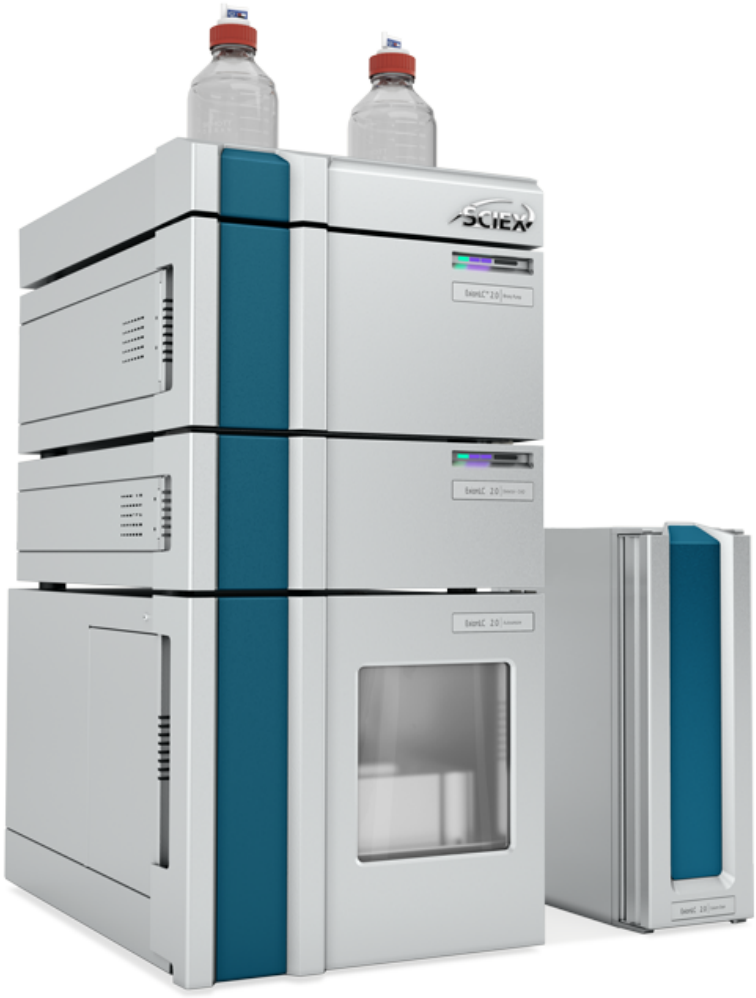
SCIEX

The Power of Precision

ExionLC 2.0 System

Hardware User Guide



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Contents

Operational Precautions and Limitations 1

This guide describes the basic operation and troubleshooting for the ExionLC 2.0 system.

Read this guide thoroughly before using the product and operate the product in accordance with the instructions in this guide.

This guide provides safety instructions and precautions to make sure that the user operates the system safely. Follow all Warning and Caution instructions provided in the guide.

Keep this guide for future reference. Make sure that it is accessible to the operator of the system.

Operational Precautions and Limitations

Note: Before operating the system, carefully read all of the sections of this guide.

This section contains general safety-related information. It also describes potential hazards and associated warnings for the system and the precautions that should be taken to minimize the hazards.

For information about the symbols and conventions used in the laboratory environment, on the system, and in this documentation, refer to the section: Glossary of Symbols.

Documentation Symbols and Conventions

The following symbols and conventions are used throughout the guide.

DANGER! Danger identifies an action that can cause severe injury or death.

WARNING! Warning identifies an action that can cause personal injury if precautions are not obeyed.

CAUTION: Caution identifies an operation that can cause damage to the system or corruption or loss of data if precautions are not obeyed.

Note: Notes supply important information in a procedure or description.

Tip! Tips supply information that helps to apply the techniques in a procedure or gives a shortcut, but that is not essential to the completion of a procedure.

General Safety Information

To prevent personal injury or system damage, read, understand, and obey all of the safety precautions and warnings in this document, the manufacturer chemical safety data sheets (SDSs), and product label information. Labels are shown with internationally recognized symbols. Failure to heed these warnings could result in serious injury.

This safety information is intended to supplement federal, state, provincial, and local environmental health and safety (EHS) regulations. It does not include every safety procedure that should be practiced. Ultimately, the user and the organization are responsible for compliance with federal, state, provincial, and local EHS regulations and for maintaining a safe laboratory environment.

Refer to the correct laboratory reference material and standard operating procedures.

Regulatory Compliance

This system complies with the regulations and standards listed in this section. For dated references, refer to the declaration of conformity included with the system and the individual system components. Applicable labels have been affixed to the system.

Australia and New Zealand

- **Electromagnetic Compatibility (EMC):** Radio Communications Act 1992 as implemented in these standards:
  - Electromagnetic Interference—AS/NZS CISPR 11/ EN 55011/ CISPR 11 (Class A). Refer to the section: Electromagnetic Interference.
- **Safety:** AS/NZ 61010-1 and IEC 61010-2-081

Canada

- **Electromagnetic Interference (EMI):** CAN/CSA CISPR11. This ISM device complies with Canadian ICES-001. Refer to the section: Electromagnetic Interference.
- **Safety:**
  - CAN/CSA C22.2 No. 61010-1

Europe

- **Electromagnetic Compatibility (EMC):** Electromagnetic Compatibility Directive 2014/30/EU as implemented in these standards:

  - EN 61326-1
  - EN 55011 (Class A)

  Refer to the section: Electromagnetic Compatibility.
- **Safety:** Low Voltage Directives 2014/35/EU as implemented in these standards:
  - EN 61010-1
- **Waste Electrical and Electronic Equipment (WEEE):** Waste Electrical and Electronic Equipment Directive 2012/19/EU, as implemented in EN 40519. Refer to the section: Waste Electrical and Electronic Equipment.
- **Packaging and Packaging Waste (PPW):** Packaging and Packaging Waste Directive 94/62/EC
- **RoHS Restriction of Hazardous Substances:** RoHS Directive 2011/65/EU and 2015/863/EU

United States

- **Radio Emissions Interference Regulations:** 47 CFR 15, as implemented in FCC Part 15 (Class A)
- **Safety:** Occupational Safety and Health Regulations, 29 CFR 1910, as implemented in these standards:
  - UL 61010-1

International

- **Electromagnetic Compatibility (EMC):**
  - IEC 61326-1
  - IEC CISPR 11 (Class A)
  - IEC 61000-3-2
  - IEC 61000-3-3

  Refer to the section: Electromagnetic Compatibility.
- **Safety:**
  - IEC 61010-1

Electrical Precautions

WARNING! Electrical Shock Hazard. Do not remove the covers. If the covers are removed, then injury or incorrect system operation can occur. Removal of the covers is not required for routine maintenance, inspection, or adjustment. For repairs that require removal of the covers, contact a SCIEX field service employee (FSE).

- Obey the required electrical safe work practices.
- Use cable management practices to control electrical cables and decrease the risk of a tripping hazard.

For information about system electrical specifications, refer to the document: *Site Planning Guide*.

Mains Supply

Connect the system to a compatible mains supply as instructed in this guide.

WARNING! Electrical Shock Hazard. Use only qualified personnel for the installation of all of the electrical supplies and fixtures, and make sure that all of the installations adhere to local regulations and safety standards.

WARNING! Electrical Shock Hazard. Use only the mains supply cables that are supplied with the system. Do not use mains supply cables that are not correctly rated for the operation of this system.

CAUTION: Potential System Damage. Do not unpack or connect any system components. The FSE will unpack, connect, and configure the system for the correct operating voltage.

Guidelines:

- Do not connect the wiring in a manner other than that prescribed by the manufacturer.
- Do not rest heavy objects on the mains supply cable.
- Do not bend or pull on the mains supply cable. To disconnect the system, pull on the plug and not the cable.
- Do not route the mains supply cable near heat-generating equipment.
- Do not modify the mains supply cable in any way.

Protective Earth Conductor

The mains supply must include a correctly installed protective earth conductor. The protective earth conductor must be installed or examined by a qualified electrician before the system is connected.

WARNING! Electrical Shock Hazard. Do not intentionally interrupt the protective earth conductor. Any interruption of the protective earth conductor causes an electrical shock hazard.

Chemical Precautions

WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. Before cleaning or maintenance, identify whether decontamination is required. If radioactive materials, biological agents, or toxic chemicals have been used with the system, then the customer must decontaminate the system before cleaning or maintenance.

WARNING! Environmental Hazard. Do not discard system components in municipal waste. To discard components correctly, obey local regulations.

WARNING! Biohazard or Toxic Chemical Hazard. To prevent leaks, connect the drain tubing correctly.

CAUTION: Potential System Damage. Do not submerge the end of the drain tubing in the waste liquid in the waste container.

CAUTION: Potential System Damage. Before solvents are used with the column oven, refer to the safety data sheets that are supplied by the manufacturer. Depending on the column oven settings, the interior surfaces of the column oven can become hot.

- Before servicing and regular maintenance, identify the chemicals that have been used in the system. For the health and safety precautions that must be obeyed for a chemical, refer to the safety data sheet (SDS). For storage information, refer to the certificate of analysis. To find a SCIEX SDS or certificate of analysis, go to sciex.com/tech-regulatory.
- Always wear assigned personal protective equipment, including powder-free gloves, protective eyewear, and a laboratory coat.

  Note: Nitrile or neoprene gloves are recommended.

- Do work in a well-ventilated area or fume hood. Organic solvents are toxic above a certain concentration.

- When flammable materials such as isopropanol, methanol, and other flammable solvents are in use, do not go near ignition sources.
- Be careful with the use and disposal of any chemicals. If the correct procedures for chemical handling and disposal are not obeyed, then personal injury can occur.
- During cleaning, do not let chemicals touch the skin. Wash hands after use.
- Collect all spent liquids and discard them as hazardous waste.
- Obey all of the local regulations for the storage, handling, and disposal of biohazardous, toxic, and radioactive materials.
- (Recommended) Use secondary containment trays below the solvent bottles and the waste container to collect potential chemical spills.

System Safe Fluids

The following fluids can safely be used with the system.

CAUTION: Potential System Damage. Do not use any other fluid until confirmation is received from SCIEX that it does not cause a hazard. This is not an exhaustive list.

Note: Use only new, freshly prepared LC-MS-grade or better solvents for the LC mobile phases.

- **Organic Solvents**
  - LC-MS-grade acetonitrile, up to 100%
  - LC-MS-grade methanol, up to 100%
  - LC-MS-grade isopropanol, up to 100%
  - LC-MS-grade or higher water, up to 100%
- **Buffers**
  - Ammonium acetate, less than 100 mM
  - Ammonium formate, less than 100 mM
- **Acids and Bases**

  The pH range is from 2 to 12.
  - Formic acid, less than 1%
  - Acetic acid, less than 1%
  - Trifluoroacetic acid (TFA), less than 1%
  - Heptafluorobutyric acid (HFBA), less than 1%
  - Ammonia/ammonium hydroxide, less than 1%

Ventilation Precautions

The venting of fumes and disposal of waste must comply with all of the federal, state, provincial, and local health and safety regulations. It is the responsibility of the customer to make sure that the air quality is maintained in compliance with local health and safety regulations.

WARNING! Flammable Chemical Hazard, Biohazard, Ionizing Radiation Hazard, and Toxic Chemical Hazard. Be sure to use the system in a well-ventilated laboratory environment in compliance with local regulations and with correct air exchange for the work performed. Solvents used in high performance liquid chromatography are flammable and toxic.

Physical Precautions

WARNING! Lifting Hazard. Before moving any of the modules, find out their weight. Refer to the document: the *Site Planning Guide*. Make sure that at least two people are available to help move and position any module that weighs more than 18 kg (40 lb).

WARNING! Crushing Hazard. Wear protective footwear when moving heavy objects.

Environmental Precautions

Use qualified personnel for the installation of electrical mains, heating, ventilation, and plumbing supplies and fixtures. Make sure that all of the installations comply with local bylaws and biohazard regulations. For information about the required environmental conditions for the system, refer to the document: *Site Planning Guide*.

When the system is set up, make sure that there is sufficient access space around the equipment.

WARNING! Fire Hazard. Do not operate the system in the presence of an open flame, or in the same room as equipment that could potentially emit sparks.

WARNING! Biohazard. For biohazardous material use, always obey local regulations for hazard assessment, control, and handling. Neither this system nor any part is intended to be used as a biological containment.

WARNING! Environmental Hazard. Obey established procedures for disposal of biohazardous, toxic, radioactive, and electronic waste. The customer is responsible for the disposal of hazardous substances, including chemicals, waste oils, and electrical components, in accordance with local laws and regulations.

WARNING! Fire Hazard. Do not use flammable sprays, such as hair sprays or insecticide sprays, near the system. They could ignite and cause a fire.

CAUTION: Potential System Damage. Avoid exposure to corrosive gas and excessive dust.

CAUTION: Potential System Damage. Take precautions to prevent the system from falling in the event of an earthquake.

Electromagnetic Environment

CAUTION: Potential Wrong Result. Do not use this device in close proximity to sources of strong electromagnetic (EMC) radiation, such as unshielded intentional RF sources, because EMC radiation might interfere with the proper operation.

Electromagnetic Compatibility

Basic Electromagnetic Environment: Environment existing at locations characterized by being supplied directly at low voltage from the public mains network.

Performance Criteria A (Criteria A): Equipment shall operate as intended with no degradation of performance and no loss of function during or after the test.

Performance Criteria B (Criteria B): Equipment may experience loss of function (one or more) during the test but shall operate as intended after the test.

Performance Criteria C (Criteria C): LOSS OF FUNCTION is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

The equipment is intended for use in a basic electromagnetic environment.

Make sure that a compatible electromagnetic environment for the equipment can be maintained so that the device will operate as intended. If the power supply line is subject to high electrical noise, then install a surge protector.

Electromagnetic Interference

Group 1 Equipment: This equipment is classified as industrial, scientific, and medical (ISM) equipment that might use RF energy for internal operation.

Class A Equipment: Equipment which is suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. [Derived from CISPR 11:2009, 5.3] Class A equipment shall meet Class A limits.

CAUTION: Potential Radio Interference. This equipment is not intended for use in residential environments and may not supply adequate protection to radio reception in such environments.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC (Federal Communications Commission) Compliance Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the operator's manual, can cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case you will be required to correct the interference, at your own expense. Changes or modifications not expressly approved by the manufacturer could void your authority to operate the equipment.

Decommissioning and Disposal

WARNING! Environmental Hazard. Obey established procedures for disposal of biohazardous, toxic, radioactive, and electronic waste. The customer is responsible for the disposal of hazardous substances, including chemicals, waste oils, and electrical components, in accordance with local laws and regulations.

Before decommissioning, obey local regulations to decontaminate the entire system.

When the system is removed from service, obey national and local environmental regulations to divide and recycle different materials. Refer to the section: Storage and Handling.

Note: SCIEX will not accept any system returns without a completed *Decontamination Form*. Contact an FSE to get a copy of the form.

Do not discard system components or subassemblies, including computer parts, as unsorted municipal waste.

Waste Electrical and Electronic Equipment

Obey local municipal waste ordinances for the correct disposal provisions to decrease the environmental impact of waste, electrical, and electronic equipment (WEEE). To discard this equipment safely, contact a local Customer Service office for complimentary equipment pick-up and recycling.

Qualified Personnel

Only qualified SCIEX personnel are permitted to install, examine, and supply servicing for the equipment. After the system has been installed, the field service employee (FSE) uses the document: *Customer Familiarization Checklist* to help the customer become familiar with system operation, cleaning, and basic maintenance. If a system under warranty is serviced by personnel who are not authorized by SCIEX, then SCIEX is not responsible to repair any damage caused by the servicing.

To use the system, the user must have the following qualifications:

- Basic knowledge of liquid chromatography.
- Knowledge about the properties of the solvents used and their health risks.
- Training for the special tasks and activities in the laboratory.
- Knowledge of the relevant standards and regulations.
- Ability to understand and carry out all of the work described in the operating instructions for the instrument and to recognize and avoid possible dangers independently.
- Reactions that are not impaired by the consumption of drugs, alcohol, or medication.
- Trained in the use of the system by SCIEX.

Equipment Use and Modification

WARNING! Electrical Shock Hazard. Do not remove the covers. If the covers are removed, then injury or incorrect system operation can occur. Removal of the covers is not required for routine maintenance, inspection, or adjustment. For repairs that require removal of the covers, contact a SCIEX field service employee (FSE).

WARNING! Personal Injury Hazard. Use SCIEX-recommended parts only. The use of parts that are not recommended by SCIEX or the use of parts for any purpose other than their intended purpose can put the user at risk of harm or have a negative effect on system performance.

WARNING! Lifting Hazard. Before moving any of the modules, find out their weight. Refer to the document: the *Site Planning Guide*. Make sure that at least two people are available to help move and position any module that weighs more than 18 kg (40 lb).

Use the system indoors in a laboratory that has the environmental conditions recommended in the document: *Site Planning Guide*, or contact an FSE.

If the system is used in an environment or with a method that is not approved by the manufacturer, then the performance and protection that is supplied by the equipment might be decreased.

Contact an FSE for information about servicing the system. Unauthorized modification or operation of the system might cause personal injury and equipment damage, and might void the warranty. If the system is operated outside the recommended environmental conditions or with unauthorized modifications, then the acquired data might be inaccurate.

Maintenance, Inspections, and Adjustment

WARNING! Personal Injury Hazard. Contact the SCIEX representative if product installation, adjustment, or relocation is required.

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

- For planned maintenance, contact a SCIEX representative.
- Replacement cycles described for periodic replacement parts are estimates. Replacement might be required earlier than the described replacement cycles depending on usage environment and frequency. Customers are expected to replace consumable items such as the rotor seal, sample needle, sample loop, autosampler syringe, filters, piston seals, lamps, and so on.

Foreseeable Misuse

Do not use the device for the following purposes or conditions:

- Medical purposes. The device is not approved as a medical product.
- Operation outside of a laboratory or measurement room. Otherwise, the manufacturer does not guarantee the functionality and safety of the device.
- Operation in potentially explosive areas without special and additional explosion protection. For more information contact sciex.com/request-support.

Intended Use

Only use the device for applications that fall within the range of the intended use. Otherwise, the protective and safety equipment of the device could fail. The device is intended to be used for chromatographic applications in the laboratory.

Principles of Operation 2

The ExionLC 2.0 system has the following components:

The standard 12,500 psi/860 bar system includes:

- ExionLC 2.0 Binary or LPG Pump
- ExionLC 2.0 Autosampler
- ExionLC 2.0 Column Oven with a solvent pre-heater system
- ExionLC 2.0 Solvent Tray
- ExionLC 2.0 Solvent Bottle Set
- ExionLC 2.0 Solvent Waste Management System

The standard 18,000 psi/1240 bar system includes:

- ExionLC 2.0 Binary Pump+
- ExionLC 2.0 Autosampler+
- ExionLC 2.0 Column Oven with a solvent pre-heater system
- ExionLC 2.0 Solvent Tray
- ExionLC 2.0 Solvent Bottle Set
- ExionLC 2.0 Solvent Waste Management System

The following options are available:

- ExionLC 2.0 Wash System
- ExionLC 2.0 Diode Array Detector
- ExionLC 2.0 Diode Array Detector HS
- ExionLC 2.0 Multiwavelength Detector
- ExionLC 2.0 2-Column Switching Kit
- ExionLC 2.0 Multicolumn Switching Kit

WARNING! Toxic Chemical Hazard. Store chemicals in a secondary containment system at a convenient height for handling, if possible, below eye level, to reduce risk of a chemical splash to eyes and face if a spill occurs.

Note: The valve drive, column oven, and detector can be installed on either side of the main stack.

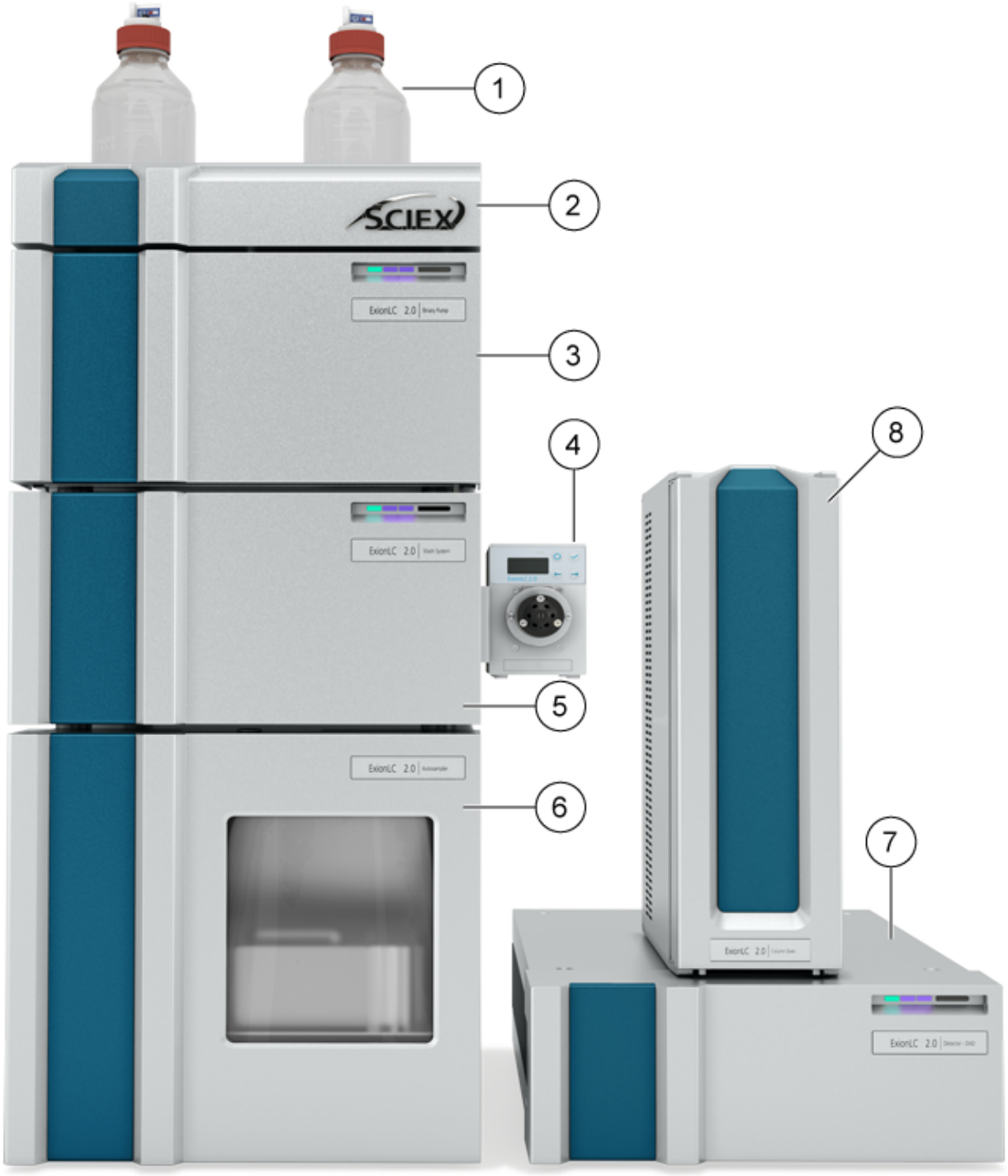
Figure 2-1 Example of the ExionLC 2.0 System

Item	Description
1	Reservoir bottles. Mobile phase is drawn out of the reservoir bottles and then pumped through the tubing by the pump.
2	Solvent tray
3	ExionLC 2.0 2-Column Switching Kit or ExionLC 2.0 Multicolumn Switching Kit (optional valve drives). The column switching kit can be attached to the pump or wash system.
4	Pump. The pump sends the mobile phase through the autosampler, column, and optional detector, in that order, and then to the mass spectrometer or the waste container.
5	Autosampler. The autosampler automatically injects the sample in the flow lines. The autosampler must always be at the bottom of the stack, sitting on the bench.
6	Column oven. The column in the column oven separates the components through the interactions of the mobile phase and the column packing (stationary phase). The solvent pre-heater system controls the temperature of the solvent flowing to the column, allowing for more accurate retention times, particularly for configurations that include column switching valves.

Figure 2-2 Example of the ExionLC 2.0 System with one Optional Module

Item	Description
1	Reservoir bottles. Mobile phase is drawn out of the reservoir bottles and then pumped through the tubing by the pump.
2	Solvent tray
3	Pump. The pump sends the mobile phase through the autosampler, column, and optional detector, in that order, and then to the mass spectrometer or the waste container.
4	Wash system (optional). The wash system provides enhanced autosampler performance by enabling selection of up to seven different wash solvents that can be delivered at higher flow rates than the standard autosampler.
5	ExionLC 2.0 2-Column Switching Kit or ExionLC 2.0 Multicolumn Switching Kit (optional valve drives). The column switching kit can be attached to the detector or pump. Or Detector (optional). The detector detects the components eluted from the column, and then sends the signal data to the acquisition computer.
6	Autosampler. The autosampler automatically injects the sample in the flow lines. The autosampler must always be at the bottom of the stack, sitting on the bench.
7	Column oven. The column in the column oven separates the components through the interactions of the mobile phase and the column packing (stationary phase). The solvent pre-heater system controls the temperature of the solvent flowing to the column, allowing for more accurate retention times, particularly for configurations that include column switching valves.

Figure 2-3 Example of the ExionLC 2.0 System with the Optional Wash System and Detector



Item	Description
1	Reservoir bottles. Mobile phase is drawn out of the reservoir bottles and then pumped through the tubing by the pump.
2	Solvent tray
3	Pump. The pump sends the mobile phase through the autosampler, column, and optional detector, in that order, and then to the mass spectrometer or the waste container.
4	ExionLC 2.0 2-Column Switching Kit or ExionLC 2.0 Multicolumn Switching Kit (optional valve drives). The column switching kit can be attached to the detector or pump.
5	Wash system (optional). The wash system provides enhanced autosampler performance by enabling selection of up to seven different wash solvents that can be delivered at higher flow rates than the standard autosampler.
6	Autosampler. The autosampler automatically injects the sample in the flow lines. The autosampler must always be at the bottom of the stack, sitting on the bench.
7	Detector. The detector detects the components eluted from the column, and then sends the signal data to the acquisition computer.
8	Column oven. The column in the column oven separates the components through the interactions of the mobile phase and the column packing (stationary phase). The solvent pre-heater system controls the temperature of the solvent flowing to the column, allowing for more accurate retention times, particularly for configurations that include column switching valves.

Pump

The following pumps are available:

- ExionLC 2.0 Binary Pump
- ExionLC 2.0 Binary Pump+
- ExionLC 2.0 LPG Pump

All pumps are available with stainless steel pump heads, stainless steel capillaries, and PEEK connectors.

- **Binary pumps**: The binary pump contains of two pump drives and a 4-channel degasser with a solvent selection valve. The Binary Pump includes a pressure sensor with an integrated inline filter, a purge valve, and a mixer. The Binary Pump+ includes a pressure sensor, a separate integrated inline filter, a purge valve, and a mixer. Each pump head can be operated optionally with two different solvents, which enables gradient formation. Both solvents are

connected to the solvent selection valve. The solvents flow from the degasser to one pump head and then are merged in the mixer. The pressure sensor of the Binary Pump+ is connected with the automatic purge valve.

- **LPG pumps**: The LPG pump contains of a pump, a valve block, and a 4-channel degasser. It also includes a pressure sensor with an integrated inline filter, a purge valve, and a mixer. Each chamber has an inlet and an outlet on the front side of the pump. The degasser ships with the degasser outlet connected to the valve block.

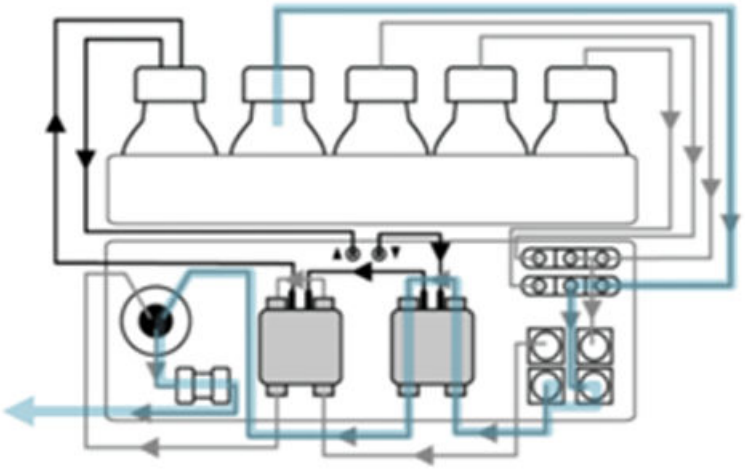
  Up to four solvents can be connected to the degasser inlet. The solvent from the degasser flows through the solvent switching valve to the pump head, and then through the pressure sensor to the mixing chamber.

The following components are shipped with the pump:

- Pump accessory kit
- SCIEX accessory kit

Pump Flow Paths

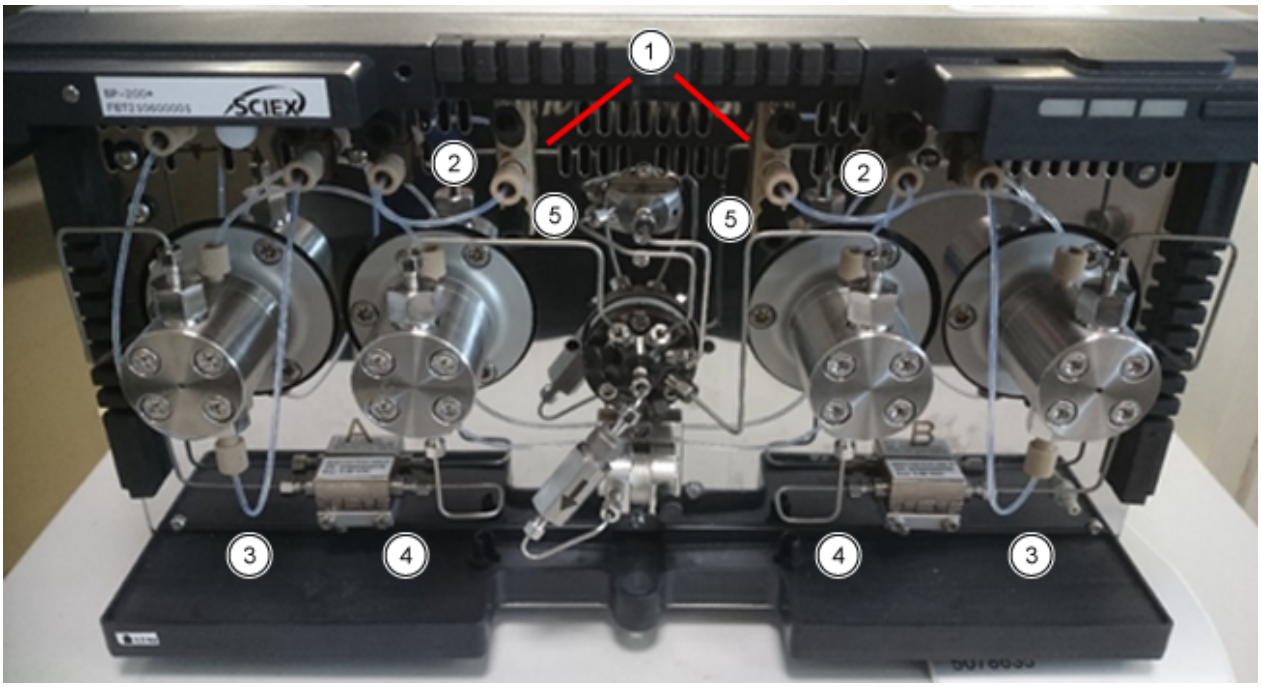
Figure 2-4 Flow Path of the Mobile Phase (Binary Pump)



Step	Path
1	Mobile phase bottle
2	Solvent selection valve
3	Degasser
4	Pump head inlet
5	Pump head outlet

Step	Path
6	Purge valve/pressure sensor
7	Filter
8	Mixer

Figure 2-5 Binary Pump+



Item	Path
1	Eluent bottle to the solvent selection valve
2	Solvent selection valve to the degasser
3	Connection from the degasser to the pump head inlet
4	Flow through the auxiliary pressure sensor in between the two pump heads.
5	Connection from the pump head to the purge valve

Pump Heads

Every pump head is equipped with a radio frequency identification (RFID) chip. The chip is used to monitor and save all important parameters and settings. RFID technology offers the following advantages:

- The values of the pump parameters are communicated to the software automatically.
- All service-relevant data for the pump head is stored on the RFID chip.

Table 2-1 Pump Heads

Specification	Value
Size	5 mL or 10 mL
Material	Pump head with stainless steel inlays

Mixers

The following table shows the available mixer volumes. The mixer volume is marked on the right side of the mixer. The parameters necessary for the mixer are set in the software when the system is configured. Refer to the Help System that comes with the software.

Table 2-2 Mixers

Specification	Value
Size	50 µL (standard for BP-200 and BP-200+), 100 µL, or 200 µL (standard for LPG-200)
Maximum Pressure	18,000 psi/1,240 bar

Pump LEDs

The LEDs show different colors depending on the operating status. To put the pump in Standby state, press the button beside the LEDs for 5 seconds.

Table 2-3 Pump LEDs

Location	Color	Status	Action
Left LED	Flashing red	An error has occurred.	• Examine the system. • Press the button beside the LEDs briefly to deactivate the error message.
	Red	A serious error has occurred.	• Start the module again. • If the operating condition does not change, then contact sciex.com/request-support.

Table 2-3 Pump LEDs (continued)

Location	Color	Status	Action
	Green	A program or sequence is running or has been loaded.	N/A
Center LED	Off	The module is not ready for operation.	N/A
	Green	The module is ready for operation.	N/A
Right LED	Green	The module has been turned on.	N/A
	Blue	The module is in Standby state.	Press **Standby** to take the module out of Standby state.

Tip! The system might start to malfunction after being repeatedly put in Standby state. If this issue occurs, then turn the module off and then on, to reset the data storage.

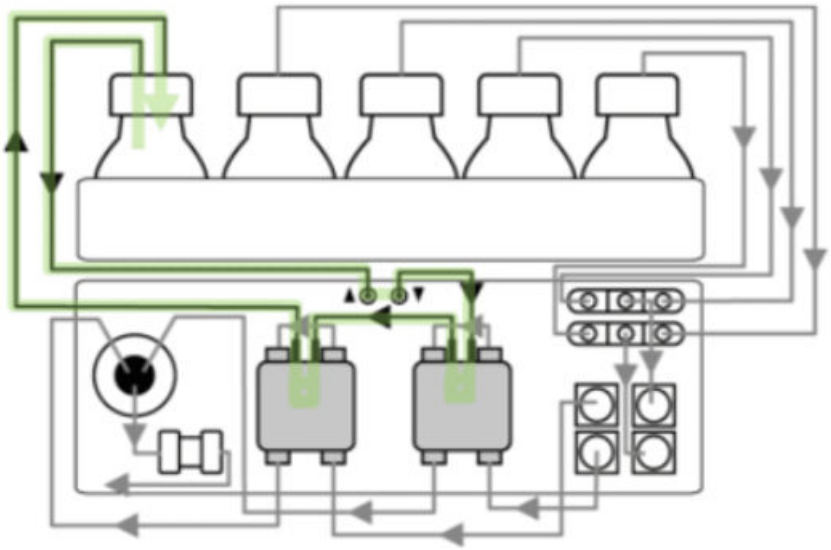
Piston Backflush

During piston backflushing, the back piston space of the pump head is flushed with the wash solution. The wash solution is re-used. Because the flow path is circular, only one bottle is required for the wash solution.

The piston backflush function automatically flushes the back piston area of the pump head, as follows:

- **Startup:** The backflush automatically runs for 15 seconds.
- **Continuous mode:** The backflush runs automatically for 15 seconds every 15 minutes.

Figure 2-6 Flow Path of the Piston Backflush Solvent (Binary Pump)



Degasser

Liquids are connected to the degasser inlets. In binary pumps, the solvent flows from the degasser to the pump head, and then through the pressure sensor to the mixing chamber. In LPG pumps, the solvent flows through the degasser to the solvent selection valve, pump, and purge valve, and then to the mixer.

Autosampler and Autosampler+

WARNING! Puncture Hazard. Handle the auto-injection system carefully to prevent injuries.

Note: For information about consumables and spare parts, refer to the document: *Parts and Equipment Guide*.

An accessory kit is shipped with the autosampler.

The high speed of the auto-injection system fulfills the requirements of ultra-high performance liquid chromatography. When the door of the autosampler is open, the speeds of the sample tray, syringe, and needle are automatically decreased.

For injections in the high pressure range, the autosampler uses a valve that contains of a rotor-stator combination and a central port for pressure release. Pressure is released from the sample loop to prevent dilution of the sample by the solvent. Extremely fast switching valves reduce

pressure surges further on. This design results in accurate sample aspiration, reproducible injection volumes, and long-lasting columns.

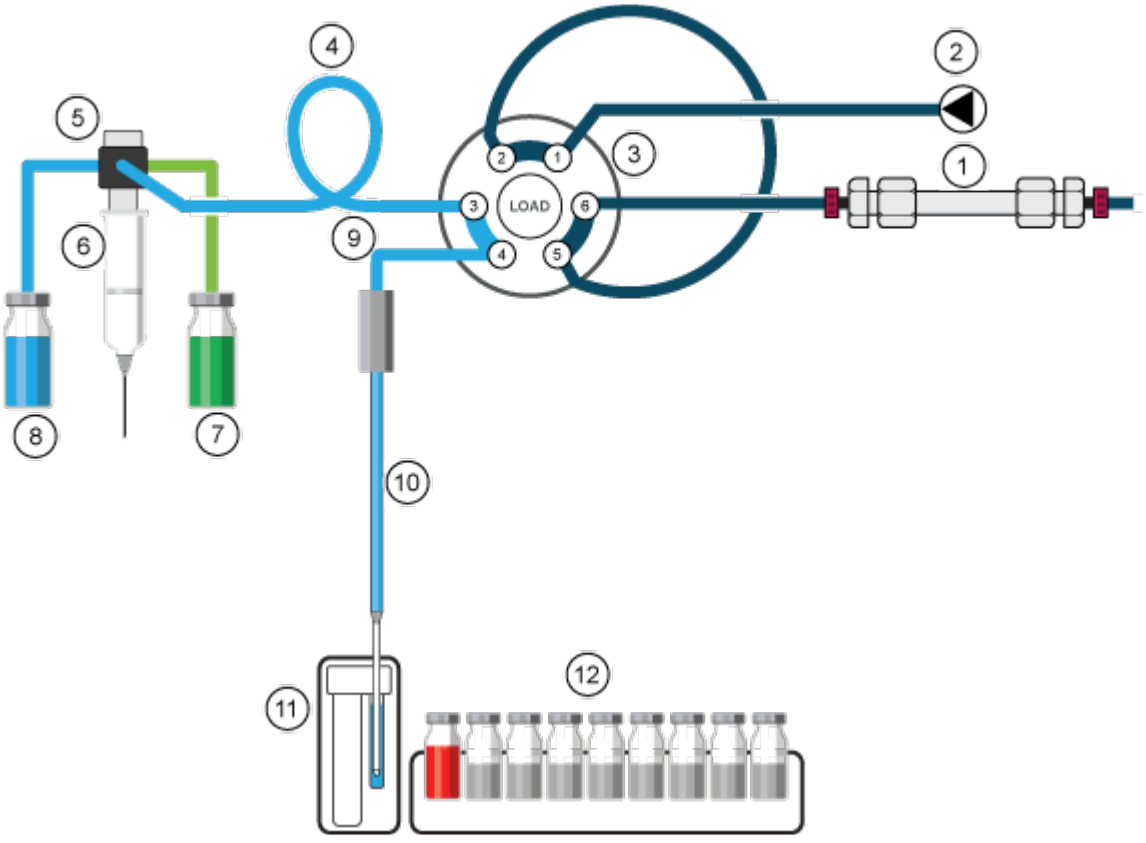
The optional head-space pressure injection option provides the following features:

- No need to degas samples.
- No air bubbles in the sample loop.
- No clogging or contamination of the sample needle.
- Precise control of syringe movement.

The following injection modes are available:

- Full Loop Filling
- Partial Loop Filling
- Microliter Pickup Plus

Figure 2-7 Microliter Pickup Plus Mode



Item	Description
1	Column
2	Pump
3	Injection valve
4	Buffer tubing
5	Syringe valve
6	Syringe
7	Transport/Wash2 liquid
8	Wash liquid
9	Needle tubing
10	Sample needle
11	Wash/Transport reservoir
12	Samples

Microliter Pickup Plus Mode

The Microliter Pickup Plus injection mode is optimized for a specified hardware configuration and is the injection method of choice if the total run time and the pre-injection phase of the autosampler must be as short as possible. For the first injection, the transport reservoir is filled with transport liquid during the pre-injection phase. After the first injection, the transport reservoir is not filled during the pre-injection phase but rather during the final step of the wash cycle of the previous injection. This step is completed during the washing procedure after the injection is made.

In Microliter Pickup Plus injection mode, the sample is located between two sections of transport liquid. For the transport liquid, use a solvent that is compatible with the starting LC gradient conditions. There is no loss of sample when using microliter pickup plus.

Before using the Microliter Pickup Plus injection mode, make sure that the autosampler is configured. The Microliter Pickup Plus injection mode is optimized for the described hardware configuration.

The standard hardware configuration is 15 µL needle tubing volume and 250 µL syringe. Default settings are 100 µL sample loop, 250 µL buffer tubing, and 10 µL injection volume. Air segment and headspace pressure options are deactivated by default. This injection mode is selected in the Advanced Settings section in the software. If the activated devices does not include a Wash System, then under General Settings, **Rinse mode** is set to **Advanced** and the user must set up the advanced rinse steps. If a Wash System is included, then under General Settings, the **Rinse mode** is automatically set to **Wash System**.

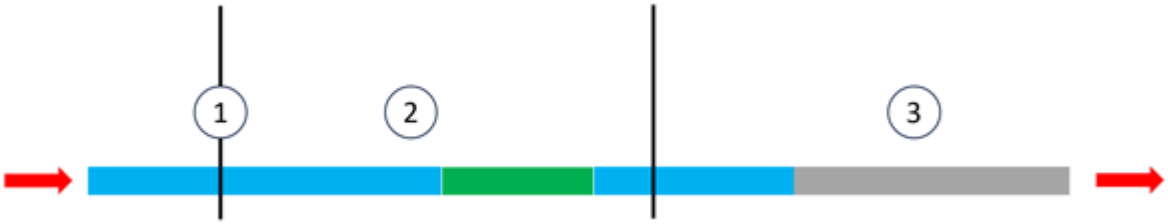
It is important to connect the wash tubing and the transport/wash 2 tubing to the correct ports of the syringe valve.

In this injection mode, the sample is delivered to the sample loop by the transport liquid. The process results in maximum accuracy of the sample volume without sample loss.

Note:

1. In this mode the headspace pressure is deactivated to prevent the sample volume from being distorted by air expansion during the movement from the sample vial to the sample loop.
2. The wash solution and transport liquid must be compatible. Use the software to flush the tubing extensively with transport liquid or wash solution.

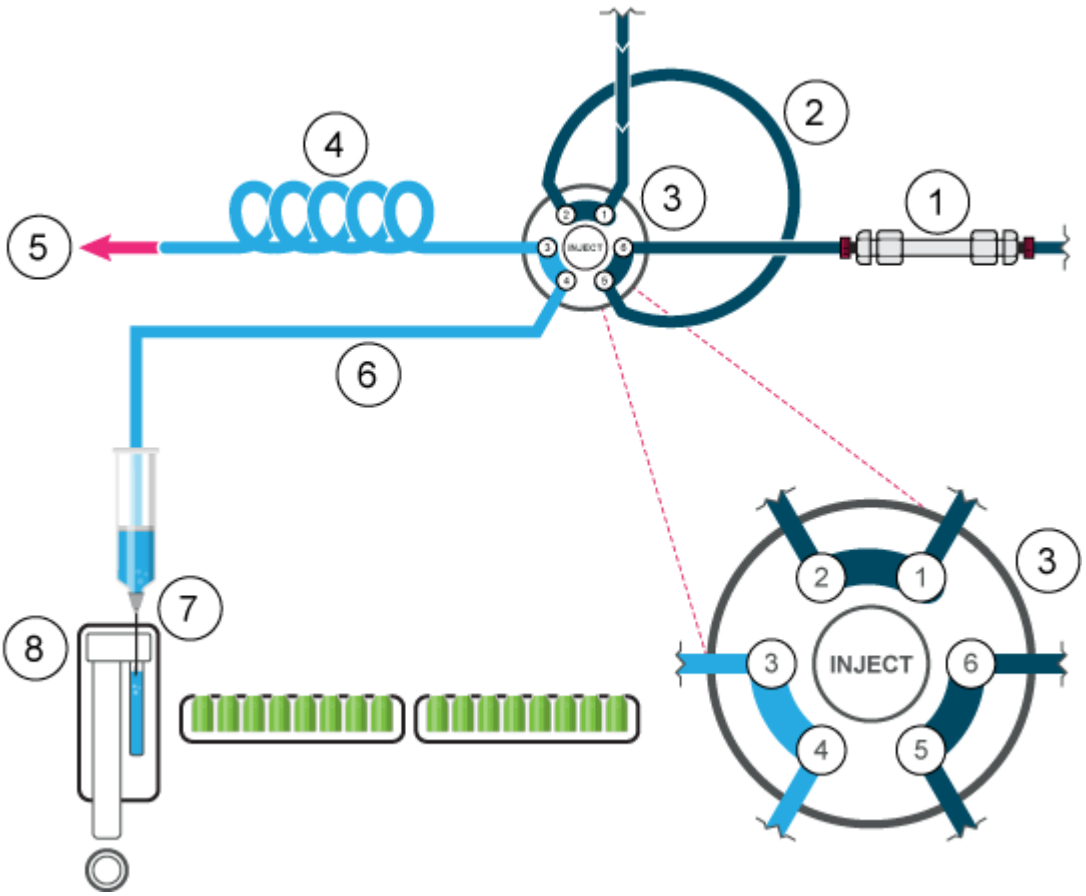
Figure 2-8 Microliter Pickup Plus Mode



Item or Color	Description
1	Sample needle
2	Sample loop
3	Buffer tubing
Blue	Transport
Green	Sample
Grey	Mobile phase

1. The injection valve starts in the Inject position. The sample needle is in the transport reservoir, which contains the transport liquid. The needle and tubing are filled with transport liquid aspirated from the transport reservoir. The software default transport volume is 37.5 µL, which applies to each of the two transport liquid segments. The second transport segment is described in step 3.

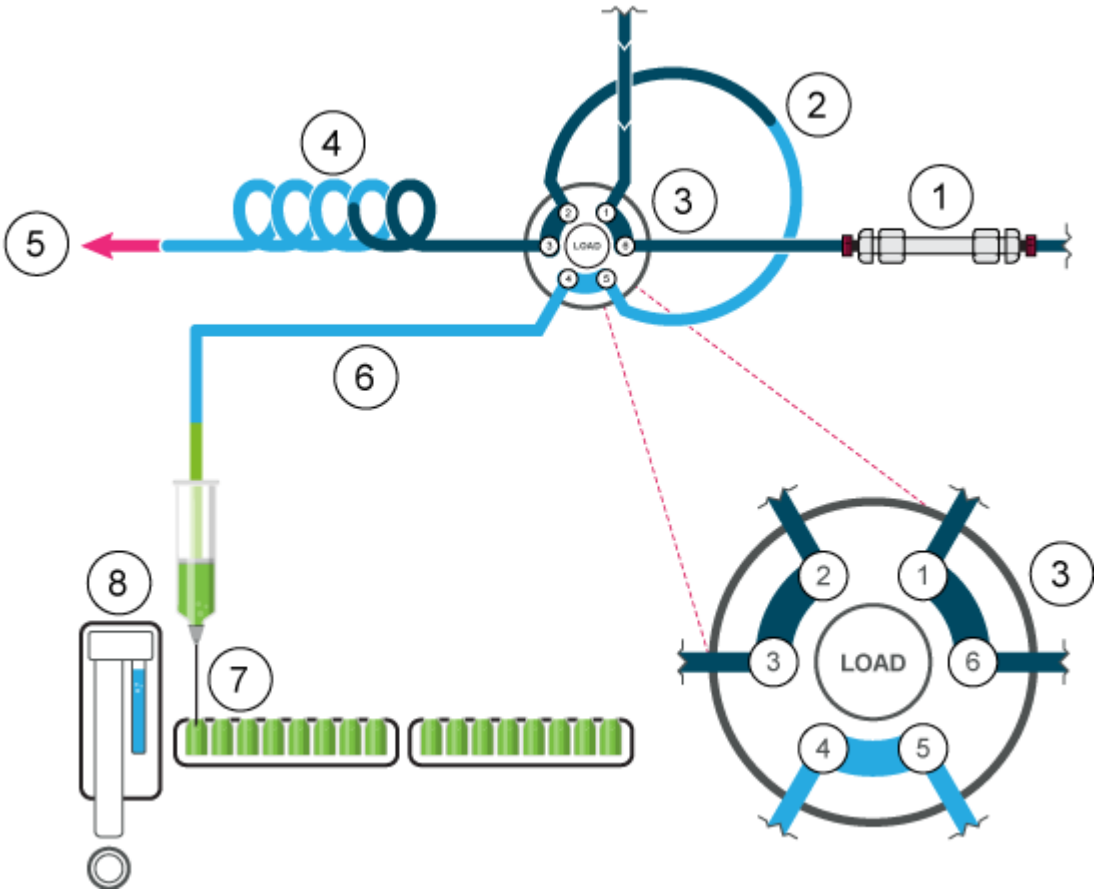
Figure 2-9 Initial Condition



Item	Description
1	Column
2	Sample loop
3	Injection valve
4	Buffer tubing
5	To syringe
6	Needle tubing
7	Sample needle
8	Wash/transport reservoir

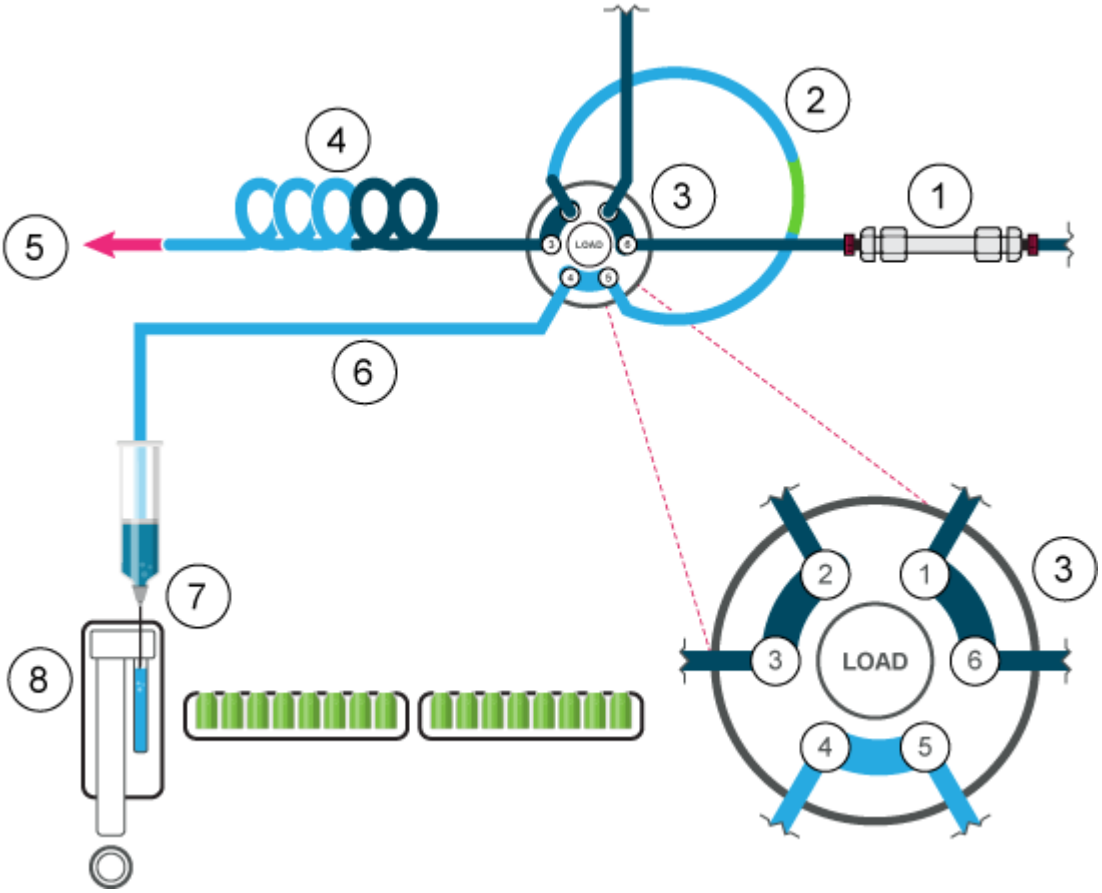
2. The injection valve changes to the Load position and the needle moves to the sample vial. The sample is aspirated, behind the first segment of transport liquid.

Figure 2-10 Sample is Aspirated



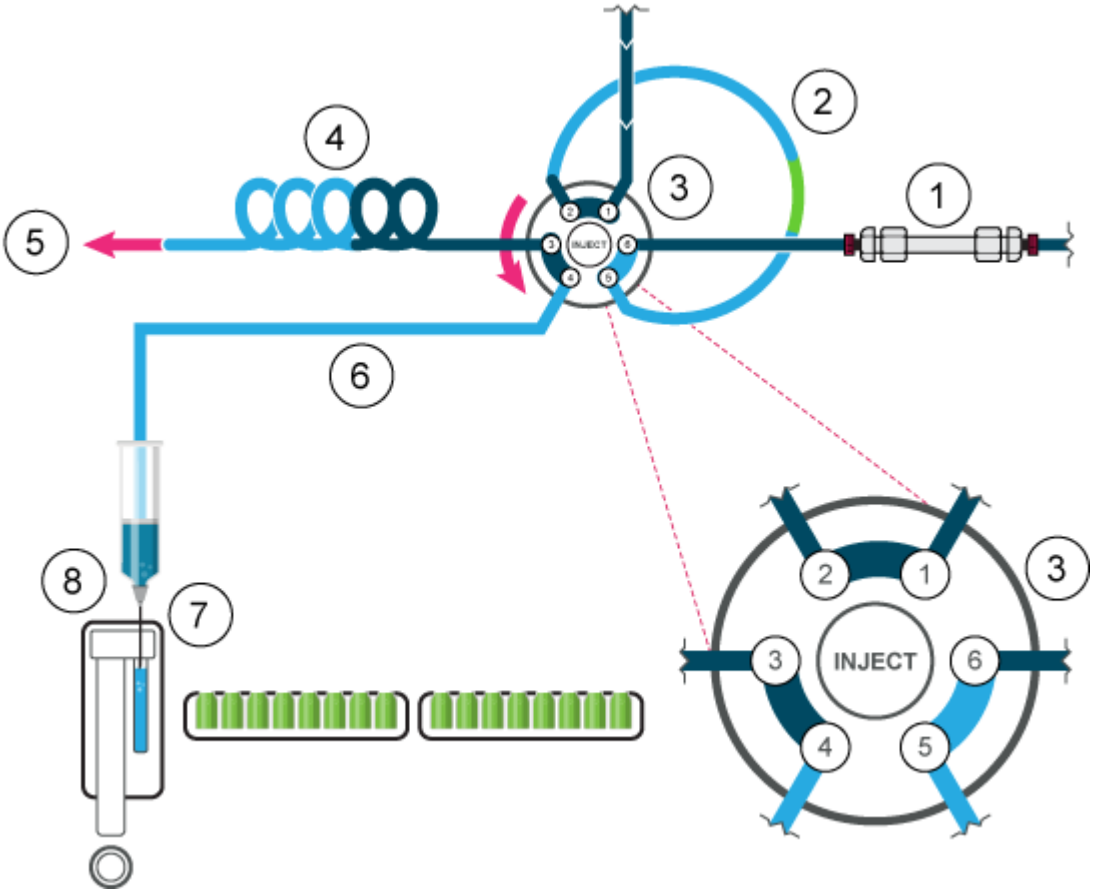
3. After the programmed sample volume is aspirated, the needle moves back to the transport reservoir. The second segment of transport liquid is aspirated, moving the sample to the middle of the sample loop.

Figure 2-11 Second Transport Liquid Segment is Aspirated



4. The injection valve changes to the Inject position. Because the sample loop is now in the flow path of the analytical system, the sample is transported to the column.

Figure 2-12 Sample is Injected



Full Loop Mode

In Full Loop Fill mode, the sample loop is completely filled with the sample. This mode provides maximum injection reproducibility but not maximum injection accuracy, because from loop to loop, the size can vary up to ±10%. The injection volume equals the loop volume. The volume of sample aspirated depends on the loop volume:

- Loops less than or equal to 100 µL: 3 × loop volume
- Loops greater than 100 µL and less than or equal to 500 µL: 2 × loop volume
- Loops greater than 500 µL: 1.5 × loop volume

The sample loss per injection is the aspiration volume plus the flush volume, minus the loop volume.

To reduce the flush volume, use an air segment of 5 µL. The air segment precedes the flush segment and is not injected.

For a standard sample needle, the flush volume must be 30 µL with an air segment, and 35 µL without an air segment. A higher flush volume might be required to reduce syringe speed and improve performance for extremely viscous samples. If samples are highly viscous then it might be necessary to program larger flush volumes and reduce the syringe speed for better performance.

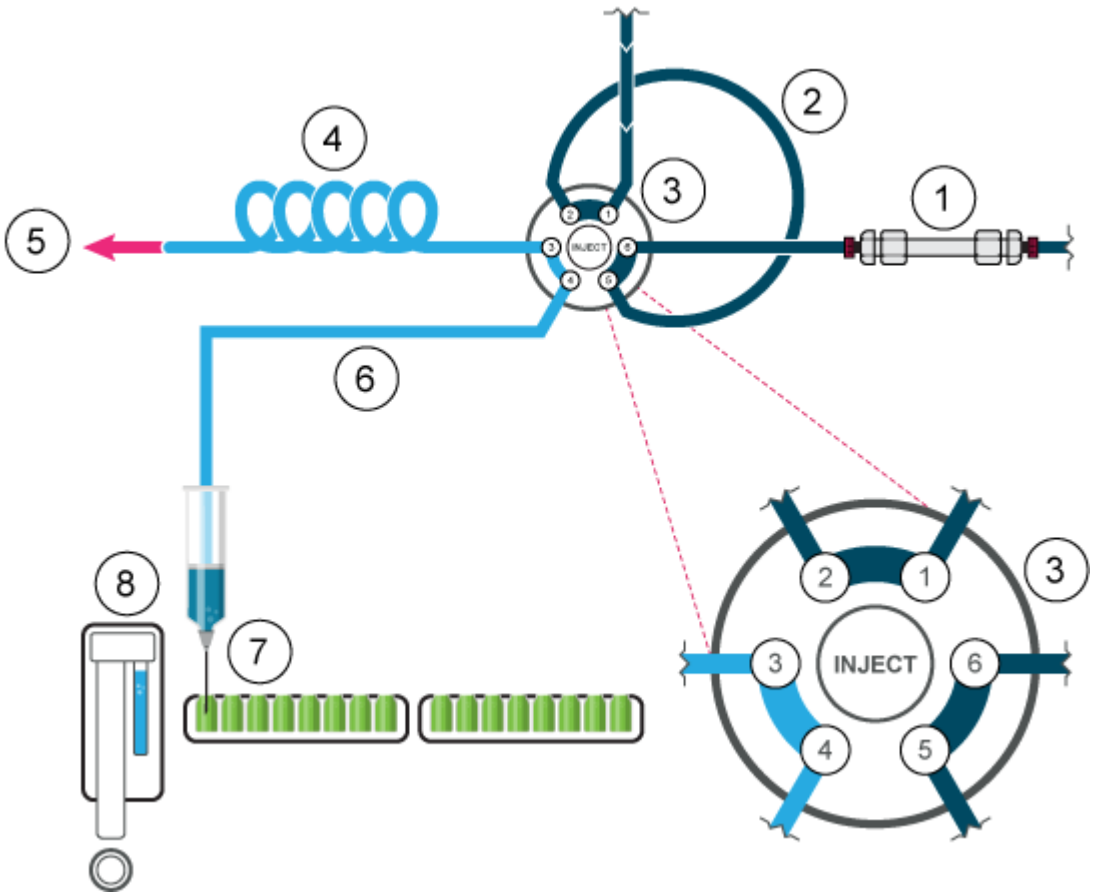
Figure 2-13 Full Loop Mode

Item	Description
1	Sample needle
2	Sample loop
3	Buffer tubing
Green	Sample
Grey	Mobile phase
Purple	Wash

Note: Flush the needle after every injection.

1. The injection valve is in the Inject position. The sample needle and air needle are inserted in the vial. If headspace pressure is activated, then the air needle creates pressure, which prevents outgassing of the liquid and subsequent formation of air bubbles.

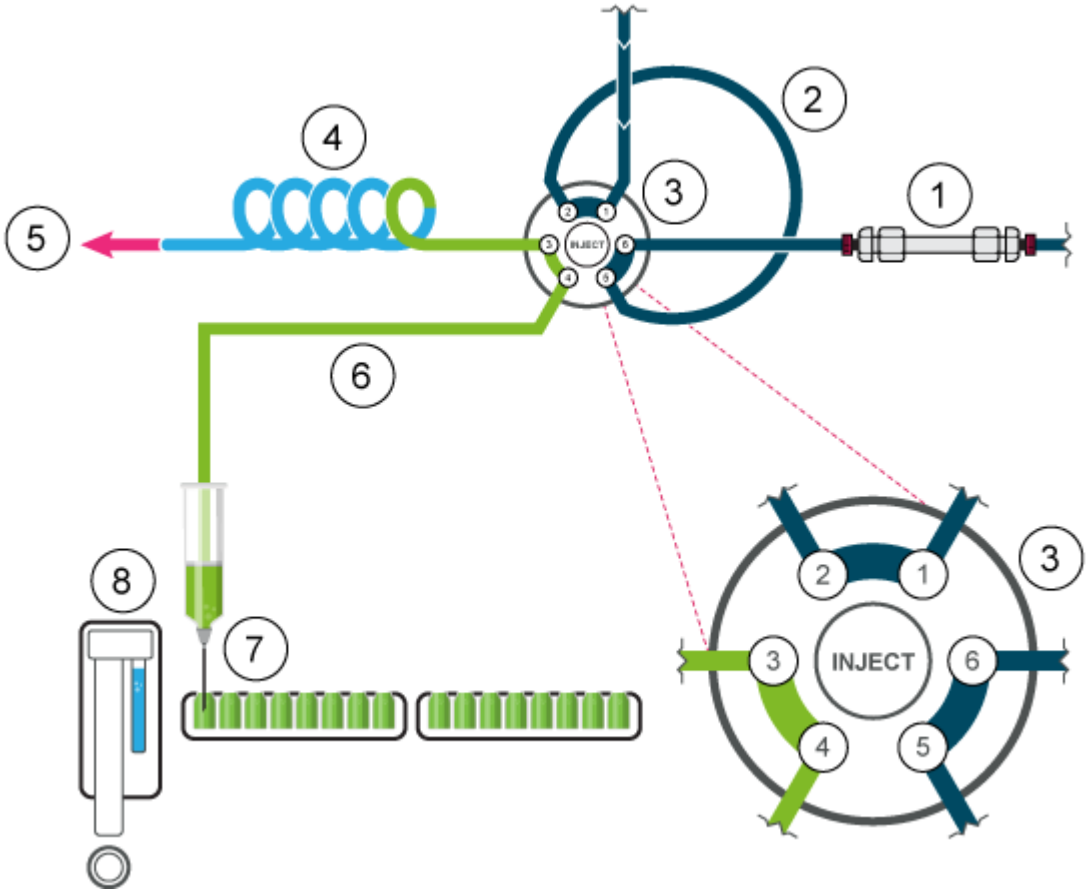
Figure 2-14 Initial Condition



Item	Description
1	Column
2	Sample loop
3	Injection valve
4	Buffer tubing
5	To syringe
6	Needle tubing
7	Sample needle
8	Wash/transport reservoir

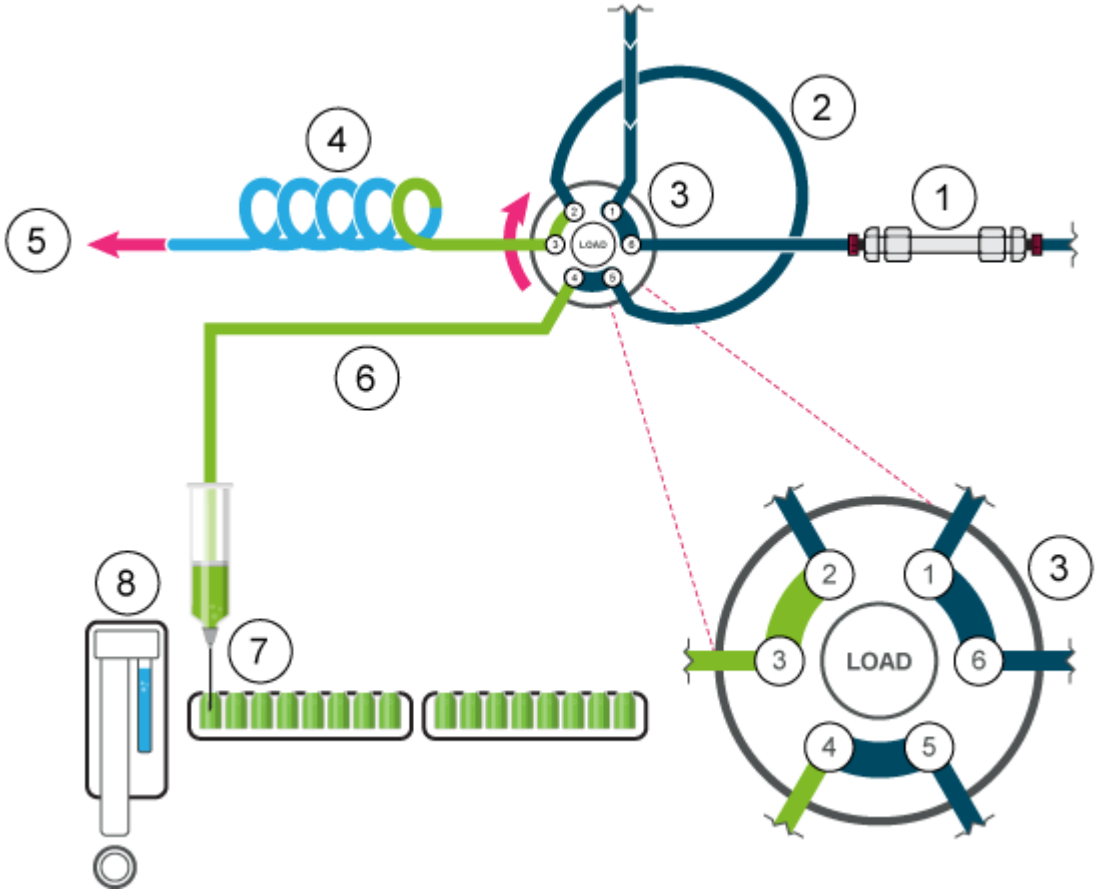
2. The syringe aspirates the flush volume from the sample vial to the sample line and removes any washing solution.

Figure 2-15 The Needle and Needle Tubing are Flushed



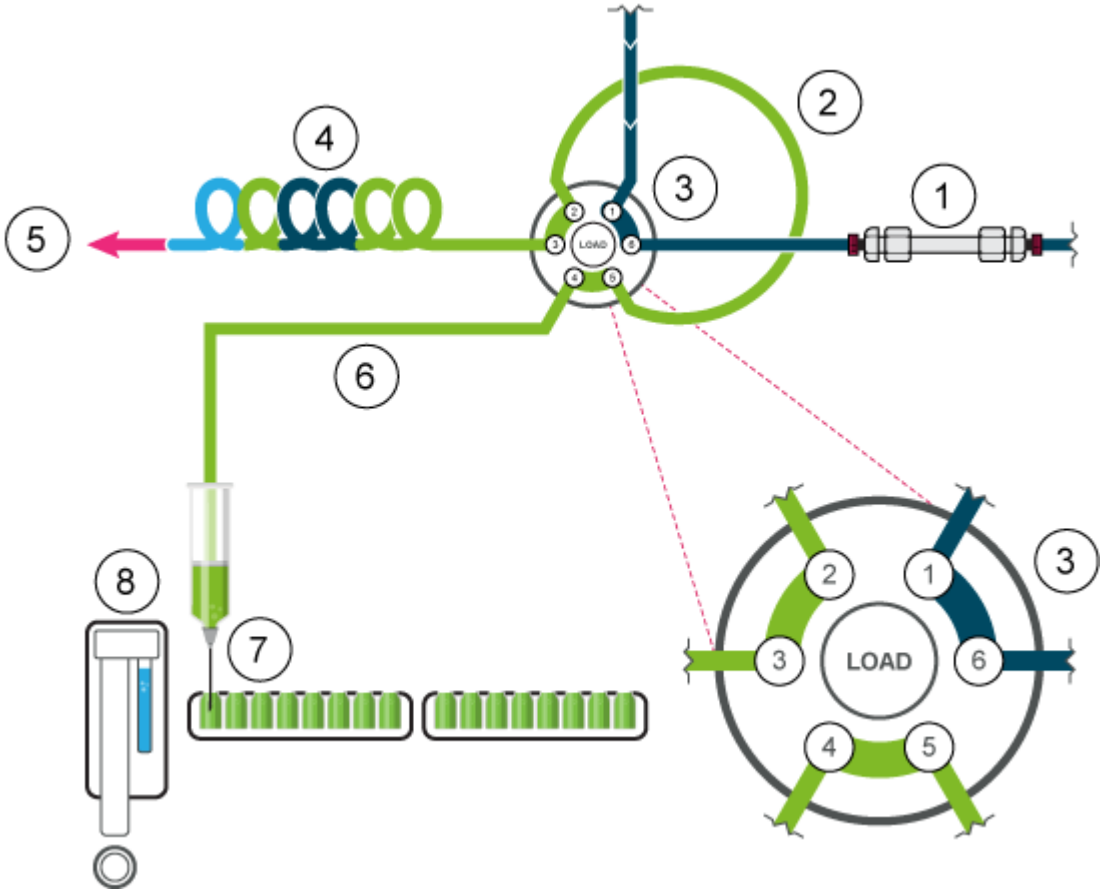
3. The valve changes to the Load position to transport the sample to the inlet of the sample loop.

Figure 2-16 Load Position



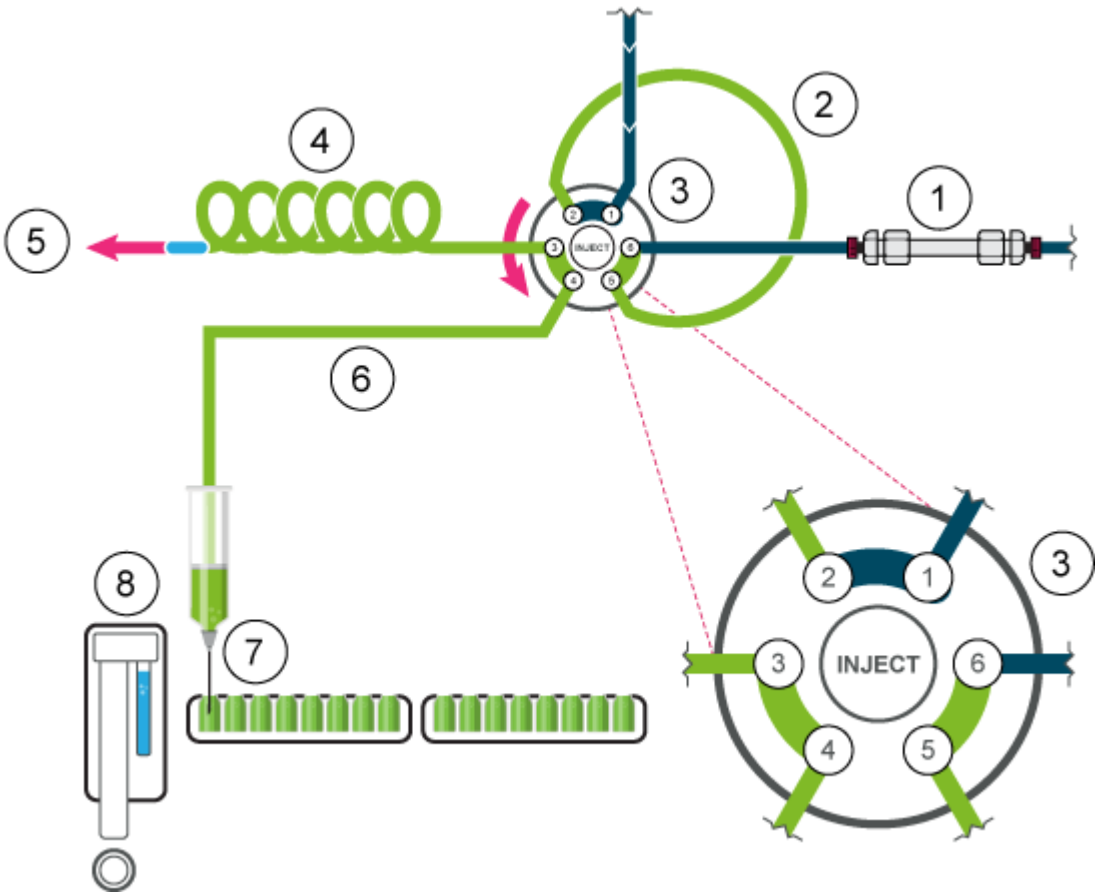
4. A volume of sample, depending on the volume of the loop, is transported through the loop. For loops up to 100 µL, 3 × the loop volume is aspirated.

Figure 2-17 Full Sample Loop



5. The valve changes to the Inject position, and the sample loop becomes part of the LC flow path. The sample is transported to the column.

Figure 2-18 Sample is Injected



Partial Loop Mode

This injection mode results in maximum accuracy of sample injection and low carryover values.

To reduce the flush volume, use an air segment of 5 µL. The air segment precedes the flush segment and is not injected. If headspace pressure is activated, then the air needle creates pressure in the sample vial, which prevents outgassing of the liquid and subsequent formation of air bubbles during sample aspiration.

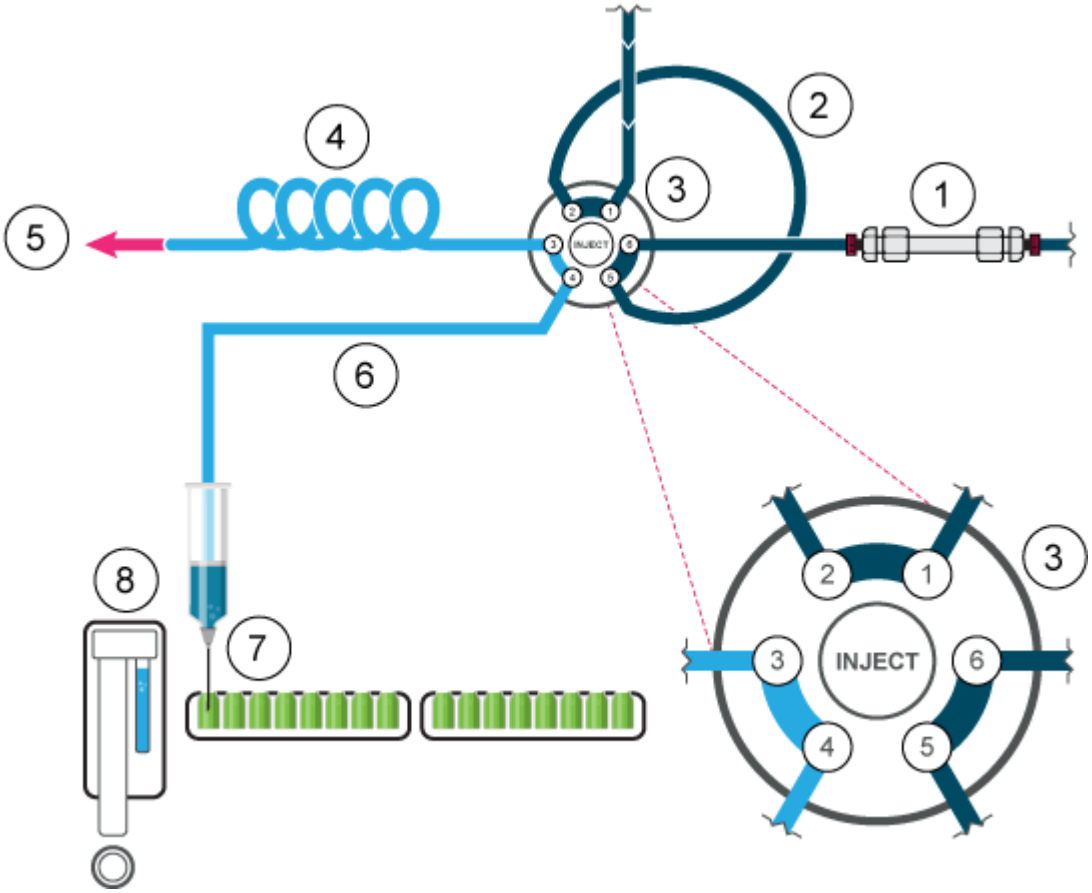
Figure 2-19 Partial Loop Mode

Item	Description
1	Sample needle
2	Sample loop
3	Buffer tubing
Green	Sample
Grey	Mobile phase
Purple	Wash

1. The injection valve is in the Inject position. The sample needle is inserted in the vial. The buffer and needle tubing are filled with sample.

   If headspace pressure is activated in the software, headspace pressure is applied through the air needle, which prevents outgassing of the liquid and subsequent formation of air bubbles during sample aspiration.

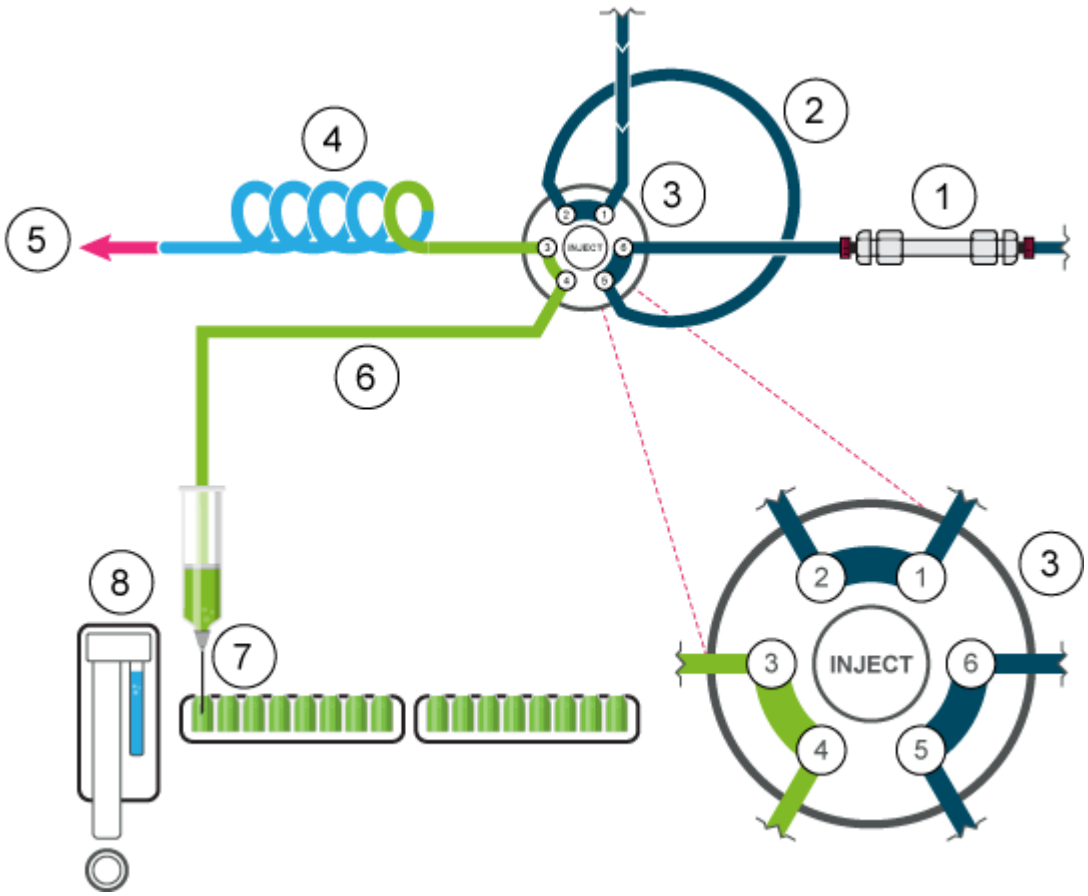
Figure 2-20 Initial Condition



Item	Description
1	Column
2	Sample loop
3	Injection valve
4	Buffer tubing
5	To syringe
6	Needle tubing
7	Sample needle
8	Wash/transport reservoir

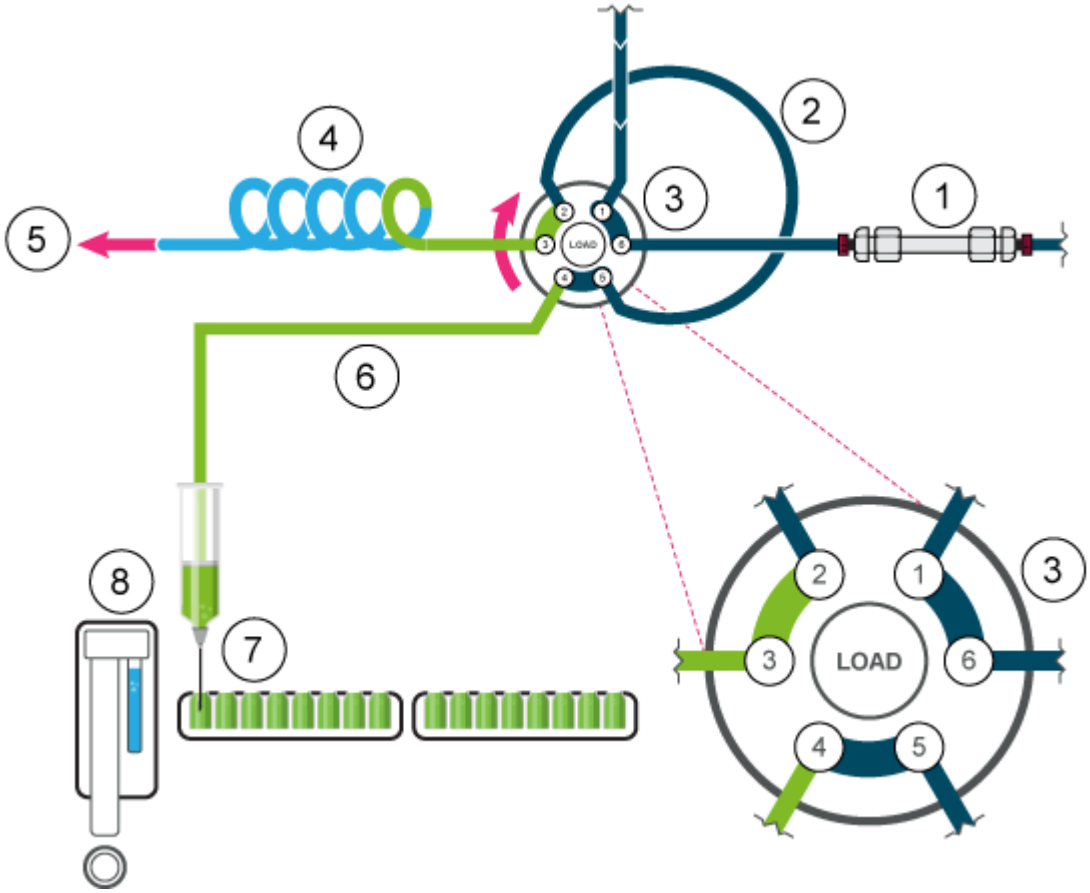
2. The flush volume is aspirated from the sample vial to remove the wash solution from the needle tubing.

Figure 2-21 The Needle and Needle Tubing are Flushed



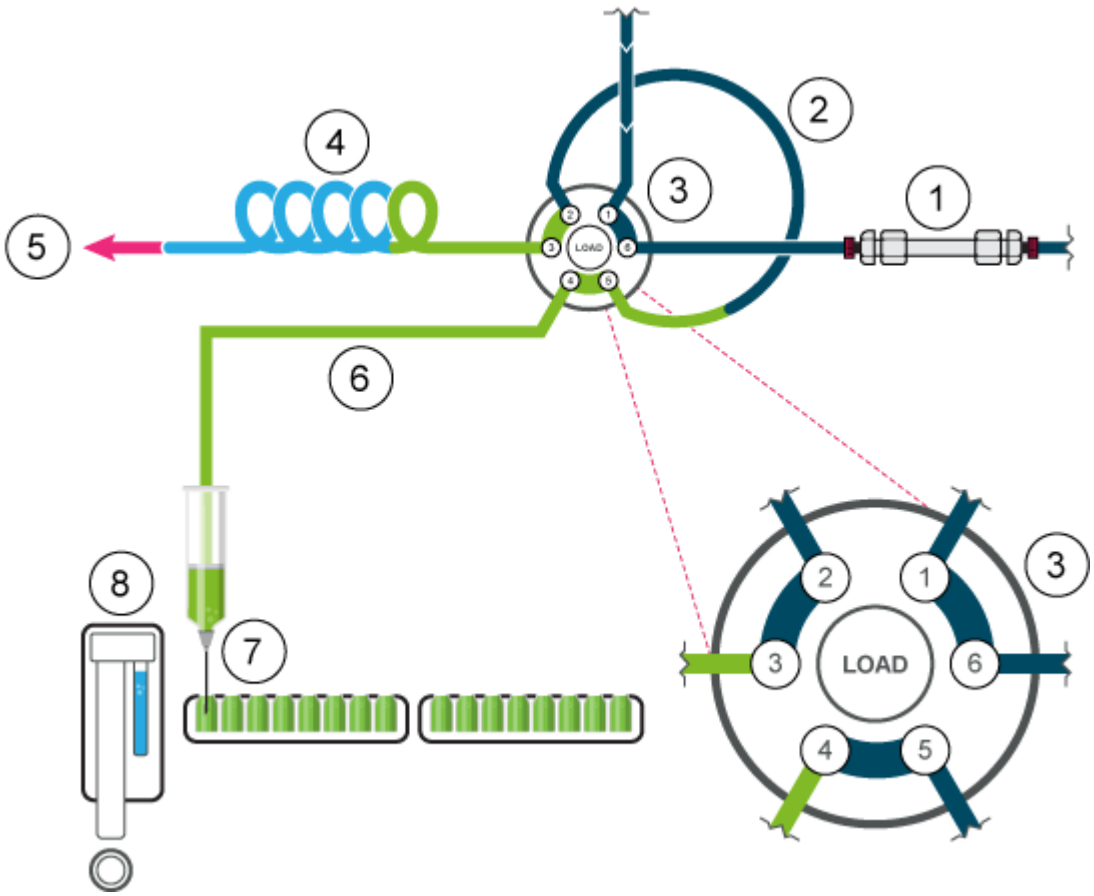
3. The injection valve switches to the Load position.

Figure 2-22 Load Position



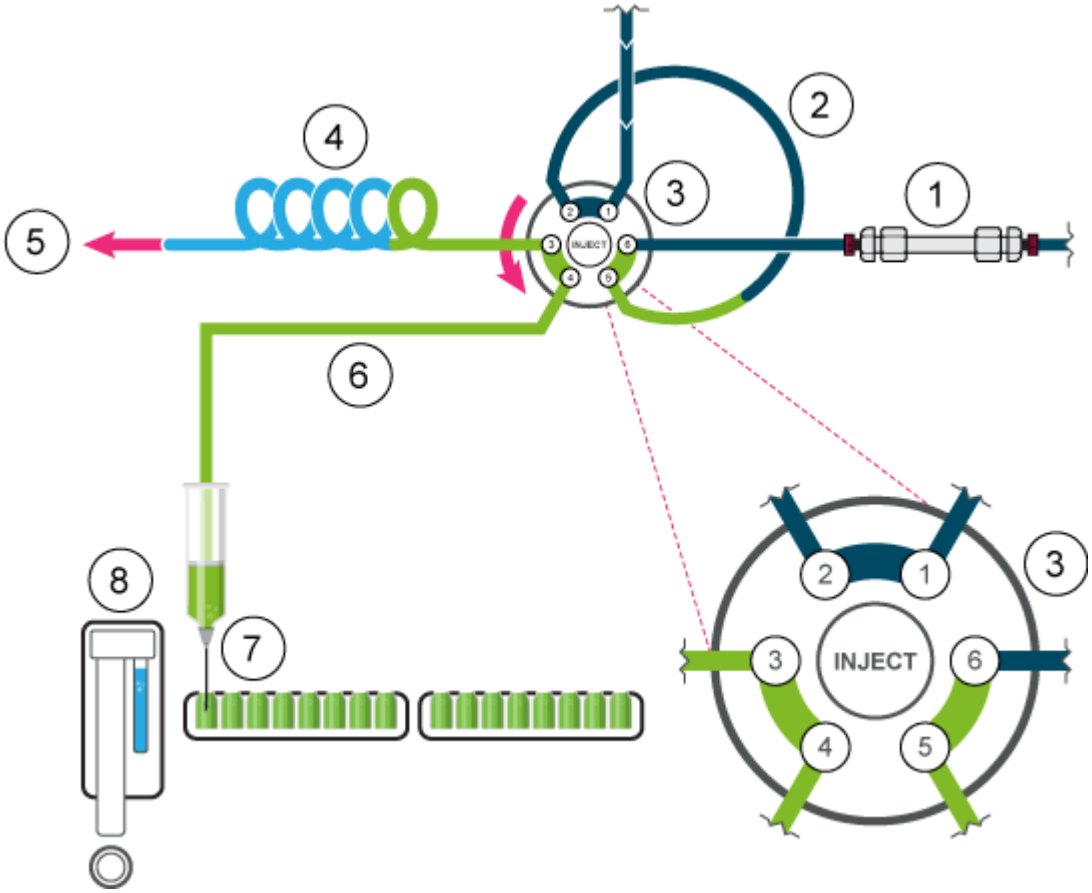
4. The sample is aspirated into the loop. In this mode, the loop can be filled to a maximum of 50% with sample.

Figure 2-23 Partially Filled Sample Loop



5. The injection valve switches to the Inject position. Because the sample loop is now within the flow path of the analytical system, the sample is transported to the column.

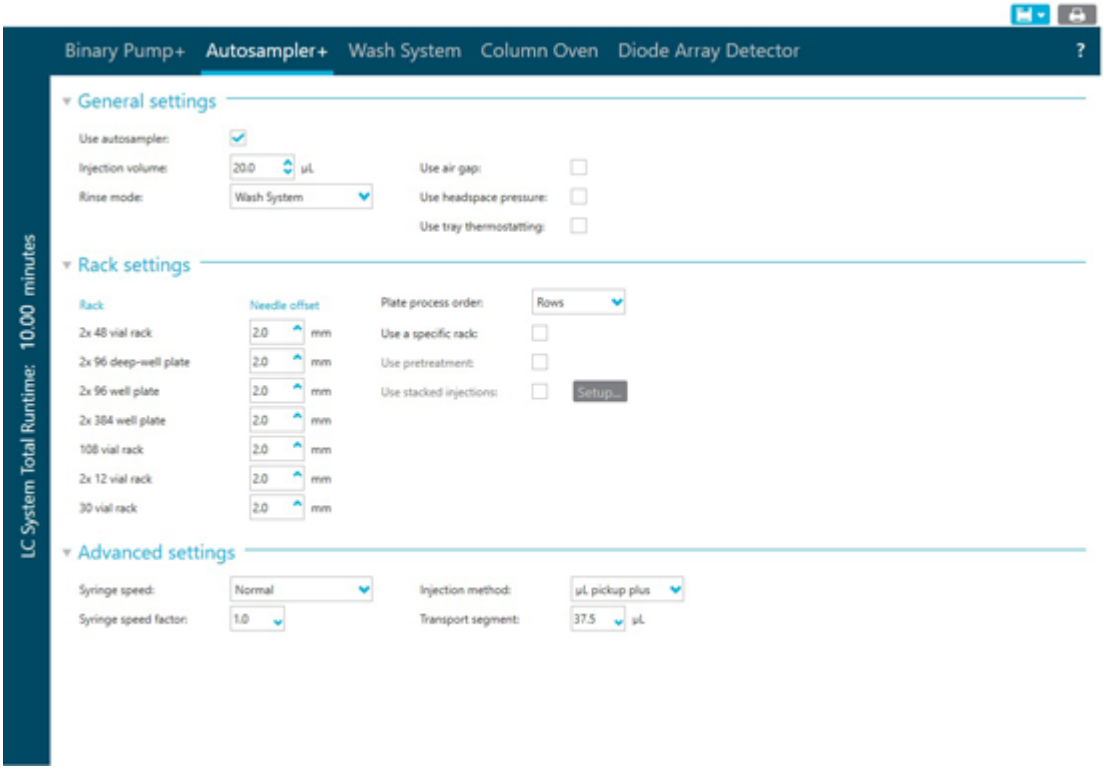
Figure 2-24 Sample is Injected



Autosampler Aspiration Speeds

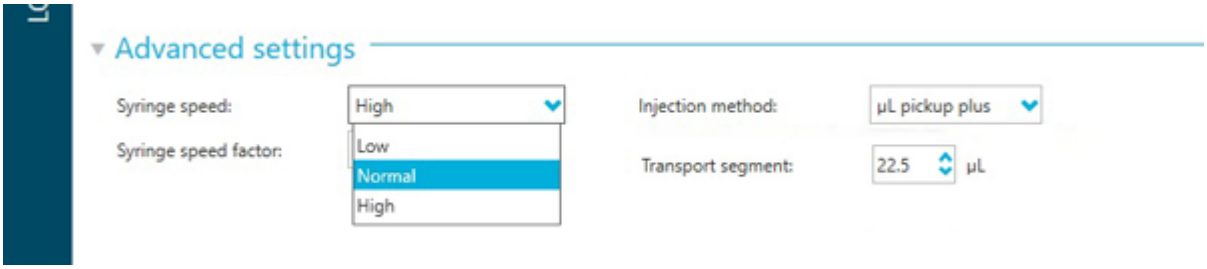
The rate at which the plunger descends to aspirate and rises to dispense sample or solvent can be configured using the **Syringe speed** and **Syringe speed factor** parameters. Set these parameters correctly to achieve consistent aspirations. Aspirating too quickly may cause inaccurate aspirations and bubbles in the autosampler syringe.

Figure 2-25 Autosampler Tab Parameters



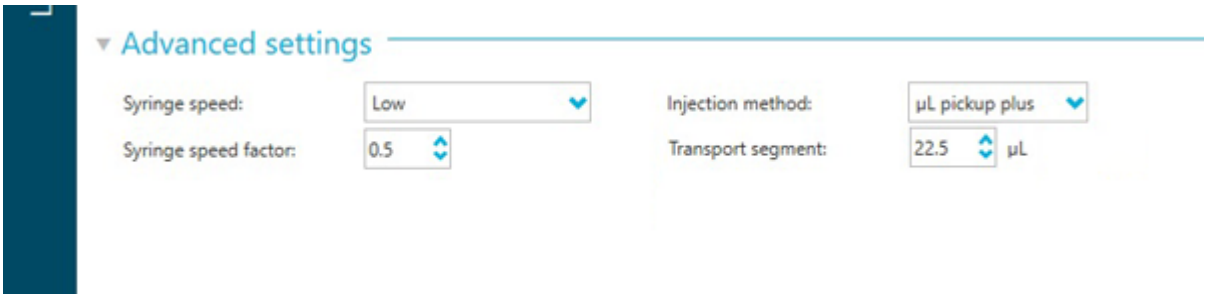
There are three **Syringe speed** settings: **Low**, **Normal**, and **High**. These are approximately 50 %, 100%, and 150 % of the standard speed, respectively.

Figure 2-26 Syringe Speed Parameter



The **Syringe speed factor** parameter can be configure in ten increments which include a range of 100 % (1.0) to 10 % (0.1) of the syringe speed.

Figure 2-27 Syringe Speed Factor



Air Needles

The required lengths for the air needles for the autosampler are listed in the following table.

Note: The needle holder lets the needle height be adjusted by 6 mm.

Table 2-4 Available Air Needles

Vial Rack	Needle Type
48 × 1.5 mL	62 mm (standard)
108 × 1.5 mL	62 mm (standard)
30 ×10 mL	50 mm (yellow) If the vial is less than 60% full, then the standard air needle can be used. Otherwise, a 56 mm (red) or 50 mm (yellow) needle is recommended.
12 × 10 mL	50 mm (yellow) If the vial is less than 60% full, then the standard 62 mm air needle can be used. Otherwise, a shorter air needle, 56 mm (red) or 50 mm (yellow), is recommended.

Standard Air Needle

The standard air needle is 62 mm long and can be used for a wide range of deep and shallow vial plates.

When 10 mL sample vials are used, the needle deeply penetrates the sample vial. If the vial is less than 60% full, then the standard air needle, and deep microtiter plates, can be used with the standard methods.

For non-standard settings, use the corresponding needle types.

Figure 2-28 Standard Air Needle with 2 mL Sample Vials

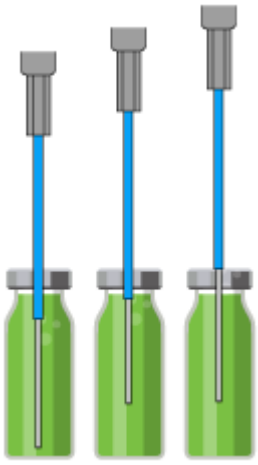
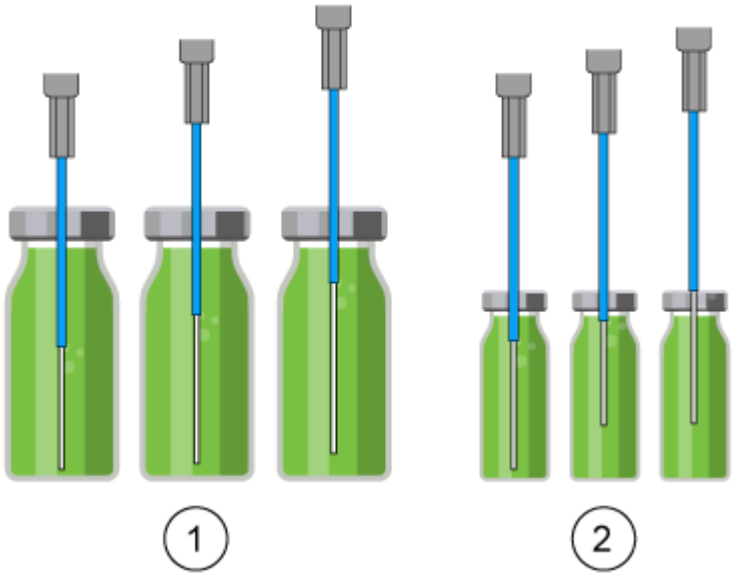


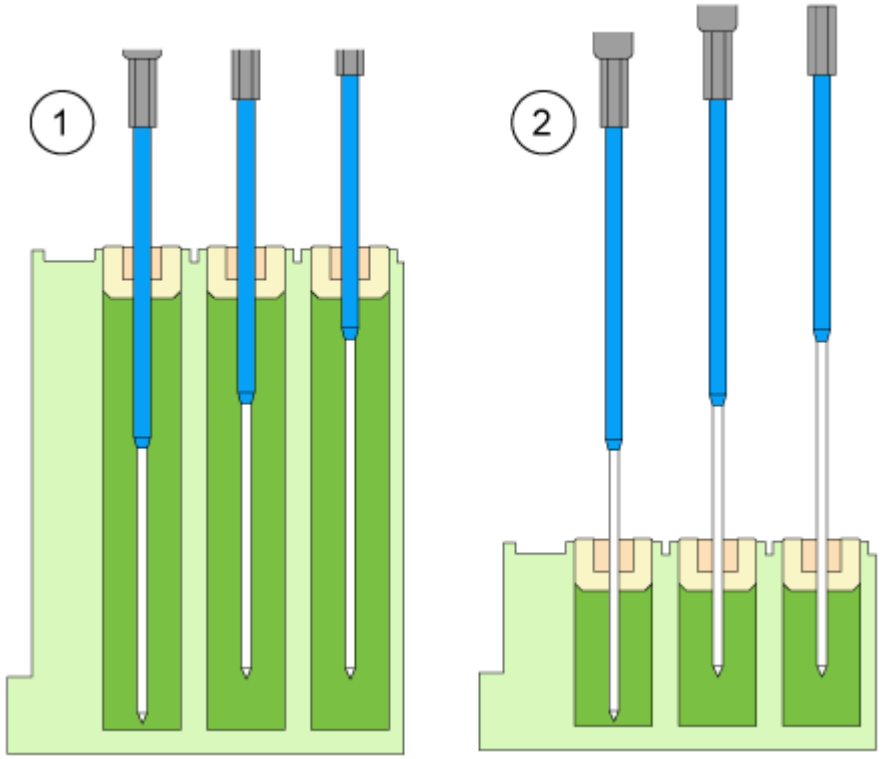
Figure 2-29 Standard Air Needle with 10 mL and 2 mL Sample Vials



Item	Description
1	10 mL sample vials
2	2 mL sample vials

The optional head-space pressure injection option should not be used with low microtiter plates. The sample needle sufficiently punctures the seal to prevent formation of a vacuum and therefore the air needle is not required.

Figure 2-30 Standard Air Needle with Deep and Low Microtiter Plates

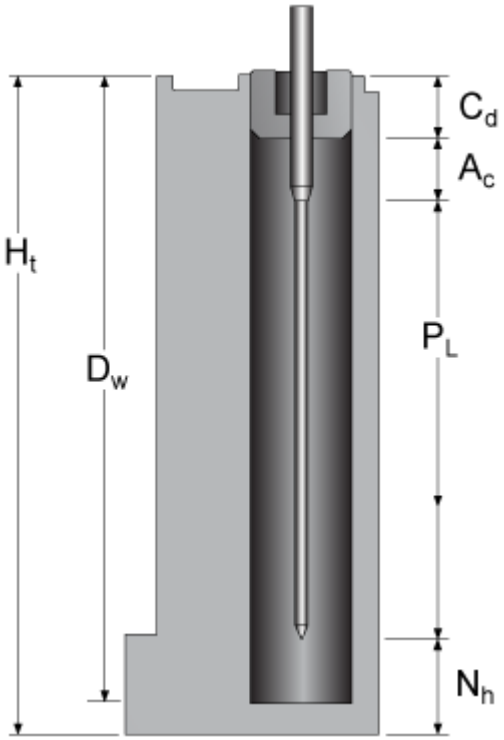


Item	Description
1	Deep microtiter plate with closure
2	Low microtiter plate

Air Needle Selection

The correct air needle is selected on basis of the protrusion length (P_L). Use the calculation in this section to select the correct air needle.

Figure 2-31 Air Needle Calculation



Parameter	Description
H_t	Sample plate height
D_w	Hole depth
C_d	Closure thickness
A_c	Distance from air needle tip to closure (minimum 2 mm)
P_L	Protrusion length. The distance between the tip of the air needle and the tip of the sample needle.
N_h	Set needle height

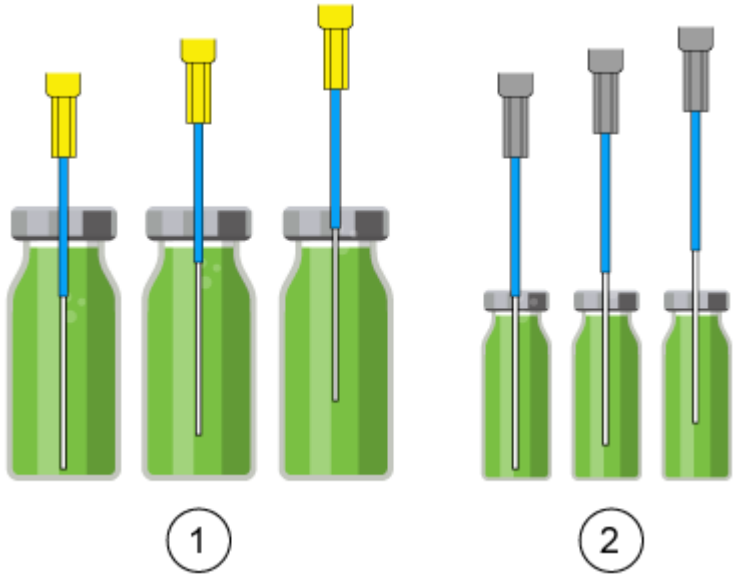
1. Verify that $H_t – D_w$ = 2 mm to 6 mm.
2. Calculate the protrusion length with the following equation:

   $P_L = H_t – C_d – N_h — A_c$
3. Select the applicable air needle from the following table.

Table 2-5 Air Needle by Protrusion Length

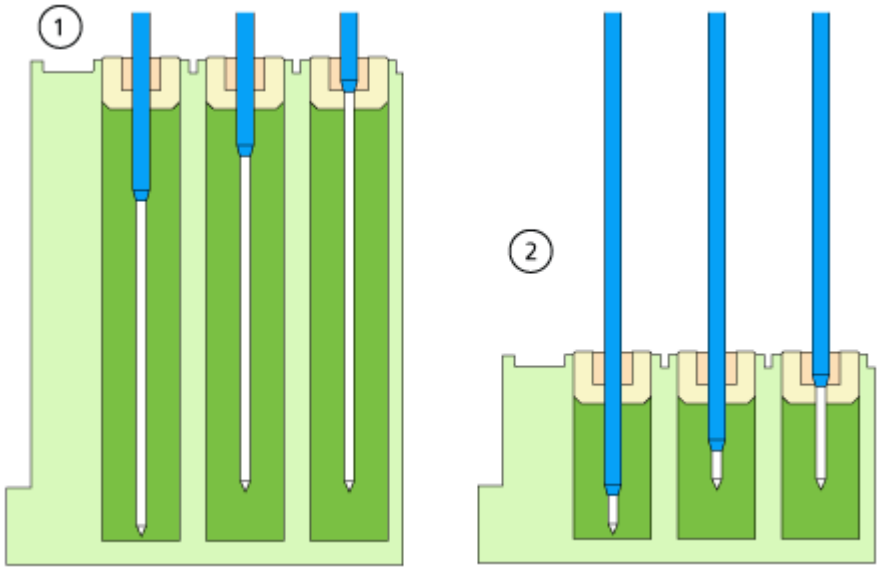
Protrusion Length (P_L)	Air Needle Type
34 mm to 40 mm	50 mm, yellow
28 mm to 34 mm	56 mm, red
22 mm to 28 mm	62 mm, natural (standard needle)
16 mm to 22 mm	68 mm, blue
10 mm to 16 mm	74 mm, green
4 mm to 10 mm	80 mm, black

Figure 2-32 Air Needles With Different Sample Vials



Item	Description
1	10 mL sample vial with 50 mm air needle
2	2 mL sample vial with 62 mm air needle

Figure 2-33 Air Needles With Different Microtiter Plates



Item	Description
1	Deep microtiter plate with closure with 56 mm air needle
2	Low microtiter plate with 80 mm air needle

Example calculation:

This calculation is for the following example:

- Autosampler with standard setting for needle height.
- Deep microtiter plate with closure.

Table 2-6 Dimensions

Parameter	Values
H_t	41.4 mm
D_w	37.8 mm
C_d	3.8 mm
N_h	6.0 mm (standard)
A_c	2.0 mm (standard)

1. $H_t - D_w = 41.4\ mm - 37.8\ mm = 3.6\ mm$

The condition has been met.

2. Protrusion length:

   $H_t – C_d – N_h – A_c$

   41.4 mm – 3.8 mm – 6.0 mm – 2.0 mm = 29.6 mm

   An air needle length of 56 mm is required.

Sample Vials

When handling the sample vials, follow these guidelines:

Note:

- Use vial caps with pre-split septa.
- To allow air to escape, fill the sample vials using a pipette.
- To prevent the sample from contaminating the air needle, do not fill the sample vials to the top.
- To prevent air bubbles from forming, and to prevent volatile components from evaporating, only use air-tight closure seals.
- Do not use sample vials that are open.
- Do not use sample vials with hard closures that the sample needle cannot pierce.

Pretreatment

In the Pretreatment section in the software, the user can program a mix method for the autosampler, to mix or dilute the sample fluid.

- The mixing routine and syringe speed are configured in the software.
- A mix method can contain up to 15 steps.

The following actions are possible in a mix method:

- **ADD**: The specified volume is aspirated from either the sample vial, the vial with reagent A, the vial with reagent B, or the flushing fluid, and then dispensed in the destination vial.

  Note: To prevent carryover, the autosampler removes 125% of the given volume from the corresponding sample vial and uses the additional 25% to flush the needle tube and needle.

- **MIX**: The contents of a specific sample vial are mixed by aspirating and dispensing the specified volume *n* times. If a destination vial has not been defined, then mixing is performed in the current sample vial.

Note: When defining the sample vials, users can only define the first destination vial for a mix method. For the following samples, the autosampler selects the next vial as the destination vial. For example, if the first sample is in vial 1 and the first destination vial is vial 49, then the autosampler uses vial 2 for the sample and vial 50 for the destination vial.

- **WAIT**: The system waits until the programmed delay time has elapsed before executing the next line of the program.

Example: ADD

The command ADD 100 µL from Reagent A to destination vial triggers the following steps:

1. An air segment of 5 µL is aspirated to separate the wash solution in the buffer tube from Reagent A.
2. 25 µL of Reagent A is aspirated to flush the tube and needle.
3. The syringe is emptied to the waste container through the drain tubing.
4. 100 µL of Reagent A is aspirated and then dispensed to the destination vial.
5. The sample tube and needle are flushed with the wash solution.

Example: MIX

In the ADD to Destination command, mixing is performed in the destination vial. If this command is preceded by an ADD to Sample command, then mixing is performed in the sample vial.

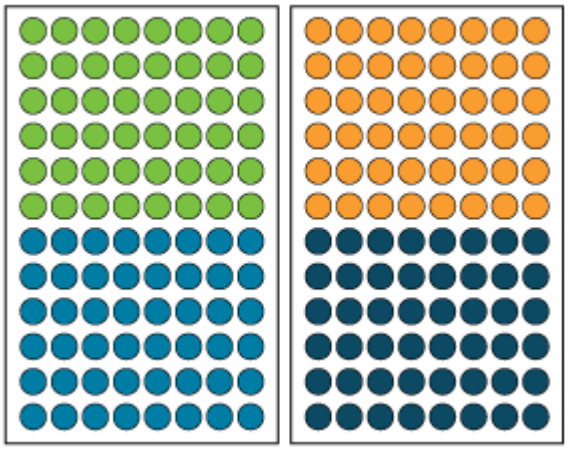
The MIX 3 times with 100 µL command triggers the following steps:

1. An air segment of 5 µL is aspirated to separate the wash solution in the needle buffer tube from the sample solution to be mixed.
2. The syringe is emptied to the waste container through the drain tubing.
3. 100 µL of the solution is aspirated and dispensed to the same sample vial.
4. Step 3 is repeated twice.
5. The tube and needle are flushed with the wash solution.

Sample Positions in a Mixing Routine

The following figure is an example of how to set up forty-eight samples when mixing two reagents.

Figure 2-34 Sample and Reagent Positions



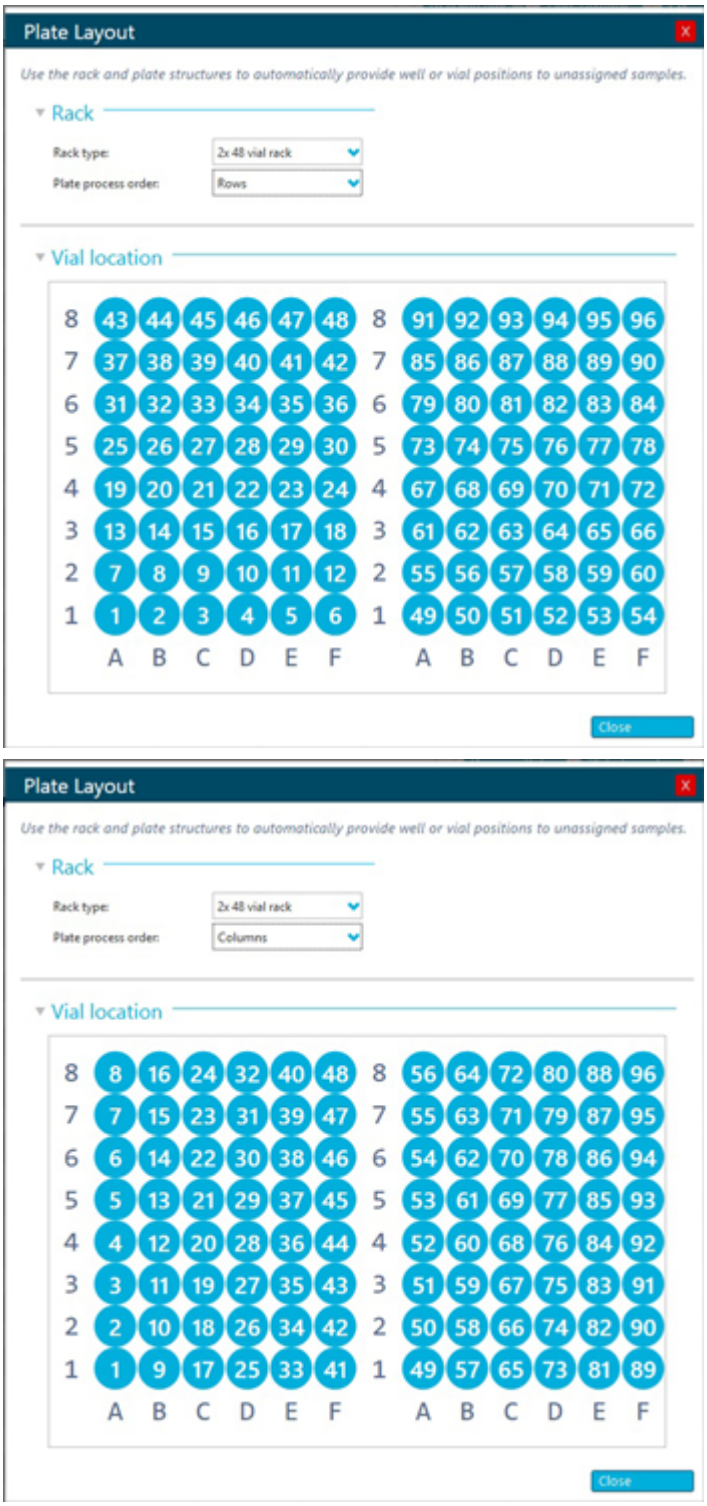
Vial	Description
	Sample
	Destination
	Reagent A
	Reagent B

Sample Plates

The plates can be loaded either by row or by column.

- Row: Loading by row increments the letter of the position, then the number. For example A1, B1, C1, ... F1, A2, B2, and so on.
- Column: Loading by column increments the number of the position, then the letter. For example A1, A2, A3, ... A8, B1, B2, and so on.

Figure 2-35 Example of Two 48-Vial Plates In the SCIEX OS Software



The first sample plate of the 2 × 48 sample plate configuration includes samples 1 to 48. The second sample plate includes samples 49 to 96, with position 48 located in the lower left corner of the next plate.

The following vial plates are supported:

- 2 × 48 (2 mL vials)
- 2 × 12 (10 mL vials)
- 1 × 108 (2 mL vials)

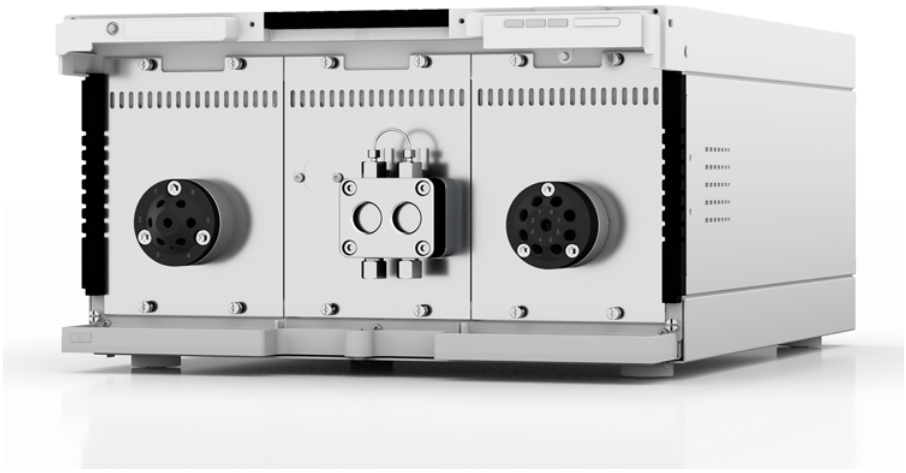
The following microtiter plates are supported:

- 2 × 96
- 2 × 384

Wash System

The wash system can be used as an optional addition for the autosampler. A combination of the wash system with the autosampler can enable very low carryover values. The wash system with a fast wash pump and switching valves takes over the wash procedure from the autosampler. The fast wash pump allows higher wash flow rates than the autosampler. The valve on the left side of the module (wash mode valve) selects the wash flow path (wash system or autosampler). The valve on the right side of the module (solvent selection valve) selects the solvents to be used for the wash cycle.

Figure 2-36 Wash System Without the Front Cover



The module is equipped with a fast wash pump, a wash mode valve, and a solvent selection valve. The wash system has the following features:

- Two valve drives
- Dual-piston technology for constant flow rates
- Easy removal and replacement of the pump heads using the four front-accessible screws
- Liquid transport with stable flow rate and high flow accuracy
- Long service life
- Stainless steel pump heads
- 10 mL pump head
- Piston backflushing
- High physical and chemical stability

Pump Head

The pump head has the following features:

- Stainless steel with stainless steel inlays for standard applications
- Pump head size: 10 mL

The front of the pump head is labeled with the maximum pumping capacity: 10 mL. Pump heads with inlays are additionally labeled with the composite material. For example, SST for stainless steel.

Valve Drive

The valve drive, which is controlled by the software, enables automatic valve switching. Because the switching time is very short, the flow path is interrupted for a very short time and pressure disruptions are minimized.

The valve on the left hand side of the module (wash mode valve) is a 6 port/2 position valve, with 1/16 inch ports. The valve on the right hand side of the module (solvent selection valve) is an 8 port/8 position valve, with 1/8 inch ports.

Wash System LEDs

The LEDs show different colors depending on the operating status. To put the wash system in Standby state, press the button beside the LEDs for 5 seconds.

Table 2-7 Wash System LEDs

Location	Color	Status	Action
Left LED	Flashing red	An error has occurred.	• Examine the system. • Press the button beside the LEDs briefly to deactivate the error message.
	Red	A serious error has occurred.	• Start the module again. • If the operating condition does not change, then contact sciex.com/request-support.
	Green	A program or sequence is running or has been loaded.	—
Center LED	Off	The module is not ready for operation.	—
	Flashing green	The module is equilibrating.	Wait until the module is ready.
	Green	The module is ready for operation.	—
Right LED	Green	The module has been turned on.	—
	Blue	The module is in Standby state.	Press **Standby** to take the module out of Standby state.

Tip! The system might start to malfunction after being repeatedly put in Standby state. If this issue occurs, then turn the module off and then on, to reset the data storage.

Column Oven

The ExionLC 2.0 Column Oven can be used in the following configurations:

- Up to eight columns of dimensions 125 mm × 4.6 mm i.d.
- Up to four columns of dimensions 300 mm × 4.6 mm i.d.
- One column of dimensions 300 mm × 16 mm i.d.

- A solvent precolumn heating cartridge is available to make sure that the mobile phase is at the set temperature before it enters the column.

A constant temperature between 5 °C to 85 °C can be selected.

Detectors

The following optional detectors are available: the ExionLC 2.0 Diode Array Detector, the ExionLC 2.0 Diode Array Detector HS, and the ExionLC 2.0 Multiwavelength Detector. The detector detects substances in liquids and can be used to determine their concentration. The sensitivity of the detector depends on the flow cell used. All of the detectors are automatically auto-zeroed at the start of sample analysis.

A test cell is shipped with the detector.

Detector LEDs

There are three LEDs and a button on the front of the detector.

The LEDs show different colors depending on the operating status. To put the pump in Standby state, press the button beside the LEDs for 5 seconds.

Table 2-8 Detector LEDs

Location	Color	Status	Action
Left LED	Red	Error	• Examine the system. • Press the button beside the LEDs briefly to deactivate the error message.
	Green	Data is acquired.	—
Center LED	Off	The lamp has been turned off or the self-test fails.	—
	Flashing green	The lamps are initializing or validation is in progress.	Wait until the lamp is running or the validation is finished.
	Green	The deuterium lamp is on.	—
Right LED	Green	The module has been turned on.	—

Table 2-8 Detector LEDs (continued)

Location	Color	Status	Action
	Blue	The module is in Standby state.	Press **Standby** to take the module out of Standby state.

About the Flow Cell

Several different flow cells are available for the detector. The following components can be ordered separately:

- ExionLC 2.0 Detector Flow Cell 50 bar: These cartridges combine a maximum light transmission, using total reflection, with a minimum cell volume to offer an ideal signal-to-noise ratio. The standard version offers a flow path of 10 mm and a volume of 2 µL.
- ExionLC 2.0 Detector Flow Cell HS 50 bar: These cartridges combine a maximum light transmission, using total reflection, with a minimum cell volume to offer an ideal signal-to-noise ratio. The high sensitivity version offers a flow path of 50 mm and a volume of 6 µL.
- ExionLC 2.0 Detector Flow Cell 300 bar: These cartridges are bio-inert and feature an increased pressure stability (up to 300 bar/4350 psi).

Note: The detector is shipped with a test cell. A flow cell must be ordered separately.

Signal sensitivity, peak broadening, and response can all be affected by the choice of flow cell. Other factors to consider when selecting a flow cell include the following:

- Volume
- Path length
- Chemical compatibility of wetted parts
- Pressure stability
- Type of flow cell connection

Flow Cell Volume

Depending on the system configuration, column and samples, one flow cell volume might be more applicable than another. If the volume is too large, then peak resolution might be reduced due to peak broadening. If the volume is too small, then the noise might be higher and the signal might be too small due to less light reaching the photo diodes.

Therefore, the ideal flow cell volume balances peak broadening and sensitivity.

A good rule of thumb is that the flow cell volume should not be more than one-third of the peak volume of the separated sample. To determine the volume of the peaks, multiply the peak

width, as reported in the integration results, by the flow rate. To then calculate the ideal flow cell volume, divide the peak volume by 3.

Cartridge flow cells with volumes of 2 µL, 6 µL, and 10 µL are available for the detectors. Narrow-bore columns (~ 2.1 mm i.d.) are suitable for flow cells with smaller volumes. Columns with a larger inner diameter (3.0 mm i.d.) are less affected by the volume of the flow cell.

The flow rate should also be taken into consideration. A lower flow rate increases the axial and longitudinal diffusion and adds to a broadened flow profile, which might lead to peak broadening.

Path Length

As described by the Beer-Lambert law, the path length of a flow cell affects the light intensity that is detected.

Figure 2-37 Path Length

$$A = -\log T = \log\left(\frac{I}{I_0}\right) = \varepsilon \times d \times c$$

Value	Description
A	Measured absorption at a given wavelength
T	Transmittance, specified as the quotient of the light intensity (I) after passing through the sample and the initial light intensity (I_0) before passing through the sample
ε	Molar absorptivity coefficient (wavelength and temperature-dependent)
d	Path length
c	Analyte concentration (temperature-dependent)

For the same concentration, the peak height is higher if the path length is longer. Path lengths of 10 mm and 50 mm are available for the detectors. A longer path length, therefore, increases the sensitivity of a method. The limit of detection is inversely proportional to the path length.

Wetted Parts

The wetted parts of the flow cell must be chemically compatible with the solvents and sample.

Pressure Stability

Different flow cells can withstand different maximum pressures. The upper pressure limits of the flow cells are 50 bar (725 psi) or 300 bar (4351 psi). Do not subject a flow cell to the maximum pressure for a long period of time.

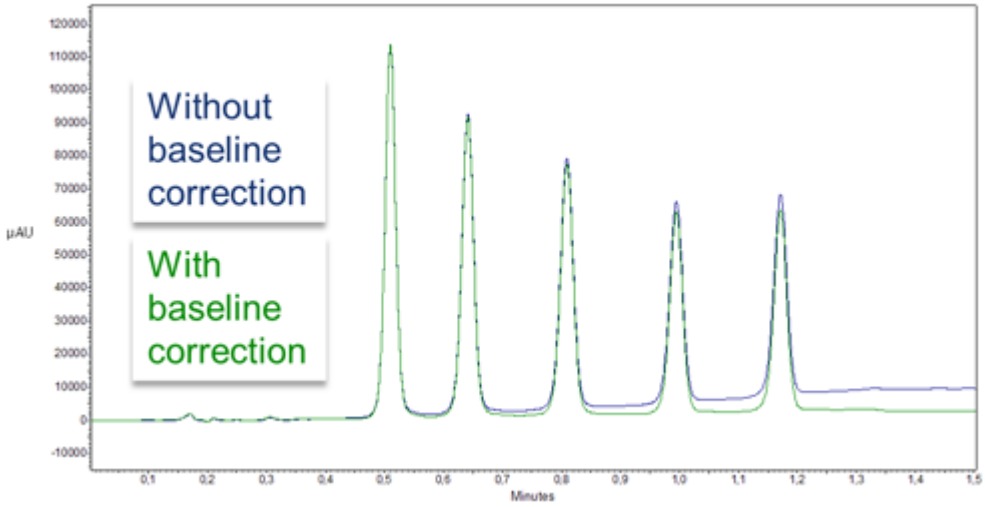
Flow Cell Connection

To prevent undesirable effects, such as the loss of resolution in the chromatogram, make sure that the tubing is correctly connected to the flow cell, and that any dead volume is eliminated.

Wavelength Selection

- **Signal wavelength:** Wavelength selection can influence the sensitivity, selectivity, and linearity of a measurement. The selected measurement wavelength can be within the range from 190 nm to 1000 nm, for the ExionLC 2.0 Diode Array Detector HS DADHS-200, or 190 nm to 700 nm, for the ExionLC 2.0 Diode Array Detector DAD-200 or the ExionLC 2.0 Multiwavelength Detector MWD-200, in 1 nm steps. The best wavelength for a given measurement, the signal wavelength, is the wavelength that gives the maximum absorption above the UV cutoff of the mobile phase. In cases where there are multiple components with different absorbance maxima, choose a compromise wavelength where all components absorb.
- **Baseline correction or reference wavelength:** To minimize baseline drift resulting from refractive index effects, set a reference wavelength to correct the baseline. Refer to the following figure.

Figure 2-38 Baseline Correction



Set the reference in the same spectral region as the signal wavelength (UV or Vis) but at a wavelength at which the analyte has no absorbance.

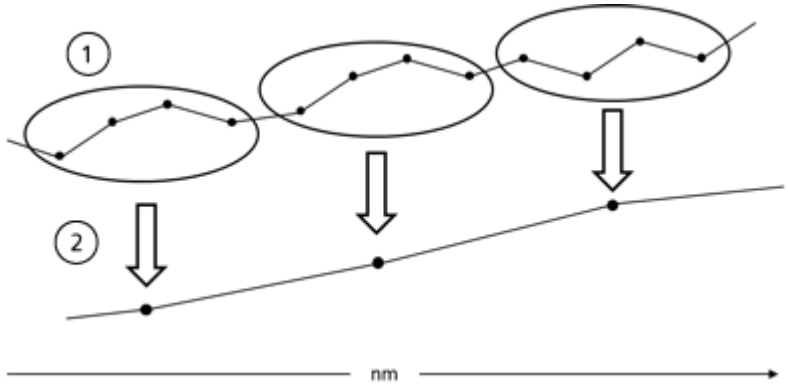
- **Default reference wavelength:** By default, the reference wavelength 360 nm is activated (for channel 2). This value is suitable for most applications.

When selecting the signal and reference wavelengths, select the corresponding bandwidths. Refer to Bandwidth.

Bandwidth

The bandwidth defines the total number of wavelengths actually registered by the photodiode when a specific wavelength is set. For example, a wavelength set at 254 nm with a bandwidth of 4 nm results in average absorption of 252 nm to 256 nm.

Figure 2-39 Bandwidth



Item	Description
1	Raw data
2	Bunched data

When selecting bandwidth, balance sensitivity and selectivity. Narrow bandwidths increase selectivity, whereas broad bandwidths increase sensitivity.

By default, the bandwidth for the signal wavelength is set to 8 nm, and the bandwidth for the reference wavelength is set to 30 nm.

Spectral Range

The spectral range selected for a given measurement determines the amount of space required to store the generated data. When a narrower spectral range is selected, the signal intensity increases. This increase is limited, however, by the data rate.

A narrow spectral range reduces the amount of data acquired. The range, however, should be wide enough to detect all of the components. Also, the spectral range must always include the signal wavelength and the reference wavelength, if applicable.

Time Constant and Data Rate

Response Time

The time constant influences the response time of the detector. The response time determines how quickly the detector responds to a change in signal.

Time Constant

The time constant smooths the signal. The larger the time constant, the more the signal will be smoothed. The best time constant is usually the reciprocal of the data rate.

A good rule of thumb for selection of the time constant is that it should be no larger than 1/10 of the baseline peak width of the first peak of interest, in seconds. Increasing the time constant allows more averaging of the signal (digital filtering) and results in less baseline noise. However, increasing the time constant too much might result in broad peaks, reduced peak heights and asymmetric peak shapes. Therefore, a compromise must be found. Refer to the following table.

Table 2-9 Time Constant

Peak width [min]	Time constant [s]	Data rate [Hz]
<0.003	0.01	100
>0.007	0.02	50
>0.017	0.05	20
>0.033	0.1	10
>0.067	0.2	5
>0.167	0.5	2
>0.333	1	1

If increased sensitivity is required, or if the baseline noise interferes with integration, then increase the time constant. If resolution is compromised, then decrease it.

We recommend that the time constant and data rate be adjusted depending on the peak width.

Data Rate

The data (sampling) rate is the number of data points per second (Hz) at which the detector transmits data to the computer.

Default Data Rate

The default data rate setting for the detectors is 1 Hz. The maximum data rate (digital signal) is 100 Hz. Lower data rates store average data points. A 50 Hz data rate averages 2 points. A 10 Hz data rate averages 10 points. The analog data rate is fixed at 12.5 Hz.

Optimize the Data Rate

The optimal data rate depends on the application. A low data rate, with too few points across a peak, decreases detail and compromises reproducibility. A high data rate, with too many points, introduces noise to the system and results in large files. Following are some items to consider:

- Each peak should have 20 to 30 data points. For chromatograms with co-eluting peaks or with low signal-to-noise ratios, 40 to 50 data points per peak are recommended.
- If all peaks are relatively wide, then select a slower data rate.
- If any peaks of interest are less than a few seconds, then select a faster data rate.
- If the data rate is too low, then the start and end points of the peaks are not accurately determined. If the data rate is too high, then data files might occupy excessive disk space and post-run analyses might require more processing time.

Integration Time (Signal Level)

The integration time influences the intensity of the signal and therefore the sensitivity of the measurement. As integration time increases, the intensity of the signal increases, until the maximum sensor counts are reached. The software automatically calculates integration time before the start of a measurement. The calculations are in relation to the spectral range. Refer to Spectral Range.

Subtraction of the Baseline Chromatogram

Baseline subtraction can eliminate the effects of drift that result from solvent, gradient, or flow programming. The baseline profile is subtracted from the measured chromatogram. This results in a mathematically reprocessed chromatogram with an ideally flat baseline.

Extended Linear Range

The extended linear range option broadens the linear range of the detector, through internal stray light correction. This option is available in the advanced settings for the module. It is available for devices with firmware versions 01.23 (DAD-200) and 01.10 (DADHS-200, MWD-200) or higher.

Valve Drive

The valve drive enables automatic valve switching. Because the switching time is very short, the flow path is interrupted for a very short time, and pressure disruptions are minimized. The valve drive is controlled by the software, or manually, using the buttons on the front of the valve drive. Valves are identified using innovative radio frequency identification (RFID) technology. This technology facilitates GLP processes. For example, automatic notifications make sure that rotor seals are replaced on an appropriate schedule.

The device status is shown by the LED on the front of the module.

Table 2-10 Valve Status

LED Color	Status
Off	Not ready. Set the valve position to Home.
Green	Flashing: The method in the chromatographic software is paused. On: Ready
Red	Flashing: Error On: Fatal error. Contact sciex.com/request-support
Blue	Standby

The status of the valve is shown on the screen on the valve drive.

Table 2-11 Status

LED	Status
Blank	No RFID valve is installed
Vertical bars	An RFID tag was found
Horizontal dots	No RFID tag was found
Horizontal lines	There is no connection with the valve drive module

The valve is shipped with an accessories kit.

Valve Buttons

The buttons on the front of the valve are used to operate the device.

Note: If no button is pressed within 10 seconds, then the screen returns to the Main screen.

Table 2-12 Valve Buttons

Button	Name	Description
	Navigation	Use these buttons to: • Scroll through menus. • Change values.

Table 2-12 Valve Buttons (continued)

Button	Name	Description
	Select	Use this button to: • Select a menu. • Select a value to change. • Return to the main screen. Press and hold this button for three seconds.
	Confirm	Use this button to confirm a selection.

Suggested Mobile Phases and Liquids

The following table suggests mobile phases for different workflows. All solvents should be LC-MS-grade or higher.

Table 2-13 Example Mobile Phases

Workflow	Mobile Phase A	Mobile Phase B
Peptide	Water + 0.1% formic acid	Acetonitrile + 0.1% formic acid
Small molecule	Water + modifier (For example, formic acid)	100% methanol plus modifier (For example, formic acid)

Table 2-14 Example Liquids

Piston Backflush Solvent	Autosampler Wash Solution	Autosampler Transport Liquid
50% isopropanol	20% isopropanol (wash)	Mobile phase A

SecurityLINK UHPLC Tubing Lengths

The ExionLC 2.0 System modules are connected to each other using 0.1 mm id SecurityLINK tubing. Standard tubing lengths are shown in the following table.

Table 2-15 SecurityLINK UHPLC Tubing Lengths

Module Connections	Tubing Length (mm) Standard Configuration	Tubing Length (mm) Standard Configuration With the Optional Detector	Tubing Length (mm) Standard Configuration With the Optional Wash System
Without a Column Switching Kit			
Pump to autosampler	500	600	600
Autosampler to column oven	500	500	500
With a Column Switching Kit			
Pump to autosampler	500	600	600
Autosampler to column switching valve	500	500	500
Column switching valve to column (qty 1 per column)	350	350	350
Column to column switching valve (qty 1 per column)	500	500	500
Column switching valve to detector	N/A	500	N/A

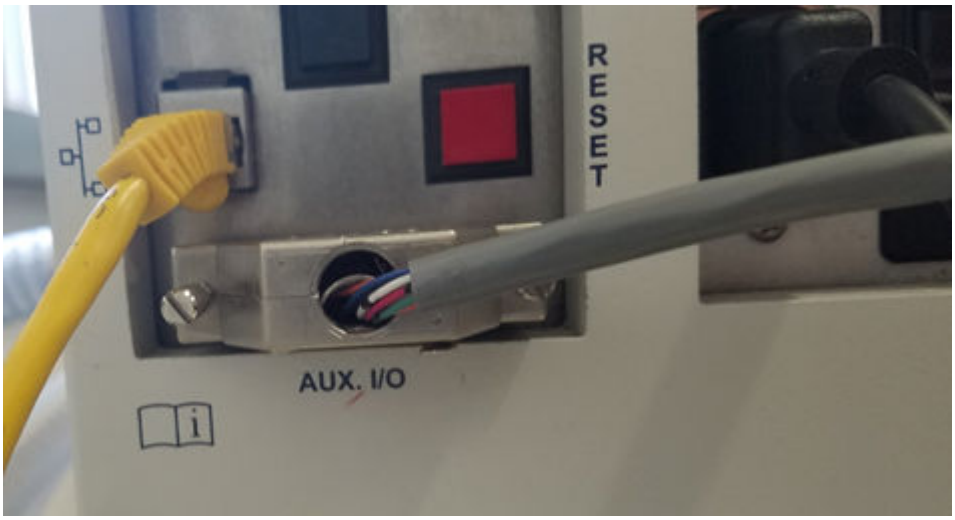
For information on tubing lengths for systems that have both the detector and wash system installed, contact sciex.com/request-support.

Connect the Cables and Mains Supply

1. Make sure that all of the modules are turned off.
2. Connect the modules to the mains supply. Do not turn them on.
3. Analyst software: Connect the trigger cable between the autosampler I/O port and the mass spectrometer **AUX I/O** port.

Figure 2-40 Autosampler I/O Port

Figure 2-41 Mass Spectrometer AUX I/O Port



Install the Software

- If the software is not already installed, download the Microsoft Visual C++ 2010 Redistributable Package (x86) (vcredist_x86.exe) from microsoft.com and then install it on the host computer.

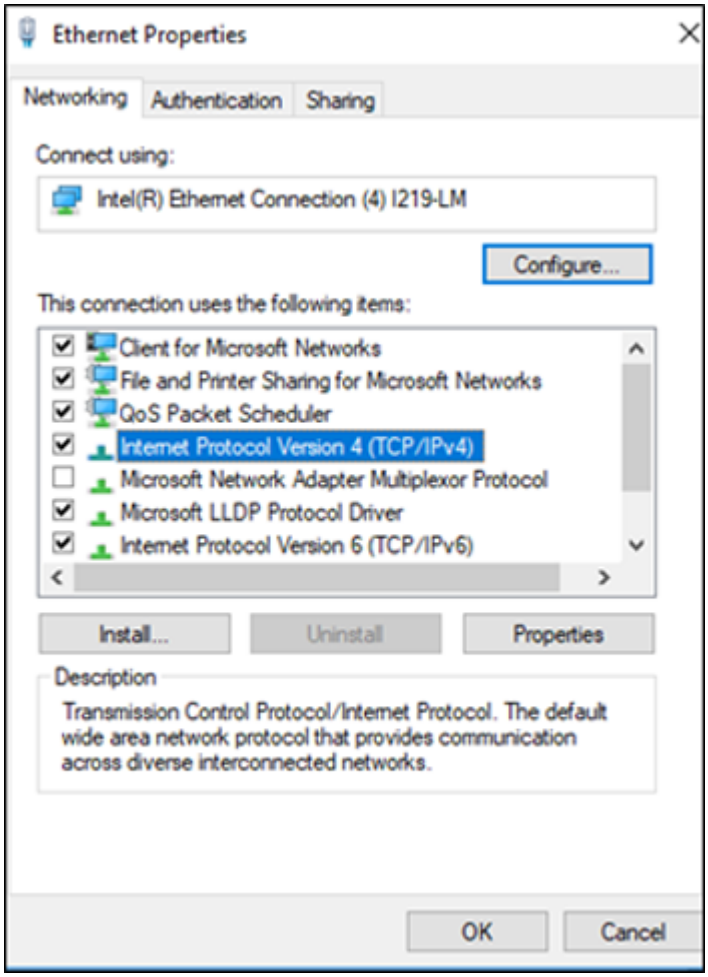
Configure the Ethernet Switch

Prerequisites
• In Windows, the power saving, hibernation, standby, and screen saver features are deactivated. • For all LAN devices, **Allow the computer to turn off this device to save power** is disabled in the Device Manager for the network adapter.

The ExionLC 2.0 system requires version 4 of the TCP/IP protocol (IPv4). IPv6 is not supported.

1. Connect the power supply to the Ethernet switch.
2. Turn on the Ethernet switch.
3. Configure the Ethernet port for the ExionLC 2.0 system on the acquisition computer.
   a. Click **Control Panel** > **Network and Internet** > **Change Adapter Settings**.
   b. Right-click the network to which the ExionLC 2.0 system is connected.
   c. Click **Rename**.
   d. Type `Exion 2`.
   e. Right-click on the Exion 2 network, and then click **Properties**.
   f. Click the **Networking** tab, and then double-click **Internet Protocol Version 4 (TCP/IPv4)**.

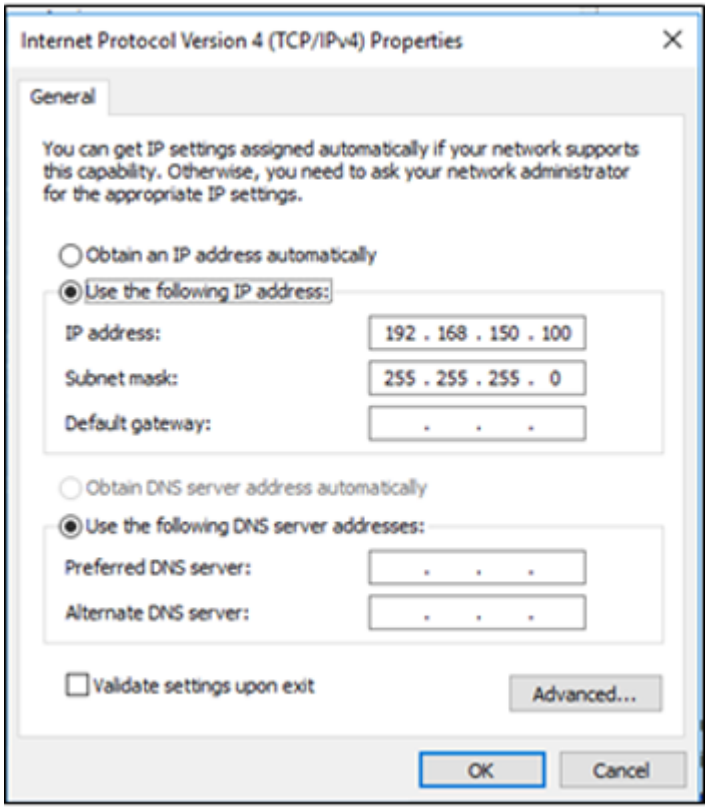
Figure 2-42 Ethernet Properties Dialog



g. Click the **General** tab, click **Use the following IP address**, and then type the following:

- IP address: **192.168.150.100**
- Subnet mask: **255.255.255.0**

Figure 2-43 Ethernet Properties Dialog: General Tab



4. Click **OK**.
5. Click **OK** to close the Ethernet Properties dialog.
6. Connect the Ethernet cables to ports 1 to 4 of the Ethernet switch (adding 5 to 7 if a valve drive, detector, or Wash System are installed).
7. Connect the computer to port 1 on the switch.
8. Connect the pump to port 2 on the switch.
9. Connect the autosampler to port 3 on the switch.
10. Connect the column oven to port 4 on the switch.
11. (If applicable) Connect the LAN 1 port of the valve drive to port 5 of the switch.
12. (If applicable) Connect the detector to port 6 on the switch.

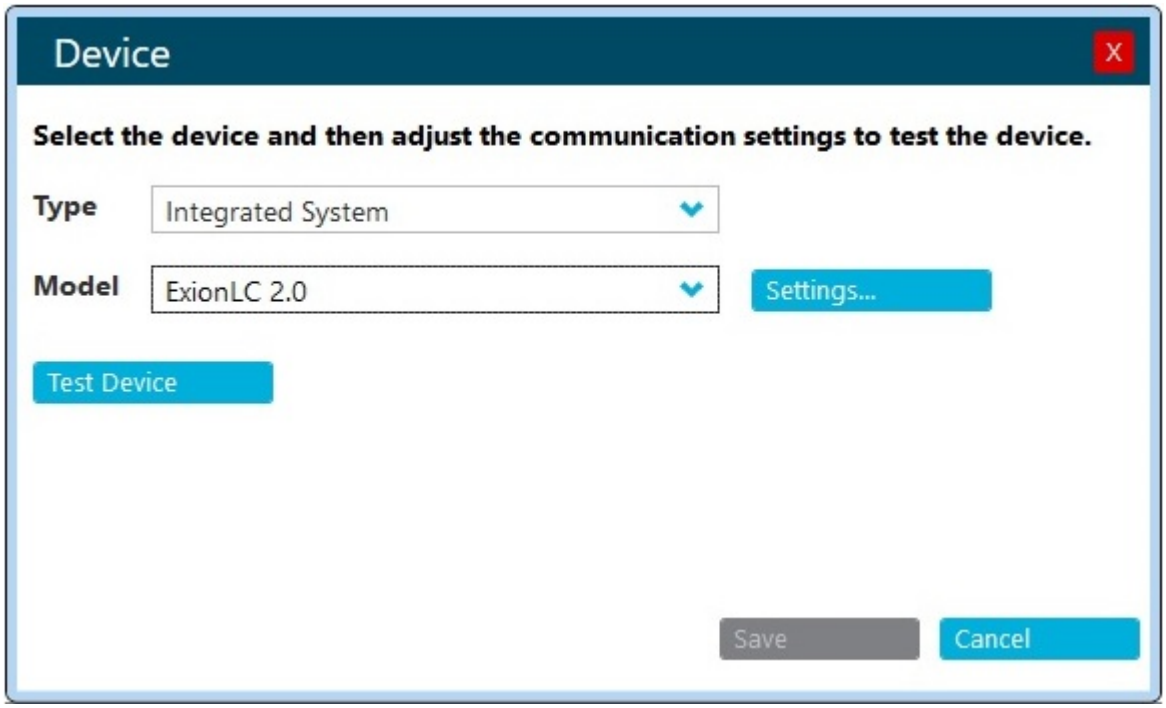
13. (If applicable) Connect the wash system to port 7 on the switch.
14. Turn on the pump.
15. Turn on the autosampler.
16. Turn on the column oven.
17. (If applicable) Turn on the valve drive.
18. (If applicable) Turn on the detector.
19. (If applicable) Turn on the Wash System.
20. Open the control software.
21. Edit and then activate a hardware profile, including a mass spectrometer and the ExionLC 2.0 system as an integrated system, to make sure that the LC system is detected correctly by the SCIEX OS or Analyst software. If there are any issues, then refer to **Troubleshooting** > **LAN troubleshooting**.

Add and Activate the ExionLC 2.0 System With the SCIEX OS Software

Note: To prevent activation issues, always add the mass spectrometer before other devices.

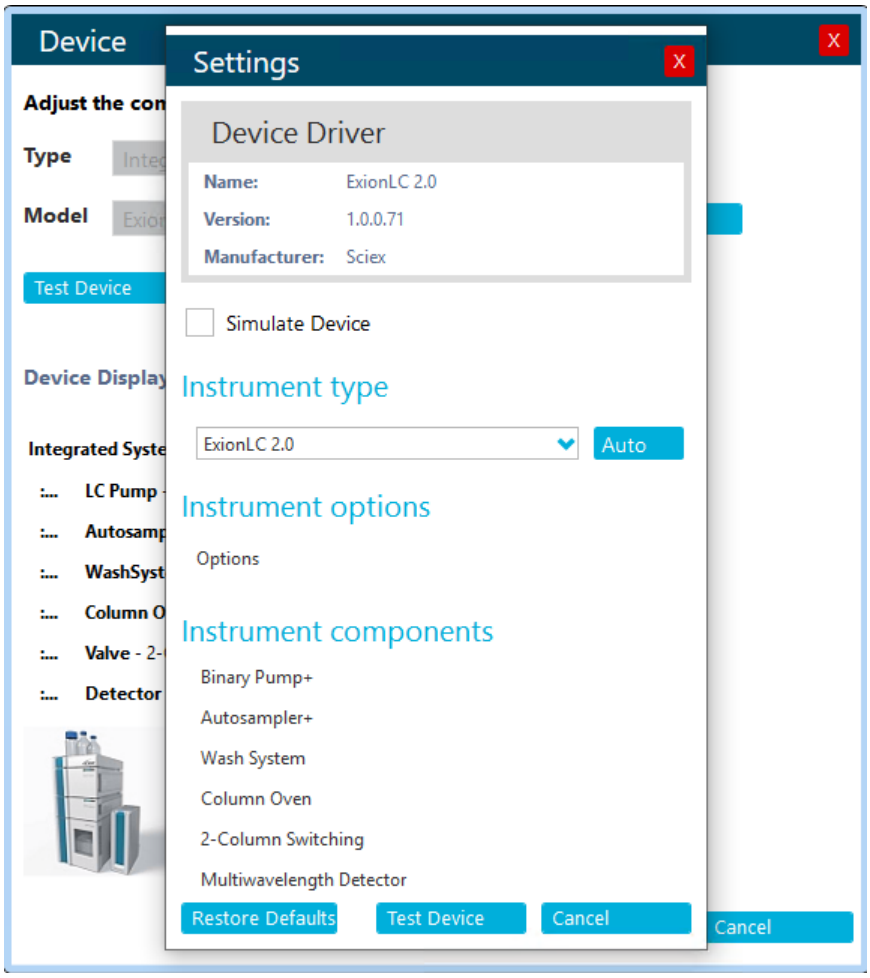
1. Open the SCIEX OS software.
2. Open the Configuration workspace.
3. Click **Devices**.
4. If any devices are active, then click **Deactivate**.
5. Click **Add**.
   The Device dialog opens.
6. In the **Type** list, click **Integrated System**.
7. In the **Model** list, click **ExionLC 2.0**.

Figure 2-44 Device Configuration



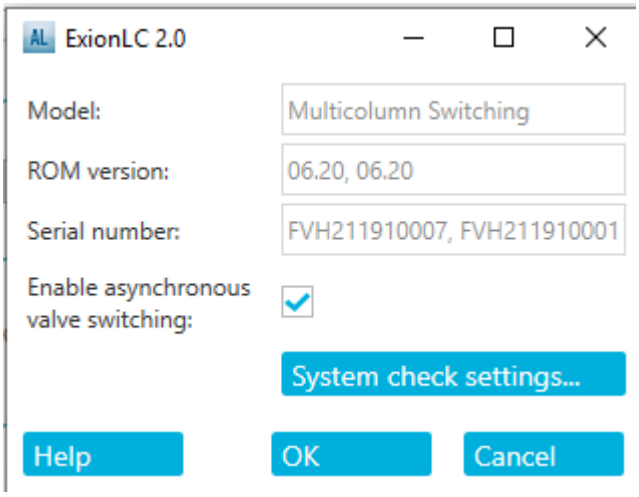
8. Click **Settings**.
9. In the **Instrument type** list, click **ExionLC 2.0**.

Figure 2-45 Settings Dialog



10. To automatically find and configure the LC modules, click **Auto**.
11. If multicolumn switching is configured, then under Instrument components, click **Multicolumn Switching**, and then select the **Enable asynchronous valve switching** check box to enable individual valve control.

Figure 2-46 Multicolumn Switching Activation

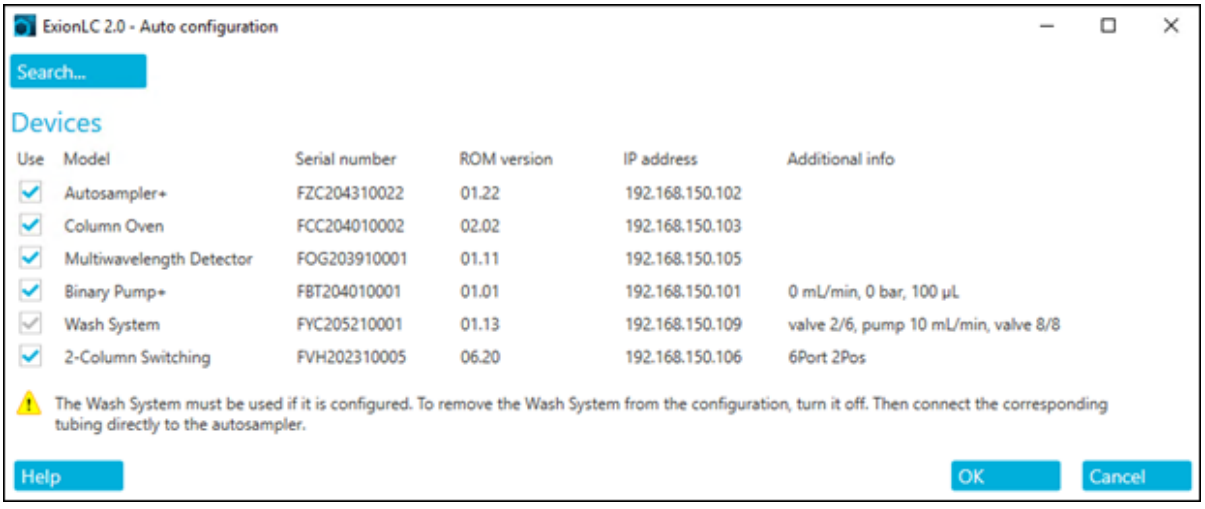


12. To not include a device from the configuration, clear the check box for that device.

Note: If the wash system is configured, then it must be used. To remove the wash system from the configuration, turn it off. Then connect the related tubing directly to the autosampler.

Note: The SCIEX OS software does not support data acquisition from both a diode array detector (DAD) and a multiwavelength detector (MWD) at the same time. If a DAD and MWD are found, then clear one of the check boxes, and then click **OK**.

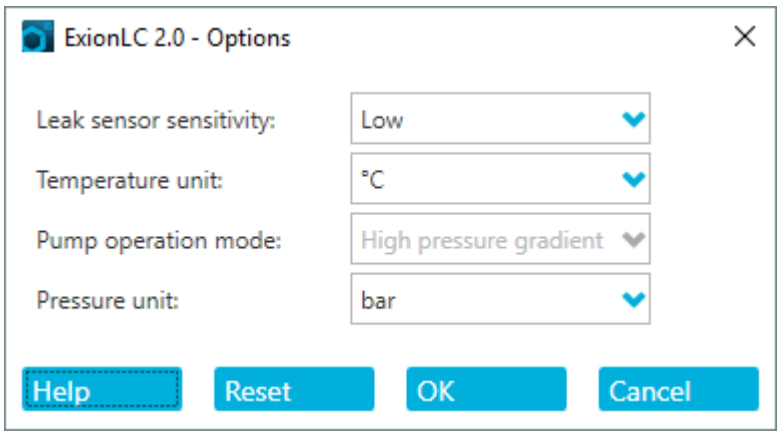
Figure 2-47 Auto Configuration



13. Click **OK**.

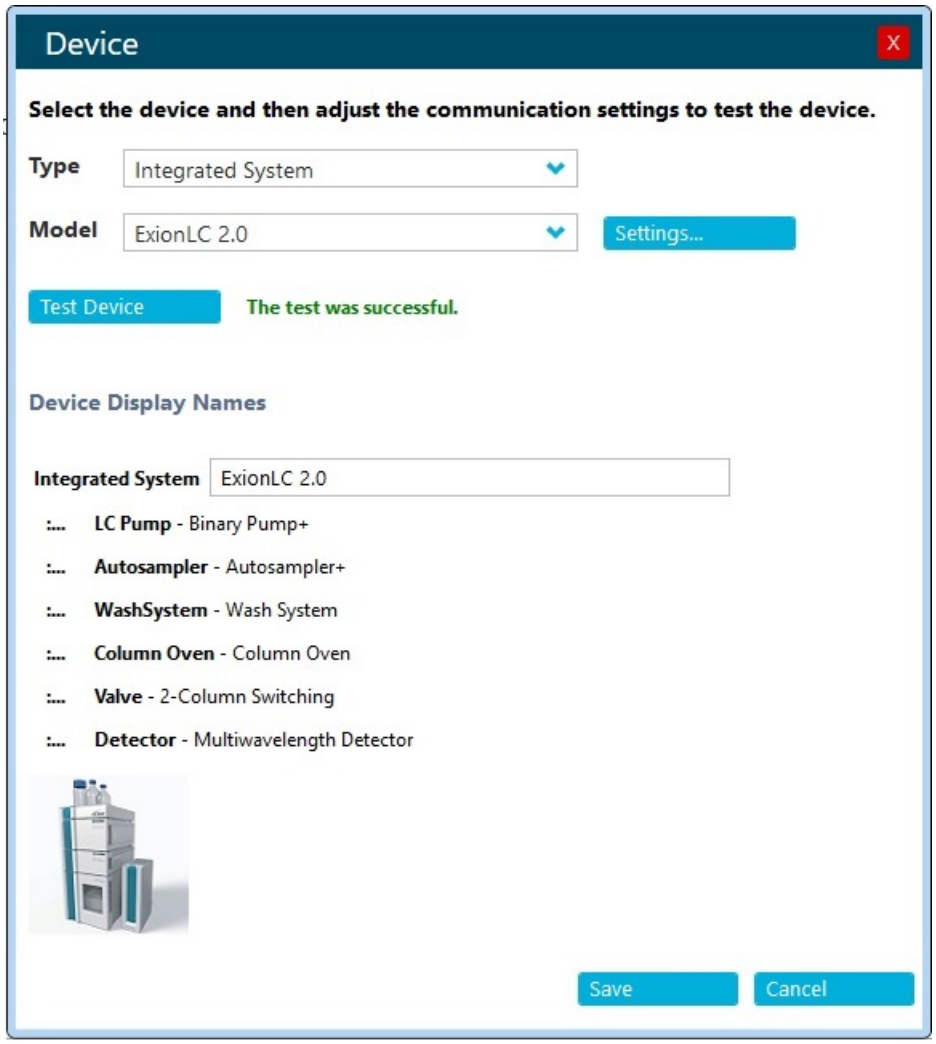
14. Under Instrument options, click **Options**, and then select the options as required. For field descriptions, press **F1**.

Figure 2-48 Options



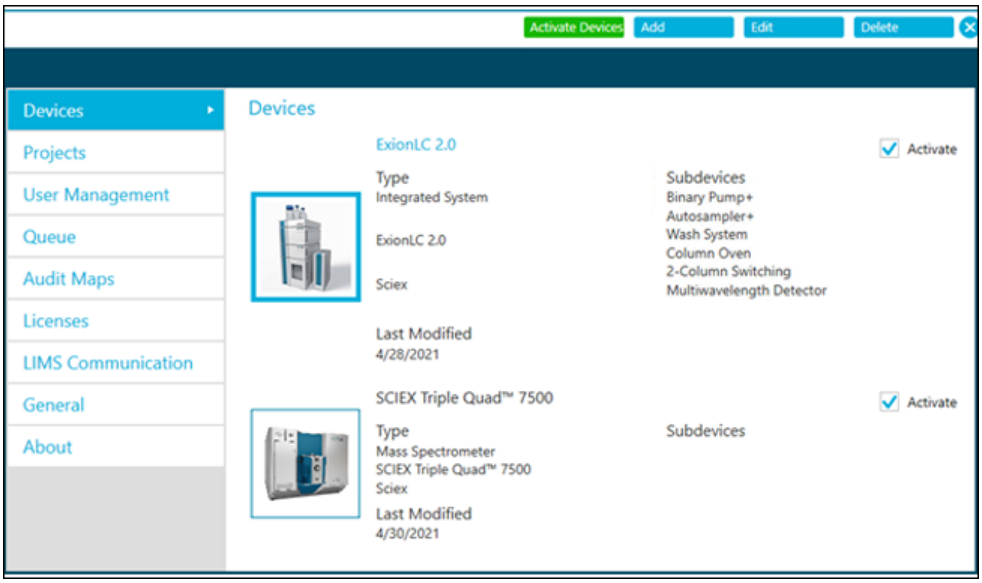
15. Click **OK**.
16. Under Instrument components, click each module, and then select the options as required. For field descriptions, press **F1**.
17. To make sure that the device is configured correctly and available for use, click **Test Device**.

Figure 2-49 Device Dialog



18. Click **Save**.
19. Select the **Activate** check box beside each device to be activated, and then click **Activate Devices**.

Figure 2-50 Devices Workspace



The selected devices are activated.

Tip! To edit or delete devices, and for field descriptions, press **F1**.

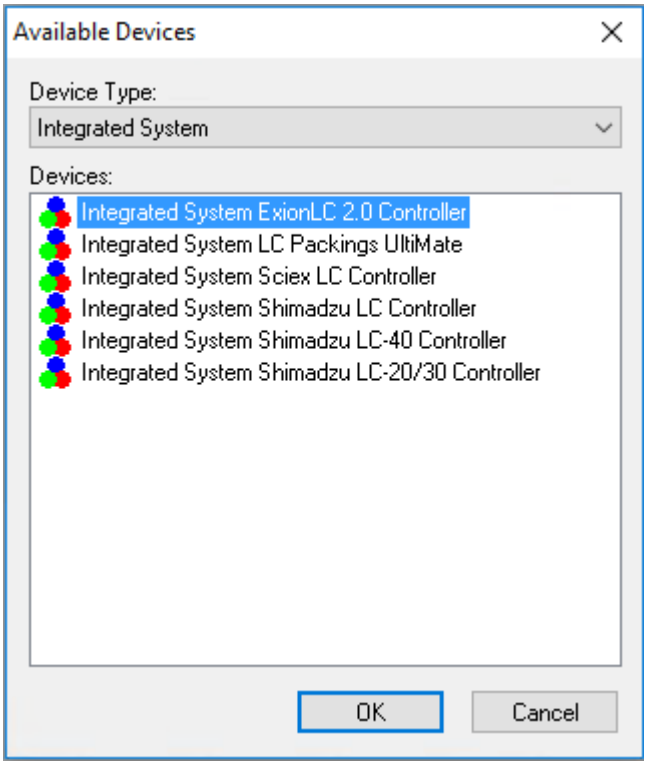
Note: After the devices are activated, make sure that the status of each module is correct in the Device Details.

Add and Activate the ExionLC 2.0 System With the Analyst Software

1. Open the Analyst software.
2. On the Navigation bar, double-click **Hardware Configuration**.
   The Hardware Configuration Editor opens.
3. Click **New Profile**.
   The Create New Hardware Profile dialog opens.
4. Type a name in the **Profile Name** field, and then click **Add Device**.
   The Available Devices dialog opens. The **Device Type** field is set to **Mass Spectrometer**.
5. Select a SCIEX mass spectrometer from the **Devices** list, and then click **OK**.
6. (If required) To configure the mass spectrometer, select it in the **Devices in current profile** list, and then click **Setup Device**. Refer to the document: *System User Guide* for the mass spectrometer.

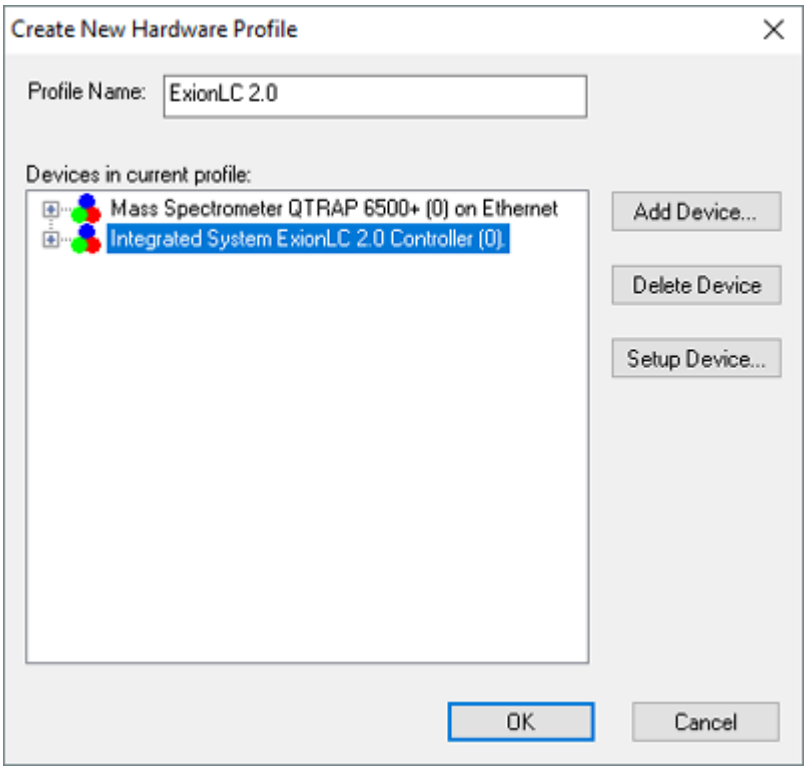
7. On the Create New Hardware Profile dialog, click **Add Device**, and then set the **Device Type** to **Integrated System**.

Figure 2-51 Available Devices Dialog



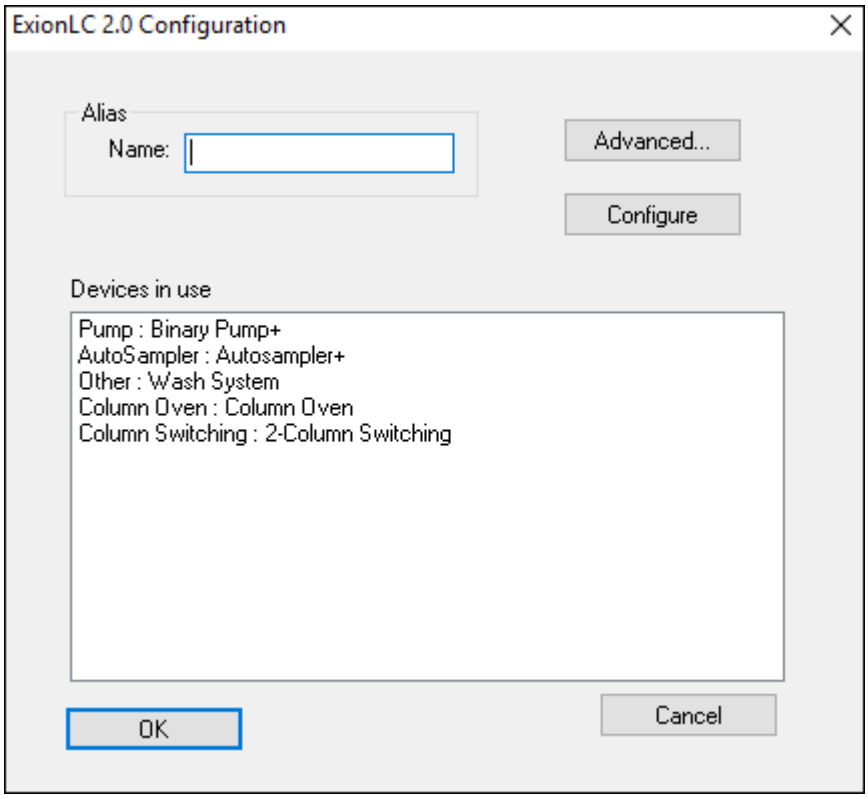
8. Click **Integrated System ExionLC 2.0 Controller**, and then click **OK**.

Figure 2-52 Create New Hardware Profile Dialog



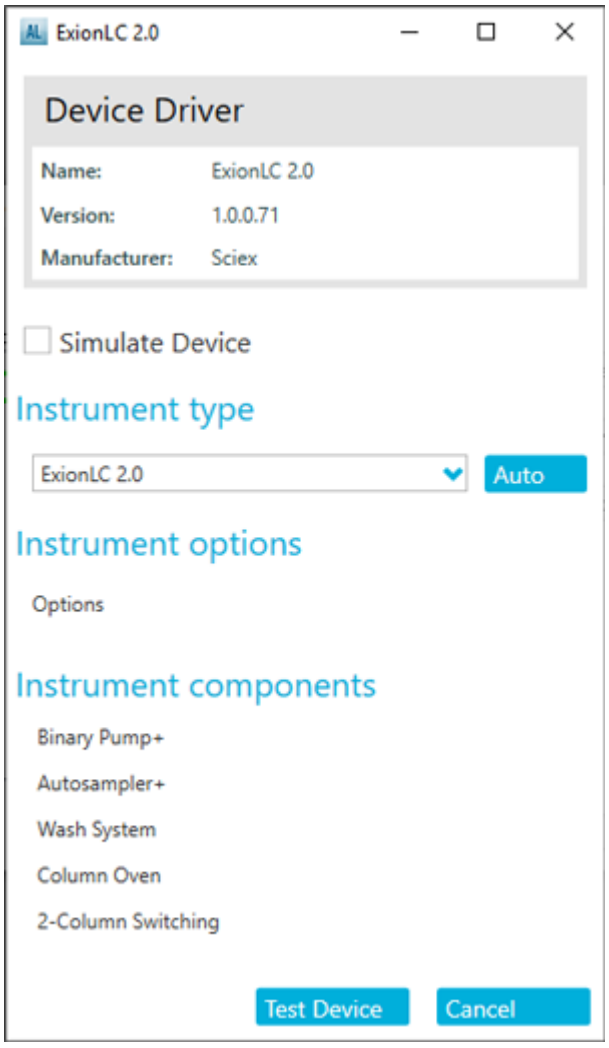
9. Click **Integrated System ExionLC 2.0 Controller**, and then click **Setup Device**.

Figure 2-53 ExionLC 2.0 Configuration Dialog



10. Type a name in the **Alias Name** field, if required, and then click **Configure**.

Figure 2-54 Device Driver Configuration Dialog

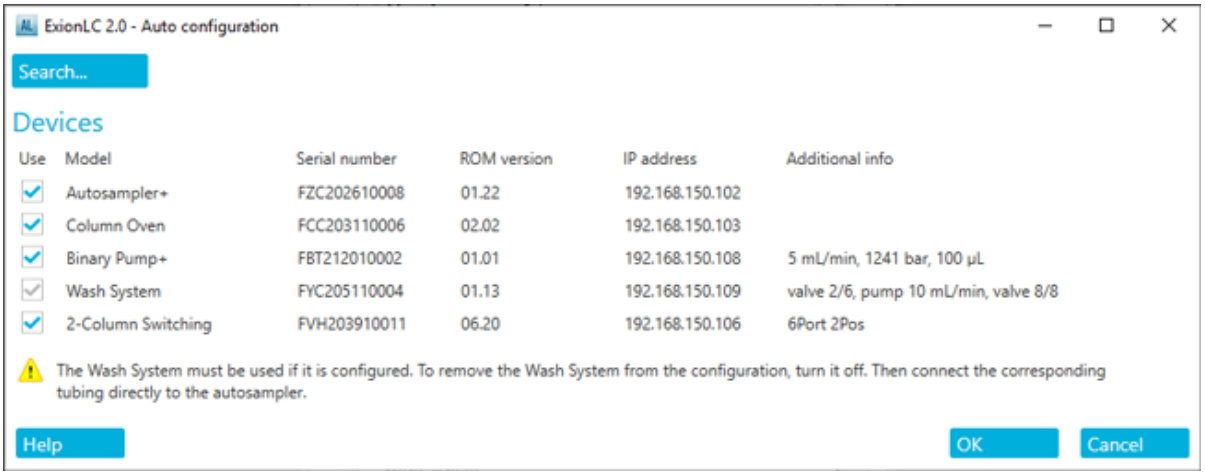


11. Click **Auto**.

Figure 2-55 Auto Configuration

When the search completes, the following dialog opens.

Figure 2-56 Auto Configuration Completed

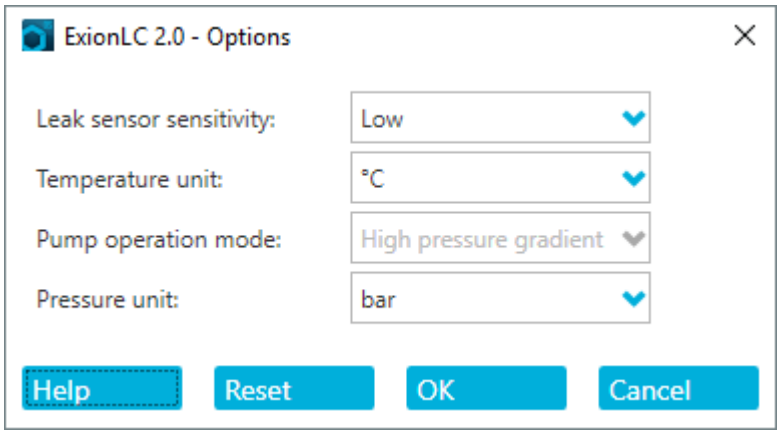


12. To exclude a device from the configuration, clear the check box for that device.

Note: If the wash system is configured, then it must be used. To remove the wash system from the configuration, turn it off. Then connect the corresponding tubing directly to the autosampler.

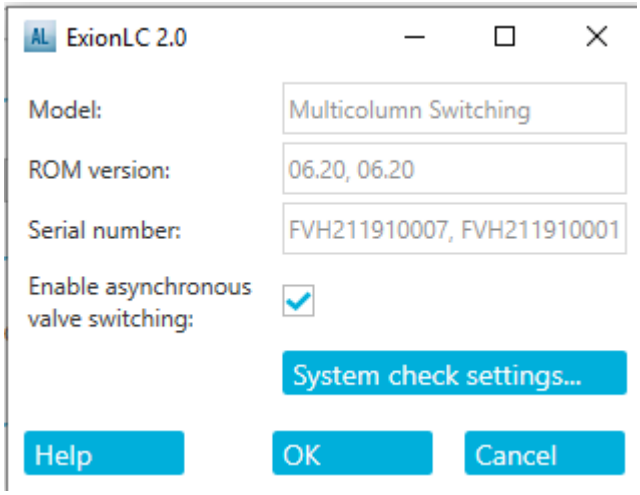
13. Click **OK**.
14. Under Instrument options, click **Options**, and then select the options as required. For field descriptions, press **F1**.

Figure 2-57 Options



15. Click **OK**.
16. Under Instrument components, click each module, and then select the options as required. For field descriptions, press **F1**.
17. If multicolumn switching is configured, under Instrument components, click **Multicolumn Switching**, and then click the **Enable asynchronous valve switching** check box to enable individual valve control.

Figure 2-58 Multicolumn Switching Activation



18. Click **Test Device**.
19. Click **Close**, and then click **OK**.
20. Click **OK** in the Create New Hardware Profile dialog. The hardware profile for the system is added.

21. Click **Activate Profile**.
    The hardware profile for the system is activated.

Operating Instructions 3

WARNING! Hot Surface Hazard. Do not open the column oven door if the high temperature lamp is flashing. The internal temperature of the column oven is 60 °C or greater.

WARNING! Biohazard. Wear personal protective equipment when handling potentially infectious or toxic substances, such as human samples or reagents, to prevent contact with the skin.

Sample Workflow

Step	To do this	Refer to
1	Prepare the mobile phase and rinse solution for the autosampler	Suggested Mobile Phases and Liquids
2	Prepare the column	Install the Column
3	Turn on the LC system	Turn on the System
5	Create and select an LC method	*ExionLC System Software User Guide*
6	Create and select an MS method	*Software User Guide* or the *System User Guide* for the mass spectrometer
7	Prepare the sample	Sample Vials
8	Start acquisition	• *Software User Guide* • *System User Guide* for the mass spectrometer
9	Complete acquisition	• *Software User Guide* • *System User Guide* for the mass spectrometer

Install the Column

WARNING! Hot Surface Hazard. Beware of burns when the oven operating temperature is high (60 °C or greater).

CAUTION: Potential System Damage. To prevent pinching of the tubing, route all of the tubing through the tubing notch in the top edge of the column oven.

Figure 3-1 Column Oven Tubing

Note: A maximum of one separating column can be connected to the solvent pre-heater system.

Note: When installing multiple columns, examine the distribution of the column labels. Labels directly in front of the fan can impede air circulation.

Note: We recommend that the solvent be pre-heated for flow rates of more than 500 µL/min and temperatures above 50 °C.

1. Open the column oven door.
2. Connect one of the two capillaries of the solvent pre-heater to the autosampler or manual injection valve.
3. Connect the other capillary to the column.
4. Close the column oven door.

Connect the Autosampler Capillaries and Tubing

WARNING! Flammable Chemical Hazard, Biohazard, Ionizing Radiation Hazard, and Toxic Chemical Hazard. Be sure to use the system in a well-ventilated laboratory environment in compliance with local regulations and with appropriate air exchange for the work performed. Solvents used in high performance liquid chromatography are flammable and toxic. Empty the waste container regularly to prevent it from overflowing. Clean the overflow hole if waste does overflow.

Prerequisite Procedures
• Remove the front cover.

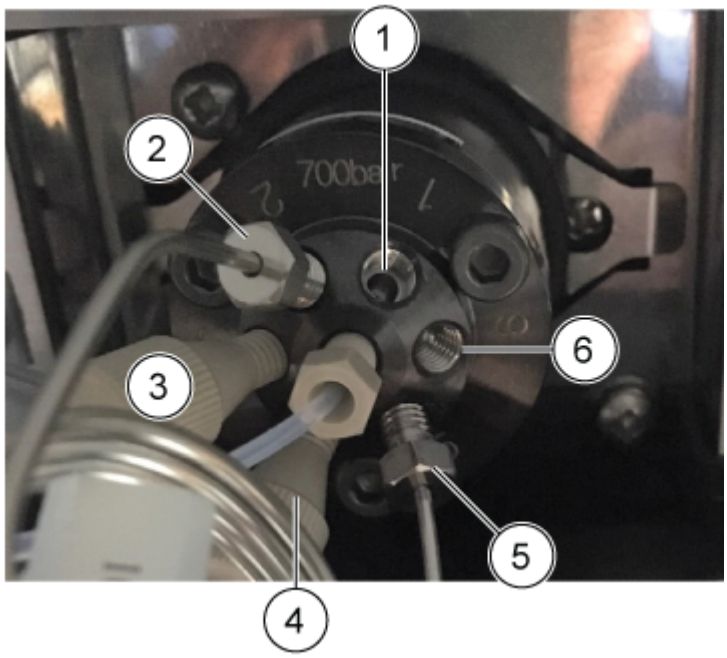
The waste drain system removes all flushing fluids and all uninjected sample solutions.

Note: If the tubing needs to be replaced, then do this:

1. Make sure that the end of the tubing is flush with the end of the ferrule.
2. Do not overtighten nuts. Nuts that are too tight can cause blockages in the flow path.
3. Make sure that the tubing volumes are applicable for use with the other elements in the flow path.

1. Connect the tubing.

Figure 3-2 Tubing Connections on the Valve



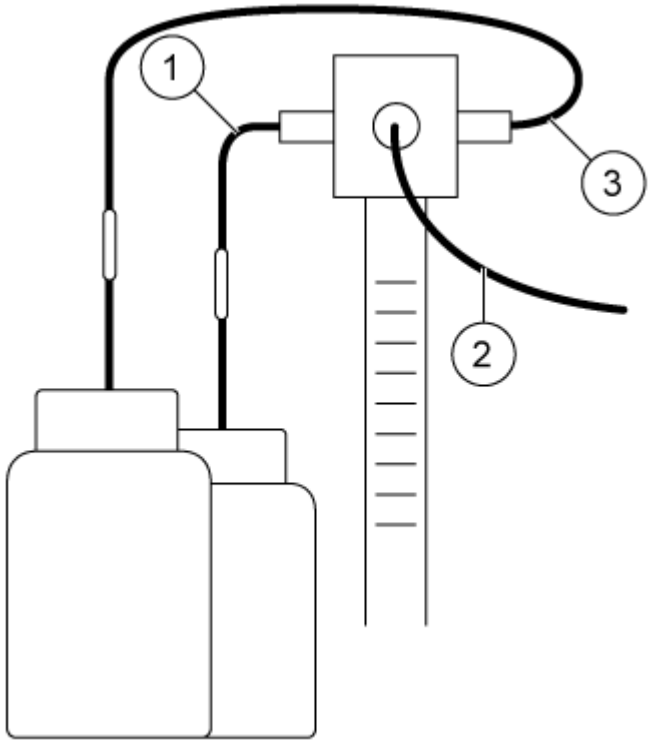
Item	Description
1	Port 1 connected to the pump using the appropriate SecurityLINK tubing
2	Sample loop connected to ports 2 and 5
3	Port 3 with the connected buffer tubing
4	Port 4 with the connected needle tubing
5	Sample loop connected to ports 2 and 5
6	Port 6 connected to the column using the appropriate SecurityLINK tubing

Tip! For all connections made using Phenomenex SecurityLINK UHPLC tubing and fittings, insert the fitting in the device port and rotate clockwise until a click is heard. If no click is heard, then the connection is not secure and leakage might occur.

2. Connect the tubing to the syringe valve.

Note: These syringe connections are applicable to systems that do not use the wash system.

Figure 3-3 Syringe Connections



Item	Description
1	Tube for the wash solution
2	Buffer tubing connected to the injection valve
3	Tube for the transport liquid

3. Connect the drain tubing to the bottom left side of the autosampler.

Figure 3-4 Drain Tubing

4. Install the waste bottle under the module.
5. Connect the drain tubing to the autosampler waste bottle. Examine the tubing for kinks that can prevent the liquid from draining and can cause flooding at the autosampler waste drainage site.
6. Install the front cover on the autosampler.

Plumb the Autosampler Transport Tubing to the Degasser (Binary Pump+)

1. Install a fitting and ferrule on the end of the rinse tubing.

Figure 3-5 Rinse Tubing with the Ferrule

2. Insert the tubing, fitting, and ferrule in the left-most port of the syringe valve, and then tighten the fitting until it is finger-tight.
3. Route the tubing to the degasser.
4. Cut the tubing to the appropriate length.
5. Install a fitting and ferrule on the cut end of the rinse tubing.

6. Insert the tubing, fitting, and ferrule in the left-most port of the degasser, and then tighten the fitting until it is finger-tight.
7. Install a fitting and ferrule on the end of another piece of tubing.
8. Insert the tubing, fitting, and ferrule in the right-most port of the same degasser, and then tighten the fitting until it is finger-tight.
9. Route the other end of the tubing to the bottle that contains a wash solution of 20% isopropanol.
10. Cut the tubing to the appropriate length.
11. Put the tubing through the bottle cap until the end of the tubing is submerged in the solvent.
12. Repeat steps 5 to 11 for the right-most port of the syringe valve, using mobile phase A as the transport solution.

Prepare the Mobile Phase Tubing

Use tubing with built-in solvent filters to connect the capillaries to the solvent bottles. The tubing must be installed on the system using flangeless fittings.

Note: Tools can damage the fitting. Tighten the fitting only until it is finger-tight.

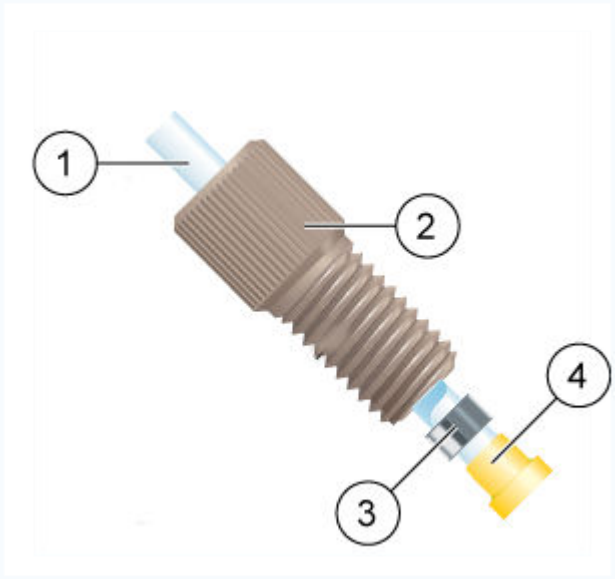
Tip! For all connections made using Phenomenex SecurityLINK UHPLC tubing and fittings, insert the fitting in the device port and rotate clockwise until a click is heard. If no click is heard, then the connection is not secure and leakage might occur.

CAUTION: Potential System Damage. Do not use PEEK capillaries with pure acetonitrile. Acetonitrile can cause capillaries to crack or rupture.

1. Insert the tubing through the flangeless fitting.
2. Insert the tubing through the fixation ring.

   Note: To avoid damaging the ferrule, make sure that the broad side of the fixation ring points in the direction of the fitting.
3. Insert the tubing through the ferrule.
4. Install the assembled flangeless fitting on the device by hand.

Figure 3-6 Tubing Connection



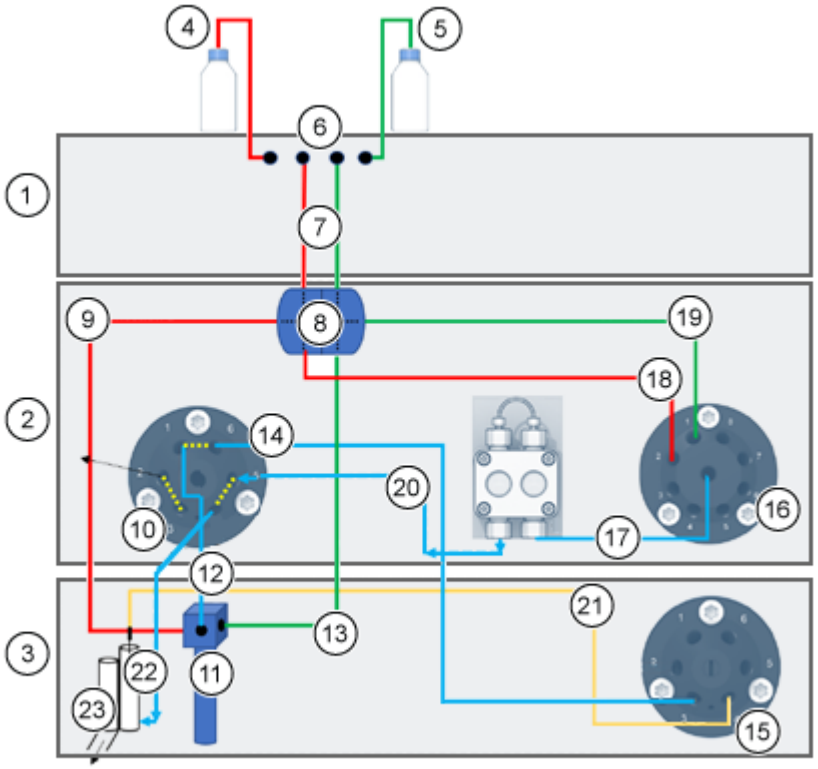
Item	Description
1	Tubing
2	Fitting
3	Fixation ring **Note:** The wider side of the fixation ring is toward the fitting.
4	Ferrule

Connect the Wash System (Binary Pump and the Binary Pump+)

Required Materials
• Wash solution (20% isopropanol in water) • Capillary holders • Tubing

This procedures applies to the Binary Pump and the Binary Pump+.

Figure 3-7 Wash System Connections



Item	Description
1	Pump
2	ExionLC 2.0 Wash System
3	Autosampler
4	Wash liquid
5	Transport liquid
6	Degassers
7	Wash/Transport liquid connections from the degasser to the double T-piece (tubing #1)
8	Double T-piece
9	Wash liquid connection from the double T-piece to the syringe valve (tubing #2)

Item	Description
10	Wash valve
11	Syringe valve
12	Syringe valve connection to the wash valve (tubing #3)
13	Transport liquid connection from double T-piece to the syringe valve (tubing #7)
14	Wash valve connection to the autosampler valve (tubing #4)
15	Autosampler valve
16	Solvent selection valve
17	Solvent selection valve connection to the ExionLC 2.0 Wash System pump (tubing #6)
18	Wash liquid connection from the double T-piece to the solvent selection valve (tubing #5)
19	Transport liquid connection from the double T-piece to the solvent selection valve (tubing #5)
20	Connection from the ExionLC 2.0 Wash System pump to the wash valve
21	Sample needle
22	Connection from wash valve to the wash station (tubing #9)
23	Waste

1. Disconnect the autosampler leak management tubing.
2. Fill a bottle with wash solution and then put the bottle in the solvent tray.
3. Connect the wash solution to the degasser in the pump module.
4. Connect tubing #1 to the degasser outlet and to the top port of side 1 of the double T-piece.
5. Connect tubing #2 to the side port of side 1 of the double T-piece and to the left port of the syringe valve in the autosampler.
6. Connect tubing #5 to the bottom port of side 1 of the double T-piece and to port #2 of the solvent selection right valve on the wash system.
7. Fill a bottle with transport solution (Mobile Phase A) and then put the bottle in the solvent tray.
8. Connect the transport solution to the degasser in the pump module.
9. Connect tubing #1 to the degasser outlet and to the top port of side 2 of the double T-piece.

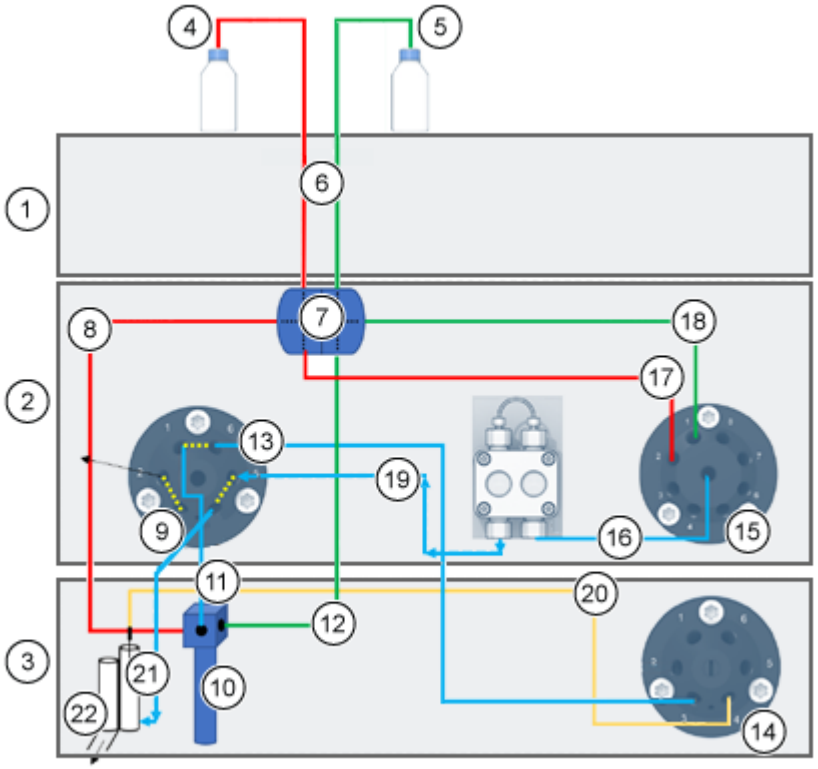
10. Connect tubing #5 to the side port of side 2 of the double T-piece and to port #1 of the solvent selection right valve on the wash system.
11. Connect tubing #7 to the bottom port of side 2 of the double T-piece and to the right port of the syringe valve in the autosampler.
12. Connect tubing #3 to the center port of the syringe valve of the autosampler and to port #1 of the 6-port, 2-position left valve of the wash system
13. Connect tubing #4 to port #6 of the 6-port, 2-position left valve of the wash system and to port #3 of the switching valve of the autosampler.
14. Connect tubing #6 to the center of the solvent selection right valve of the wash system and to the inlet of the wash system pump
15. Connect tubing #8 to the outlet of the wash system pump and to port #5 of the 6-port, 2-position left valve of the wash system.
16. Connect tubing #9 to the port in the modified wash station and port #4 on the 6-port, 2-position left valve of the wash system.

Connect the Wash System (LPG Pump)

Required Materials
• Capillary holders • Tubing

This procedure applies to the LPG Pump.

Figure 3-8 Wash System Connections



Item	Description
1	Pump
2	ExionLC 2.0 Wash System
3	Autosampler
4	Wash liquid
5	Transport liquid
6	Wash/Transport liquid connections from the degasser to the double T-piece (tubing #1)
7	Double T-piece
8	Wash liquid connection from the double T-piece to the syringe valve (tubing #2)
9	Wash valve

Item	Description
10	Syringe valve
11	Syringe valve connection to the wash valve (tubing #3)
12	Transport liquid connection from double T-piece to the syringe valve (tubing #7)
13	Wash valve connection to the autosampler valve (tubing #4)
14	Autosampler valve
15	Solvent selection valve
16	Solvent selection valve connection to the ExionLC 2.0 Wash System pump (tubing #6)
17	Wash liquid connection from the double T-piece to the solvent selection valve (tubing #5)
18	Transport liquid connection from the double T-piece to the solvent selection valve (tubing #5)
19	Connection from the ExionLC 2.0 Wash System pump to the wash valve
20	Sample needle
21	Connection from wash valve to the wash station (tubing #9)
22	Waste

1. Disconnect the autosampler leak management tubing.
2. Fill a bottle with wash solution and then put the bottle in the solvent tray.
3. Connect tubing #1 the double T-piece.
4. Connect tubing #2 to the side port of side 1 of the double T-piece and to the left port of the syringe valve in the autosampler.
5. Connect tubing #5 to the bottom port of side 1 of the double T-piece and to port #2 of the solvent selection right valve on the wash system.
6. Fill a bottle with transport solution (Mobile Phase A) and then put the bottle in the solvent tray.
7. Connect tubing #5 to the side port of side 2 of the double T-piece and to port #1 of the solvent selection right valve on the wash system.
8. Connect tubing #7 to the bottom port of side 2 of the double T-piece and to the right port of the syringe valve in the autosampler.

9. Connect tubing #3 to the center port of the syringe valve of the autosampler and to port #1 of the 6-port, 2-position left valve of the wash system
10. Connect tubing #4 to port #6 of the 6-port, 2-position left valve of the wash system and to port #3 of the switching valve of the autosampler.
11. Connect tubing #6 to the center of the solvent selection right valve of the wash system and to the inlet of the wash system pump
12. Connect tubing #8 to the outlet of the wash system pump and to port #5 of the 6-port, 2-position left valve of the wash system
13. Connect tubing #9 to the port in the modified wash station and port #4 on the 6-port, 2-position left valve of the wash system.

Connect the Binary Pump

CAUTION: Potential System Damage. Remove the cap fittings from the inlet and outlet of the pump head before use. The pump head, module, or system might be damaged if the pump head inlet and outlet head are blocked.

Prerequisite Procedures
• Turn off the pump. • Disconnect the mains supply cable. • Remove the front cover.

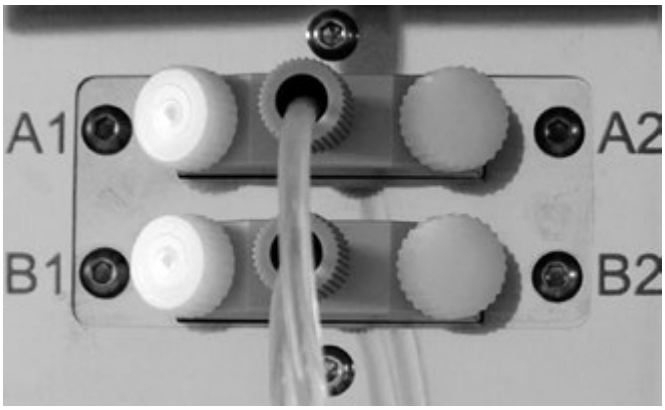
Required Materials
• Flangeless fitting • Silicone tube • Mobile phase tubing

The solvent selection valves enable the two different solvents to be selected for each solvent channel, A or B, without reinstallation of the tubing. Solvent A is connected to inlets A1 and A2, and solvent B is connected to inlets B1 and B2.

The two degasser inlets connect both solvents. The solvents are routed from the degasser to the pump head. From the pump head the solvent is routed through the pressure sensor to the mixer.

1. Connect the tubing from the four solvent bottles to the solvent selection valve inlets A1, A2, B1, and B2.

Figure 3-9 Solvent Selection Valve with Cap Fitting



2. Use cap fittings to seal any inlets that are not in use.

Connect the LPG Pump

CAUTION: Potential System Damage. Remove the cap fittings from the inlet and outlet of the pump head before use. The pump head, module, or system might be damaged if the pump head inlet and outlet head are blocked.

CAUTION: Potential System Damage. Do not connect the degasser to the pump outlet. Very high pressures can damage the degasser membrane. The membrane can withstand a maximum pressure of 7 bar/100 psi.

Prerequisite Procedures
• Turn off the pump. • Disconnect the mains supply cable. • Remove the front cover.

Required Materials
• Flangeless fitting • Silicone tube • Mobile phase tubing

The solvent mixture is conveyed from the degasser through the valve block to the pump head. From the pump head the solutions are conveyed to the mixer. The mixer is connected to the LC system.

1. If the tubing must be replaced, then do the following steps.
    a. Connect the tubing from the degasser outlets to the valve block. Insert the tubing through the flangeless fitting.
    b. Insert the tubing from the valve block in the free inlet on the bottom of the pump head and then tighten the fitting until it is finger-tight.
2. Connect the tubing from the four solvent bottles to the four inlets on the degasser A, B, C, and D.
3. Use cap fittings to seal any inlets that are not in use.
4. To change the central outlet connection, install a different capillary. Loosen at least two of the outer flangeless fittings on the valve block to install the connection in the center by hand.

Note: The valve block inlets are pre-installed.

Connect the Piston Backflush

Required Materials
• Backflush solution: 50% isopropanol

This procedure is applicable to the Binary Pump and LPG Pump. For the Binary Pump+, put the ends of the pre-connected tubing in the solvent bottle.

The silicone tubing between the piston backflushing and the flush pump is pre-installed. The inlet and outlet of the flush pump are located on the front of the module. The flush pump is inside of the device and it is not visible from the outside. Use this procedure if the tubing must be replaced.

Note: Fluctuations in the level of the back piston cylinder might might give an indication of an issue with the seals or connections of the pump head.

1. To connect the piston backflush tubing, connect one end of a silicone tube to the inlet of the flush pump and the other end to the wash solution bottle.
2. Connect one end of another silicone tube to an empty capillary connector on the flush pump and the other end to the wash solution bottle.

Connect the Binary Pump+

Prerequisite Procedures
• Turn off the pump and then disconnect it from the mains supply. • Remove the front cover.

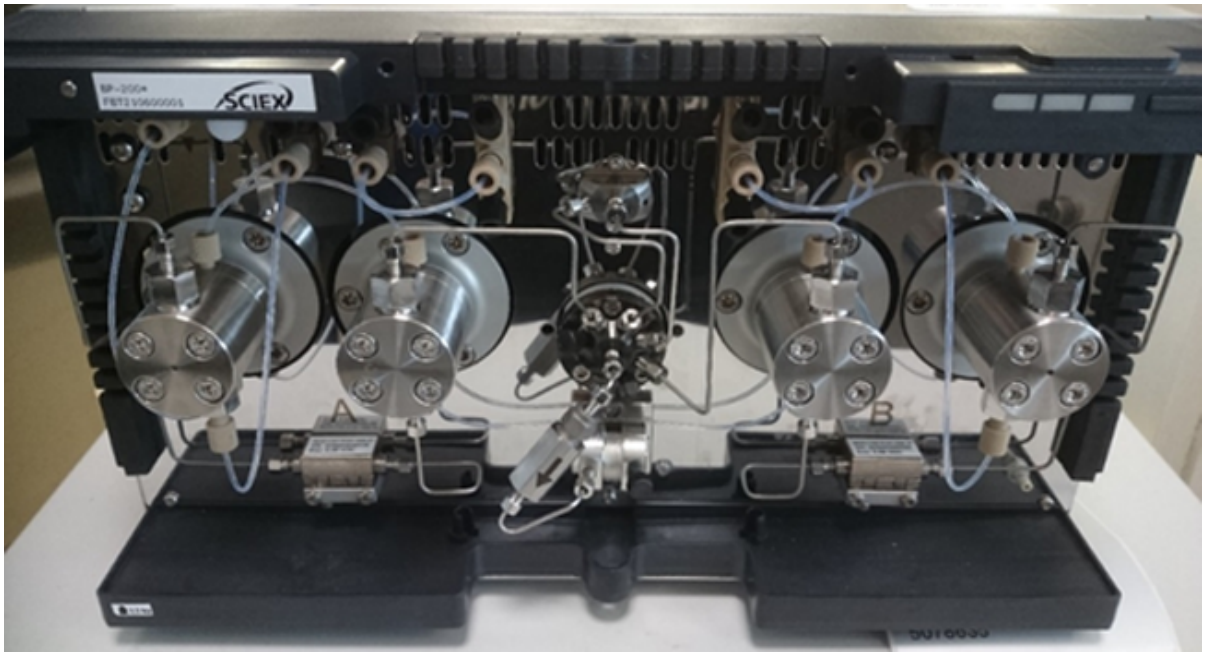
Required Materials
• Torque wrench • Open-end wrench

Most of the tubing and capillaries are pre-installed. An exception is the tubing from the solvent bottle to the solvent selection valve.

The solvent selection valve allows each solvent channel to alternate between two different solvents, without reconfiguration of the tubing. For the two solvent channels, A and B, one of two solvents can be selected separately. Solvent A is connected to ports A1 and A2, and solvent B to ports B1 and B2.

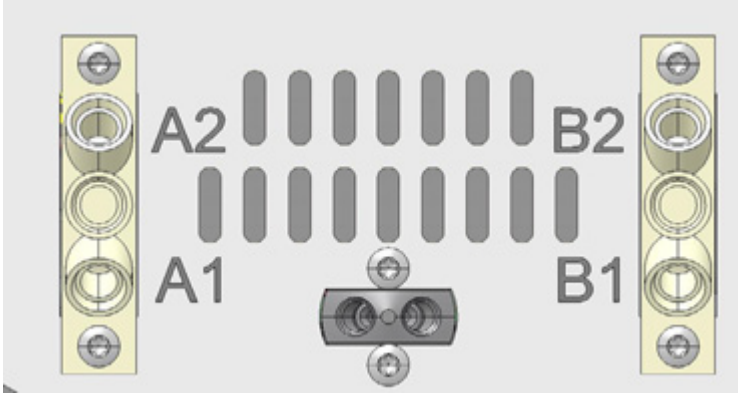
1. Connect the capillaries and tubing as shown in the following figure.

Figure 3-10 Capillary and Tubing Connection



2. Connect the tubing from the four solvent bottles to ports A1, A2, B1, and B2.

Figure 3-11 Solvent Selection Valve



3. Close unused ports with plugs.
4. Connect the capillary from the outlet of pump head A to port 1 on the purge valve.
5. Connect the capillary from the outlet of pump head B to port 6 on the purge valve.
6. Connect the pressure sensor to ports 7 and 8 on the purge valve.
7. Connect the purge valve to the mixing chamber with a capillary, through the central port.
8. Connect waste tubes to ports 2 and 5 on the purge valve.

Install the Flow Cell in the Optional Detector

WARNING! Eye Injury Hazard. Always turn off the detector or the lamps before installing the flow cell. High-energy UV light can leak from the flow cell, causing retinal irritation.

This procedure is applicable only when the optional detector is used. Before putting a flow cell filled with solvent into operation, make sure that the solvent used is miscible with the solvent used previously. If it is not, purge the flow cell with a medium miscible with both of the solvents.

Tip! Disconnect the capillary for easier handling.

Prerequisites
• No flow cell or test cell is installed. • The module is turned off.

1. Remove the covers from the optical ports on the side of the flow cell.

2. Insert the flow cell in the opening and then push it toward the back of the module until it clicks in place.
3. Push the capillary through the fitting.

   Capillaries connect the detector with the column, waste, and subsequent operating detectors. We recommend the use of PEEK capillaries and PEEK fittings.
4. Insert the tubing through the lock ring.

   Note: The tapered end of the lock ring must be closest to the seal ring.
5. Attach the seal ring.
6. Fasten the capillary at the flow cell until it is finger tight.
7. Turn on the detector.

   PEEK fittings withstand a maximum pressure of 400 bar (5800 psi).

Turn on the System

Prepare the Pump

Make sure that the device or hardware profile is activated in the software.

Before the pump can be used, it must be purged to remove excess air from the capillaries.

Flush the pump at the following times:

- At initial startup, to eliminate air bubbles from tubing and capillaries.
- When changing solvents.
- After using buffer solutions, to eliminate salt residues.
- Before turning off the module, if the module will not be immediately started.

Turn on the Pump

CAUTION: Potential System Damage. Maintain a consistent temperature in the laboratory. Changes in the environmental temperature can cause condensation inside of the module. Allow the module to acclimate for 3 hours before connecting it to the power supply and putting it in operation.

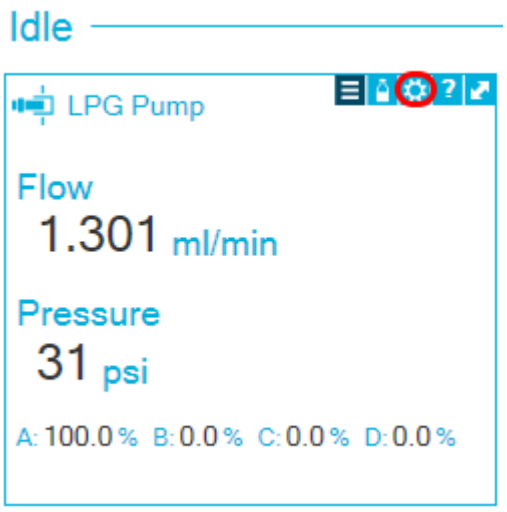
Note: After the pump is turned on, it is automatically back flushed for 15 seconds.

1. Remove air from the capillaries and tubing using the plastic syringe that comes with the system.
2. Connect the mains supply cable to the mains supply outlet.

3. Turn on the module power switch.
4. Wait until the pump has completed the self-test.
5. Start the pump at a flow rate of 4 mL/min.

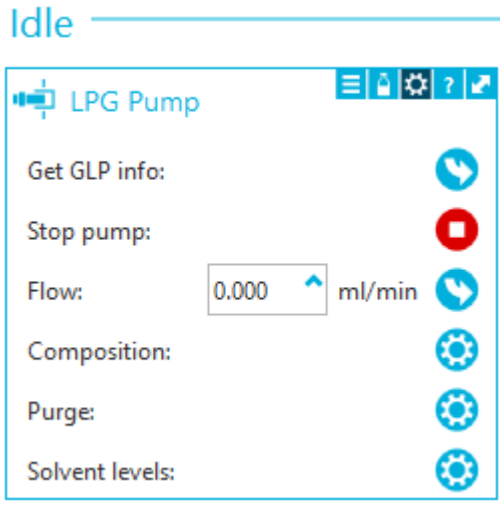
   - SCIEX OS: Click **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device ( ) and then click to show the available control options.

   Figure 3-12 Device Control



6. In the Pump section, type the flow rate and then click .

Figure 3-13 Pump Flow Rate



Purge the Pump (Binary Pump and LPG Pump)

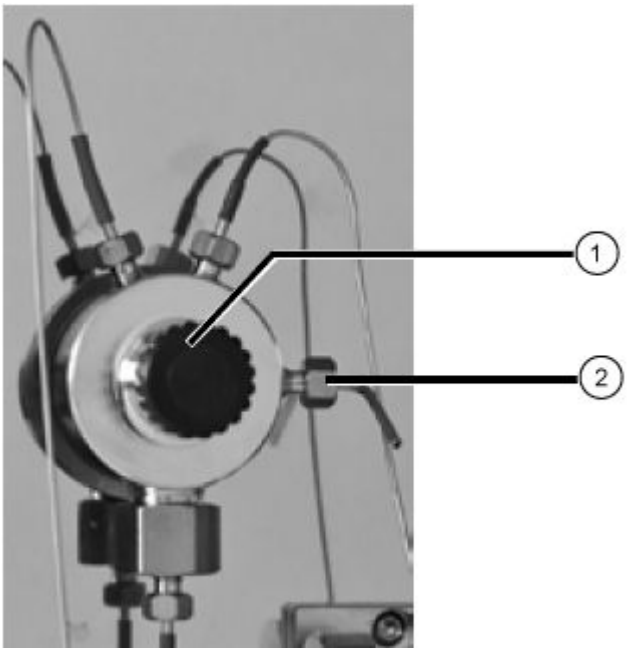
CAUTION: Potential System Damage. Open the purge valve and remove the column to avoid damaging the column during the purge process.

Prerequisites
• The installation has been completed. • The capillaries and tubing have been connected. • The pump has been turned on.

Required Materials
• Syringe with luer lock • Wash solution **Note:** If a buffer solution is used, then choose a flushing solvent in which the buffer solution is soluble. • Silicone tubing

1. Open the purge valve on the pressure sensor (item 1).
2. Connect the syringe to the pressure sensor vent with the silicone tubing (item 2).

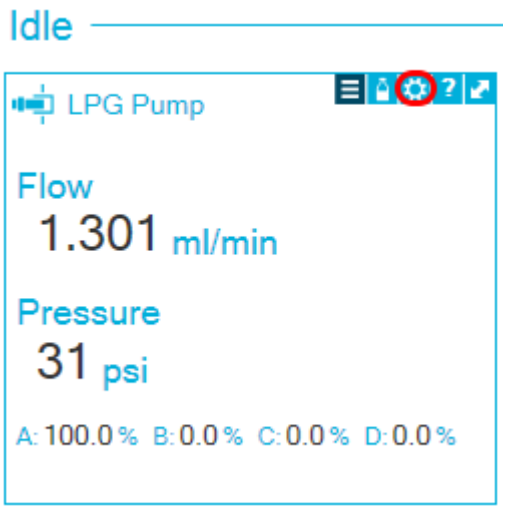
Figure 3-14 Pressure Sensor



3. Open the device control dialog in one of the following ways:

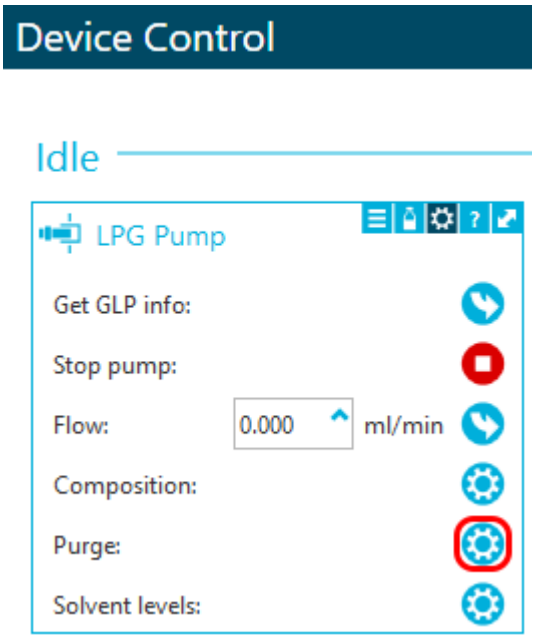
   - SCIEX OS: Click  **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device () and then click  to show the available control options.

Figure 3-15 Device Control



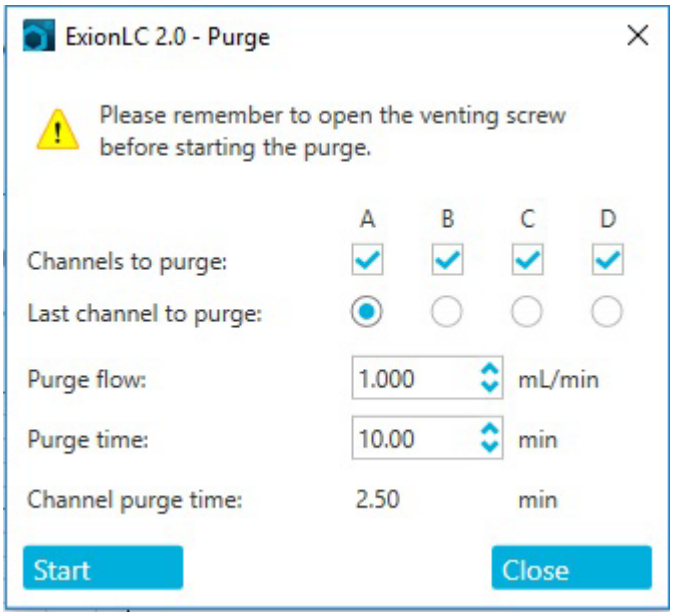
4. In the Pump section, start the purge by clicking the icon.

Figure 3-16 Start the Purge



5. Select the channel to purge and then start the pump at a flow rate of 4 mL/min.

Figure 3-17 Purge Dialog



6. With the syringe, carefully extract liquid through the purge port.
7. If the extracted liquid flows continuously, then stop suction.

   The pump purge process is limited to a maximum pressure of 725 psi (50 bar). If this value is exceeded during the purge process, then the pump automatically stops the flow of liquid.

   If the capillaries contains air bubbles, then the flow will pulsate. As soon as the flow is constant, the purge is complete, and the purge process can be stopped.
8. Close the purge valve and stop the pump flow.

Purge the Binary Pump+

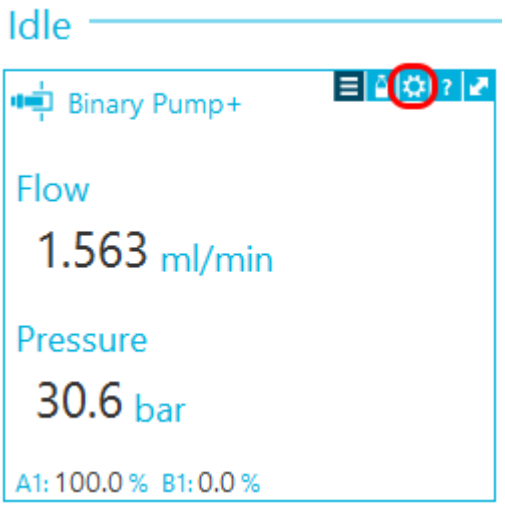
Prerequisites
• The installation has been completed. • The capillaries and tubing have been connected. • The pump has been turned on and is in flow mode.

Required Materials
• Wash solution **Note:** If a buffer solution is used, then choose a flushing solvent in which the buffer solution is soluble.

1. Open the device control dialog in one of the following ways:

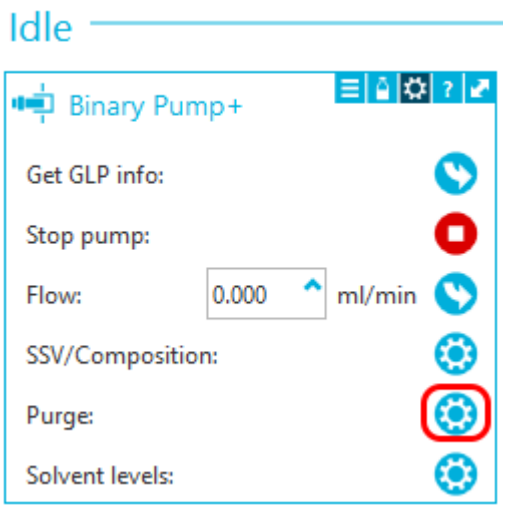
   - SCIEX OS: Click **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device ( ) and then click to show the available control options.

   Figure 3-18 Device Control



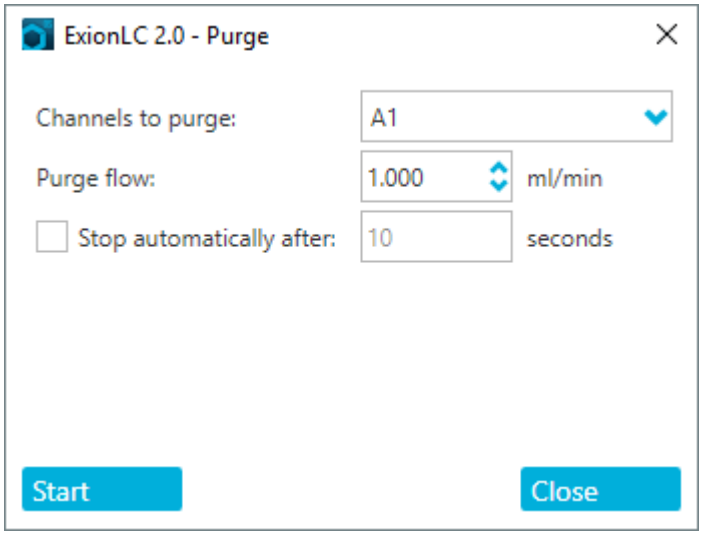
2. In the Pump section, click to open the Purge dialog.

Figure 3-19 Start the Purge



3. Select the channel to purge and then start the pump at a flow rate of 4 mL/min.

Figure 3-20 Purge Dialog



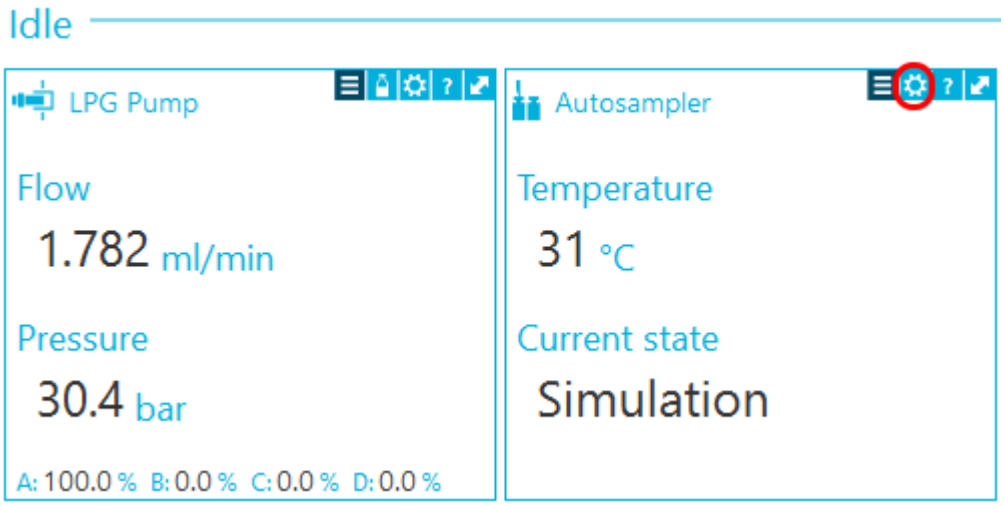
Flush the Autosampler

Note: If tubing connections are correctly installed but have leaks, then remove the fitting and the ferrule at the leaking connection and replace them with new connection fitting and ferrule.

1. Turn on the autosampler.
2. Open the device control dialog:

- SCIEX OS: Click **(Direct device control)**.
- Analyst software: On the status bar, double-click on the icon for the device and then click to show the available control options.

Figure 3-21 Device Control



3. In the Autosampler section, to open the Advanced rinse steps dialog, click beside **Needle rinsing**.
4. In the **Rinse steps** field, click **2**.
5. Type `100 µL` for the first wash and type 4 × the volume of the installed syringe for the second wash.
6. For the second wash, click the **Rinse valve** check box.
7. Select **OK** to flush the system.
8. If there is air in the autosampler syringe, repeat step 7.

Turn on the Wash System

CAUTION: Potential System Damage. Never operate the system using only pure distilled water. To prevent significant wear to the piston and piston seals, always use water mixed with an additive or modifier.

CAUTION: Potential System Damage. Make sure that the capillaries are not blocked. User error and blocked capillaries can cause high pressure spikes.

CAUTION: Potential System Damage. Make sure that solvent flows through the pump head and piston backflushing to prevent damage to the pump head if it runs dry.

Prerequisites
• The installation is completed. • The mains supply cable has been connected. • The capillaries in the solvent bottles have a filter insert. • The capillaries, tubing, and cables are connected. • The transport liquid container is full. • The wash liquid container is full.

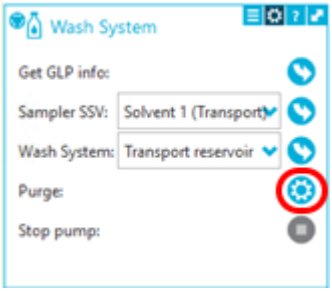
1. Turn on the module using the power switch on the back.
2. Wait until the module has completed the self-test.

   After the self-test completes successfully, the second light from the right changes to green.

   The firmware has successfully initialized if, after the module is turned on, all three LEDs turn red, green, and blue for approximately 1 second. If the test fails, then an error message is shown.
3. Purge the wash system pump.
4. Open the device control dialog in one of the following ways:

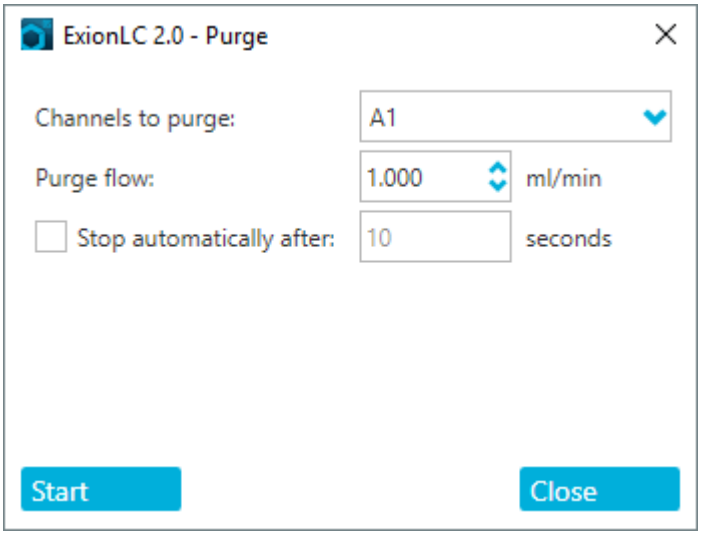
   - SCIEX OS: Click  **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device () and then click  to show the available control options.
5. In the Wash System section, click  to open the Purge dialog.

Figure 3-22 Wash System Section



6. Select the solvent to purge and then start the pump at a medium flow rate at 4 mL/min.

Figure 3-23 Purge Dialog



Turn on the Detector

Prerequisites
• The installation is completed. • The mains supply cable has been connected. • A clean flow cell is installed. • The capillaries are connected.

CAUTION: Potential System Damage. Maintain a consistent temperature in the laboratory. Changes in the environmental temperature can cause condensation inside of the module. Allow the module to acclimate for 3 hours before connecting it to the power supply and putting it in operation.

The detector is an optional module.

- Turn on the module using the power switch on the back.
  The detector starts its self-test. When the self-test is complete, the green LEDs on the right and in the center are illuminated.

Prepare the Detector

The performance of the detector is largely dependent on the performance of the LC system:

- Noise can be related to pump stability, the flow cell cleanliness, lamp quality, mobile phase composition, and other factors.
- Drift is usually related to long-term changes in the environment, such as detector warm-up or fluctuations in temperature and mobile phase composition.

1. Turn on the lamps.
2. Wait 30 minutes for the detector to warm.

Turn on the Column Oven

CAUTION: Potential System Damage. Maintain a consistent temperature in the laboratory. Changes in the environmental temperature can cause condensation inside of the module. Allow the module to acclimate for 3 hours before connecting it to the power supply and putting it in operation.

Prerequisites
• The installation is completed • The mains supply cable has been connected.

1. Turn on the module using the power switch.
2. Set the temperature, as required, in the software.
   When the thermostat is not in operation, the heating and cooling elements are off. After 4 minutes to 5 minutes, the interior fan also stops. Only the external fan and the controller power supply continue to consume power.

Turn on the Valve Drive

1. Connect the mains supply cable to the mains supply and then turn on the valve.

The start screen opens.

2. Wait for the self test to complete.
   An information message might be shown. For descriptions of the messages, or if the rotor seal must be replaced, refer to Troubleshooting.
3. Press any key to clear the message.
   The main screen is shown.

Set the Valve Position Immediately

If the Confirmation Mode parameter is set to OFF, then the valve position is set immediately. If the parameter is set to ON, then the user is prompted for confirmation.

- On main screen, use the navigation buttons to set the position and then release the navigation button.
  - If Confirmation Mode is OFF, then the valve position is set.
  - If Confirmation Mode is ON, then the system prompts for confirmation. Press  (**Confirm**).

Set the Valve Position After Confirmation

1. To change to confirmation mode, click **Main Display** > **Drive Setup** > **Confirmation Mode**
2. Press  (**Select**).
3. Use the navigation buttons to change the setting from **OFF** to **ON**.
4. Press  (**Confirm**).
5. Go to the Main screen. Refer to Table C-1.
6. Use the navigation buttons to set a value for the position.
7. Press **Confirm**.

Configure the Valve Drive Control

Process	Procedure
LAN Control	Sets the LAN control to Manual (MANL) or DHCP. 1. Select **Main Display** > **Drive Setup** > **Control**. 2. Press **Select**. 3. Use the navigation buttons to change the setting to **DHCP/MANL**. 4. Press **Confirm**.
IP PORT	Configures the IP port. 1. Select **Main Display** > **Drive Setup** > **IP Port**. 2. Press **Select**. 3. Use the navigation buttons to navigate to the value to be changed. 4. Press **Select**. 5. Use the navigation buttons to set the value. 6. Press **Confirm**.
LAN Settings	Sets the IP address, netmask, and gateway. 1. Select **Main Display** > **Drive Setup** > **LAN Setup**. 2. Press **Select**. 3. Select **IP Addr**, **Netmask**, or **GW**. 4. Use the navigation buttons to navigate to the value to be changed. 5. Press **Select**. 6. Use the navigation buttons to set the value. 7. Press **Confirm**.
Input	Sets the input control to manual (Inputs) or binary (BinCod). 1. Select **Main Display** > **Drive Setup** > **In.Pins**. 2. Press **Select**. 3. Use the navigation buttons to set the value. 4. Press **Confirm**.

Process	Procedure
Output	Sets the output control to Event or Trigger. 1. Select **Main Display** > **Drive Setup** > **Out.Pins**. 2. Press **Select**. 3. Use the navigation buttons to set the value. 4. Press **Confirm**.

Put the Valve in Standby State

- Press and hold  (**Select**) for 3 seconds.
  The screen shows `Standby` and the status LED on the device turns blue.

  Note: To return to normal operation, press and hold **Select** for 3 seconds. The status LED on the device changes to green.

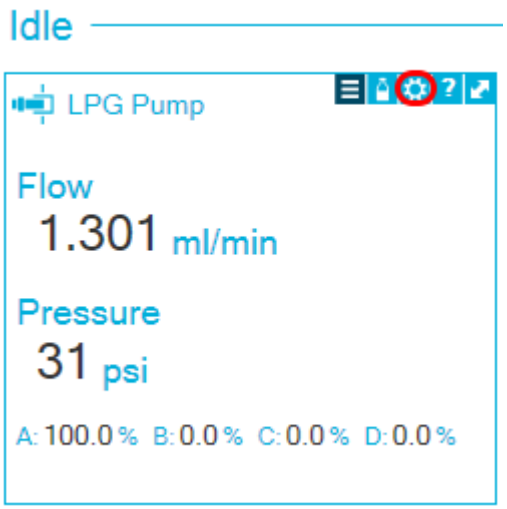
Set the Valve Position to Home

1. Change to the Main menu to re-home the drive.
2. Press  (**Confirm**).

Put the Pump in Standby State

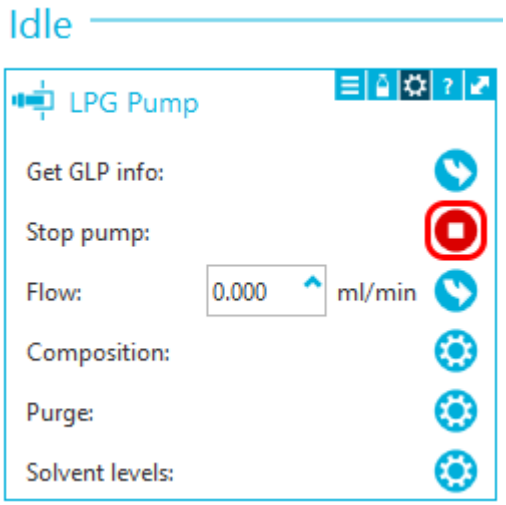
1. Open the device control dialog in one of the following ways:
   - In SCIEX OS, click  **(Direct device control)**.
   - In the Analyst software, on the status bar, double-click the icon for the device () and then click  to show the available control options.

Figure 3-24 Device Control



2. To stop the flow, click the **Stop pump** icon.

Figure 3-25 Stop Pump



3. On the pump, press **Standby** for 5 seconds.
4. Wait until the LED changes to blue.
5. Press **Standby** again to take the pump out of the standby state. Wait until the LED changes to green.

Tip! Alternatively, to take the module out of standby state, press the power button on the module.

Take the Pump out of Standby State

The pump automatically goes to the standby state after a period of non-use.

- Press **Standby** again to take the pump out of the standby state. Wait until the LED changes to green.

Tip! Alternatively, to take the module out of standby state, press the power button on the module.

Maintenance 4

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Toxic Chemical Hazard. Before disconnecting parts in the flow line, stop the LC pump and then make sure that the pressure of the mobile phase is decreased to zero.

WARNING! Biohazard. Wear personal protective equipment when handling potentially infectious or toxic substances, such as human samples or reagents, to prevent contact with the skin.

WARNING! Hot Surface Hazard. Do not open the column oven door if the high temperature lamp is flashing. The internal temperature of the column oven is 60 °C or greater.

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

This section contains information about the maintenance, care, and storage of the system. It also provides instructions for maintenance tasks that can be performed by the customer. For maintenance procedures that are not included in this guide, contact sciex.com/request-support.

Unless otherwise specified, to install a component, do the steps to remove the component in reverse order.

When to Complete a Maintenance Task

A maintenance task for the LC system includes the cleaning or replacement of a system component or component part. Cleaning or replacement of a component or part is required when any one of the following occurs:

- Upon inspection, the module, or the area surrounding it, is visibly soiled with spilled fluid or coated with a build-up of dirt or dust.
- The module is determined to be responsible for a degradation in system performance.
- Usage of the module has been tracked and the number of times the part has been used reaches or exceeds its maximum usage recommendation.
- The interval for periodic cleaning or replacement of the module has been reached.

Who Can Complete a Maintenance Task

Each LC-related maintenance task is classified by the required qualifications of the person who can do the maintenance task.

Customers are responsible for purchasing and replacing all consumable parts. This includes, but is not limited to, filters, lamps, rotor seals, sample needles, syringes, sample loops, piston seals, and check valves. These parts are not covered under the warranty of a service contract unless specifically noted in the contract. Customers will incur a service charge for any consumable parts that are replaced by SCIEX.

Table 4-1 Maintenance Tasks

If A Task Is Classified As	It Requires This Minimum Qualification	Next Step
User	No special tools are required, other than those supplied with the system. No special training or level of service expertise is required.	Click the link provided to get access to instructions for performing the task.
FSE only	Field Service Employee (FSE) is required.	Schedule a service call sciex.com/request-support.

Before Inspection and Maintenance

Flush all of the wetted components of a module, such as the flow cells of the detectors, with isopropanol and then with water before maintaining, disassembling, or disposing of the module.

- Replace the mobile phase in both of the flow lines with LC-MS-grade water.
- Wipe off any dirt from the front panel and the main cover.
- Wipe off any dirt from the keypad with tissue paper or a soft cloth dampened with water.
- Stop the pump before performing maintenance.

Recommended Maintenance Schedule

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Ionizing Radiation Hazard, Biohazard, or Toxic Chemical Hazard. Before cleaning or maintenance, identify whether decontamination is required. If radioactive materials, biological agents, or toxic chemicals have been used with the system, then the customer must decontaminate the system before cleaning or maintenance.

The following table provides a recommended schedule for cleaning and maintaining the system.

Table 4-2 Maintenance Tasks

Component	Frequency	Task	More Information, Refer to
Detector: lamps	Weekly	Inspect	Replace the Lamps.
Detector: flow cell	After 6,000 operating hours	Replace	Replace the Flow Cell.
Pump	After 1,000 operating hours	• Clean the pistons on the pump • Examine the check valves on the pump head	Examine the Pump Fittings and Check Valves (All Pumps).
Pump (also applicable to the wash system pump)	After 5,000 operating hours	• Replace all seals • Clean the check valves on the pump head	Examine the Pump Fittings and Check Valves (All Pumps).
Pump (also applicable to the wash system pump)	After 10,000 operating hours	• Replace the spare parts in the pump head • Replace the check valves on the pump head	Examine the Pump Fittings and Check Valves (All Pumps).
Wash system: rotor seal	Approximately every three years	Replace the rotor seal.	Update the Rotor Seal Replacement Record.

Table 4-2 Maintenance Tasks (continued)

Component	Frequency	Task	More Information, Refer to
Valve drive: rotor seal	Approximately every three years	Replace the rotor seal.	Update the Rotor Seal Replacement Record.
Autosampler: syringe	As needed	Replace the syringe.	Replace the Syringe.
Autosampler: sample loop	As needed	Replace the sample loop.	Replace the Sample Loop.
Autosampler: sample needle	As needed	Replace the sample needle.	Replace the Sample Needle.
Autosampler: rotor seal	Approximately every year	Replace the rotor seal.	Update the Rotor Seal Replacement Record.
Autosampler: valve leak bin	As needed	Clean the valve leak bin located beneath the injection valve with a damp cloth with non-aggressive cleaning liquid. For example, water or methanol.	N/A
Autosampler: sample rack	As needed	Clean any spills.	Clean the Module Surfaces.
Autosampler: drain tubing	As needed	Regularly flush with solvent to prevent clogging and to be sure that any liquids and condensate are removed.	N/A

Do periodic inspections to make sure that the system can be used safely. These periodic inspections can be performed by a SCIEX Field Service Employee (FSE) on a contractual basis. For information about the inspection and maintenance contract, contact a SCIEX representative.

Required Materials

- Powder-free gloves, nitrile or neoprene recommended
- Safety glasses
- Laboratory coat

- Fresh LC-MS–grade water. Old water can contain contaminants that can contaminate the system.
- Cleaning solution. Either:
  - 100% LC-MS–grade methanol
  - 100% LC-MS–grade isopropanol (2-propanol)
- Clean 1 L or 500 mL glass beaker to prepare cleaning solutions
- 1 L beaker to catch used solvent
- Organic waste container
- Lint-free wipes. Refer to the section: Tools and Supplies Available from the Manufacturer.
- (Optional) Polyester (poly) swabs. Refer to the section: Tools and Supplies Available from the Manufacturer.

Tools and Supplies Available from the Manufacturer

Note: For part numbers, refer to the document: *Parts and Equipment Guide*.

- Small poly swab, thermally bonded. Also available in the Cleaning kit.
- Lint-free wipe (11 cm x 21 cm, 4.3 inches x 8.3 inches). Also available in the Cleaning kit.

Clean the Module Surfaces

Required Materials
• Dry, soft rags, or tissue paper • For persistent stains: water

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

1. Wipe the module surfaces with the rag or tissue paper.
2. If the stains persist, then do this:
   a. Dampen a rag in water, and then wring it dry.
   b. Wipe the module surfaces.
   c. Dry the surfaces with a dry rag.

Prepare the System

Prime the Backflush Tubing (Low Pressure Pump)

1. Disconnect the backflush tubing from the backflush inlet on pump A.
2. Connect the syringe with the tubing adapter to this tubing.
3. Gently pull on the plunger to aspirate backflush solution through the tubing.
4. When the tubing is full, disconnect it from the syringe and then install it on the backflush inlet of pump A.
5. Repeat this procedure for the tubing connected to the backflush pump inlet.

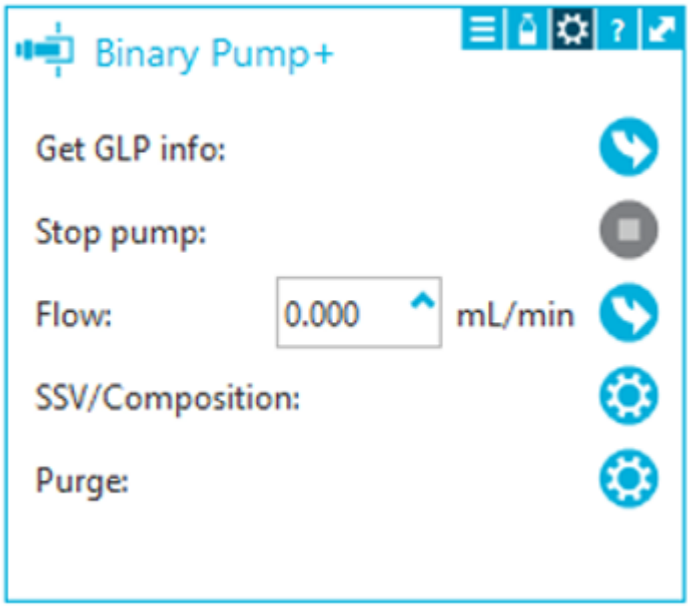
Flush the Binary Pump with Mobile Phase

1. Low pressure pumps only: Open the purge valve.
2. Open the control software.
3. Open the device control dialog in one of the following ways:

   - SCIEX OS: Click  **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device () and then click  in the Binary Pump section to show the available control options.

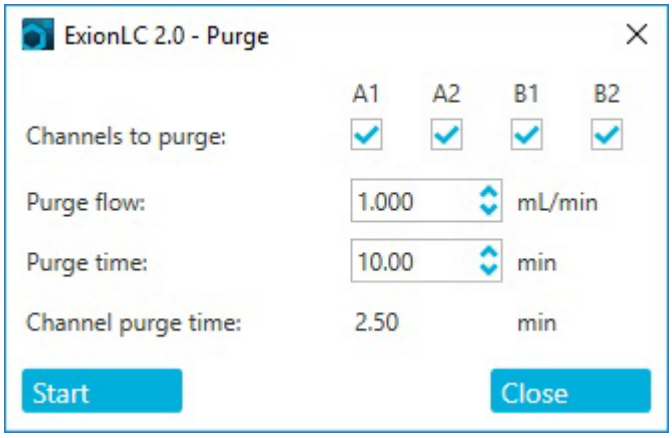
4. Click  (Purge).

Figure 4-1 Purge Icon



5. Complete the information as shown in the following figure.

Figure 4-2 Purge Dialog



6. Click **Start**.
7. After all channels have been purged, in the Purge window, click **Close**.
8. Low pressure pumps: Close the purge valve.

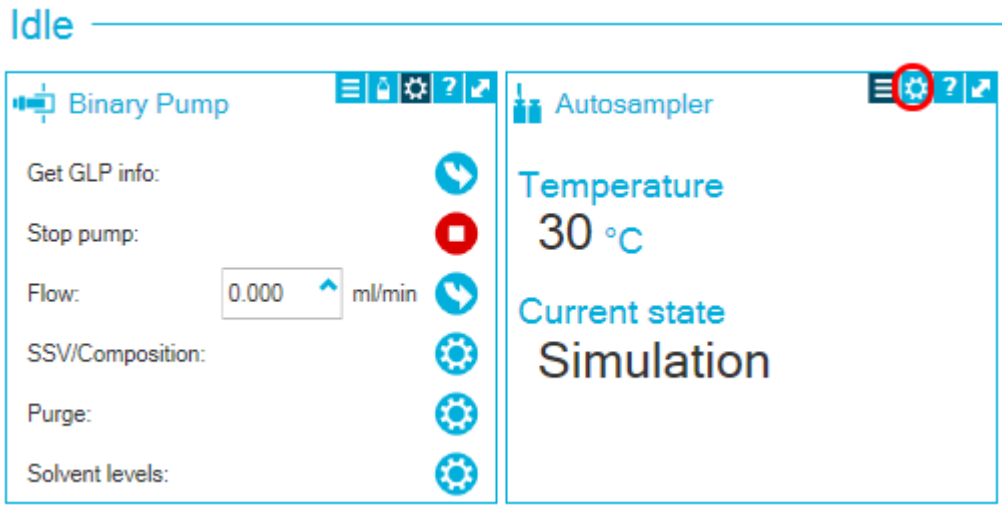
Flush the Autosampler with the Transport and Wash Solutions

Flush the autosampler to make sure that the system performs optimally, especially when analyzing very small samples or analytes of low concentration.

1. Open the device control dialog:

   - SCIEX OS: Click **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device and then click in the Autosampler section to show the available control options.

   Figure 4-3 Device Control



2. In the Autosampler section, click next to **Needle rinsing** to open the Advanced rinse steps dialog.

Figure 4-4 Needle Rinsing Icon

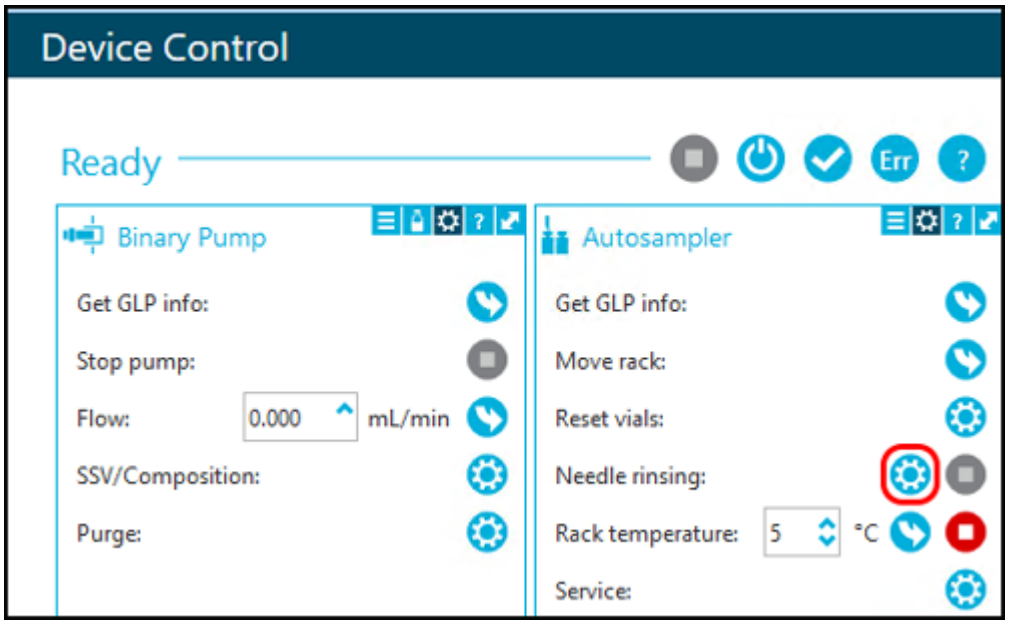
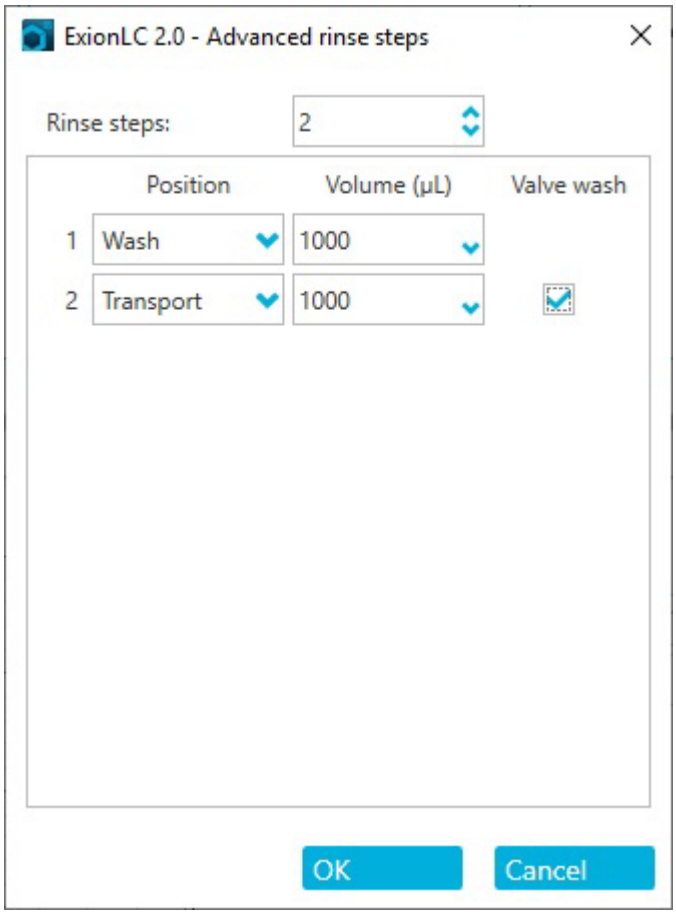


Figure 4-5 Advanced Rinse Steps Dialog



3. In the **Rinse steps** field, click **2**.
4. For step 1, click **Wash**, type `1000` µL, and then clear the **Rinse valve** check box.
5. For step 2, click **Transport**, type `1000` µL, and then click the **Rinse valve** check box.
6. Click **OK** to rinse the system.
7. Repeat step 6 if there is still air in the syringe.
8. Click **Close**, and then close the device control dialog.

Note: Is this procedure does not work, then use one of these alternative methods and repeat the rinse procedure.

- Replace the wash and transport solutions with 100% isopropanol and then repeat the rinse procedure.
- Remove the syringe from the autosampler. Manually fill the syringe with isopropanol, and then reinstall the syringe. Complete the wash as described in the usual procedure.

Pump Maintenance

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Toxic Chemical Hazard. Before disconnecting parts in the flow line, stop the LC pump and then make sure that the pressure of the mobile phase is decreased to zero.

CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

Remove the Pump Front Cover

WARNING! Biohazard or Toxic Chemical Hazard. Wear appropriate personal protective equipment when performing maintenance tasks on the module. The parts might be contaminated with biohazardous or toxic substances.

1. Turn off the pump.
2. Hold the front cover on both sides and then pull it forward.

Examine the Pump Fittings

Note: If leaks occur at the capillary fittings after they are properly installed, then do not tighten them further, but instead replace them with new connection fittings.

Required Materials
• Torque wrench **Note:** Torque wrenches are not supplied or maintained by SCIEX.

- Using a torque wrench, verify that all of the fittings listed in the following table are tight. Tighten any fittings that do not meet the torque specifications in the table.

Table 4-3 Torque Specifications

Fitting Type	Material	Torque Specification (Nm)
Pump Head Inlet Fittings: 10 mL	Stainless steel	7.5
Pump Head Outlet Fittings: 10 mL	Stainless steel	5
Inline Filter	Stainless steel fittings	7.5
Capillary Fittings	Stainless steel fittings	5
Mixer	Stainless steel fittings	5

Binary and LPG Pumps

Flush the Binary Pump or LPG Pump

Prerequisite Procedures
• Connect the capillaries and tubing. Refer to the section: Connect the Binary Pump or Connect the LPG Pump. • Turn on the Pump.

Required Materials
• Wash solution **Note:** • When buffers have been used, flush with water. • When aggressive solvents have been used, flush with isopropanol. For applications with normal phase, only use isopropanol as wash solution. • Silicone tubing

Flush the pump and all of its components, including the valves and the degasser at the following times:

- After each operation
- Before changing the solvent
- To remove air bubbles from the capillary and tubing

1. Put one end of the solvent tubing in the wash solution.
2. Connect a silicone tube to the venting nozzle on the pressure sensor.
3. In the SCIEX OS or Analyst software, use the Purge function to start purging the pump. Refer to the section: Purge the Pump (Binary Pump and LPG Pump).

Remove the Pump Head (Binary Pump and LPG Pump)

WARNING! Toxic Chemical Hazard. Wear personal protective equipment (PPE), including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

CAUTION: Potential System Damage. Take care to not tilt the pump head. Loosen or tighten the screws evenly and diagonally, one turn at a time, to prevent damaging the pump piston.

Prerequisite Procedures
• Purge the Pump (Binary Pump and LPG Pump).

Required Materials
• 3 mm hex key • 1/4 inch open-ended wrench • 13 mm open-ended wrench

1. Loosen the finger-tight fitting (item 1) from the pump inlet and then disconnect the tubing.

Figure 4-6 Pump Head

2. Loosen the 1/4 inch (item 2) fitting from the pump outlet and then disconnect the capillary.
3. Disconnect the tubing for the piston backflush (item 3) at the pump head.
4. Loosen the four 3 mm hex screws by one turn.
5. While holding the pump head with one hand, remove the screws.
6. Lift the pump head off of the pump.

Install the Pump Head (Binary Pump and LPG Pump)

CAUTION: Potential System Damage. To prevent damaging the pump head, do not over-tighten the capillary fitting.

Required Materials
• 3 mm hex key • 1/4 inch open-ended wrench • 13 mm open-ended wrench • Star driver

Figure 4-7 Pump Head

1. While holding the pump head with one hand, alternately tighten the four star screws.
2. Install the piston seal wash tubing (item 3).
3. Tighten the inlet fitting (item 1) and the outlet fitting (item 2).

Filter Cartridge (Binary Pump and LPG Pump)

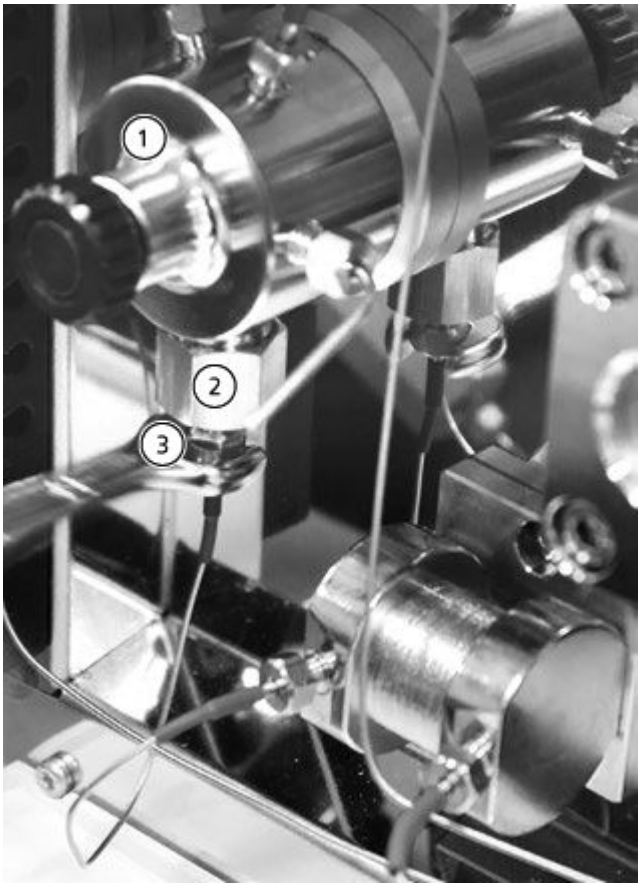
A blocked filter cartridge inside of the pressure sensor can cause pressure fluctuations and irregular flow. Inline filters are not cleaned but are replaced as an assembly. The filter cartridge is located below the pressure sensor.

Remove the filter cartridge if it is blocked.

Remove the Filter Cartridge

Required Materials
• 1/4 inch open-ended wrench • 13 mm open-ended wrench

Figure 4-8 Capillary Below the Cartridge



Item	Description
1	Pressure sensor
2	Outlet bushing
3	Filter cartridge fitting

1. Use the 13 mm open-ended wrench to hold the outlet bushing.

2. Loosen the pressure sensor fitting, located below the filter cartridge fitting (item 3), with the 1/4 inch open-ended wrench.
3. Loosen the outlet bushing (item 2) with the 13 mm open-ended wrench, and then remove it.
4. Remove the filter cartridge from the outlet fitting.

Install the Filter Cartridge

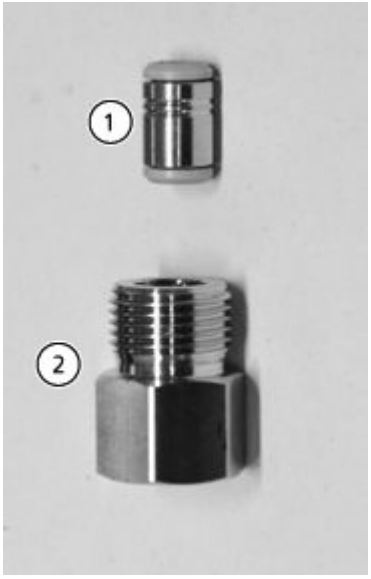
CAUTION: Potential System Damage. Tighten screws with a torque wrench, using the proper technique. Stop turning the torque wrench as soon as the pressure is released.

Required Materials
• Torque wrench

A notch on the filter cartridge indicates the flow direction. Insert the filter cartridge and fitting in the pressure sensor with the notch pointing up.

1. Insert the filter cartridge in the outlet fitting with the notch pointing up. For the titanium filter, which does not contain a notch, make sure that the disc is facing down.

Figure 4-9 Filter Cartridge and Fitting



Item	Description
1	Filter cartridge
2	Outlet bushing

2. Manually install the bushing that contains the filter cartridge in the pressure sensor, by rotating it counterclockwise.
3. Using the torque wrench, tighten the bushing to a torque of 5 Nm.
4. Connect the capillary to the pressure sensor below the filter cartridge bushing.

Replace the Mixer (Binary and LPG Pumps)

Prerequisite Procedures
• Rinse the new mixer with isopropanol.

Required Materials
• Plugs • Size 1/4 inch open-end wrench • 2 mm hex key • Torque wrench

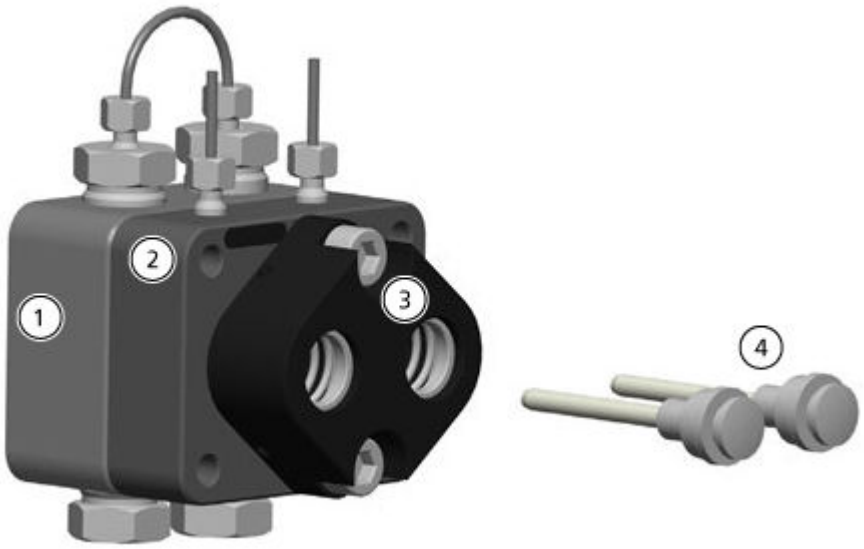
A blocked mixer can cause pressure fluctuations and irregular flow. The mixer is replaced as a complete assembly.

1. Disconnect the tubing from the mixer.
2. Remove the 2 mm hex screws and then remove the mixer and set it aside.
3. Install the new mixer, attaching it with the 2 mm hex screws.
4. Install the capillary fittings in the mixer.
5. Tighten the fittings with a wrench.

Maintain the Pump, and the Wash System Pump Head (Binary Pump and LPG Pump)

During routine maintenance, or when the pump malfunctions, the pump head can be disassembled and cleaned. During this procedure, seals, washers, springs, or pistons can be replaced.

Figure 4-10 Rear View of 10 mL Pump Head



Item	Description
1	Pressure plate with check valve (high-pressure side)
2	Pressure plate with connectors for the piston backflushing (low-pressure side)
3	Piston guide
4	Pistons

1. Flush the pump head with a suitable flushing solution or with isopropanol if the pump head is to be stored.
2. Remove the pump head.
3. Disassemble the pump head. Refer to Disassemble the 10 mL Analytical Pump Head (Binary Pump and LPG Pump).
4. Examine the components and then replace them, if required.
5. Assemble the pump head in the correct order.

Binary Pump+

Flush the Binary Pump+

Prerequisite Procedures
• Connect the capillaries and tubing. Refer to the section: Connect the Binary Pump+ . • Turn on the Pump.

Required Materials
• Wash solution **Note:** • If buffers have been used, then flush with water. • If aggressive solvents have been used, then flush with isopropanol. For applications with normal phase, only use isopropanol as the wash solution. • Silicone tubing

Flush the pump and all of its components, including the valves and the degasser at the following times:

- After each operation
- After changing the solvent is replaced
- To remove air bubbles from the capillary and tubing

1. Put one end of the solvent tubing in the wash solution.
2. In the SCIEX OS or Analyst software, use the Purge function to flush the pump. Refer to the section: Purge the Binary Pump+.
   The purge valve automatically connects the pump head outlets with the waste tubing installed on the purge valve.

   Note: The purges stops after the specified interval.

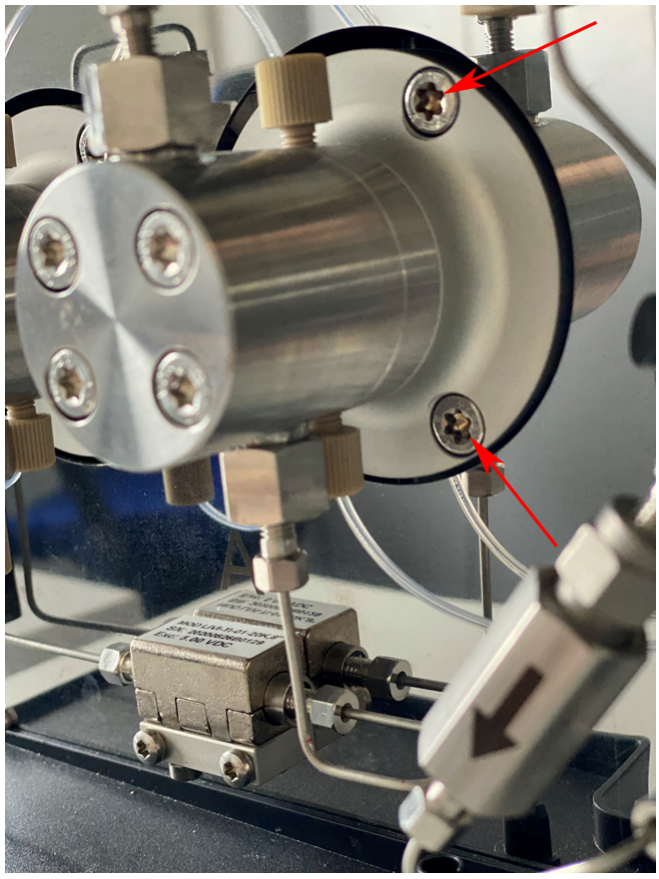
Remove the Head (Binary Pump+)

WARNING! Toxic Chemical Hazard. Wear personal protective equipment (PPE), including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

CAUTION: Potential System Damage. Take care to not tilt the pump head. Loosen or tighten the screws evenly and diagonally, one turn at a time, to prevent damaging the pump piston.

Required Materials
• 1/4 inch open-ended wrench • T25 star driver

Figure 4-11 Pump Head (Two of Three Screws Shown)



1. Loosen the finger-tight fittings and then disconnect the tubing.
2. Loosen the 1/4 inch fittings and then disconnect the capillary.
3. Loosen the three T25 star screws alternately, one turn at a time.
4. While holding the pump head with one hand, remove the screws.
5. Remove the pump head.

Remove the Stator (Binary Pump+)

Required Materials
• T20 star driver

1. Take a photo of or draw the connections on the purge valve.
2. Remove all of the fittings from the purge valve.
3. Remove the three T20 star screws.
4. Gently remove the stator from the valve body.

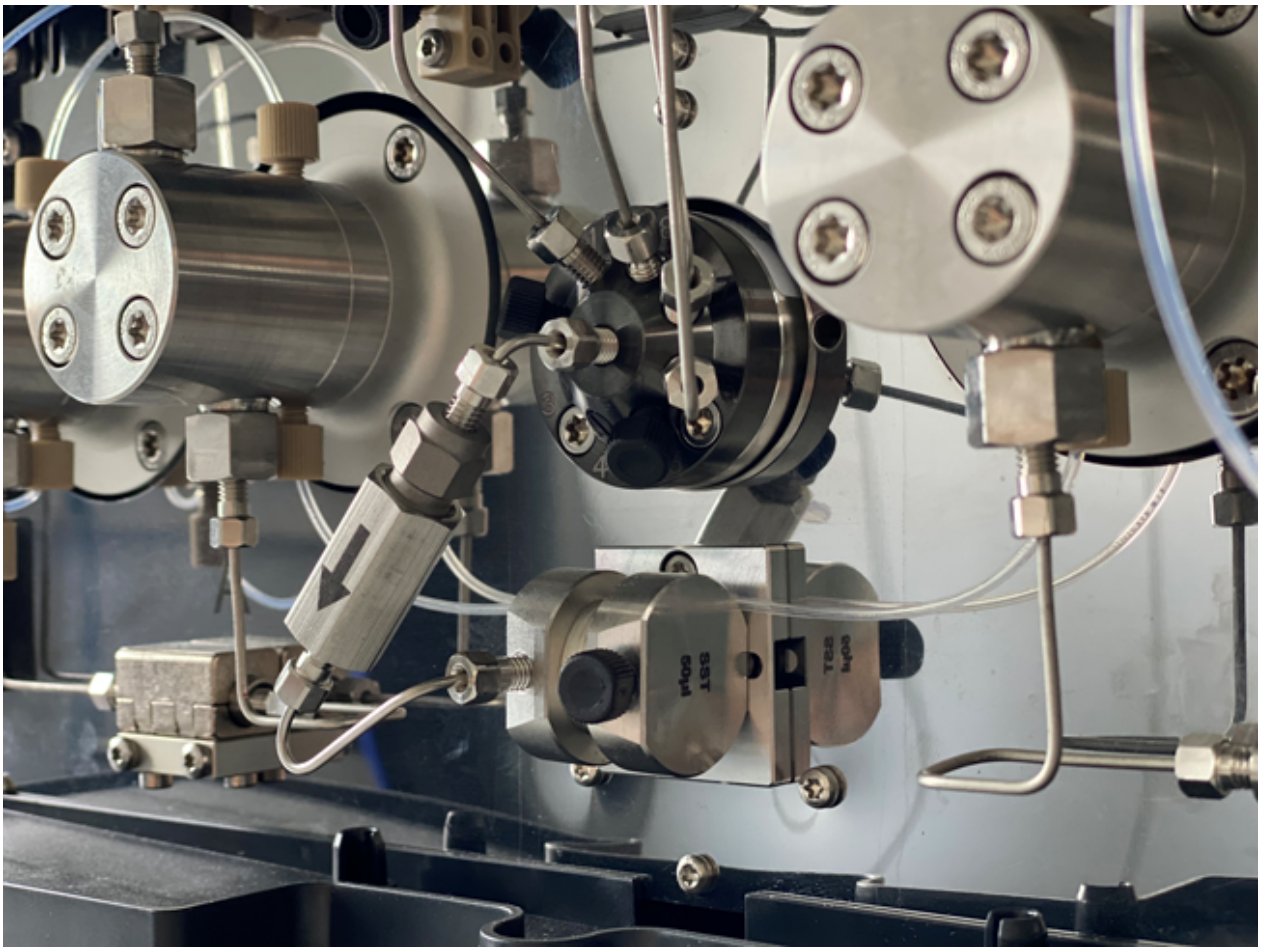
Tips for Installing the Stator

- Tighten the screws alternately, half a turn at a time. Do not fully tighten one screw, then move to the others.

Replace the Mixer (Binary Pump+)

Required Materials
• T10 star driver • Torque wrench

Figure 4-12 Mixer



1. Disconnect the filter assembly tubing from the mixer and purge valve.
2. Remove the two T10 star screws from the mixer bracket.
3. Remove the mixer from the pump.
4. Turn the mixer over, and then remove the two T10 star screws that attach the mixer on the bracket.
5. Install the new mixer, attaching it with the two T10 star screws.
6. Install the capillary fittings in the mixer.
7. Tighten the fittings with a wrench.

Maintain the Binary Pump+ Pump Head

Required Materials
• T25 Torx driver

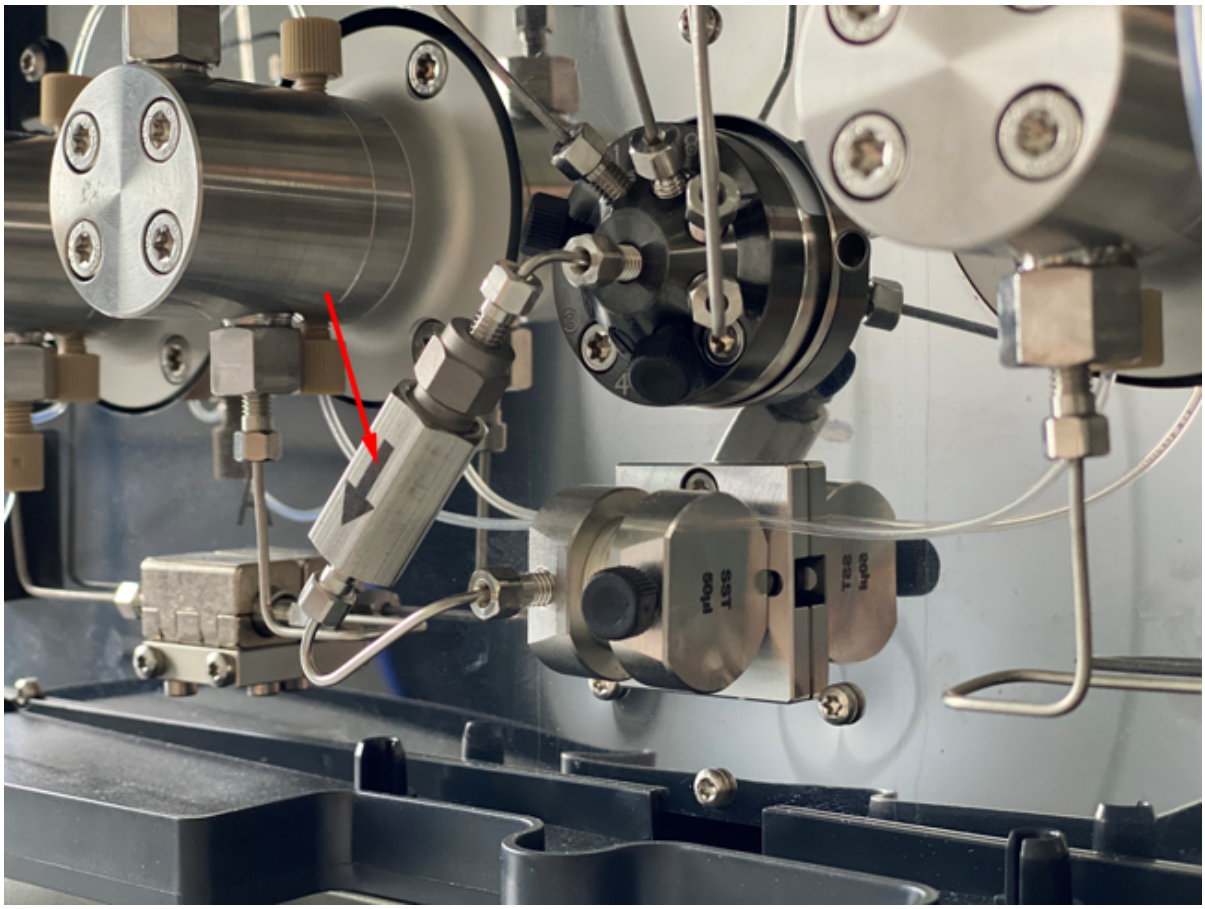
During routine maintenance, or when the pump malfunctions, the pump head can be disassembled and cleaned. During this procedure, seals, washers, springs, or pistons can be replaced.

1. Remove the mobile phase inlet and outlet tubing.
2. Remove the backflush pump inlet and outlet tubing.
3. Remove the four T25 screws on the front of the pump assembly.
4. Carefully remove the backing ring from the pump assembly.
5. Carefully pull the backing ring directly away from the pump assembly.
6. Replace the seals as required.
7. If the piston is to be replaced, then remove the three T25 screws to remove the remainder of the pump head.

Replace the In-Line Filter (Binary Pump+)

1. Remove the 1/4 inch nut at the center of the purge valve.
2. Remove the 1/4 inch nut at the mixer inlet.
3. Disassemble the filter holder, using two adjustable wrenches.
4. Remove the filter from the filter holder.

Figure 4-13 High-pressure In-line Filter



5. Install the new filter in the holder, with the grooves facing the inlet flow.
6. Tighten the two parts of the filter holder.
7. Loosen the 1/4 inch nut at the top part of the filter holder.
8. Insert the 1/4 inch nut in the mixer, and then tighten it.
9. Insert the 1/4 inch nut in the center port of the purge valve, and then tighten it.
10. Tighten the two parts of the filter holder.
11. Do a leak test.

Remove the Rotor Seal

Prerequisite Procedures
• Turn off the Wash System • Remove the Stator

This procedure applies to both valves.

- Carefully remove the rotor seal from the rotor.

Do a Pump Head Run-In

CAUTION: Potential System Damage. Make sure to do the pump head run-in procedure correctly to prevent damaging the pump head. Set the correct back pressure and flow rate for the procedure.

CAUTION: Potential System Damage. Make sure that solvent flows through the pump head and piston backflushing to prevent damage to the pump head if it runs dry.

CAUTION: Potential System Damage. Make sure to remove the cap fittings from the inlet and outlet before use. Blocked pump heads can damage the pump head and system.

Required Materials
• LC-MS-grade methanol

Prerequisite Procedures
• Prime and purge the pump with methanol.

Do a run-in procedure before using the pump for the first time, after maintenance of the pump head, or if new pump heads have been installed.

A run-in procedure might also be required to achieve optimal pump performance if a pump is not in operation for a long period of time, for example, after shipping.

Note: All pump heads are filled with isopropanol before shipment.

1. Connect the pump mains supply cable to the mains supply outlet.
2. Turn on the power switch.

3. To prevent leaks, make sure that all of the tubing and capillaries are connected and that all plugs have been removed from the purge valve.
4. Wait until the pump self-test is complete.
   The LED is illuminated blue.
5. Connect a restriction capillary to generate approximately 3887 psi to 4351 psi (268 bar to 300 bar) for the Binary Pump or LPG Pump, or 6802 psi to 7614 psi (469 bar to 525 bar) for the Binary Pump+.
6. Start the pump at 3 mL/min for 15 minutes.

Check Valves (All Pumps)

Blocked check valves do not open and close correctly, resulting in pressure fluctuations and irregular flow. If the check valves cannot be cleaned, then replace the whole check valve.

Note: If acetonitrile is used, then a decreased flow rate might be caused by the formation of acetonitrile polymers. To avoid this issue, add 5% water to the solvent.

We also recommend that the system be rinsed for several hours using a mixture of 50% methanol and 50% acetone. Alternatively, rinse the system for an hour using a solution of 50% isopropanol.

Required Materials
• 13 mm open-ended wrench • Beaker • Solvent such as isopropanol • Ultrasonic bath • Torque wrench

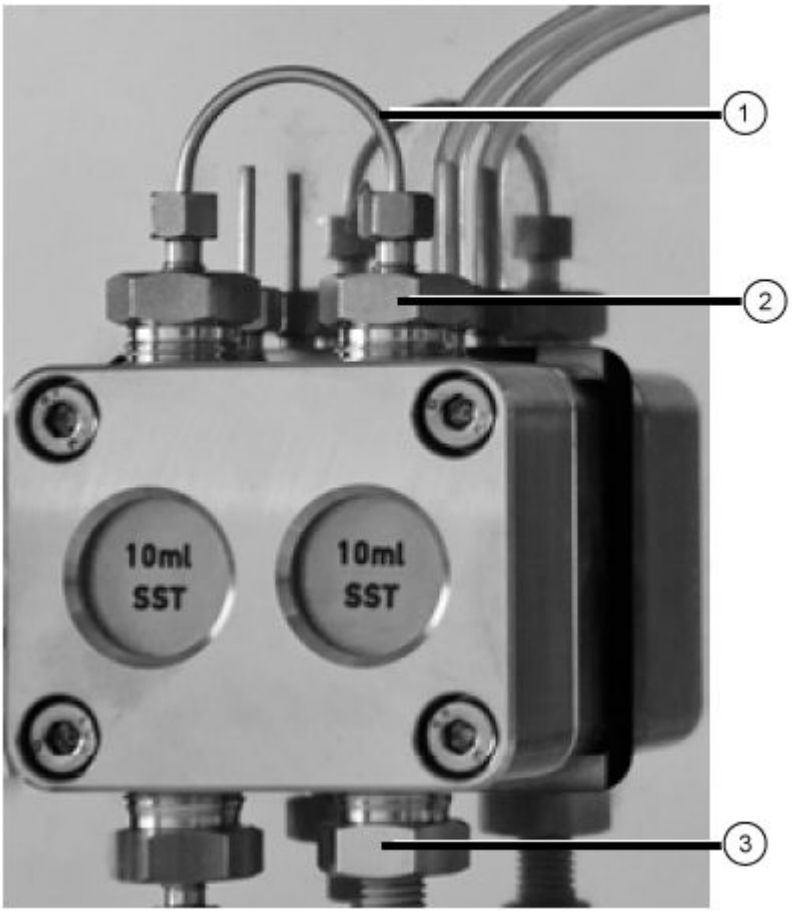
Remove the Check Valves (Binary and LPG Pumps)

Prerequisite Procedures
• Purge the Pump (Binary Pump and LPG Pump).

Note: The check valves are located on the right side of the pump. The dummy check valves are located on the left.

The pump head is equipped with two check valves. Note the position of the notches before removing the check valves.

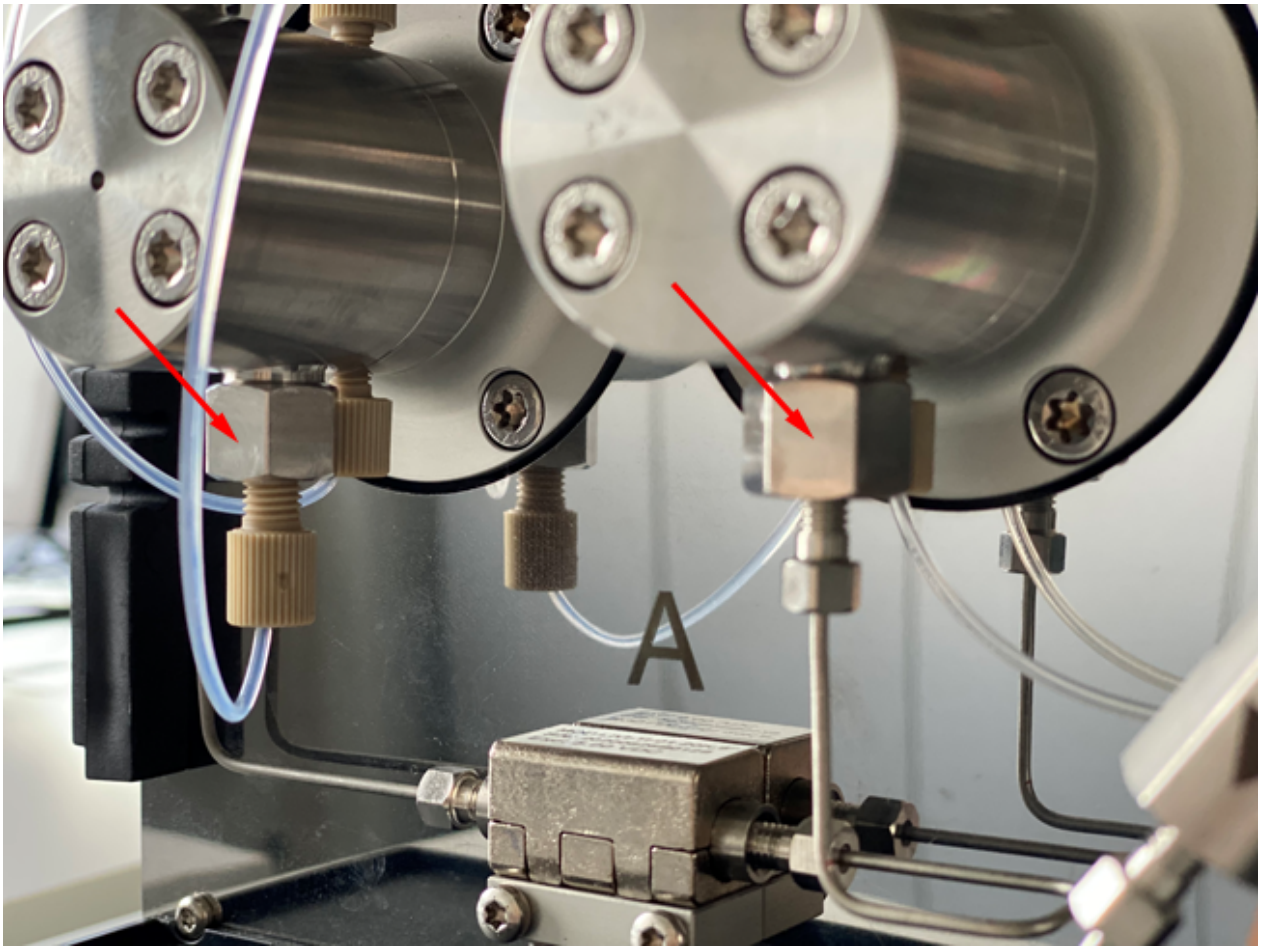
Figure 4-14 Check Valve in the Pump Head (Binary Pump)



1. Loosen and then remove the capillary connection at the check valve (item 1).
2. Use the wrench to remove the inlet fitting (item 3) and then remove the inlet check valve.
3. Note the orientation of the notch of each check valve.
4. Use the wrench to remove the outlet fitting (item 2) and then remove the outlet check valve.

Remove the Check Valves (Binary Pump+)

Figure 4-15 High-Pressure Check Valves



1. Disconnect the mobile phase tubing from the check valve holder.
2. Using an adjustable wrench, loosen and then remove the check valve nut.
3. Remove the check valve from the nut.

Clean the Check Valve

Prerequisite Procedures
• Remove the Check Valves (Binary and LPG Pumps) or Remove the Check Valves (Binary Pump+).

Required Materials
• Isopropanol

The check valves cannot be disassembled for cleaning. They are cleaned as a unit.

1. Put each check valve in a beaker that contains isopropanol.
2. Put the beaker that contains the check valve in an ultrasonic bath and then sonicate it for at least 10 minutes.
3. Let the check valves dry.

Install the Check Valve (Binary and LPG Pumps)

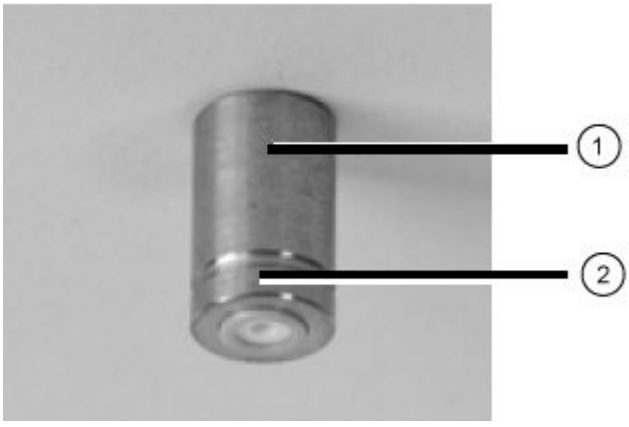
CAUTION: Potential System Damage. To avoid damaging the components, do not overtighten the fittings.

Prerequisite Procedures
• Make sure that the check valve is dry.

Required Materials
• Torque wrench

1. Insert the check valves (item 1) in the inlet and outlet fittings, making sure that the notches (item 2) are oriented downward. Refer to Check Valves (All Pumps).

Figure 4-16 Check Valve



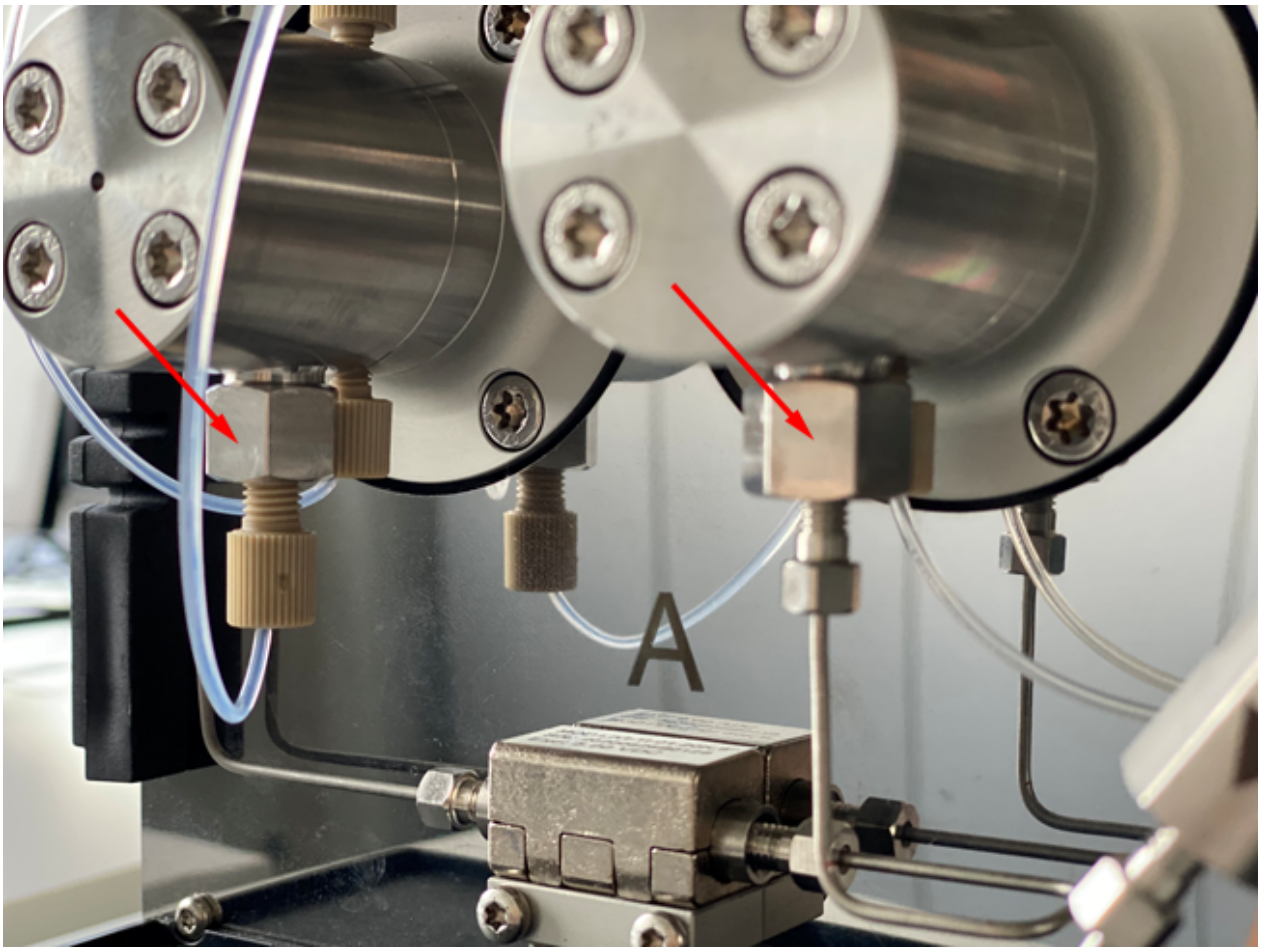
2. Install the inlet and outlet fitting in the pump head by hand, and then tighten them to 7.5 Nm.
3. Connect the capillary connections.
4. Purge and flush the system.

Install the Check Valves (Binary Pump+)

Prerequisite Procedures
• Make sure that the check valve is dry.

Required Materials
• Torque wrench

Figure 4-17 High-Pressure Check Valves



1. Install the new check valve in the nut, with the notch away from the pump.
2. Tighten the check valve nut to 5 Nm.
3. Replace the mobile phase tubing.
4. Purge and flush the system.
5. Do a leak check.

Remove the Dummy Check Valve

Prerequisite Procedures
• Disconnect the capillaries and tubing from the pump.

Required Materials
• 13 mm open-end wrench

1. Use the wrench to remove the pump head inlet fitting from the pump head piston.
2. Remove the dummy check valve.

Install the Dummy Check Valve

CAUTION: Potential System Damage. To avoid damaging the components, do not overtighten the fittings.

Prerequisite Procedures
• Remove the Dummy Check Valve.

Required Materials
• Torque wrench

1. Install the dummy check valve in the pump head piston.
2. Install the fittings on the pump head piston and then tighten them to 7.5 Nm.
3. Flush the pump head piston.

Disassemble the 10 mL Analytical Pump Head (Binary Pump and LPG Pump)

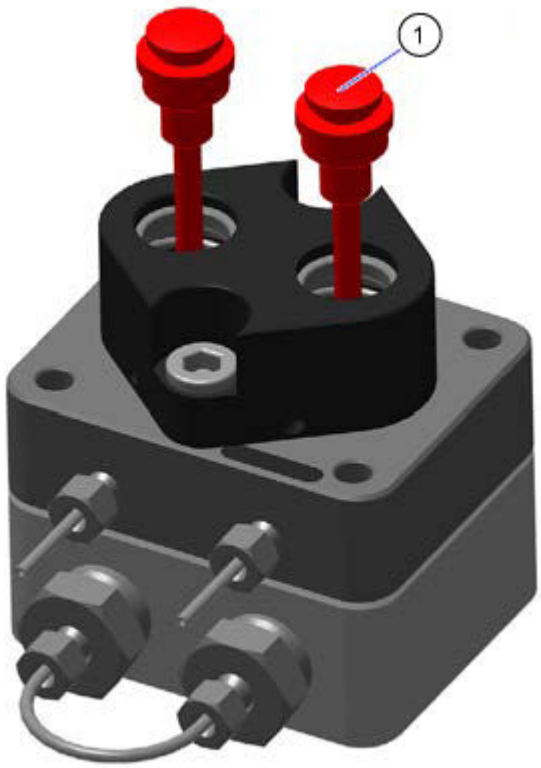
Prerequisite Procedures
• Remove the pump head.

Required Materials
• Seal removal tool

CAUTION: Potential System Damage. To prevent breaking the two piston rods, before disassembling the pump head, remove the piston rods and then put them in the correct orientation. When assembling the pump head, insert the piston rods in the same side from where they were removed.

1. Disassemble the pump head on a soft surface.
2. Using a suitable tool, such as flat pliers, remove the piston rods (item 1) from the piston guide.

Figure 4-18 Piston Rods

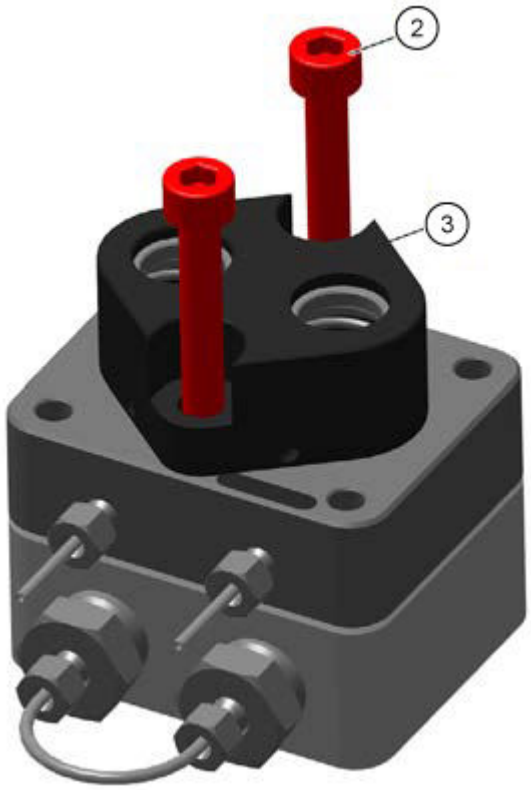


3. Examine the piston rods for scratches.

CAUTION: Potential System Damage. Before disassembling the pump head, remove the two piston rods and then put them in the correct orientation. Piston rods can break. When assembling the pump head, the piston rods must be inserted in the same side from where they were removed.

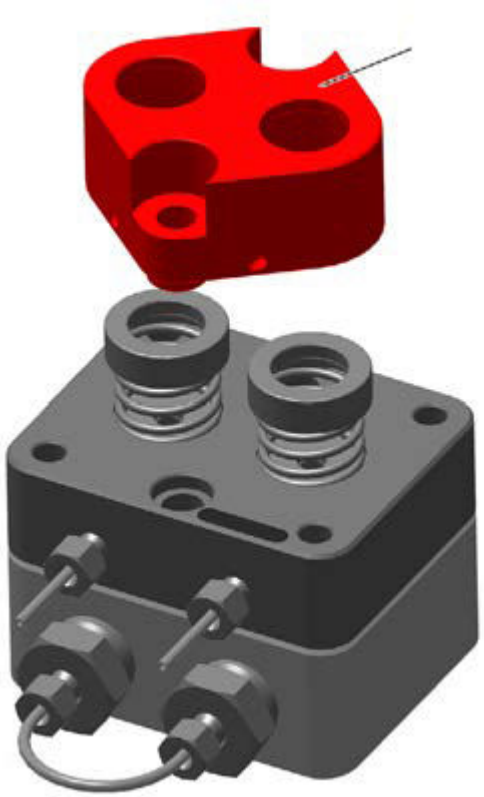
4. While pushing the piston guide (item 3) down to prevent the compression springs from popping out, loosen both screws (item 2) of the piston guide alternately, one turn at a time.

Figure 4-19 Piston Guide and Screws



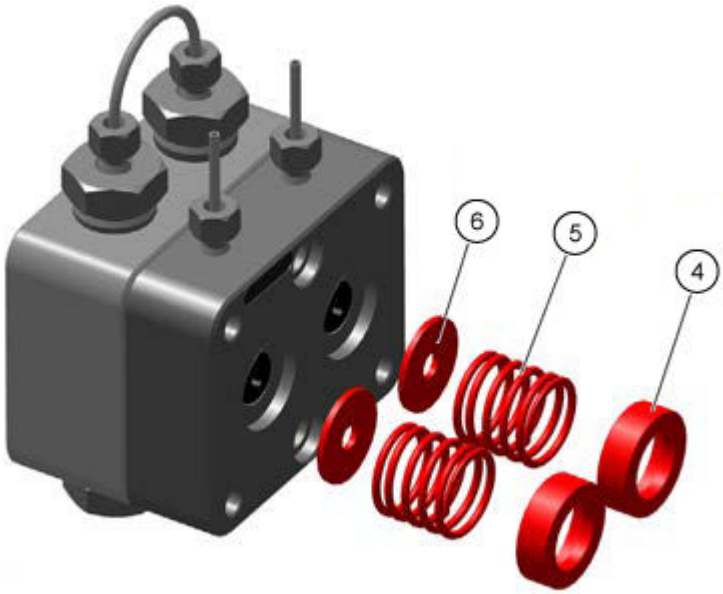
5. Remove the piston guide (item 3) from the low pressure side.

Figure 4-20 Piston Guide, Removed



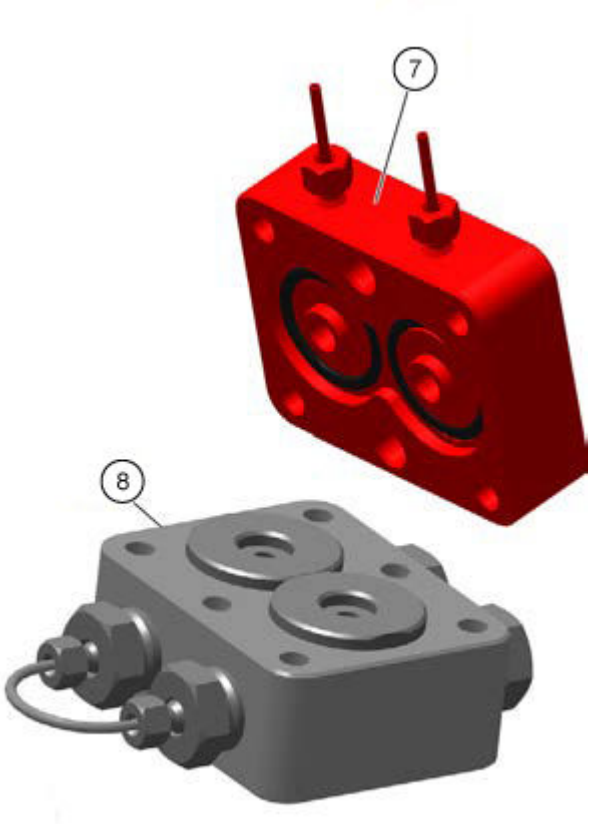
6. Remove the pressure rings (item 4), the compression springs (item 5), and the washers (item 6). Put them on the bench in the correct orientation.

Figure 4-21 Pressure Rings, Compression Springs, and Washers



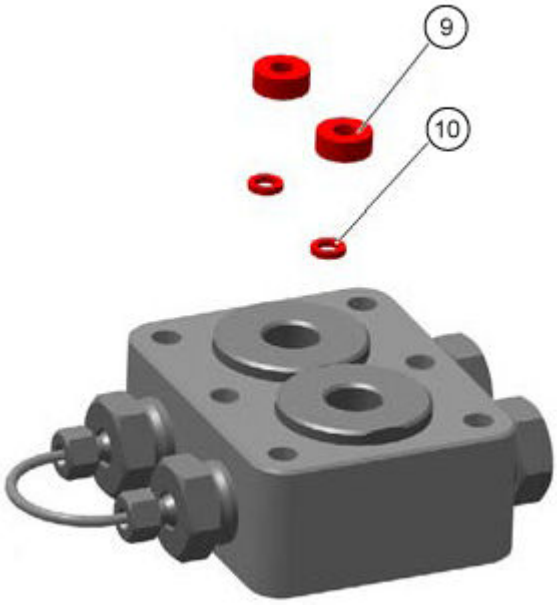
7. Remove the low pressure side (item 7) from the high pressure side (item 8).

Figure 4-22 Low and High Pressure Sides



8. Manually remove both adjusting rings (item 9) and backing rings (item 10) from the high pressure side and then put them on the bench.

Figure 4-23 Adjusting Rings and Backing Rings



Take the Pump out of Service

WARNING! Toxic Chemical Hazard. Wear protective gloves and flush the pump head before removing it, to prevent skin damage from aggressive or toxic solvents.

CAUTION: Potential System Damage. To avoid damage to the pump piston, follow these guidelines:

- **Tilt the pump head when removing and installing it.**
- **Loosen and tighten the screws evenly, in a criss-cross pattern, one turn at a time.**

Prerequisite Procedures
• Flush the Binary Pump or LPG Pump or Flush the Binary Pump+.
• Turn off the pump.
• Disconnect the mains supply cable from the mains supply outlet.

Required Materials
• Syringe • Isopropanol

The pump is designed to be used with a variety of solvents. If the pump is not used for several weeks, then solvent residues can damage it. Therefore, we recommend that all components of the pump be flushed, to remove the used solvent completely, and that all pump components and tubing be filled with isopropanol. Close all open connections. Do not remove capillaries and tubing that connect individual components of the pump.

If the module will be stored, then make sure that all tubing and capillaries have been emptied or filled with a wash solution, such as isopropanol. To prevent algae formation, do not use pure water. Close all inlets and outlets with plugs.

1. Fill the syringe with the wash solution and then inject the solution in the capillary at the pump head inlet.
2. Wait for 5 minutes.
3. Flush the module with an appropriate purging solution.
4. Fill the pump head with isopropanol.
5. Loosen the fittings and then disconnect the inlet and outlet tubing.
6. Seal the inlets and outlets with plugs.
7. Pack the power supply cable together with the module.
8. Remove the pump head pistons. Refer to Remove the Pump Head (Binary Pump and LPG Pump) or Remove the Head (Binary Pump+).
9. Disconnect any remaining electrical connections and remove all accessories.

Autosampler Maintenance

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Biohazard. Wear personal protective equipment when handling potentially infectious or toxic substances, such as human samples or reagents, to prevent contact with the skin.

CAUTION: Potential System Damage. Do not lift the autosampler by the front panel.

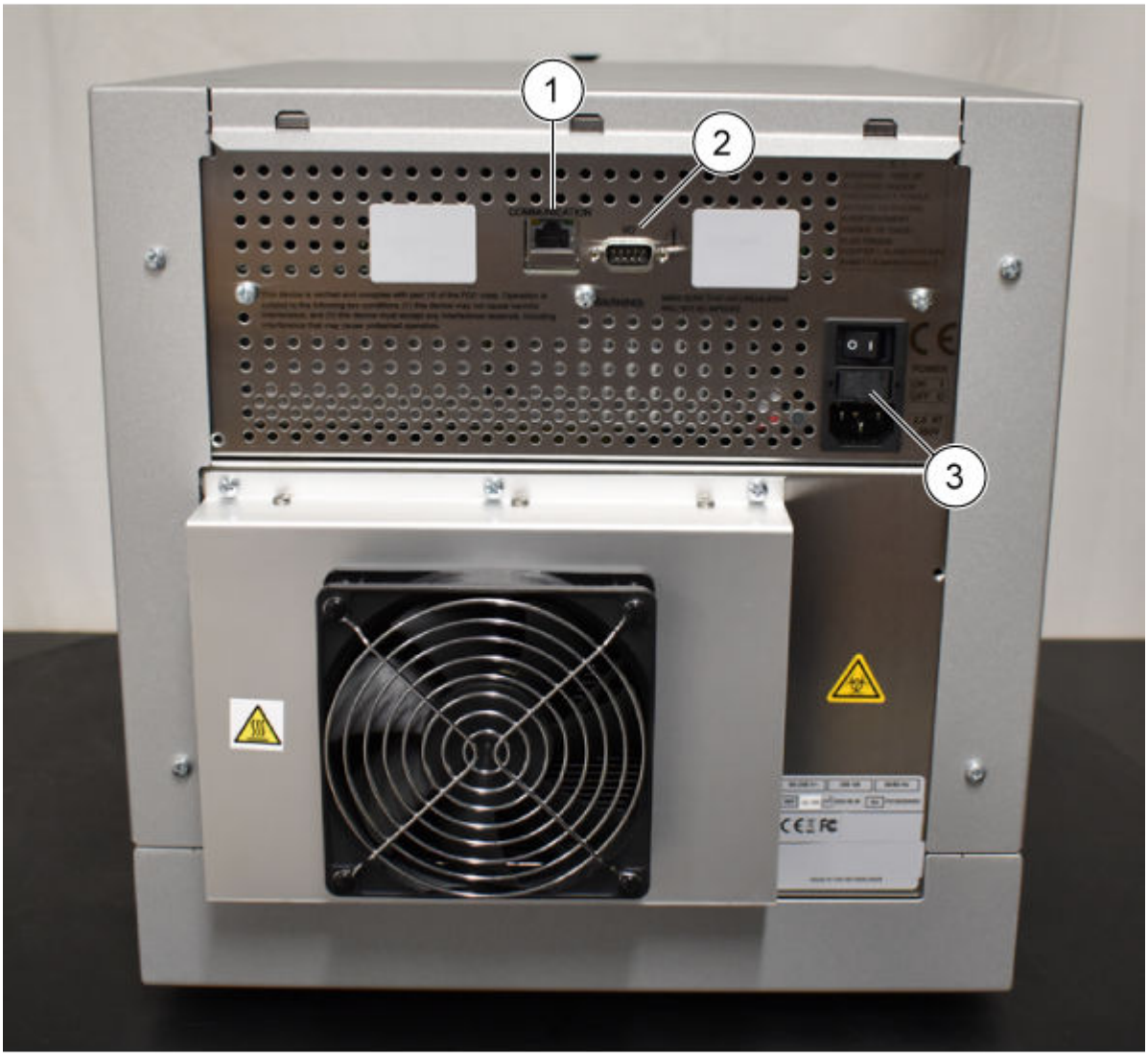
CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

Note: Complete periodic inspections of this module to make sure that it is used safely and to maintain peak performance.

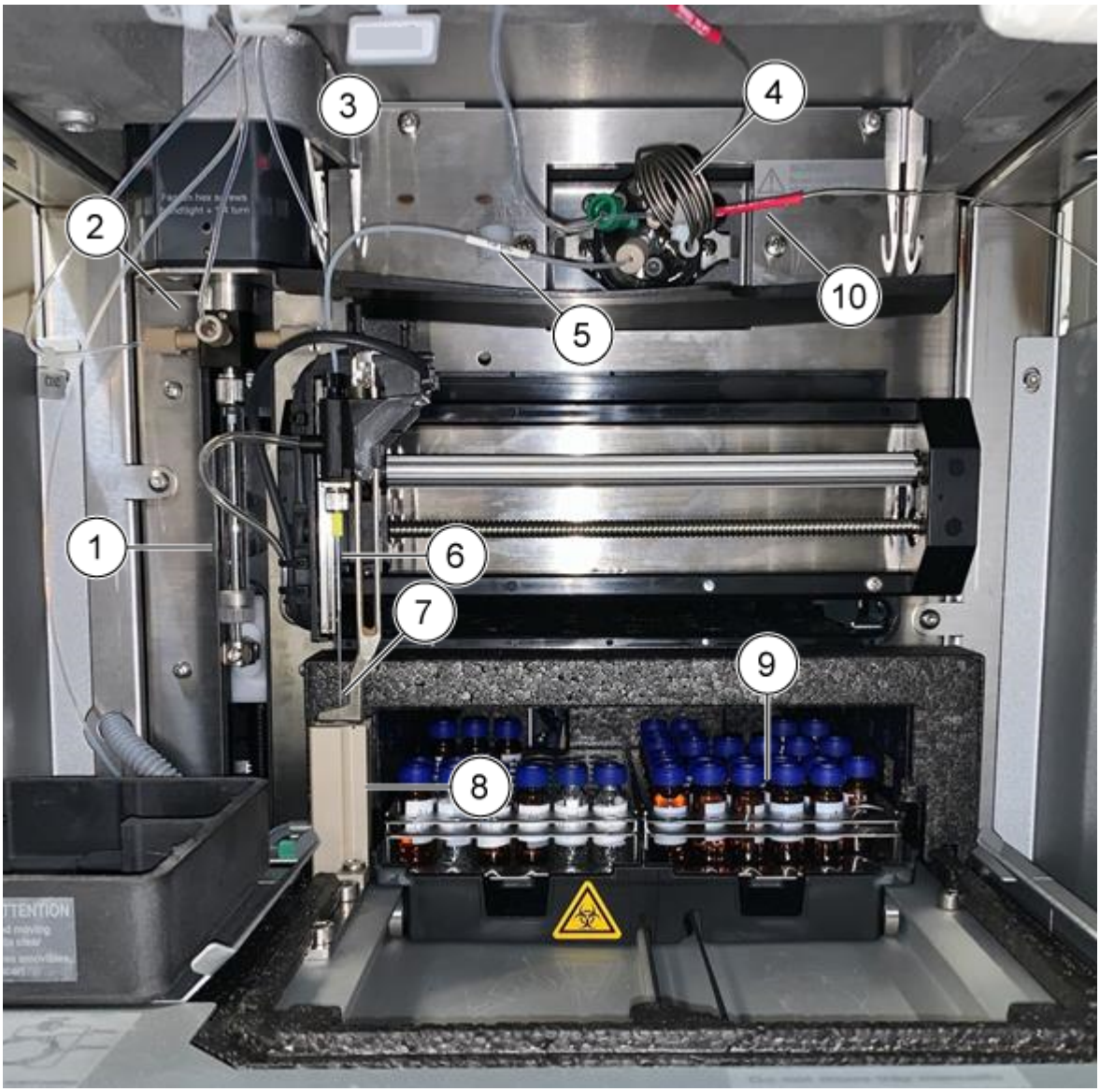
Autosampler Overview

Figure 4-24 Back of the Autosampler



Item	Description
1	Ethernet connector
2	9-pin male connector (input/output)
3	Power switch

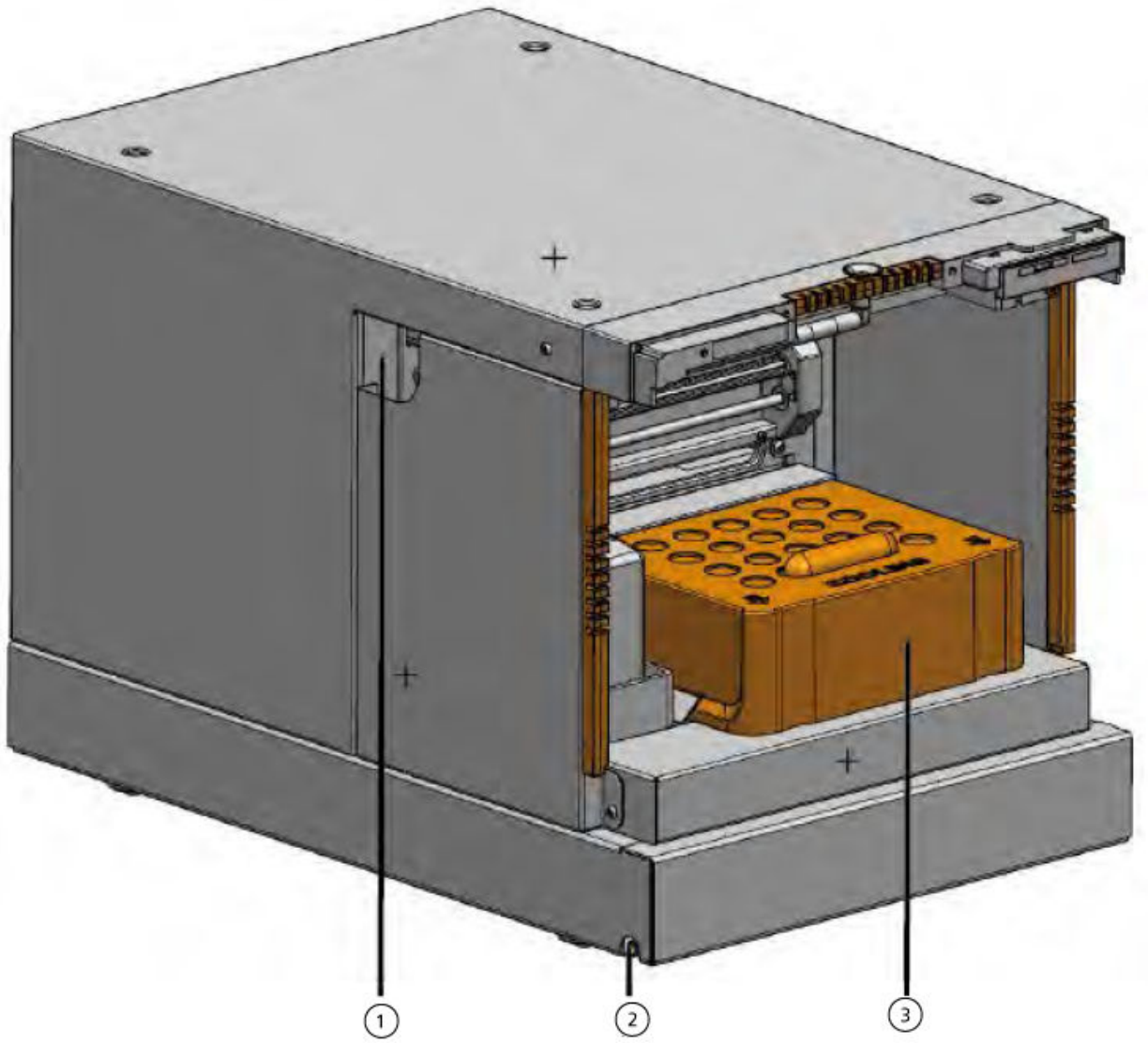
Figure 4-25 Autosampler: Front Cover Removed



Item	Description
1	Syringe
2	Syringe valve
3	Buffer tubing, which connects the sample valve and the syringe valve
4	Injection valve, which contains the sample loop
5	Sample needle tubing

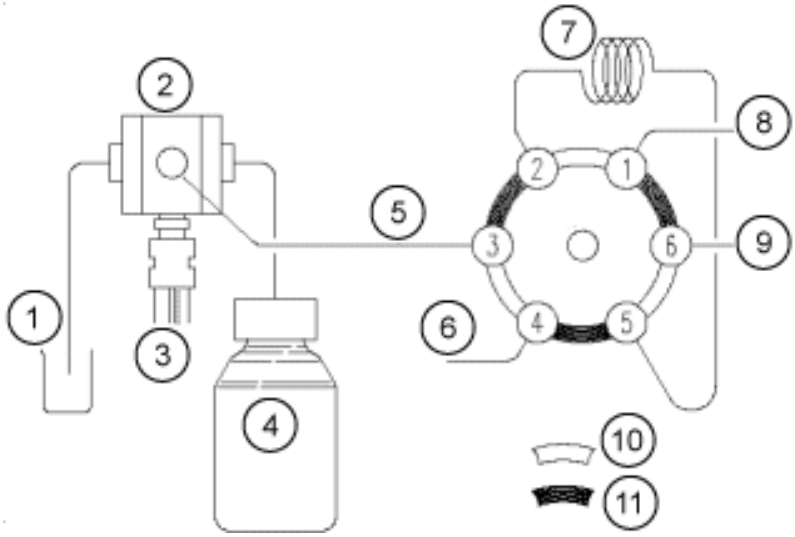
Item	Description
6	Air needle
7	Sample needle
8	Wash station
9	Cooled sample compartment
10	Tubing connected to trap, column, valve, and detector

Figure 4-26 Autosampler: Front Cover Removed



Item	Description
1	Tubing guide
2	Outlet for wash or waste and condensed water or leakage
3	Cooling cover

Figure 4-27 Fluid Connections



Item	Description
1	Wash liquid
2	Syringe valve
3	Syringe
4	Transport bottle
5	Buffer tubing
6	Needle
7	Loop
8	Pump
9	Column
10	Inject position
11	Load position

Replace the Injection Valve

Required Materials
• 3 mm hex key • Phillips screwdriver

1. Remove the front cover from the autosampler.
2. Disconnect the capillaries from the valve.
3. Remove the Philips screws on both sides of the injection valve housing.
4. Remove the injection valve.

Note: Record the position of the pin in the shaft of the removed valve. Make sure that the pin is in the same position when reinstalling the valve.

Figure 4-28 Valve

5. Install the injection valve with ports 6 and 1 facing up.
6. Attach the valve with the screws, tightening the screws alternately, half a turn at a time, until the screws have been fully tightened.
7. Connect the capillaries and sample loop.
8. Complete a wash.

Remove the Stator

Prerequisite Procedures
• Turn off the module. • Disconnect the mains supply cable. • Remove the front cover from the autosampler. • Disconnect the capillaries and the sample loop from the valve.

Required Materials
• 3 mm hex key

1. Remove the three hex screws at the front of the valve. Alternately loosen the screws by half a turn until the tension of the spring assembly is released.
2. Remove the stator.

CAUTION: Potential System Damage. Put the stator on its outer face to prevent damage to the sealing surface of the stator.

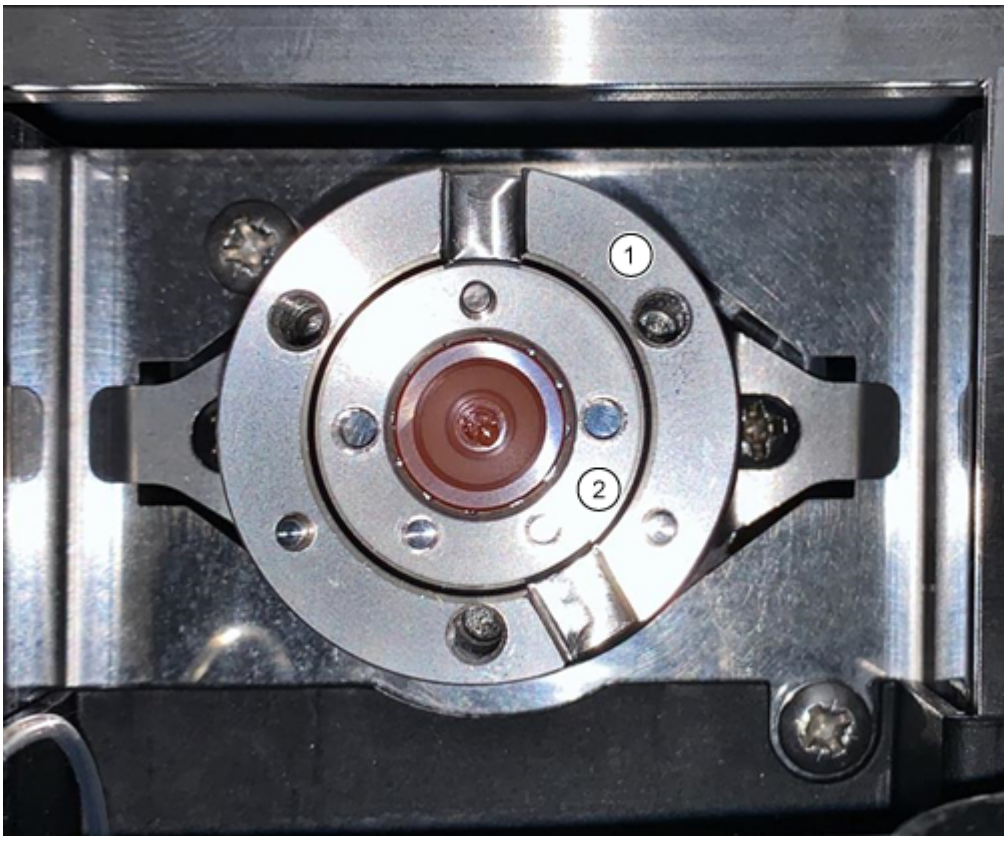
Remove the Rotor Seal

Prerequisite Procedures
• Remove the front cover from the autosampler. • Disconnect the capillaries and the sample loop from the valve.

Required Materials
• 3 mm hex key • Phillips screwdriver

Regularly clean the rotor seal of the injection valve.

Figure 4-29 Valve Components



Item	Description
1	Valve body
2	Rotor seal

1. Remove the three hex screws at the front of the valve. Alternately loosen the screws by half a turn until the tension of the spring assembly is released.
2. Remove the rotor seal from the rotor.
3. Clean the rotor seal by sonicating it in isopropanol for 10 minutes.

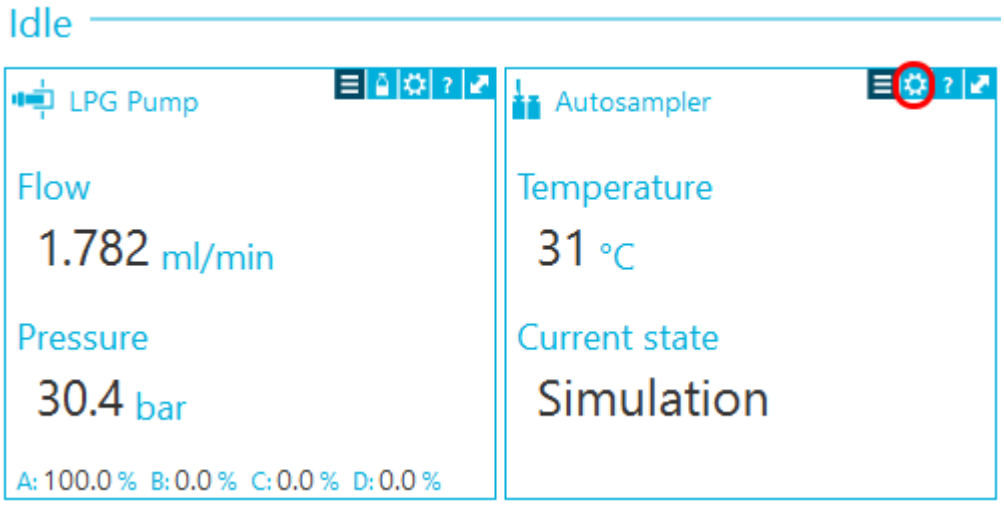
Install the Rotor Seal

1. Install the rotor seal in the valve body.
2. Install the stator on the valve body, and then attach it with the hex screws.
3. Connect the capillaries.
4. Complete a wash.

5. Open the device control dialog in one of the following ways:

   - SCIEX OS: Click **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device ( ) and then click to show the available control options.

   Figure 4-30 Device Control



6. In the Autosampler section, open the Advanced rinse steps dialog by clicking .

Figure 4-31 Needle Rinsing Icon

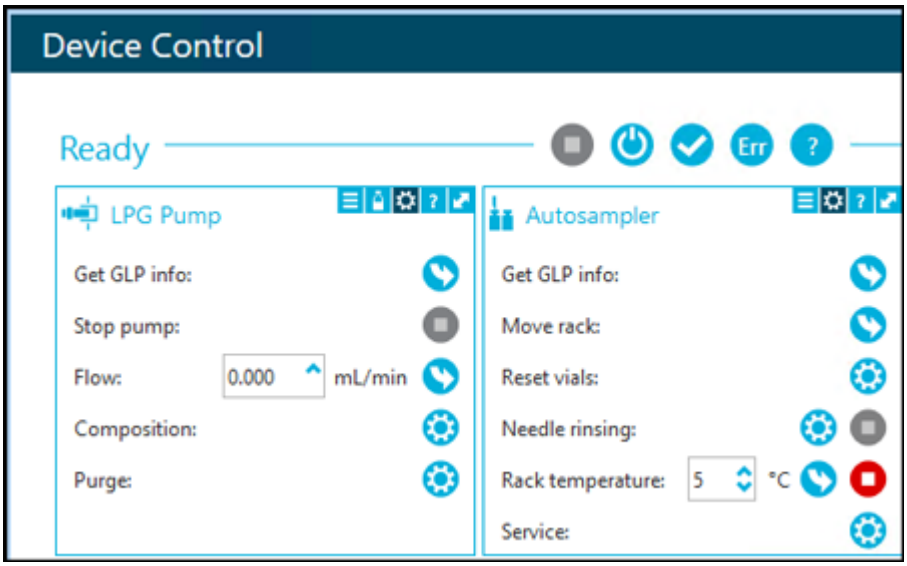
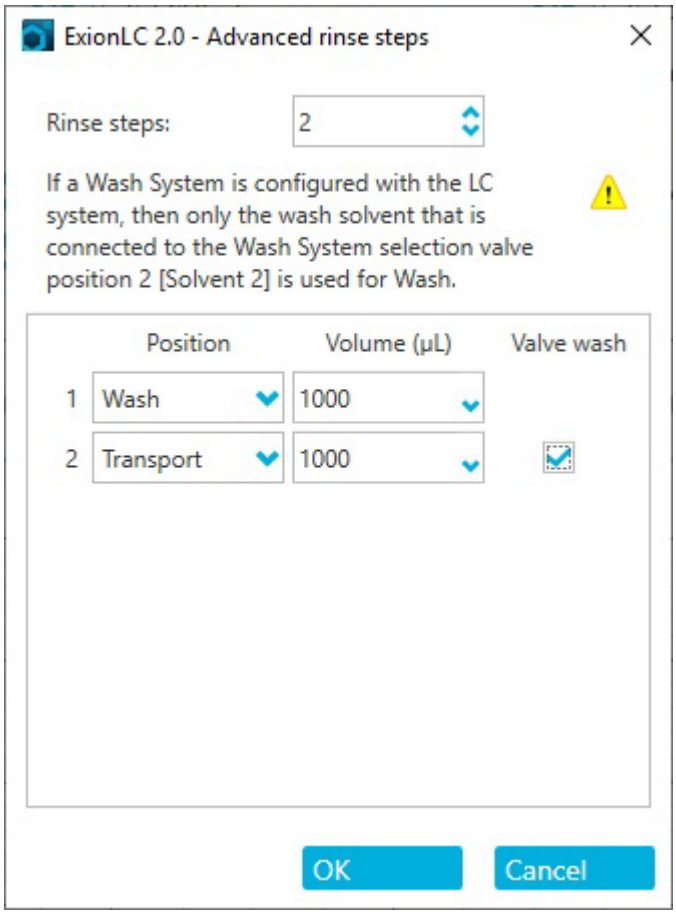


Figure 4-32 Advanced Rinse Steps Dialog



7. In the **Rinse steps** field, click **2**.
8. In row 1, click **Wash**, and then type `1000` µL.
9. In row 2, click **Transport**, and then type 4 × the volume of the installed syringe.
10. In row 2, click the **Valve wash** check box.
11. Click **OK** to flush the system and then wait until the rinse is complete.

Replace the Sample Loop

When replacing the sample loop with a loop with a different volume, make sure to use the appropriate syringe and buffer tubing, and to configure the software appropriately. The physical volume of the sample needle, syringe, and buffer tubing must match the volumes in the software. Refer to the *Software User Guide*.

1. Remove the existing sample loop.
2. Connect the new sample loop to ports 2 and 5 of the injection valve.

3. Flush the sample loop. Refer to Flush the Autosampler with the Transport and Wash Solutions.
4. If required, update the loop volume in the software.

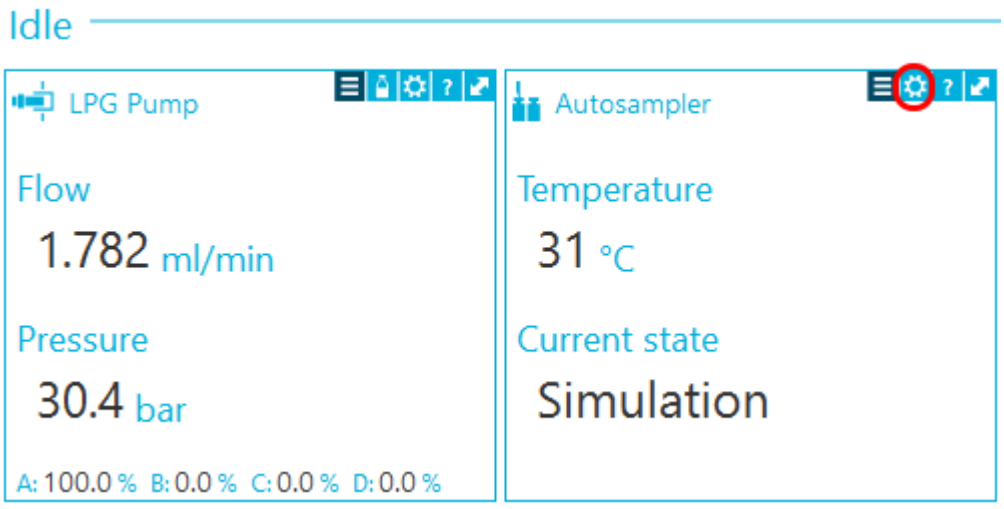
Replace the Sample Needle

When replacing the sample needle with a needle with a different volume, make sure to use the appropriate syringe and capillaries, and to configure the software appropriately. The physical volume of the sample needle, syringe, and buffer tubing must match the volumes in the software.

If sample plates with 12, 48, or 108 sample vials are used, then make sure that the setting for the needle offset (the distance from the needle tip to the bottom of the vial or well) is greater than 2 mm, to prevent the needle from contacting the bottom of the sample vial.

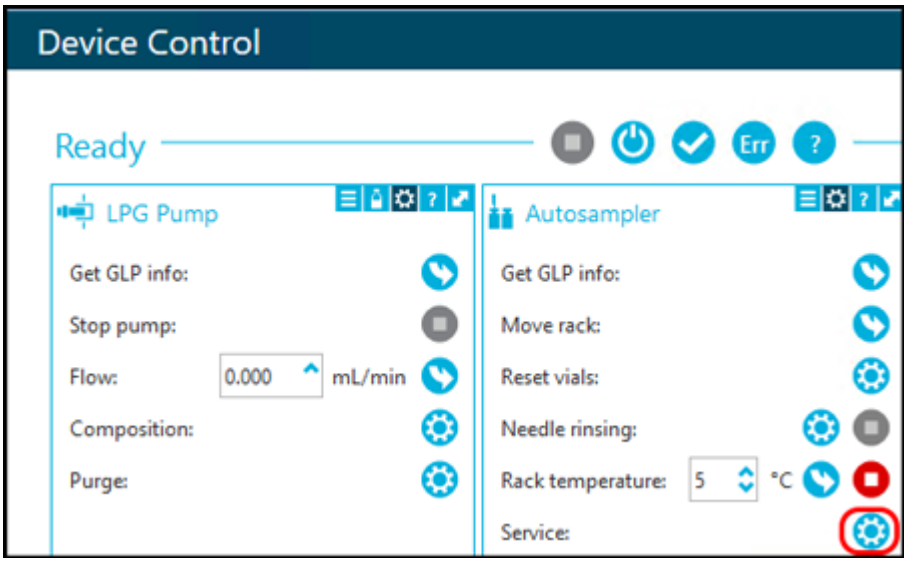
1. Open the device control dialog:
   - SCIEX OS: Click **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device , and then click to show the available control options.

   Figure 4-33 Device Control



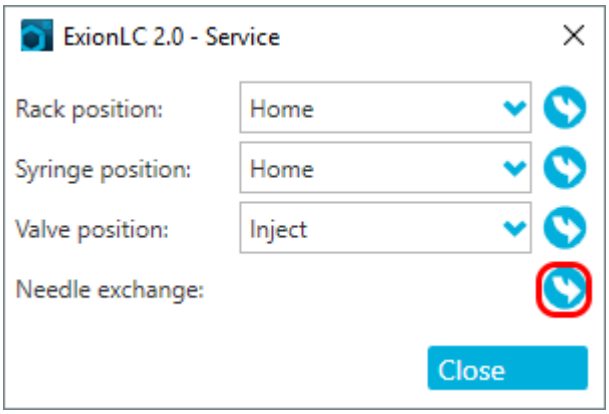
2. In the Autosampler section, click to open the Service dialog.

Figure 4-34 Service Icon



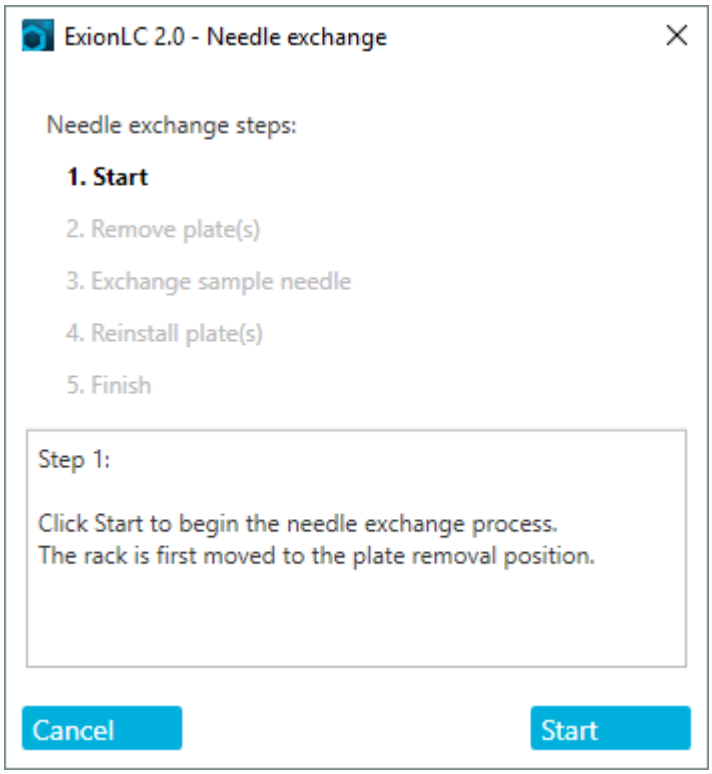
3. Click the (**Needle Exchange**).

Figure 4-35 Needle Exchange Icon



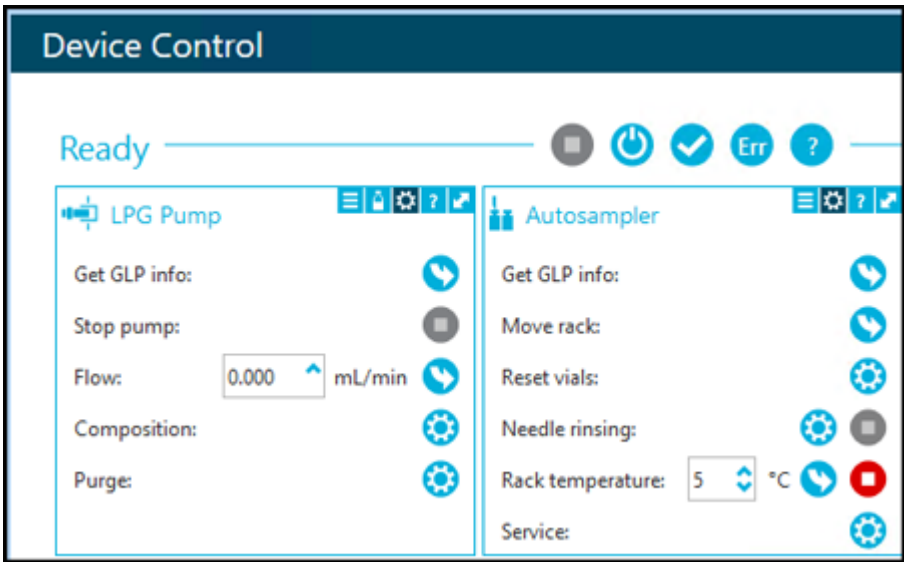
4. Click **Start**, and then follow the onscreen instructions.

Figure 4-36 Needle Exchange Steps



5. Remove the sample plates when prompted by the software.
6. Loosen the air nut.
7. Remove the fitting that attaches the sample needle to the injection valve.
8. Remove the sample needle.
9. Install a new sample needle by pushing the sample needle through the sample needle assembly.
10. Tighten the air nut. Make sure not to cross-thread the nut.
11. Connect the sample needle to port 4 on the injection valve.
12. If necessary, update the sample needle volume in the software.
13. In the Autosampler section, click  to open the Advanced rinse steps dialog.

Figure 4-37 Needle Rinsing Icon



14. In the **Rinse steps** field, click **2**.
15. Type 100 µL for the first wash and then type 4 × the volume of the installed syringe for the second wash.
16. For the second wash, click the **Rinse valve** check box.
17. Click **OK** to flush the system, and then wait until the rinse is complete.

Replace the Air Needle

Prerequisite Procedures
• When replacing the air needle, make sure that the thread of the new height adjustment screw is flush with the lower edge of the retaining nut. • Make sure that the sealing ring is installed in the retaining nut.

1. Remove the sample needle. Refer to step 1 to step 8 in the section: Replace the Sample Needle.
2. Loosen the retaining nut of the air needle, and then pull the needle down together with the air needle.
3. Remove the retaining nut from the height adjustment screw.
4. Install a new air needle with a new height adjustment screw in the retaining nut.
5. Install the retaining nut.

6. Replace the sample needle. Refer to step 9 to step 17 in the section: Replace the Sample Needle.

Remove the Syringe Valve

Prerequisite Procedures
• Remove the front cover.

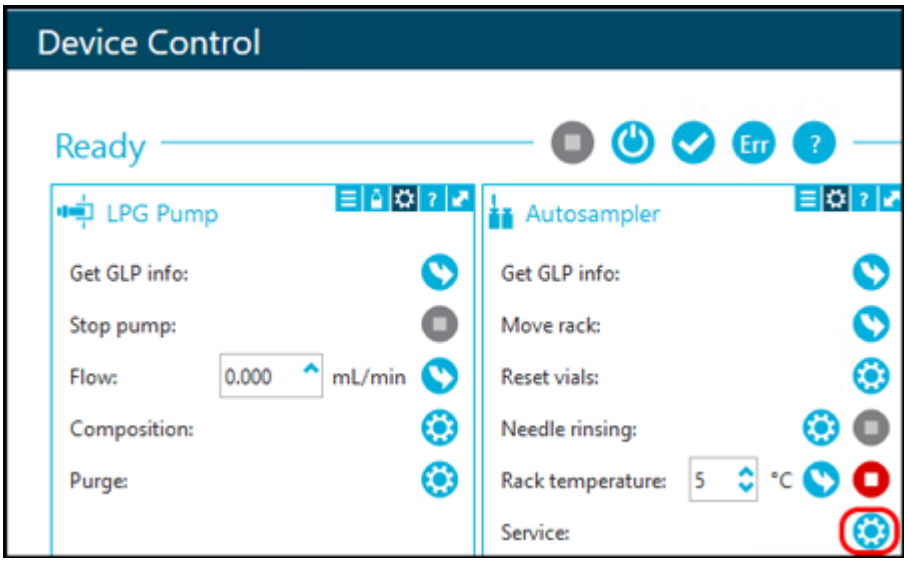
Required Materials
• 2.5 mm hex key • Phillips screwdriver, size 1

The syringe valve is subject to wear and it must be replaced periodically. A worn valve might cause poor system performance.

Note: Put the syringe valve in Wash port 2 position before replacing the syringe valve. In this position, the mounting screws are in line with the holes.

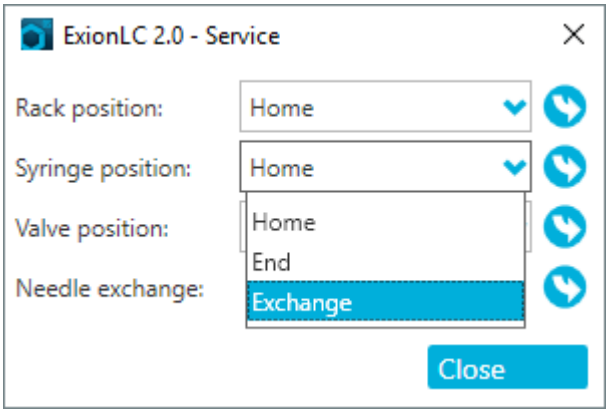
1. Open the device control dialog in one of the following ways:
   - SCIEX OS: Click  **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device ().
2. In the Autosampler section, click  to open the Service dialog.

Figure 4-38 Service Icon



3. From the **Syringe position** list, click **Exchange**.

Figure 4-39 Syringe Position List



The syringe moves half-way down.

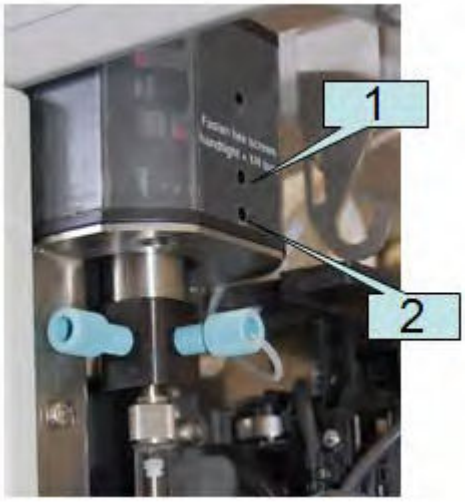
4. Remove the syringe.

WARNING! Toxic Chemical Hazard. Exercise all appropriate safety precautions when working on capillary or tube fittings. Use safety goggles, safety gloves, and protective clothing as described in the safety data sheet (SDS) supplied by the solvent supplier. Solvents might leak.

5. Disconnect all of the tubing from the syringe valve.
6. Loosen the lower socket-head screw (item 2) one full rotation counter-clockwise.

7. Loosen the upper socket head screw (item 1) a full rotation counter-clockwise.

Figure 4-40 Syringe Valve

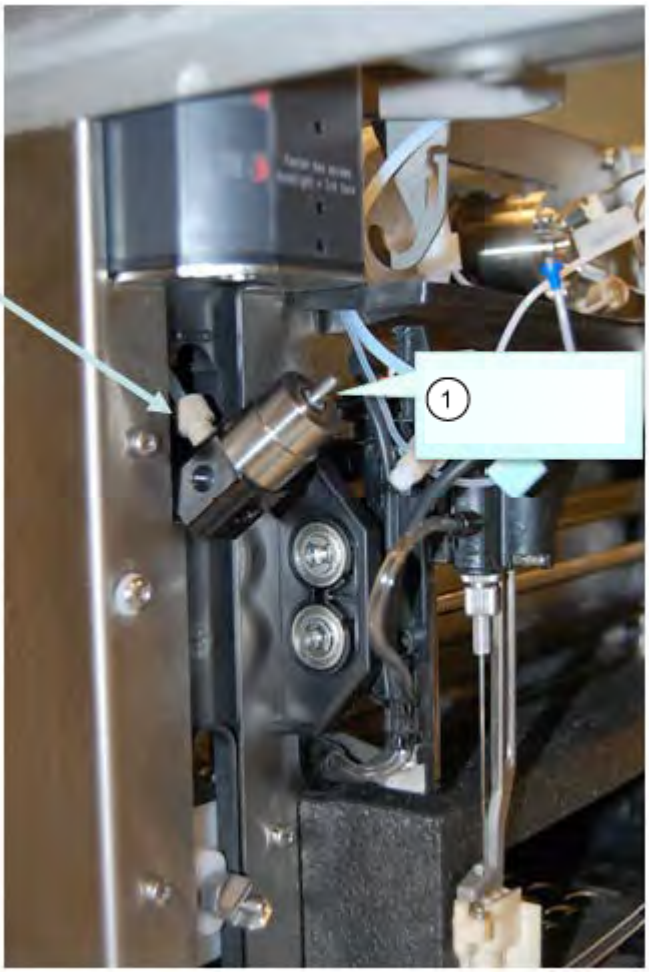


8. Pull the syringe valve down to remove it from the module.
9. Disconnect the waste tubing and then remove the syringe valve.

Tips for Installing the Syringe Valve

1. Connect the waste tubing to the back of the new valve.
2. Install the new syringe valve, making sure that the flat side (item 1) of the valve is facing forward.

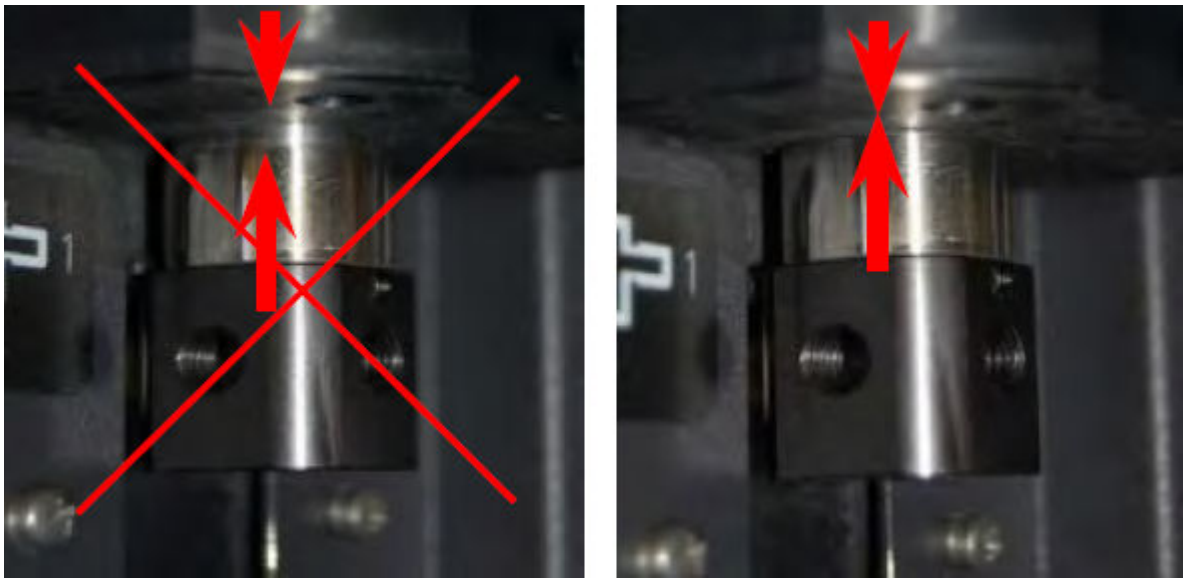
Figure 4-41 Valve



Note: Make sure the that valve is completely up when tightening the two screws.

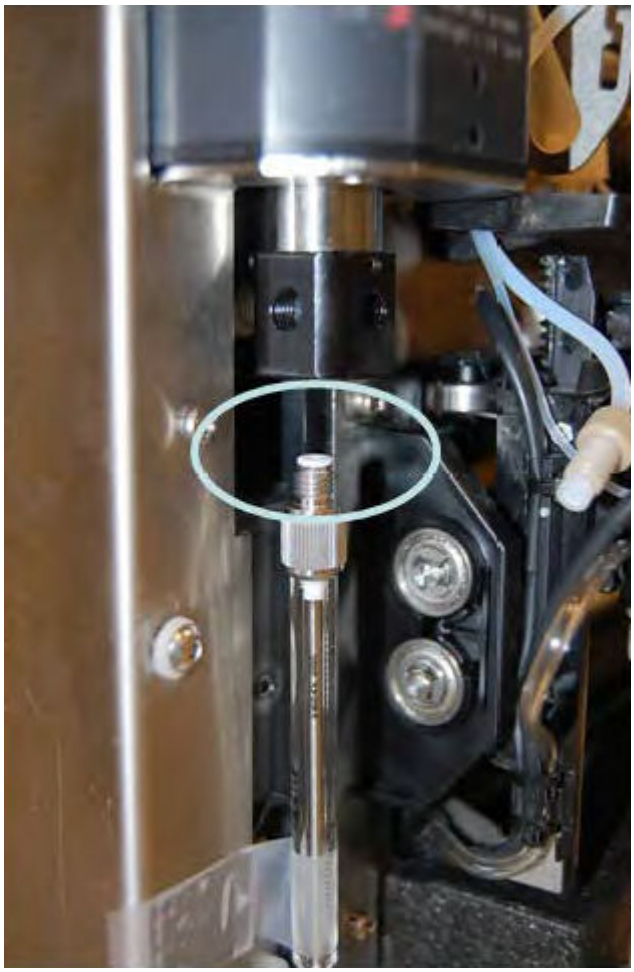
CAUTION: Potential System Damage. Tighten the screws until they are finger-tight, plus 1/4 turn. Overtightening the screws might result in an unrepairable syringe assembly.

Figure 4-42 Valve Installation



3. Install the syringe with a new PTFE seal.

Figure 4-43 PTFE Seal



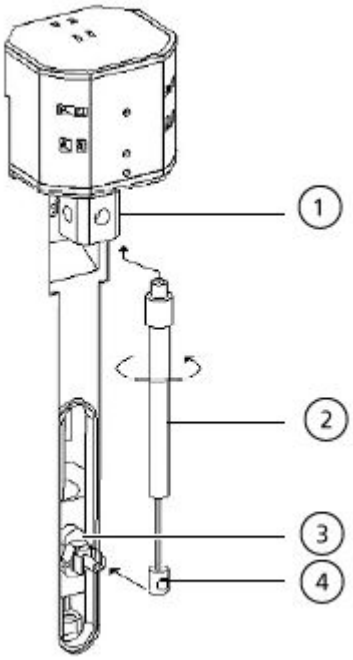
4. Connect all tubing.

Replace the Syringe

Required Materials
• LC-MS-grade wash solution, such as isopropanol, methanol, ethanol, or water.

When replacing the syringe with a syringe with a different volume, make sure to use the appropriate buffer tubing and sample needle, and to configure the software appropriately. The physical volume of the sample needle, syringe, and buffer tubing must match the volumes in the software.

Figure 4-44 Syringe Replacement

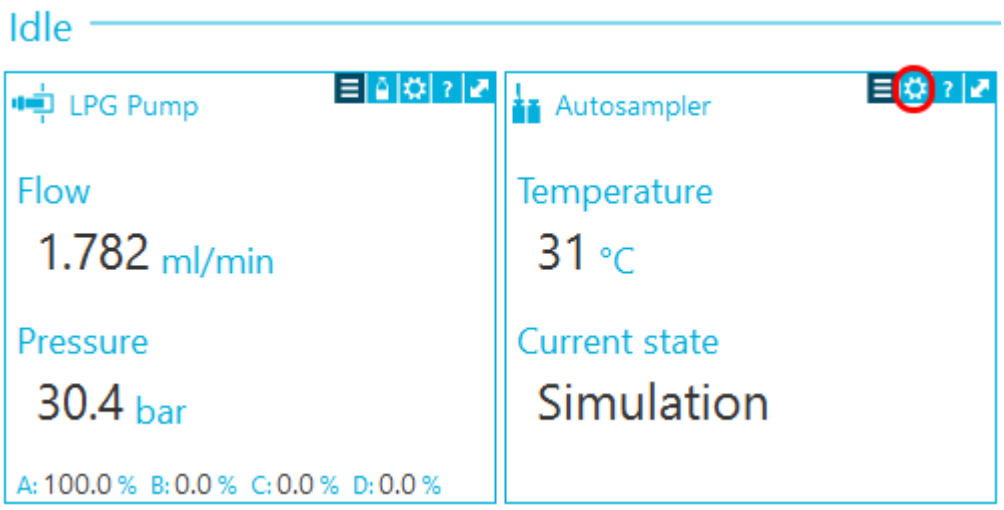


Item	Description
1	Syringe valve
2	Syringe
3	Syringe drive
4	Syringe plunger

1. Open the device control dialog:

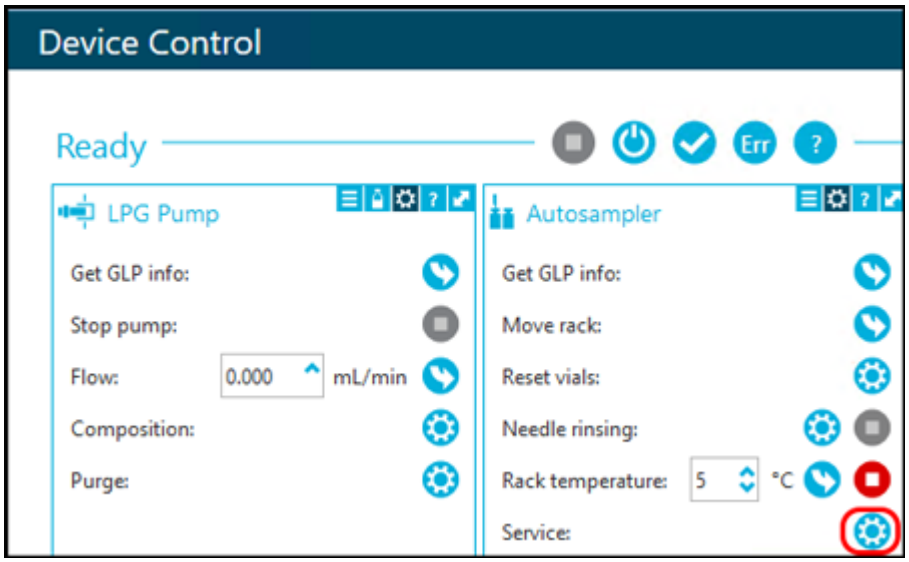
   - SCIEX OS: Click **(Direct device control)**.
   - Analyst software: On the status bar, double-click the icon for the device and then click to show the available control options.

Figure 4-45 Device Control Icon



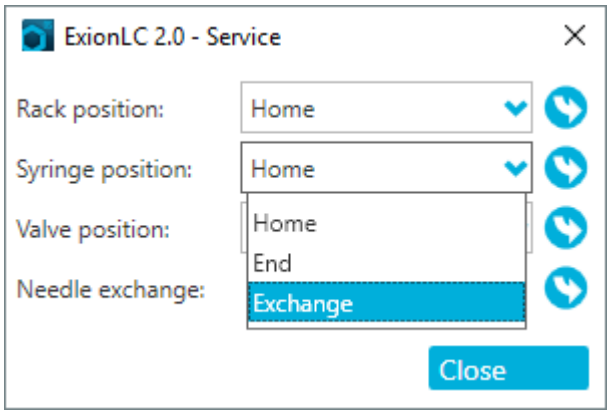
2. In the Autosampler section, click  to open the Service dialog.

Figure 4-46 Service Icon



3. From the **Syringe position** list, click **Exchange**, and then click  .

Figure 4-47 Syringe Position List



The syringe plunger lowers.

4. Turn the syringe clockwise to remove it from the syringe valve. Refer to item 2 in the figure: Figure 4-44.
5. Remove the polytetrafluoroethylene (PTFE) seal.
   The PTFE seal might drop out when the syringe is removed, or it might be stuck inside of the syringe valve. Be careful to not damage the syringe valve when removing the PTFE seal.
6. Pull the plunger base out of the retaining clip.
7. Fill the new syringe with wash solution.
8. Insert the plunger base in the retaining clip.
9. Put the new PTFE seal that came with the new syringe on top of the syringe.
10. Install the syringe in the syringe valve. Attach it by turning it counterclockwise.
11. If required, update the syringe volume in the software.
12. In the **Syringe position** list, click **Home**.
    The contents of the syringe are emptied in the drain tubing.
13. Flush the syringe. Refer to the section: Flush the Autosampler with the Transport and Wash Solutions.

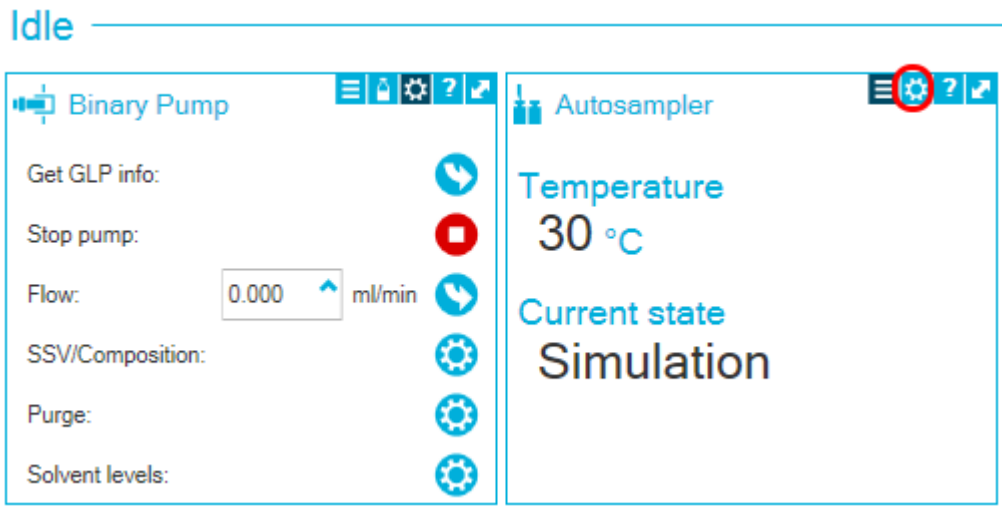
Flush the Autosampler with the Transport and Wash Solutions

Flush the autosampler to make sure that the system performs optimally, especially when analyzing very small samples or analytes of low concentration.

1. Open the device control dialog:

- SCIEX OS: Click **(Direct device control)**.
- Analyst software: On the status bar, double-click the icon for the device and then click in the Autosampler section to show the available control options.

Figure 4-48 Device Control



2. In the Autosampler section, click next to **Needle rinsing** to open the Advanced rinse steps dialog.

Figure 4-49 Needle Rinsing Icon

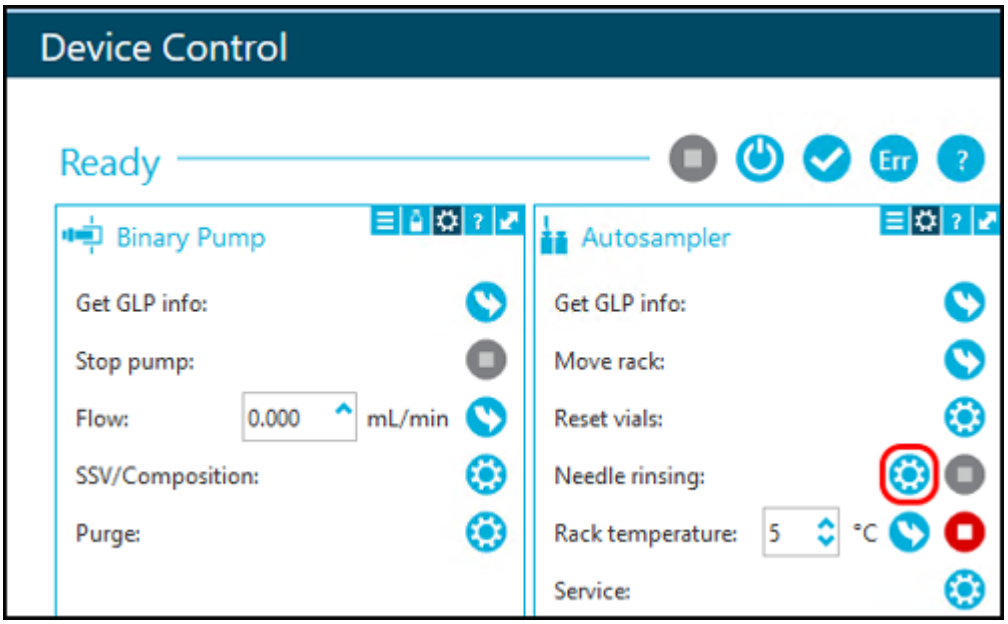
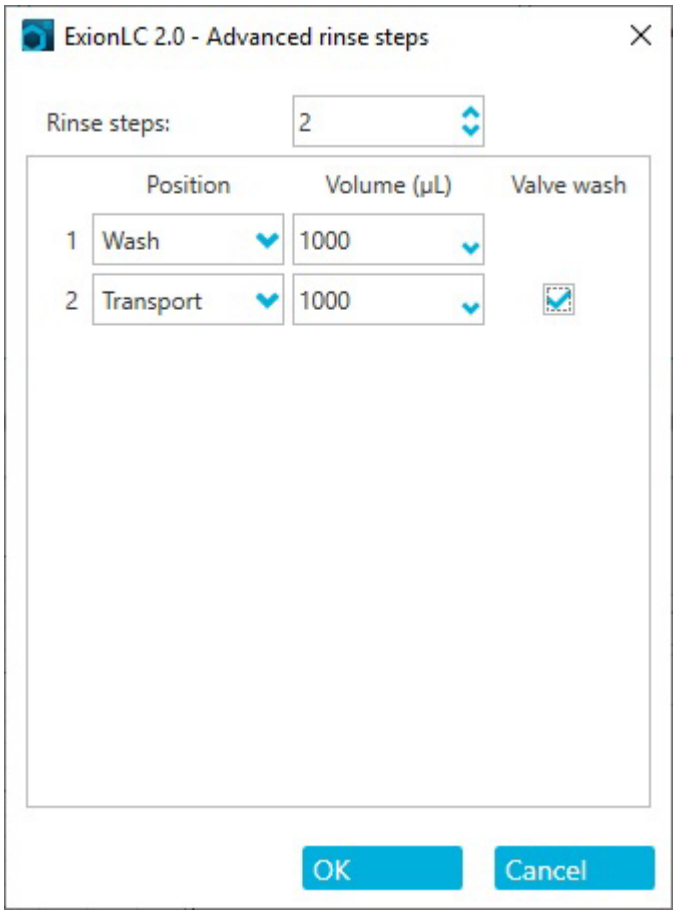


Figure 4-50 Advanced Rinse Steps Dialog



3. In the **Rinse steps** field, click **2**.
4. For step 1, click **Wash**, type `1000` µL, and then clear the **Rinse valve** check box.
5. For step 2, click **Transport**, type `1000` µL, and then click the **Rinse valve** check box.
6. Click **OK** to rinse the system.
7. Repeat step 6 if there is still air in the syringe.
8. Click **Close**, and then close the device control dialog.

Note: Is this procedure does not work, then use one of these alternative methods and repeat the rinse procedure.

- Replace the wash and transport solutions with 100% isopropanol and then repeat the rinse procedure.
- Remove the syringe from the autosampler. Manually fill the syringe with isopropanol, and then reinstall the syringe. Complete the wash as described in the usual procedure.

Replace the Autosampler Fuse

WARNING! Fire Hazard or Electrical Shock Hazard. Before replacing fuses, turn off the system and disconnect it from the mains supply. Replace a fuse only with a fuse of the correct type and rating. Failure to follow these guidelines might result in fire, electric shock, or instrument malfunction.

Prerequisite Procedures
• Turn off the autosampler. • Disconnect the mains supply cable from the mains supply outlet.

Required Materials
• Fuses: 2 × 2.5 A

1. Remove the fuses from the fuse box at the back of the module.
2. Pull the fuse holder out of the compartment.
3. Install the new fuses.
4. Connect the mains supply and then turn on the module.

Store the Autosampler

WARNING! Toxic Chemical Hazard. Wear personal protective equipment (PPE), including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

WARNING! Environmental Hazard. Obey established procedures for disposal of biohazardous, toxic, radioactive, and electronic waste. The customer is responsible for the disposal of hazardous substances, including chemicals, waste oils, and electrical components, in accordance with local laws and regulations.

Required Materials
• Isopropanol

1. Thoroughly flush the system with isopropanol.
2. Disconnect and remove all tubing, except for the sample loop.
3. Turn off the autosampler and then disconnect it from the mains supply.
4. Install the foam block in the rack location.
5. Store the autosampler in the original packaging materials. Refer to the section: Decommissioning and Disposal.

Wash System

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Toxic Chemical Hazard. Before disconnecting parts in the flow line, stop the LC pump and then make sure that the pressure of the mobile phase is decreased to zero.

CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

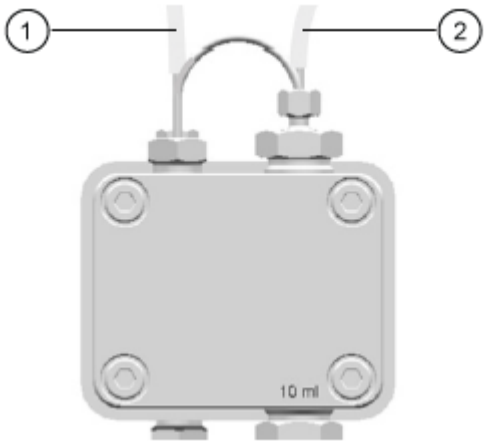
For maintenance procedures for the pump in the ExionLC 2.0 Wash System, refer to the binary pump maintenance procedures in the section: Pump Maintenance.

Flush the Piston Seals

Required Materials
• Water • 80:20 water: isopropanol • Tubing • Syringe

Flush the piston seals regularly to increase the service life of the seal and the piston. Flushing the piston seals washes any contaminants from the backflush space.

Figure 4-51 Backflush Wash



Item	Description
1	Connect to the waste container
2	Connect to the syringe

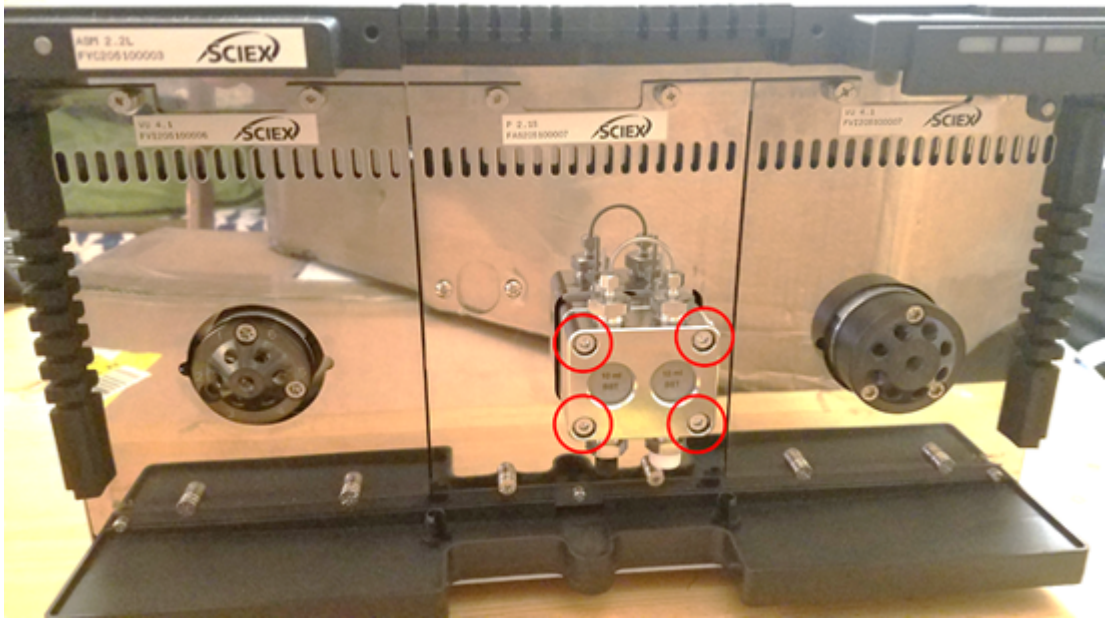
1. Connect the tubing from the outlet to the waste container.
2. Connect the tubing from the inlet to the syringe.
3. Using the syringe, flush the pump head with the flushing liquid until no air bubbles flow through to the waste bottle.
4. Remove the backflush tubing.

Remove the Pump Head

Required Materials
• 3 mm hex key • 80:20 water: isopropanol • Tubing • Syringe

1. Disconnect the inlet and outlet tubing from the pump head.
2. Disconnect the piston seal wash tubing from the pump head.
3. Remove the four 3 mm screws that attach the pump head to the pump drive.

Figure 4-52 Bolts on the Pump Head



4. Carefully pull the pump head away from the pump drive.

Open the Pump Head

Required Materials
• 4 mm hex key

Prerequisite Procedures
• Turn off the Wash System • Remove the Pump Head

Note: Refer to Binary and LPG Pumps for maintenance procedures.

1. Remove the two 4 mm screws.
2. Carefully lift the black backing plate from the valve head.
   The pistons, springs, seals, and other components can now be removed.

Remove the Stator

Prerequisite Procedures
• Turn off the Wash System

Required Materials
• T20 star driver

This procedure applies to both valves.

1. Label and then disconnect all of the tubing.
2. Remove the three T20 star screws.

Figure 4-53 Screws on the Stator

3. Remove the stator from the valve body.

Remove the Rotor Seal

Prerequisite Procedures
• Turn off the Wash System • Remove the Stator

This procedure applies to both valves.

- Carefully remove the rotor seal from the rotor.

Turn off the Wash System

Prerequisites
• The pump has been rinsed. Use isopropanol before a long-term decommissioning or to prepare for storage. • Flush the Piston Seals.

Required Materials
• Isopropanol

1. Stop the flow.
2. Turn off the power switch on the back of the module.

Column Oven Maintenance

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Hot Surface Hazard. Do not open the column oven door if the high temperature lamp is flashing. The internal temperature of the column oven is 60 °C or greater.

CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

Replace the Column Oven Fuse

WARNING! Fire Hazard or Electrical Shock Hazard. Before replacing fuses, turn off the system and disconnect it from the mains supply. Replace a fuse only with a fuse of the correct type and rating. Failure to follow these guidelines might result in fire, electric shock, or instrument malfunction.

Prerequisite Procedures
• Turn off the column oven. • Disconnect the column oven from the mains supply. • Make sure that the back of the module is accessible.

Note: The column oven has a fuse holder on the back of the module, between the power switch and the connector for the mains supply cable. The fuse holder contains two fuses, the operating fuse and a spare fuse.

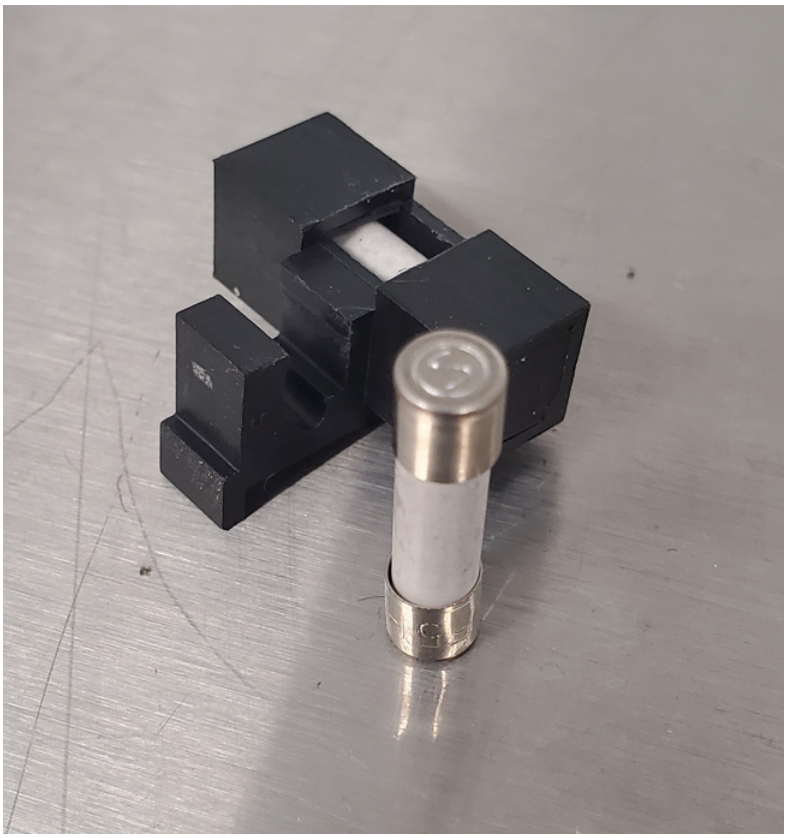
Required Materials
• Small flat-head screwdriver • Replacement fuse

1. From below, insert the head of the screwdriver behind the flap of the fuse holder. Carefully pull the screwdriver up to open the flap. The fuse holder pops slightly out when the flap loosens.

Figure 4-54 Fuse Holder

The fuse holder can only be installed in the correct orientation.

Figure 4-55 Fuse and Fuse Holder



2. Pull the fuse holder out of the compartment.
3. Remove the old fuse.
4. Install the new fuse.
5. Install the fuse holder in the compartment and then close the flap.
6. Connect the mains supply cable and then turn on the module.

Detector Maintenance

WARNING! Electrical Shock Hazard. Do not operate the module without the covers installed. Follow all electrical safe work practices.

WARNING! Personal Injury Hazard. To prevent injury to the eyes, do not look directly into the operating lamp. UV-Lamp RG3 (risk group 3 – IEC TR 62471–2)

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

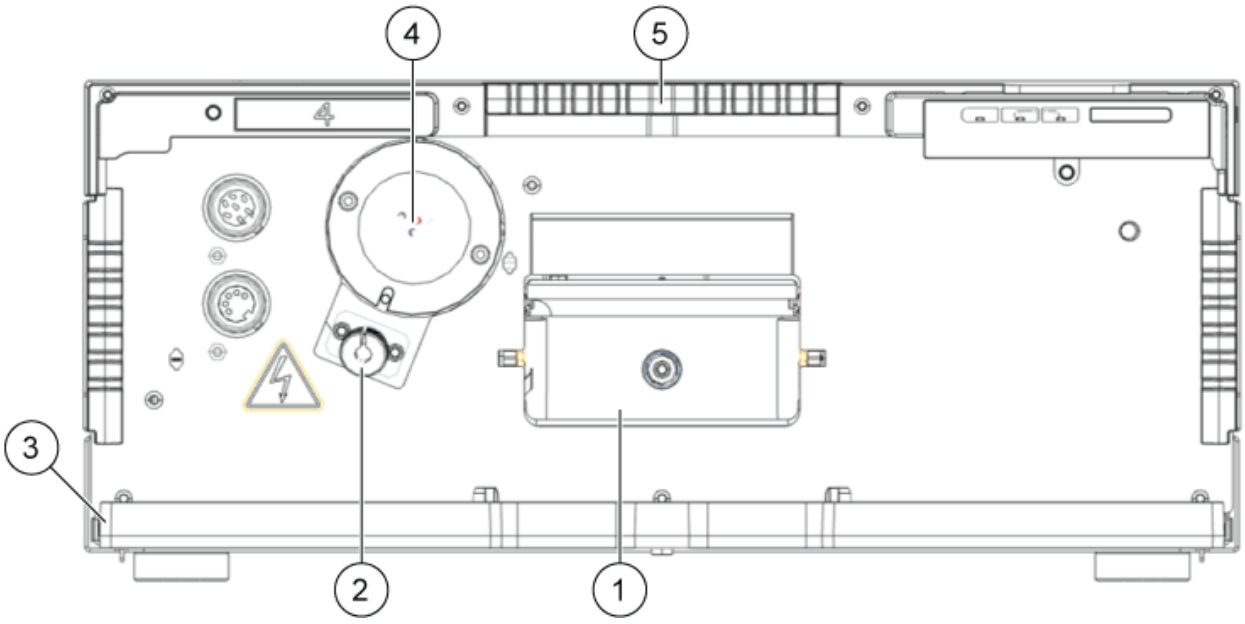
WARNING! Hot Surface Hazard. Turn off the lamp and allow it to cool for at least 15 minutes before turning off the module and disconnecting it from the mains supply.

WARNING! Biohazard. Wear personal protective equipment when handling potentially infectious or toxic substances, such as human samples or reagents, to prevent contact with the skin.

CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

Figure 4-56 Front of the Detector



Item	Description
1	Flow cell

Item	Description
2	Halogen lamp
3	Leak tray
4	Deuterium lamp
5	Capillary holder

Clean the Flow Cell

WARNING! Eye Injury Hazard. Always turn off the detector or the lamps before installing the flow cell. High-energy UV light can leak from the flow cell, causing retinal irritation.

CAUTION: Potential System Damage. Do not touch the fiber optic ends. Touching the ends might deposit skin residue and drastically impair the performance of the flow cell and detector. To diagnose this issue, generate an intensity spectrum using the software. Dirty fiber optic ends result in little or no UV light.

Increased baseline noise and reduced sensitivity can be the result of a dirty flow cell. Often rinsing the flow cell restores optimal sensitivity. The following solvents are recommended for rinsing:

- 1 M HCl
- 1 M NaOH, aqueous
- Ethanol
- Acetone

Note: If acetonitrile or mixtures that contains acetonitrile are used as mobile phase with the flow cells, then clean the flow cell at regular intervals to maintain the performance of the cell. Remove the installed column and then flush the flow cell with pure methanol at 1 mL/min for approximately 15 minutes every two weeks.

Required Materials
• Syringe • LC-MS-grade water

Note:

- Do not contaminate the flow cell with oil drops.
- Do not use compressed air for drying.

1. Fill the syringe with water.
2. Inject the water in the inlet of the flow cell.
3. Wait for 5 minutes.
4. Repeatedly flush with a syringe and water until it is clean.
5. Remove the flow cell from the detector.
6. Dry the flow cell with a nitrogen stream.

Advanced Cleaning

WARNING! Toxic Chemical Hazard. Use a fume hood when pouring solvents or evaporating solvents. Refer to the chemical product safety data sheets and follow all of the recommended safety procedures when handling, storing, and disposing of chemicals.

WARNING! Toxic Chemical Hazard. Wear personal protective equipment (PPE), including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

WARNING! Toxic Chemical Hazard. Make sure that a water supply, such as a wash basin, is available. If solvent gets in the eyes or on the skin, then flush it away immediately.

Prerequisite Procedures
• Prepare the required cleaning solutions. • Install the Flow Cell in the Optional Detector.

Required Materials
All chemical reagents should be LC-MS-grade. • 0.5 M potassium hydroxide in 100% ethanol. After thorough mixing, the solution should be filtered through a 20 µm pore size filter. (Solution A) • 100% methanol (Solution B) • Water (Solution C) • Two syringes with appropriate volumes (about 10 mL) or a peristaltic pump

Advanced Cleaning Using the Syringes

1. Disconnect the capillaries from the flow cell.
2. Fill one syringe with 0.5 M potassium hydroxide in ethanol (Solution A).
3. Connect the syringes to the liquid ports of the flow cell.
4. Introduce Solution A to the flow cell.
5. Flush Solution A back and forth between the syringes 10 to 12 times.
6. Repeat step 2 to step 5 using Solution B and then Solution C until flow cell performance stops improving noticeably.
   Identify the point where subsequent cleaning cycles no longer improve the performance of the flow cell.
7. Flush the flow cell with water for at least 15 minutes to completely remove all cleaning solutions and all persistent residues that might affect flow cell performance or stability.
8. Flush the flow cell with the solution to be used in the next application.
   The application can now be started.

Flow Cell Cleaning Protocol

To extend the life of the flow cells, clean them at regular intervals. When using solvents that contain acetonitrile, clean the flow cells every two weeks.

Prepare the Cleaning Solution

Required Materials
• Potassium hydroxide (pellets) • Hydrogen peroxide solution (30%) • LC-MS-grade water

WARNING! Toxic Chemical Hazard. Use a fume hood when pouring solvents or evaporating solvents. Refer to the chemical product safety data sheets and follow all of the recommended safety procedures when handling, storing, and disposing of chemicals.

WARNING! Toxic Chemical Hazard. Wear personal protective equipment (PPE), including a laboratory coat, gloves, and safety glasses, to avoid skin or eye exposure.

WARNING! Toxic Chemical Hazard. Make sure that a water supply, such as a wash basin, is available. If solvent gets in the eyes or on the skin, then flush it away immediately.

For optimum performance, always prepare the cleaning solution just before use.

1. Stirring carefully, dissolve 5.7 g of potassium hydroxide in 10 mL of water over heat.
2. Stirring carefully, slowly add 6 mL of hydrogen peroxide solution.
3. Add 10 mL of water and mix.

Clean the Flow Cell (Maintenance Cleaning)

Prerequisite Procedures
• If the flow cell contains residues of organic solvents, then rinse it with water first before cleaning with the cleaning solution.

Required Materials
• Cleaning solution. Refer to Prepare the Cleaning Solution. • A syringe with a luer lock adapter for UNF 10/32 threading (Volume: at least 5 mL). • Drain tubing and waste container. • Plugs (2).

1. Fill a syringe with a luer lock adapter with at least 5 mL of the cleaning solution, and then connect it to the inlet port on the flow cell.
2. Connect the drain tubing from the outlet port on the flow cell to a waste container.
3. Slowly and carefully flush the flow cell with the cleaning solution.
4. Disconnect the drain tubing from the flow cell and then close the port with a plug.
5. Remove the syringe from the inlet port and then close it with a plug.

6. Leave the cleaning solution in the flow cell for at least 2 hours.

   Note: For a more thorough cleaning, let the cleaning solution work for at least 12 hours.

7. Remove the plugs, fill a luer lock syringe with at least 5 mL of water and then connect the syringe to the inlet port.
8. Connect the drain tubing from the outlet port to the waste container.
9. Slowly and carefully flush the flow cell with water.
10. Install the flow cell in the system and then flush it with water for 15 minutes at a flow rate of 1 mL/min.
11. Make sure that the light intensity at 220 nm is at least 3500 ADC counts.
12. If necessary, repeat steps 2 to 11.

Replace the Flow Cell

WARNING! Eye Injury Hazard. Always turn off the detector or the lamps before installing the flow cell. High-energy UV light can leak from the flow cell, causing retinal irritation.

Prerequisite Procedures
• Disconnect the capillaries. • Turn off the detector.

Over time, exposure to UV light causes the flow cells to solarize, making them unsuitable for use. We recommend replacing the flow cell after about 6,000 operating hours.

1. Disconnect the tubing from the flow cell.
2. Push the release lever down.
3. Pull out the flow cell.
4. Remove the covers from the optical ports on the side of the new flow cell
5. Install the new flow cell, pushing until it locks in place.
6. Connect the capillaries.

Replace the Lamps

WARNING! Electrical Shock Hazard. Disconnect the module from the mains supply before changing the lamps. Verify the status of the lamps in the software and on the LEDs. High voltages inside the detector pose a life threatening risk.

WARNING! Hot Surface Hazard. Turn off the lamp and allow it to cool for at least 15 minutes before turning off the module and disconnecting it from the mains supply.

CAUTION: Potential System Damage. To avoid damage to the lamp, and inaccurate results, follow these guidelines:

- **Wear gloves. Do not touch the glass body with bare hands.**
- **Use a clean, soft cloth for cleaning.**

Prerequisite Proceduress
• Turn off the detector. • Wait for the lamp to cool.

Required Materials
• 2.5 mm hex key

Replace the lamp if it malfunctions or if its intensity is low.

Note: If the module is in operation, then the integrated security switch turns off the lamp automatically when the lamp cover is opened. An error message is shown, the red LED illuminates, and the center LED does not illuminate.

Note: After installing a new deuterium lamp in the detector, allow the lamp a running-in time of approximately 24 hours.

Table 4-4 Recommended Lamp Operating Time

Module	Lamp	Recommended Operating Time
All	Deuterium	2,000 hours

Table 4-4 Recommended Lamp Operating Time (continued)

Module	Lamp	Recommended Operating Time
ExionLC 2.0 Diode Array Detector HS	Halogen	1,000 hours

1. Loosen the screws on the lamp cover, and then remove the cover.
2. Loosen the lock ring on the lamp cable, and then pull out the cable.
3. Loosen the two 2.5 mm hex screws on the lamp socket, and then remove the lamp.
4. Hold the new lamp at the lamp socket, and then put the glass body in the lamp pod.

Tip! Insert the halogen lamp at a slight angle.

Note: The bolt for the deuterium lamp is in a notch in the lamp socket.

5. Tighten the two 2.5 mm hex screws on the lamp socket.
6. Connect the lamp cable, and then tighten the lock ring.
7. Install the lamp cover, and then attach it with the screws.
8. Turn on the module.

Note: To clean the lamp, use a lint-free cloth and isopropanol.

Valve Drive Maintenance

WARNING! Fire Hazard or Electrical Shock Hazard. Always turn off the power and then disconnect the system from the mains supply before doing inspection and maintenance. Otherwise, fire, electric shock, or a malfunction might occur.

WARNING! Biohazard. Wear personal protective equipment when handling potentially infectious or toxic substances, such as human samples or reagents, to prevent contact with the skin.

CAUTION: Potential System Damage. Do not let spilled water stay on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces. Doing so can cause rusting and discoloration.

CAUTION: Potential System Damage. Only use the replacement parts specified in the documentation that comes with the system. Use of any other parts might result in instrument damage and malfunction.

Replace the Rotor Seal and Stator on the Valve Drive

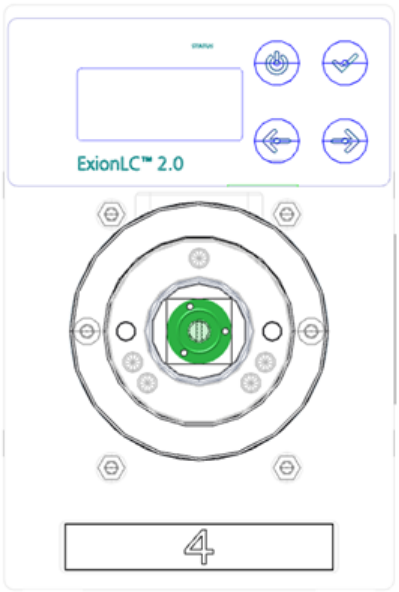
Required Materials
• T20 star driver

1. To remove the stator, carefully loosen the screws alternately by half a turn until the tension of the spring assembly is released.

Figure 4-57 Stator

2. Remove the stator from the valve body.
3. Remove the rotor seal.

Figure 4-58 Rotor Seal



Update the Rotor Seal Replacement Record

Prerequisite Procedures
• Remove the Rotor Seal.

This procedure is applicable to the valve in the valve drive.

After the start screen opens, the message `<REPLACE SEAL!>` is shown.

1. Press any key to dismiss the message.
   The main screen is shown. An indicator in the upper left corner indicates that the rotor seal must be exchanged.
2. To open the Seals Count screen, click **Main Display** > **Valve GLP** > **Seals count**.
3. Press and hold **Select** () for three seconds.
   The `<Set new seal?>` message is shown.
4. Press **Confirm** ().

Tip! To cancel the process and return to the Total Cycles screen, press any key.

The Seals Count screen is shown.

Clean Leak Trays

Prerequisite Procedures
• If liquid is inside of the device, then disconnect the mains supply cable of the device from the mains supply outlet.

Required Materials
• Cloth

If the leak tray is filled with liquid, or if liquid is inside of the device, then examine for and repair the leak.

1. Stop the leak.
2. Dry the tray.
3. Clear any error messages.

Storage and Handling

WARNING! Environmental Hazard. Do not discard system components in municipal waste. To discard components correctly, obey local regulations.

The environmental requirements for the storage and transport of the ExionLC 2.0 system are as follows:

- Altitude not exceeding 1,828 m (6,000 feet) above sea level.
- An ambient temperature of 4 °C to 35 °C (39.2 °F to 95 °F).

  The rate of temperature change must not exceed 2 °C (3.6 °F) per hour. Ambient temperature fluctuations exceeding these limits will result in higher signal drift and an inconsistent baseline signal from the detector.

  For ambient temperatures between 4 °C and 30 °C, a non-condensing relative humidity of between 20% and 85% is required.

  For ambient temperatures between 30 °C and 35 °C, a non-condensing relative humidity of between 20% and 70% is required.

Note: Do not install the system adjacent to heaters or cooling ducts, or in direct sunlight.

Troubleshooting 5

If an issue cannot be resolved by the corrective actions in this section, or if a symptom is not included in the tables in this section, then contact a SCIEX representative.

To avoid some fault conditions, if required, change the duration for each applicable module in the method. The preset run time for ExionLC 2.0 systems is 10 minutes.

LAN Troubleshooting

If the computer does not communicate with the modules then do these steps. After each step determine whether the issue is resolved before proceeding.

1. Examine all connections:
   - Are the patch cables connected to the LAN ports and not the WAN port?
   - Are all of the modules connected correctly to the Ethernet switch?
   - Are the cables securely connected?
2. Confirm that the computer can communicate with the modules by following these steps.
   a. Open the Direct Control window in one of the following ways:
      - SCIEX OS: Click  **(Direct device control)**.
      - Analyst software: On the status bar, double-click the icon for the device ().
   b. In the Direct Control window, click **Initialize**.
   c. View the status of the LAN connection in the Windows task bar.
      If communication cannot be established between the computer and the modules, then continue with the following steps.
3. Make sure that the Ethernet switch is turned on.
4. Make sure that the patch cable between the Ethernet switch and the computer is correctly connected.
5. If the Ethernet switch is integrated in a company network, then disconnect the patch cable from the WAN port. Can the modules communicate with the computer, even though the Ethernet switch is disconnected from the company network?
6. Restart the modules and the computer:
   a. Turn off all of the modules, the Ethernet switch, and the computer.

b. Turn on the Ethernet switch and wait until it has successfully completed its self-test.

c. Then turn on the modules and the computer.

7. Replace the patch cable for the module with which a connection could not be established.

8. Make sure that the IP port of the module matches the port configured in the software.
If the issue cannot be resolved, then contact sciex.com/request-support.

Autosampler

Table 5-1 Autosampler: Analytical Errors

Possible Cause	Corrective Action
Analytical Errors	• Make sure that the application has run previously without errors and that no changes have been made to the analytical system since the last successful run. • Determine whether the fault is caused by the autosampler or other modules in the system.
Errors in the injection and method configuration have resulted in wear.	• Examine the autosampler for wear, especially wear to the rotor seal and syringe.
The volumes of the sample loop, buffer tubing, and syringe are incompatible.	• Install a sample loop, buffer tubing, and syringe with compatible volumes. • Make sure that the software settings for the syringe, buffer tubing, and sample needle match the volumes of the physically installed parts.
Environmental conditions do not meet the requirements.	• Make sure that the laboratory conditions meets the requirements in the document: *Site Planning Guide*.
Light levels are too high for light-sensitive samples.	• Make sure that light exposure levels are appropriate.

Table 5-2 Autosampler: Poor Reproducibility

Possible Cause	Corrective Action
There is air in the flow path.	• Initialize the autosampler.
The syringe is leaking.	• If the syringe is leaking at the top, then make sure that it has been installed correctly, including the PTFE seal. • If the syringe is leaking at the bottom, then replace it.

Table 5-2 Autosampler: Poor Reproducibility (continued)

Possible Cause	Corrective Action
The syringe valve is leaking.	• Replace the syringe valve. • Examine the valve and then contact sciex.com/request-support.
The rotor seal is worn.	• Replace the rotor seal, and then examine the stator of the valve.
Capillary connections contain dead volume.	• Install new fittings on the capillary connections.

Table 5-3 Autosampler: Excessively Large Peak for a Blank Sample

Possible Cause	Corrective Action
There are issues with solubility of the sample.	• Either adjust the sample or accept carryover.
Interaction between the blank sample and hardware is incorrect.	• Flush the needle, inside and outside, or install a different type of needle (steel, PEEK, or glass-coated). • Replace the rotor seal with a seal made of a different material. • Replace the tubing and fittings between the autosampler and the columns or use a different type of tubing (steel or PEEK) or wash solution.
A blank sample is contaminated.	• Use a new blank sample.
The cause is unknown.	• Try to resolve the issue by using different solvents and liquids.

Table 5-4 Autosampler: No Injection

Possible Cause	Corrective Action
The flow path is blocked.	• Disconnect the fitting of the needle from the injection valve. • Start flushing the system. • If solvent flows out at the free port (port 4), then examine the needle. • If no solvent flows out at the free port (port 4), then disconnect the buffer tubing from the injection valve (port 3). • Start flushing the system. • If solvent flows out at the open end of the buffer tubing, then examine the rotor seal and stator. • If no solvent flows out of the open end of the buffer tubing, then disconnect it from the syringe valve. • Start flushing the system. • If solvent flows out of syringe valve, then examine the buffer tubing and replace it if required. • If no solvent flows out of the syringe valve, then examine the connections of the flow path to determine whether they are too tight and examine the syringe valve.
A valve is leaking.	• Disconnect the needle and buffer tubing from the injection valve. • Connect the pump to port 1 of the injection valve and block port 6 with a blind plug. • Set the valve to the LOAD position (initial position), and then start the pump at a low flow rate. • Examine ports 3 and 4 for leaks. • If there is a leak, then examine the rotor seal and stator. • If there is no leak, then install new capillaries and examine the for leaks again.

Autosampler Messages

If an error occurs, then a repetitive signal sound is heard. If the module shows error messages other than those listed in the following sections, then restart the module once. If error messages are shown repeatedly, then contact sciex.com/request-support.

After resolving the error, press **ENTER** to continue.

Table 5-5 Autosampler Error Messages

Error Message	Description
Autosampler is in run mode.	• Close the software, and then open it again. Turn the module off, and then on.
Autosampler is not responding. Please check communication settings and ensure the device is online.	• Turn the module off, and then on. Make sure that the network configuration is correct. If the message is shown again, then contact sciex.com/request-support.
Cannot run autosampler.	• Turn the module off, and then on. Make sure that the network configuration is correct. If the message is shown again, then contact sciex.com/request-support.
Cannot set destination vial to (number).	• Correct the parameters in the software.
Cannot set first transport vial to (number).	• Correct the parameters in the software.
Cannot set last transport vial to (number).	• Correct the parameters in the software.
Cannot stop autosampler.	• Make sure that the network configuration is correct. If the message is shown again, then contact sciex.com/request-support.
Communication port for autosampler was not initialized. Please check the configuration settings.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Configuration settings do not match with the device. Run cannot start.	• Correct the parameters in the software.
Destination position not reached.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Deviation of more than ±2 mm towards home.	• Remove any blockages that prevent the vial plate from moving. Make sure that the belt for the vial plate has the correct tension.
Dispenser error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Electronics error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
EEPROM error in adjustments.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
EEPROM error in log counter.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
EEPROM error in settings.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
EEPROM write error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error 369.	• The store does not have enough transport liquid.
Error 370.	• The store does not have enough reagent.
Error by setting Mix&Dilute vials.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error occurred during initialization, the Autosampler cannot start.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Error resetting output.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error running user defined program.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting injection mode.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting injection mode.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting syringe speed.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the analysis time.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the auxiliaries.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the flush volume.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the injection volume.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the loop volume.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Error setting the prep. mode.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the syringe volume.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting timed events.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the tray configuration.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the tray temperature.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting the vial number.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Error setting tubing volume.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support
Error setting wash volume.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Flush volume error.	• Correct the parameters in the software.
Home sensor activated when not expected.	• Correct the parameters in the software. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Home sensor not de-activated.	• Remove any blockages that prevent the vial plate from moving. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Home sensor not reached.	• Remove any blockages that prevent the vial plate from moving. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Horizontal: home sensor activated when not expected.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Horizontal: home sensor not de-activated.	• Remove any blockages that prevent the needle unit from moving. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Horizontal: home sensor not reached.	• Remove any blockages that prevent the needle unit from moving. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Horizontal: needle position is unknown.	• Initialize the needle unit using the software.
Illegal sensor readout.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Incorrect amount of steps executed to reach the home position	• Remove any blockages that prevent horizontal movement or cause too high torque in the movement.
Incorrect first destination vial.	• Correct the parameters in the software.
Injection needle unit error.	• Remove any blockages that prevent the needle unit from moving. If the message is shown again, then contact sciex.com/request-support.
Injection valve or ISS unit error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Injection volume (number) is invalid. For specified injection method, volume should be within the range %.2f µL-%.2f µL, with (number). µL increments.	• Correct the parameters in the software.
Injection volume error.	• Correct the parameters in the software.
Invalid (number) vial position (number). The vial position must be between 01 and (number).	• Correct the parameters in the software.
Invalid combination of the trays. The combination of different trays for the Mix&Dilute mode is not allowed.	• Install the correct vial plate. Correct the parameters in the software.
Invalid combination of the trays. The combination of plates 384 low and 96 high is not allowed.	• Install the correct vial plate. Correct the parameters in the software.
Invalid configuration. ISS option not installed on autosampler. Please switch off this option in configuration dialog.	• Correct the parameters in the software.
Invalid configuration. SSV option not installed on autosampler. Please switch off this option in configuration dialog.	• Correct the parameters in the software.
Invalid flush volume (number) µL. The flush volume should be between 0 and (number) µL.	• Correct the parameters in the software.
Invalid instrument is detected.	• Correct the parameters in the software.
Invalid loop volume (number) µL. The loop volume should be between 0 and (number) µL.	• Correct the parameters in the software.
Invalid mix program: no Destination vial is specified in the configuration dialog.	• Correct the parameters in the software.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Invalid mix program: no Reagent A vial is specified in the configuration dialog.	• Correct the parameters in the software.
Invalid mix program: no Reagent B vial is specified in the configuration dialog.	• Correct the parameters in the software.
Invalid mix times. The time should be between 1 and 9.	• Correct the parameters in the software.
Invalid needle height (number) mm. The needle height should be between (number) and (number) mm.	• Correct the parameters in the software.
Invalid time-based method. Several AUX events have the same time.	• Correct the parameters in the software.
Invalid time-based method. Several SSV events have the same time.	• Correct the parameters in the software.
Invalid tray temperature (number) °C. The temperature should be between 4 °C and 22 °C.	• Correct the parameters in the software.
Invalid loop volume (number) µL. The loop volume should be between 0 and (number) µL.	• Correct the parameters in the software.
Invalid loop volume (number) µL. The loop volume should be between 0 and (number) µL.	• Correct the parameters in the software.
Invalid wait time. The time should be between 0 and 9 h 50 min 59 sec.	• Correct the parameters in the software.
Invalid loop volume (number) µL. The volume should be between the 0 and the syringe volume (%d µL).	• Correct the parameters in the software.
ISS valve error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Missing destination vial.	• Make sure that the position of the sample vial is correct. Correct the parameters in the software.
Missing reagent vial.	• Make sure that the position of the sample vial is correct. Correct the parameters in the software.
Missing transport vial.	• Make sure that the position of the sample vial is correct. Correct the parameters in the software.
Needle movement error.	• Make sure that the position of the needle unit is correct. Turn the module off, and then on.
Missing vial.	• Make sure that the position of the needle unit is correct. Turn the module off, and then on.
No destination vial is specified in the configuration.	• Correct the parameters in the software.
No reagent A vial is specified in the configuration.	• Correct the parameters in the software.
No reagent B vial is specified in the configuration.	• Correct the parameters in the software.
No user defined or mix program is running.	• Correct the parameters in the software.
Not enough reagent liquid.	• Make sure that the volume of liquid is correct and change it as required.
Not enough transport liquid available due to missing transport vials.	• Make sure that the volume of liquid is correct and change it as required.
Please specify inject marker or AUX event to be able to trigger the run.	• Correct the parameters in the software.
Selecting transport position failed.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Serial number is not valid. Please check the configuration.	• Correct the parameters in the software.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Setting mix program error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Setting service mode failed.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Syringe dispenser unit error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Syringe home sensor not de-activated.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Syringe home sensor not reached.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Syringe position is unknown.	• Initialize the syringe unit using the software.
Syringe rotation error.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support
Syringe valve did not find destination position.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Temperature above 48 °C at cooling ON.	• Turn off cooling and make sure that the ambient temperature sensor is functioning correctly. If the message is shown again, then contact sciex.com/request-support.
ISS option not installed on autosampler. Please switch off ISS-B option in configuration dialog.	• Correct the parameters in the software.
The autosampler is not ready. Please try later.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
The injection volume of (number) µL is invalid. For the specified injection method, volume should equal (number) µL.	• Correct the parameters in the software.
Tray error.	• Correct the parameters in the software.
Tray position is unknown.	• Turn the module off, and then on.
Valve error.	• Correct the parameters in the software.
Vertical: home sensor not de-activated.	• Remove any blockages that prevent the needle unit from moving. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Vertical: home sensor not reached.	• Remove any blockages that prevent the needle unit from moving. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Vertical: needle position is unknown.	• Initialize the instrument in the software.
Vertical: stripper did not detect plate (or wash/ waste). Missing vial.	• Make sure that the sample vial and plate are installed correctly. Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Vertical: stripper stuck.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Vertical: The sample needle arm is at an invalid position.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support.
Wear-out limit reached.	• Turn the module off, and then on. If the message is shown again, then contact sciex.com/request-support. The valve must be replaced.

Table 5-5 Autosampler Error Messages (continued)

Error Message	Description
Wrong tubing volume. The largest tubing volume for standard injections is 200 µL.	• Correct the parameters in the software.

Syringe Dispenser Unit Error Messages

Table 5-6 Syringe Dispenser Unit Error Messages

Error Message	Description
Syringe valve didn't find wanted position.	• Make sure that the syringe valve pulley is not damaged.
Syringe home sensor not reached.	• Examine the spindle and transport block. • Do a wash using Direct Control to make sure that the flow is not restricted.
Syringe home sensor not de-activated.	• Examine the spindle and transport block. • Do a wash using Direct Control to make sure that the flow is not restricted.
Asked syringe load volume is too high.	• Make sure the syringe volume in the program and system settings are correct.
Asked syringe unload volume is too high.	• Make sure the syringe volume in the program and system settings are correct.
Syringe position is unknown.	• Initialize the module using Direct Control.
Syringe rotation error.	• Do a wash using Direct Control to make sure that the flow is not restricted.

Needle Unit Error Messages

Table 5-7 Needle Unit Error Messages

Error Message	Description
Horizontal: needle position is unknown.	• Initialize the module using Direct Control.

Table 5-7 Needle Unit Error Messages (continued)

Error Message	Description
Horizontal: home sensor not reached.	• Make sure the needle movement is not blocked.
Horizontal: home sensor not de-activated.	• Make sure the needle movement is not blocked.
Incorrect amount of steps executed to reach the home position	• Make sure the horizontal needle movement is not blocked.
Vertical: needle position is unknown.	• Initialize the module using Direct Control.
Vertical: home sensor not reached.	• Make sure the needle movement is not blocked.
Vertical: home sensor not deactivated.	• Make sure the needle movement is not blocked.
Vertical: home sensor activated when not expected.	• Contact sciex.com/request-support
Vertical: stripper did not detect plate (or wash/waste).	• Make sure that plates or vials are installed.
Vertical: stripper stuck.	• Make sure that the vial stripper is fully in the down position. • Examine the spring mechanism for the stripper. • Examine the vial stripper for any obstructions or dirt.
Vertical: The sample needle arm is at an invalid position.	• Contact sciex.com/request-support

Tray Error Messages

Table 5-8 Tray Error Messages

Error Message	Description
No reagent vial.	• Install the vial in the reagent vial position.
Missing reagent A vial.	• Install the vial in the reagent vial position.
Missing reagent B vial.	• Install the vial in the reagent vial position.

Tray Unit Error Messages

Table 5-9 Tray Unit Error Messages

Error Message	Description
Home sensor not reached.	• Make sure that there are no obstructions to the tray movement. Move the tray forward and backward.
Deviation of more than +/-2mm towards home.	• Make sure there are no visible obstructions in the tray area.
Home sensor not de- activated.	• Make sure that the transport foam is removed from the tray compartment. • Make sure that there are no obstructions to the tray movement. Move the tray forward and backward.
Tray position is unknown.	• Initialize the module using Direct Control.

Electronics Error Messages

Table 5-10 Electronics Error Messages

Error Message	Description
EEPROM write error.	• Make sure that the upload procedure was followed.
EEPROM error in settings.	The autosampler was not able to read the settings values from the EEPROM during startup. • Start the module again. • If the error occurs again, then replace the board.
EEPROM error in adjustments.	The autosampler was not able to read the adjustment values from the EEPROM during startup. • Start the module again. • If the error occurs again, then replace the board.
EEPROM error in log counter.	The autosampler was not able to read the log counter values from the EEPROM during startup. • Start the module again. • If the error occurs again, then replace the board.

Table 5-10 Electronics Error Messages (continued)

Error Message	Description
Error occurred during initialization, Autosampler cannot start.	An error occurred during start-up. The autosampler will continue to operate, but it will not inject samples, and other functions will not work properly. • Start the module again and verify the error code.

Cooling Unit Error Messages

Table 5-11 Cooling Unit Error Messages

Error Message	Description
Temperature above 48 °C at cooling ON.	• Turn cooling off, wait for 30 minutes, and then examine the temperature sensor to make sure that it shows the ambient temperature. If it does not, then replace the sensor. • Make sure that the Peltier unit is not full of ice.

Injection Valve Unit Error Messages (Autosampler)

Table 5-12 Injection Valve Unit Error Messages

Error Message	Description
Indicated position not reached.	• Contact sciex.com/request-support
Wear-out limit reached.	• Examine the injection valve for leaks and wear. Contact sciex.com/request-support
Illegal sensor readout.	• Contact sciex.com/request-support

Column Oven

Table 5-13 Column Oven

Symptom	Corrective Action
The module cannot be turned on.	• Make sure that the mains supply cable is connected to the mains supply.
A leak does not trigger an alarm.	• Make sure that the leak sensor settings are correct.

Table 5-13 Column Oven (continued)

Symptom	Corrective Action
The alarm is triggered even though there is no visible leakage.	The leak sensor sensitivity is set too high. Examine the leak sensor settings. **Note:** After long periods of storage or after transportation, open the door slightly to ventilate the ExionLC 2.0 system.
The target temperature is not reached.	• Make sure that the door is fully closed. • Make sure that the ventilation slots on the back and on the side are unobstructed. • Make sure that the fans inside and outside of the module are working. • Set a longer plateau phase. • Correct the temperature.
A system failure has occurred.	• Turn off the module the module and then start it again.

Pumps (All Pumps)

Table 5-14 Pumps (All Pumps)

Symptom	Corrective Action
The module cannot be turned on.	• Make sure that the mains supply cable is connected to the mains supply.
The pump turns off during purging.	• Examine the purge valve on the pressure sensor to see if it is open.

Table 5-14 Pumps (All Pumps) (continued)

Symptom	Corrective Action
The pump does not transport solvent.	• Purge the pump head to remove the air bubbles. • Clean the check valves. • Replace the check valves. • Contact sciex.com/request-support for pump head maintenance. **Note:** If solvent enters the piston backflush system, contact sciex.com/request-support. The pump head seals are defective.
Pressure and flow rate vary.	• Purge the pump head to remove the air bubbles. • Tighten the inlet and outlet fittings on the pump head with a wrench. • Clean the check valves. • Replace the check valves. • Replace the pump head. • Contact sciex.com/request-support for pump head maintenance.
The pump head is leaking.	• Examine the inlet and outlet fittings on the pump head. • Replace the pump head. • If the seals are defective and liquid enters the piston backflushing system, then contact sciex.com/request-support.
The flow rate is not correct.	• Examine the data for solvent compressibility. • Clean the check valves. • Replace the check valves.
A system failure has occurred.	• Turn off the module and then start it again.

Table 5-14 Pumps (All Pumps) (continued)

Symptom	Corrective Action
No flow, issues with pressure.	Improper pump storage can cause the check valves to stick. To prevent these issues from occurring, fill the pump heads with ethanol before storage. Follow these steps if the check valves are stuck: 1. Connect a syringe filled with an appropriate solvent to the inlet fitting of the pump head. Make sure that the purge valve is open. 2. Use the syringe to inject ethanol in the pump head. 3. If the check valves are functioning, the fluid enters the pump head and is then flushed out the outlet of the purge valve. Because the check valves only work in one direction, it should not be possible to suction out the fluid.

Valve Drive

Table 5-15 Valve Drive

Symptom	Possible Cause	Corrective Action
The module does not turn on.	1. The external power supply is not properly connected to the module 2. The external power supply is defective.	1. Connect the module properly to the external power supply. 2. Replace the external power supply.
The module is on but the display is blank.	1. If there is no connection to the software, then the Interface board is defective. 2. The display, display cable, or Adapter board are defective.	Contact sciex.com/request-support.

Table 5-15 Valve Drive (continued)

Symptom	Possible Cause	Corrective Action
The module is on but the LED is not illuminated.	1. If this happens during start up, then the LED on keypad is defective. 2. If this happens during normal operation, then the valves need rehoming.	1. Replace the keypad. 2. Rehome the valves.
The module does not communicate with software.	1. The Interface board is defective. 2. A LAN connection error has occurred. 3. If the USB connection mode is being used, then the module is incorrectly configured.	1. Contact sciex.com/request-support. 2. Contact sciex.com/request-support. 3. Confirm that the correct baud rate, 9600, is selected.
The drive could not recognize the valve type.	1. The valve is not installed correctly. 2. The RFID tag on the valve is faulty. 3. The RFID board is defective.	1. Contact sciex.com/request-support.
The drive cannot switch between positions.	1. The drive could not find the home position. 2. The valve is not installed correctly. 3. The valve is faulty. 4. The drive is faulty.	1. Rehome the valves. 2. Contact sciex.com/request-support. 3. Replace the valve rotor seal. 4. Contact sciex.com/request-support.

Valve Drive

If an error occurs, a repetitive signal sound is heard. If the module shows error messages other than those listed below, then restart the module once. If error messages are shown repeatedly, then contact sciex.com/request-support.

After resolving the error, press **ENTER** to continue.

Table 5-16 Valve Drive Error Messages

Error message	Cause	Solution
Instrument in stand-alone mode.	The command can be executed only for devices in Remote mode.	Change to Remote mode.
Instrument in standby mode.	The command cannot be executed for devices in Stand-by mode.	Wake up the module.
Instrument in error state.	The module is in Error state.	Try to clear current error and rehome the module.
Device is busy.	The module is busy performing a reposition, initialization, or CAN bus operation.	Wait for operation to finish and then try again.
Operation not supported.	The operation not supported by the current communication interface.	Restart the module or contact sciex.com/request-support.
Not enough dynamic memory.	The internal memory resources of the module are exhausted.	Restart the module.
FRAM memory exhausted.	Non-volatile module memory gas been exhausted.	Contact sciex.com/request-support.
Cannot allocate OS resources.	The internal resources of the module are exhausted.	Restart the module.
Cannot read RTC.	The Real Time Clock component is not available.	Repeat the request or restart the module.
Operation timeout.	Some of the onboard components have not reacted.	Repeat the request or restart the module.
Not allowed on this interface.	The command cannot be executed on this communication interface. The device has Remote mode activated on another interface. Only a subset of the basic information can be requested on the secondary interface unless the primary interface is closed. Opening RS-232/USB communication will set the LAN interface to restricted mode and vice versa.	Restart the module or contact sciex.com/request-support.
CAN bus transfer failed.	Communication with the drive component has failed temporarily.	Contact sciex.com/request-support.

Table 5-16 Valve Drive Error Messages (continued)

Error message	Cause	Solution
Operation is not allowed.	Valve reposition control requests are not allowed for BinCode-controlled devices.	Reconfigure the module.
RFID initialization failure.	The valve RFID tag communication hardware was not started correctly.	Restart the module or contact sciex.com/request-support.
RFID antenna failure.	Initialization of the valve RFID tag communication has failed.	Restart the module or contact sciex.com/request-support.
RFID tag reading failure.	Reading of the valve RFID tag has failed.	Restart the module or contact sciex.com/request-support.
RFID tag writing failure.	Writing of the valve RFID tag has failed.	Restart the module or contact sciex.com/request-support.
Display module failure. Module is not present.	The display component was not found during module startup.	Restart the module or contact sciex.com/request-support.
Display module failure. Initialization failed.	The display component failed to initialize.	Restart the module or contact sciex.com/request-support.
Homing failure. Encoder index not found.	The drive component failed to initialize. The encoder index was not found.	Restart the module or contact sciex.com/request-support.
Homing failure. Encoder is locked.	The drive component failed to initialize. The drive was locked.	Contact sciex.com/request-support.
Drive failure. Over-temperature limit reached.	The drive component over-temperature limit has been changed.	Restart the module or contact sciex.com/request-support.
Drive failure. Stopped due over- heating	The drive component stopped abnormally because it overheated.	Restart the module or contact sciex.com/request-support.
Drive failure. Phase short to ground condition detected.	The drive component stopped abnormally due to overload or incorrect settings.	Restart the module or contact sciex.com/request-support.

Table 5-16 Valve Drive Error Messages (continued)

Error message	Cause	Solution
Valve was hot swapped. Rehoming needed.	The valve was replaced.	Rehome the drive.
Valve RFID tag was not found.	The valve RFID tag was not found.	If the valve is removed, then install it back and rehome the drive.
Drive module was reset. Rehoming needed.	The drive component was reset due to overload or incorrect settings.	Restart the module or contact sciex.com/request-support.
Drive module under- voltage detected. Rehoming needed.	The drive component stopped due to under-voltage detection.	Restart the module or contact sciex.com/request-support.
Requested position not reached. Rehoming needed.	The drive component was not able to move to the requested position. The drive is either locked or overloaded.	Restart the module or contact sciex.com/request-support.
Homing failure. Encoder index not reached.	The drive component failed to initialize. The encoder index was not reached. The drive or velocity settings are incorrect.	Contact sciex.com/request-support.

Detector

Table 5-17 Detector

Symptom	Corrective Action
The module cannot be turned on.	• Make sure that the mains supply cable is connected to the mains supply.

Table 5-17 Detector (continued)

Symptom	Corrective Action
The detector is not functioning.	• Examine all cabling. • Examine all screw fittings. • Examine for air in the supply lines. • Examine for leaks. • Read any system messages.
The UV light level is low.	• Clean fiber optic ends in the flow cell holder with alcohol. To clean the internal fiber optics, contact sciex.com/request-support • Replace the lamp.
The module cannot be calibrated.	• Install the test cell. • Test the calibration with a weak absorbing solvent.
The baseline drifts.	• Make sure that the temperatures in the laboratory are kept constant during the measurement.
The baseline contains noise.	• Inspect the flow cell assembly. • Replace the defective flow cell. • Inspect the service life of the lamp in the software. • Use a degasser to reduce the air in the flow cell.
The relationship of the signal to the light path reference is very low.	• Flush the flow cell. • Replace the lamps.

The following table shows the error numbers and associated indexes that are shown on the control unit if an error occurs.

Note: All of the error messages generated by the modules connected to the system are shown in the software.

Table 5-18 Detector Error Messages

Error Number	Description
Error_10	A leak was detected.

Table 5-18 Detector Error Messages (continued)

Error Number	Description
Error_13	The spectrum output is busy or not ready. 3D data acquisition cannot be started at the moment. The module is busy sending data.
Error_16	The command is invalid. An incorrect command was sent to the module.
Error_17	The parameters are invalid. A valid command was sent, but with incorrect parameters. For example, required parameters are missing, or parameter values are outside of their limits.
Error_18	A CRC failure occurred. A disruption occurred during communication. The module is not active at the moment.
Error_19	The user does not have the required access for this operation. The user cannot edit the lamp power supply data. Use Service mode.
Error_20	The instrument is in Local mode. This command cannot be executed in Local mode.
Error_24	The I2C operation failed. An error occurred during upload of the leak sensor or lamp power supply firmware, or an EEPROM I2C communication failure occurred.
Error_28	Error input was activated. Error input was activated by external hardware.
Error_30	The time program contains too many lines. Programs cannot exceed 200 lines.
Error_33	The program step exceeds 145.6 hours. The time between wavelength/bandwidth/DO changes cannot exceed 145.6 hours (145 hours 38 minutes and 7 seconds).

Table 5-18 Detector Error Messages (continued)

Error Number	Description
Error_35	The program is already running. The program cannot be started because it is already being executed by a module.
Error_47	The wake-up time has passed. The module could not be changed to Wake-up mode because the wake-up time is past.
Error_50	The wavelength index is not active in the program. The program contains a wavelength/bandwidth change for a channel that was not initialized by the PROG_INIT command.
Error_54	The program is not running. The HOLD or UNHOLD command cannot be performed because no programs are running.
Error_55	The program is not initialized. The program must initialized with the PROG_INIT command before it is started.
Error_87	The leak sensor failed. The leak sensor was not detected or it does not respond.
Error_91	The deuterium lamp is heating. Manual validation cannot be executed during ignition of the deuterium lamp.
Error_93	The deuterium lamp did not start.
Error_115	A communication timeout occurred. A communication timeout occurred on the RS-232 (5 s) or leak sensor (0.5 s), or a hardware communication failure occurred on the lamp power supply, EEPROM, or I2C with GUI.
Error_116	The light level is low. Validation failed because the integration time exceeded the limits.

Table 5-18 Detector Error Messages (continued)

Error Number	Description
Error_117	The deuterium lamp is off. Manual validation cannot be executed while the deuterium lamp is off.
Error_138	The module is busy.
Error_187	The communication buffer overflowed. RS-232 communication was disrupted.
Error_219	A deuterium lamp failure occurred. Manual validation cannot be executed when no deuterium lamp is present.
Error_220	The lamp cover is open. The lamp cover is not properly installed or the micro switch has malfunctioned.
Error_221	The temperature sensor for the lamp failed. The lamp temperature sensor was not detected or it does not respond.
Error_222	The ambient temperature sensor failed. The Main board temperature sensor was not detected or it does not respond.
Error_223	A temperature control failure occurred. The maximum temperature was exceeded on the lamp.
Error_224	The lamp power supply failed. The lamp power supply is not installed or it does not respond.
Error_225	The temperature limit for the lamp was exceeded. The upper temperature limit for the lamp was reached.
Error_226	The temperature limit for the lamp power supply was exceeded. The upper temperature limit for the lamp power supply was reached.

Table 5-18 Detector Error Messages (continued)

Error Number	Description
Error_227	The program cannot be edited from the running link. The recommended life of the deuterium lamp was exceeded.
Error_228	The module is in Standby mode. The command is not allowed in Standby mode.
Error_229	Wavelength/bandwidth is outside of the spectral range. The selected wavelength and bandwidth are outside the spectral range.
Error_230	The feature is not available for this communication mode. 3D data acquisition and single scan are not available over RS-232.
Error_231	Wavelength validation failed. The accuracy test failed. Holmium oxide, Hα, or Hβ lines are out of specification.
Error_232	The spectrum buffer overflowed. An internal 3D data buffer is exhausted because of a bad LAN connection.
Error_233	A shutter position failure occurred. The motor for the shutter filter has malfunctioned.
Error_234	A lamp not installed. GLP data cannot be obtained and lamp operation cannot be performed when a deuterium or halogen lamp is not installed.
Error_235	The instrument has not been validated. Data acquisition/single scan cannot be executed when the instrument is not validated.
Error_236	Lamps are off. Data cannot be acquired.
Error_237	The recommended life of the halogen lamp has been exceeded.

Control I/O Connections A

The autosampler has the following input/output (I/O) connections:

- RS232 connector for serial communication
- Contact closure output connector

  The contact closure outputs can be programmed as **Inject Marker**, **Auxiliary**, or **Alarm**.
- Time to Live (TTL) input connector, active high or active low

  The TTL inputs can be programmed as **Next Injection Input**, **Freeze Input** or **Stop Input**. These inputs can be used to allow other devices to control the autosampler.

WARNING! Do not connect this module to instruments that do not meet the applicable safety standards. The manufacturer does not accept any liability for damages directly or indirectly caused by connecting this module to instruments which do not meet relevant safety standard.

The I/O connectors are configurable in the System settings.

Contact Closure Outputs and TTL Inputs

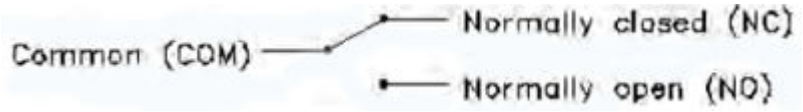
Table A-1 Contact Closure Outputs and TTL Inputs

Pin no	Description	Cable Colors
1	Output - Common	RED (3-wired)
2	Output - Normally open	BLACK (3-wired)
3	Input 1	RED (4-wired)
4	Input 2	BLACK (4-wired)
5	GND	—
6	Output - Normally closed	BROWN (3-wired)
7	GND	—
8	GND	ORANGE (4-wired)
9	GND	BROWN (4-wired)

Contact closure outputs can be identified as:

- **Inject Marker Output (default):** An Inject Marker output is generated when the injection valve switches from Load to Inject. The duration of the Inject Marker output is the same as the duration for the Inject Marker pulse. The Inject Marker pulse can be from 0.1 seconds to 2.0 seconds. Note that in the User program (optional) the Inject Marker pulse is programmed using the User program marker actions.
- **Alarm Output:** The Alarm output is activated whenever an error occurs. Refer to Tray Unit Error Messages for a description of the autosampler error codes.
- **Auxiliary:** The contact closure output is used as an Auxiliary output that can be programmed on a time base up to 4 times On/Off.

Figure A-1 Contact Closure

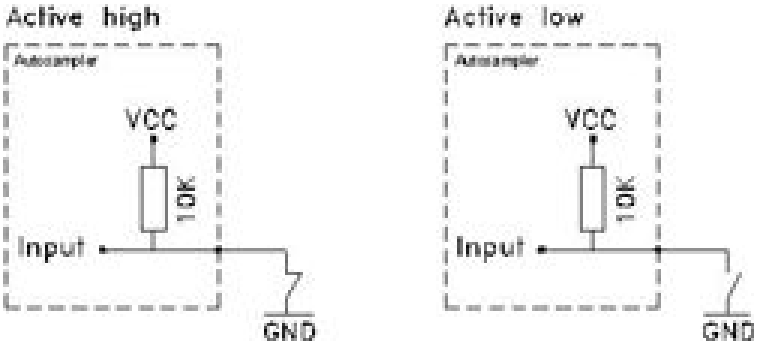


Note: Contact closure output: Vmax = 28 Vdc / Vac, Imax = 0.25 A

TTL inputs can be identified as:

- **Next Injection Input (default):** Starts the next injection sequence. After the injection sequence finishes, the autosampler waits for the Next Injection Input.
- **Freeze Input:** Freezes analysis while this input is active. If analysis is not being performed when the Freeze input is active, then the autosampler performs all programmed pre-injection sample handling (sample loop). But the autosampler does not inject samples until the Freeze input is no longer active.
- **Stop Input:** Immediately stops the autosampler run.

Figure A-2 TTL Input



IP Address Maintenance B

The following table shows the recommended IP Address to use for each ExionLC 2.0 system module.

Table B-1 ExionLC 2.0 Modules and IP Addresses

Device	Model	IP Address
Ethernet switch		192.168.150.100
Pump	LPG-200	192.168.150.101
Pump	BP-200 (Pump A)	192.168.150.101
Pump	BP-200 (Pump B)	192.168.150.110
Pump	BP-200+	192.168.150.101
Second pump	BP-200, BP-200+ or LPG-200	192.168.150.107
Second pump	BP-200 (Pump B)	192.168.150.121
Wash System	WS-200	192.168.150.109
Autosampler	AS-200	192.168.150.102
Autosampler	AS-200+	192.168.150.102
Valve drive	DR-200	192.168.150.106
Second valve drive	DR-200	192.168.150.108
Column oven	CO-200	192.168.150.103
Detector	MWD-200	192.168.150.105
Detector	DAD-200	192.168.150.104
Detector	DADHS-200	192.168.150.104

Menu Reference for the Valve Drive C

Table C-1 Menus

Menu	Description
Start screen	Shown during initialization, after the module is turned on. This screen shows the module name. When initialization is complete, the Main screen is shown.
Main screen	Opens after the module has initialized. The Main screen is the default screen for the module. Use one of the following options to return from any point of the menu to the Main screen: • Wait for 10 seconds. • Press **Confirm**. • Press **Select** for 3 seconds. The Main screen shows the RFID status, the current valve position , and the total number of valve positions.
Main menu	Gets access to the device menus. To open this menu, press **Select** on the Main screen. To open a submenu, navigate to it with the navigation buttons, and then press **Select**.
Main menu: Drive Setup	Configures the valve drive.
Main menu: Drive GLP	Retrieves GLP data for the valve drive.
Main menu: Valve GLP	Retrieves GLP data for the valve.
Main menu: Rehome Drive	Sets the valve drive position to Home.

Table C-2 Submenus: Drive Setup

Menu	Description
Control	Sets the LAN settings to **Manual** or **DHCP**.
IP Port	Configures the IP port.
LAN Setup	Configures the IP address, subnet mask, or gateway.

Table C-2 Submenus: Drive Setup (continued)

Menu	Description
In.Pins	Configures the input control as **Manually** or **Binary**.
Out.Pin	Configures the output control as **Via Event** or **Via Trigger**.
Out.Mode	Configures the output control as **Via OC** or **Via TTL**.
Confirm mode	Selects whether changes to the valve position are applied immediately (OFF) or after confirmation (ON).

Table C-3 Submenus: Drive GLP

Menu	Description
Mot.revs.	Shows the number of switching cycles for the valve drive.
Serial Number	Shows the serial number of the valve drive.
Firmware	Shows the version of the firmware.
Service Date	Shows the last service date.

Table C-4 Submenus: Valve GLP

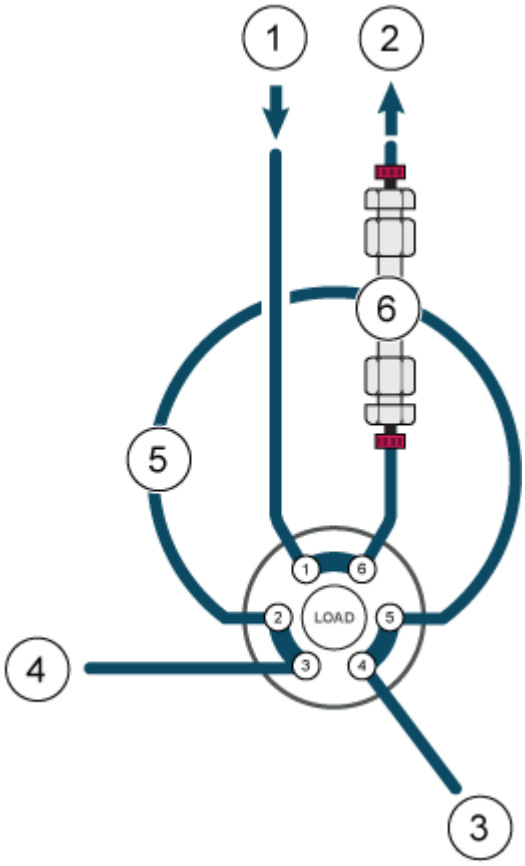
Menu	Description
Switching Cycles	Shows the number of switching cycles for the mounted valve with the current rotor seal.
Seals Count	Shows the number of rotor seal replacements.
Total Cycles	Shows the total number of switching cycles for the mounted valves.
Serial Number	Shows the serial number of the mounted valve.
Valve Information	Shows the number of positions and ports for the mounted valve.
Maximum Pressure	Shows information about the maximum pressure for the mounted valves.
Part Number	Shows the part number of the mounted valve.

Plumbing Diagrams D

The following figures show example configurations. These configurations might not be suitable for all applications but they can be used as starting points to create a suitable configuration.

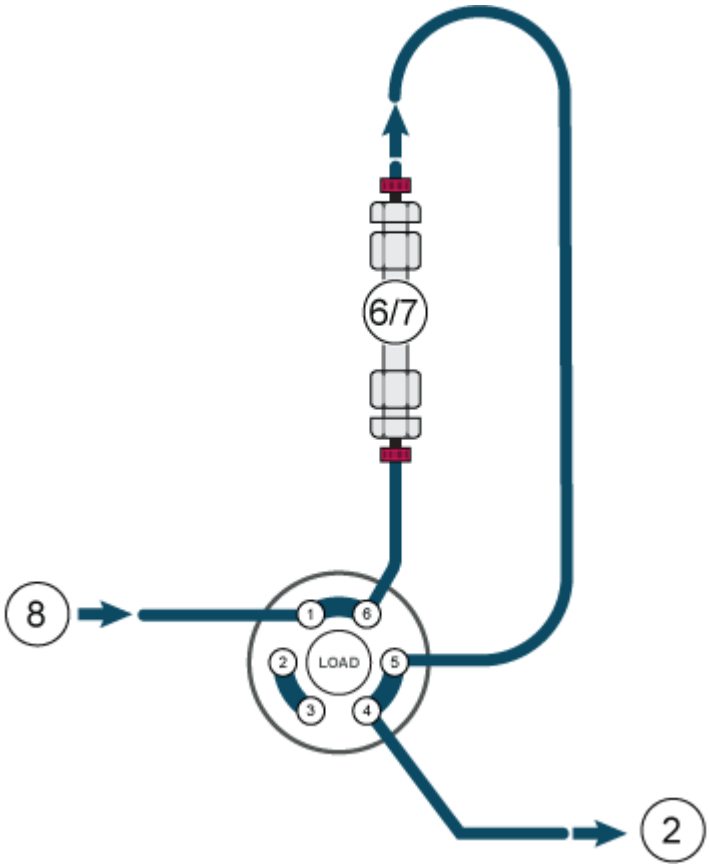
Item	Description
1	Pump
2	Ion source
3	Sample needle
4	Buffer tubing/syringe
5	Loop
6	Column
7	Pre-heater
8	Autosampler port 6
9	Waste
10	Trap

Figure D-1 One Pump, No Valve Drive, Direct Injection



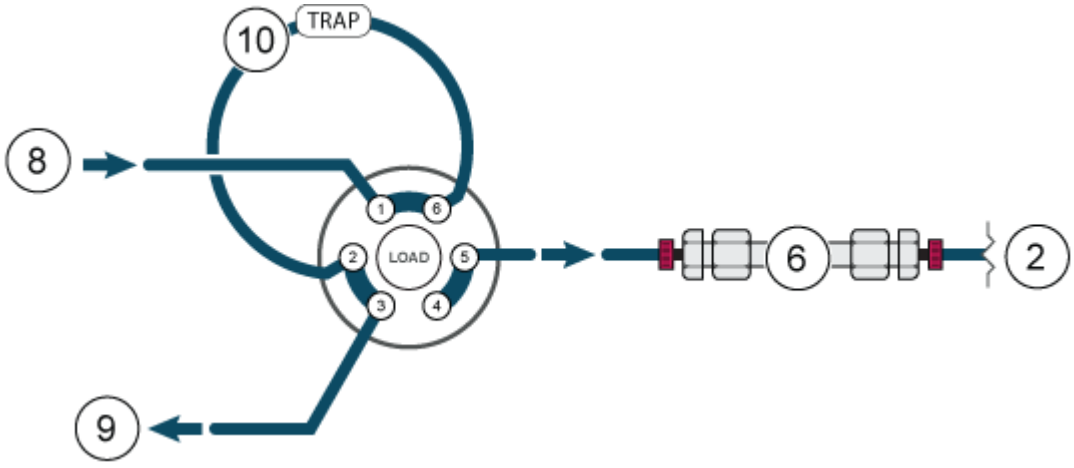
Note: The valve in this configuration refers to the valve in the valve drive. Refer to Figure D-2.

Figure D-2 One Pump, One Valve Drive, One Column



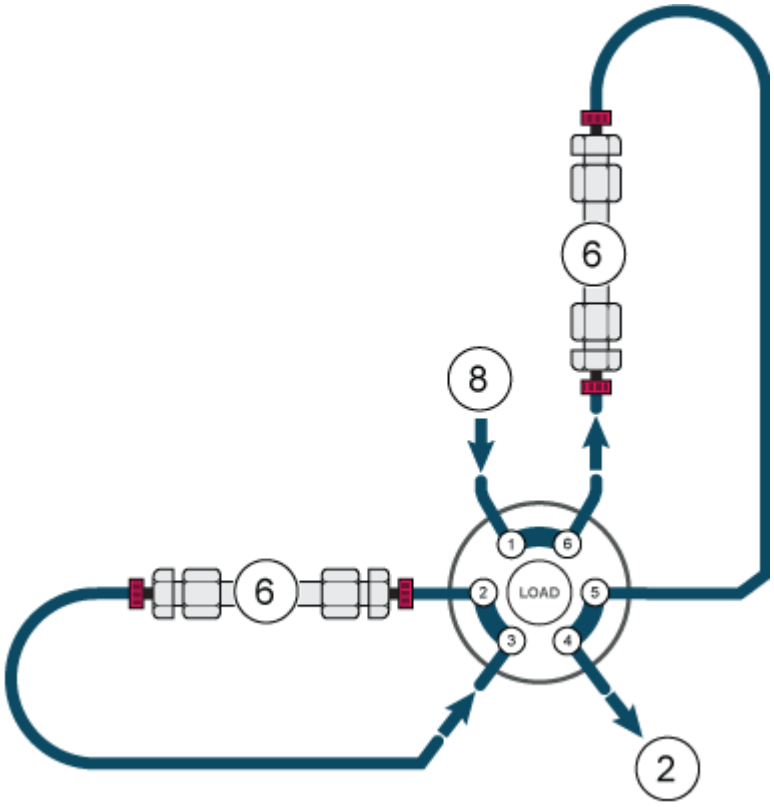
Note: Reversed flow direction through the trap. Refer to Figure D-3.

Figure D-3 One Pump, One Valve Drive, One Trap, One Column



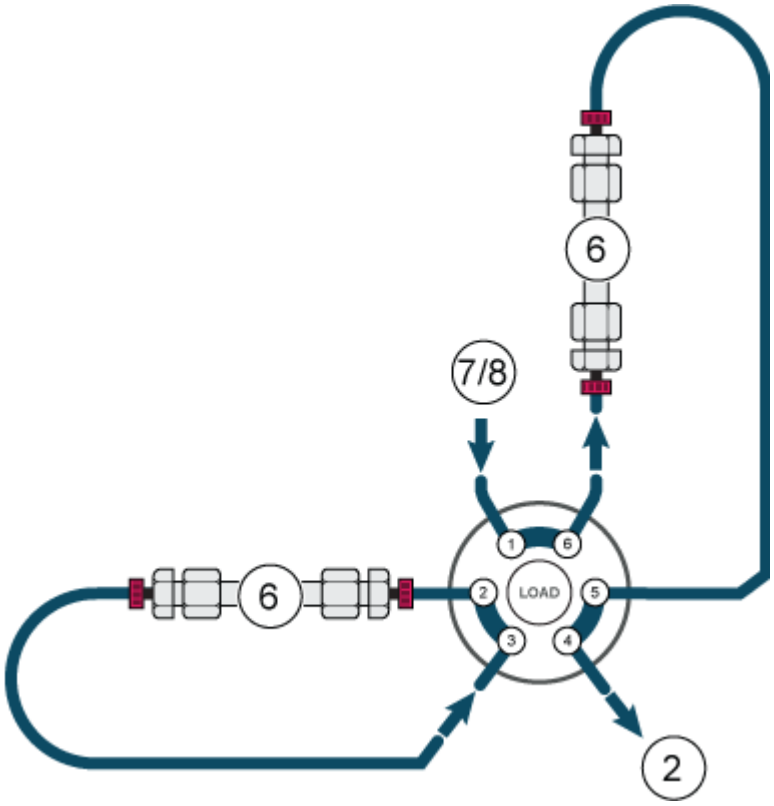
Note: A pre-heater is not used. Refer to Figure D-4.

Figure D-4 One Pump, One Valve Drive, Two Columns



Note: A pre-heater is used on Column 1 only. A union is required. Refer to Figure D-5.

Figure D-5 One Pump, One Valve Drive, Two Columns



Note: A pre-heater is not used. Refer to Figure D-6.

Figure D-6 Two Pumps, One Valve Drive, One Column

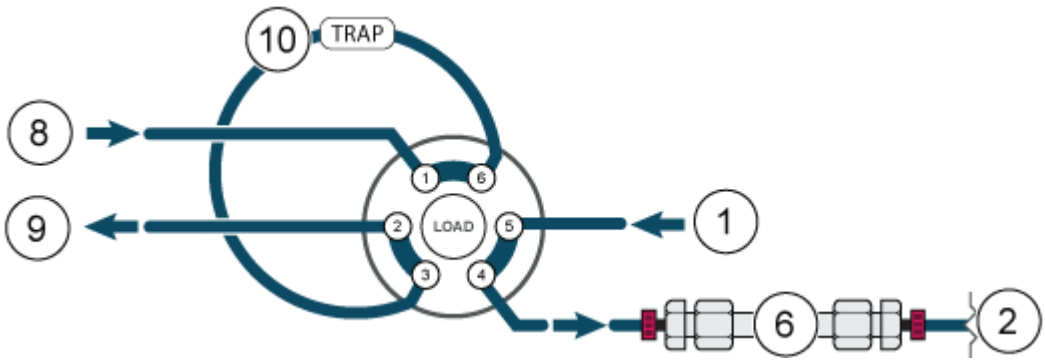
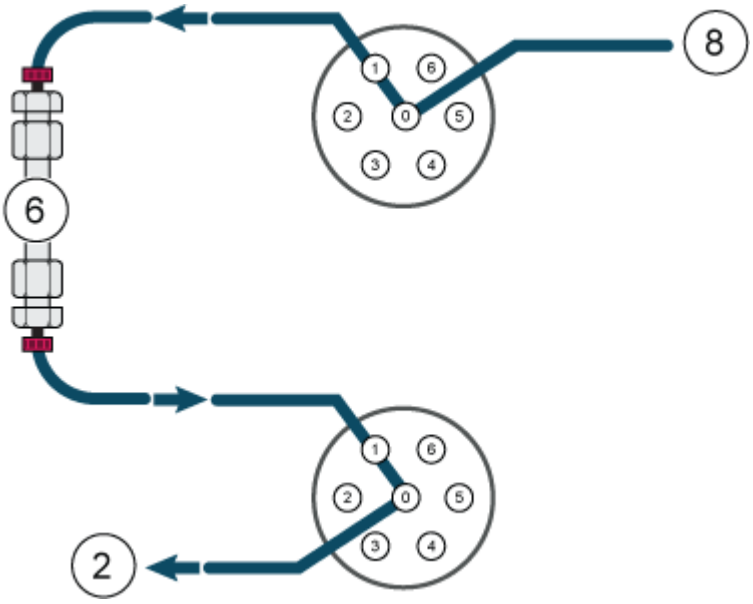


Figure D-7 One Pump, Two Multi Drives, 8 Columns (for Visual Clarity, only Column 1 is Shown)

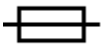


Glossary of Symbols E

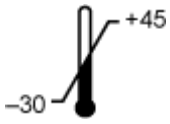
Note: Not all of the symbols in the following table are applicable to every instrument.

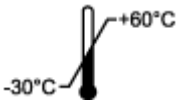
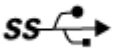
Symbol	Description
	Australian Regulatory Compliance Mark. Indicates that the product complies with Australian Communications Media Authority (ACMA) EMC and Electrical Safety Requirements.
	Alternating current
A	Amperes (current)
	Asphyxiation Hazard
EC REP	Authorized representative in the European community
	Biohazard
CE	CE Marking of Conformity
C US	cCSAus mark. Indicates electrical safety certification for Canada and USA.
REF	Catalog number

Symbol	Description
	Caution. Consult the instructions for information about a possible hazard. **Note:** In SCIEX documentation, this symbol identifies a personal injury hazard.
	China RoHS Caution Label. The electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows show the product is recyclable. The date code on the label or product indicates the date of manufacture.
	China RoHS logo. The device does not contain toxic and hazardous substances or elements above the maximum concentration values and the device is an environmentally-friendly product that can be recycled and reused.
	Consult instructions for use.
	Crushing Hazard
	cTUVus mark for TUV Rheinland of North America
	Data Matrix symbol that can be scanned by a barcode reader to obtain a unique device identifier (UDI)
	Environmental Hazard

Symbol	Description
	Ethernet connection
	Explosion Hazard
	Eye Injury Hazard
	Fire Hazard
	Flammable Chemical Hazard
	Fragile
	Fuse
Hz	Hertz
	International safety symbol "Caution, risk of electric shock" (ISO 3864), also known as High Voltage symbol If the main cover must be removed, then contact a SCIEX representative to prevent electric shock.
	Hot Surface Hazard
	In Vitro Diagnostic Device

Symbol	Description
	Ionizing Radiation Hazard
	Keep dry. Do not expose to rain. Relative humidity must not exceed 99%.
	Keep upright.
	Lacerate/Sever Hazard
	Laser Radiation Hazard
	Lifting Hazard
	Magnetic Hazard
	Manufacturer
	Moving Parts Hazard
	Pacemaker Hazard. No access to people with pacemakers.

Symbol	Description
	Pinching Hazard
	Pressurized Gas Hazard
	Protective Earth (ground)
	Puncture Hazard
	Reactive Chemical Hazard
	Serial number
	Toxic Chemical Hazard
	Transport and store the system within 66 kPa to 103 kPa.
	Transport and store the system within 75 kPa to 101 kPa.
	Transport and store the system within the specified minimum (**min**) and maximum (**max**) levels of relative humidity, noncondensing.
	Transport and store the system within –30 °C to +45 °C.

Symbol	Description
	Transport and store the system within –30 °C to +60 °C.
	USB 2.0 connection
	USB 3.0 connection
	Ultraviolet Radiation Hazard
UK CA	United Kingdom Conformity Assessment Mark
UKRP	United Kingdom Responsible Person
VA	Volt Ampere (apparent power)
V	Volts (voltage)
	WEEE. Do not dispose of equipment as unsorted municipal waste. Environmental Hazard
W	Watts (power)
	*yyyy-mm-dd* Date of manufacture

Glossary of Warnings F

Note: If any of the labels used to identify a component become detached, then contact a SCIEX field service employee (FSE).

Label	Translation (if applicable)
FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.	FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.

Glossary of Terms G

Term	Description
Absorption	The process of retention in which the solute is bound to fixed surfaces, such as tubing, sample vials, and the like.
Analytical	The analysis and determination in terms of volume for liquid chromatography (LC) samples.
Backflushing	A process used in liquid chromatography to remove compounds that are held strongly at the head of a column. Also, flowing liquid through the pump head with the purpose of maintaining or cleaning the internal seals.
Calibration	A process for correcting measurements by determining the amount by which a measuring device deviates from the standard, and then adjusting measurements accordingly.
Capillary	Thin tubing made of PEEK, metal, or fused silica that connects components and devices within the LC system, and directs flow to the proper place.
Chromatogram	A record of a detector signal, showing the measured signal plotted against time.
Column	The tubing, with fittings, and stationary phase, through which mobile phase flows, resulting in a chromatographic separation.
Dead volume	Extra volume experienced by solutes as they pass through a chromatographic system, especially any unswept volume exposed to the mobile phase flow.
Degassing	The process of removing dissolved gas from the mobile phase before or during use.
Detector	A device that measures the composition or the quantity of a substance.
GLP	Good Laboratory Practice. A quality assurance system for laboratories.
Gradient	A process to change solvent strength as a function of time, usually by changing solvent composition, thus eluting progressively more highly retained analytes.
HPLC	High-Pressure Liquid Chromatography (HPLC).
Isocratic	A mode of sample separation in which the composition of a solvent remains constant.
Luer-Lock	A standardized connector used to connect syringes and cannulas.

Term	Description
Mobile phase	The fluid that moves solutes through the column.
Peak	The detection of an analyte by the detector in a differential chromatogram.
Pump	A device that delivers the mobile phase at a controlled volume flow to the LC system.
Response time	The time in which a detector responds to approximately 90% of the incoming solute amount. The response time is generally taken as two to four times the time constant.
Retention time	The time required after the injection of a substance to achieve the visibility of the maximum concentration of the substance.
Sample	A mixture of different components that are to be separated using liquid chromatography. The components are moved by the mobile phase and eluted from the column.
Sample loop	A loop, which is separated from the system by the valve, through which the sample first enters the system. After the valve is switched, the solvent flows through the loop and is flushed to the column.
Solvent	The liquid used to dissolve a sample for injection to an LC column or CE capillary, and to transport it through the system for separation and isolation.
Valve	A mechanism to insert the sample in the solvent flow.

Contact Us

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