data to be lost or corrupted.

WARNING: Only Hamilton Trained Field Service Engineers should install or remove any electrical component, device, or accessory.

2.6 Computer

WARNING: Running other software in parallel to Hamilton software may negatively affect the running of the instrument.

WARNING: Any manipulation of the [MPE]² data or application files can result in erroneous test results or instrument failure.

WARNING: Only Hamilton software may be used to control the [MPE]².

WARNING: To avoid computer breakdowns, configure a hard disk of sufficient space in the computer. Ensure that there is always enough storage capacity on the hard drive. Generated data within the Log files directory (for example, trace files) should be backed up on the laboratory's host device and deleted from the controlling computer's hard disk at weekly intervals.

3 Device Overview

3.1 Control Box

The Control Box connects the [MPE]² to the power supply and controlling computer. It also connects to the liquid waste and to the laboratory air supply to operate a pump via a Filter/Regulator Unit.

Figure 3–1: [MPE]² Control Box

Additional modules, like the Evaporator and Reagent Fill Modules, require an additional Accessory Control Module Extension (ACME) to integrate with the [MPE]². The ACME connects to the Control Box to communicate with the Logistics Module.

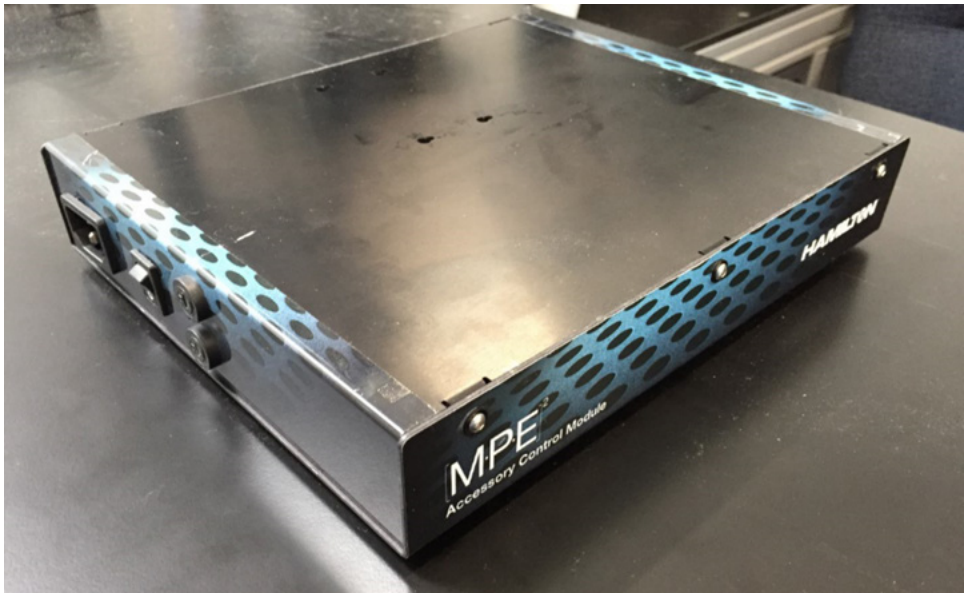


Figure 3–2: Accessories Control Module Extension

The Control Box manages the air flow into the Logistics Module. The [MPE]² has been tested with compressed air and nitrogen with pressure ranging from 1 to 120 psi. There is a pressure drop of approximately 20% from the input at the Control Box to the Manifold in the Logistics Module. For example, an input pressure of 100 psi at the Control Box translates to a pressure of 80 psi at the manifold. The [MPE]² has sensors that read pressure; an input pressure below 80 psi will generate an error.

3.2 Logistics Module

The Logistics Module is where the [MPE]² processes samples. This component can operate as a benchtop device or as an integration with a liquid handling system. Refer to section 4.2 for instructions on integrating the Logistics Module with different Hamilton platforms.

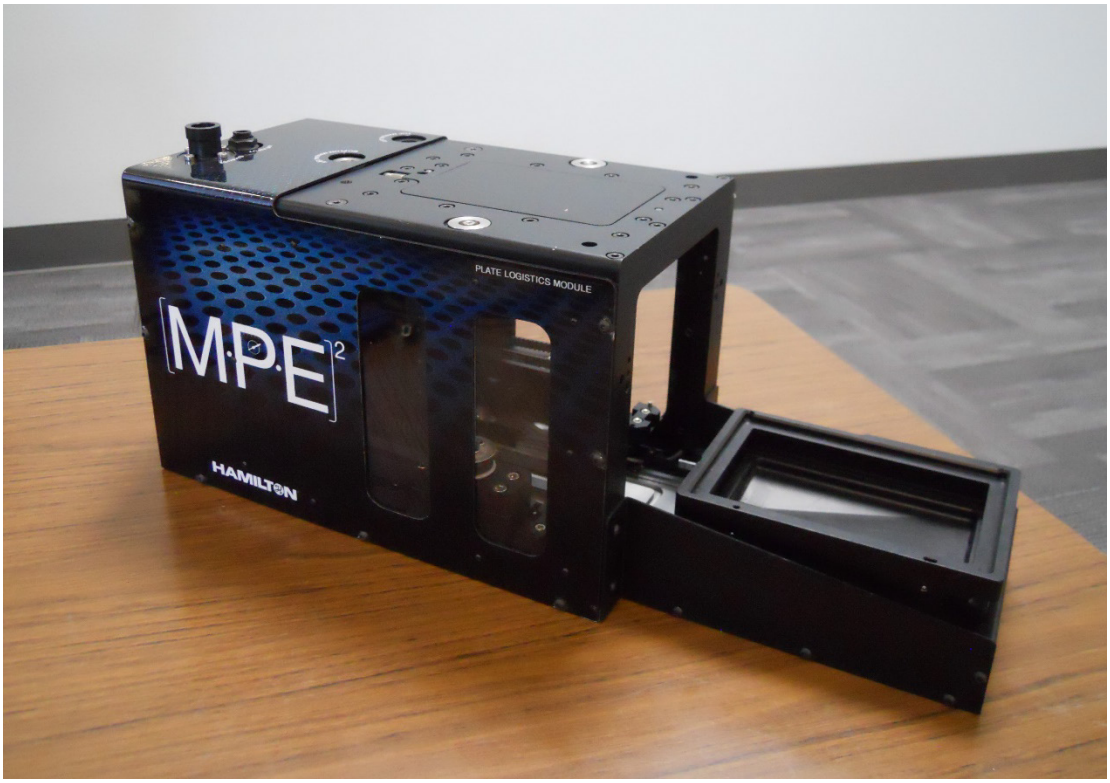


Figure 3–3: [MPE]² Logistics Module

3.2.1 Dual Elevator System

The [MPE]² Logistics Module uses a dual elevator system to handle and process samples. The top elevator stage indicated in Figure 3–3 transports and seals labware (or the Evaporator Module) to the air manifold. The bottom elevator stage, located directly below the top stage in Figure 3–3, works in conjunction with the top elevator stage to transport liquid to a collection bottle. The bottom stage is connected to a pump in the Control Box, which works with a vacuum trap to capture the liquid as it moves toward the waste bottle. The bottom elevator stage also transports collection plates used during elution steps.

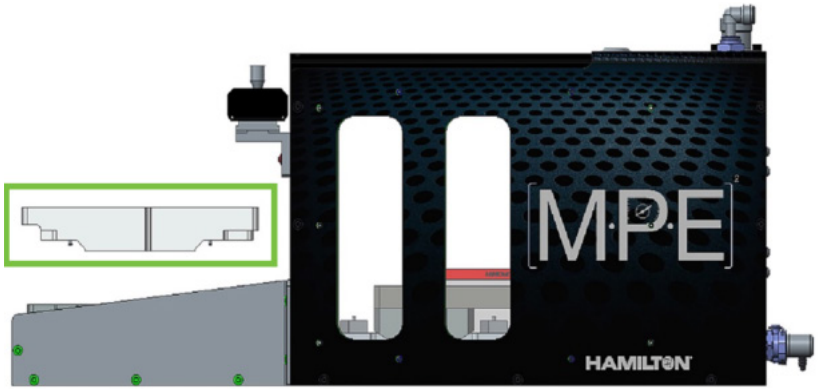


Figure 3–4: Dual elevator system

Both the top and bottom elevator stages can be forced to release labware using the manual release buttons on top of the Logistics Module. This function is useful in the event of unrecoverable errors that occur while labware is being processed within the [MPE]². Refer to section 8 for additional information on troubleshooting.

3.2.2 Manifold

The manifold is where pressure is applied to labware via an air pump. It is designed to distribute air pressure equally across all plate wells, and make sure that wells that are processed more quickly do not affect other wells. Manifolds are tested to ensure that a CV of 2% is achieved across the plate.

Different manifolds are available for 96-well, 48-well, and 24-well formats. The manifolds can be removed and switched to process different plate sizes. The 48- and 24-well manifolds can be used with tube adapters to process samples tubes. Refer to section 4.8 for instructions on installing manifolds.

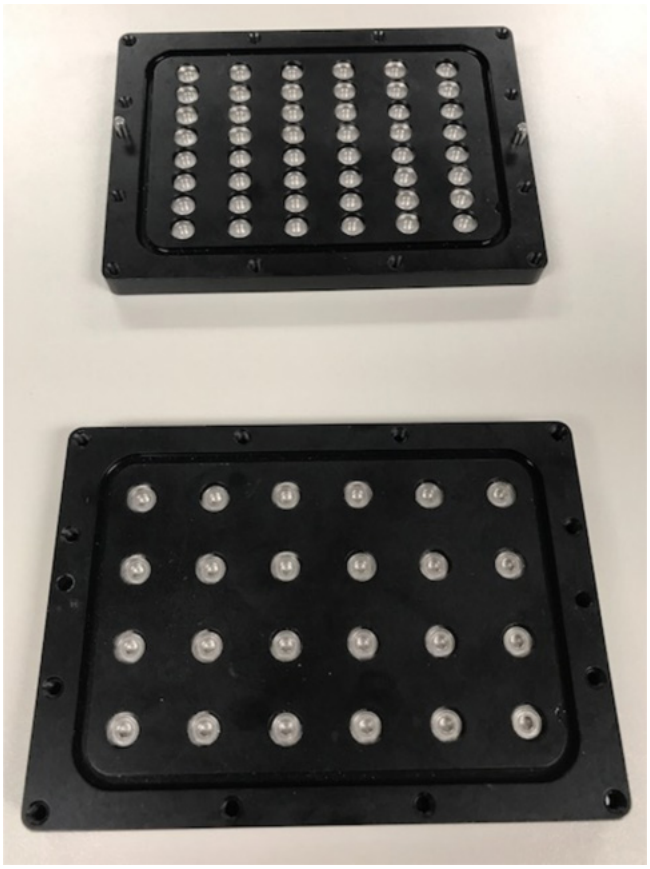


Figure 3–5: Air manifolds

3.3 Evaporator Module

The Evaporator Module can be used in conjunction with the Logistics Module to evaporate solvents. Unlike the Logistics Module, the Evaporator Module does not have a fixed deck position when integrated – the instrument's gripper must place the Evaporator Module on a filter plate adapter on the Logistics Module when it is used. Depending on the solvent and evaporation parameters, the Evaporator Module can evaporate solvents in 2-20 minutes.

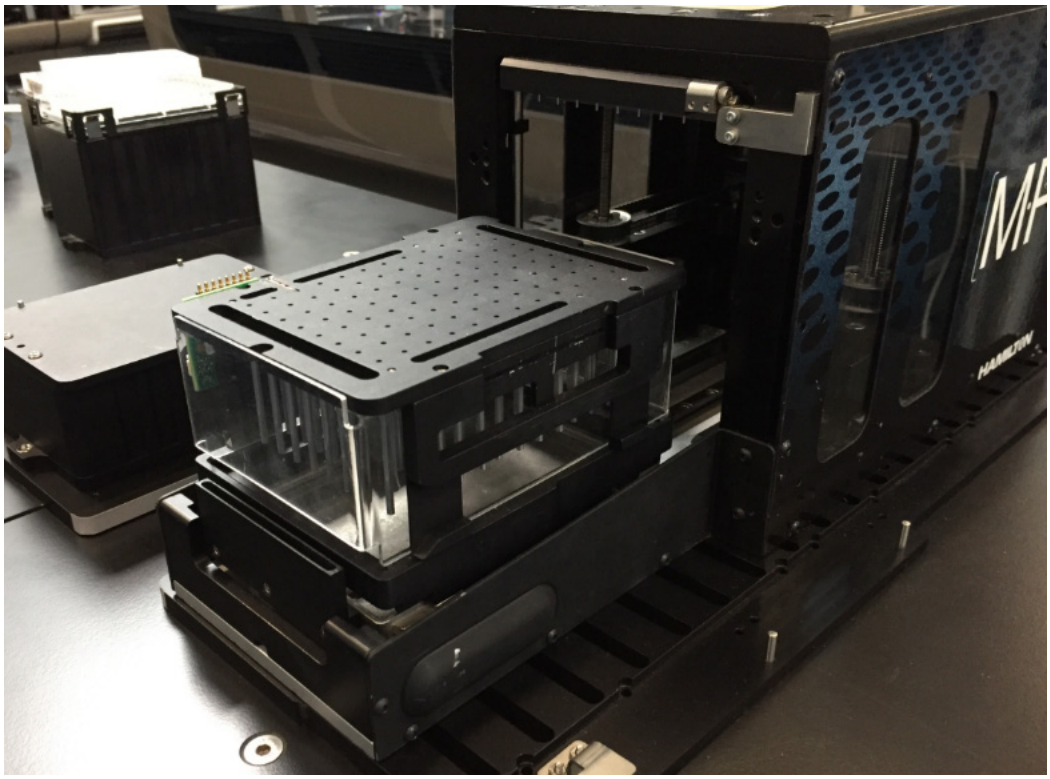


Figure 3–6: Placing the Evaporator Module on a filter plate adapter

WARNING: The air exhaust must be connected to the laboratory ventilation system and routed out of the building to avoid creation of harmful aerosols. The [MPE]² has ports available to connect to a fume hood or ventilation system, but it is the responsibility of the laboratory to provide them.

The Evaporator Module works with a gas heater integrated with the Logistics Module. Instead of a filter plate, the Evaporator Module is loaded onto the dual elevator. The needles on the Evaporator module are heated, evaporating liquid in the wells of the plate below.

WARNING: Do not touch the Evaporator Module or gas heater when it is in use.

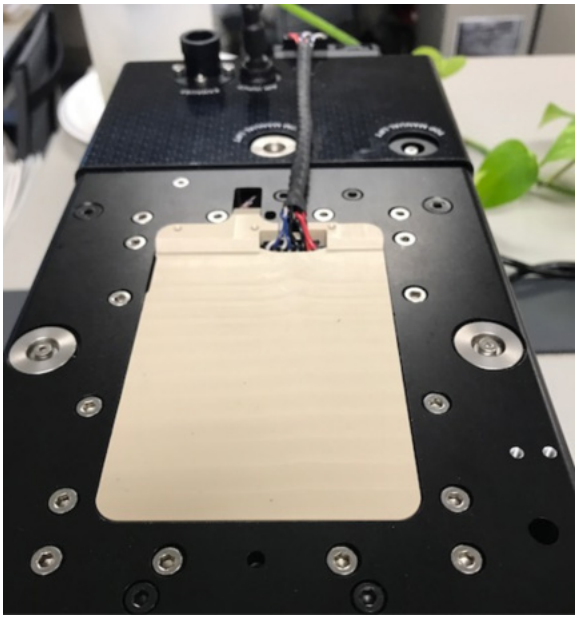


Figure 3–7: Gas heater

3.4 Reagent Fill Module

The Reagent Fill Module integrates with the dual elevator on the Logistics Module to distribute reagents to labware. The pump can distribute 1 mL of liquid across a 96-well plate in 50 seconds using a reagent manifold, and is able to connect to 17 reagent bottles when using valve extensions. The manifold can dispense 50-2000 µL per well.

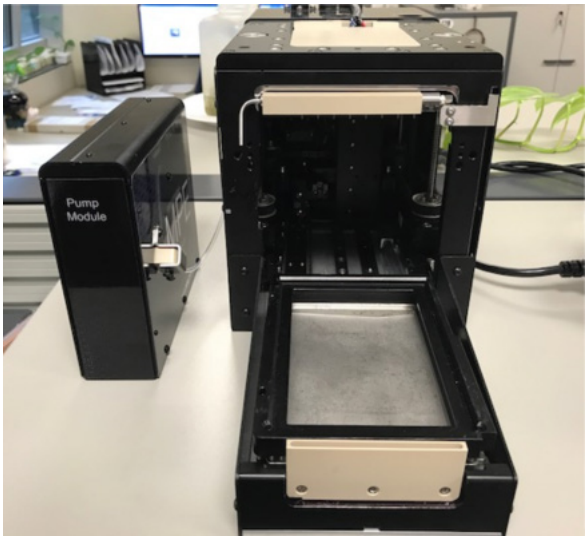


Figure 3–8: Reagent Fill Module and pump

The reagent tubes must be flushed with deionized water between dispenses. Liquid waste is pumped to a waste bottle.

The reagent bottles can be housed in Hamilton bottle racks. Each bottle rack holds two reagent bottles. The bottle racks are equipped with load cells that connect to the ACME to tell when a reagent bottle is empty. Refer to sections 4.3.3 and 4.5 for instructions on installing and connecting the reagent bottles and bottle racks.

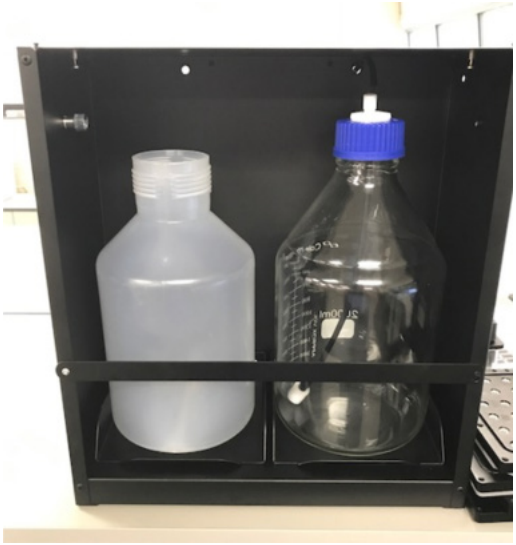


Figure 3–9: Reagent bottle rack

4 Installation

4.1 Site Considerations

The [MPE]² must be located on a stable surface that can accommodate the weight and dimensions of all its components. If the [MPE]² is used as part of an integration, make sure to provide adequate space for the Logistics Module, Control Box, and all cables. Refer to section 10.1 for the full specifications.

WARNING: If using a volatile liquid, a fume hood or ventilation system may be required. The [MPE]² has ports available to connect to a fume hood or ventilation system, but it is the responsibility of the laboratory to provide them.

Protect the [MPE]² from direct sunlight, excessive vibrations, and fluctuating temperatures or humidity.

Provide sufficient space for the controlling computer and the liquid waste. The liquid waste should be stored beneath the work bench to aid the liquid flow. Storage for documentation, tips, pedestals, and maintenance materials should also be taken into account. See sections 4.2, 4.2.2 and 4.2.3 for space requirements for all integration positions.

Provide power outlets for the [MPE]² and the controlling computer. Refer to section 10.1 for the power input requirements for the instrument.

WARNING: Main power voltage supply fluctuations are not to exceed 10% of the nominal supply voltage.

Air/Gas Requirements:

- Clean, oil-free air or nitrogen
- Minimum uninterrupted pressure of 80 psi; if more than one [MPE]² is used, each device requires a consistent air pressure of 80 psi
- Hamilton-provided flow regulator requires 80-120 psi
- Air supply and ¼-inch tubing from air source to regulator/Control Box

Examine the packaging for signs of damage. If the crate or device has been damaged, refer to section 11.1.

Verify the contents of the package of the package with shipping lists. Refer to section 11.1 if any items are missing.

4.2 Integration

4.2.1 Open NIMBUS Integration

4.2.1.1 NIMBUS96 and NIMBUS384

The installation of the [MPE]² on an open NIMBUS96 or NIMBUS384 depends on the type of pipetting tip being used. When using 1 mL tips, the [MPE]² must be installed on the rear adjustable site of the 9+2 deck, as shown in Figure 4–1. Modified adjustable sites and supports are provided in an additional integration kit.

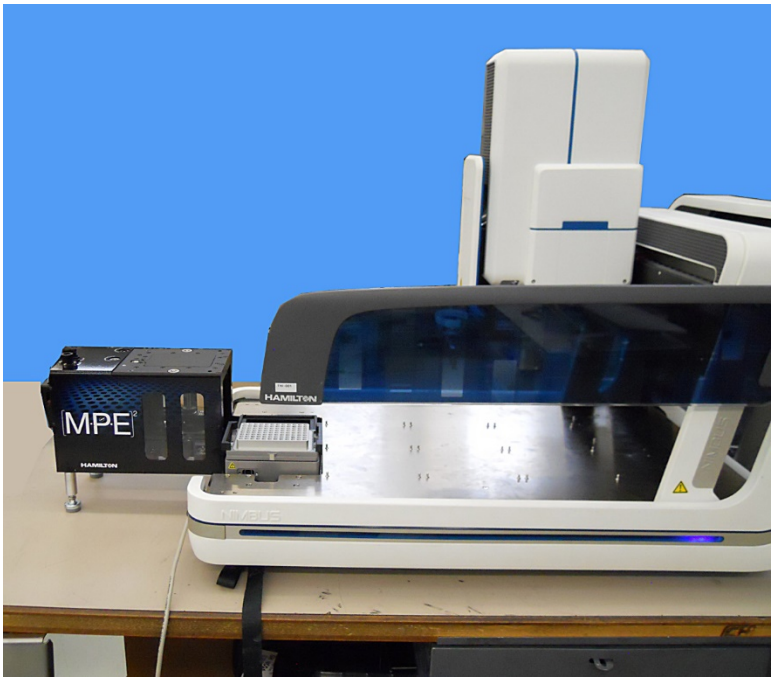


Figure 4–1: Integrating the [MPE]² for use with the MPH and 1 mL tips

If 1 mL tips are not used, the [MPE]² is installed on the middle-right site, as in Figure 4–2.

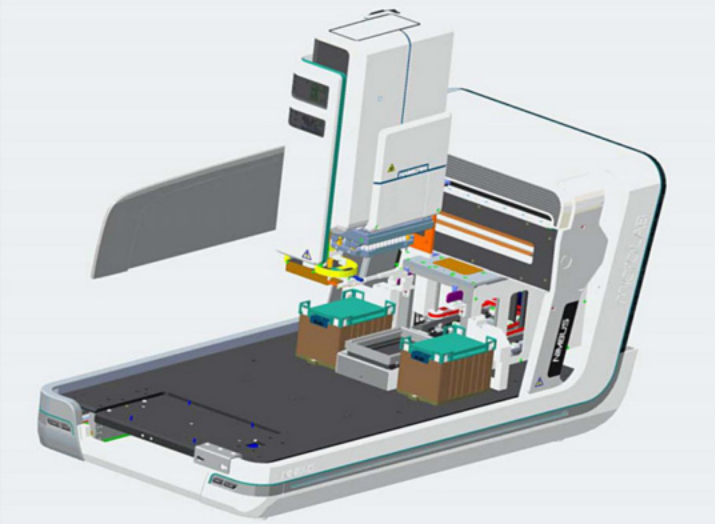


Figure 4–2: Integrating the [MPE]² for use with the MPH

If the [MPE]² has a Reagent Fill Module, place the pump and valve extensions off-deck and use the longer tubing to connect the pump to the Logistics Module. Refer to section 4.3.2 for full instructions on installing the Reagent Fill Module. The pedestal included with the Evaporator Module is used to park it when not in use.

4.2.1.2 NIMBUS4

For an open NIMBUS4, the [MPE]² is placed on the middle-right deck site. Before installing the [MPE]², the tip eject bar must be removed, and the split waste bar must be installed in its place. If the system uses CO-RE Paddles, they must be mounted on the [MPE]², as in Figure 4–3.

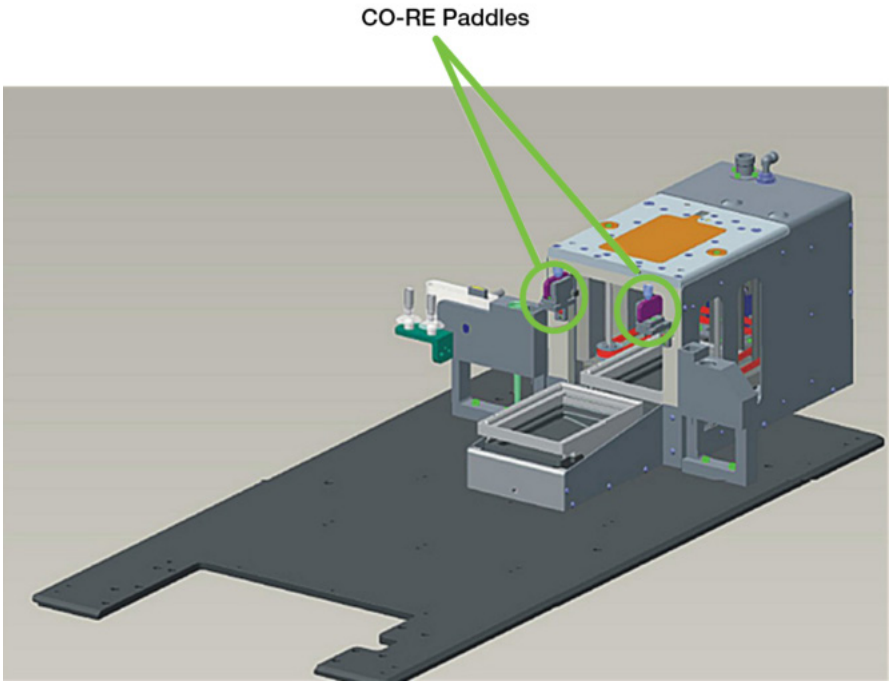


Figure 4–3: Integrating the [MPE]² for use with channels

If the [MPE]² has a Reagent Fill Module, place the pump and valve extensions off-deck and use the longer tubing to connect the pump to the Logistics Module. Refer to section 4.3.2 for full instructions on installing the Reagent Fill Module. The pedestal included with the Evaporator Module is used to park it when not in use.

4.2.2 Enclosed NIMBUS Integration

On the enclosed NIMBUS, the [MPE]² is typically integrated on the front-right site. This is site 11 on a 9+2 deck and site 12 on a 3x4 deck. This integration applies to the NIMBUS4 and a NIMBUS96 or NIMBUS384 that does not use 1 mL tips. If the MPH uses 1 mL tips, a variation of the NIMBUS HD integration is used, with the [MPE]² integrated on the rear-left site using a modified enclosure and supports.

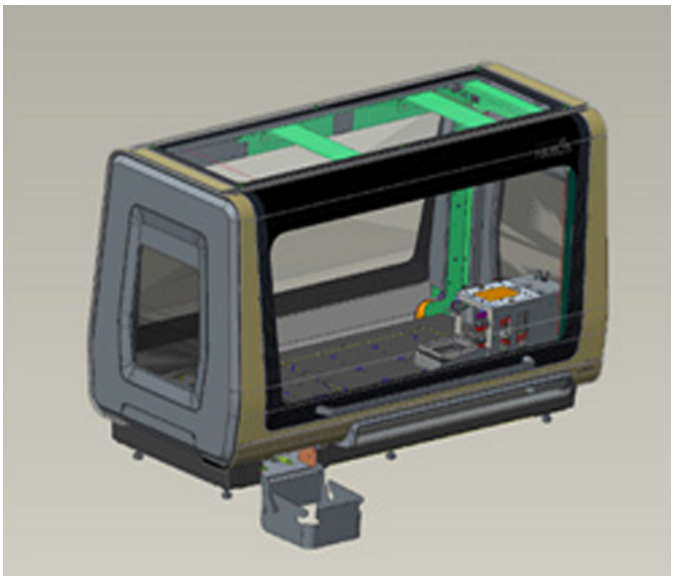


Figure 4–4: Integrating the [MPE]² for use with the enclosed NIMBUS

On the NIMBUS HD, the [MPE]² is placed on the rearmost site on a seven-track carrier loaded onto tracks 1-7. The carrier also supports an adapter for the Evaporator Module pedestal. This integration requires that the Logistics Module sit partway out of the enclosure on supports; a kit with a modified side panel for the enclosure is required for this integration. The tubing for the Reagent Fill module must be routed through the opening on the left side of the enclosure.

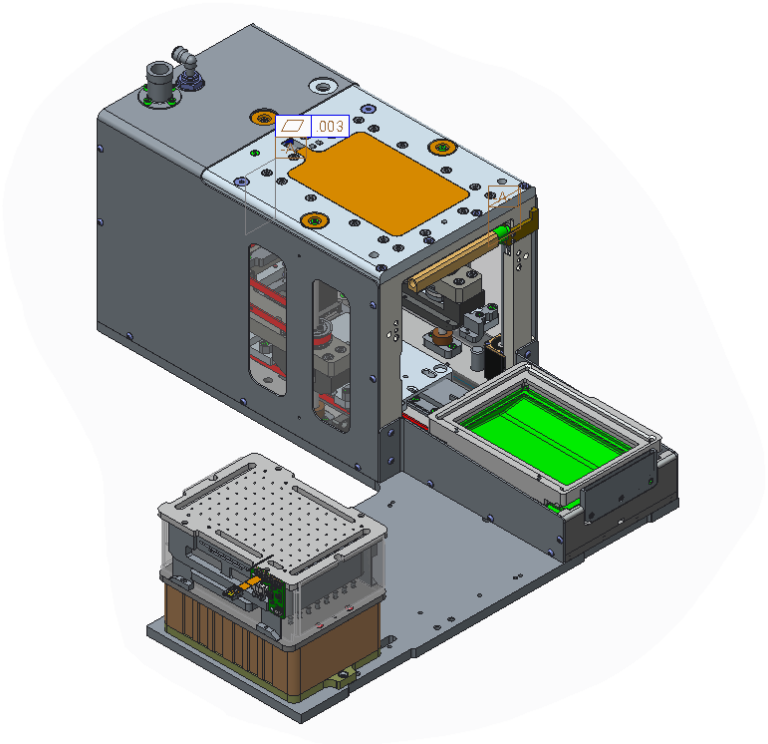


Figure 4–5: NIMBUS HD integration carrier

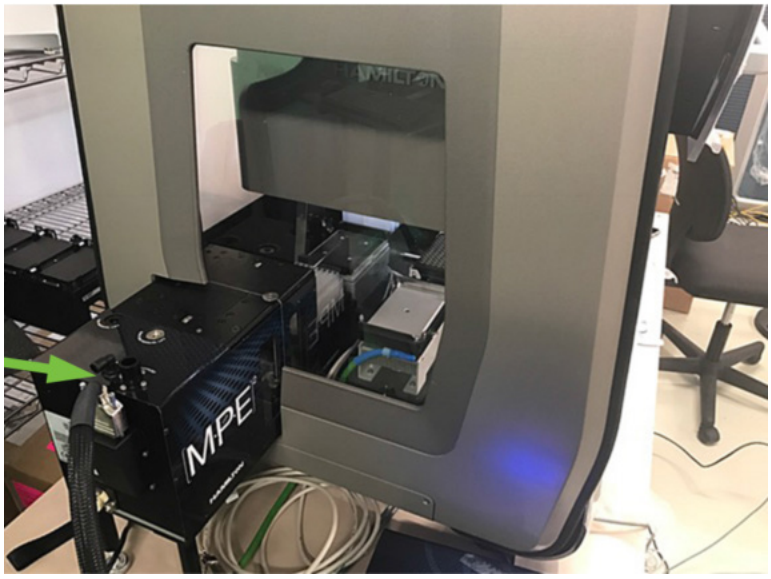


Figure 4–6: Adjusting the enclosure for integration

If the [MPE]² has a Reagent Fill Module, place the pump and valve extensions off-deck and use the longer tubing to connect the pump to the Logistics Module. Refer to section 4.3.2 for full instructions on installing the Reagent Fill Module.

4.2.3 STAR Integration

The integration position for the STAR depends on the pipetting device used with the [MPE]². Note that to use the MPH with the [MPE]², the MPH head cover included with the [MPE]² must be installed.

WARNING: To prevent collisions when using the MPH, remove the standard MPH cover and replace it with the modified cover included with the [MPE]² integration kit.

The requirements and use for each integration position are summarized in the following table. The name of the position refers to the rightmost track that the Logistics Module occupies.

STAR		Track 1	Track 3	Track 7	Far left
Track Consumption		1	1-3	1-7	0
Plate Transport	iSWAP	Yes	No	Yes	Yes
	CO-RE Grippers	No	Yes	Yes	No
Pipetting	Channels	No	No	Yes	No
	MPH	Yes	Yes	Yes	Yes

STAR		Track 1	Track 3	Track 7	Far left
System Modification	Travel Lanes	Yes	Yes	No	No
	Deck Extension	Yes	Yes	No	Yes

- **Track 1:** This position places the [MPE]² partially to the left of track 1. Use of this position requires use of an iSWAP to transport the plates, and seven tracks of free space in front of the [MPE]².

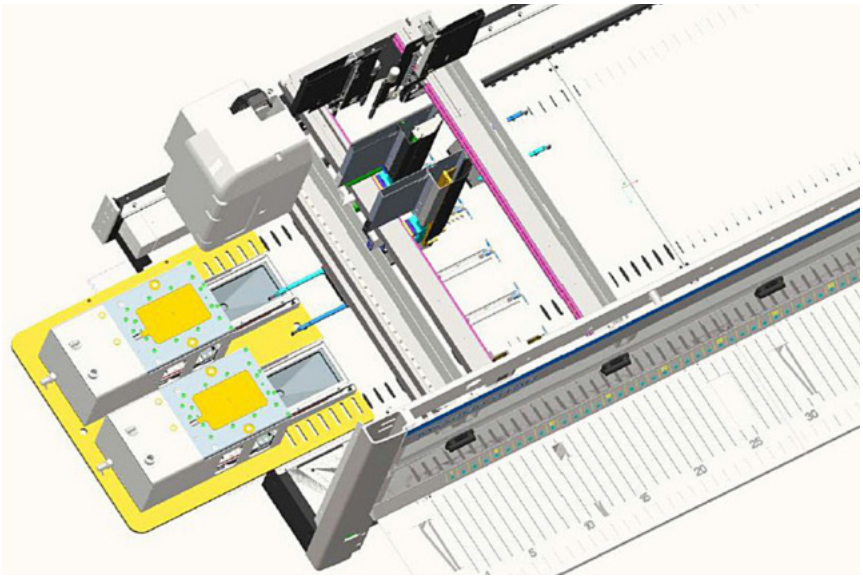


Figure 4–7: Using the Track 1 STAR integration

- **Track 3:** This position is used for instruments that do not have an iSWAP. Note that the CO-RE Gripper plate movements must be offset if this position is used, as the channels cannot reach the default grip point.
- **Track 7:** This position is used for instruments that need to access the [MPE]² with channels.

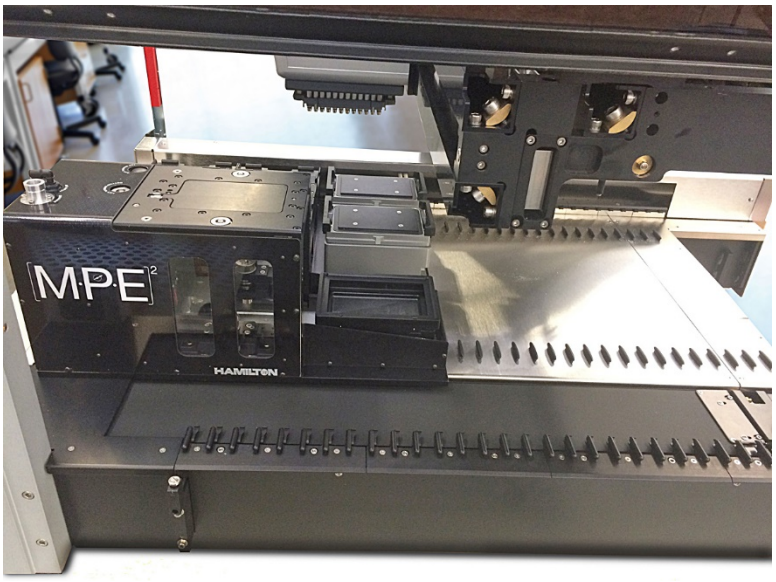


Figure 4–8: Using the track 7 STAR integration

- **Far left:** This position places the [MPE]² off the deck, and occupies zero tracks. Use of this position requires an iSWAP for plate transport.

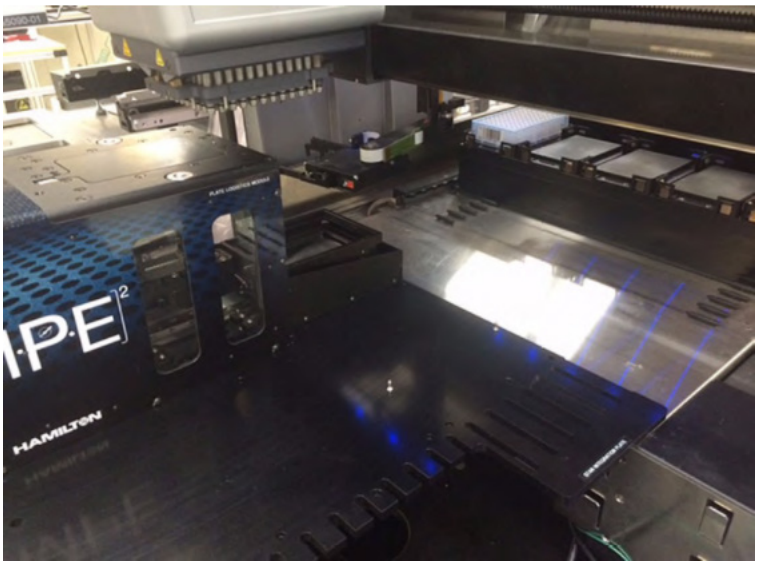


Figure 4–9: Using the Far Left STAR integration

All integrations use an adapter plate to attach to the deck. The adapter plate can integrate up to two [MPE]² devices, depending on their configuration. An [MPE]² with a Reagent Fill Module requires an adapter plate with a cutout. If an adapter plate with one cutout (shown in Figure 4–11) for a reagent pump is used, then an Evaporator Module or a second [MPE]² without a Reagent Fill Module may be placed on the plate.

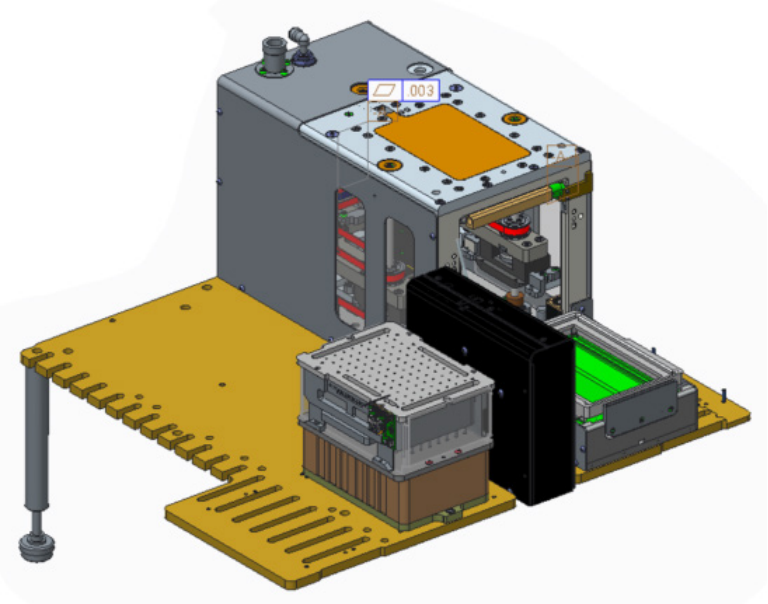


Figure 4–10: Adapter plate with one reagent pump cutout

An adapter plate with two reagent pump cutouts (shown in Figure 4–12) can integrate two [MPE]² devices with any configuration. If either of them uses an Evaporator Module, it must be parked on an MFX base using the special adapter shown in Figure 4–13.

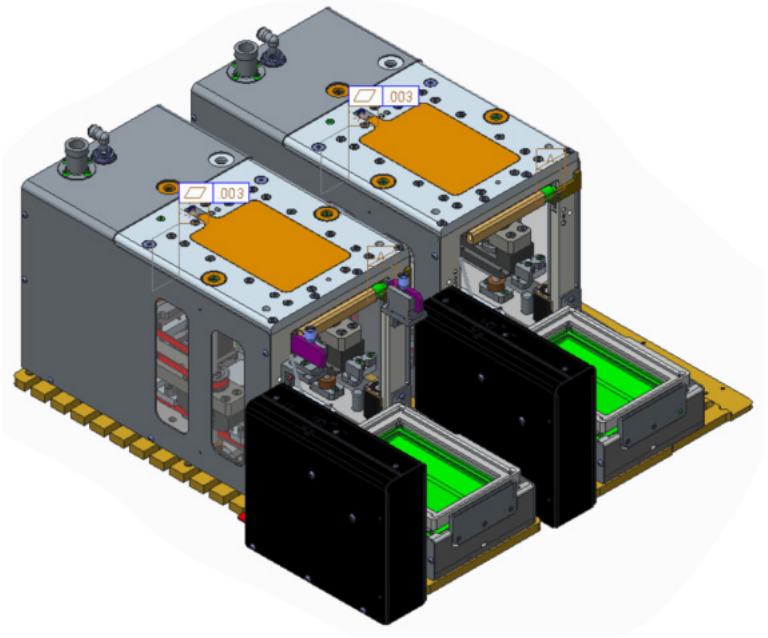


Figure 4–11: Integrating multiple [MPE]² devices with reagent pumps

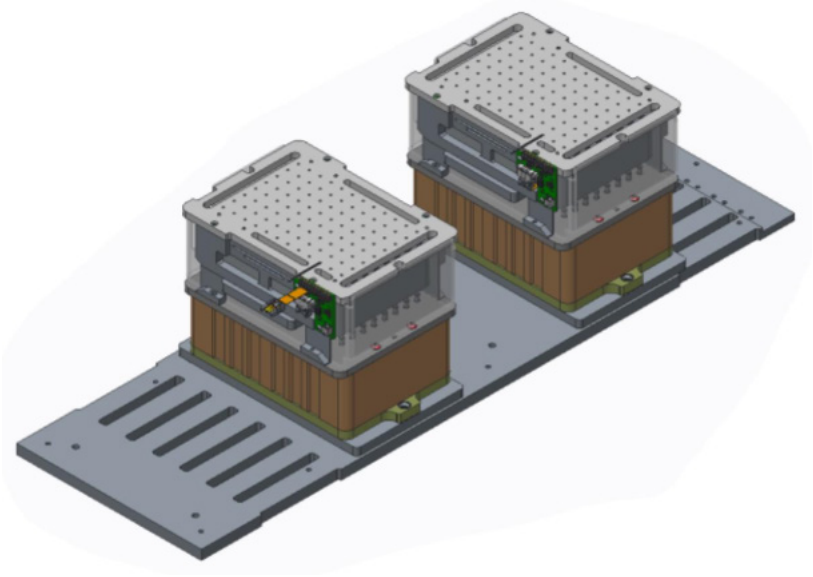


Figure 4–12: Evaporator MFX carrier

Attaching a reagent pump to the adapter plate requires a kit with a mounting bracket. The kit and mounting bracket are included with the integration plate.

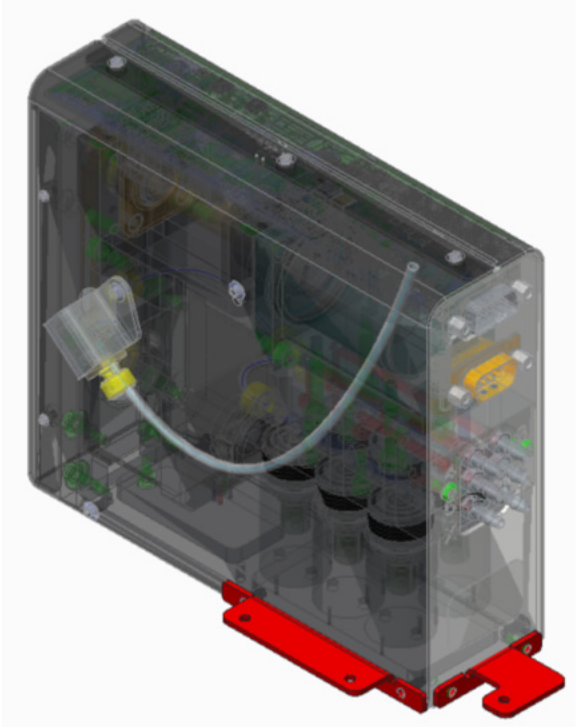


Figure 4–13: STAR reagent pump bracket

4.2.4 Microlab VANTAGE Integration

The integration position for the Microlab VANTAGE depends on the pipetting device used with the [MPE]². The requirements and use for each integration position are summarized in the

following table. Note that to use the MPH with the [MPE]², the MPH head cover included with the [MPE]² must be installed.

WARNING: To prevent collisions when using the MPH, remove the standard MPH cover and replace it with the modified cover included with the [MPE]².

The requirements and use for each integration position are summarized in the following table. The name of the position refers to the rightmost track that the Logistics Module occupies.

Note that the [MPE]² cannot be integrated with a Microlab VANTAGE that has both an Active Side Waste and an Internal Plate Gripper.

VANTAGE		Track 1	Track 12	Track 16
Track Consumption		1	1-12	1-16
Plate Transport	IPG	Yes	No	No
	QCG	No	Yes	Yes
	Track Gripper	Yes	Yes	Yes
Pipetting	Channels	No	Yes	Yes
	MPH Access	Yes	Yes	Yes
System Modification	Travel Lanes	No	No	No
	Deck Extension	Yes	Yes	Yes

- **Track 1:** This position is used for instruments that need to access the [MPE]² with the IPG. It places the [MPE]² off the deck, so it is only accessible by the MPH for pipetting.
- **Track 12:** This position is used for instruments that have either an MPH or channels, but not both. It is accessible by all grippers, except for the IPG.
- **Track 16:** This position is used for instruments that have both an MPH and channels. It is accessible by all grippers, except for the IPG.

All integrations use an adapter plate to attach to the deck. The adapter plate can integrate up to two [MPE]² devices, depending on their configuration. An [MPE]² with a Reagent Fill Module requires an adapter plate with a cutout. If an adapter plate with one cutout (shown in Figure 4–17) for a reagent pump is used, then an Evaporator Module or a second [MPE]² without a Reagent Fill Module may be placed on the plate.

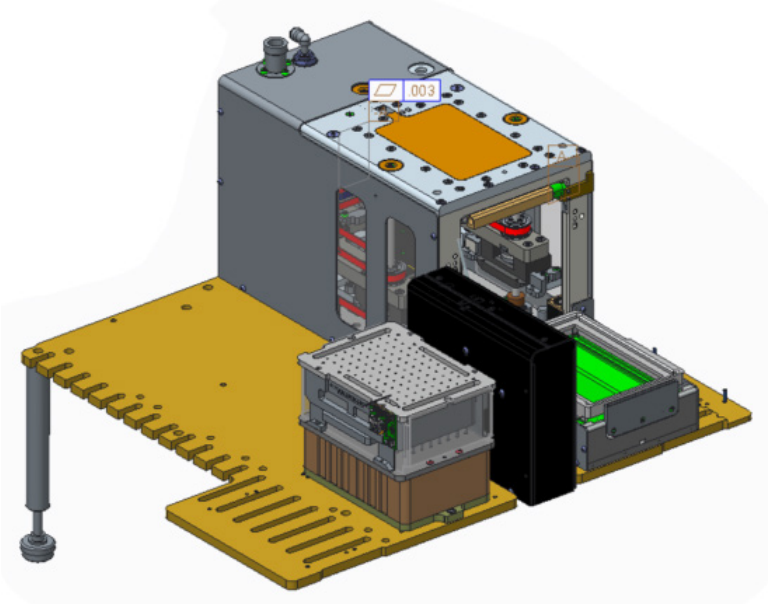


Figure 4–14: Adapter plate with one reagent pump cutout

An adapter plate with two reagent pump cutouts (shown in Figure 4–18) can integrate two [MPE]² devices with any configuration. If either of them uses an Evaporator Module, it must be parked on an MFX base using the special adapter shown in Figure 4–19.

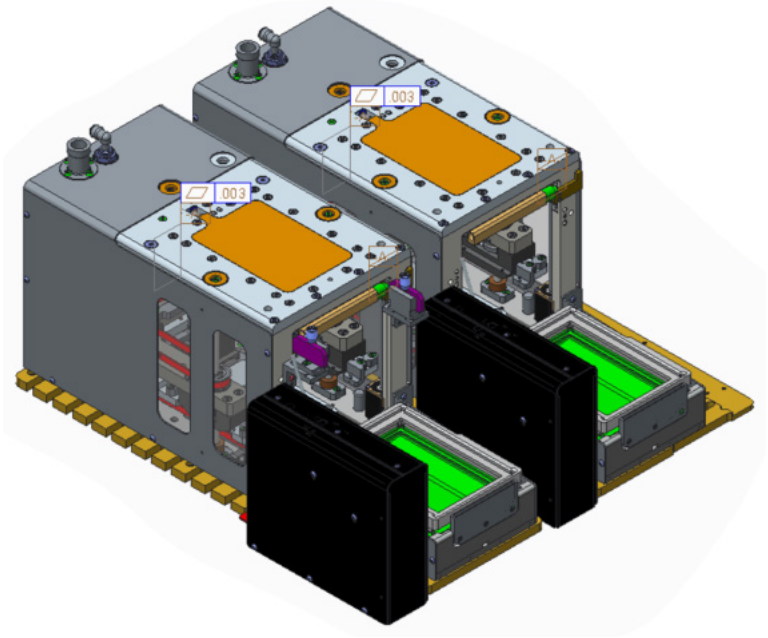


Figure 4–15: Integrating multiple [MPE]² devices with reagent pumps

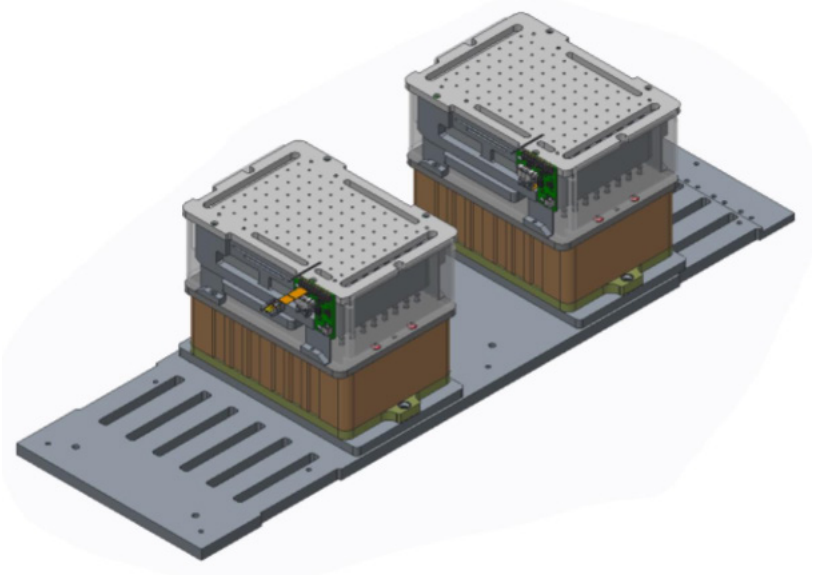


Figure 4–16: Evaporator MFX carrier

Attaching a reagent pump to the adapter plate requires a kit with a mounting bracket. The kit and mounting bracket are included with the integration plate.

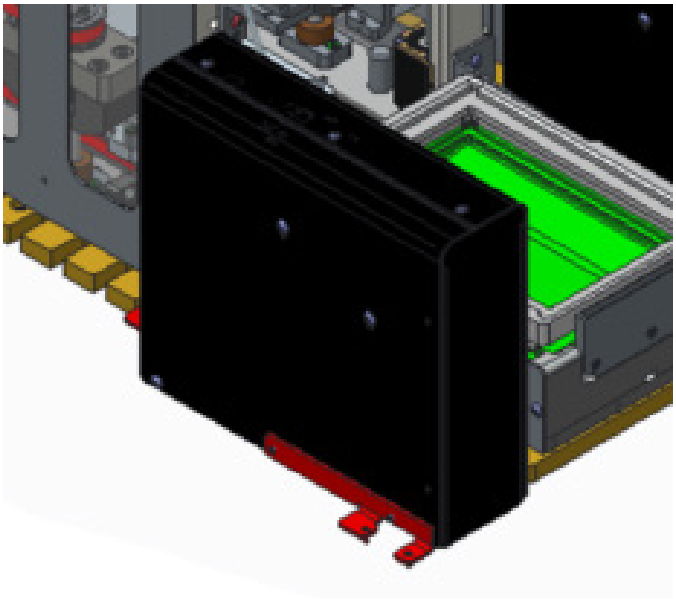


Figure 4–17: Microlab VANTAGE reagent pump bracket

4.3 Connecting Cables

WARNING: Before installing or removing a mechanical or electrical component, device, or accessory, the [MPE]² and any associated instruments must be switched off and disconnected from the power supply.

4.3.1 Logistics Module

1. **Connect the Logistics Module to the Control Box using the PWR/COMM cable.** The cable plugs into the "COMMUNICATION" port on the Control Box. The bracket for the Logistics Module port can be rotated or removed for ease of use.

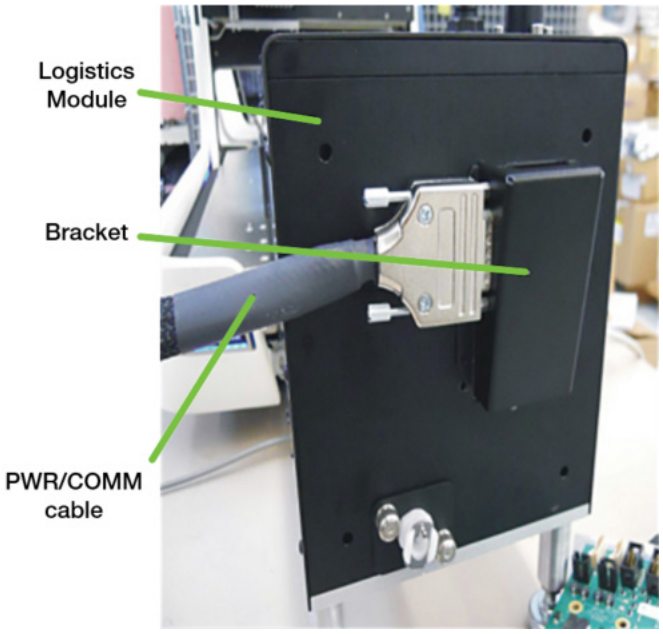


Figure 4–18: Connecting the PWR/COMM cable

2. **If a Reagent Fill or Evaporator Module is used, connect the ACME to the Control Box** via the "[MPE]² CONNECTION" port on the ACME and the "GAS/HEATER" port on the Control Box. Place the ACME beneath the Control Box for best results.

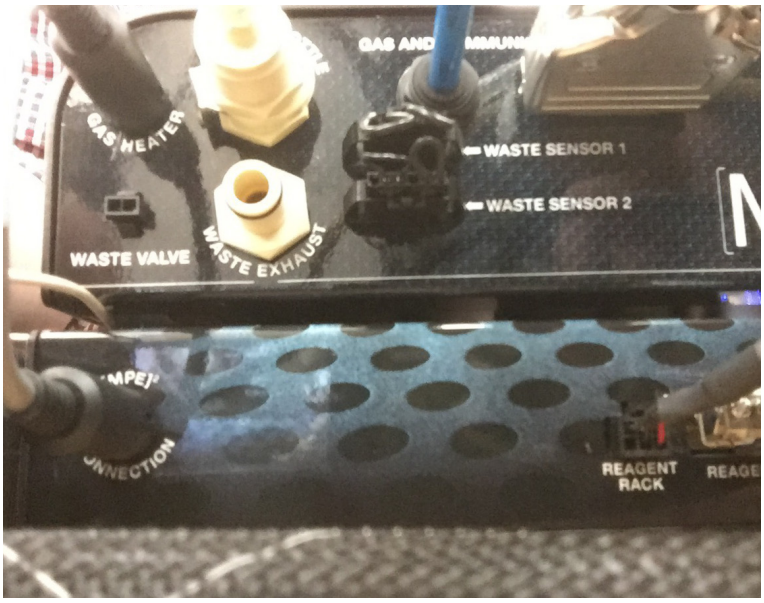


Figure 4–19: Connecting the ACME to the Control Box

3. **Connect the Control Box to the controlling computer.** The [MPE]² supports both USB and Ethernet connections.
4. **Connect the Control Box (and ACME, if present) to a grounded wall outlet.** The AC power cable plugs into the "POWER SUPPLY" port on the Control Box, and the other to the AC adapter.

4.3.2 Evaporator Module

The [MPE]² ships with the adapter and cables for the gas heater pre-installed. The gas heater just needs to be connected to the "EVAPORATOR" port on the ACME (shown in Figure 4–27) using the supplied cable.

4.3.3 Reagent Fill Module

1. **Connect the pump to the Logistics Module.** Use the tubing supplied to connect the nozzle on the side of the pump to the metal elbow fitting on the Logistics Module indicated in Figure 4–23.

   The ideal pump placement is in front of the Logistics Module and to the left, as shown in Figure 4–23. For all NIMBUS integrations, the pump module is placed behind the Logistics Module and to the left; use the longer tubing supplied for these integrations.

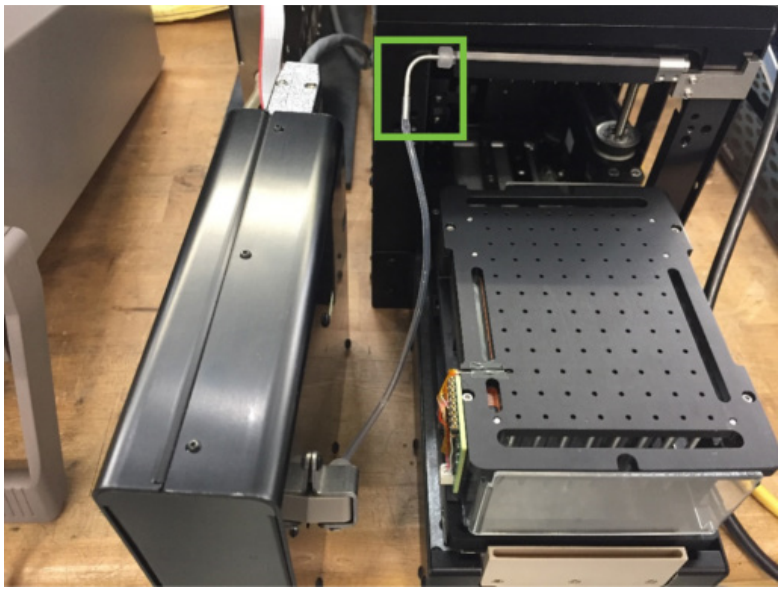


Figure 4–20: Connecting the pump to the Logistics Module

2. **If using valve extensions for extra reagents, connect them end-to-end and place them in their stand, shown in Figure 4–24.** The first valve extension outlined in Figure 4–24, called the "single valve extension," has the port that connects to the pump. Connect any additional valve extensions (called "multiple valve extensions") after the single valve extension.

   Make sure to cover the connector on the last valve extension with the plate and screws provided.

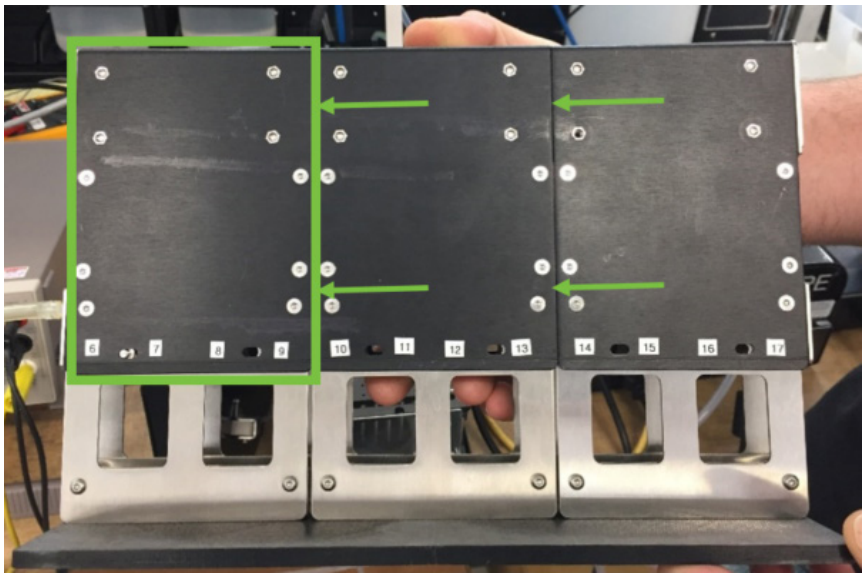


Figure 4–21: Connecting additional valve extensions

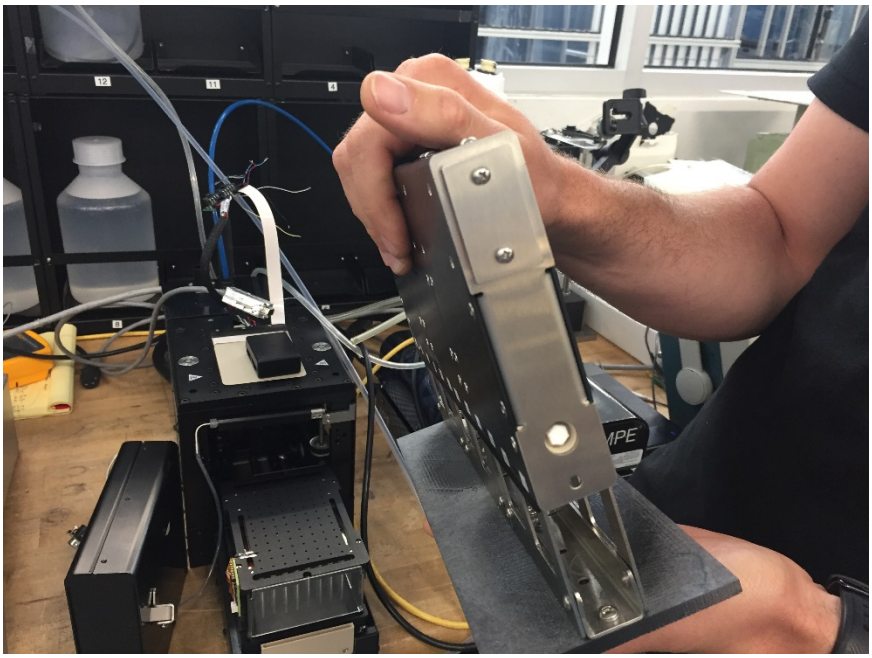


Figure 4–22: Covering the last valve extension connector

3. **If using valve extensions, connect them to the pump.** Connect the tubing to the nozzle labelled "X" on the back of the pump. Connect the RS-232 cable to the port labelled "REAGENT RACK" on the pump.

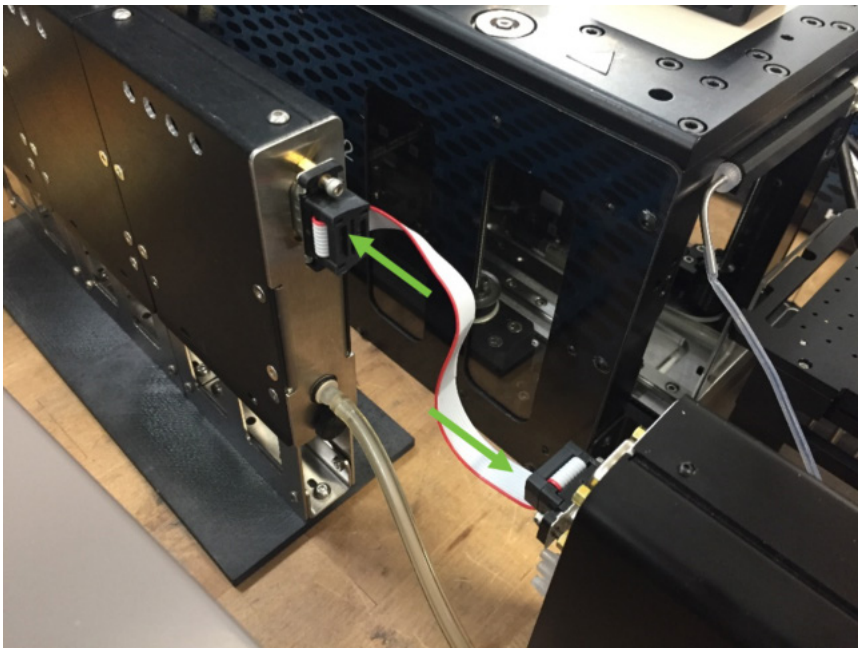


Figure 4–23: Connecting the valve extension to the pump

4. **Connect the pump to the ACME.** Use the supplied RS-232 cable to connect the top port on the back of the pump to the "REAGENT PUMP" port on the ACME.

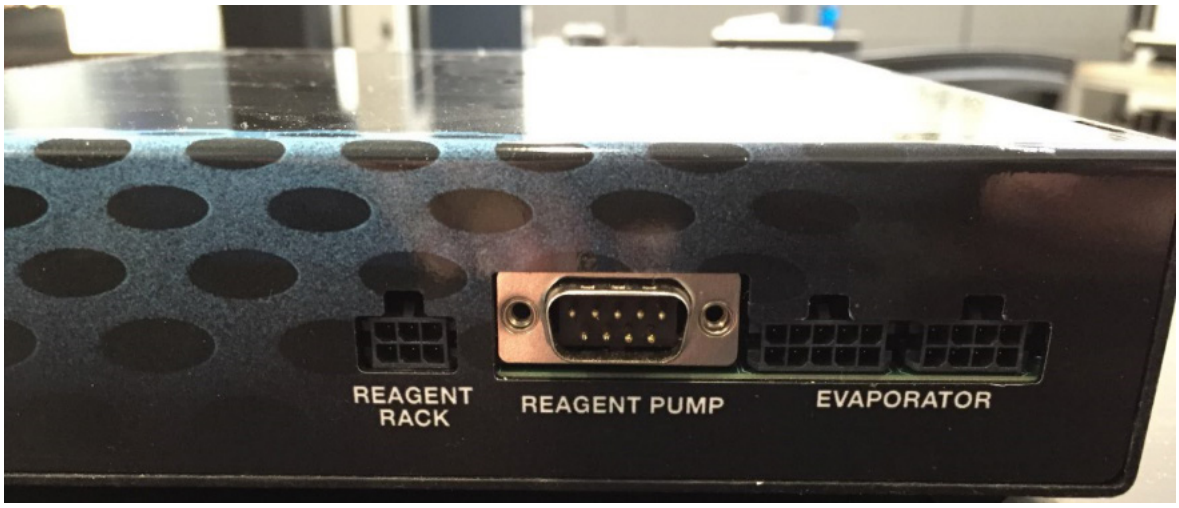


Figure 4–24: Viewing ACME ports

5. **Connect the reagent bottles to the pump and valve extensions.** Connect the DI water bottle to the nozzle labelled "X" on the pump if there are no valve extensions used. If there are, connect the DI water bottle to the last nozzle on the valve extensions.

   Refer to section 4.5 for instructions on attaching the tubing to the bottle caps and using the bottle racks.

6. **If using bottle racks, connect the first rack to the ACME.** The first bottle rack, called the "single bottle rack," has the port that connects to the ACME. Connect any additional bottle racks (called "multiple bottle racks") after the single bottle rack.

4.4 Installing Liquid Waste

1. **Remove both waste tubes from their packaging**.
2. **Connect Waste Tube 1 to the port on the back of the Logistics Module.** Waste Tube 1 does not have the disc-shaped vacuum filter attached to it.

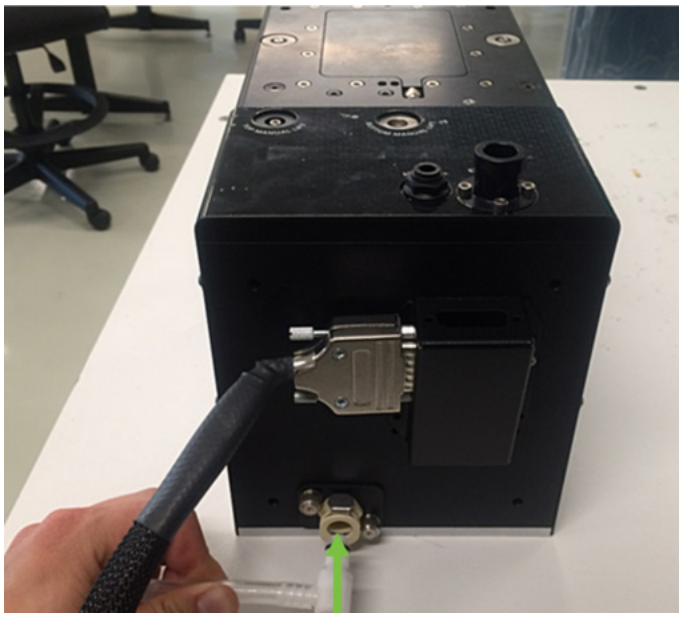


Figure 4–25: Connecting Waste Tube 1

3. **Connect the other end of the tube to the valve on the waste bottle until it clicks.** Either of the valves on the bottle can be used. Make sure the check valve on the waste tube is positioned near the waste bottle, and that the chamfered edge points toward the waste bottle.

WARNING: Make sure the top of the waste bottle is closed tightly to maintain the vacuum in the bottle.

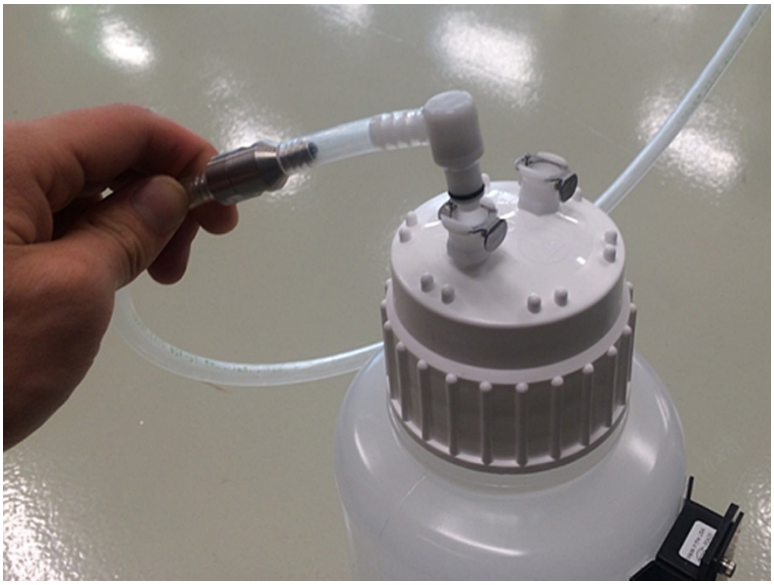


Figure 4–26: Connecting the waste bottle

4. **Connect Waste Tube 2 to the port on the Control Box labelled "TO WASTE BOTTLE".** Waste Tube 2 has a disc-shaped vacuum filter attached to it. Make sure the vacuum filter is positioned near the Control Box.

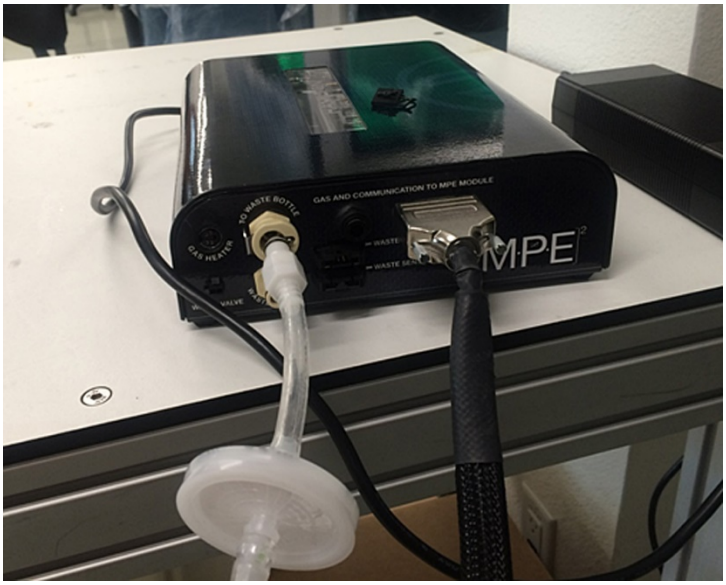


Figure 4–27: Connecting the Control Box waste

5. **Connect the other end of the tube to the value on the waste bottle until it clicks.** Either of the valves on the bottle can be used.

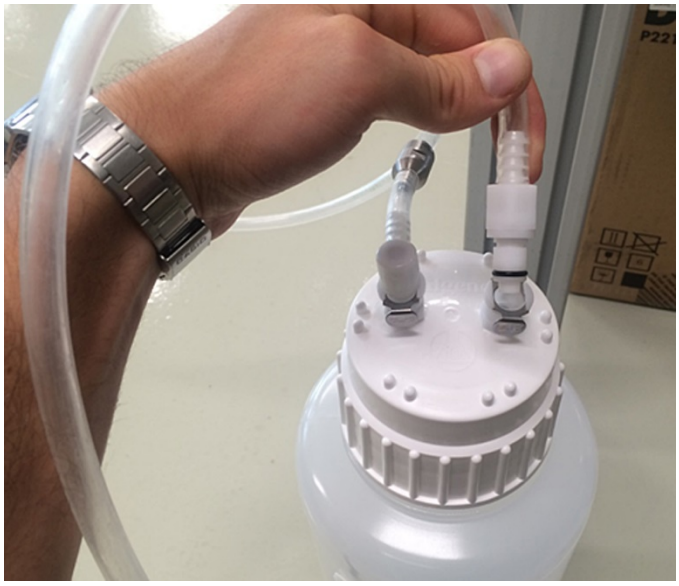


Figure 4–28: Connecting the second waste tube

6. **Connect the Interconnect Cable to the sensor on the waste bottle**.

Figure 4–29: Connecting the Waste Bottle sensor

7. **Connect the other end of the Interconnect Cable to the Control Box** port labelled "WASTE SENSOR 1" until it clicks.

Figure 4–30: Connecting the sensor to the Control Box

WARNING: Before installing or removing a mechanical or electrical component, device, or accessory, the [MPE]² must be switched off and disconnected from the power supply.

4.5 Connecting Reagent Bottles

1. **Unpack the cap, tubing, and the white plug with the compression fitting.** Make sure to keep the instructions included with the compression fitting.

Figure 4–31: Unpacking the reagent bottle cap kit

2. **Screw the white plug into one of the ports on the cap.** Both ports are the same, and only one is needed.

Figure 4–32: Plugging the unused port

3. **If using a Hamilton bottle rack, thread the tubing through the back panel**.

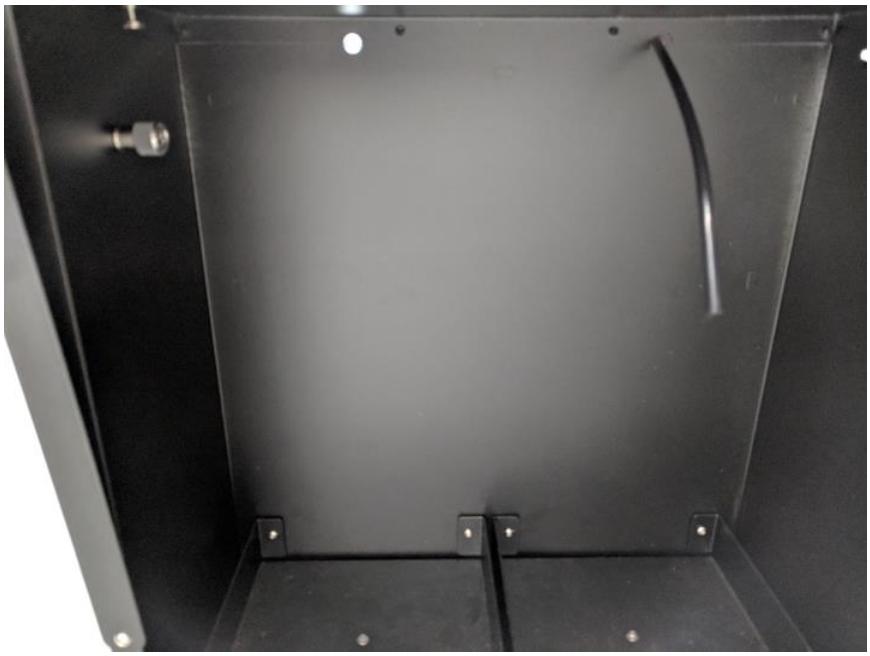


Figure 4–33: Threading the reagent bottle tubing

4. **Attach the black compression fitting to the tube** according to the instructions included in its bag. Make sure the metal ring and green ferrule are properly oriented, or the tubing will not be secure.

Figure 4–34: Attaching the compression fitting

5. **Slide the free end of the tube through the cap** until the free end reaches the bottom of the bottle.
6. **Tighten the compression fitting into the cap** once the desired length of tubing is set.

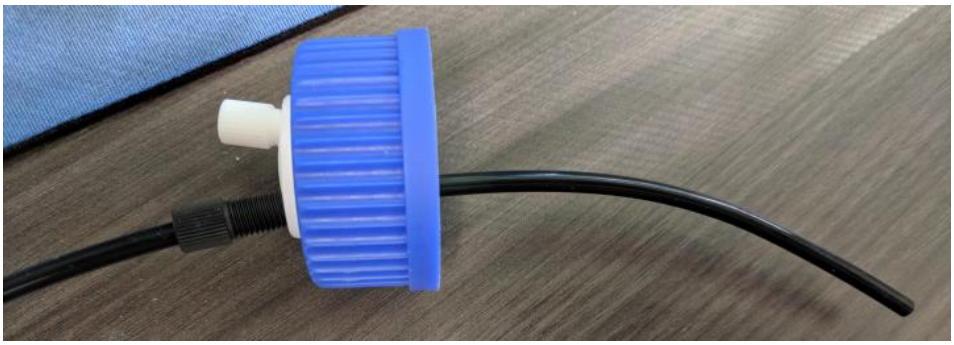


Figure 4–35: Fixing the tubing to the cap

4.6 Installing the Filter/Regulator

WARNING: System uses pressurized air or nitrogen gas. Use caution when disconnecting the supply line. Ensure the Filter/Regulator is turned off before disconnecting supply from the Control Box.

1. **Remove the cap screw shown in Figure 4–39** using the hex/ball screwdriver and handle screwdriver.

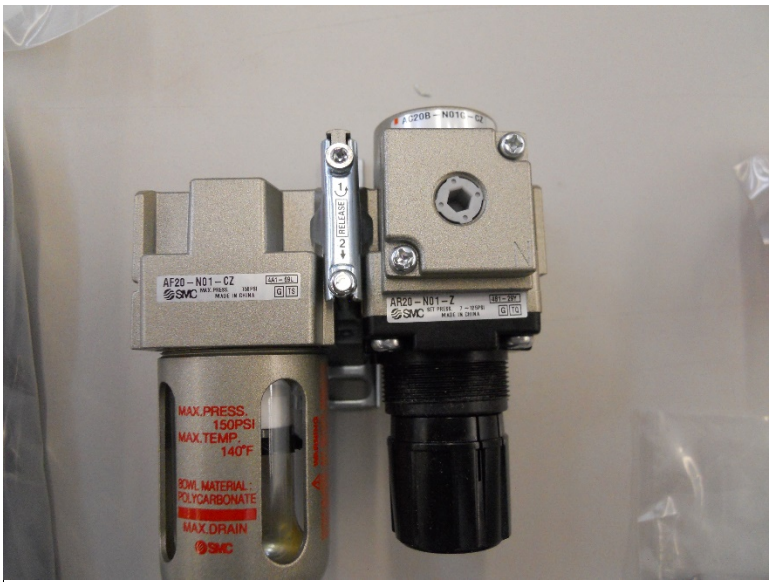


Figure 4–36: Locating the flow regulator cap screw

2. **Attach the pressure gauge** to the port that the cap screw covered.
3. **Attach the two elbow fittings on either side of the Filter/Regulator** as shown in Figure 4–40.

Figure 4–37: Attaching the pressure gauge and elbow fittings

4. **Cut the desired length of tubing from the 10 feet of tubing supplied and use it to connect the Filter/Regulator Unit and the Control Box via the "AIR INPUT" port.** Use the supplied tubing cutter to cut the desired length of tubing.

   Use the least amount of tubing possible to reduce pressure losses between the Filter/Regulator and the [MPE]².

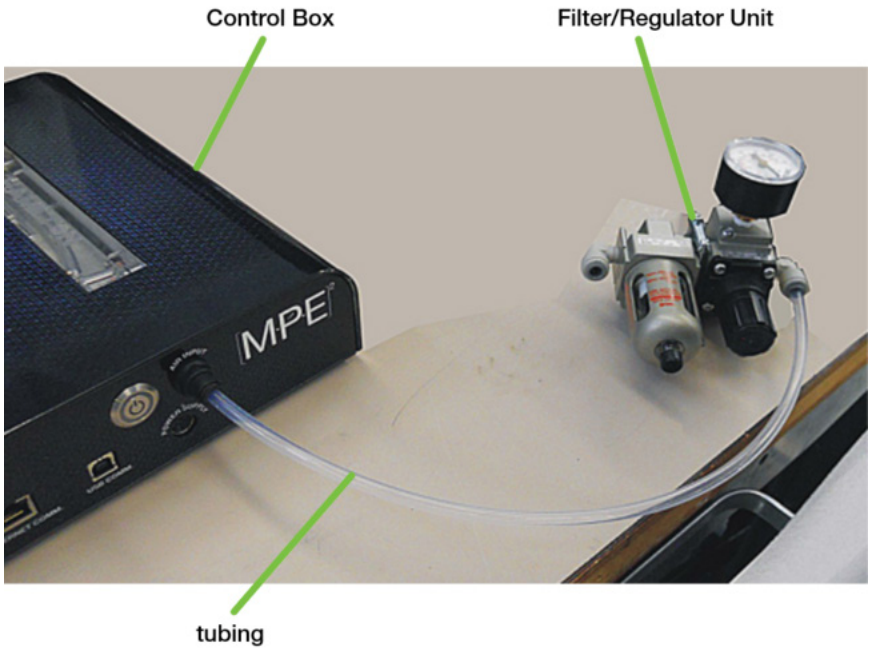


Figure 4–38: Connecting the Filter/Regulator to the Control Box

5. **Connect the Filter/Regulator to the laboratory air supply using ¼-inch tubing, and set the Filter/Regulator to a maximum pressure up to 120 psi.** Turn the black knob below the pressure gauge to increase or decrease the pressure. An uninterrupted supply of air at a minimum of 80 psi is required for each [MPE]².

   For best results, place the Filter/Regulator as close to the laboratory air supply as possible. The Filter/Regulator may be mounted to a wall if desired.

6. **Cut another length of tubing to connect the Control Box and the Logistics Module.** Connect one end of the tube to the "GAS" port on the Control Box and the other to the "AIR INPUT" port on the Logistics Module.

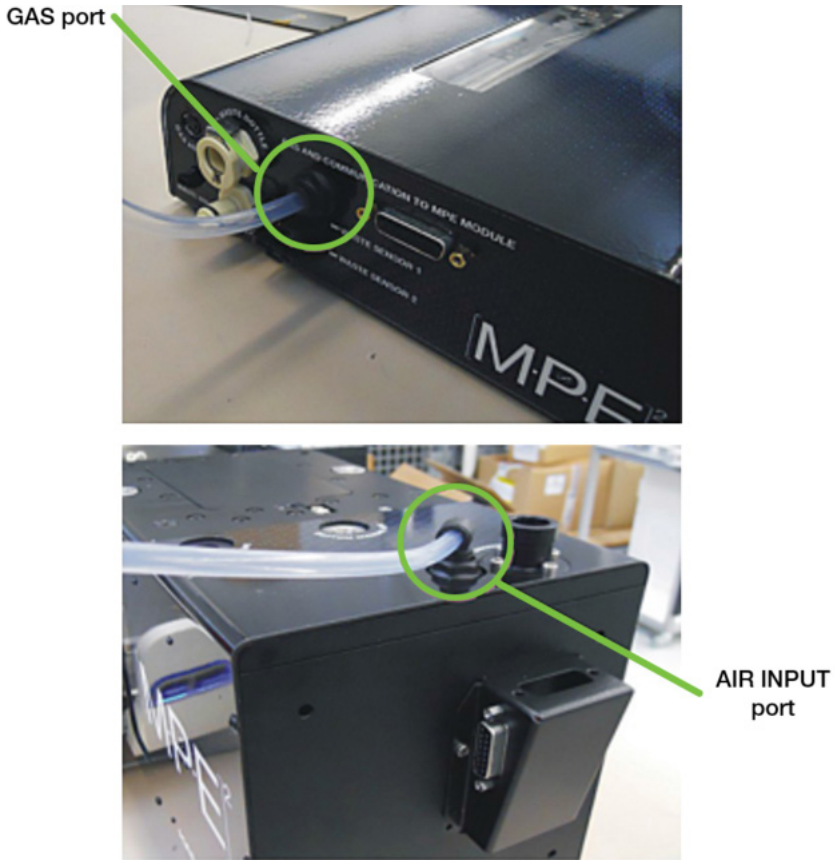


Figure 4–39: Connecting the Control Box and Logistics Module

4.7 Software Installation

Install the necessary drivers for use with Hamilton software. Before launching the installation, turn off or disable any antivirus software and internet connection.

It is recommended that only Hamilton authorized personnel should install or update software. Do not change the factory settings for sleep/hibernation, as doing so may cause run interruption and loss of data.

WARNING: Take the necessary precautions to guard against software viruses. Use only the manufacturer's original installation media for the operating system and Hamilton software.

4.7.1 Minimum Computer Requirements

- 2.0 GHz processor
- 800 MHz FSB
- 14 in monitor at 1920 x 1080 px

- DirectX 10.0-compatible graphics card
- 4.0 GB RAM
- 80 GB hard drive
- 4 USB ports
- 1 Ethernet port
- Windows 7 (32- or 64-bit) Professional or Ultimate
- Adobe Reader and Microsoft Office Home and Business pre-installed

4.7.2 Setting the Computer's IP Address

The controlling computer can communicate with the [MPE]² using an Ethernet connection. If an Ethernet connection is used, it must be configured correctly. Use the following procedure to set up the connection properties.

1. **Click the Windows START button and then select Control Panel**.
2. **Click Network and Internet > Network and Sharing Center > "Change adapter settings"**.
3. **Right-click the Ethernet connection and select Properties.** In the Properties window, double-click the connection "Internet Protocol Version 4 (TCP/IPv4)."
4. **Place the cursor in the Subnet mask box.** The mask 255.255.255.0 should automatically appear, as in Figure 4–43.
5. **Click OK to save the properties.** Close any opened dialog boxes to return to the desktop.

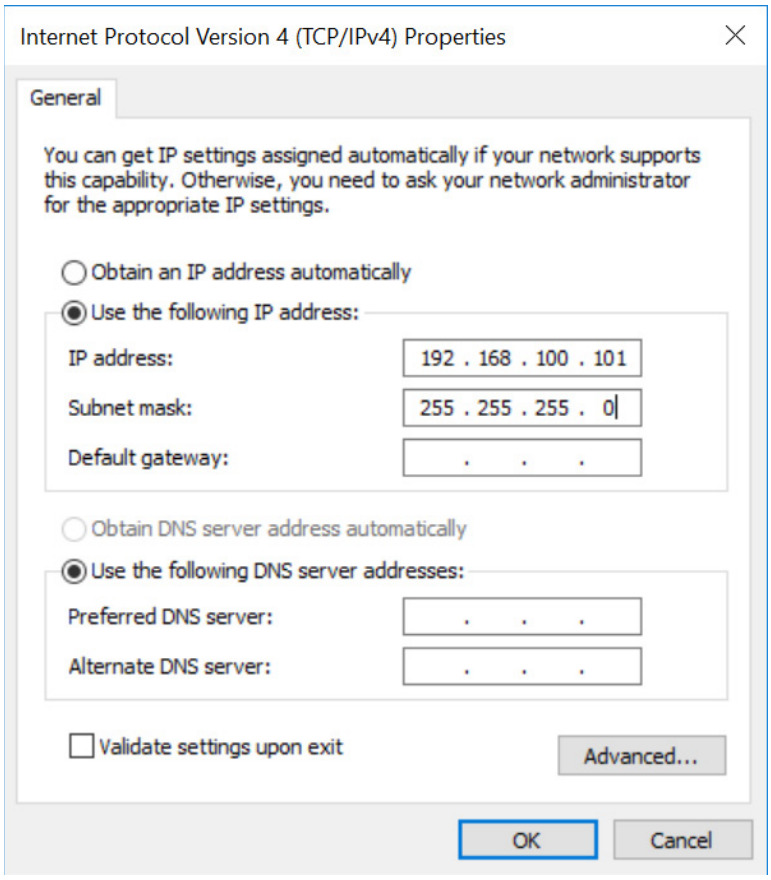


Figure 4–40: Internet Protocol Version (TCP/IPv4) Properties window

4.7.3 Installing Drivers

The installers described in this section do not include the controlling software. For benchtop use or integration with a STAR or NIMBUS, make sure the appropriate Vector software is installed first, then install the HSL driver. For integration with the Microlab VANTAGE, make sure INSTINCT V is installed first, then install the SiLA driver.

4.7.3.1 HSL Driver

The HSL driver installs a library of commands for the [MPE]². Refer to chapter 6 for detailed descriptions of these commands.

1. **Insert the installation media**.
2. **Open the installation media folder and run the executable.** The Setup Wizard appears.

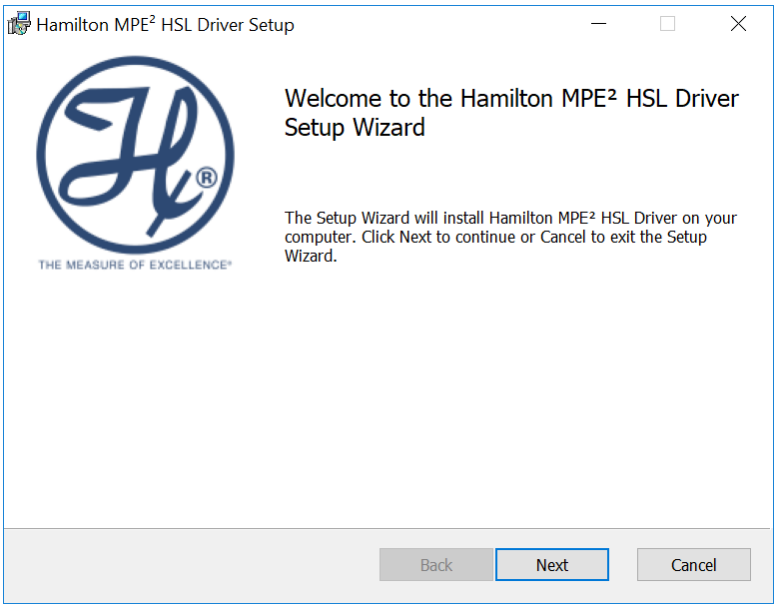


Figure 4–41: Beginning HSL driver installation

3. **Click the Next button.** The End-User License Agreement appears.

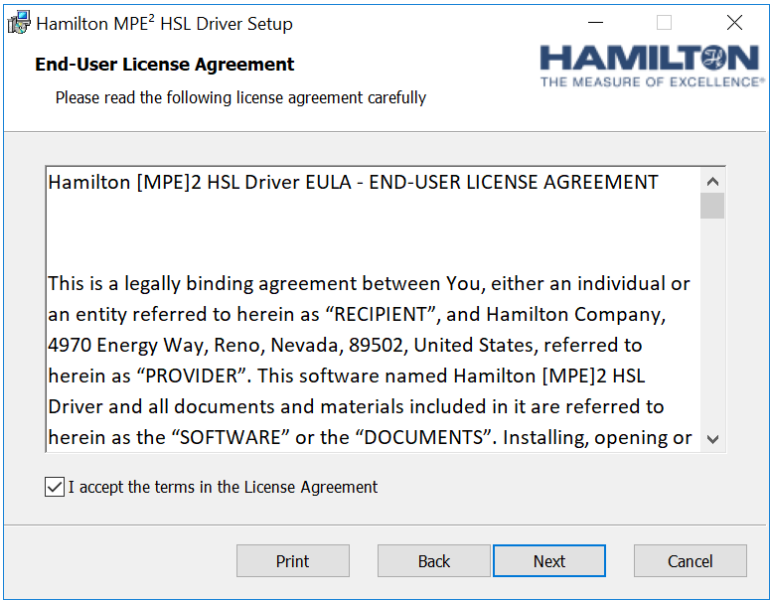


Figure 4–42: Viewing the HSL driver End-User License Agreement

4. **Read the agreement and check the box, then click Next.** The Destination Folder dialog appears.

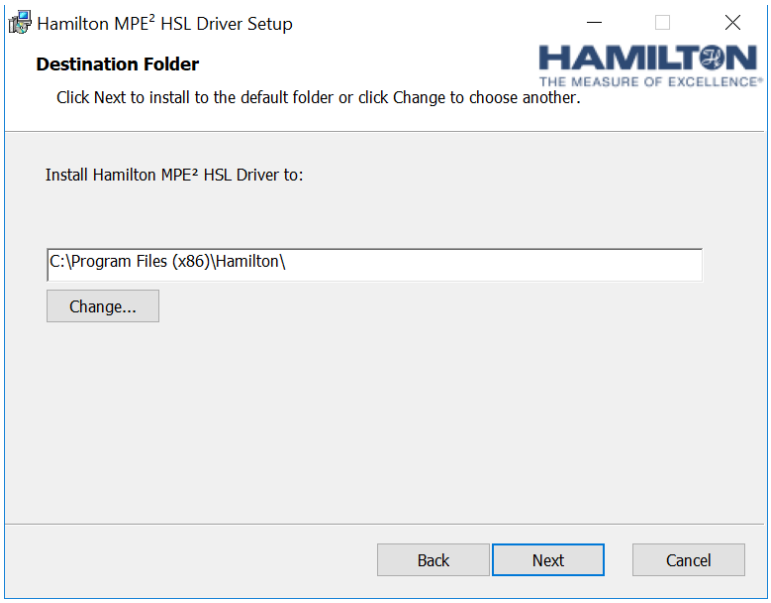


Figure 4–43: Choosing the HSL driver destination folder

5. **Choose where the program files will be stored.** The default is C:\Program Files (x86)\Hamilton. Click the "Change…" button to browse for a different folder.
6. **Click Next when finished.** The "Ready to install" dialog appears.

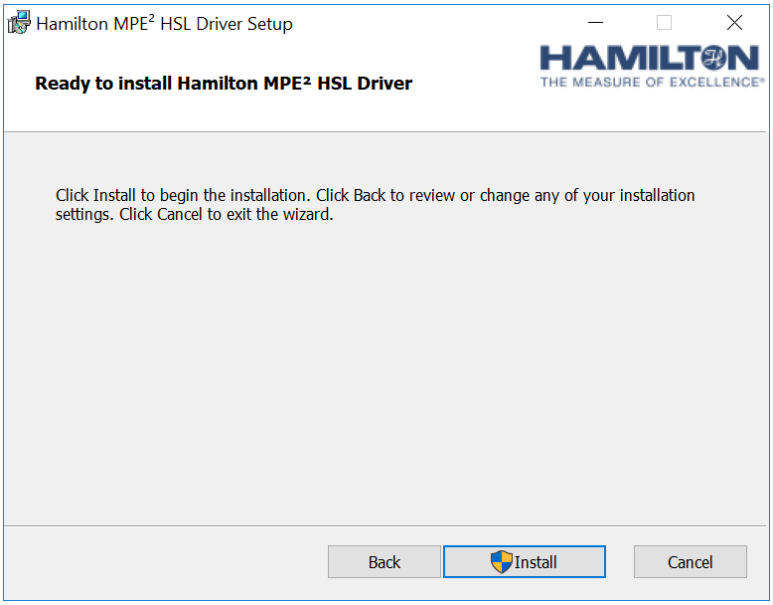


Figure 4–44: Confirming HSL driver installation

7. **Click Install to begin installing the driver.** A progress bar shows the status of the installation.

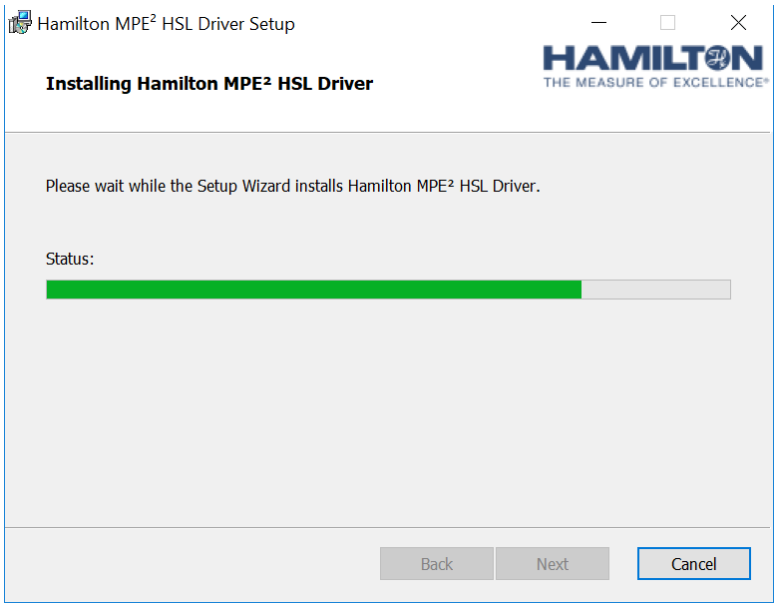


Figure 4–45: Viewing HSL driver installation progress

8. **When the FTDI CDM Drivers dialog appears, click Extract.** The Setup Wizard appears.

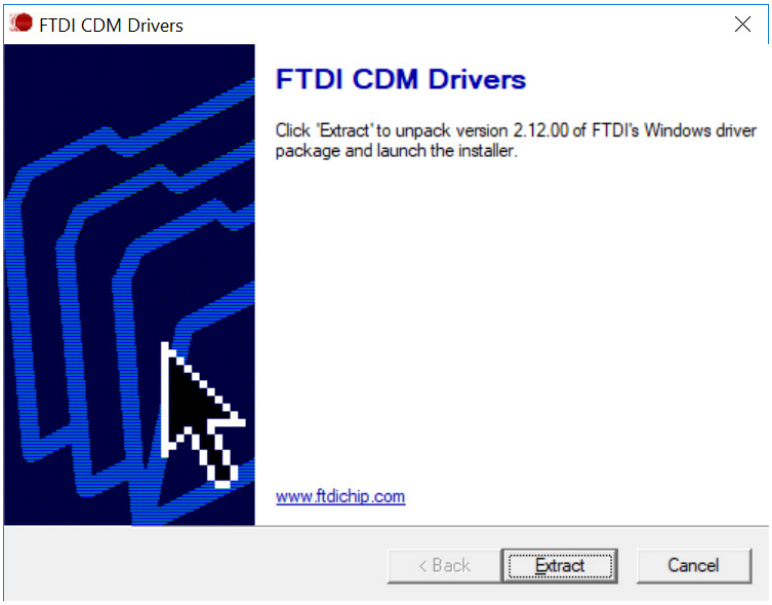
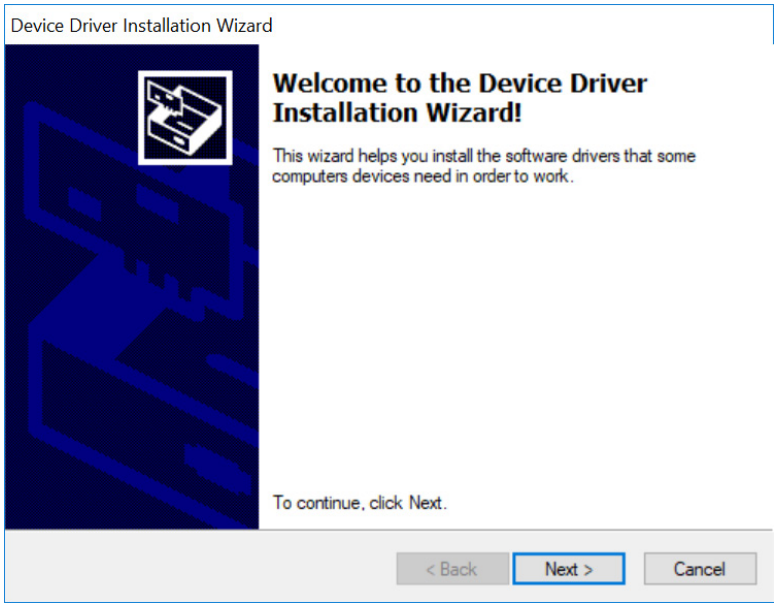


Figure 4–46: Beginning FTDI driver installation



9. **Click the Next button.** The License Agreement appears.

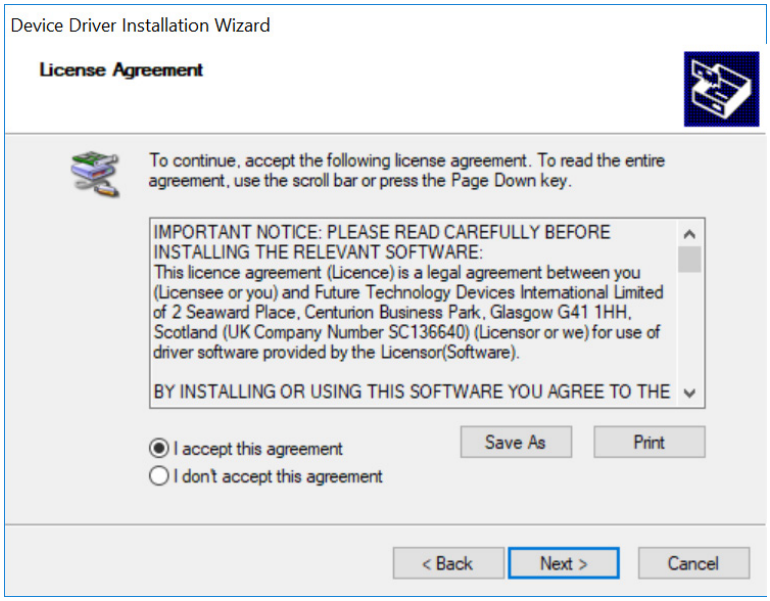


Figure 4–47: Viewing the FTDI license agreement

10. **Read the agreement and check the box, then click Next.** A progress bar will show the progress of the installation. A confirmation dialog will appear when finished.

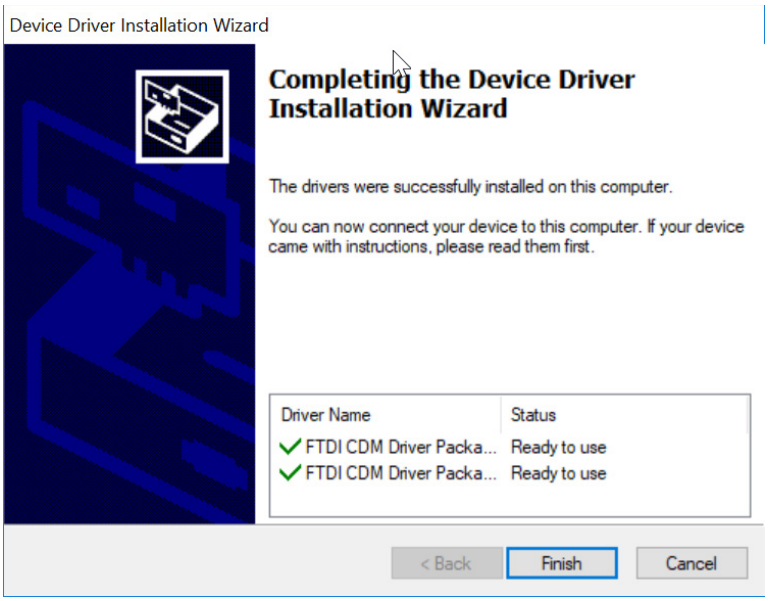


Figure 4–48: Completing the FTDI driver installation

11. When the HSL Setup Wizard is complete, click Finish.

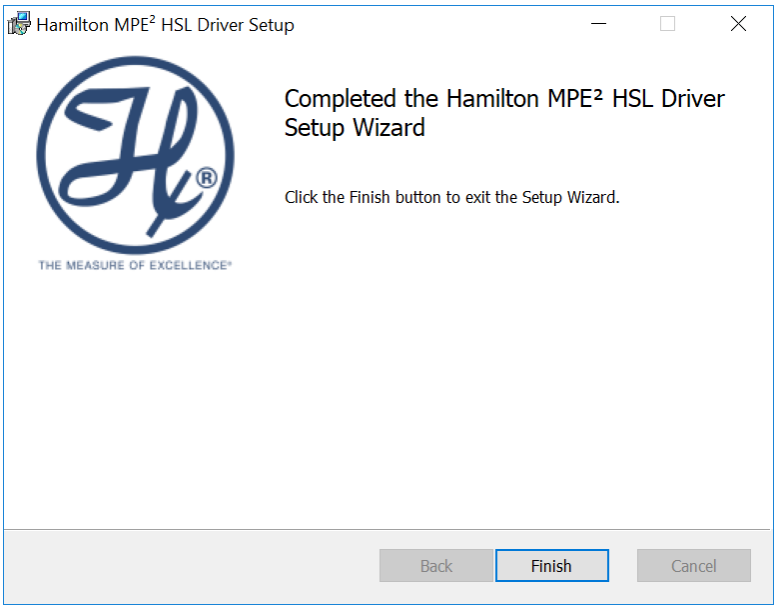


Figure 4–49: Completing HSL driver installation

12. Open the Method Editor.
13. Create or open a method and navigate to Method > Libraries. The Libraries dialog appears.
14. **Click "Add Library…" and select the [MPE]² library, HSLMPELib.hsl.** It is located by default in C:\Program Files (x86)\Hamilton\Library. Click OK when finished, and the [MPE]² commands will appear in the Toolbox.

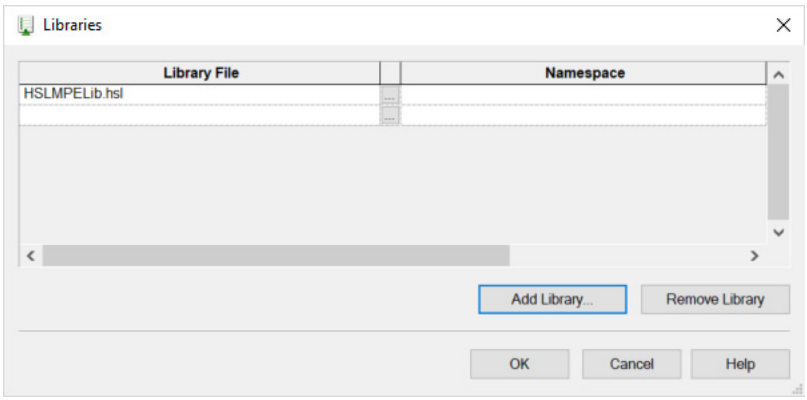


Figure 4–50: Adding the [MPE]² HSL library

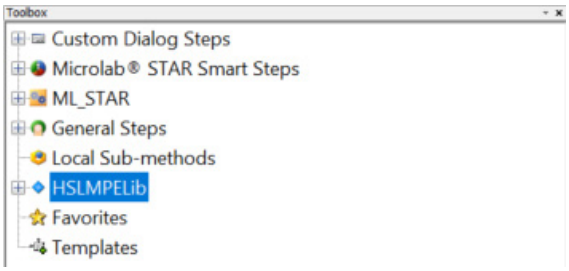


Figure 4–51: [MPE]² HSL library

4.7.3.2 SiLA Driver

The SiLA driver installs a SiLA service provider and an XSL library of commands for the [MPE]². Refer to chapter 6 for detailed descriptions of these commands.

- **Insert the installation media**.
- **Open the installation media folder and run the executable.** The Setup Wizard appears.

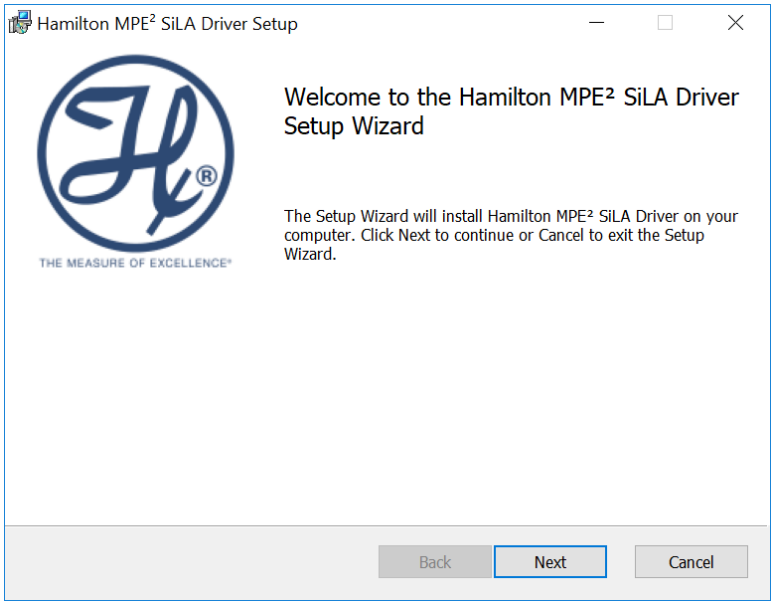


Figure 4–52: Beginning SiLA driver installation

- **Click the Next button.** The End-User License Agreement appears.

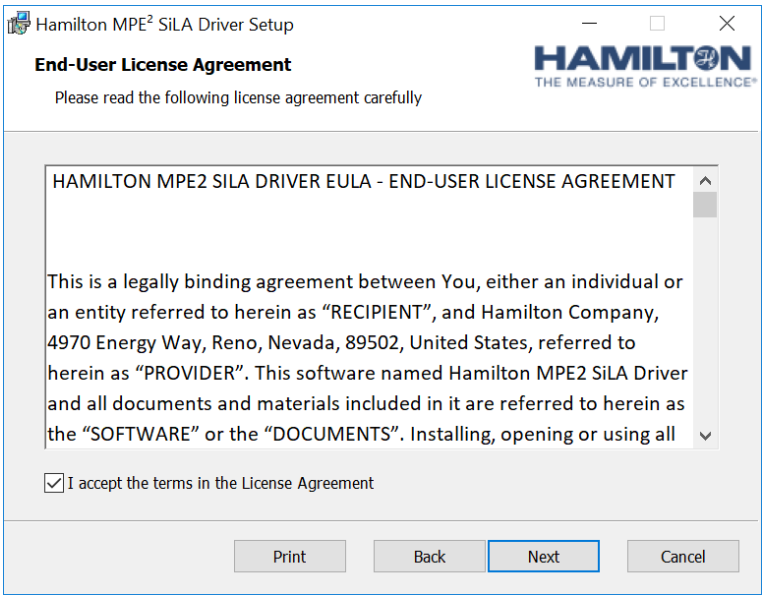


Figure 4–53: Viewing the SiLA driver End-User License Agreement

- **Read the agreement and check the box, then click Next.** The Destination Folder dialog appears.

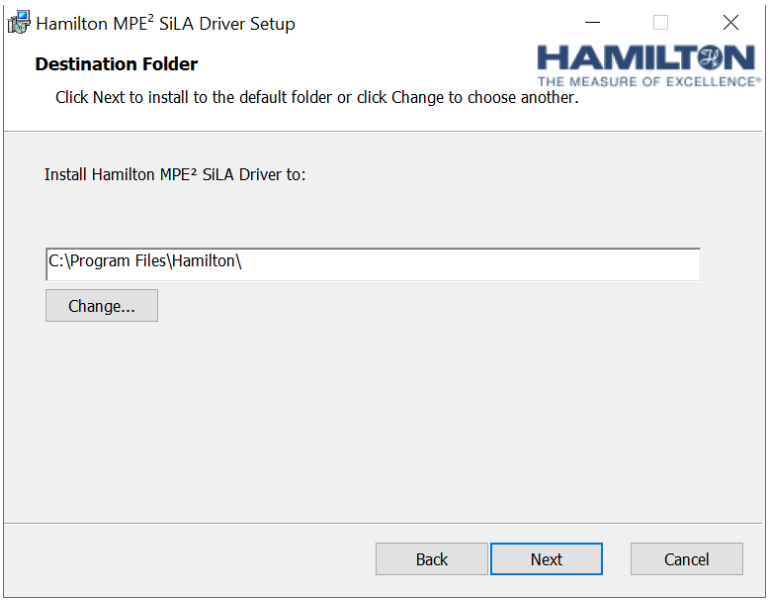


Figure 4–54: Choosing the SiLA driver destination folder

- **Choose where the program files will be stored.** The default is C:\Program Files\Hamilton. Click the "Change…" button to browse for a different folder.
- **Click Next when finished.** The "Ready to install" dialog appears.

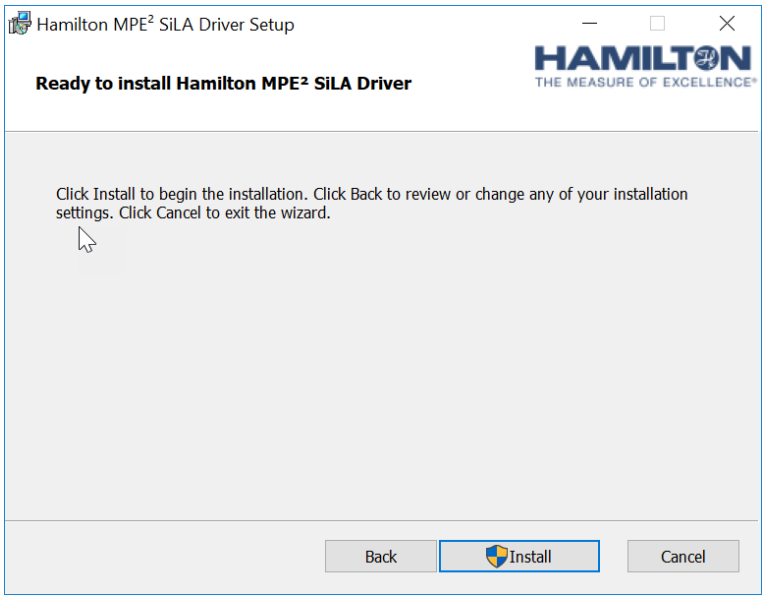


Figure 4–55: Confirming SiLA driver installation

- **Click Install to begin installing the driver.** A progress bar shows the status of the installation.

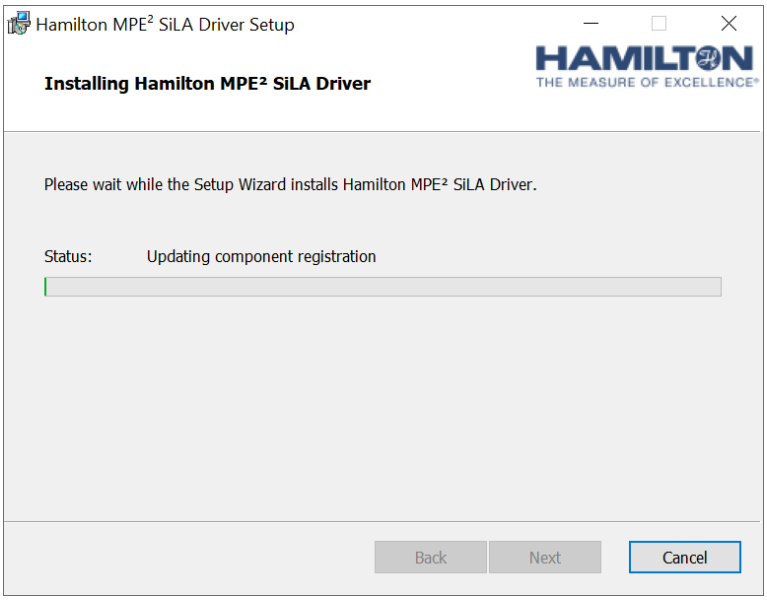


Figure 4–56: Viewing SiLA driver installation progress

- **When the connections dialog appears, enter the number of devices connected and click Continue.** The connection type dialog appears.

Figure 4–57: Specifying the number of devices

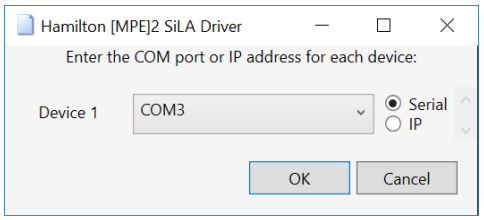


Figure 4–58: Entering the device connection

- **Specify the connection type for each [MPE]².** Enter the COM port for USB connections or the IP address for Ethernet connections. Refer to section 4.7.2 for instructions on configuring an IP address.

  To find the COM port, open the File Explorer, right-click This PC, and select Manage. In the Computer Management window, select Device Manager. The COM port connections are listed under "Ports (COM & LPT)".

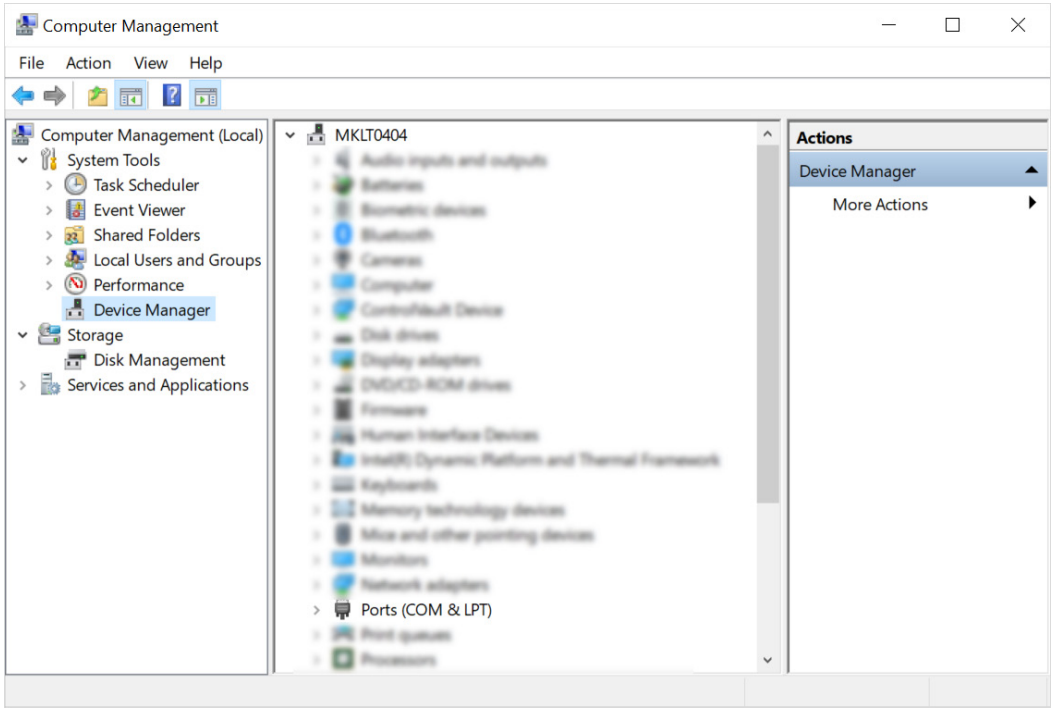


Figure 4–59: Obtaining the COM port

- **Copy the WSDLs for the device(s) and click Next.** The WSDLs are required for binding the devices to the system.

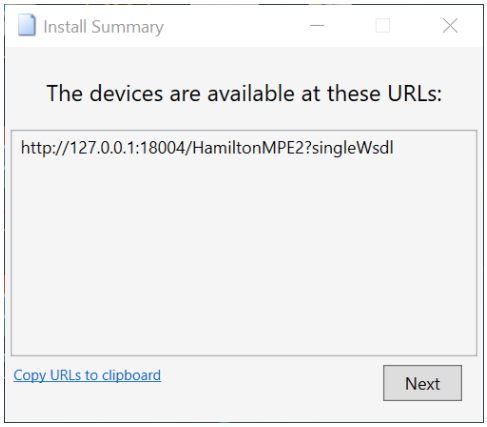


Figure 4–60: Viewing the [MPE]² WSDLs

- **When the SiLA Setup Wizard is complete, click Finish**.

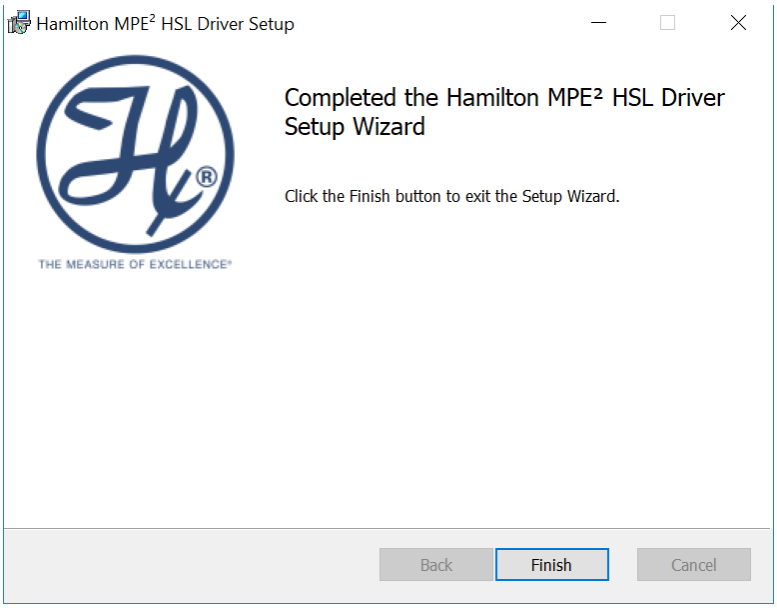


Figure 4–61: Completing SiLA driver installation

- **Launch the INSTINCT V Main Program**.
- **Create or open a System document**.
- **In the Instrument configuration, add a SiLA Generic Device** from the Devices category of the Tools Panel.
- **In the Properties panel for the Generic Device, set the DeviceClass to VacuumPump** for the Logistics Module. Add Evaporator and Dispenser classes for the Evaporator and Reagent Fill Modules if they are present. Change the name of the Generic Device to differentiate it from other devices of [MPE]² modules.

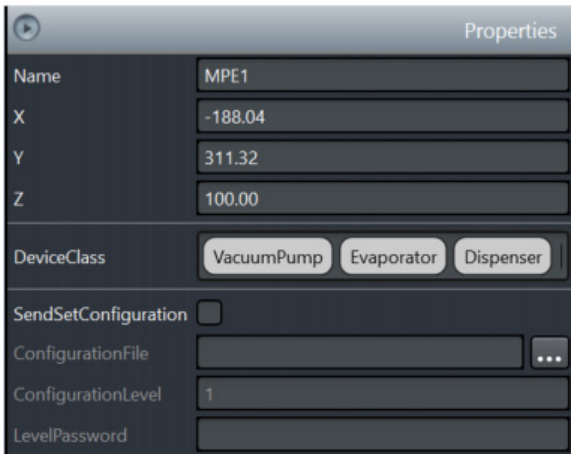


Figure 4–62: Changing the SiLA device class

- **In the Workspace configuration, add a Custom Site** from the Site category of the Tools Panel.

- **In the Properties panel for the Custom Site, set the Associated Device to the Generic Device for the [MPE]².** Change the name to reflect the selection.

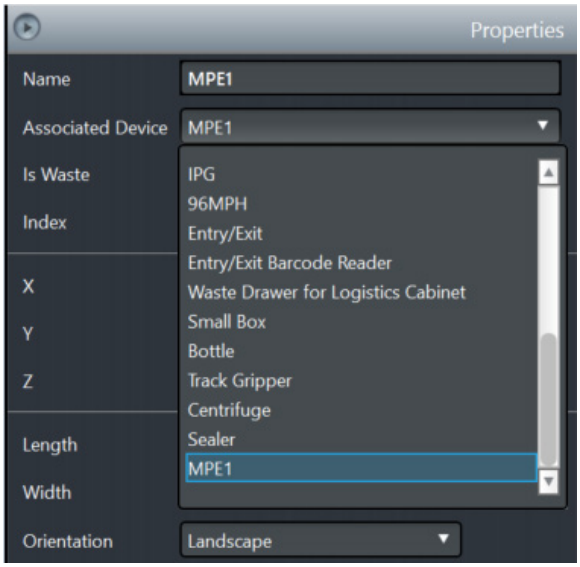


Figure 4–63: Associating the Custom Site

- **Create a new Position Resource and assign it to the Custom Site.** Save the System when finished.

Figure 4–64: Adding a Position Resource

- **Start the SiLA service provider for the [MPE]².** The service is located under C:\Program Files\Hamilton\SiLA\MPE2.**x**\Hamilton.SiLA.ServiceProviderExecuter.exe, where **x** is the number of the device in the order it was installed.
- **Open the Instrument view in INSTINCT V and change the Current Active System to the System with the [MPE]².** Select the appropriate system under Discovered Instruments.
- **Click "Bindings…" and expand SiLA Logical Module in the Current Bindings section.** The Binding Information dialog appears.

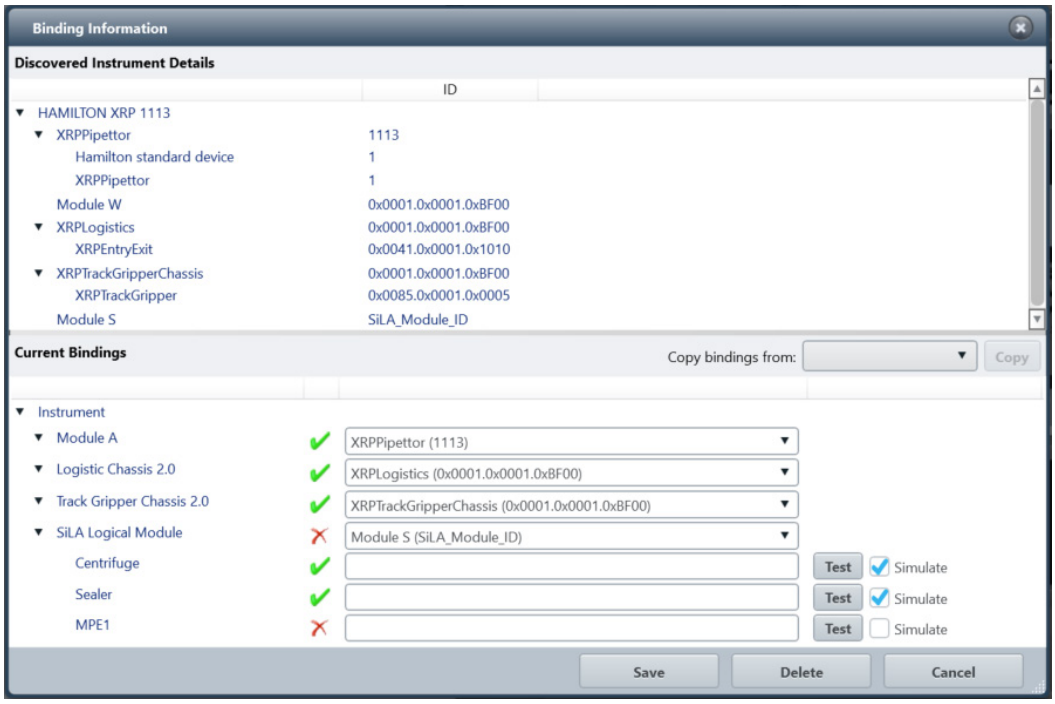


Figure 4–65: Binding Information dialog

- **Paste the WSDL of each [MPE]² device in the appropriate field.** Click Save and close the Binding Information dialog when finished.

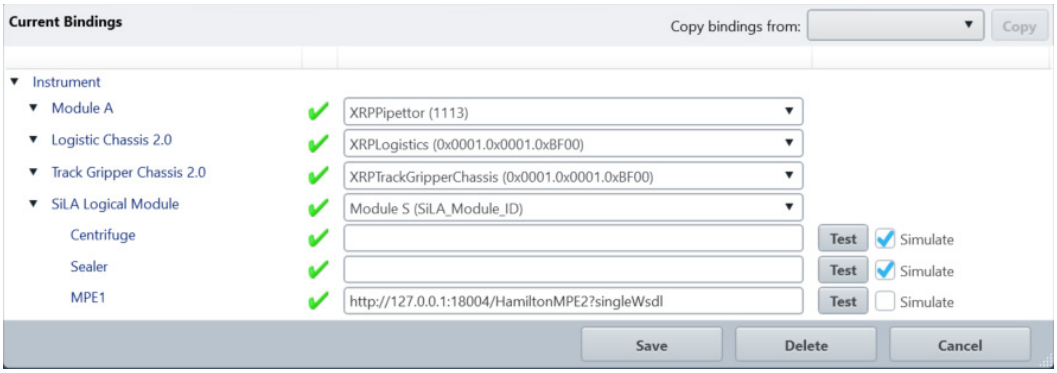


Figure 4–66: Binding the [MPE]²

- **Click Connect in the Instrument view**.
- **Add the [MPE]² library to the desired document.** In an Assay document, click Manage Libraries in the Toolbox panel and check the MPECommandLib box in the Libraries dialog, then click OK. The [MPE]² subroutines will appear in the Subroutines section of the Toolbox panel.

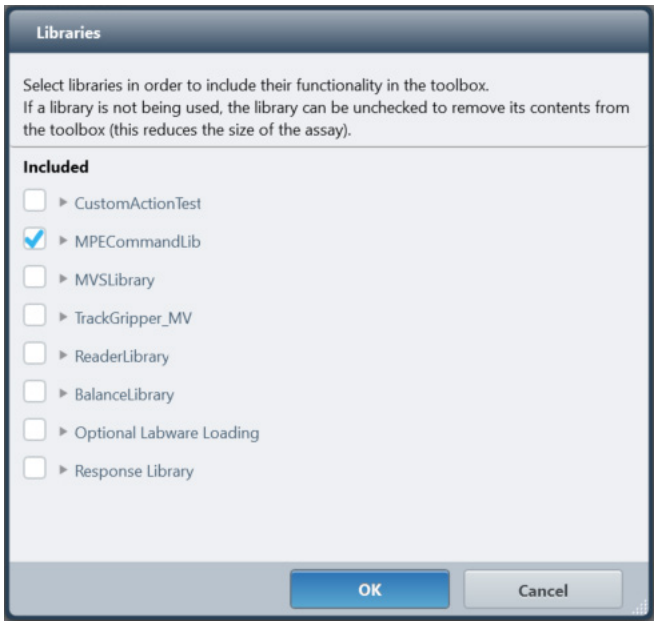


Figure 4–67: Adding the [MPE]² XSL library to an Assay document

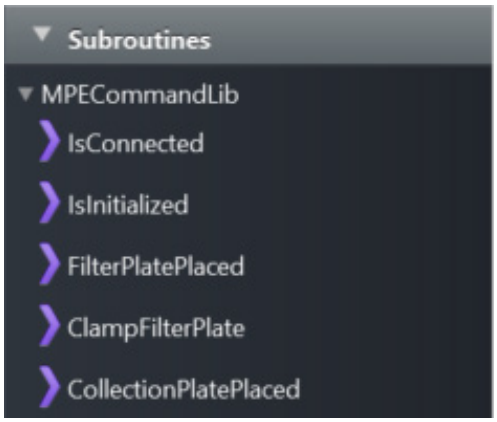


Figure 4–68: [MPE]² XSL library in an Assay

- **In an XSL document, add a `Library Reference` command from General > Link.** In the Properties panel, click the ellipsis button and select MPECommandLib for the Referenced Library property, then click OK. The [MPE]² subroutines will appear under Document Library Cache > MPECommandLib > Subroutines in the Libraries panel.

  If the library does not appear in the Referenced Library dialog, it must be imported manually. It is located by default under C:\Program Files\Hamilton\SiLA.

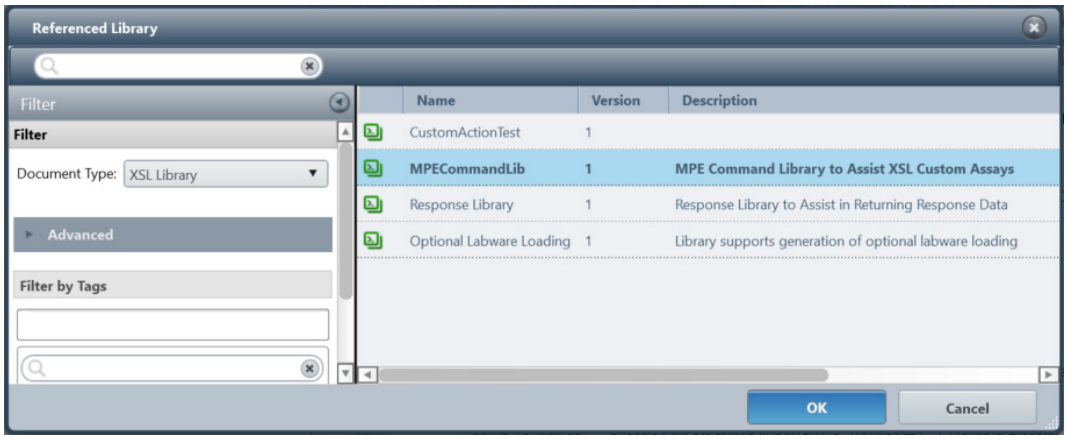


Figure 4–69: Adding the [MPE]² XSL library to an XSL document

Figure 4–70: [MPE]² in an XSL document

4.8 Changing an Air Manifold

1. **Remove the twelve screws around the manifold on top of the Logistics Module** using a 3 mm hex wrench. Make sure the [MPE]² is turned off, and keep a hand beneath the manifold.

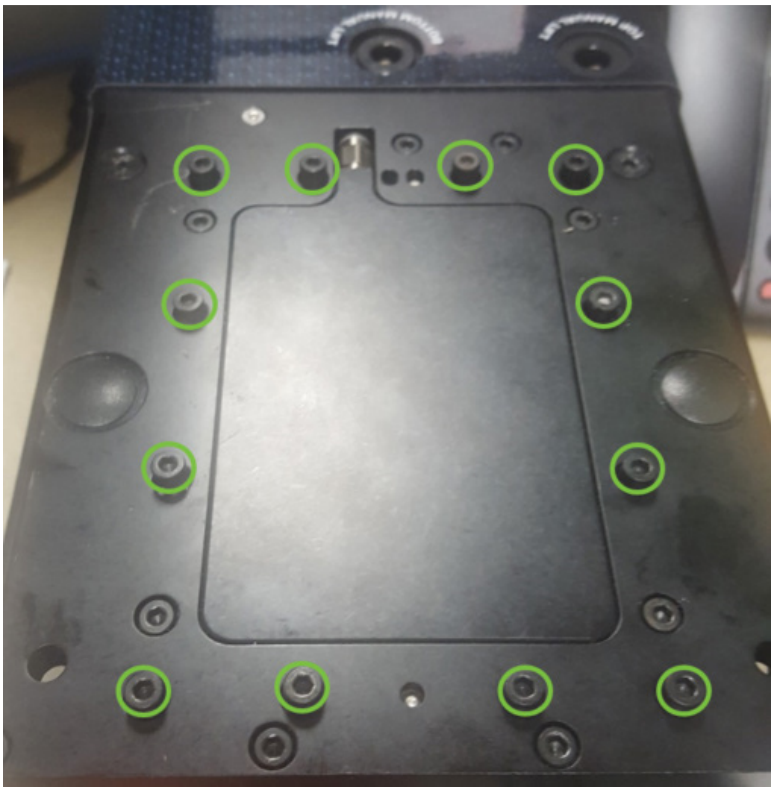


Figure 4–71: Removing the manifold screws

2. **Remove the manifold from the [MPE]².**
3. **Hold the new manifold in place and secure it with the same twelve screws.** Note that the manifold has asymmetrical pins, meaning it can only be oriented one way.

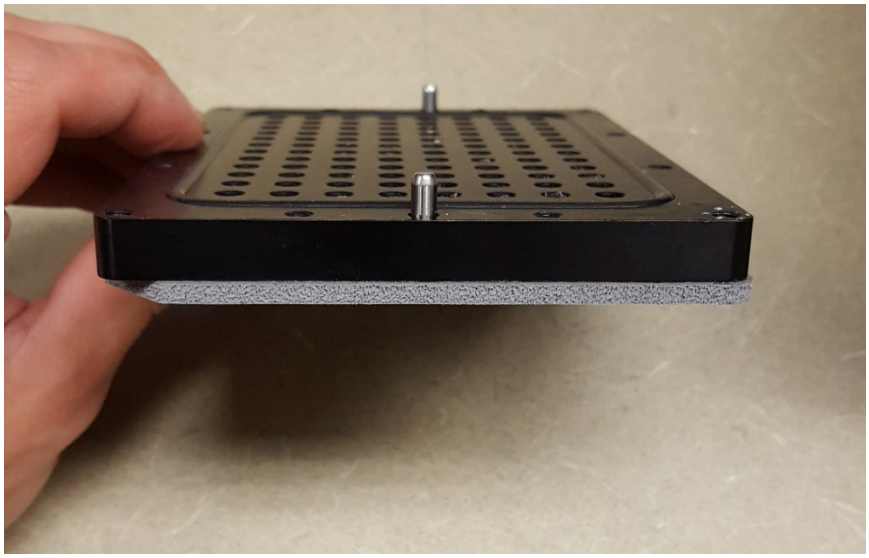


Figure 4–72: Orienting the manifold

Whenever an air manifold is changed on the Logistics Module, the manifold calibration values must be updated in the software. This update is done through the [MPE]² Toolkit software.

1. **Make sure the [MPE]² is on** and connected to the controlling computer.
2. **Launch MPEToolKit.exe from the installation media.** The program can also be launched from the Hamilton\Bin folder. The log in screen for the utility appears.

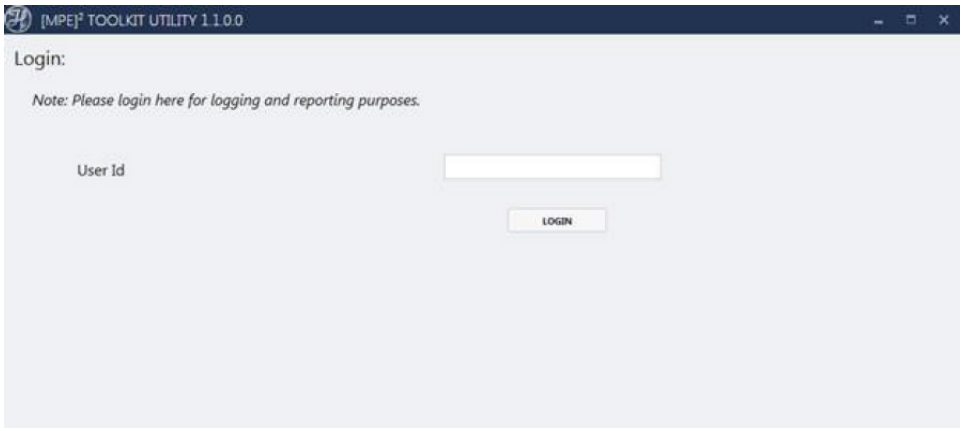


Figure 4–73: Logging into the [MPE]² Toolkit software

3. **Enter a User ID and click LOGIN.** For a manifold change, the generic ID 1234 can be used. The connection screen appears.

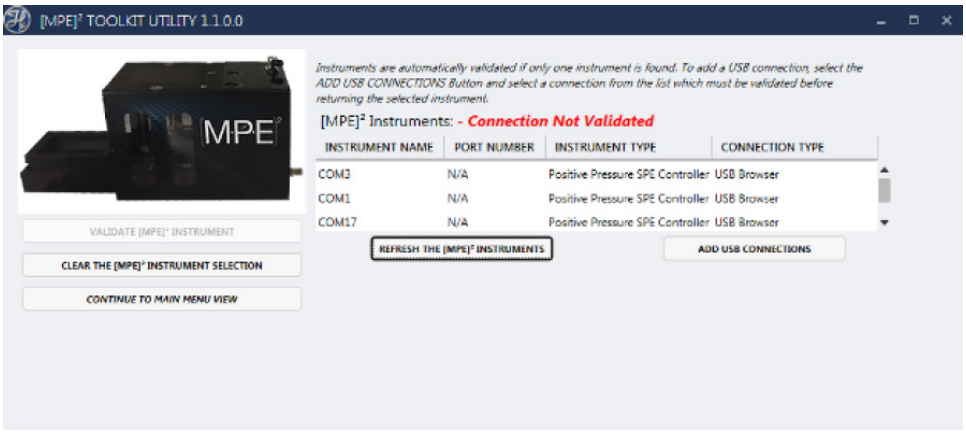


Figure 4–74: Selecting the device connection

4. **Select the connection used for the [MPE]² and click OK when the screen shown in Figure 4–78 appears.** If the [MPE]² is connected via USB, click ADD USB CONNECTIONS and then select the connection. The main menu appears once the connection is established.

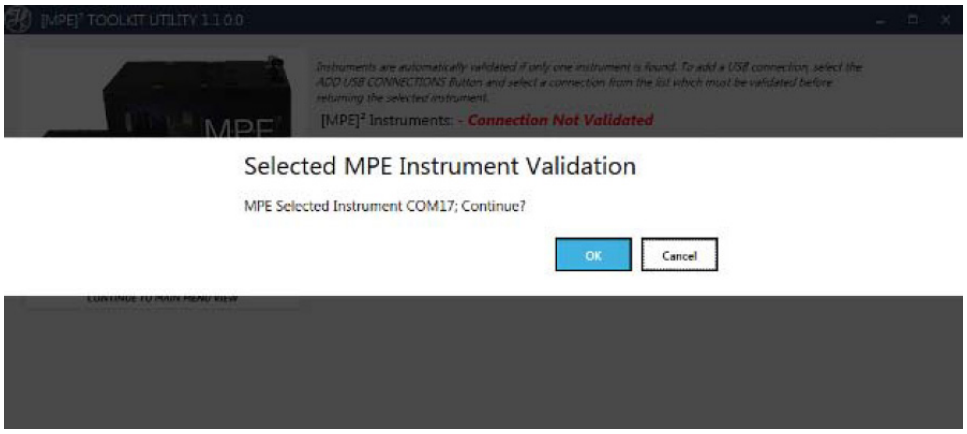


Figure 4–75: Confirming the device connection

Figure 4–76: [MPE]² Toolkit main menu

5. **Click Load Manifold Calibration.** A list of available calibration files appears.

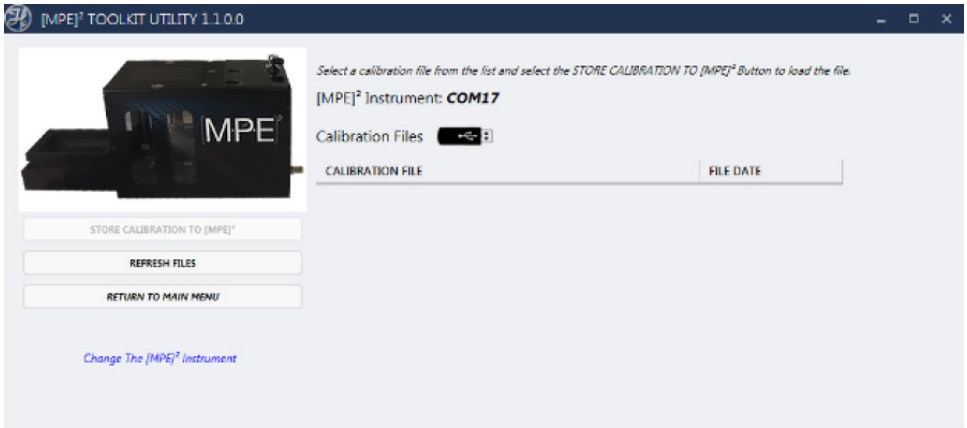


Figure 4–77: Viewing calibration files

6. **Select the appropriate calibration file and click STORE CALIBRATION TO [MPE]².** Make sure the serial number on the calibration file matches that of the manifold. The serial (LOT) number is visible through the window on the right side of the Logistics Module.

Figure 4–78: Confirming the manifold serial number

7. **Close the [MPE]² Toolkit when finished.** The status will read "Successful" when the manifold calibration file has been changed.

4.9 Updating Firmware

1. **Make sure the [MPE]² is on** and connected to the controlling computer. If the device is connected using a USB, have the COM port ready.

   To find the COM port, open the File Explorer, right-click This PC, and select Manage. In the Computer Management window, select Device Manager. The COM port connections are listed under "Ports (COM & LPT)".

2. **Navigate to the folder with the desired firmware and open it**.

3. **Run the "RunMe.bat" batch file.** A command prompt will open and ask how the [MPE]² is connected.

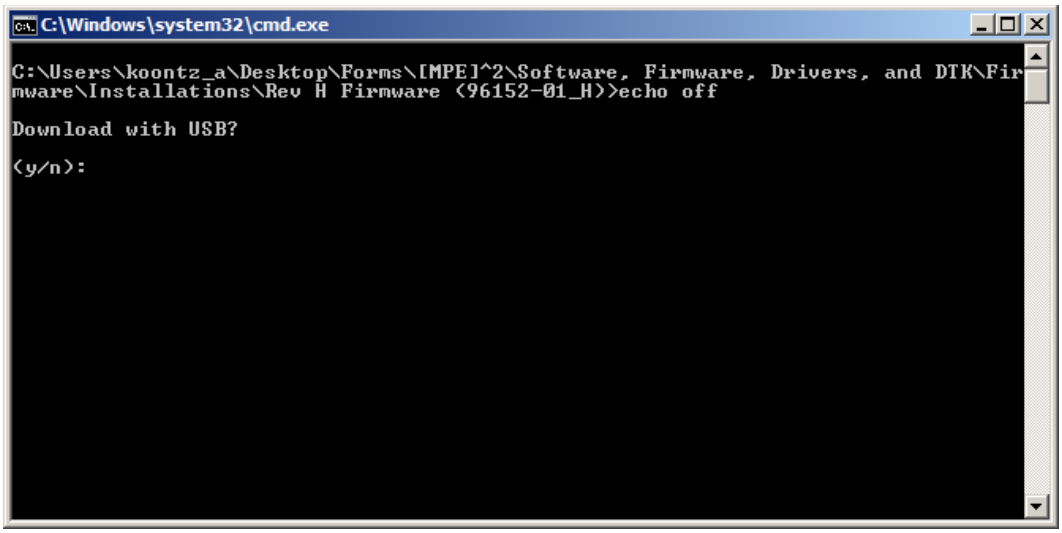


Figure 4–79: Running the batch file

4. **If using a USB connection, type "y" and press Enter.** Type in the COM port as it appears in the Device Manager and press Enter.

   If using an Ethernet connection, type "n" and press Enter. Type in the IP address in its entirety and press Enter.

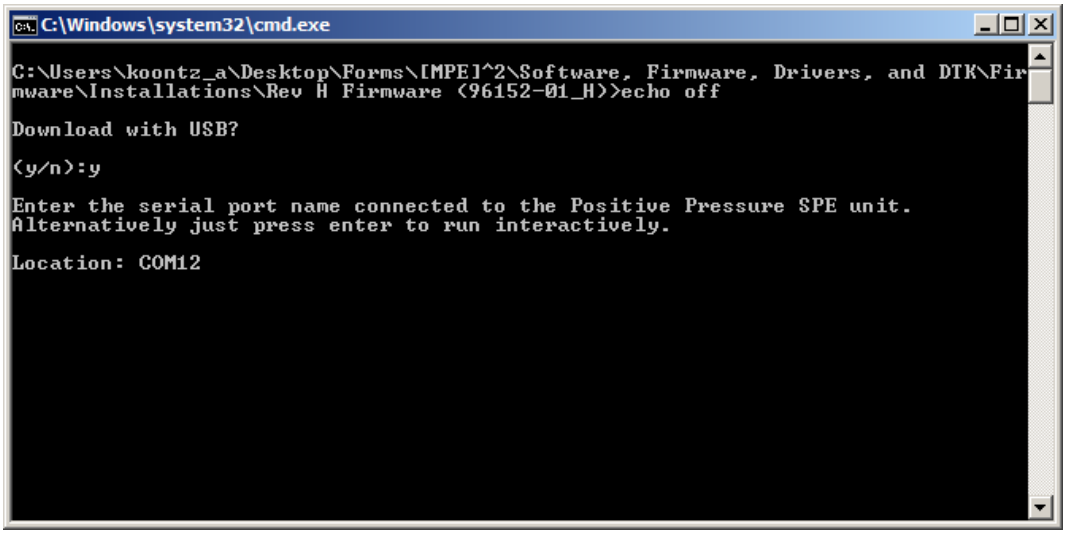


Figure 4–80: Downloading firmware using a USB connection

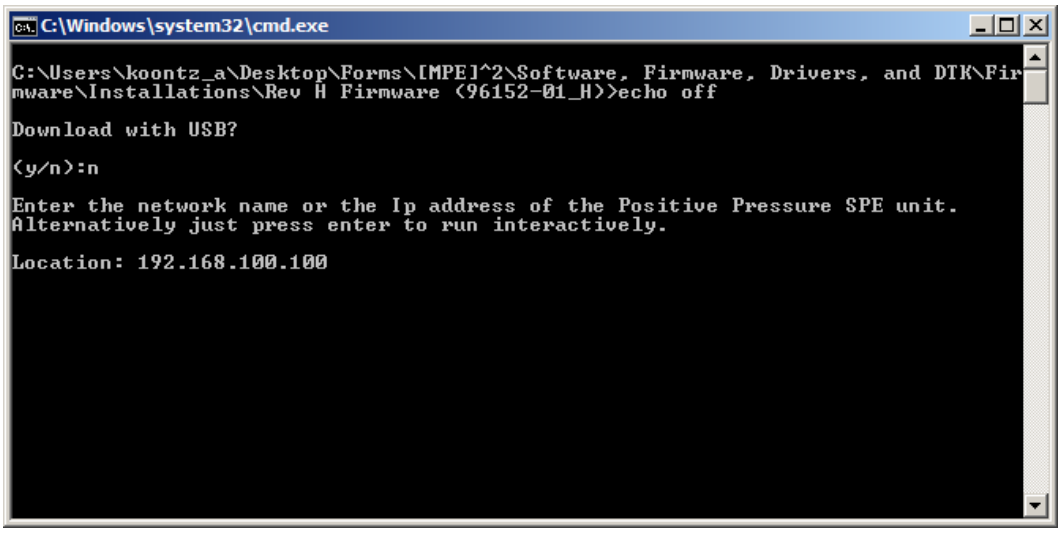


Figure 4–81: Downloading firmware using an Ethernet connection

5. **Power cycle the [MPE]² when the firmware is finished downloading.** Confirm the firmware update in the DTK. Refer to section 11.1.4 for instructions on finding the firmware version.

5 Operation

5.1 Software Overview

When used as a benchtop device, the [MPE]² utilizes Hamilton's Vector software. This software is used primarily to control Hamilton's liquid handling platforms, but it can also be used to program methods for the [MPE]² as a benchtop device.

The software is composed of several different editors. The following editors are relevant for the [MPE]² when used as a benchtop device:

- The **Method Editor** allows the user to create custom methods that drive the [MPE]². It is accessed via the Hamilton Method Editor icon on the desktop.

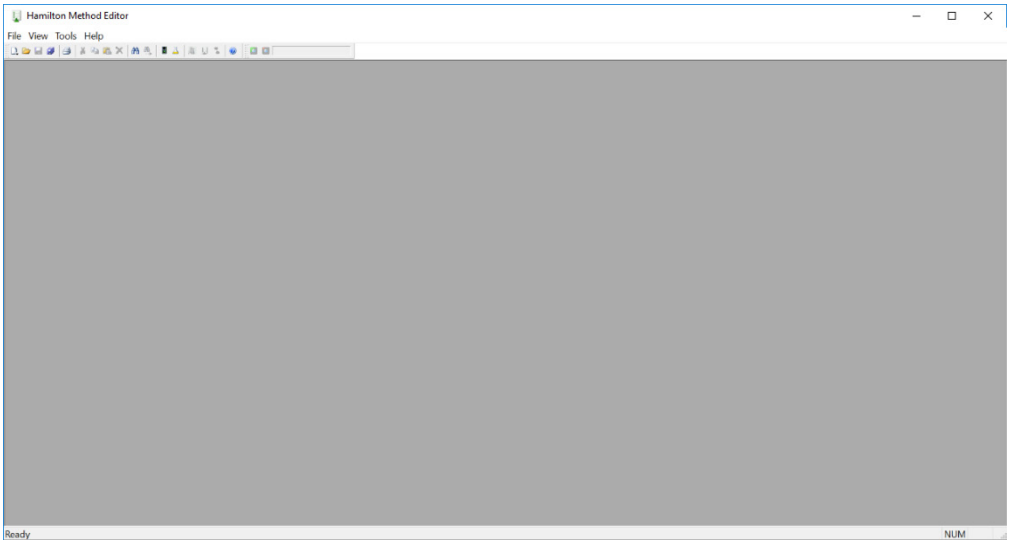


Figure 5–1: Viewing the Method Editor

- The **System Configuration Editor** allows the user to change the system settings. From the Method Editor, click Tools > System Configuration Editor.

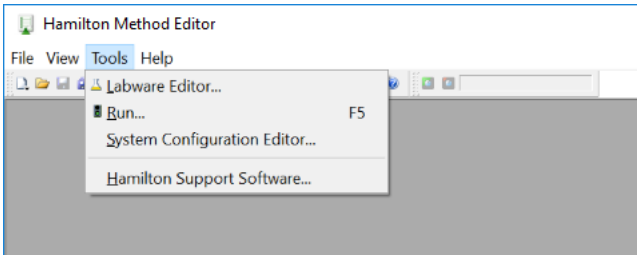


Figure 5–2: Accessing the System Configuration Editor

5.2 Running a Method

The following procedure applies to an [MPE]² used as a benchtop device. If using the [MPE]² as part of an integration with a liquid handling platform, refer to the Operator's Manual for that platform, as each platform has different loading procedures.

1. **Turn on the Control Box, then the ACME if the Evaporator or Reagent Fill Modules will be used.** Make sure to turn on the Control Box first, or the [MPE]² will only recognize the Logistics Module.
2. **Flush the tubes with deionized water or methanol for 2-5 minutes.** The tubes must be flushed at the beginning and end of every day. Refer to section 7.3 for details.

WARNING: Verify that the waste bottle is empty before starting a run.

3. **Prepare the required filter and collection plates for the run.** To make sure that the filter and collection plates are compatible with the [MPE]², refer to section 5.3.
4. **Open the Hamilton Run Control program and use File > Open to find the desired method.** Methods are stored by default in C:\\Program Files (x86) > Hamilton > Methods.
5. **Click on View and select the desired view windows**. Once these windows are opened, they can be resized and rearranged as necessary, as shown in Figure 5–4. The views can also be turned on and off by clicking the appropriate toggle buttons on the right side of the icon bar.
    - The **Method View** shows which steps are being performed.
    - The **Deck View** normally shows a colorized model of the deck as the method runs. A deck layout is only present when integrated with an instrument running the Vector software.
    - The **Trace View** shows the traces for each step as they are executed.

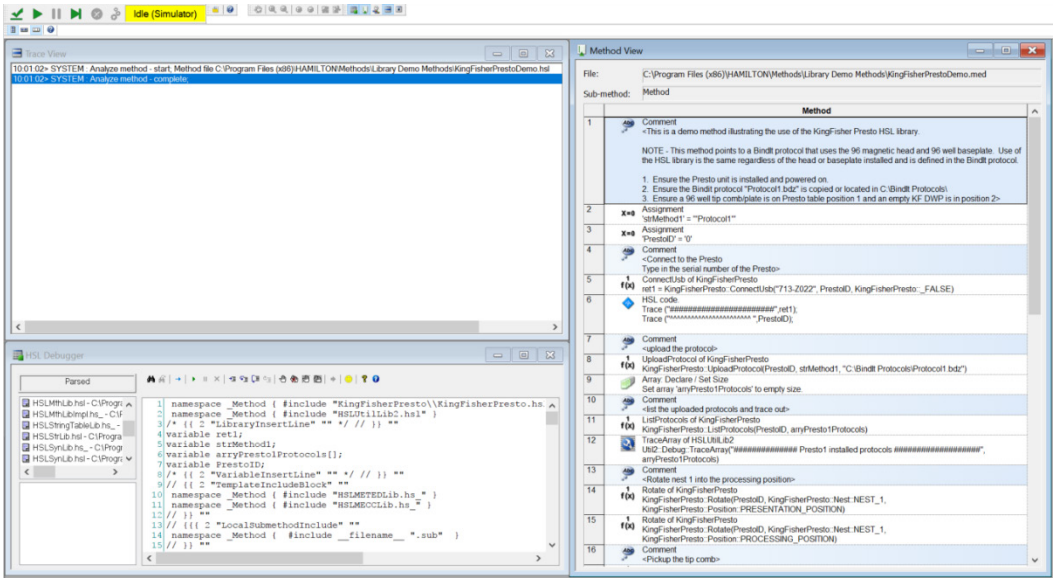


Figure 5–3: Arranging view windows

6. **Compare the deck view with what is on the deck of the [MPE]² and make sure they match before starting the method.** Click on the deck and use the mouse wheel to zoom in on the deck view, or use the view buttons in the View menu.

7. **Click the Start button at the top of the Run Control window.** The F5 key can also be used to start a method.

Figure 5–4: Run Control buttons

8. **To pause a run, click the blue Pause button at the top of the Run Control window.** The [MPE]² will finish the last command it received and then come to a stop. To resume after a pause, click the Pause button again.

9. **To abort a run, click the red Abort button at the top of the Run Control window.** A confirmation dialog will appear. Click OK. The [MPE]² will finish the last command it received, come to a stop, and the method will be aborted. Aborted methods must be restarted from the beginning.

5.3 After a Run

The following procedure applies to an [MPE]² used as a benchtop device. If using the [MPE]² as part of an integration with a liquid handling platform, refer to the Operator's Manual for that platform, as each platform requires different procedures.

1. **Remove processed labware**.

2. **Empty the waste bottle**, if it is full.

WARNING: Empty the waste bottle as soon as it is full, but only after a run is complete or if the run is paused.

WARNING: Waste may contain biohazardous or chemically contaminated material.

3. **When all runs are finished, close Run Control**.
4. **Turn off the [MPE]² and shut down the controlling computer.** At the end of the day, perform Daily or Weekly maintenance. Refer to sections 7.3 and 7.4 for maintenance procedures.

5.4 Labware Compatibility

The [MPE]² accepts ANSI/SLAS format microplates as inputs, as well as tubes within the accepted height. This section describes how to calculate the total height of a given filter plate or tubes, which determines whether it is compatible with the Logistics Module.

WARNING: Enter the calculated height of the labware in the Labware Editor so the [MPE]² does not crash when transporting labware to the manifold.

The maximum adjusted height of the filter and collection plates is 114 mm. The following procedure gives this adjusted height:

1. **Measure and record the total height of the filter plate in mm**, including the nozzles.
2. **Measure the height of the plate skirt in mm**, as shown in Figure 5–6. Record this value as H_{filter}.

Figure 5–5: Measuring the skirt height

3. **Find the difference between the values from the first two steps.** Record this value as H_{spacer} if it is greater than 6.1 mm. If the difference is less than 6.1 mm, use 6.1 for H_{spacer}.

4. **Measure and record the height of the collection plate in mm.** Record this value as $H_{collect}$.
5. **Add the following values.** If the sum is within 114 mm, the plate can be used with the [MPE]². If it is greater than 114 mm, it could cause a crash when used with the [MPE]².

$$H_{filter} + H_{spacer} + H_{collect} + 2\ mm$$

Record these values after confirming that the plates are usable with the [MPE]². Several commands used to program the [MPE]² require these measurements as inputs. Refer to chapter 6 for more information.

5.5 Error Handling

The [MPE]² drivers do not include any default error handling. Error handling can be manually programmed using the `GetLastError` command. Refer to section 6.1.5 for details.

6 Programming

The HSL and SILA libraries included in their respective installers consist of commands for each module, as well as general commands like Initialize. The two libraries use the same commands with the same input parameters. The function of and required inputs for each command are described in the following sections.

6.1 General Commands

6.1.1 ConnectUsingCOM

The `ConnectUsingCOM` command connects to the [MPE]² using a USB cable. This command requires input values for five parameters:

- **comPort:** Enter the port on the controlling computer to which the [MPE]² is connected. To find the COM port, open the File Explorer, right-click This PC, and select Manage. In the Computer Management window, select Device Manager. The COM port connections are listed under "Ports (COM & LPT)".

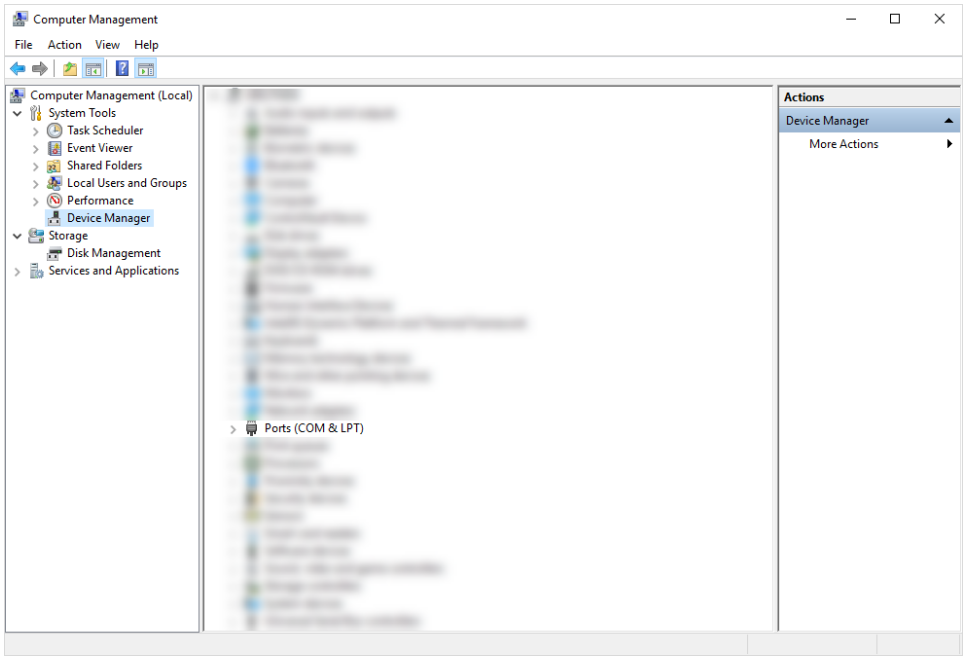


Figure 6–1: Obtaining COM port values

- **baudRate:** Enter the baud rate used to connect to the [MPE]². The rate is 921600 Bd by default.
- **simulationMode:** Indicate whether the device is being run in simulation mode. Enter "1" for simulated and "0" for not simulated.

- **deviceId:** Select an integer variable to store the device ID. This value will be used to determine which device will receive [MPE]² commands. The variable must be declared earlier in the method to be selected.
- **mpeOptions:** Indicate any additional modules used with the Logistics Module. Each combination of modules is associated with an integer:
    - 0: No additional modules
    - 1: Reagent Fill Module
    - 2: Evaporator Module
    - 3: Reagent Fill and Evaporator Modules
    - 4: Accessory controller only

6.1.2 ConnectUsingIP

The `ConnectUsingIP` command connects to the [MPE]² using an Ethernet cable. This command requires inputs for five parameters:

- **instrumentName:** Enter the address for the [MPE]² connection or the name of the device. The address is "192.168.100" by default.
- **portNumber:** Identify the port used to connect to the [MPE]². The port number is set to "2000" by default.
- **simulationMode:** Indicate whether the device is being run in simulation mode. Enter "1" for simulated or "0" for not simulated.
- **deviceId:** Select an integer variable to store the device ID. This value will be used to determine which device will receive [MPE]² commands. The variable must be declared earlier in the method to be selected.
- **mpeOptions:** Indicate any additional modules used with the Logistics Module. Each combination of modules is associated with an integer:
    - 0: No additional modules
    - 1: Reagent Fill Module
    - 2: Evaporator Module
    - 3: Reagent Fill and Evaporator Modules
    - 4: Accessory controller only

6.1.3 Disconnect

This command is used to disconnect from an [MPE]² that was previously connected using one of the `Connect` commands. If the method will be run again without closing Run

Control, this command must be executed. Its only parameter is "deviceID", which specifies which device will receive the command.

6.1.4 DisconnectAll

This command disconnects all connected [MPE]² devices. It is only available on the SiLA driver for the [MPE]², and it has no input parameters.

6.1.5 GetLastError

`GetLastError` **returns an error message corresponding to the last [MPE]² error.** This command can be used to manually program error handling by adding recovery commands for different error codes. A guide to the error codes can be found in the help file for the library. The command requires input values for three parameters:

- **deviceId:** Specify which device will receive the command.
- **clearError:** Indicate whether the error will be cleared after returning the error message. Enter "1" to clear the error or "0" to leave the error.
- **errorMessage:** Select a string variable to store the error message. The variable must be declared earlier in the method to be selected.

6.1.6 Initialize

This command is used to initialize the [MPE]² after it has been connected. `Initialize` must be placed before labware is placed or processed – no labware can be loaded on the [MPE]² before it has initialized. The command's only parameter is "deviceID", which specifies which device will receive the command.

6.1.7 InitializeWithParameters

This command performs a smart initialization of the [MPE]². A smart initialization only initializes the components required for the method, allowing for a shorter initialization. This command requires the following parameters:

- **deviceId:** Specify which device will receive the command.
- **smart**: Indicate whether only the necessary components will be initialized. A value of "1" will enable smart initialization, while "0" will disable it.
- **wasteContainerId:** Specify the waste bottle port that the Logistics Module is connected to. Enter "0" for the first port, "1" for the second port, and "-1" for no connection.
- **vacuumRunTime:** Enter the minimum amount of time in seconds to turn on the vacuum pump upon initialization.
- **disableVacuumCheck:** Enable or disable a check for high vacuum pressure. Disabling the check can make evacuating more viscous fluids easier, while enabling the check

can help detect clogs in the system. Enter "1" to disable the vacuum check or "0" to enable it.

6.1.8 IsConnected

The `IsConnected` command is used to determine whether the [MPE]² has been successfully connected following a `Connect` command. The command requires inputs for two parameters:

- **deviceId:** Specify which device will receive the command.
- **isConnected:** Select an integer variable to store the connection status. A value of "1" indicates that the [MPE]² is connected, while "0" indicates that the device is not connected. The variable must be declared earlier in the method to be selected.

6.1.9 IsInitialized

The `IsInitialized` command is used to determine whether the [MPE]² has been successfully initialized following an `Initialize` command. The command requires inputs for two parameters:

- **deviceId:** Specify which device will receive the command.
- **isConnected:** Select an integer variable to store the initialization status. A value of "1" indicates that the [MPE]² has been initialized, while "0" indicates that the device has not been initialized. The variable must be declared earlier in the method to be selected.

6.2 Logistics Module Commands

6.2.1 ClampFilterPlate

This command clamps a filter plate against the [MPE]² manifold. In a method, `ClampFilterPlate` follows a `FilterPlatePlaced` command, and comes before a `ProcessFilter` command. Its only parameter is "deviceID", which specifies which device will receive the command.

6.2.2 CollectionPlatePlaced

The `CollectionPlatePlaced` command tells the [MPE] that a collection plate has been placed and specifies its dimensions. The command requires input values for three parameters:

- **deviceId:** Specify which device will receive the command.
- **collectionPlateHeight:** Enter the height of the collection plate in millimeters.
- **offsetFromNozzles:** Enter the distance in millimeters between the bottom of the filter plate nozzles and the top of the collection plate. The distance can be positive or negative – a positive distance indicates a gap between the nozzles and the collection

plate, whereas a negative distance indicates that the nozzles protrude into the collection plate.

6.2.3 CollectionPlateRemoved

This command indicates the removal of a collection plate from the [MPE]². Its only parameter is "deviceID", which specifies which device will receive the command. The command requires no direct action from the [MPE]².

6.2.4 FilterPlatePlaced

The `FilterPlatePlaced` command indicates to the [MPE]² that a filter plate has been placed on the filter plate adapter. This command requires input values for three parameters:

- **deviceId:** Specify which device will receive the command.
- **filterHeight:** Enter the height of the filter skirt in millimeters.
- **nozzleHeight:** Enter the full height of the filter plate in millimeters, measured from the top of the plate to the bottom of the nozzles.

6.2.5 FilterPlateRemoved

This command indicates the removal of a filter plate from the [MPE]². Its only parameter is "deviceID", which specifies which device will receive the command. `FilterPlateRemoved` must follow a `RetrieveFilterPlate` command, which unclamps the plate from the manifold. The command requires no direct action from the [MPE]².

6.2.6 GetVacuumStatus

This command is used to determine whether the vacuum is active. It requires inputs for two parameters:

- **deviceId:** Specify which device will receive the command.
- **rVacuumActive:** Select an integer variable to store the vacuum status. A value of "1" indicates that the vacuum is active, whereas "0" indicates that the vacuum is inactive. The variable must be declared earlier in the method to be selected.

6.2.7 ProcessFiltertoCollectionPlate

This command is one of two processing commands for the Logistics Module. Once filter and collection plates have been placed and clamped, `ProcessFiltertoCollectionPlate` moves the plates into position and applies pressure. The command requires inputs for three parameters:

- **deviceId:** Specify which device will receive the command.
- **controlPoints:** Enter the parameters for processing in the form "Type,Value,Duration".

"Type" has three possible values: Flow, Pressure, and Idle. Enter "Flow" for the Type to define a mass flow rate of gas through the filter plate. Enter "Pressure" to specify a pressure to be applied to the entire plate. Enter "Idle" to apply no pressure and wait for the specified duration.

"Value" is an integer whose value is different depending on the Type. For Flow, the Value is the mass flow rate in L/min; for Pressure, the Value is the pressure applied to the plate in psi, with an acceptable range of 0-120 psi. The Value is arbitrary for Idle, since no action is being performed, but the input must be an integer to avoid causing an error.

"Duration" is the time in seconds that the [MPE]² will process the plate.

- **returnPlateToIntegrationArea:** Indicate whether the filter plate is returned along with the collection plate to the presentation site after processing is finished. Enter "1" to return the filter plate or "0" to keep the plate clamped to the manifold.

Multiple processes can be performed in one `ProcessFiltertoCollectionPlate` step by connecting multiple "controlPoints" inputs with semicolons. For example, the input "pressure,15,20;idle,30,45;pressure,60,20" would make the [MPE]² apply 15 psi of pressure to the plate for 20 seconds, wait for 45 seconds, then apply 60 psi of pressure for 20 seconds. Note that the Value field for the "idle" input does not affect the command.

6.2.8 ProcessFiltertoWasteContainer

This command is one of two processing commands for the Logistics Module. Once a filter plate has been placed and clamped, `ProcessFiltertoWasteContainer` applies pressure to the plate. The command requires inputs for five parameters:

- **deviceId:** Specify which device will receive the command.
- **controlPoints:** Enter the parameters for processing in the form "Type,Value,Duration".

  "Type" has three possible values: Flow, Pressure, and Idle. Enter "Flow" for the Type to define a mass flow rate of gas through the filter plate. Enter "Pressure" to specify a pressure to be applied to the entire plate. Enter "Idle" to apply no pressure and wait for the specified duration.

  "Value" is an integer whose value is different depending on the Type. For Flow, the Value is the mass flow rate in L/min; for Pressure, the Value is the pressure applied to the plate in psi, with an acceptable range of 0-120 psi. The Value is arbitrary for Idle, since no action is being performed, but the input must be an integer to avoid causing an error.

  "Duration" is the time in seconds that the [MPE]² will process the plate.

- **returnPlateToIntegrationArea:** Indicate whether the filter plate is returned to the presentation site after processing is finished. Enter "1" to return the filter plate or "0" to keep the plate clamped to the manifold.
- **wasteContainerId:** Specify the waste bottle port that the Logistics Module is connected to. Enter "0" for the first port, "1" for the second port, and "-1" for no connection.
- **checkForExcessiveVacuum:** Enable or disable a check for high vacuum pressure. Disabling the check can make evacuating more viscous fluids easier, while enabling the check can help detect clogs in the system. Enter "1" to enable the vacuum check or "0" to disable it.

6.2.9 RetrieveFilterPlate

The `RetrieveFilterPlate` command is used to release the clamp on a processed filter plate and return it to the presentation site. This command is not necessary if the "returnPlatetoIntegrationArea" parameter is enabled in a `ProcessFilter` command. The only parameter is "deviceID", which specifies which device will receive the command.

6.2.10 StartMPEVacuum

This command is used to start the vacuum waste pump without the using the `ProcessFiltertoWasteContainer` command for an unspecified length of time. This command is used for flushing the waste tubing. It requires inputs for three parameters:

- **deviceId:** Specify which device will receive the command.
- **wasteContainerId:** Specify the waste bottle port that the Logistics Module is connected to. Enter "0" for the first port, "1" for the second port, and "-1" for no connection.
- **disableVacuumCheck:** Enable or disable a check for high vacuum pressure. Disabling the check can make evacuating more viscous fluids easier, while enabling the check can help detect clogs in the system. Enter "1" to disable the vacuum check or "0" to enable it.

6.2.11 StartVacuum

This command was used to start the vacuum waste pump without the using the `ProcessFiltertoWasteContainer` command for a specified length of time. In new methods, the `StartMPEVacuum` command should be used instead. This command requires inputs for four parameters:

- **deviceId:** Specify which device will receive the command.
- **wasteContainerId:** Specify the waste bottle port that the Logistics Module is connected to. Enter "0" for the first port, "1" for the second port, and "-1" for no connection.

- **seconds:** Enter the duration of time in seconds to run the vacuum pump.
- **disableVacuumCheck:** Enable or disable a check for high vacuum pressure. Disabling the check can make evacuating more viscous fluids easier, while enabling the check can help detect clogs in the system. Enter "1" to disable the vacuum check or "0" to enable it.

6.2.12 StopVacuum

The `StopVacuum` command is used to stop and the vacuum waste pump. Note that this command will return an error if the vacuum has not been acquired or maintained since the last `StartVacuum` command. The only parameter is "deviceID", which specifies which device will receive the command.

6.3 Reagent Fill Module Commands

6.3.1 Dispense

The `Dispense` command is the main processing commands for the Reagent Fill Module. Once the desired plate is in position, this command dispenses the specified liquid to all wells on the plate. It requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify which reagent to dispense to the plate (1-17).
- **wellVolume:** Enter the volume of reagent per well in µL to dispense.
- **flowRate:** Specify how quickly to dispense to the plate in µL/s.
- **needleOffset:** Enter the desired distance between the top of the wells and the needles in millimeters. Negative values will lower the needles into the wells before dispensing.

6.3.2 DispenseNonStandard

This command is used to dispense to plates that have well spacing other than 9 mm. It can also be used to only dispense to specific columns on a plate. It requires inputs for the same parameters as the `Dispense` command, with two additional inputs:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify which reagent to dispense to the plate (1-17).
- **wellVolume:** Enter the volume of reagent per well in µL to dispense.
- **flowRate:** Specify how quickly to dispense to the plate in µL/s.
- **needleOffset:** Enter the desired distance between the top of the wells and the needles in millimeters. Negative values will lower the needles into the wells before dispensing.

- **edgeToWellOffset:** Enter the distance between the edge of the plate and the center of the first well to dispense to in millimeters.
- **wellToWellOffsets:** Enter an array of distances between rows of wells (measured from center to center) in millimeters.

For example, an edgeToWellOffset value of 13.5 and a wellToWellOffsets array of {9.0, 18.0, 9.0} for a standard microplate would dispense to the first, second, fourth, and fifth columns on a plate.

6.3.3 Flush

The `Flush` command pumps deionized water through the manifold to a waste container. The tubes must be flushed before and after a run, and every time the pump switched reagents. The command requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **wellVolume:** Enter the volume of water per well in µL to dispense.
- **flowRate:** Specify how quickly to flush the tubes in µL/s.
- **wasteContainerId:** Specify the waste bottle port that the Logistics Module is connected to. Enter "0" for the first port, "1" for the second port, and "-1" for no connection.

6.3.4 Prime

This command primes the Reagent Fill Module pump for the specified source bottle to be dispensed. The pump must be primed before using either of the `Dispense` commands. This command requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify which reagent to prime for dispensing (1-17).
- **wellVolume:** Enter the volume of reagent per well in µL to be dispensed.
- **flowRate:** Specify how quickly to dispense to the plate in µL/s.
- **wasteContainerId:** Specify the waste bottle port that the Logistics Module is connected to. Enter "0" for the first port, "1" for the second port, and "-1" for no connection.

6.4 Calibration Commands

These commands are used to calibrate the source bottles for the Reagent Fill Module. They must be calibrated upon installation and after any change to the bottle connections. Note that the [MPE]² Toolkit software on the installation media may also be used to calibrate the source bottles.

6.4.1 StartContainerCalibration

This command begins the calibration process for the specified source bottle. It requires inputs for three parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify the source bottle to be calibrated. The bottles are numbered 1-17. The value must correspond to the source bottle configuration set by the `SetSourceConfiguration` command.
- **volume:** Enter the expected liquid capacity in milliliters.

6.4.2 MeasureEmptyContainer

The `MeasureEmptyContainer` command calibrates the liquid sensor for the specified source bottle when empty. It requires inputs for three parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify the source bottle to be calibrated. The bottles are numbered 1-17.
- **emptyReading:** Select an integer variable to store the minimum allowable volume in milliliters. The variable must be declared earlier in the method to be selected.

6.4.3 MeasureFullContainer

The `MeasureFullContainer` command calibrates the liquid sensor for the specified source bottle when full. It requires inputs for three parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify the source bottle to be calibrated. The bottles are numbered 1-17.
- **fullReading:** Select an integer variable to store the maximum allowable volume in milliliters. The variable must be declared earlier in the method to be selected.

6.4.4 SaveContainerCalibration

This command saves the calibration data for the specified source bottle. Both the `MeasureEmptyContainer` and `MeasureFullContainer` commands must be performed before saving the calibration data. This command requires the following input parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify which source bottle's calibration data will be saved. The bottles are numbered 1-17.

6.4.5 CancelContainerCalibration

This command cancels the calibration in progress for the specified source bottle. If a calibration is cancelled, the previous calibration values are restored. This command requires the following input parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify which source bottle's calibration will be cancelled. The bottles are numbered 1-17.

6.4.6 GetContainerCalibration

`GetContainerCalibration` **returns the saved calibration data for the specified source bottle.** It requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **sourceId:** Specify which source bottle's calibration data will be returned. The bottles are numbered 1-17.
- **volume:** Select an integer variable to store the bottle's liquid capacity in milliliters. The variable must be declared earlier in the method to be selected.
- **emptyReading:** Select an integer variable to store the empty bottle reading. The variable must be declared earlier in the method to be selected.
- **fullReading:** Select an integer variable to store the full bottle reading. The variable must be declared earlier in the method to be selected.
- **calibrationDate:** Select a variable to store the date that the specified bottle was last calibrated.

6.4.7 ClearSourceConfiguration

This command clears calibration data for all source bottles. This command is useful if the bottles need to be connected to different nozzles. Note that the [MPE]² must be power cycled after this command is called. This command requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **reset:** Set to "1" to reset all errors and configuration data immediately.

6.4.8 GetSourceConfiguration

The `GetSourceConfiguration` command generates an XML file containing the available calibration data for all source bottles. The file is saved to the Hamilton\Bin\MPE2 folder under Program Files can later be used with the `SetSourceConfiguration` command. This command's only parameter is "deviceID", which specifies which device will receive the command.

6.4.9 SetSourceConfiguration

This command reads an XML file created by the `GetSourceConfiguration` command and uses it to calibrate the source bottles. The file must be in the Hamilton\BinMPE2 folder to be read. The only parameter for this command is "deviceID", which specifies which device will receive the command.

6.5 Evaporator Module Commands

6.5.1 EvaporatePrepare

This command primes the Evaporator Module for an `Evaporate` command. An `Initialize` command is still required before this command is called. This command requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **temperature:** Enter the desired evaporation temperature in °C.
- **pressure:** Enter the desired gauge pressure in psi.
- **timeout:** Enter the amount of time in minutes to allow this command to run. A value of 0 defaults to a five-minute timeout.

6.5.2 Evaporate

The `Evaporate` command moves a collection plate to the Evaporator for the specified amount of time after the target temperature and pressure have been reached. The `EvaporatePrepare` command must be called first to set a temperature and pressure for the evaporation, and a collection plate must be placed on the [MPE]² (indicated by a `CollectionPlatePlaced` command). This command requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **plateHeight:** Enter the height of the plate in millimeters. This parameter is equivalent to the filterHeight parameter in the `FilterPlatePlaced` command.
- **needleOffset:** Enter the distance in millimeters between the needle tips and the top of the plate.
- **wellDepth:** Enter the depth in millimeters of the plate being evaporated.
- **evaporateTime:** Enter the duration of the `Evaporate` step in seconds.

6.5.3 EvaporateWithRate

This command functions like the `Evaporate` command, but it moves the plate closer to the Evaporator manifold needles at a specified rate. This feature allows for a consistent

distance between the liquid level in the wells and the needles during evaporation. The command requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **plateHeight:** Enter the height of the plate in millimeters. This parameter is equivalent to the filterHeight parameter in the `FilterPlatePlaced` command.
- **needleOffset:** Enter the initial distance in millimeters between the needle tips and the top of the plate.
- **evaporatorTravelDistance:** Enter the depth in millimeters of the plate being evaporated.

WARNING: Subtract the depth of any remaining liquid in the wells from the well depth to avoid contaminating the Evaporator's needles.

- **evaporateTime:** Enter the duration of the `Evaporate` step in seconds.
- **followRate:** Enter the rate in mm/s to reduce the distance between the needle tips and the plate. This value must be less than the evaporatorTravelDistance divided by the evaporateTime.

6.5.4 EvaporateEnd

This command turns off the heater and waits until the Evaporator Module reaches 43°C. Any filter and collection plates must be removed after an `Evaporate` or `EvaporateWithRate` command and before this command. `EvaporateEnd` requires the following input parameters:

- **deviceId:** Specify which device will receive the command.
- **timeout:** Enter the amount of time in minutes to allow this command to run. A value of 0 defaults to a twenty-minute timeout.

6.5.5 GetCurrentHeaterStatus

The `GetCurrentHeaterStatus` command returns data on the current state of the Evaporator Module. It requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **reset:** Set to 1 to reset any errors or data that have been generated during the run.
- **currentEvaporatorTemperature:** Select an integer variable to store the temperature of the Evaporator Module heater in °C. The variable must be declared earlier in the method to be selected.

- **currentGasTemperature:** Select an integer variable to store the temperature of the air exiting the Evaporator Module in °C. The variable must be declared earlier in the method to be selected.
- **heating:** Select an integer variable to store the heater status. A value of "1" indicates that the heater is on, while "0" indicates that it is off. The variable must be declared earlier in the method to be selected.

6.5.6 GetHeaterTemperatureRange

This command returns data about the Evaporator Module's operation from the current run. It requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.
- **reset:** Set to 1 to reset any errors or data that have been generated during the run.
- **minimumEvaporatorTemperature:** Select an integer variable to store the lowest temperature of the Evaporator Module in °C recorded since the last reading. The variable must be declared earlier in the method to be selected.
- **maximumEvaporatorTemperature:** Select an integer variable to store the highest temperature of the Evaporator Module in °C recorded since the last reading. The variable must be declared earlier in the method to be selected.
- **minimumGasTemperature:** Select an integer variable to store the lowest air temperature in °C from the Evaporator Module since the last reading. The variable must be declared earlier in the method to be selected.
- **maximumGasTemperature:** Select an integer variable to store the highest air temperature in °C from the Evaporator Module since the last reading. The variable must be declared earlier in the method to be selected.
- **targetTemperature:** Select an integer variable to store the temperature set in the `EvaporatePrepare` command. The variable must be declared earlier in the method to be selected.
- **heating:** Select an integer variable to store the heater status. A value of "1" indicates that the heater is on, while "0" indicates that it is off. The variable must be declared earlier in the method to be selected.

6.5.7 GetTemperatureRange

The GetTemperatureRange command returns a quick summary of data on the Evaporator Module's operation from the current run. It requires inputs for the following parameters:

- **deviceId:** Specify which device will receive the command.

- **minimumEvaporatorTemperature:** Select an integer variable to store the lowest temperature setting in °C recorded since the last reading. The variable must be declared earlier in the method to be selected.
- **maximumEvaporatorTemperature:** Select an integer variable to store the highest temperature setting in °C recorded since the last reading. The variable must be declared earlier in the method to be selected.

6.6 Method Structure

This section describes the general order of the commands in a method using the [MPE]² Logistics Module. The example will not describe the commands themselves in depth; refer to sections 6.1 through 6.5 for descriptions of each command. The outline in this section does not translate into a fully functional method, and is only intended to show the order of the commands.

1. `ConnectUsingCOM` or `ConnectUsingIP`
2. `IsConnected` (optional)
3. `Initialize`
4. `IsInitialized` (optional)
5. `FilterPlatePlaced`
6. `ClampFilterPlate`
7. `CollectionPlatePlaced` (if using a collection plate)
8. `ProcessFiltertoWasteContainer` or `ProcessFiltertoCollectionPlate` (if using a collection plate)
9. `CollectionPlateRemoved`
10. `RetrieveFilterPlate` (if not done during `ProcessFilter` step)
11. `FilterPlateRemoved`
12. `Disconnect`

6.7 Processing Recommendations

This section offers recommendations to optimize the performance of the [MPE]². Methods will vary according to the specific application, but the following recommendations can function as a starting point when programming a new method.

6.7.1 Sorbent Conditioning

Many filter beds are prepared with conditioning solutions prior to sample capture. This step varies by protocol, depending largely on the type of sorbent material. A typical conditioning step applies pressure for approximately 30 seconds over a range of 5 to 30 psi.

Example controlPoints for a `ProcessFilter` command:
"pressure,5,5;pressure,15,5;pressure,25,5;pressure,30,10"

6.7.2 Sorbent Drying

Applying high pressure is useful for removing all moisture from a sorbent bed before elution. Some sorbent materials are more sensitive, and can be damaged if subjected to pressures above 60 psi. A drying step can take as long as 20 minutes, depending on the relative humidity of the laboratory.

6.7.3 Sample Capture and Matrix Cleanup

Low pressures over indeterminate periods of time are useful both for binding target analytes and removing interfering compounds. This step is especially dependent on liquid properties; a poor choice of flow rate or pressure can compromise results. Flow rates that are too fast will prevent complete binding between the sorbent and the target compounds.

Example controlPoints for a `ProcessFilter` command: "pressure,15,7;pressure,20,5"

6.7.4 Sample Elution

Generally, starting with a low pressure and gradually applying more pressure is the best practice for passing a solvent through. The volume of solvent used is dependent on the strength of the interaction between the target compounds and the sorbent.

Any residual liquid on the bottom of the filter plate nozzles can be a source for cross-contamination. To remove these droplets, a short burst of high pressure (such as 75 psi for 2 seconds) is recommended at the end of the "controlPoints" input.

6.7.5 High Volume

Too much pressure applied at the beginning of the processing step may cause splashing onto the filter plate gasket. Wells filled with 75% or more can spill over, which can lead to cross-contamination. Starting with a low pressure and gradually applying more pressure will ensure safer sample processing.

Example controlPoints for a `ProcessFilter` command:
"pressure,5,5;pressure,10,5;pressure,20,5;pressure,30,5"

6.7.6 Viscous Liquids

Processing viscous liquids requires longer processing times, low initial pressures, and high final pressures. Final pressure values at the end of a processing pressure ramp may be

as high as 70 or 80 psi, and the processing time for each section of a step may be as long as 10-15 seconds. These values will vary with the specific liquids and sorbents used.

Example controlPoints for a `ProcessFilter` command:
"pressure,10,10;pressure,25,10;pressure,55,10"

6.7.7 Volatile Liquids

Lower pressures and shorter processing times are sufficient for volatile liquids. Pressures under 10 psi are often adequate for liquids like ethanol and acetone to pass through a filter bed.

Example controlPoints for a `ProcessFilter` command:
"pressure,3,5;pressure,7,5;pressure,9,5"

7 Maintenance

Periodic maintenance is required in order to assure safe and reliable operation of the [MPE]². Daily and weekly maintenance must be performed by the operator in order to keep the instrument clean and to verify proper function. Half-yearly preventative maintenance must be performed by a Hamilton Trained Field Service Engineer to maintain proper functioning and verify performance.

WARNING: Only certified technicians are authorized to perform mechanical maintenance on the [MPE]².

WARNING: Wear appropriate PPE during all maintenance and decontamination procedures.

7.1 Intervals

Hamilton recommends that the appropriate maintenance be performed at the following intervals:

- Daily - Recommended before shut-down at the end of the day.
- Weekly - Recommended at the end of the week before shut-down.
- Every 6 months - Recommended preventative maintenance by a Hamilton Trained Field Service Engineer. This PM includes replacement of the gasket, tubing, and filters, as well as lubricating the components of the dual elevator system.

WARNING: Observe and carry out the maintenance procedures given. Failure to do so may impair the reliability and correct functioning of the [MPE]². Preventative maintenance beyond daily maintenance, cleaning, and decontamination must only be performed by a Hamilton Trained Field Service Engineer.

7.2 Materials Required

- Personal protective equipment (gloves, eyewear, lab coat)
- Paper towels
- Lint-free paper towels
- Deionized water

- Microcide SQ. This is a cleaner and broad-spectrum disinfectant for use on Hamilton instrumentation. It is a colorless, low foaming liquid. The concentrate comes with a spray bottle. Dilute the concentrate with deionized water according to the instructions on the bottle.

WARNING: Do not use cleaning or disinfecting solutions which contain hypochlorite, such as bleach, on the device.

7.3 Daily Maintenance

Daily maintenance requires the following tasks to be performed:

- Inspect and clean the manifold gasket
- Clean dual elevator system
- Flush fluid lines

The following procedure describes each task in more detail.

1. **Examine the manifold gasket for cleanliness.** If the manifold appears damaged, refer to section 11.1 for assistance.
2. **Use a lint-free cloth to clean the gasket.** If necessary, use a cloth with water or methanol.
3. **Clean the dual elevator system with a lint-free cloth.** If necessary, wet the cloth with water.
4. **Flush the tubes with water or DI water or isopropanol for 2-5 minutes.** Fill the bottom elevator with the water or isopropanol with the pump turned on. The tubes should also be flushed at the beginning of the day.

7.4 Weekly Maintenance

Weekly maintenance requires the following tasks to be performed, in addition to daily maintenance:

- Check all connections
- Look for obstructions in the liquid waste tubing

The following procedure describes each task in more detail.

1. **Inspect all cables and tubes.** Check for leaks in the tubing at each junction. Tighten connections as necessary. If junctions leak frequently, refer to section 11.1 for technical assistance.
2. **Examine the waste tray and tubing for obstructions.** Flush the tubes as necessary to clear any blockages.

Figure 7–1: Checking the waste tray for obstructions

7.5 Decontamination

These instructions include recommendations and required materials for cleaning and decontamination. Be aware of any materials which may be incompatible with parts of the device.

Appropriate decontamination in the event of a hazardous material spill on or inside the equipment is the user's responsibility.

It is also the user's responsibility to avoid using cleaning agents that could cause a hazard as a result of a reaction with equipment or with any materials contained within. The manufacturer or their agent should be consulted if there is any doubt about the compatibility of decontamination or cleaning agents.

The recommended decontamination procedure is as follows:

1. **Turn off the [MPE]²**.
2. **Remove the seven cover screws from each side of the device.** The screws are located along the sides and bottom of the cover on the two long sides of the [MPE]².

Figure 7–2: Locating the cover screws

3. **Lift the cover off the device and clean it** using Microcide SQ, followed by deionized water.

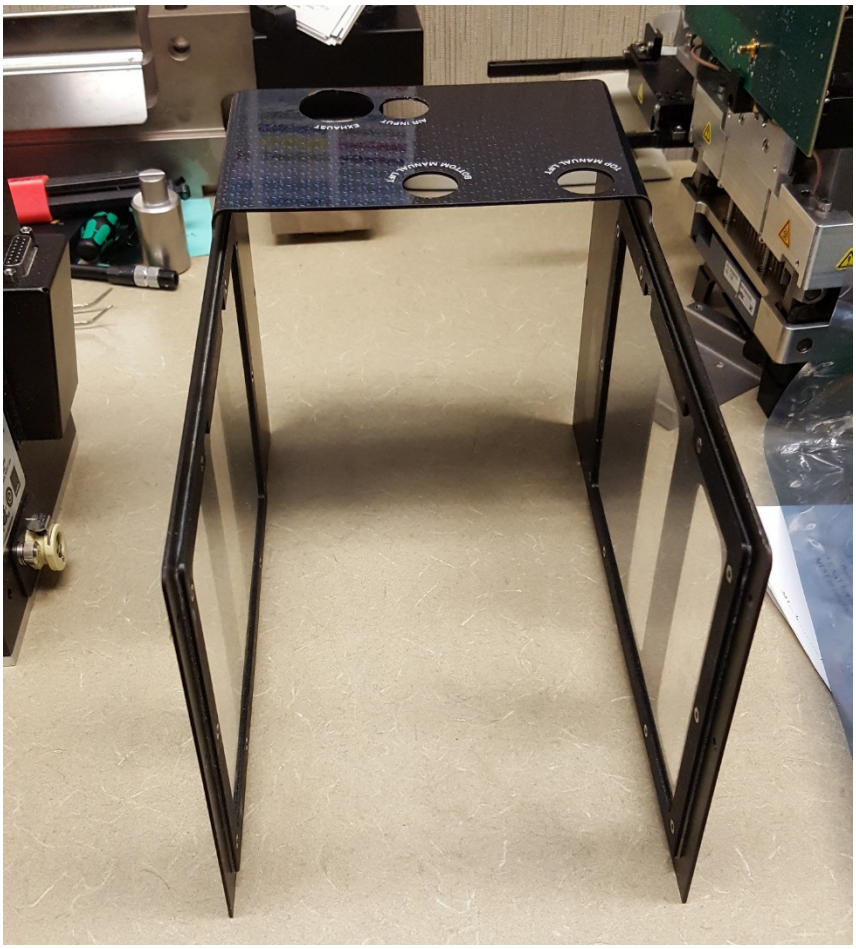


Figure 7–3: Removing the cover

4. **Use the screws indicated in Figure 7–4 to raise both elevators** to the top of the device.

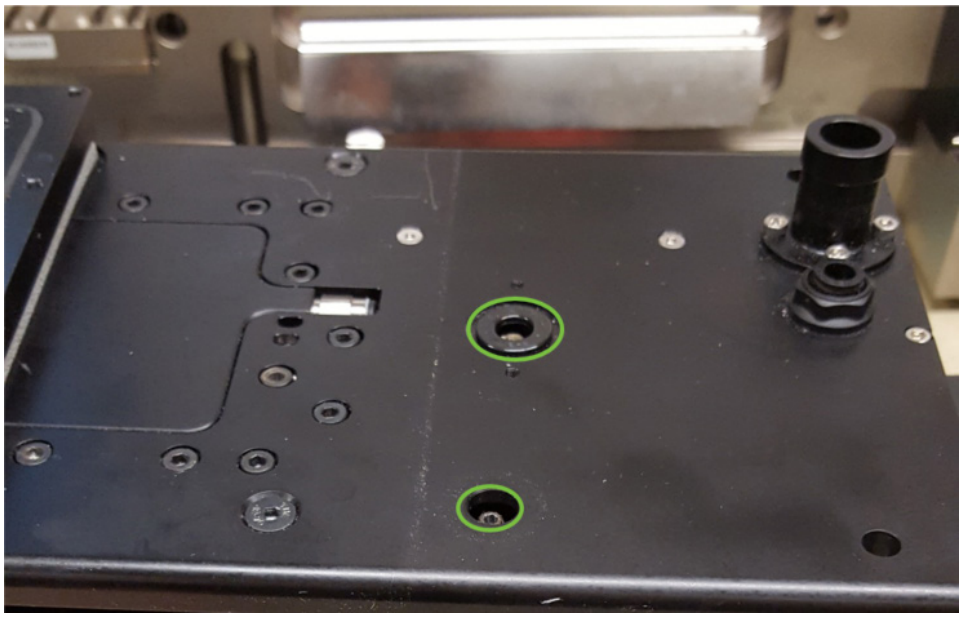


Figure 7–4: Locating the lifter screws

5. **Unscrew and remove the waste tube bracket** indicated in Figure 7–5.

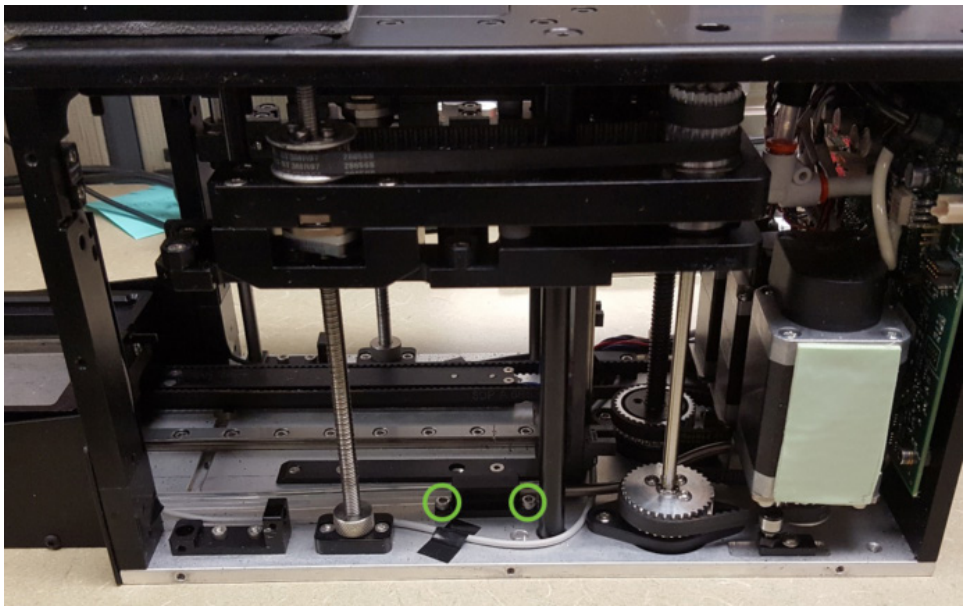


Figure 7–5: Locating the waste tube bracket screws

6. **Disconnect and remove the waste tube from the waste tray.** The connection is located beneath the waste tray. Dispose of the waste tube according to laboratory procedure.

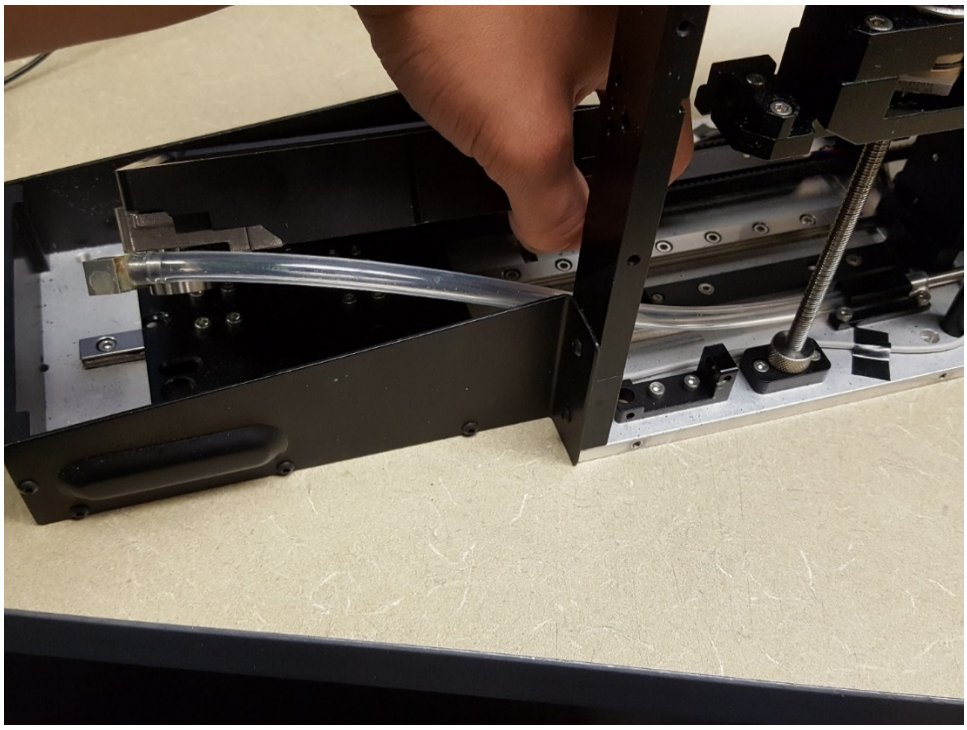


Figure 7–6: Locating the waste tube connection

7. **Remove and clean both the filter plate adapter and the waste tray.** Clean them using Microcide SQ, followed by deionized water.
8. **Wipe down the inside of the [MPE]² as thoroughly as possible** using Microcide SQ, following by deionized water.

WARNING: Avoid all electrical components when cleaning the interior of the [MPE]².

9. **Reassemble the [MPE]² when finished.** Make sure to replace the discarded waste tube.

8 Troubleshooting

This section describes possible solutions for errors that can occur during routine use of the [MPE]². If the solutions presented in this section do not resolve the errors, refer to section 11.1 for service contact information.

8.1 Insufficient Vacuum

If the vacuum pressure is insufficient, there could be a bad connection somewhere in the waste tubing.

Solution

Check all connections in the waste tubing. Make sure the waste bottle cap is tightly screwed on, and that all tubes are securely connected to their valves. Inspect the tubing for any punctures or holes, and replace damaged tubing as necessary.

8.2 Excess Vacuum/Vacuum Fails to Initialize

If the vacuum encounters an error on initialization, there could be an issue with the check valve. This error can occur if the waste lines are not flushed during daily maintenance, or if especially viscous reagents are used.

Solution 1	Flush the waste lines.
Solution 2	Clean the check valve.

Solution 1

First, make sure the waste lines are clear. Refer to section 7.3 for the process for daily maintenance.

Solution 2

If flushing the waste lines does not work, the check valve may need to be cleaned.

WARNING: Treat the check valve as contaminated. Wear appropriate PPE when removing and cleaning the check valve.

Figure 8–1: Check valve

1. **Remove both ends of the tubing from the check valve**.
2. **Using pliers and a wrench (or another pair of pliers), unscrew the two halves of the check valve.** Keep the check valve vertical to keep the spring and steel ball within from falling out.

Figure 8–2: Unscrewing the check valve

3. **Use a small tool, such as a hex wrench, to remove the O-Ring** from within the check valve.

Figure 8–3: Removing the O-Ring

4. **Clean the O-Ring using isopropyl alcohol (or another appropriate cleaning agent) and replace it in the check valve.** Make sure it is centered in the bore.

WARNING: Check the chemical compatibility of the cleaning solution used with the laboratory's waste liquids.

5. **Remove the steel ball and clean it with isopropyl alcohol** (or another appropriate cleaning agent).

Figure 8–4: Removing the steel ball

6. **Replace the steel ball in the check valve.** Make sure it is centered on the spring.
7. **Screw the two halves of the check valve together.** Using a small tool, push on the steel ball to make sure it moves freely on the spring.
8. **Reconnect the check valve.** Make sure the chamfered end of the valve points in the direction of liquid flow.

8.3 Issues with Plate Sealing

If plates are sticking after they are sealed or the plates do not seal properly, there may be a problem with the gasket. These problems can occur if the gasket is not cleaned thoroughly during daily maintenance, or if the gasket is damaged.

Solution 1	Clean the gasket.
Solution 2	Inspect the gasket for damage.

Solution 1

First, make sure the gasket is clean. Refer to section 7.3 for the process for daily maintenance.

Solution 2

If plates are still not sealing properly, the gasket could be damaged. Remove the gasket and inspect it for tears. If the gasket is torn or otherwise damaged, contact Hamilton for help replacing the gasket.

8.4 Comlink USB Files Not Generated

If comlink USB files are not being generated after each run, contact your Hamilton applications specialist. They will provide a folder with files that must be copied to both of the following directories, under either the Program Files or Program Files (x86) folder:

- Hamilton\Bin\MPE2
- Hamilton\Bin

9 Parts and Accessories

9.1 Device Configurations

Part Number	Description
96160-01	[MPE]² with 96 air manifold
96160-02	[MPE]² with 48 air manifold
96160-03	[MPE]² with 24 air manifold
96160-04	[MPE]² with 96 air manifold and Evaporator Module
96160-05	[MPE]² with 48 air manifold and Evaporator Module
96160-06	[MPE]² with 24 air manifold and Evaporator Module
96160-07	[MPE]² with 96 air manifold and Reagent Fill Module
96160-08	[MPE]² with 48 air manifold and Reagent Fill Module
96160-09	[MPE]² with 24 air manifold and Reagent Fill Module
96160-10	[MPE]² with 96 air manifold, Evaporator and Reagent Fill Modules
96160-11	[MPE]² with 48 air manifold, Evaporator and Reagent Fill Modules
96160-12	[MPE]² with 24 air manifold, Evaporator and Reagent Fill Modules

9.2 Parts List

Part Number	Description
3892-05	Power cord
4427-02	Cable assembly, USB, SER A/B
4629-01	Tubing, FEP, 1/4 OD x 1/32 W
6233-01	Tubing cutter, 1/8TO5/8, PLASTIC
93086-01	96 gasket
94043-01	Logistics Module
94724-01	Power supply
94902-01	Control Box
95121-01	Cable assembly, PWR/COMM, MTR
95709-01	96 manifold assembly

Part Number	Description
95746-01	Filter/Regulator, 120 PSI
95880-01	Fitting, STR, 1/8 NPT x 1/4T
95882-01	Fitting, ELB, 1/8 NPT x 1/4T
95962-01	Single bottle waste kit
95987-01	Waste tube 1
95987-02	Waste tube 2
96241-01	Hex/ball screwdriver, 2 mm x 7
96242-01	Hex/ball screwdriver, 2.5 mm x 7
96244-01	Screwdriver, handle, 2WY, HEX DRI
99105-01	24-position air manifold
99106-01	48-position air manifold
99107-01	96-position air manifold
99180-01	2 L plastic Hamilton bottle
99185-01	2 L glass Hamilton bottle
6600691-01	1 L amber glass bottle
6600689-01	Single bottle rack kit
6600689-02	Multiple bottle rack kit
6600690-01	Single valve extension kit
6600690-02	Multiple valve extension kit

9.3 Integration

Part Number	Description
98356-01	NIMBUS HD integration kit
99261-02	Reagent Fill Module tubing for integration
6600599-01	MFX adapter plate for Evaporator Module
96042-01	[MPE]² adapter plate with single reagent pump cutout
96042-02	[MPE]² adapter plate with two reagent pump cutouts
6600745-01	Reagent pump bracket kit for adapter plates
6600805-01	Reagent pump bracket kit for 96042-02 on Microlab VANTAGE

9.4 Manuals and Software

Part Number	Description
95541-01	[MPE]² User's Manual
95990-01	[MPE]² software

10 Technical Specifications

10.1 Device Specifications

Parameter	Specification		
Power			
Input Power (Primary), Universal Supply	100-240 VAC, 50-60 Hz, 2.5 A		
Output Power (Secondary)	48 VDC, ±2%; 221 W maximum		
Physical Dimensions	**Logistics Module**	**Control Box**	**Waste Bottle**
Length	17.53 in (44.5 cm)	10.38 in (26.4 cm)	14.08 in (35.8 cm)
Width	6.25 in (15.9 cm)	8.43 in (21.4 cm)	5.78 in (14.7 cm)
Height	7.11 in (18.1 cm)	2.88 in (7.3 cm)	8.09 in (20.5 cm)
Weight	15.25 lbs. (6.9 kg)	5 lbs. (2.3 kg)	-
Operation			
Deck consumption	NIMBUS: 1 labware site STAR/Microlab VANTAGE: 7 tracks (maximum)		
Communication	Ethernet/USB		
Operating Temperature	5-40°C (41-104°F)		
Relative Humidity	15-90% non-condensing		
Storage			
Storage Temperature	-20-70°C (-4-158°F)		
Relative Humidity	10-90% non-condensing		
Regulatory			
CSA Certification Installation Category	II		
Pollution Degree	2		

Parameter	Specification
Note: Indoor Operation and Use Only Per Section 3.6.6.2 "pollution degree 2" is defined as "normally only non-conductive pollution occurs (addition of foreign matter, solid, liquid, or gaseous (ionized gasses), that may produce a reduction of dielectric strength or surface resistivity)." Occasionally, however a temporary conductivity cause by condensation must be expected.	

10.2 Reagent Fill Module

Parameter	Specification			
Power				
Input Power (Primary), Universal Supply	90-240 VAC, 47-63 Hz, 2.5 A			
Physical Dimensions	**Reagent Pump**	**Valve Extension**	**Bottle Rack**	**ACME**
Width	2 in (5.1 cm)	1.125 in (2.9 cm)	12.5 in (31.8 cm)	10.38 in (26.4 cm)
Depth	6.25 in (15.9 cm)	3.625 in (9.3 cm)	6 in (15.3 cm)	8.43 in (21.4 cm)
Height	5.47 in (13.9 cm)	7 in (17.8 cm)	13.75 in (35.0 cm)	2 in (5.1 cm)
Weight	3.75 lbs. (1.7 kg)	1.5 lbs. (0.68 kg)	-	3 lbs. (1.4 kg)
Operation				
Communication	Ethernet/USB (via Control Box)			
Operating Temperature	5-40°C (41-104°F)			
Relative Humidity	15-90% non-condensing			
Storage				
Storage Temperature	-20-70°C (-4-158°F)			
Relative Humidity	10-90% non-condensing			
Regulatory				
CSA Certification Installation Category	II			
Pollution Degree	2			

Parameter	Specification
Note: Indoor Operation and Use Only Per Section 3.6.6.2 "pollution degree 2" is defined as "normally only non-conductive pollution occurs (addition of foreign matter, solid, liquid, or gaseous (ionized gasses), that may produce a reduction of dielectric strength or surface resistivity)." Occasionally, however a temporary conductivity cause by condensation must be expected.	

10.3 Chemical Compatibility

10.3.1 Top Elevator

Compound	Specification
DMSO	Absolute / 100%
Sulfuric acid	18 M / 36 N / ~96%
Sodium hypochlorite	~10%
Halogenated organics, including chlorides	Absolute / 100%
Chloroform, methylene chloride	Absolute / 100%
Bromophenol blue, crystal violet, methylene blue	10% at most
Acetonitrile	Absolute / 100%
Hexanes	Absolute / 100%
Alcohols Ethanol, methanol, isopropanol, 2-propanol	Absolute / 100% Absolute / 100%
HCL	12.1 M / 12.1 N / ~37%
Acetic acid, glacial	17.4 M / 17.4 N / 99.7%
Formic acid	23.6 M / 23.6 N / 90.5%
Hydrofluoric acid	28.9 M / 28.9 N / 49.0%
Nitric acid	15.8 M / 15.8 N / 70.0%
Perchloric acid	11.7 M / 11.7 N / 70.0%
Phosphoric acid	14.8 M / 44.6 N / 85.0%
Acetic anhydride	97.0%
Ammonium hydroxide	14.8 M / 14.8 N / 57.0%

Compound	Specification
Potassium hydroxide	11.7 M / 11.7 N / 45.0%
Sodium hydroxide	19.3 M / 19.3 N / 50.0%
Calcium chloride	1 M
Sodium bicarbonate	10%

10.3.2 Reagent Fill Module

The following compounds are compatible with the wetted components of the Reagent Fill Module:

- Water
- DI Water
- Hexane
- Isooctane
- Petroleum Ether
- Cyclohexane
- Carbon Tetrachloride
- Chloroform
- Methylene Chloride
- Tetrahydrofuran
- Diethyl Ether
- Acetone
- Ethyl Acetate
- Acetonitrile
- Isopropanol
- Methanol
- Acetic Acid

10.4 Evaporator Module

Parameter	Specification
Physical Dimensions	
Length	5.5 in (14.0 cm)
Width	4.16 in (10.6 cm)
Height	2.13 in (5.5 cm)
Weight	0.7 lbs. (0.32 kg)
Power	
Input Power (Primary), Universal Supply	90-240 VAC, 47-63 Hz, 2.5 A
Operation	
Communication	Ethernet/USB (via Control Box)
Operating Temperature	5-40°C (41-104°F)
Relative Humidity	15-90% non-condensing
Storage	
Storage Temperature	-20-70°C (-4-158°F)
Relative Humidity	10-90% non-condensing
Regulatory	
CSA Certification Installation Category	II
Pollution Degree	2
Note: Indoor Operation and Use Only Per Section 3.6.6.2 "pollution degree 2" is defined as "normally only non-conductive pollution occurs (addition of foreign matter, solid, liquid, or gaseous (ionized gasses), that may produce a reduction of dielectric strength or surface resistivity)." Occasionally, however a temporary conductivity cause by condensation must be expected.	

10.5 AC20B-A Filter/Regulator Specifications

Parameter	Specification	
Component	Air Filler	Air Regulator

Parameter	Specification	
	AF20-A	AR20-1
Port size	1/8 in	1/4 in
Pressure gauge port size	1/8 in	
Fluid	Air, nitrogen	
Ambient and fluid temperature	-5-60°C (with no freezing)	
Proof pressure	1.5 MPa (217 psi)	
Maximum operating pressure	1.0 MPa (145 psi)	
Set pressure range	0.05-0.7 MPa (7.25-101 psi)	
Nominal filtration rating	5 µm	
Bowl material	Polycarbonate	
Bowl guard	Semi-standard (steel)	Standard polycarbonate
Regulator construction	Relieving type	
Weight	.27 kg (9.53 oz.)	

11 Appendix

11.1 Getting Technical Assistance

If additional assistance with the [MPE]² is required, please contact an authorized Hamilton Company distributor or the Hamilton Company directly. Regional contact information is provided in sections 11.1.1 and 11.1.2. Please have the following information available when requesting technical assistance:

- Model number
- Serial number
- Configuration
- Description of the problem
- Laboratory contact information

If possible, supply the following additional information:

- What was happening at the time of the error
- What has been tried so far to solve the problem
- Version of software (see section 11.1.3)
- Screenshots of any errors (see section 11.1.4)
- Photos that could more readily illustrate the problem
- Trace files, log files (found in the "Hamilton Company/Logfiles" directory)
- A copy of the method

If being returned for repair, the [MPE]² must be repacked in a Hamilton provided shipping box. The provided box will have instructions on how to properly re-pack the instrument for return. There must be no containers in the [MPE]² during transportation.

Hamilton service, application technician and the laboratory share the responsibility for the installation qualification (IQ) and the operation qualification (OQ), i.e. verification. The process qualification (PQ) is the sole responsibility of the laboratory.

11.1.1 Support in the Americas and Pacific Rim

Hamilton Company

4970 Energy Way, Reno, Nevada 89502, USA

Toll Free (USA and Canada), General: 800-648-5950

Toll Free (USA and Canada), Service Hotline: 800-527-5269

Telephone: + 1- 775-858-3000

Fax: +1-775-856-7259

E-Mail: tech@hamiltoncompany.com

11.1.2 Support in Europe, Asia, and Africa

Hamilton Bonaduz AG

CH-7402, P.O. Box 26, Bonaduz, Switzerland

Telephone: + 41 81 660 60 60

Fax: +41 81 660 60 70

E-Mail: itechsupport@hamiltoncompany.com

11.1.3 Finding the Software Version

To find the software version, navigate to Windows START and click All Programs > Hamilton > Version Info.

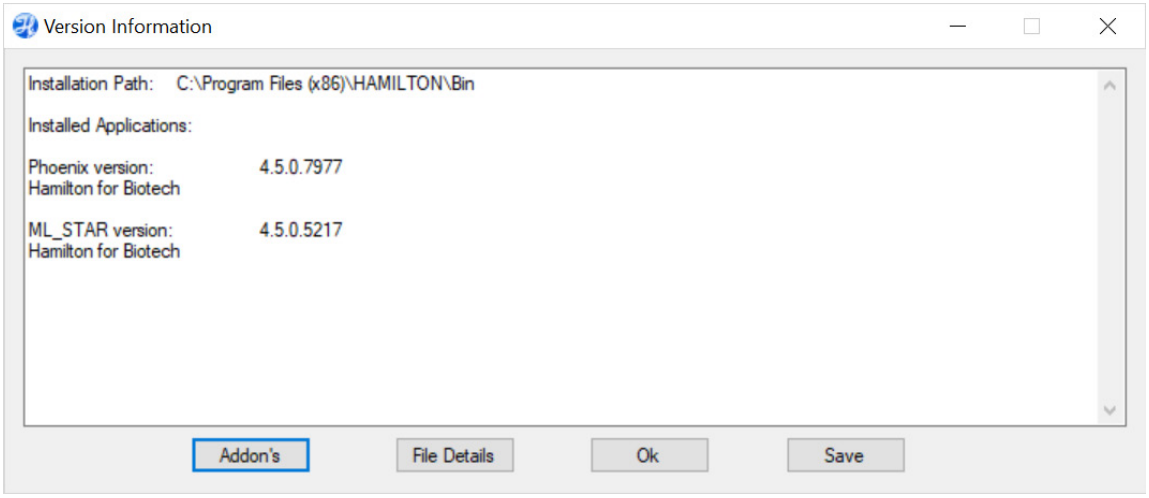


Figure 11–1: Locating the software version

To find the version of the HSL or SiLA driver, open the Programs and Features list using the Control Panel.

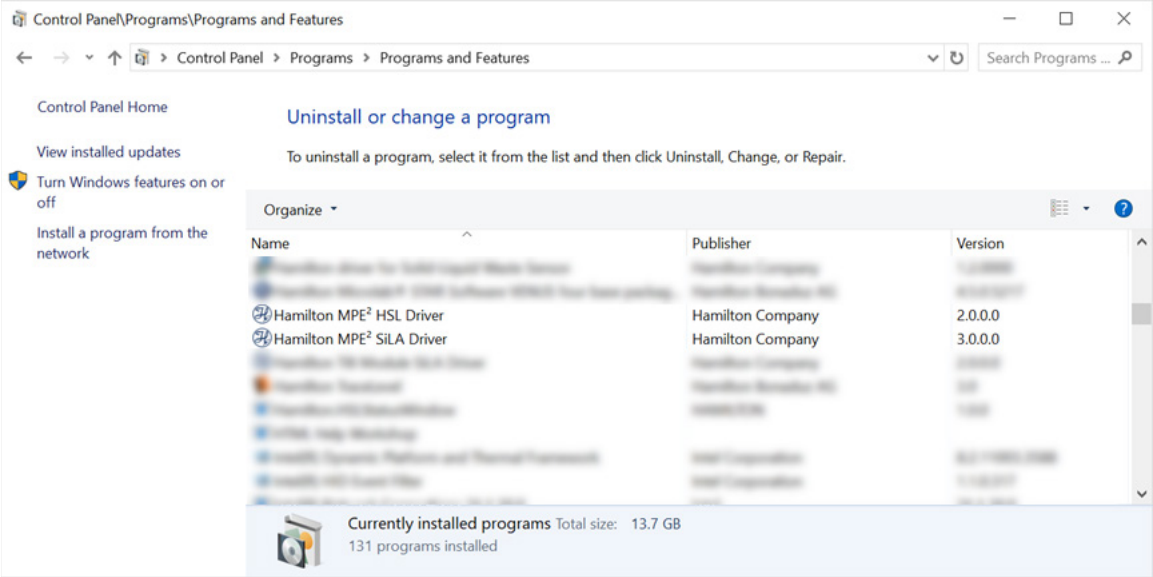


Figure 11–2: Finding the driver version

11.1.4 Finding the Firmware Version

If the [MPE]² firmware version is needed, it can be done using the Device Toolkit (DTK) program. The program is located in the Bin folder in the Hamilton directory.

1. **Make sure the [MPE]² is on** and connected to the controlling computer.
2. **Open the DTK software** from the Bin folder. The program is named "Hamilton.Tools.DeviceToolKit.exe."

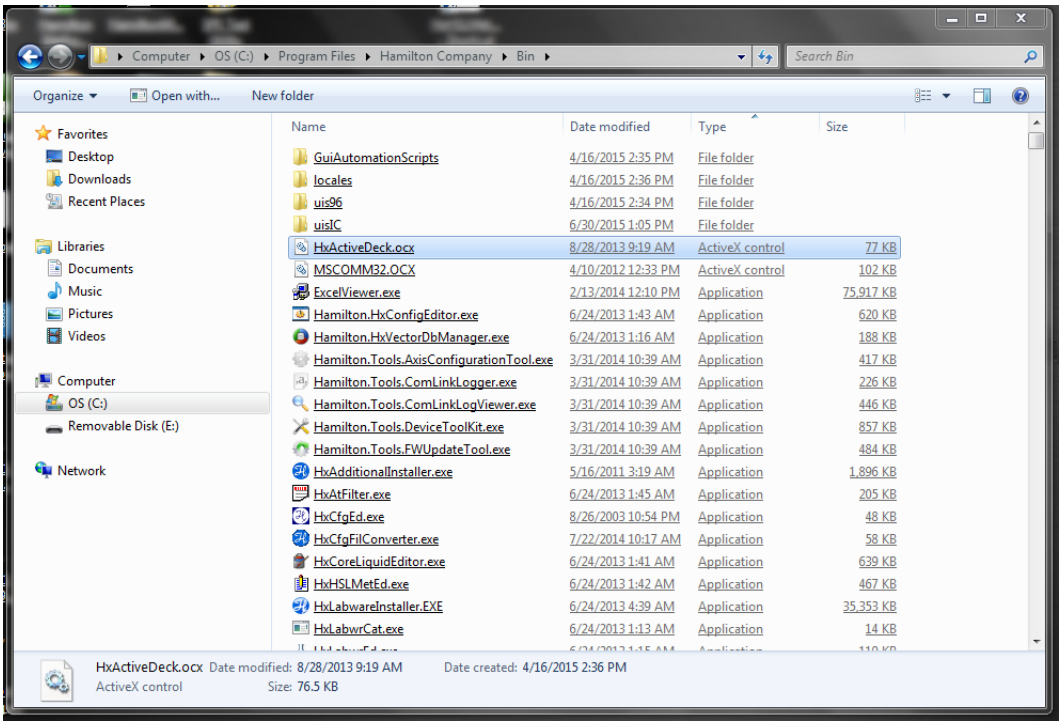


Figure 11–3: Locating the DTK software

3. **Connect to the [MPE]².** The Transport option will be set to Ethernet ("Tcp") by default. If using an Ethernet connection, enter the IP address in the "Host" field and "2000" in "Port". Click Connect when finished.

   If using a USB connection, select the "Rs-232" radio button. Select the COM port from the Port drop-down menu; the menu should auto-populate with the connected devices. Enter the bit rate for the [MPE]² (usually 921600) and click Connect.

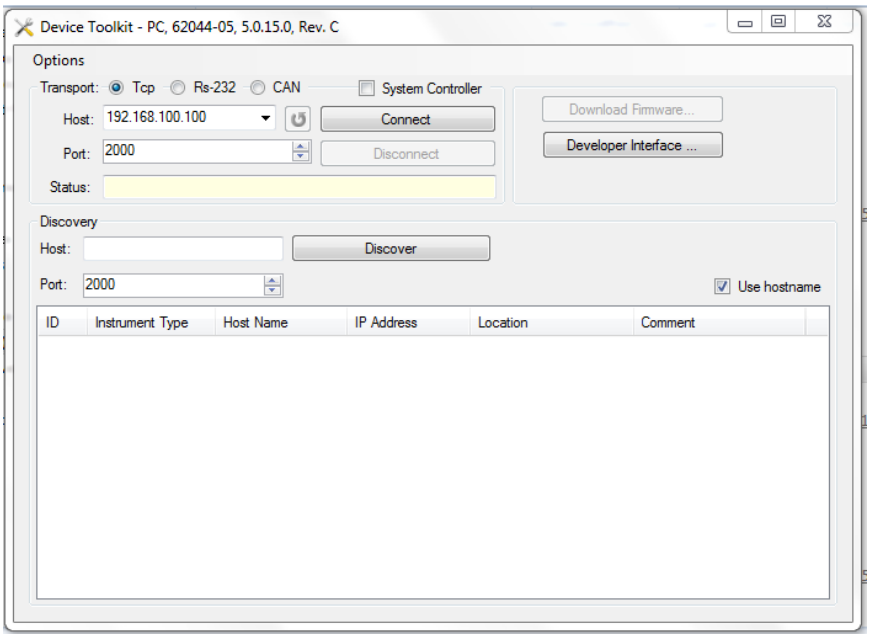


Figure 11–4: Connecting DTK using an Ethernet connection

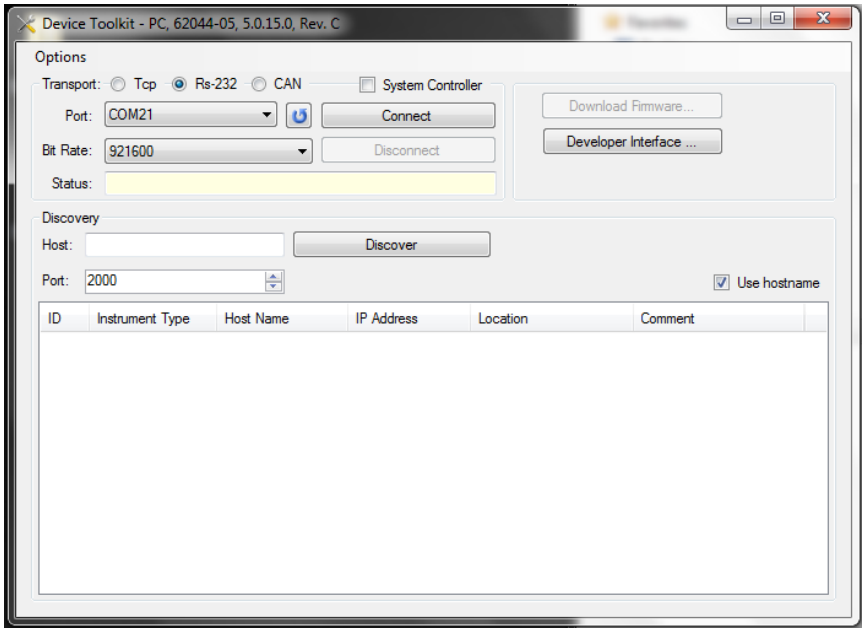


Figure 11–5: Connecting DTK using a USB connection

4. **When the Status field reads "Connected", click the Download Firmware button.** The Download Firmware dialog appears, listing the firmware for each of the modules.

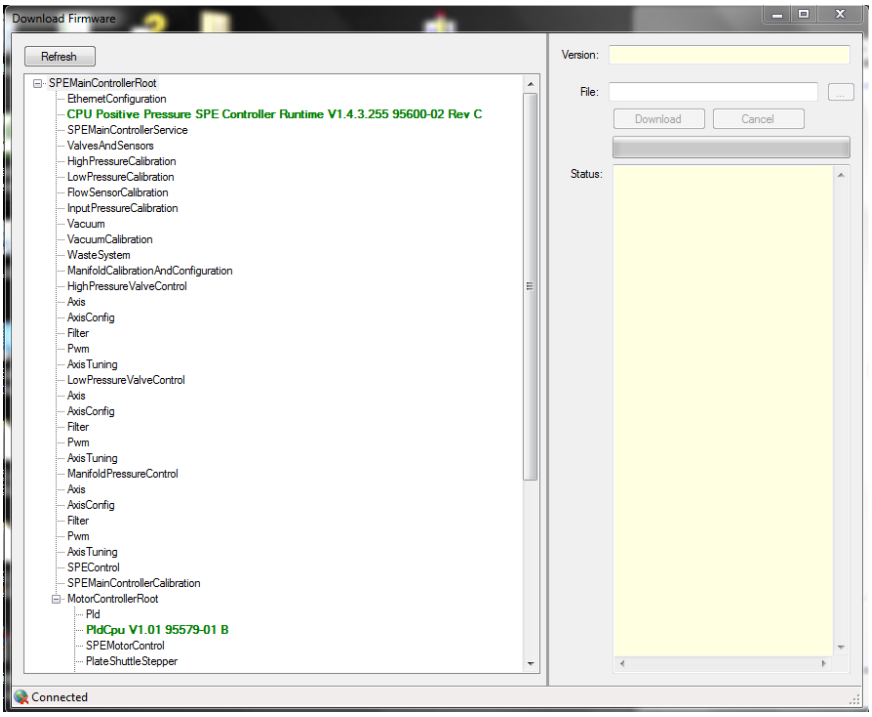


Figure 11–6: Viewing [MPE]² firmware

5. **Select the board firmware for each module to view the version.** The firmware for the modules are labelled as follows:
    - Control Module: SPEMainControllerRoot > CPU Positive Pressure SPE Controller Runtime
    - Logistics Module: MotorControllerRoot > CPU PP SPE Motor Control Runtime
6. When finished, close the Download Firmware dialog and click Disconnect in the DTK window.

11.1.5 How to Get a Screenshot

If an error appears on the screen, follow these instructions to take a screenshot:

1. **Click on the desired window or error dialog**.
2. **On the keyboard, click Alt+PrtScrn.** This will copy a picture of the window. To make a screenshot of the visible desktop, use Ctrl+PrtScrn.
3. **Paste the screenshot into a Word document or Wordpad.** Save the document.

11.2 Warranty

Hamilton Company warrants this product to be free of defects in material and workmanship for a period of 12 months from the date of delivery. This warranty is extended to the buyer of record on the original purchase order to Hamilton Company.

Hamilton Company or an authorized Hamilton representative will repair or replace, at its option and free of charge to the buyer at a normal place of business or at a Hamilton repair facility, any part or parts that, under proper and normal use, prove to be defective during the warranty period.* Abuse, unauthorized replacement of parts, modifications, or adjustments made by anyone other than Hamilton Company or an assigned representative voids this warranty.

This warranty gives the owner specific rights. No other warranties, expressed or otherwise, including implications of warranties of merchantability and fitness for a particular product, are made.

This warranty does not apply if:

- The product has not been operated in accordance with the user manual
- The product is not regularly and correctly maintained
- The product is not maintained, repaired, or modified by a Hamilton authorized representative or user
- Parts other than original Hamilton parts are used
- The product and parts thereof have been altered without written authorization from Hamilton
- The product is not returned properly packaged and secured Hamilton Company's liability on the sale of all products shall be limited to repair, replacement, or refund of price of any defective product.

Hamilton Company endeavors to provide prompt and satisfactory service.

*Hamilton Company reserves the right to refuse to accept the return of any instrument or valve that has been used with radioactive, microbiological, or any other material or substance that may be deemed hazardous to employees of Hamilton Company.

11.2.1 Repair under Warranty or Contract

The [MPE]² is a return-to-factory device. If the [MPE]² malfunctions, the following actions are required:

1. **Call the Hamilton Service line.** Refer to section 11.1 for contact information.
2. **If the problem cannot be fixed over the phone, a Return Materials Action (RMA) number will be generated**.
3. **A refurbished [MPE]² will be sent** to replace the damaged unit.
4. **Send the malfunctioning unit to Hamilton Company in Reno, NV.** Refer to section 11.1.1 for mailing information.

11.2.2 Repair without Warranty or Contract

1. **Call the Hamilton Service line.** Refer to section 11.1 for contact information.
2. **If the problem cannot be fixed over the phone, a service quote and Return Materials Action (RMA) number will be generated** once a purchase order is received.
3. **A refurbished [MPE]² will be sent** to replace the damaged unit.
4. **Send the malfunctioning unit to Hamilton Company in Reno, NV.** Refer to section 11.1.1 for mailing information.

11.3 Regulatory

CE, CSA and UL conformity are maintained for the [MPE]².

11.3.1 In Vitro Diagnostics

The Microlab® [MPE]² is an In Vitro Diagnostic Device and therefore regulated by the Directive 98/79/EC of the European Parliament and of the Council of 1998-10-27 on in vitro diagnostic medical devices.

11.3.2 Declaration of Conformity

The declaration of conformity is part of the delivery of the [MPE]² instrument. It verifies that the instrument meets all required Directive standards.

11.4 Index

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