Agilent InfinityLab LC Series

1260 Infinity II Preparative Autosampler

User Manual

Notices

Document Information

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CAUTION

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

In This Book:

This manual covers the following module:

Agilent 1260 Infinity II Preparative Autosampler

1 Introduction

This chapter gives an introduction to the module and instrument overview.

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

3 Using the Module

This chapter provides information on how to use the module.

4 Preparing the Module

This chapter explains the operational parameters of the module.

5 Optimizing Performance

This chapter provides information on how to optimize the module.

6 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

7 Error Information

This chapter describes the meaning of error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

8 Maintenance

This chapter describes the maintenance of the module.

9 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance and repair.

10 Identifying Cables

This chapter provides information on cables used with the Agilent InfinityLab LC Series modules.

11 Hardware Information

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Contents

1 Introduction

This chapter gives an introduction to the module and instrument overview.

Product Description

The 1260 Infinity II Preparative Autosampler is designed for laboratories that need automated sample injection to increase daily throughput of purified sample. This autosampler is easy to use, reliable, and capable of injecting sample volumes from vials in the microliter to milliliter range.

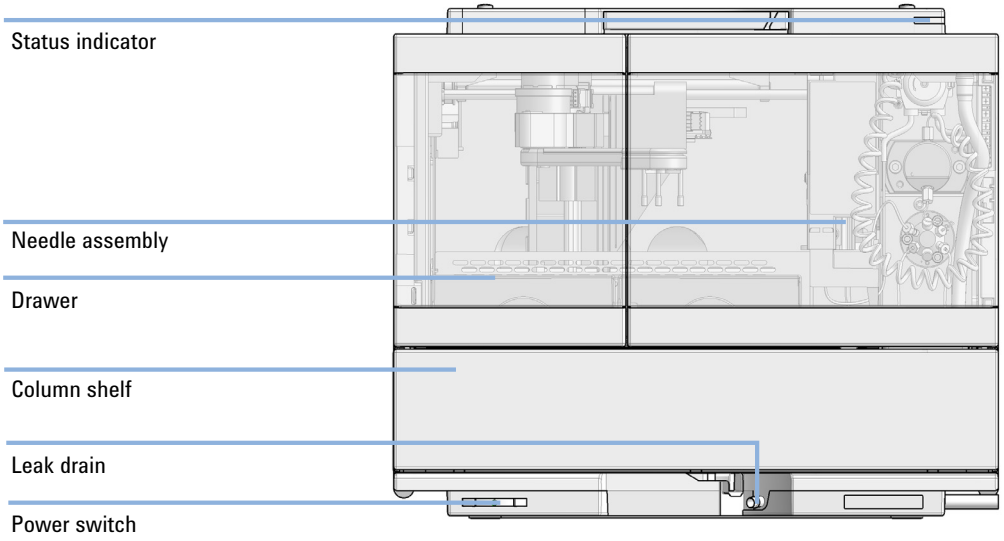


Figure 1 Overview of the sampler

Features

Purification efficiency

- Needle flush port enables rinsing the outside of the needle for lowest carryover
- Low internal volume means minimum contribution to total internal volume of the system

Instrument efficiency

- Fully automated vial sampler for reliable injection of sample volumes from 0.1 µL to 3.6 mL
- Support of flow rates up to 200 mL/min at 400 bar

Laboratory efficiency

- Maximum capacity of 132 sample vials within the same foot print
- Flexible and convenient sample handling with different types of sample containers

Overview of the Module

The Agilent 1260 Infinity II Preparative Autosampler is designed for use with other modules of the Agilent 1200 Infinity Series, 1200 Series, and 1100 Series LC, or with other LC systems if adequate remote control inputs and outputs are available. The Preparative Autosampler is controlled by Agilent control software (OpenLAB CDS).

Three sample-rack sizes are available for the Preparative Autosampler. The standard half-size rack holds 2× 66 vials (2.0 mL) while the other half-size rack options provide space for 2× 18 vials (6.0 mL) respectively. Any two half-size rack drawers can be installed in the autosampler simultaneously. A specially designed two half-size sample-rack holding 2× 50 vials (2.0 mL) vials is available for method compatibility. These special 2× 50 vials (2.0 mL) half-size racks are not designed for combinations with the other rack portfolio.

The preparative autosampler's transport mechanism uses an X-Z-Theta movement to optimize vial pick-up and return. Vials are picked up by the gripper arm, and positioned below the needle station. The gripper transport mechanism, the needle station, and the hydraulic unit are driven by motors. Movement is monitored by optical sensors and optical encoders to ensure correct operation. The metering device is always flushed after injection to ensure minimum carry-over.

The 1260 Infinity II Preparative Autosampler injection head provides volumes from 0.1 – 900 µL and can be operated up to 400 bar.

The six- port injection valve unit (only 5 ports are used) is driven by a high- speed hybrid stepper motor. During the sampling sequence, the valve unit bypasses the autosampler, and directly connects the flow from the pump to the column. During injection and analysis, the valve unit directs the flow through the autosampler. This ensures that all the sample is completely injected into the column. Any sample residue is removed from the metering device and from the needle before the next sampling sequence begins.

For applications that require control of the vial temperature, the module can be combined with the Sample Cooler (G7167-60005) or Sample Thermostat (G7167-60101). The combination of the Preparative Autosampler with the Sample Cooler is called a "cooled Preparative Autosampler". For more details, refer to the 1290 Infinity Sample Cooler documentation.

Operating Principle

Sampling Sequence

The preparative autosampler processor continuously monitors the movements of the preparative autosampler components during the sampling sequence. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sampling sequence can't be completed successfully, an error message is generated.

During the sampling sequence, the solvent bypasses the preparative sampler via the injection valve. The gripper arm selects the sample vial, either from a static sample rack, or from external vial positions. The gripper arm places the sample vial below the injection needle. The required volume of sample is drawn into the sample loop by the metering device. Sample is applied to the column when the injection valve returns to the mainpass (main path) position at the end of the sampling sequence.

The sampling sequence occurs in the following order:

1. The injection valve switches to the bypass position.
2. The piston of the metering device moves to the initialization position.
3. The gripper arm moves from the home position, and selects the vial. At the same time, the needle lifts out of the seat.
4. The gripper moves into the needle station and stops in the draw position.[1]
5. The needle lowers into the vial.
6. The metering device draws the defined sample volume.
7. The needle lifts out of the vial.
8. The gripper arm moves out slightly and stops in the wash position[1].
9. The needle moves downwards and dips into the wash well of the wash port. Simultaneously the peristaltic pump delivers the flush solvent.[1]
10. The needle moves back.[1]
11. The gripper arm moves out of the needle station and the wash port snaps back in position.
12. The gripper arm replaces the vial, and returns to the home position. Simultaneously, the needle lowers into the seat.
13. The injection valve switches to the mainpass (main path) position.

[1] only if automated needle wash is selected. If this feature is disabled, the gripper arm positions the sample vial directly below the needle (Step 4) and lowers the needle into the vial.

Injection Sequence

Before the start of the injection sequence, and during a preparative run, the injection valve is in the mainpass (main path) position (see Figure 2 on page 14). In this position, the mobile phase flows through the autosamplers metering device, sample loop, and needle. This ensures that all parts in contact with sample are flushed during the run, thus minimizing carry-over.

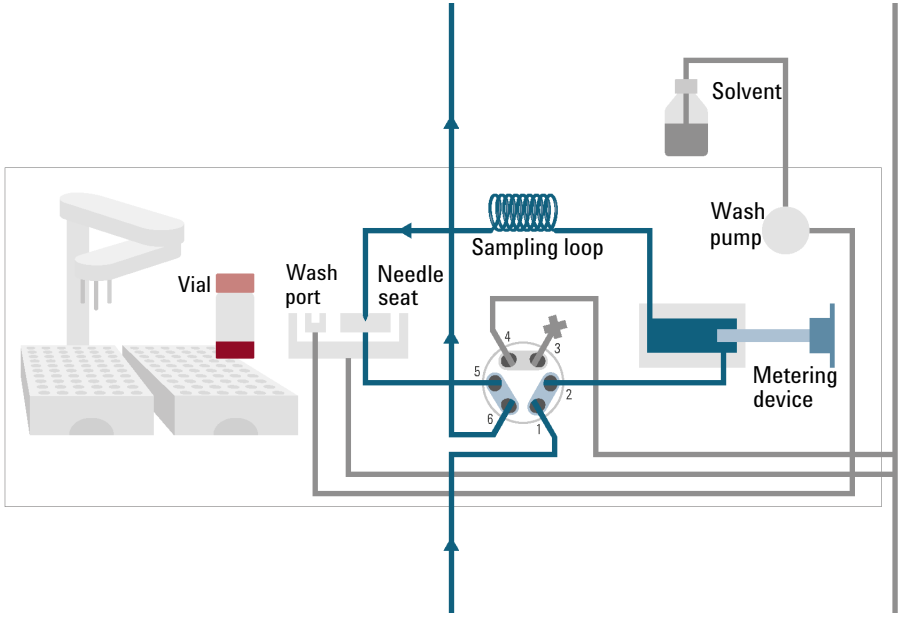


Figure 2 **Mainpass (main path) Position - standard position during runs and when the sampler is idle**

When the sample sequence begins, the valve unit switches to the bypass position (see Figure 3 on page 15). Solvent from the pump enters the valve unit at port 1, and flows directly to the column through port 6.

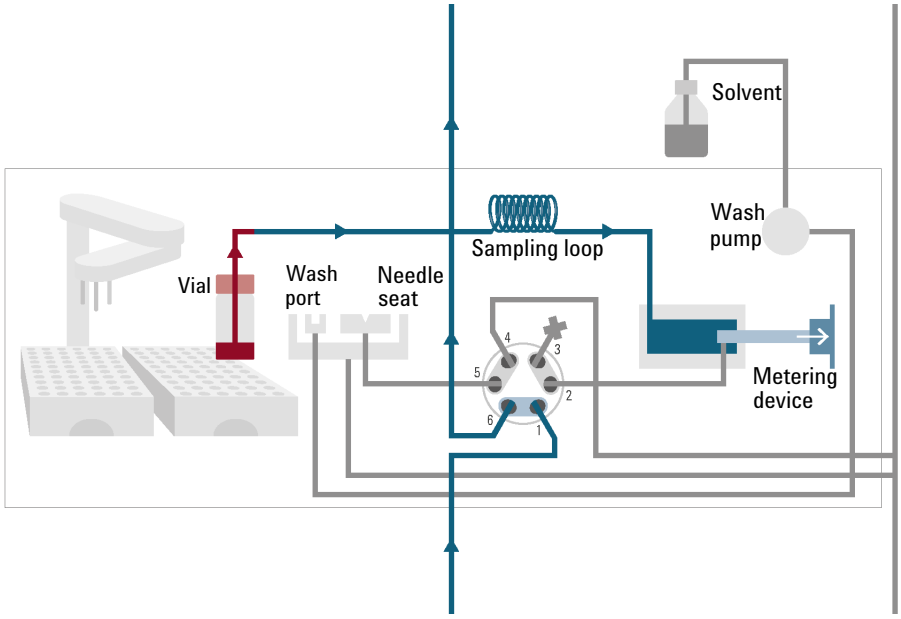


Figure 3 Valve in bypass - needle in vial, metering device aspirates sample volume

Then the vial is positioned below the needle. The needle moves down into the vial, the metering unit draws the required sample volume into the loop, and the needle is raised. In the next step, the needle is washed (see Figure 4 on page 16).

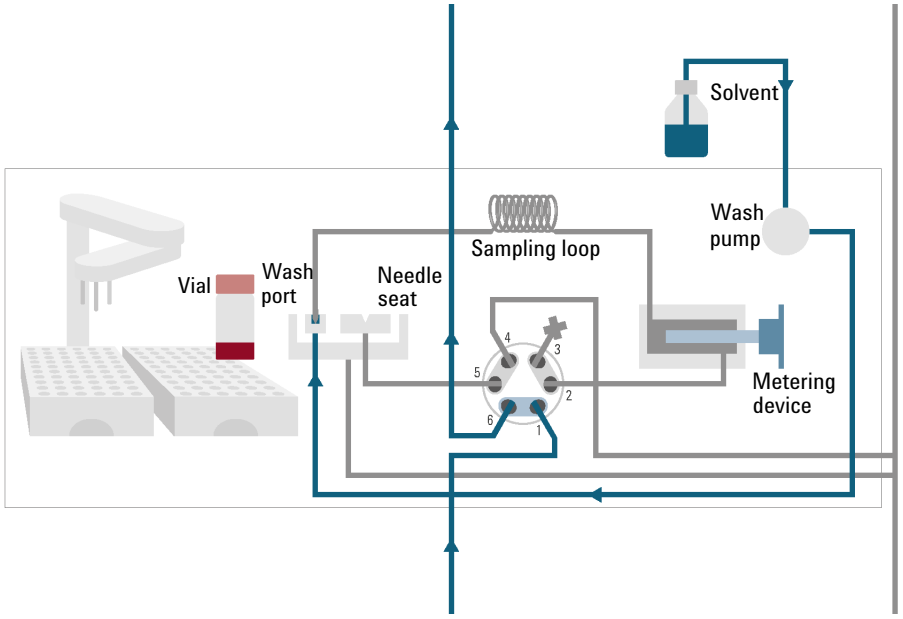


Figure 4 Outer face of needle getting washed in wash port

When the metering unit has drawn the required volume of sample into the sample loop, the vial is replaced in the sample tray. The wash port flips into the origin position, the needle is lowered into the needle seat, and the injection valve switches back to mainpass (main path) position, flushing the sample onto the column (see Figure 5 on page 17).

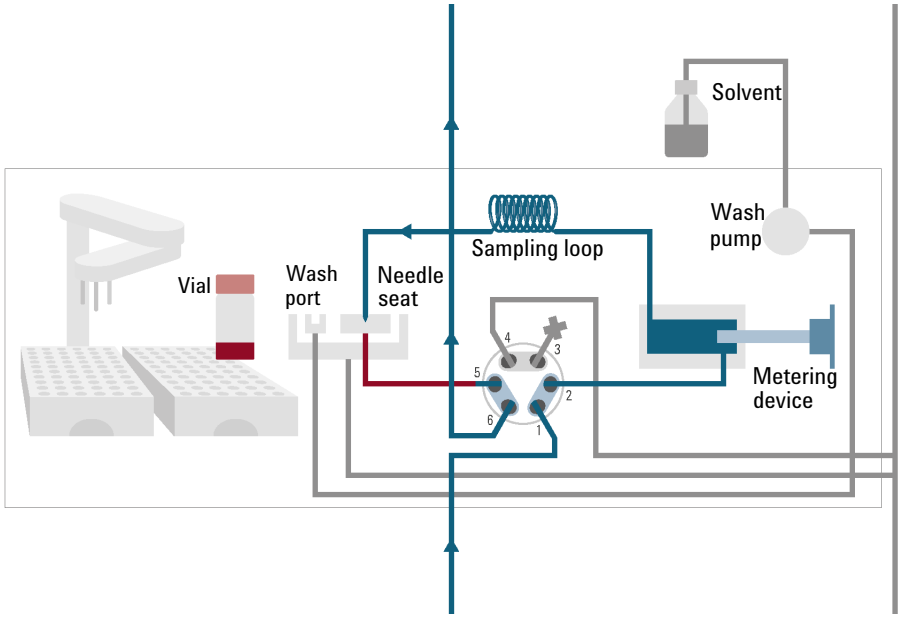


Figure 5 Valve switches to mainpass (main path) - sample is transferred towards the LC column

Needle Parkstation

The needle parkstation comprises two main assemblies: needle drive and wash port.

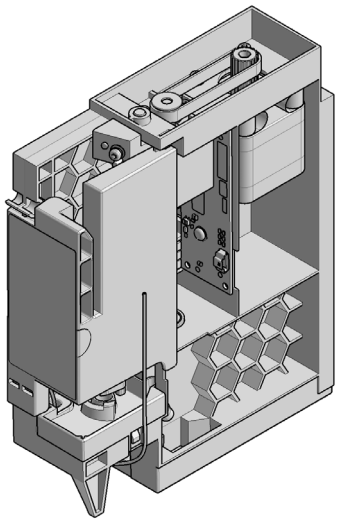


Figure 6 Needle Station

Needle-Drive

The needle movement is driven by a stepper motor connected to the spindle assembly by a toothed belt. The circular motion of the motor is converted to linear motion by the drive nut on the spindle assembly. The upper and lower needle positions are detected by reflection sensors on the needle station board, while the needle-in-vial position is determined by counting the motor steps from the upper needle-sensor position.

Hydraulic Box

The hydraulic box comprises two main assemblies: metering device, and injection valve.

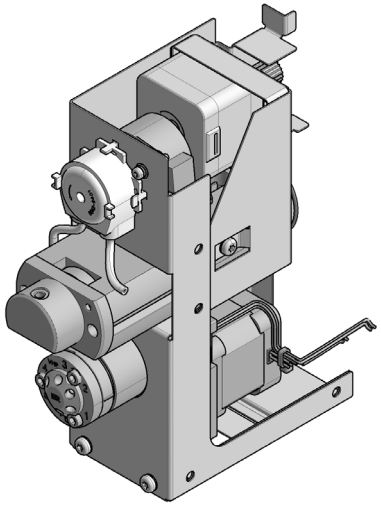


Figure 7 Hydraulic Unit

NOTE

The replacement hydraulic box excludes the injection valve and metering head assemblies.

Analytical Head

The analytical head is driven by the stepper motor that is connected to the drive shaft by a toothed belt. The drive nut on the spindle converts the circular movement of the spindle to linear motion. The drive nut pushes the sapphire piston against the tension of the spring into the analytical head. The base of the piston sits on the large bearing of the drive nut, which ensures the piston is always centered. A ceramic ring guides the movement of the piston in the analytical head. The home position of the piston is sensed by an optical sensor on the hydraulic unit board while the sample volume is determined by counting the number of steps from the home position. The backward movement of the piston (driven by the spring) draws sample from the vial.

Injection Valve

The two-position 6-port injection valve is driven by a stepper motor. Only five of the six ports are used (port 3 is not used). A lever/slider mechanism transfers the movement of the stepper motor to the injection valve. Two microswitches monitor switching of the valve (bypass and mainpass (main path) end positions). No valve adjustments are required after replacing internal components.

Transport Assembly

The transport unit comprises an X-axis slide (left-right motion), a Z-axis arm (up-down motion), and a gripper assembly (rotation and vial-gripping).

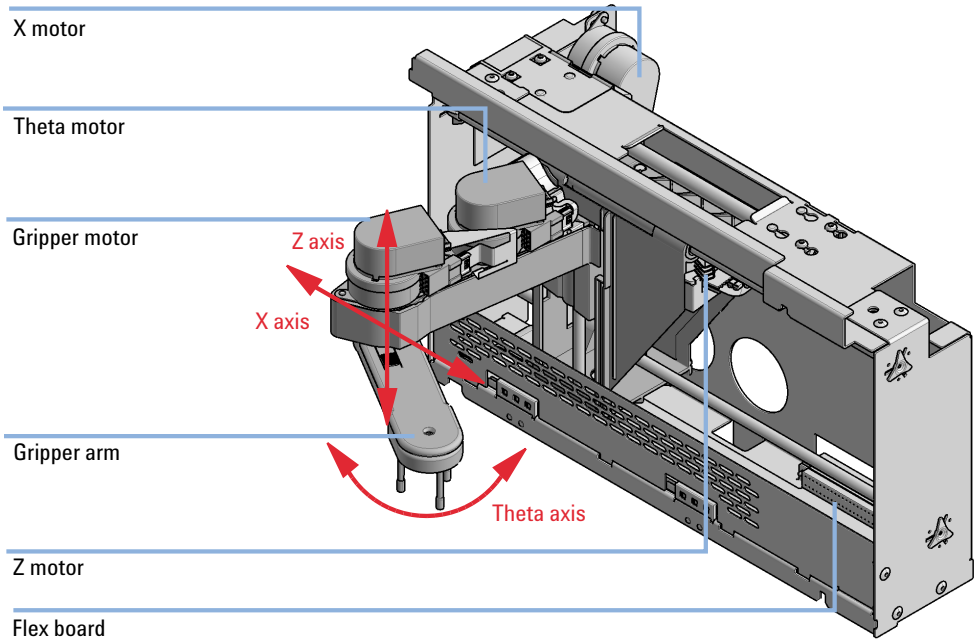
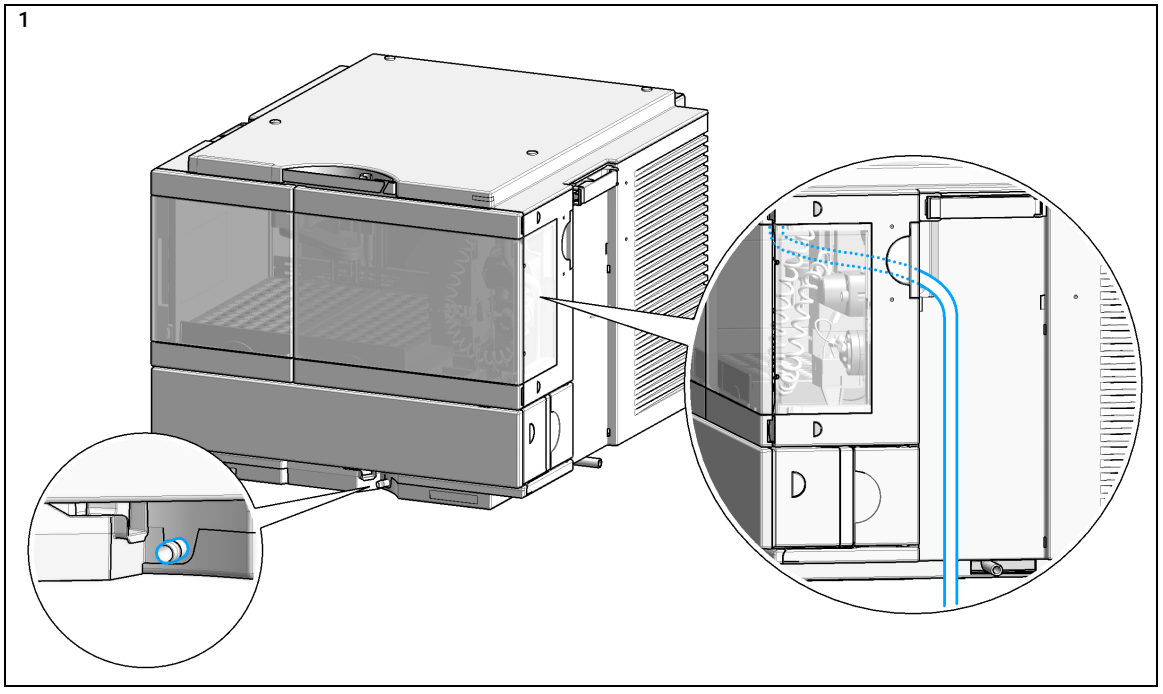


Figure 8 Transport Assembly

The transport assembly uses four stepper motors driven in closed-loop mode for accurate positioning of the gripper assembly. The rotational movement of the motors is converted to linear motion (X- and Z-axes) by toothed belts connected to the drive spindles. The rotation (theta axes) of the gripper assembly is transferred from the motor by a toothed belt and series of gears. The opening and closing of the gripper fingers are driven by a stepper motor linked by a toothed belt to the planetary gearing inside the gripper assembly.

The stepper motor positions are determined by the optical encoders mounted onto the stepper-motor housing. The encoders monitor the position of the motors continually, and correct for position errors automatically (e.g. if the gripper is accidentally moved out of position when loading vials into the vial tray). The initialization positions of the moving components are sensed by reflection sensors mounted on the flex board. These positions are used by the processor to calculate the actual motor position. An additional six reflection sensors for tray recognition are mounted on the flex board at the front of the assembly.

Leak and Waste Handling



Leak Sensor

CAUTION

Solvent incompatibility

The solvent DMF (dimethylformamide) leads to corrosion of the leak sensor. The material of the leak sensor, PVDF (polyvinylidene fluoride), is incompatible with DMF.

- ✓ **Do not use DMF as mobile phase.**
- ✓ **Check the leak sensor regularly for corrosion.**

NOTE

The leak sensor in the sampler is hidden under the Column Shelf.

Waste Concept

1 Agilent recommends using the 6 L waste can with 1 Stay Safe cap GL45 with 4 ports (5043-1221) for optimal and safe waste disposal. If you decide to use your own waste solution, make sure that the tubes don't immerse in the liquid.

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

Site Requirements

Site Requirements

A suitable environment is important to ensure optimum performance of the instrument.

Power Considerations

The module power supply has wide ranging capability. It accepts any line voltage in the range described in Table 1 on page 28. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Hazard of electrical shock or damage of your instrumentation

can result, if the devices are connected to a line voltage higher than specified.

- ✓ **Connect your instrument to the specified line voltage only.**

WARNING

Electrical shock hazard

The module is partially energized when switched off, as long as the power cord is plugged in.

The cover protects users from personal injuries, for example electrical shock.

- ✓ **Do not open the cover.**
- ✓ **Do not operate the instrument and disconnect the power cable in case the cover has any signs of damage.**
- ✓ **Contact Agilent for support and request an instrument repair service.**

WARNING

Inaccessible power plug.

In case of emergency it must be possible to disconnect the instrument from the power line at any time.

- ✓ **Make sure the power connector of the instrument can be easily reached and unplugged.**
- ✓ **Provide sufficient space behind the power socket of the instrument to unplug the cable.**

Power Cords

Country-specific power cords are available for the module. The female end of all power cords is identical. It plugs into the power-input socket at the rear. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

Agilent makes sure that your instrument is shipped with the power cord that is suitable for your particular country or region.

WARNING

Unintended use of power cords

Using power cords for unintended purposes can lead to personal injury or damage of electronic equipment.

- ✓ **Never use a power cord other than the one that Agilent shipped with this instrument.**
- ✓ **Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.**
- ✓ **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**

WARNING

Absence of ground connection

The absence of ground connection can lead to electric shock or short circuit.

- ✓ **Never operate your instrumentation from a power outlet that has no ground connection.**

WARNING

Electrical shock hazard

Solvents may damage electrical cables.

- ✓ **Prevent electrical cables from getting in contact with solvents.**
- ✓ **Exchange electrical cables after contact with solvents.**

Bench Space

The module dimensions and weight (see Table 1 on page 28) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench shall carry a complete HPLC system, make sure that the bench is designed to bear the weight of all modules.

The module should be operated in a horizontal position, especially if a Sample Cooler or Sample Thermostat is installed. Use a bubble level to check the leveling of the sampler.

NOTE

Agilent recommends that you install the HPLC instrument in the InfinityLab Flex Bench rack. This option helps to save bench space as all modules can be placed into one single stack. It also allows to easily relocate the instrument to another laboratory.

WARNING

Heavy weight

The module is heavy.

- ✓ **Carry the module at least with 2 people.**
- ✓ **Avoid back strain or injury by following all precautions for lifting heavy objects.**
- ✓ **Ensure that the load is as close to your body as possible.**
- ✓ **Ensure that you can cope with the weight of your load.**

Condensation

CAUTION

Condensation within the module

Condensation can damage the system electronics.

- ✓ **Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.**
- ✓ **If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.**

Physical Specifications

Table 1 Physical Specifications

Type	Specification	Comments
Weight	19 kg (41.9 lbs)	w/o sample thermostat
Dimensions (height × width × depth)	320 x 396 x 468 mm (12.8 x 15.6 x 18.4 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	350 VA / 350 W / 1195 BTU/h	
Ambient operating temperature	4 - 40 °C (39 - 104 °F), without sample cooler or sample thermostat up to 55 °C (131 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)[1]	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15092 ft)	For storing the module
Safety standards: IEC, EN, CSA, UL	Overvoltage category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Boiling point ≥56 °C (133 °F). Auto-ignition temperature ≥200 °C (392 °F).	

[1] If a sample thermostat is included the upper value for humidity can be reduced. Please check your lab conditions to stay beyond dew point values for non–condensing operation.

Performance Specifications

Table 2 Performance Specifications G7157A

Type	Specification	Comments	Method/Conditions
Settable injection range	0.1 – 900 µL, up to 3600 µL with seat extension		
Injection precision	1 µL: <5 % 5 µL: <2 % 10 µL, 50 µL: <1 % 500 – 3600 µL: <0.25 %	Measured caffeine	**Sample: Caffeine in Water/ACN (98/2)** for 1 – 50 µL Injection Volume: • Column: Agilent Zorbax SB-C18, 4.6 x 50 mm, 5 µm (PN: 846975-902) • Eluent: Water/ACN (90/10) isocratic, premixed pumping Channel A/B (50/50) • Flow rate: 5.0 mL/min • Temperature: RT • Detection: 273/4 nm Ref. 360/100 nm, 10 Hz • Needle wash: 5 s in flush port with Water/ACN (90/10) • Draw speed: 100 µL/min • Eject speed: 3000 µL/min • Wait time after draw: 5 s for 500 – 3600 µL Injection Volume: • Column: Agilent 5 Prep-C18, 21.2 x 50 mm, 5 µm (PN: 446905-102) • Eluent: Water/ACN (85/15) isocratic • Flow rate: 30.0 mL/min • Temperature: RT • Detection: 273/4 nm Ref. 360/100 nm, 10 Hz • Needle wash: 5 s in flush port with Water/ACN (85/15) • Draw speed: 900 µL/min • Eject speed: 3000 µL/min • Wait time after draw: 5 s • for 2000 – 3600 µL: seat extension (PN: G7157-68711)

Table 2 Performance Specifications G7157A

Type	Specification	Comments	Method/Conditions
Pressure range	0 – 40 MPa (0 – 400 bar, 0 – 5801.51 psi)		
Sample viscosity range	0.2 – 5 cP		
Sample capacity	132 x 2 mL vial (two trays default) 100 x 2 mL vial (two classic trays optional) 36 x 6 mL vials (two trays optional)		
Carryover	<0.005 % (50 ppm)		**Method** • Column: Agilent 5 Prep-C18, 21.2 mm x 50 mm, 5 µm (446905-102) • Eluent: Water/ACN (85/15) isocratic • Flow rate: 30.0 mL/min • Temperature: RT • Detection: 273/4 nm Ref. 360/100 nm, 10 Hz • Injection volume: 500 µL • Needle wash: 10 s in flush port with Water/ACN (85/15) • Draw speed: 900 µL/min • Eject speed: 3000 µL/min • Wait time after draw: 5 s **Sample** • Caffeine 5 g/L in Water /ACN (98/2)

Table 2 Performance Specifications G7157A

Type	Specification	Comments	Method/Conditions
Injection cycle time	<60 s for injection volume 900 µL		**Method** • Column: Restriction capillary (0.25 x 4000 mm; PN: 5065-4493) • Eluent: Water/ACN (85/15) isocratic • Flow rate: 5.0 mL/min • Temperature: RT • Injection volume: 900 µL • Needle wash: no needle wash • Draw speed: 9000 µL/min • Eject speed: 9000 µL/min • Wait time after draw: 1.2 s • Overlapped injection mode: prefetch vial **Sample: Water**
Instrument Control	LC & CE Drivers A.02.17 or above Instrument Control Framework (ICF) A.02.04 or above Instant Pilot (G4208A) with firmware B.02.22 or above Lab Advisor B.02.10 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC and CE Drivers	
Communications	Controller-area network (CAN), Local Area Network (LAN) ERI: ready, start, stop and shut-down signals		
Maintenance and safety-related features	Extensive diagnostics, error detection and display with Agilent Lab Advisor software Leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas		
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors.		
Housing	All materials recyclable.		

Specifications of the Sample Cooler

The Agilent Infinity II Sample Cooler is a vapor-compression refrigeration system that uses a fluorinated greenhouse gas (HCF-134a) as the refrigerant. For information on carbon dioxide equivalency (CDE) and global warming potential (GWP), see the instrument label.

Table 3 Physical Specification of the Sample Cooler

Type	Specification	Comment
Weight	< 6 kg (< 13.2 lbs)	
Dimensions (height × width × depth)	205 x 340 x 370 mm (8.1 x 13.4 x 14.6 inches)	
Refrigerant gas	HFC-134a (0.042 kg)	Ozone depletion potential (ODP) = 0
Supply voltage	24 VDC	
Current	10 A max.	
Ambient operating temperature	4 – 40 ° C (39 – 104 ° F)	
Ambient non-operating temperature	-40 – 70 ° C (-40 – 158 ° F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

- ✓ **The disposal or scrapping of the Sample Cooler or the Sample Thermostat must be carried out by a qualified disposal company.**
- ✓ **All media must be disposed of in accordance with national and local regulations.**
- ✓ **Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance or check www.agilent.com for more info.**

Table 4 Performance Specifications of the Sample Cooler

Type	Specifications
Operating principle	High performance, low-energy consumption micro-compressor based cooler with ozone-friendly HFC-134a coolant (42 g), user-upgradable.
Temperature range	from 4 °C to 5 °C below ambient
Temperature settable	from 4 – 40 °C in 1 ° increments
Temperature accuracy (<25 °C, <50 % r.H.)	2 °C to 6 °C at a setpoint of 4 °C

NOTE

The Agilent Infinity II Sample Cooler is not available for trade sales anymore and has been replaced by the Agilent InfinityLab Sample Thermostat.

Specifications of the Sample Thermostat

The Agilent InfinityLab Sample Thermostat is the combination of an electric heater and a vapor-compression refrigeration system. It uses isobutane as a non-Freon refrigerant, which is harmless to the environment and does not affect the ozone layer and global warming, but it is combustible. Please adhere to the warnings listed in the manual.

Table 5 Physical Specifications of the Sample Thermostat (G7167-60101 and G7167-60201)

Type	Specification	Comments
Weight	<6 kg (< 13.2 lbs)	
Dimensions (height x width x depth)	205 x 340 x 370 mm (8.1 x 13.4 x 14.6 inches)	
Refrigerant gas	R600a (max. 0.030 kg)	Ozone depletion potential (ODP) =0 Global warming potential (GWP) =3
Supply voltage	24VDC	
Current	10 A max.	
Ambient operating temperature	4 °C to 40 °C (39 °F to 104 °F)	For sample cooling, ambient temperature ≥10 °C
Ambient non-operating temperature	-40 °C to +70 °C (-40 °F to +158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Safety standards: IEC, EN, CSA, UL	Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

CAUTION

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Table 6 Performance Specifications for the Sample Thermostat (G7167-60101 and G7167-60201)

Type	Specifications
Operating principle	High performance, low-energy consumption micro-compressor based cooler with natural R600a coolant (Isobutane max. 0.030 kg), user-upgradable
Temperature range	from 4 °C to 40 °C
Temperature settable	from 4 °C to 40 °C in 1 ° increments
Temperature accuracy (<25 °C, <50 % r.H.)	2 °C to 6 °C at a setpoint of 4 °C

Table 7 Minimum System Requirements for the G7167-60101 Sample Thermostat

Type	Specification
LC & CE Drivers	A.02.14, (A.02.18)[1] or above
Instrument Control Framework (ICF)	A.02.04, (A.02.05)[1] or above
Lab Advisor Software	B.02.11 or above
Firmware	D.07.22 or above

[1] Minimum version for full thermostat functionality.

Table 8 Minimum System Requirements for the G7167-60201 Sample Thermostat

Type	Specification
LC & CE Drivers	A.02.14, (A.02.18)[1] or above
Instrument Control Framework (ICF)	A.02.04, (A.02.05)[1] or above
Lab Advisor Software	2.19 or above
Firmware	D.07.37 or above

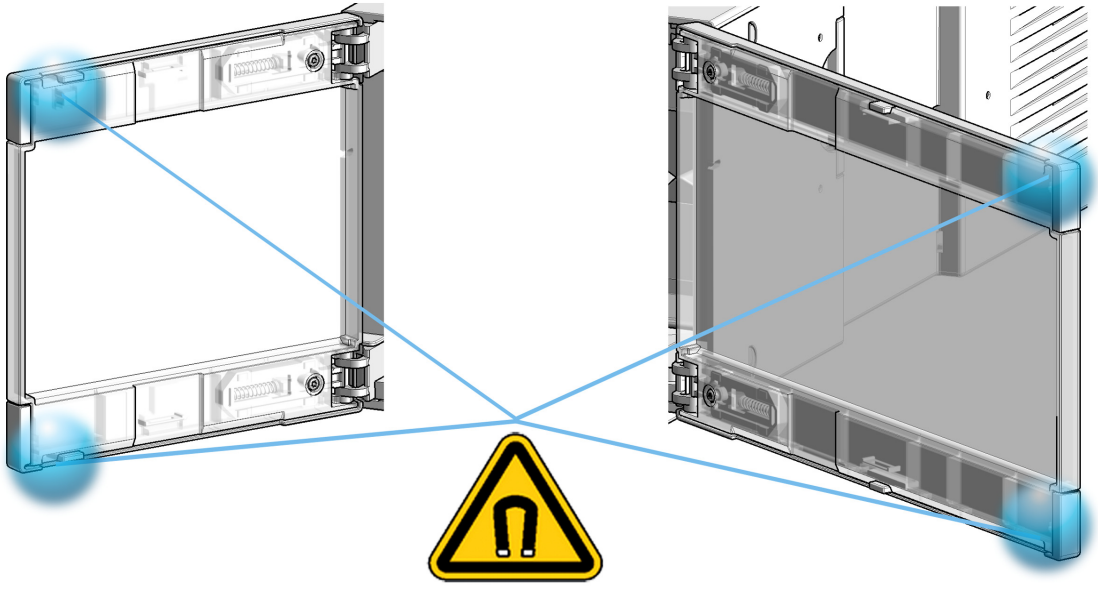
[1] Minimum version for full thermostat functionality.

3 Using the Module

This chapter provides information on how to use the module.

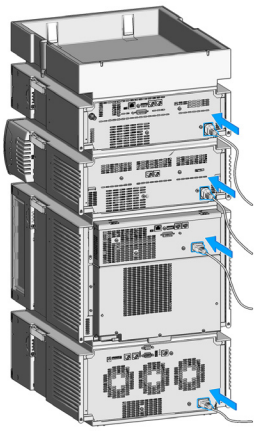
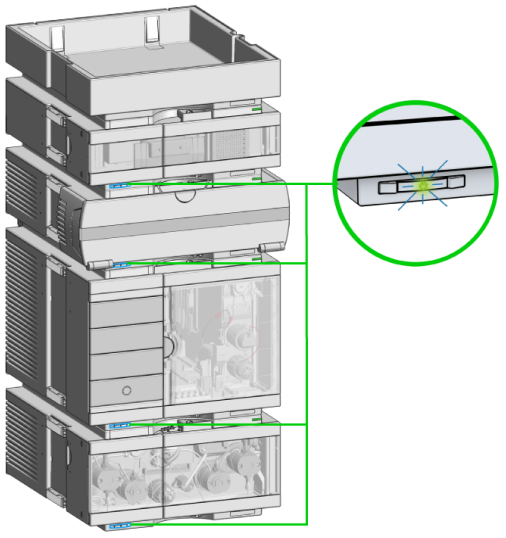
Magnets

1 Magnets in doors of pumps, autosamplers, detectors, and fraction collectors.

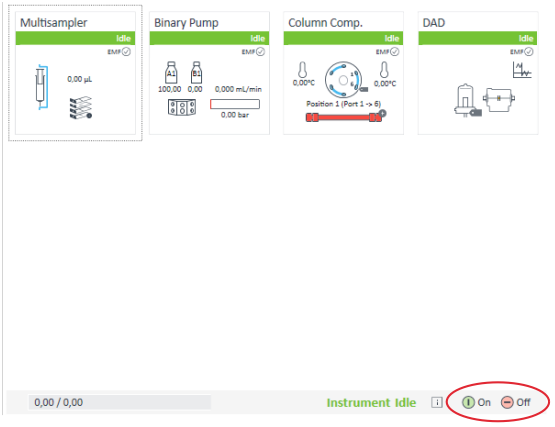


Turn on/off

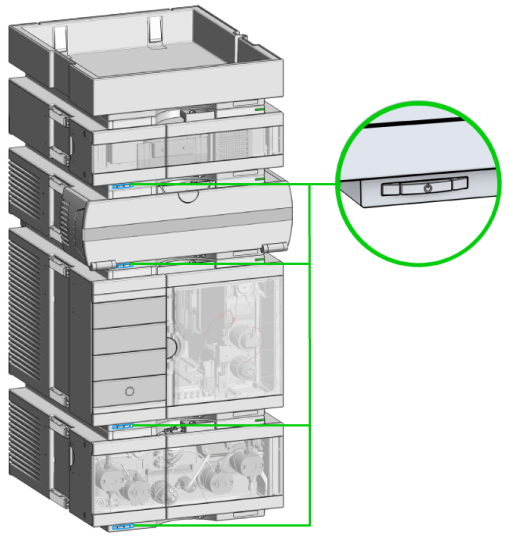
This procedure exemplarily shows an arbitrary LC stack configuration.

1 	2  Power switch: On

3 Turn instrument **On/Off** with the control software.

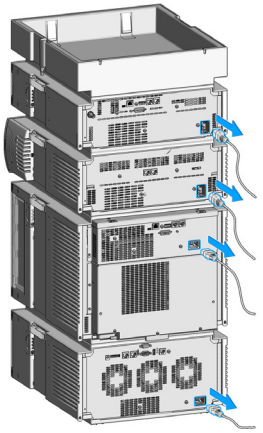


4



Power switch: Off

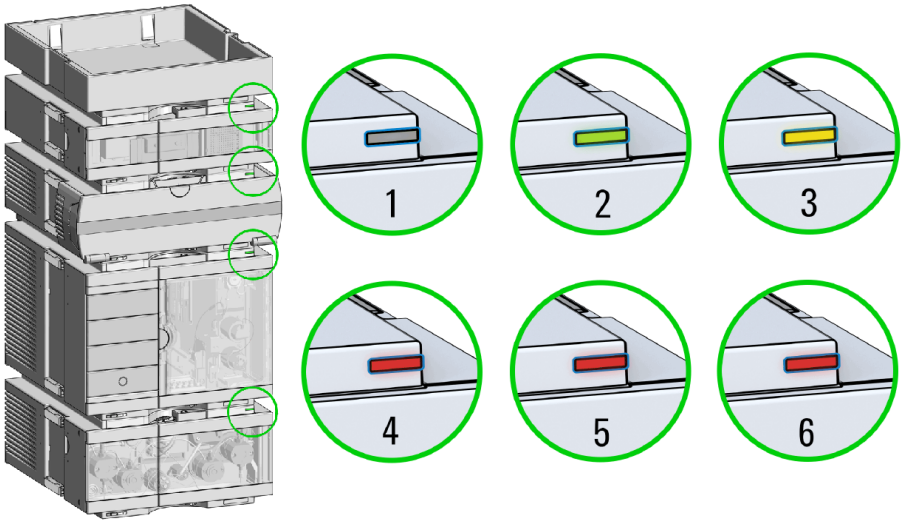
5



Status Indicators

This procedure exemplarily shows an arbitrary LC stack configuration.

1 The module status indicator indicates one of six possible module conditions:



Status indicators

1. Idle
2. Run mode
3. Not-ready. Waiting for a specific pre-run condition to be reached or completed.
4. Error mode - interrupts the analysis and requires attention (for example, a leak or defective internal components).
5. Resident mode (blinking) - for example, during update of main firmware.
6. Bootloader mode (fast blinking). Try to re-boot the module or try a cold-start. Then try a firmware update.

Exchange Drawers

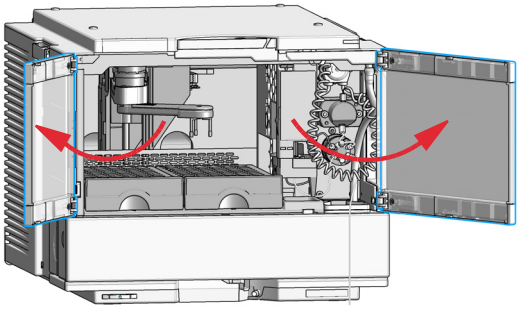
NOTE Do not operate the sampler without drawers installed.

NOTE Install all drawers for best cooling performance.

NOTE Do not mix standard and classic drawers.

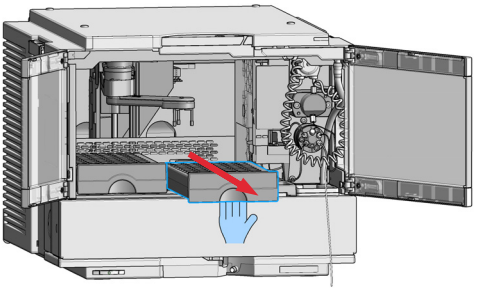
Install classic drawer 1-50 to the left, classic drawer 51-100 to the right side.

1 Open the doors of the module.

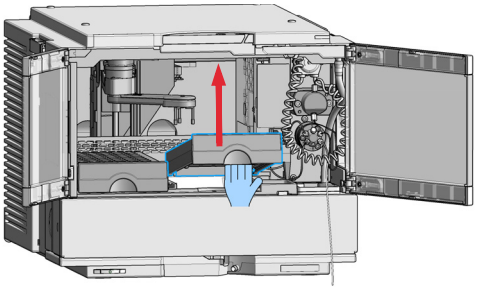


2 Remove the drawer.

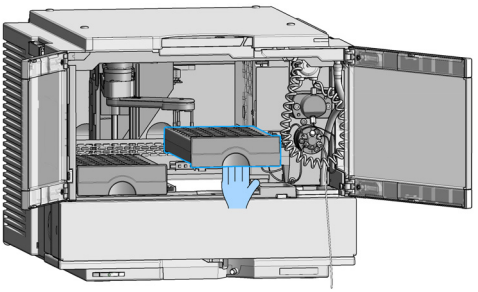
a Pull the drawer out.



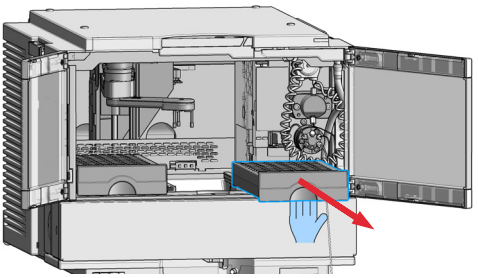
b Lift the front of the drawer.



c Lift the drawer out.

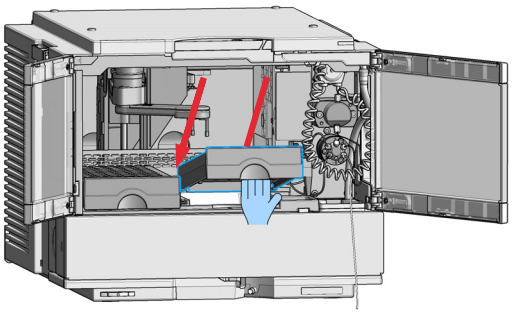


d Remove the drawer.

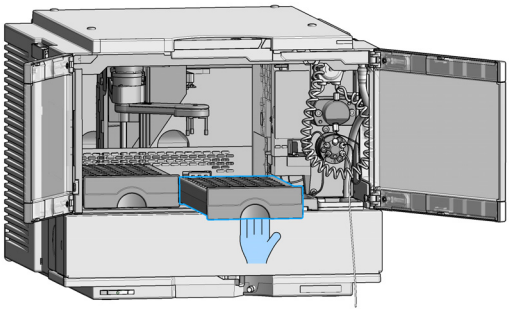


3 Install the drawer.

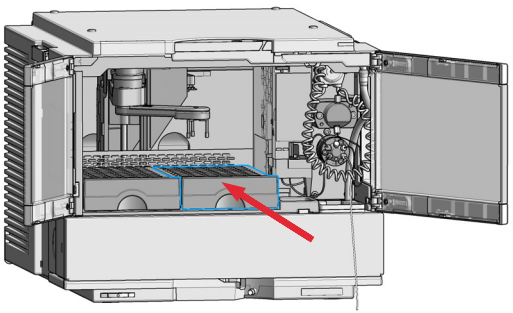
a Insert the back of the drawer.



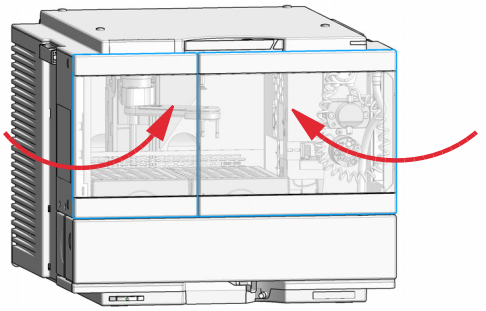
b Align the drawer.



c Push in the drawer.



4 Close the doors.



Install the External Tray

Tools required

Description
Flathead screwdriver

Parts required

p/n	Description
G7129-60000	External Tray for 5 x 2 mL Vials
G1313-27302	Disposal tube

Preparations

- Finish any pending acquisition job.
- Open the doors of the sampler.

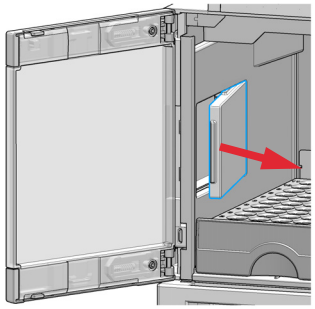
NOTE

Keep foam and plastic cover in a safe place.

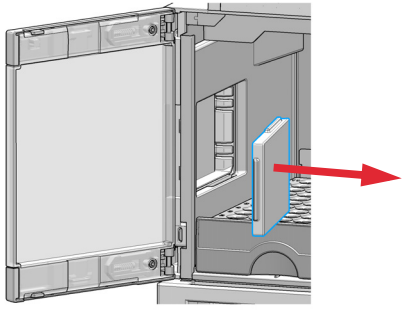
For best temperature performance, and if the external tray is not in use, it is best to cover the opening for the external tray with the original parts.

1 Remove the foam and the plastic cover.

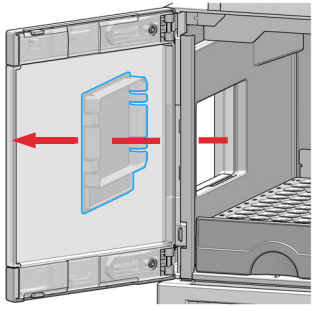
a Lift the front part of the foam with a flathead screw driver.



b Remove the foam.

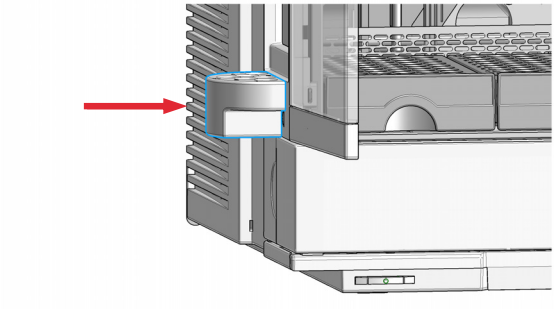


c Push out the plastic cover.

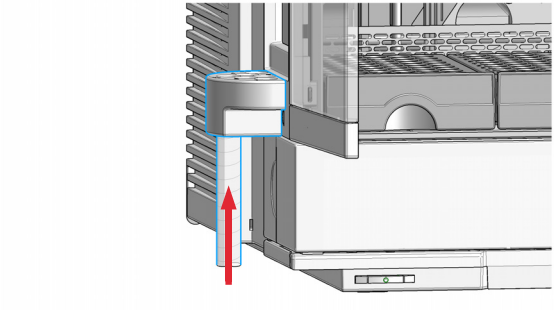


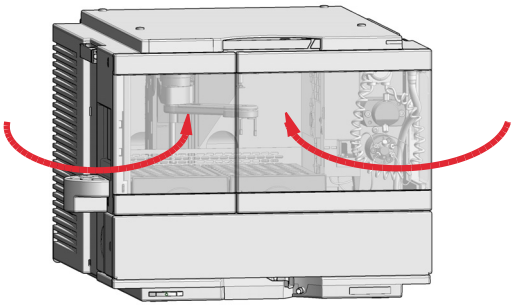
2 Install the external tray and the disposal tube.

a Mount the external tray in the mounting holes on the left side of the sampler and ensure that it is pushed in all the way.



b Install the disposal tube.



3 Close the doors. 	**4** Configure the External Tray in the online view of the Chromatographic Data System: right-click on the sampler dashboard and select **Modify >External Tray**. In the dialog, select the **External Tray installed** check box.

Sample Trays

Supported drawers for the module:

p/n	Description
G7129-60010	Drawer for 66 x 2 mL Vials
G7129-60110	Drawer for 18 x 6 mL Vials
G7129-68210	Classic Vial Drawer Kit (a set of left and right drawers)
G7129-60000	External Tray for 5 x 2 mL Vials

NOTE Install all drawers for best cooling performance.

Drawer Combinations

Drawers can be installed in any combination enabling both 2 mL- and 6 mL-vials to be used simultaneously. The only exception is the usage of the classical drawer option (100 x 2 mL). This option can't combine with the other drawers.

Numbering of Vial Positions

The standard 2*66 vial drawers have 132 vial positions from P1-A1-P2-F11. However, when using two drawers, the numbering convention is slightly different. The vial positions of the right-hand drawer begin at position P2-A1 as follows:

Left-hand Drawer for 66 x 2 mL Vials: P1-A1 to P1-F11

Left-hand Drawer for 18 x 6 mL Vials: P1-A1 to P1-C6

Right-hand Drawer for 66 x 2 mL Vials: P2-A1 to P2-F11

Right-hand Drawer for 18 x 6 mL Vials: P2-A1 to P2-C6

Drawer for 50 x 2 mL Vials Classic Left: Vial 1-50

Drawer for 50 x 2 mL Vials Classic Right: Vial 51-100

External Tray 5-position: 201 – 205 Position
(The disposal tube is installed into the external tray by turning and pushing it into the backside of the hole position, No. 206)

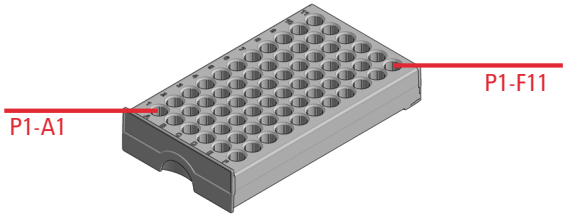


Figure 9 Numbering of drawer position (left-hand Drawer for 66 x 2 mL Vials)

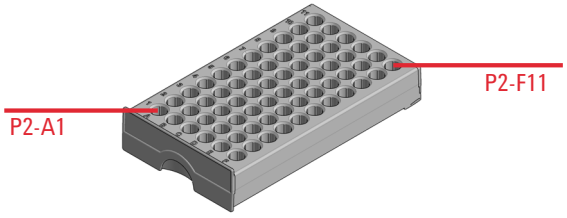


Figure 10 Numbering of drawer position (right-hand Drawer for 66 x 2 mL Vials)

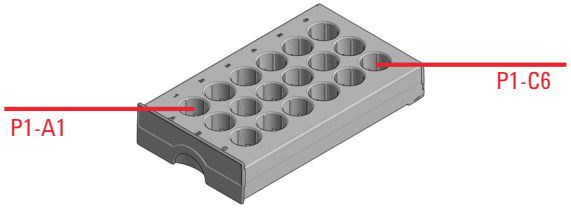


Figure 11 Numbering of drawer position (left-hand Drawer for 18 x 6 mL Vials)

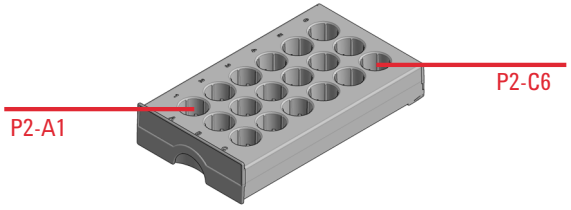


Figure 12 Numbering of drawer position (right-hand Drawer for 18 x 6 mL Vials)

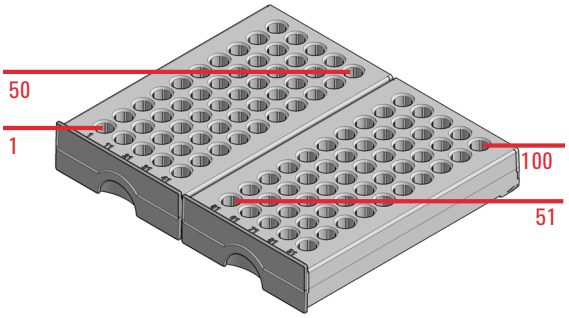


Figure 13 Numbering of drawer position (Drawer for 50 x 2 mL Vials Classic)

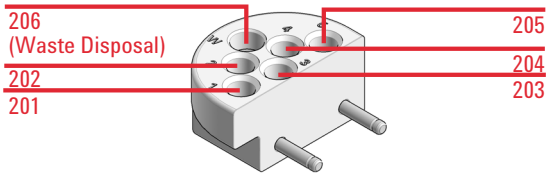


Figure 14 Numbering of tray position (External tray)

Choice of Vials and Caps

List of Compatible Vials and Caps

For reliable operation vials used with the autosampler must not have tapered shoulders or caps that are wider than the body of the vial. The vials in "Crimp Top Vials" on page 51, "Snap Top Vials" on page 52 and "Screw Top Vials" on page 52 and caps in "Crimp Caps" on page 53, "Snap Caps" on page 53 and "Screw Caps" on page 53 (shown with their Part numbers) have been successfully tested using a minimum of 15,000 injections with the autosampler.

Crimp Top Vials

p/n	Description
5181-3375	Crimp Top Vial, 2 mL, clear glass, 100/Pack
5183-4491	Crimp Top Vial, 2 mL, clear glass, 1000/Pack
5182-0543	Crimp Top Vial, 2 mL, clear glass, write-on spot, 100/Pack
5183-4492	Crimp Top Vial, 2 mL, clear glass, write-on spot, 1000/Pack
5183-4494	Crimp Top Vial, 2 mL, clear glass, write-on spot, 100/Pack (silanized)
5181-3376	Crimp Top Vial, 2 mL, amber glass, write-on spot, 100/Pack
5183-4493	Crimp Top Vial, 2 mL, amber glass, write-on spot, 1000/Pack
5183-4495	Crimp Top Vial, 2 mL, amber glass, write-on spot, 100/Pack (silanized)
5182-0567	Crimp Top Vial, 1 mL, polypropylene, wide opening, 100/Pack
5183-4496	Crimp Top Vial, 1 mL, polypropylene, wide opening, 100/Pack (silanized)
9301-0978	Crimp top vial, 250 µL, polypropylene, wide opening, 1000/Pack

Snap Top Vials

p/n	Description
5182-0544	Snap Top Vial, 2 mL, clear glass, 100/pk
5183-4504	Snap Top Vial, 2 mL, clear glass, 1000/Pack
5183-4507	Snap Top Vial, 2 mL, clear glass, 100/Pack (silanized)
5182-0546	Snap Top Vial, 2 mL, clear glass, write-on spot, 100/Pack
5183-4505	Snap Top Vial, 2 mL, clear glass, write-on spot, 1000/Pack
5183-4508	Snap Top Vial, 2 mL, clear glass, write-on spot, 100/Pack (silanized)
5182-0545	Snap Top Vial, 2 mL, amber glass, write-on spot, 100/Pack
5183-4506	Snap Top Vial, 2 mL, amber glass, write-on spot, 1000/Pack
5183-4509	Snap Top Vial, 2 mL, amber glass, write-on spot, 100/Pack (silanized)

Screw Top Vials

p/n	Description
5182-0714	Screw Cap Vials, 2 mL, clear glass, 100/Pack
5183-2067	Screw Top Vial, 2 mL, clear glass, 1000/Pack
5183-2070	Screw Top Vial, 2 mL, clear glass, 100/Pack (silanized)
5182-0715	Screw Top Vial, 2 mL, clear glass, write-on spot, 100/Pack
5183-2068	Screw Top Vial, 2 mL, clear glass, write-on spot, 1000/Pack
5183-2071	Screw Top Vial, 2 mL, clear glass, write-on spot, 100/Pack (silanized)
5182-0716	Screw Cap Vial, 2 mL, amber glass, write-on spot, 100/Pack
5183-2069	Screw Top Vial, 2 mL, amber glass, write-on spot, 1000/Pack
5183-2072	Screw Top Vial, 2 mL, amber glass, write-on spot, 100/Pack (silanized)

Crimp Caps

p/n	Description
5181-1210	Crimp Cap, silver aluminum, septum (clear PTFE/red rubber), 100/Pack
5183-4498	Crimp Cap, silver aluminum, septum (clear PTFE/red rubber), 1000/Pack
5181-1215	Crimp Cap, blue aluminum, septum (clear PTFE/red rubber), 100/Pack
5181-1216	Crimp Cap, green aluminum, septum (clear PTFE/red rubber), 100/Pack
5181-1217	Crimp Cap, red aluminum, septum (clear PTFE/red rubber), 100/Pack

Snap Caps

p/n	Description
5182-0550	Snap Cap, clear polypropylene, septum (clear PTFE/red rubber), 100/Pack
5182-3458	Snap Cap, blue polypropylene, septum (clear PTFE/red rubber), 100/Pack
5182-3457	Snap Cap, green polypropylene, septum (clear PTFE/red rubber), 100/Pack
5182-3459	Snap Cap, red polypropylene, septum (clear PTFE/red rubber), 100/Pack

Screw Caps

p/n	Description
5182-0717	Screw Cap, blue polypropylene, septum (clear PTFE/red rubber), 100/Pack
5182-0718	Screw Cap, green polypropylene, septum (clear PTFE/red rubber), 100/Pack
5182-0719	Screw Cap, red polypropylene, septum (clear PTFE/red rubber), 100/Pack
5182-0720	Screw Cap, blue polypropylene, septum (clear PTFE/silicone), 100/Pack
5182-0721	Screw Cap, green polypropylene, septum (clear PTFE/silicone), 100/Pack
5182-0722	Screw Cap, red polypropylene, septum (clear PTFE/silicone), 100/Pack

Install the Optional Sample Cooler/Sample Thermostat

Unpacking the Unit

Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the instrument may have been damaged during shipment.

CAUTION

"Defective on arrival" problems

If there are signs of damage, please do not attempt to install the module. Inspection by Agilent is required to evaluate if the instrument is in good condition or damaged.

- ✓ **Notify your Agilent sales and service office about the damage.**
- ✓ **An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.**

Delivery Checklist

Ensure that all parts and materials have been delivered with your module. The delivery checklist is shown below. For parts identification, please check the illustrated parts breakdown in "Sample Thermostat Upgrade" on page 217. Please report any missing or damaged parts to your local Agilent Technologies sales and service office.

Table 9 Delivery checklist for the Sample Thermostat

Description	Quantity
Sample Thermostat (G7167-60201)	1
Condensate Drainage Kit (5067-6208)	1
Declaration of Conformity	1
Customer Letter	1

NOTE

The Agilent Infinity II Sample Cooler is not available for trade sales anymore and has been replaced by the Agilent InfinityLab Sample Thermostat.

Install the Sample Cooler/Sample Thermostat

Tools required	p/n	Description
	8710-0899	Screwdriver Pozidrive Shaft (for the Sample Cooler)
	5182-3466	Torx screwdriver T10 (for the Sample Thermostat)
OR	5023-3089	Torx key set (part of the G7120-68708 InfinityLab LC Series Tool Kit)

Parts required	#	p/n	Description
	1		Sampler
	1	G7167-60005	Sample Cooler
OR	1	G7167-60101	Sample Thermostat
OR	1	G7167-60201	Sample Thermostat
	1		Power cord
	1	5067-6208	Condensate Drainage Kit

Preparations

- The hosting sampler is installed in the HPLC stack.
- If needed, update the firmware of the hosting sampler to ensure that it supports the type of thermostat you are about to install, see "Specifications of the Sample Thermostat" on page 34.

NOTE

Visit **https://www.agilent.com/** for a video tutorial on installing the Agilent InfinityLab Sample Thermostat. Find the video by the following options:

- Enter the link **https://www.agilent.com/search/?Ntt=install-infinitylab-sample-thermostat**.
- Alternatively, the video is available on the landing page of any compatible Agilent Infinity II autosampler under the section **Videos**.

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the Sample Thermostat and laboratory.

- ✓ Keep open fire or sources of ignition away from the device.
- ✓ Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the Sample Thermostat).
- ✓ Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.
- ✓ Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the Sample Thermostat.

WARNING

Flammable refrigerant used

- ✓ When handling, installing and operating the Sample Thermostat, care should be taken to avoid damage to the refrigerant tubing or any part of the Sample Thermostat.

CAUTION

Routing of the condensation tubing

Proper routing of the condensation tubing is critical for correct condensate drainage.

- ✓ Do not place the sampler directly on the bench.

CAUTION

Condensate inside the Sample Cooler/Sample Thermostat

Damage to the electronics of the module

- ✓ After installation of the Sample Cooler/Sample Thermostat, wait at least 30 min before switching on the module.
- ✓ Make sure there is no condensate inside the module.

WARNING

In the event of a damage

- ✓ Keep open fire or sources of ignition away from the device.
- ✓ Ventilate the room for several minutes.
- ✓ Do not use the Sample Thermostat any more.

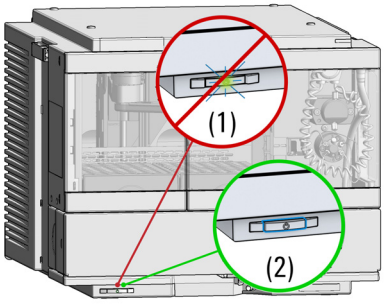
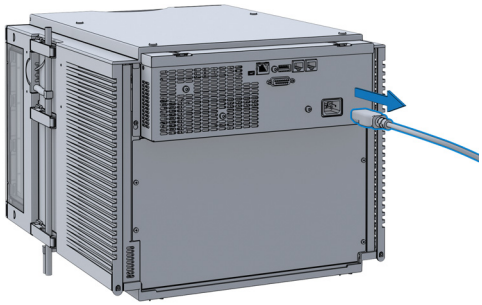
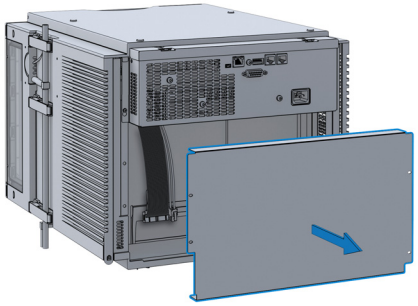
NOTE If the Sample Cooler/Sample Thermostat is disconnected from the power supply, wait for at least five minutes before replugging and switching on the compressor again.

NOTE Even under average humidity conditions, a significant amount of condensed water gathers every day. A suitable container must be provided and emptied regularly to avoid overflow.

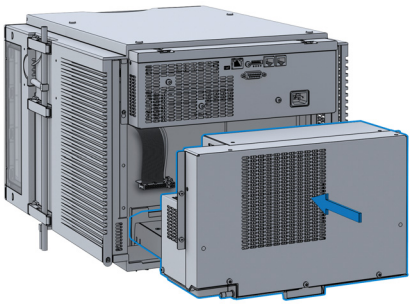
NOTE For best performance of the Sample Cooler/Sample Thermostat, all drawers must be installed in the sampler. For the Multisampler, use dummy drawers (G4267-60024) if no full hotel configuration is needed.

NOTE For the Sample Cooler installation in a Vialsampler (G7129A, G7129B, G7129C) or Preparative Autosampler (G7157A) the serial number of the Sample Cooler must be DEBAT02001 or higher.

NOTE The setup with the condensate collector funnel is suitable for bench installations only. For installations on an InfinityLab Laboratory Instrument Bench, use the alternative installation described in the *Installation of the Infinity II Cooler/Thermostat Condensate Drainage Tubing Kit Technical Note*. Enter the link **https://www.agilent.com/search/?Ntt=Installation-of-the-Infinity-II-Cooler/Thermostat-Condensate-Drainage-Tubing-Kit-Technical-Note** to locate the TechNote on **https://www.agilent.com/**.

1 Ensure that the power switch on the front of the module is OFF (switch stands out). 	**2** Disconnect the power cable from the sampler. 
3 Loosen the four screws on the rear of the module. 	**4** Remove the sheet metal back cover of the sampler. 

5 Slide the Sample Cooler/Sample Thermostat halfway into the sampler.



WARNING

Module is partially energized when switched off, as long as the power cord is plugged in.
Repair work at the module can lead to personal injuries, e.g. shock hazard, when the cover is opened and the module is connected to power.

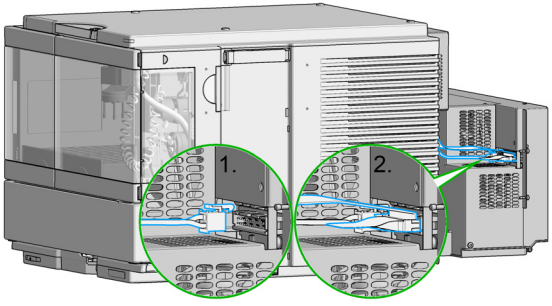
- ✓ **Make sure that it is always possible to access the power plug.**
- ✓ **Do not use the Sample Cooler/Sample Thermostat if it is not operating correctly or has been damaged. Disconnect it from the power supply and call your local service center.**
- ✓ **Remove the power cable from the module before opening the cover.**
- ✓ **Do not connect the power cable to the module while the covers are removed.**
- ✓ **If the Sample Cooler/Sample Thermostat is disconnected from the power supply, you should wait for at least five minutes before switching on the compressor.**

CAUTION

Damaged electronics

- ✓ **To avoid damages of the electronics of the module make sure the power cords are unplugged before disconnecting or reconnecting the sampler to the Sample Cooler/Sample Thermostat cables.**

6 Connect the power cable and the data cable to the Sample Cooler/Sample Thermostat.



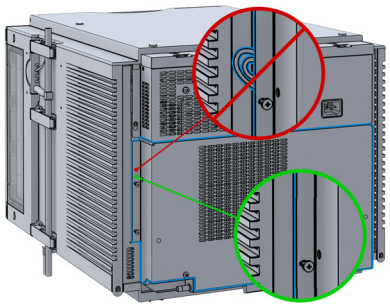
CAUTION

Damage to the cables

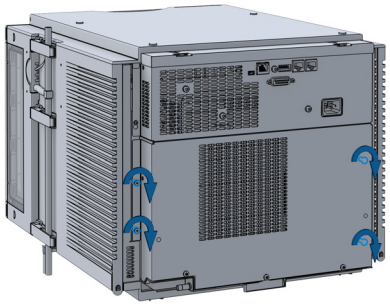
✓ **Do not bend or pinch the cables.**

✓ **Make sure that the Sample Cooler/Sample Thermostat fits perfectly in the sampler.**

7 Slide the Sample Cooler/Sample Thermostat all the way into the sampler.



8 Fix the Sample Cooler/Sample Thermostat with the four screws.

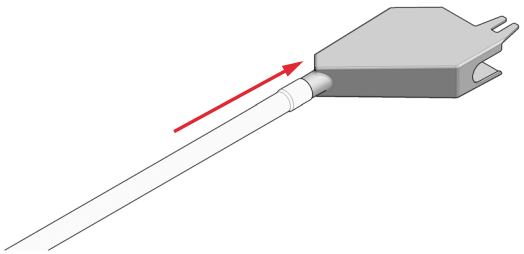


9 Use a bubble level to check the leveling of the sampler.

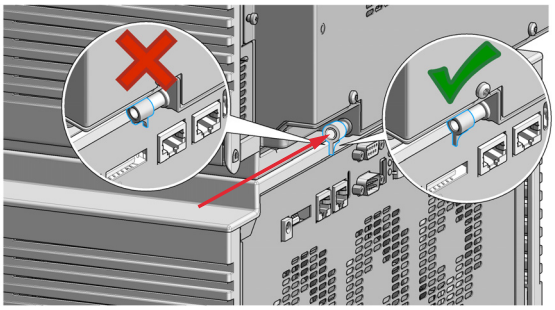
NOTE

To ensure adequate drainage for condensate, the module should be operated in a proper horizontal position.

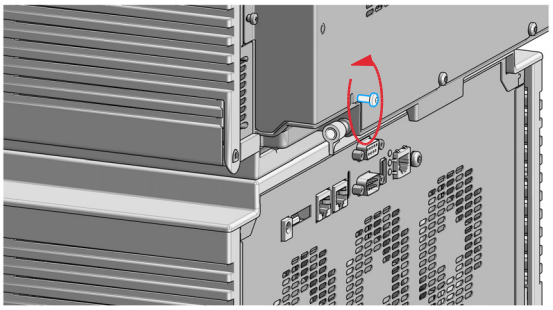
10 Attach the condensate tube to the outlet port of the condensate collector funnel.



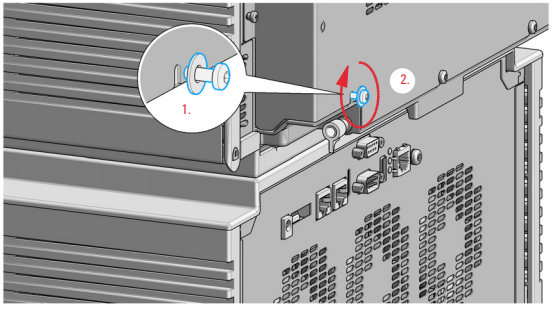
11 Mount the drain connector on the condensate drainage outlet tube. Ensure the correct orientation of the spout.



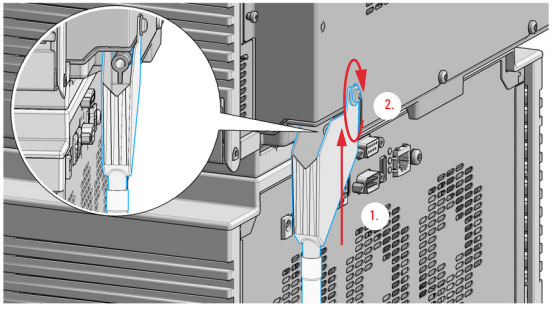
12 Remove the screw situated above the condensate drainage outlet tube.



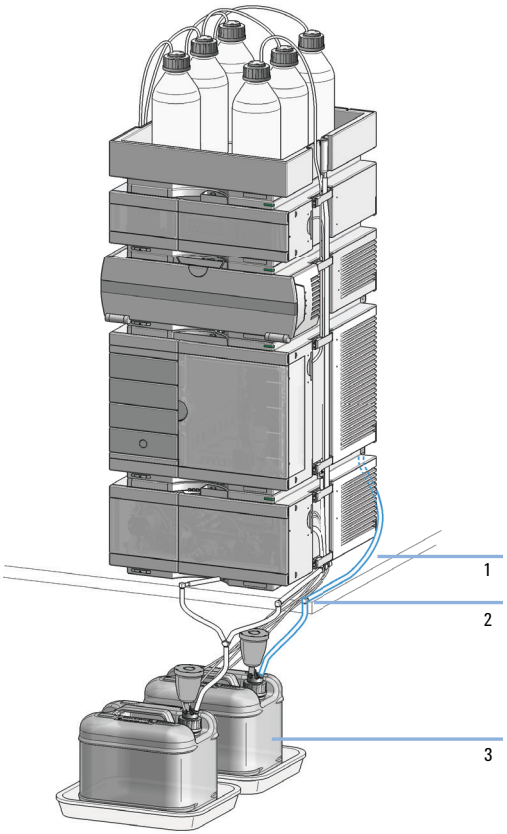
13 Place the washer over the thread of the screw (1). Screw the screw and washer halfway into the hole in the back of the cooler/thermostat (2).



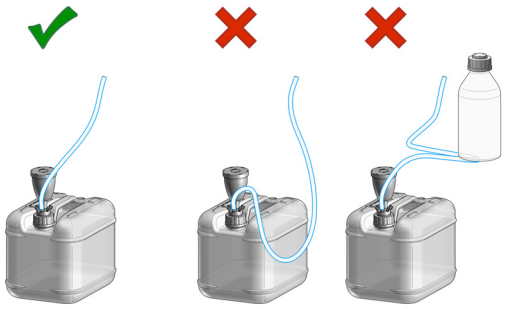
14 Position the condensate collector funnel underneath the condensate drainage outlet tube (1) and fix it to the back of the cooler/thermostat by tightening the screw (2). Ensure correct orientation and avoid overtightening the screw.



15 Shorten the condensate tube so that it runs straight into the waste container without any unnecessary detour (1). If needed, use the 90 ° tubing connector provided in the kit to eliminate uphill sections, which might occur at the edge of the bench (2). Agilent recommends the use of a separate canister for condensate collection to avoid drainage problems (3).



16 Ensure that the tubing runs straight into the waste canister without any bends or joints and it is not hindered by any mechanical obstacle. Agilent recommends using a 6 L waste canister equipped with a suitable InfinityLab Stay Safe cap for optimal condensate handling. If you decide to use your own waste solution, make sure that the tubes don't immerse in the liquid.



NOTE

For more information, see "Leak and Waste Handling" on page 22.

NOTE

Depending on the ambient conditions in the lab, the amount of condensate can vary from 200 mL to 2 L per day. Do not fill the waste container for the condensate to the top. Regularly empty the waste container.

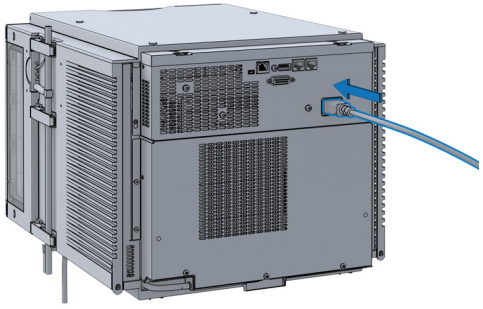
CAUTION

Damage to the Sample Cooler/Sample Thermostat

✓ **Wait at least 30 min before switching on the compressor of the cooler/thermostat.**

✓ **This allows the refrigerant and system lubrication to reach equilibrium.**

17 Connect the power cable to the power connector at the rear of the module.



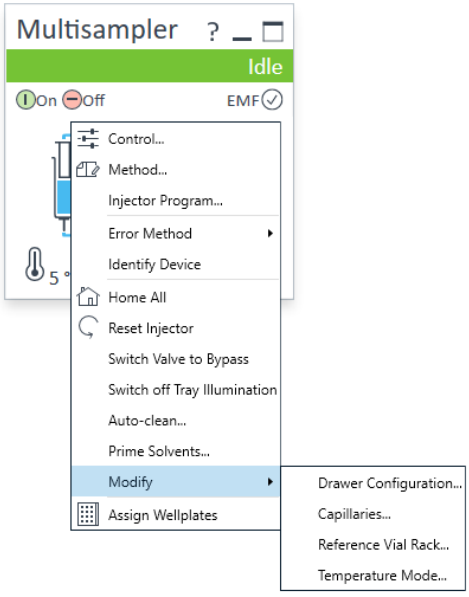
18 Configure the Sample Cooler/Sample Thermostat in the CDS.

Using the Optional Sample Cooler/Sample Thermostat

The following section describes how to operate the Agilent Infinity II Sample Cooler and the Agilent InfinityLab Sample Thermostat using the Multisampler as an example for the hosting sampler. The operation principle is the same for any other Infinity II sampler type.

Control Interface

Right-clicking the sampler GUI will prompt the control interface, where control and method parameters can be edited, configuration modified, and special commands executed.



Control

With the Sample Cooler/Sample Thermostat installed, the **Control** dialog box of the hosting Infinity II sampler will include the following cooler/thermostat-specific control options:

- **At Power On**:
  - **Turn On Thermostat**: The cooler/thermostat turns on automatically upon powering on the sampler.
- **Thermostat**:
  - **On**: The cooler/thermostat turns on and the system starts to regulate the temperature inside the sample space towards the setpoint.

NOTE

For the Sample Cooler, the set temperature must be at least 5 °C below ambient for proper temperature control.

  - **Off**: The cooler/thermostat turns off.
- **Enable Analysis**

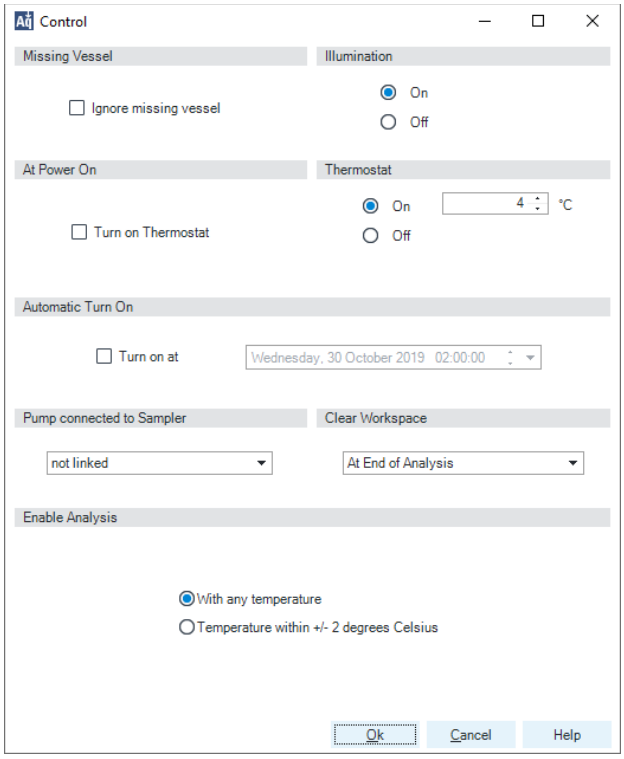
NOTE

The **Enable Analysis** control setting is available since LC & CE drivers A.02.19.

  - **With any temperature**: The analysis starts regardless of the actual temperature inside the sampler.
  - **Temperature within +/- 2 °C**: The analysis starts only when the actual temperature is within the ± 2 °C range of the setpoint temperature.

NOTE

The **Temperature within +/- 2 °C** option is only available for the Sample Thermostat.


Control
Missing Vessel
Ignore missing vessel
Illumination
On
Off
At Power On
Turn on Thermostat
Thermostat
On
Off
4
°C
Automatic Turn On
Turn on at
Wednesday, 30 October 2019 02:00:00
Pump connected to Sampler
not linked
Clear Workspace
At End of Analysis
Enable Analysis
With any temperature
Temperature within +/- 2 degrees Celsius
Ok
Cancel
Help

Temperature Mode

Selecting **Modify >Temperature Mode** in the **Control Interface** will prompt a dialog box, where the temperature control mode can be switched between being a method parameter or a system (control) setting:

- **Constant Temperature Mode**: The temperature control mode is defined as a system (control) setting, meaning that the temperature setting is independent of the method parameters. The temperature stays constant for all methods within a given sequence. This control mode is the default option and recommended for most applications.
- **Variable Temperature Mode**: The temperature control mode is defined as a method parameter, meaning that the temperature setting is part of the method parameters. The temperature can change from method to method within a given sequence. This control mode is not recommended for most analytical workflows but might be used for some special applications, such as degradation studies.

NOTE

For modifying the temperature mode, LC & CE drivers A.02.12 or higher are required. If the system is run on an earlier driver version, the temperature mode is defined as a system setting.

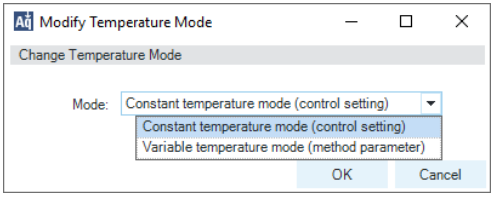


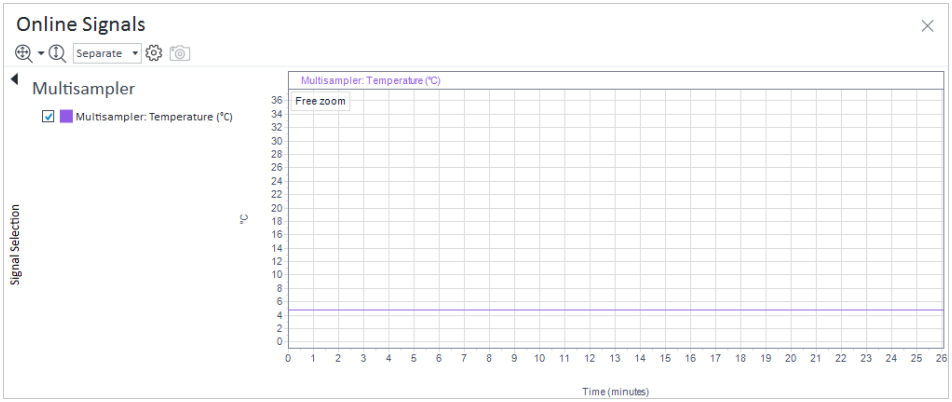
Figure 15 Modify Temperature Mode screen

Before using the **Variable Temperature Mode** setting, here are some hints and tips to consider:

- Changing the temperature setting from one method to another will affect all samples inside the sampler.
- Depending on the extent of the temperature change, it could take up to a couple of hours until the sample temperature stabilizes at the new setpoint (for example, from 4 to 40 °C or vice versa).
- It might be beneficial to use the **Temperature within +/- 2 °C** function; otherwise, the next run will start without waiting for the new setpoint being reached.

Online Signal Monitor

In the **Online Signals** tab of the CDS, the actual temperature of the sample space can be configured and plotted together with the other instrument actuals. This enables the user to have a better overview of how the temperature changes over time.



Operation Information

Reaching Setpoint Temperature

Depending on the ambient conditions and the sampler configuration (for example, hotel configuration for the Multisampler), reaching the setpoint temperature can take from 30 min up to a couple of hours.

NOTE Reaching the 4 °C setpoint from an ambient temperature of 22 °C takes about 45 min for the Vialsampler (G7129A/B/C or G7157A), as well as for the Multisampler (G7167A/B, G5668A, G7137A, or G4767A), and the Online Sample Manager (G3167A) with a single 2H drawer installed.

NOTE This relatively slow ramping down of the temperature is necessary to avoid ice formation.

NOTE For the best performance of the Sample Cooler/Sample Thermostat, all drawers must be installed in the sampler. For the Multisampler, use dummy drawers if no full hotel configuration is needed.

Condensate Formation

Operating the cooler/thermostat at temperatures below ambient results in condensate formation. This condensed water is collected in the base plate of the cooler/thermostat and drained through the drainpipe at the back of the unit. The container for condensate collection should be regularly emptied to ensure the proper functioning of the system.

NOTE If the container is overfilled or the condensate tubing is blocked, the condensate sensor is triggered, rendering the HPLC system to enter the error state (see "Sample temperature control switched off due to condensate" on page 150).

NOTE Depending on the ambient conditions in the lab, the amount of condensate can vary from 200 mL to 2 L per day. Waste containers for the condensate should not be filled to the top. The waste container must be emptied regularly.

Dew Formation

Setting the cooler/thermostat from a lower to a higher temperature setpoint, or just simply turning it off, can result in dew formation on the internal surfaces of the sampler. This is normal and should cease after a couple of hours at the most.

Frequent Door/Drawer Opening

Opening the door(s) and/or the sample drawers frequently can compromise the temperature stability, as fresh warm and humid air will enter each time. In a highly humid environment, this could also lead to the formation of significant amounts of condensate on the internal surfaces of the sampler.

Ice Formation

The Sample Cooler/Sample Thermostat was designed to operate without the risk of icing. In an unlikely event of ice formation, turn off the cooler/thermostat and wait until it defrosts.

NOTE Do not use mechanical devices or other means to accelerate the defrosting process.

Shutting Down

When the Sample Cooler/Sample Thermostat needs to be turned off for the night or a longer period, the following best practices are recommended:

- Remove all sample containers and/or vials from the sampler.
- Let the system reach the ambient temperature. Opening the door(s) of the sampler facilitates this process.
- Remove any condensate that might appear on the sample drawers or the internal surfaces of the sampler.
- Make sure that all condensate is removed from the cooler/thermostat.

NOTE Gently tapping on the sides of the sampler facilitates the condensate removal. Tilting the module towards its right back corner is not recommended as it can damage the internal parts.

Important Information

- If the temperature is too warm or too cold in the chiller, check the air vents first to make sure they are not blocked.
- If frost and ice build up inside the Sample Cooler/Sample Thermostat, defrost the chiller. This is best done overnight. After defrosting, first check the drainages of the Sample Cooler/Sample Thermostat to make sure they are not blocked.

NOTE Do not use mechanical devices or other means to accelerate the defrosting process.

- Waiting for the autosampler to cool down can take 30 min - 45 min or more. This slow ramping behavior is necessary to avoid icing inside the chiller.
- If you turn the Sample Cooler/Sample Thermostat off:
  - **a** Remove all sample containers or vials from the autosampler.
  - **b** Let the autosampler temperature stabilize to ambient temperature (open the door far enough for air to get in).
  - **c** Clean the drawers of the sample hotel or the cold reservoir (underneath the drawers) in the sampler, wipe them down, and dry them well.

NOTE Adjusting the Sample Cooler set points from a colder to a warmer set point will result in some condensation.

NOTE Adjusting the Sample Thermostat set points from a colder to a warmer set point will take longer to avoid some condensation.

NOTE Ramping up from 4 °C to 30 °C with the thermostat happens slowly. It takes more than 1 h until the instrument reaches the setpoint.

Transporting the Sampler with a Sample Cooler or Sample Thermostat Installed

NOTE

When moving the sampler around the laboratory, make sure that any condensed water inside the thermostat is removed.

- Remove the drainage and place a beaker underneath the drain outlet of the Sample Cooler/Sample Thermostat. Then carefully tilt the module to the back so that the water inside the thermostat can safely flow into the leak funnel. If condensate removal is done improperly, you can harm the electronic of the module.
- Otherwise no special precautions are needed for the modules.

WARNING

Heavy weight

The module is heavy.

- ✓ **Carry the module at least with 2 people.**
- ✓ **Avoid back strain or injury by following all precautions for lifting heavy objects.**
- ✓ **Ensure that the load is as close to your body as possible.**
- ✓ **Ensure that you can cope with the weight of your load.**

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the Sample Thermostat and laboratory.

- ✓ **Keep open fire or sources of ignition away from the device.**
- ✓ **Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the Sample Thermostat).**
- ✓ **Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.**
- ✓ **Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the Sample Thermostat.**

NOTE

Transporting the sampler with a Sample Cooler/Sample Thermostat installed is only allowed for short distances. For longer distances, you must separate the units and send them independently.

CAUTION

Unsecured transportation

Mechanical damage

✓ **Secure the transport assembly before transporting the sampler.**

If the sampler with a Sample Cooler/Sample Thermostat needs to be shipped to another location via carrier, ensure:

- The two modules are shipped in separate boxes.
- The gripper arm of the sampler is parked, see **Park Arm** in Agilent Lab Advisor online help for more information. Also ensure there is no vial in the gripper arm.
- Install the transport protection.
- Remove all vials from the drawers.
- The condensed water inside of the Sample Cooler/Sample Thermostat is removed.

Agilent Local Control Modules

Agilent InfinityLab Companion G7108AA

The Agilent InfinityLab Companion gives you complete control, system monitoring, signal plotting, and diagnostic capabilities for a wide range of LC system modules.

The instrument control solution is available as full package including all hardware and accessories, but can also be used on your own mobile devices like tablets, mobile phones and other electronic equipment.

Combining the conveniences of the Agilent Instant Pilot features with state-of-the-art mobile technology, the Agilent InfinityLab Companion gives you maximum flexibility and ease of use to control and monitor your LC system modules.

Features:

- Complete local control and monitoring of Agilent Infinity II LC modules
- Excellent usability and ease of use through a user interface specifically tailored for mobile devices - simple, intuitive touch-enabled, and visual controllable.
- High flexibility through a modern “Bring your own device” approach. Connection between LC module and mobile device either wireless via Wi-Fi or wired over USB cable (with full package).
- Convenient, ergonomic operation either handheld or attached to a module at the stack with newly developed, secure tablet holder (included in the full package).
- Preconfigured tablet with all required software already installed (included in the full package).
- Centerpiece of the solution is a USB dongle that activates the complete intelligence of the InfinityLab Companion on the instrument stack.

The InfinityLab Companion provides:

- fast and direct control in front of the instrument
- a clear overview of the system status
- control functionalities
- access to method parameters and sequences
- a logbook showing events from the modules
- diagnostic tests

4 Preparing the Module

This chapter explains the operational parameters of the module.

Leak and Waste Handling

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- ✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- ✓ **Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).**
- ✓ **Avoid high vapor concentrations. Keep the solvent temperature at least 40 °C (72 °F) below the boiling point of the solvent used. This includes the solvent temperature in the sample compartment. For the solvents methanol and ethanol keep the solvent temperature at least 25 °C (45 °F) below the boiling point.**
- ✓ **Do not operate the instrument in an explosive atmosphere.**
- ✓ **Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).**
- ✓ **Reduce the volume of substances to the minimum required for the analysis.**
- ✓ **Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.**
- ✓ **Ground the waste container.**
- ✓ **Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.**
- ✓ **To achieve maximal safety, regularly check the tubing for correct installation.**

NOTE

For details, see the usage guideline for the solvent cabinet. A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available in the Agilent Information Center or via the Internet.

For details on correct installation, see separate installation documentation.

Preparing the Module

For best performance of the module

- When using the module in a system with a vacuum degassing unit, shortly degas your samples before using them in the module.
- Filter samples before use in a 1200 Infinity Series system. Use 1290 Infinity II inline filter (0.3 µm) (5067-6189) for inline filtering.
- When using buffer solutions, flush the system with water before switching it off.
- Check the module plungers for scratches, grooves and dents when changing the piston seal. Damaged plungers cause micro leaks and will decrease the lifetime of the seal.
- Solvent Information - Observe recommendations on the use of solvents, see "Solvent Information" on page 78.
- Priming and Purging the System - When the solvents have been exchanged or the system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel. Therefore priming and purging of the system is required before starting an application.

Table 10 Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or methanol	Alternative to isopropanol (second choice) if no isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals

Solvent Information

Observe the following recommendations on the use of solvents.

- Follow the recommendations for avoiding the growth of algae, see the pump manuals.
- Small particles can permanently block capillaries and valves. Therefore, always filter solvents through 0.22 µm filters.
- Avoid or minimize the use of solvents that may corrode parts in the flow path. Consider specifications for the pH range given for different materials such as flow cells, valve materials etc. and recommendations in subsequent sections.

Recommended Wash Solvents

- water
- ethanol
- methanol
- water/acid (especially for basic compounds)
- water/base (especially for acidic compounds)
- water/acetonitrile

NOTE

For different wash solvents as mentioned above, verify that the wash solvent is suitable for the silicone wash tubing.

Solvent Compatibility of Tubings for Peristaltic Pumps

The table shows the chemical resistance properties of Silicone and PharMed tubing to different needle wash solvents:

Table 11 Solvent Compatibility of Silicone and PharMed Tubing

	Silicone	PharMed
Acids		
• weak	• good	• very good
• medium	• unsatisfactory	• good
• strong	• not recommended	• not recommended
Alkaline solution		
• weak	• good	• very good
• medium	• unsatisfactory	• very good
• strong	• not recommended	• good
Hydrocarbons		
• aliphatic	•not recommended	
• aromatizised	•not recommended	
• halogenated	•not recommended	

General Information about Solvent/Material Compatibility

Materials in the flow path are carefully selected based on Agilent's experiences in developing highest-quality instruments for HPLC analysis over several decades. These materials exhibit excellent robustness under typical HPLC conditions. For any special condition, please consult the material information section or contact Agilent.

Disclaimer

Subsequent data was collected from external resources and is meant as a reference. Agilent cannot guarantee the correctness and completeness of such information. Data is based on compatibility libraries, which are not specific for estimating the long-term life time under specific but highly variable conditions of UHPLC systems, solvents, solvent mixtures, and samples. Information also cannot be generalized due to catalytic effects of impurities like metal ions, complexing agents, oxygen etc. Apart from pure chemical corrosion, other effects like electro corrosion, electrostatic charging (especially for nonconductive organic solvents), swelling of polymer parts etc. need to be considered. Most data available refers to room temperature (typically 20 – 25 °C, 68 – 77 °F). If corrosion is possible, it usually accelerates at higher temperatures. If in doubt, please consult technical literature on chemical compatibility of materials.

MP35N

MP35N is a nonmagnetic, nickel-cobalt-chromium-molybdenum alloy demonstrating excellent corrosion resistance (for example, against nitric and sulfuric acids, sodium hydroxide, and seawater) over a wide range of concentrations and temperatures. In addition, this alloy shows exceptional resistance to high-temperature oxidation. Due to excellent chemical resistance and toughness, the alloy is used in diverse applications: dental products, medical devices, nonmagnetic electrical components, chemical and food processing equipment, marine equipment. Treatment of MP35N alloy samples with 10 % NaCl in HCl (pH 2.0) does not reveal any detectable corrosion. MP35N also demonstrates excellent corrosion resistance in a humid environment. Although the influence of a broad variety of solvents and conditions has been tested, users should keep in mind that multiple factors can affect corrosion rates, such as temperature, concentration, pH, impurities, stress, surface finish, and dissimilar metal contacts.

Polyphenylene Sulfide (PPS)

Polyphenylene sulfide has outstanding stability even at elevated temperatures. It is resistant to dilute solutions of most inorganic acids, but it can be attacked by some organic compounds and oxidizing reagents. Nonoxidizing inorganic acids, such as sulfuric acid and phosphoric acid, have little effect on polyphenylene sulfide, but at high concentrations and temperatures, they can still cause material damage. Nonoxidizing organic chemicals generally have little effect on polyphenylene sulfide stability, but amines, aromatic compounds, and halogenated compounds may cause some swelling and softening over extended periods of time at elevated temperatures. Strong oxidizing acids, such as nitric acid (> 0.1 %), hydrogen halides (> 0.1 %), peroxy acids (> 1 %), or chlorosulfuric acid degrade polyphenylene sulfide. It is not recommended to use polyphenylene sulfide with oxidizing material, such as sodium hypochlorite and hydrogen peroxide. However, under mild environmental conditions, at low concentrations and for short exposure times, polyphenylene sulfide can withstand these chemicals, for example, as ingredients of common disinfectant solutions.

PEEK

PEEK (Polyether-Ether Ketones) combines excellent properties regarding biocompatibility, chemical resistance, mechanical and thermal stability. PEEK is therefore the material of choice for UHPLC and biochemical instrumentation.

It is stable in the specified pH range (for the Bio-Inert LC system: pH 1 – 13, see bio-inert module manuals for details), and inert to many common solvents.

There are still some known incompatibilities with chemicals such as chloroform, methylene chloride, THF, DMSO, strong acids (nitric acid > 10 %, sulfuric acid > 10 %, sulfonic acids, trichloroacetic acid), halogens or aqueous halogen solutions, phenol and derivatives (cresols, salicylic acid, and so on).

When used above room temperature, PEEK is sensitive to bases and various organic solvents, which can cause it to swell. Under such conditions, normal PEEK capillaries are sensitive to high pressure. Therefore, Agilent uses stainless steel clad PEEK capillaries in bio-inert systems. The use of stainless steel clad PEEK capillaries keeps the flow path free of steel and ensures pressure stability up to 600 bar. If in doubt, consult the available literature about the chemical compatibility of PEEK.

Polyimide

Agilent uses semi-crystalline polyimide for rotor seals in valves and needle seats in autosamplers. One supplier of polyimide is DuPont, which brands polyimide as Vespel, which is also used by Agilent.

Polyimide is stable in a pH range between 1 and 10 and in most organic solvents. It is incompatible with concentrated mineral acids (e.g. sulphuric acid), glacial acetic acid, DMSO and THF. It is also degraded by nucleophilic substances like ammonia (e.g. ammonium salts in basic conditions) or acetates.

Polyethylene (PE)

Agilent uses UHMW (ultra-high molecular weight)-PE/PTFE blends for yellow piston and wash seals, which are used in 1290 Infinity pumps, 1290 Infinity II pumps, the G7104C and for normal phase applications in 1260 Infinity pumps.

Polyethylene has a good stability for most common inorganic solvents including acids and bases in a pH range of 1 to 12.5. It is compatible with many organic solvents used in chromatographic systems like methanol, acetonitrile and isopropanol. It has limited stability with aliphatic, aromatic and halogenated hydrocarbons, THF, phenol and derivatives, concentrated acids and bases. For normal phase applications, the maximum pressure should be limited to 200 bar.

Tantalum (Ta)

Tantalum is inert to most common HPLC solvents and almost all acids except fluoric acid and acids with free sulfur trioxide. It can be corroded by strong bases (e.g. hydroxide solutions > 10 %, diethylamine). It is not recommended for the use with fluoric acid and fluorides.

Stainless Steel (SST)

Stainless steel is inert against many common solvents. It is stable in the presence of acids and bases in a pH range of 1 to 12.5. It can be corroded by acids below pH 2.3. It can also corrode in following solvents:

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride) and aqueous solutions of halogens.
- High concentrations of inorganic acids like nitric acid, sulfuric acid, and organic solvents especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer, which are less corrosive against stainless steel).
- Halogenated solvents or mixtures, which form radicals and/or acids, for example:

  $2\ CHCl_3 + O_2 \rightarrow 2\ COCl_2 + 2\ HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, diisopropyl ether). Such ethers should be filtered through dry aluminum oxide, which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1 % solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylenediaminetetraacetic acid).
- Mixtures of carbon tetrachloride with isopropanol or THF.

Titanium (Ti)

Titanium is highly resistant to oxidizing acids (for example, nitric, perchloric and hypochlorous acid) over a wide range of concentrations and temperatures. This is due to a thin oxide layer on the surface, which is stabilized by oxidizing compounds. Non-oxidizing acids (for example, hydrochloric, sulfuric and phosphoric acid) can cause slight corrosion, which increases with acid concentration and temperature. For example, the corrosion rate with 3 % HCl (about pH 0.1) at room temperature is about 13 µm/year. At room temperature, titanium is resistant to concentrations of about 5 % sulfuric acid (about pH 0.3). Addition of nitric acid to hydrochloric or sulfuric acids significantly reduces corrosion rates. Titanium is sensitive to acidic metal chlorides like $FeCl_3$ or $CuCl_2$. Titanium is subject to corrosion in anhydrous methanol, which can be avoided by adding a small amount of water (about 3 %). Slight corrosion is possible with ammonia > 10 %.

Diamond-Like Carbon (DLC)

Diamond-Like Carbon is inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Fused silica and Quartz (SiO_2)

Fused silica is used in Max Light Cartridges. Quartz is used for classical flow cell windows. It is inert against all common solvents and acids except hydrofluoric acid and acidic solvents containing fluorides. It is corroded by strong bases and should not be used above pH 12 at room temperature. The corrosion of flow cell windows can negatively affect measurement results. For a pH greater than 12, the use of flow cells with sapphire windows is recommended.

Gold

Gold is inert to all common HPLC solvents, acids, and bases within the specified pH range. It can be corroded by complexing cyanides and concentrated acids like aqua regia.

Zirconium Oxide (ZrO_2)

Zirconium Oxide is inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Platinum/Iridium

Platinum/Iridium is inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Fluorinated polymers (PTFE, PFA, FEP, FFKM, PVDF)

Fluorinated polymers like PTFE (polytetrafluorethylene), PFA (perfluoroalkoxy), and FEP (fluorinated ethylene propylene) are inert to almost all common acids, bases, and solvents. FFKM is perfluorinated rubber, which is also resistant to most chemicals. As an elastomer, it may swell in some organic solvents like halogenated hydrocarbons.

TFE/PDD copolymer tubings, which are used in all Agilent degassers except 1322A/G7122A, are not compatible with fluorinated solvents like Freon, Fluorinert, or Vertrel. They have limited life time in the presence of hexafluoroisopropanol (HFIP). To ensure the longest possible life with HFIP, it is best to dedicate a particular chamber to this solvent, not to switch solvents, and not to let dry out the chamber. For optimizing the life of the pressure sensor, do not leave HFIP in the chamber when the unit is off.

The tubing of the leak sensor is made of PVDF (polyvinylidene fluoride), which is incompatible with the solvent DMF (dimethylformamide).

Sapphire, Ruby, and Al_2O_3-based ceramics

Sapphire, ruby, and ceramics based on aluminum oxide Al_2O_3 are inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Capillary Color Coding Guide

Syntax for Capillary Description

The tables below are your guide to identifying the proper specifications for your capillary. On all capillaries, dimensions are noted in id (mm), length (mm) and, where applicable, volume (µL). When you receive your capillary, these abbreviations are printed on the packaging.

Using the guide: This fitting is coded as *SPF*, for Swagelok, PEEK, Fingertight.

Table 12 Capillary coding guide

Type **The type gives some indication on the primary function, like a loop or a connection capillary.**		**Material** **The material indicates which raw material is used.**		**Fitting left/fitting right** **The fitting left/right indicate which fitting is used on both ends of the capillary.**	
Key	**Description**	**Key**	**Description**	**Key**	**Description**
Capillary	Connection capillaries	ST	Stainless steel	W	Swagelok + 0.8 mm Port id
Loop	Loop capillaries	Ti	Titanium	S	Swagelok + 1.6 mm Port id
Seat	Autosampler needle seats	PK	PEEK	M	Metric M4 + 0.8 mm Port id
Tube	Tubing	FS/PK	PEEK-coated fused silica[1]	E	Metric M3 + 1.6 mm Port id
Heat exchanger	Heat exchanger	PK/ST	Stainless steel-coated PEEK[2]	U	Swagelok union
		PFFE	PTFE	L	Long
		FS	Fused silica	X	Extra long
		MP35N	Nickel-cobalt-chromium-molybdenium alloy	H	Long head
				G	Small head SW 4
				N	Small head SW 5
				F	Finger-tight
				V	1200 bar
				B	Bio
				P	PEEK
				I	Intermediate

1 Fused silica in contact with solvent

2 Stainless steel-coated PEEK

At-a-Glance Color-Coding Keys

The color of your capillary will help you quickly identify the capillary id.

Table 13 Color-coding key for Agilent capillary tubing

Internal diameter in mm		Color code
0.015		Orange
0.025		Yellow
0.05		Beige
0.075		Black
0.075	MP35N	Black with orange stripe
0.1		Purple
0.12		Red
0.12	MP35N	Red with orange stripe
0.17		Green
0.17	MP35N	Green with orange stripe
0.20/0.25		Blue
0.20/0.25	MP35N	Blue with orange stripe
0.3		Grey
0.50		Bone White

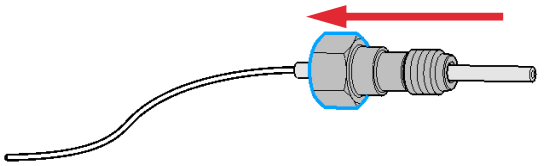
HINT

As you move to smaller-volume, high efficiency columns, you'll want to use narrow id tubing, as opposed to the wider id tubing used for conventional HPLC instruments.

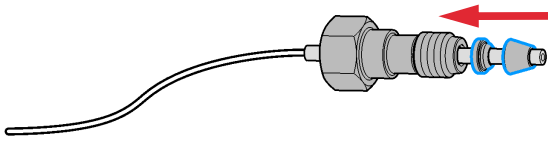
Swage Fittings

1 Select a nut that is long enough for the fitting you'll be using.

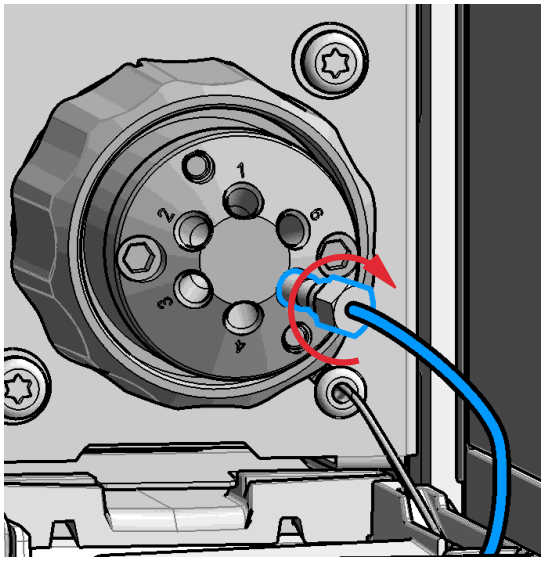
2 Slide the nut over the end of the tubing or capillary.



3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.

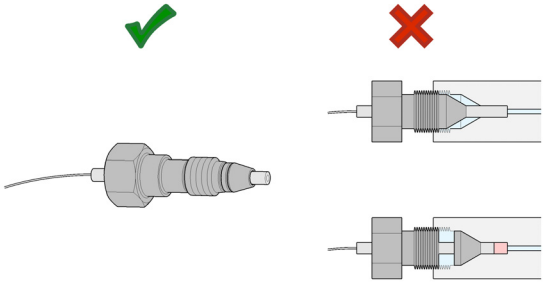


4 Use a column or injection valve to gently tighten the fitting, which forces the ferrule to seat onto the tubing or capillary.



NOTE

Don't overtighten. Overtightening will shorten the lifetime of the fitting.

5 Loosen the nut and verify that the ferrule is correctly positioned on the tubing or capillary. 	

NOTE

The first time that the Swagelok fitting is used on a column or an injection valve, the position of the ferrule is permanently set. If changing from a column or an injection valve to another, the fitting may leak or decrease the quality of the separation by contributing to band broadening. Worst case, the receptor fitting can be damaged.

Flow Connections to the Sampler

Preparations

Module is installed in the system.

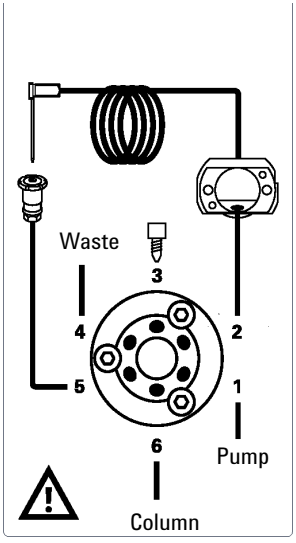
Use an appropriate solvent based on the sample and mobile phase chemistries.

The composition of the wash solvent should be the most solubilizing compatible solvent (your strongest diluent). Selecting the wash solvent is part of the method development.

A mixture of 50 % up to 100 % organic solvent in distilled water is a good choice for many applications.

1. Place a needle wash solvent reservoir into the solvent cabinet.
2. Connect the a Bottle Head Assembly to the solvent reservoir and close the bottle.
3. Guide the tube of the Needle Wash Bottle Head Assembly through the cover opening and connect it to the peristaltic pump.
4. Route the drainage of the washport outlet to the waste container.
5. Prime the wash tubing.
6. Install the capillary from the pump outlet into the port 1 of the injection valve.
7. Install the capillary from port 6 of the injection valve to the ICC or MCT

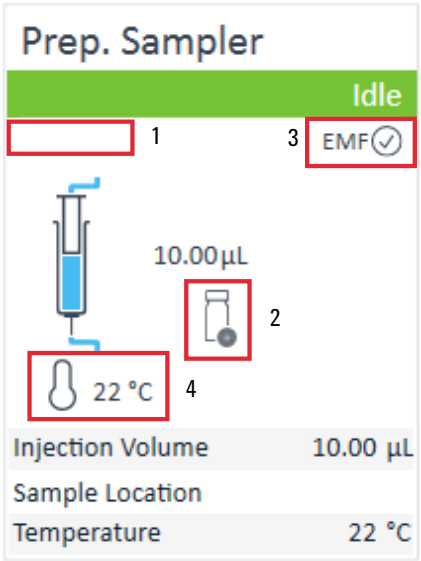
   The correct plumbing is shown in the figure below and is attached to the module.



8. Prime and purge the complete sampler.

Setting up the Sampler

Table 14 The Vialsampler User Interface



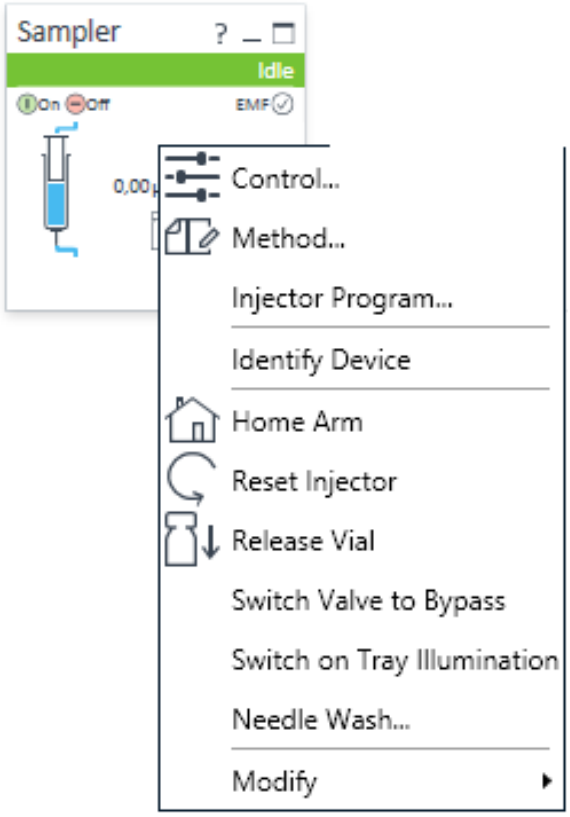
Within the sampler user interface, there are active areas. If you move the mouse cursor across the icons (tray, EMF button), the cursor will change and you may click on the icon to

1 Turn on/off the sampler
2 Check which sample drawers are installed
3 Get the status of the **EMF** (Early Maintenance Feature)
4 Cooling Temperatur (if Sample Cooler/Sample Thermostat is installed)

Current instrument information on:

- **Injection volume**
- **Sample location**

Table 14 The Vialsampler User Interface

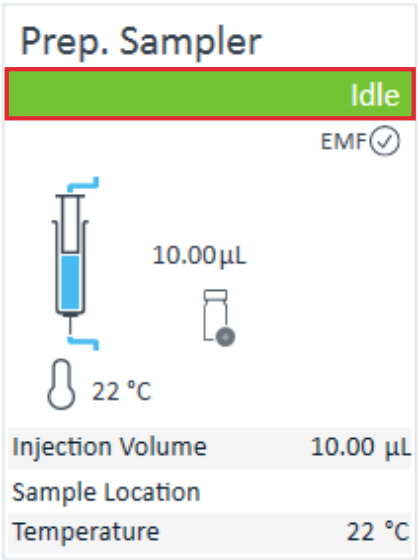
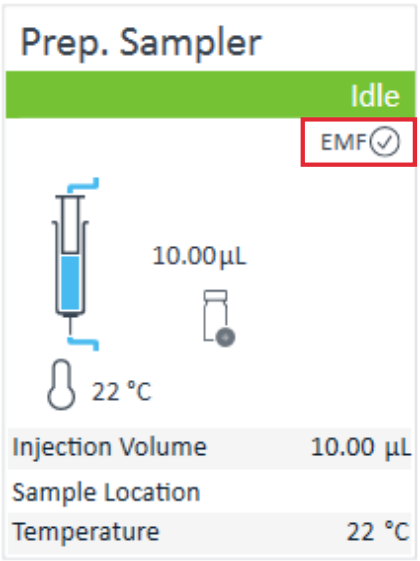


A right-click into the Active Area will open a menu with the option to adjust the following parameters:

- Show the **Control** User Interface (special module settings). See "Control Settings" on page 95.
- Show the **Method** User interface (same as via menu **Instrument >Set up Instrument Method >Setup G7129B**). See "Method Parameter Settings" on page 96.
- **Injector Program**

  When you activate a pretreatment/injector program, it replaces the standard injection cycle. See "Using an Injector Program" on page 105
- **Identify Device**
- **Home Arm**
- **Reset Injector**
- **Release Vial**
- **Switch Valve to Bypass**
- **Switch on Tray Illumination**
- **Needle Wash**: allows you to wash the needle without modifying your current method. The needle wash specified in this dialog box is carried out immediately.
- **Modify**
  - **Flow Path**: for the sample loops, needle seat, extension loops and metering devices
  - **External Tray**
  - **Temperature Mode**

Table 14 The Vialsampler User Interface

	**Module Status** shows Run / Ready / Error state and "Not Ready text" or "Error text" • **Error** (Red) • **Not ready** (yellow) • **Ready** (green) • **Pre run**, **Post run** (purple) • **Run** (blue) • **Idle** (green) • **Offline** (dark gray) • **Standby** (light gray)
	EMF Status shows Run / Ready / Error state and "Not Ready text" or "Error text" • Offline (gray) • Ok No Maintenance required (green) • EMF warning. Maintenance might be required (yellow) • EMF warning. Maintenance required (red)

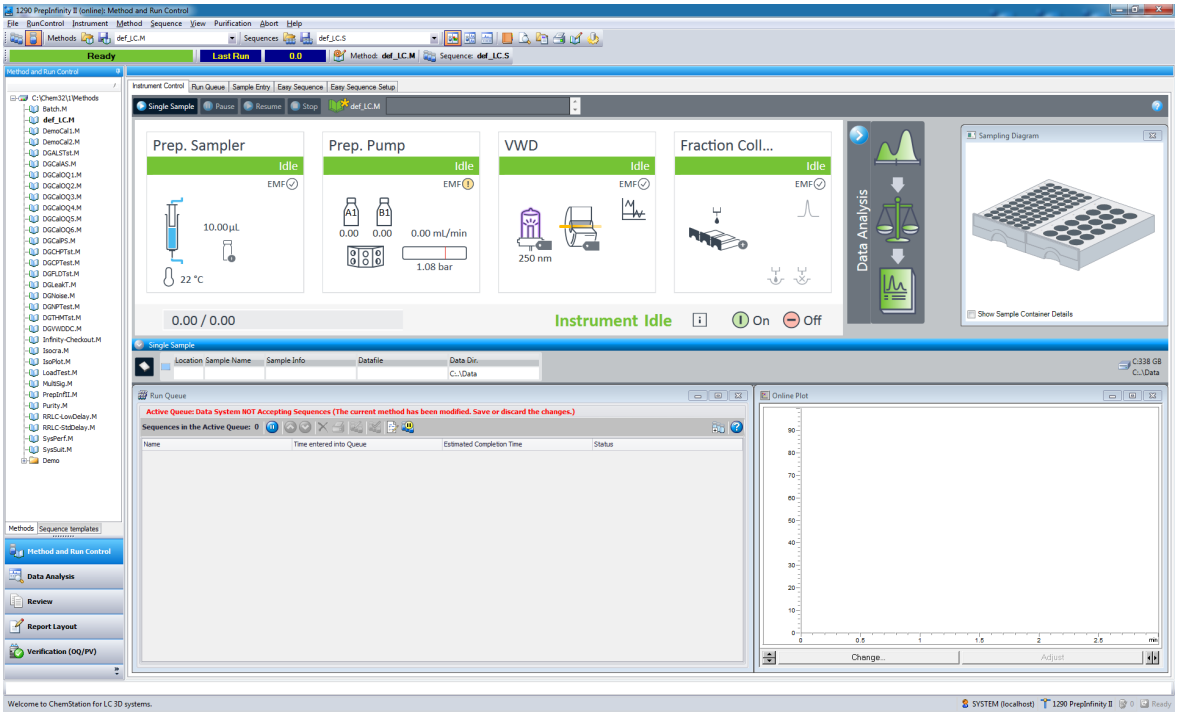


Figure 16 ChemStation Method and Run Control

Control Settings

The control settings are available via right click on the active area of the grafical user interface, see Table 14 on page 91.

Table 15 Control settings

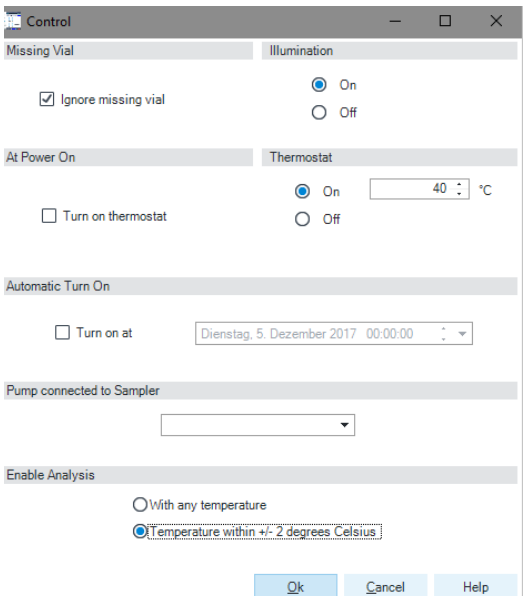


Figure 17 Control settings

The Sampler control parameters are in the following sections:

- **Missing Vial**
  Mark the **Ignore missing vial** check box to specify that, if a vial is missing, the injector ignores it and continues with a 6-second dummy run. The message "Missing vial <x>" is logged, and the system continues with the next injection.
- **Illumination**
  Toggles the illumination of the sample area, On or Off.
- **At Power On**
  The section is available when a cooler/thermostat is installed and configured. Mark the **Turn on Thermostat** check box to specify that the cooler/thermostat is switched on automatically when the instrument is switched on.
- **Thermostat**
  The section is available when a cooler/thermostat is installed and configured and the Constant temperature mode is selected.
  Select **On** to switch on the cooler/thermostat. Specify the required temperature in the adjacent field. The specified temperature must be at least 5 °C below ambient for proper temperature control.
  Select **Off** to switch off the cooler/thermostat.
- **Automatic Turn On**
  You can set a date and time at which the cooler/thermostat switches on automatically.
- **Pump connected to Sampler**
  Use this section to specify the pump that is used with the Sampler. If more than one pump is configured, display the drop-down list and select the appropriate pump from the list.
- **Enable Analysis**
  This feature requires LC & CE Drivers A.02.19 or newer and is only available for the Sample Thermostat. With this function, you can specify if the analyses should start **With any temperature** or only when the **Temperature is within ± 2 °C** range of the setpoint temperature.

NOTE

The Enable Analysis section is disabled when Not controlled is selected in the Temperature section.

NOTE

For additional help and support, highlight the desired area and press the **F1** key. A help screen will open with additional information and documentation about the topic.

Method Parameter Settings

The method parameter settings are available via right click on the active area of the grafical user interface.

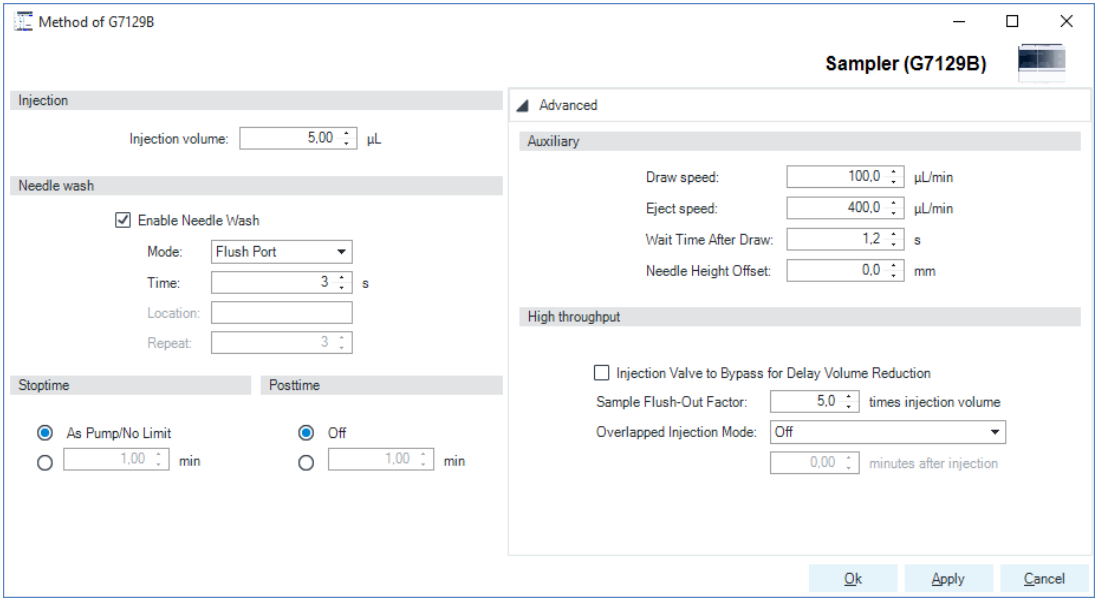


Figure 18 Method parameter settings

Table 16 Method parameter settings

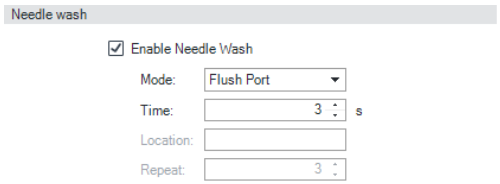
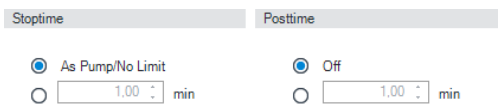
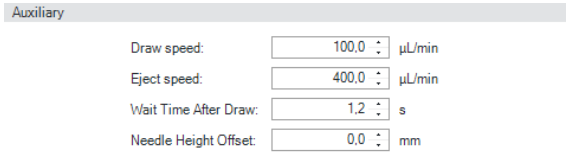
	**Injection** Specify the injection volume (in µL) in the **Injection Volume** field. The injection volume limits depend upon the configuration settings of the autosampler. Note that this setting is ignored when Pretreatment/Injector Program is defined.
	**Needle Wash** Mark the **Enable Needle Wash** check box to specify an injection with needle wash. The following wash parameters can be specified: • **Mode**: Select the wash location by clicking the down arrow and selecting the needle wash mode from the list. You can select from Flush Port (default location) or Wash Vial. • **Time**: This field is enabled only if you have selected Flush Port. Specify a flush time in seconds between 1 and 100 in steps of 1. • **Location**: enabled only if you have selected a Wash Vial. Allows you to specify a wash location in the format Vial X, where X is the vial number. Specify well locations in the format P<Plate #>-<Row Character><Column Number>, for example, P1-A1. The values of <Row Character> and <Column Number> depend on the wellplate type. • **Repeat**: available only if you have selected Wash Vial. You can specify up to 10 repeat washes.
	**Stoptime**: enables you to set the time that the analysis stops. Limits: 0.01 through 99999 min or **As Pump/No Limit**. **Posttime**: the Vialsampler remains in a post-run state during the Posttime to delay the start of the next analysis. A Posttime period can be used to allow the column to equilibrate after changes in solvent composition (for example after gradient elution). Limits: 0.01 through 99999 min or **Off**.

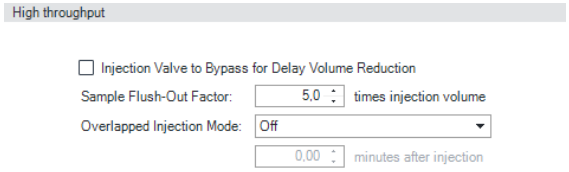
Table 16 Method parameter settings



Auxiliary

- **Draw Speed**: determines the rate at which the plunger draws sample from the vial. Set the speed to an appropriate value for your sample. For viscous samples, use a slow Draw Speed.
- **Eject Speed**: determines the rate at which the plunger ejects sample from the metering device. If you are injecting large volumes of sample, setting a high Eject Speed will shorten the time needed for an injection cycle. For viscous samples in combination with multidraw, use a slow Eject Speed.
- **Wait Time After Draw**: ensures that the temporary vacuum, which originates from the drawing of liquid from the sample vial, dissipates. The needle stays first on the seat for the specified time, then after drawing sample from the vial, remains there for the specified time.
- **Needle Height Offset**: a vertical offset that enables you to position the needle a specific distance (in mm) away from its standard position. The Offset function is useful when analyzing very small sample volumes, or when only a specific part of the sample is required, for example, the top layer.

Table 16 Method parameter settings



High Throughput

Injection Valve to Bypass for Delay Volume Reduction: Mark this check box to switch the flow from the injector from mainpass (main path) to bypass after injection has taken place. This reduces the delay volume for low volume techniques. You can specify the point during the analyses when the valve switches to bypass by setting the **Sample Flush-out Factor**.

Sample Flush-Out Factor: ensures that the sample is thoroughly flushed out of the syringe and past the capillary seat and valve. The Sample Flush-Out Factor is preset to 5.0 at the factory. The preset Sample Flush-Out Factor is correct for most methods. However, for unusually viscous samples, you should increase the Sample Flush-Out Factor to obtain the desired degree of flushing to prevent sample carryover.

Overlapped Injection Mode: provides faster throughput of samples by allowing the preparation of the next injection while the current injection is being completed. The following options can be selected from the drop-down list:

- **Off**: to switch off overlapped injection. Select When sample is Flushed Out to specify that the sample can be prepared directly after the current sample has been flushed out.
- **Prefetch Vial**: to specify that the next sample is fetched by the gripper while the current sample is running.
- **Overlap Injection Cycle**: to specify that the next sample is fetched and loaded into the sample loop while the current sample is running. Specify a time (in minutes) after injection when this process should be started.

NOTE

For additional help and support, highlight the desired area in the user interface and press the **F1** key. A help screen will open with additional information and documentation about the topic.

Injector Programm

The pretreatment/injector program comprises a series of numbered lines, each specifying an operation that the autosampler carries out sequentially. When you activate a pretreatment/injector program, it replaces the standard injection cycle.

The following functions are available :

- Draw
- Eject
- Mix
- Inject
- Move
- Wait
- Valve
- Needle
- Wash
- Remote
- Wait For
- Repeat . End Repeat
- Comment

Module Configuration View

The module configuration settings are available via menu **Instrument >Show ConfigUI**

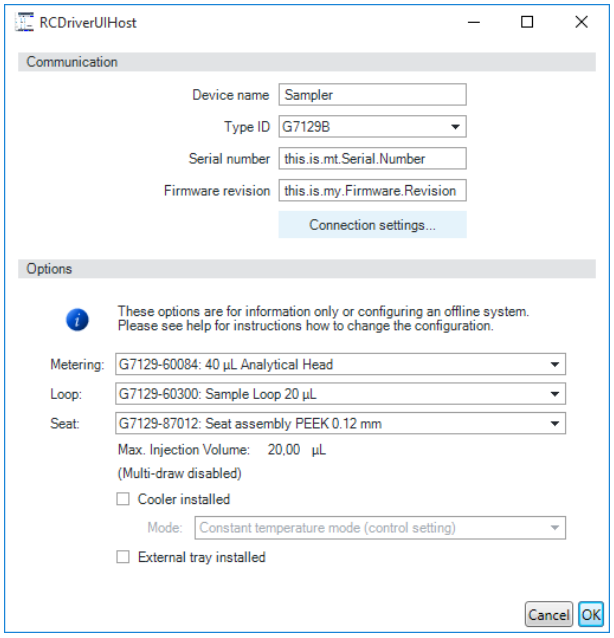


Figure 19 Configuration view

NOTE

For additional help and support. Highlight the desired area and press the **F1** key. A help screen will open with additional information and documentation about the topic.

NOTE

The vialsampler configuration is done in the module dashboard context menu, not in the instrument configuration.

5 Optimizing Performance

This chapter provides information on how to optimize the module.

Optimization for Lowest Carry-over

Several parts of an injection system can contribute to carryover:

- needle outside
- needle inside
- needle seat
- sample loop
- seat capillary
- injection valve

The autosampler continuous flow-through design ensures that sample loop, needle inside, seat capillary, and the mainpass (main path) of the injection valve is always in the flowline. These parts are continuously flushed during an isocratic and also during a gradient analysis. The residual amount of sample remaining on the outside of the needle after injection may contribute to carryover in some instances. When using small injection volumes or when injecting samples of low concentration immediately after samples of high concentration, carryover may become noticeable. Using the automated needle wash enables the carryover to be minimized and also prevents contamination of the needle seat.

Using the Automated Needle Wash (Wash Port)

The automated needle wash can be programmed either as method parameter "enable needle wash" or the needle wash can be included into the injector program. When the automated needle wash is used, the needle is moved into a wash vial before the sample is drawn. By washing the needle before drawing a sample, the sample is removed from the surface of the needle immediately.

For best results and to obtain minimum carryover, the wash port should contain solvent in which the sample components are soluble. The wash port flapper is located in the needle station and a peristaltic pump delivers the wash solvent. It has a volume of ca. 0.5 mL and the peristaltic pump delivers ca. 5 mL/min, which means the wash port volume is completely refilled with fresh solvent in ca. 6 s. If the wash port is selected, the user can set the length of time for washing the outside of the needle with fresh solvent. This may be as low as two or three seconds in routine situations where carryover is less of a problem and 10 to 20 s for more complete washing. It is recommended that washing the outside of the needle in the flush port should be standard procedure to avoid contaminating the needle seat.

Using the Needle Wash in the Wash Vial

For very critical applications where the outside of the needle cannot be cleaned sufficiently with one wash port solvent you can use an injector program and an additional wash vial with an appropriate and stronger solvent for cleaning. The wash vial should contain solvent in which the sample components are soluble, and the vial should not be capped. If the wash vial is capped, small amounts of sample remain on the surface of the septum, which may be carried on the needle to the next sample.

Injector Program with Needle Wash

The injector program includes the command WASH. When this command is included in the injector program, the needle is lowered once into the specified wash vial or flushport before injection.

For example:

1 WASH > Location P2-A1 or flushport

2 Draw 5 µL from Sample Location P1-A1

3 INJECT

Line 1 moves the needle to vial P2-A1 or the flushport. Line 2 draws 5 µL from the current sample vial P1-A1. Line 3 injects the sample (valve switches to main pass).

Using an Injector Program

The process is based on a program that switches the bypass grove of the injection valve into the flow line for cleaning. This switching event is performed at the end of the equilibration time to ensure that the bypass grove is filled with the start concentration of the mobile phase. Otherwise the separation could be influenced, especially if microbore columns are used.

Example

Outside wash of needle in vial p2-A1 before injection

Injector program:

- Draw x.x (y) µl from sample
- WASH vial location p2-A1
- Inject

  Wait (equilibration time - see text above)

  Valve bypass

  Wait 0.2 min

  Valve mainpass (main path)

  Valve bypass

  Valve mainpass (main path)

NOTE Overlapped injection together with additional injection valve switching is not possible.

General Recommendation to Lowest Carry-Over

For samples where the outside of the needle cannot be cleaned sufficiently with the wash port use wash vials with an appropriate and stronger solvent. An injector program and an extra wash vial can be used for cleaning.

In case the needle seat has got contaminated and carryover is significantly higher than expected, the following procedure can be used to clean the needle seat:

- In Lab Advisor go to **Maintenance >Change Needle**: this sets the needle into home position.
- Remove the safety cover of the sampler. Be carefully not to risk an injury by the uncovered needle.
- Pipette an appropriate solvent on to the needle seat. The solvent should be able to dissolve the contamination. If the contamination is unknown, use two or three solvents of different polarity. Use several milliliters to clean the seat.
- Clean the needle seat with a tissue and remove all liquid. Again be careful not to risk an injury by the uncovered needle.
- Reinstall the safety cover of the sampler.
- In Lab Advisor, go to **Maintenance >Change Needle** and finish the procedure.

Fast Injection Cycle and Low Delay Volume

Short injection cycle times for high sample throughput is one of the most important requirements in laboratories. In order to shorten cycle times, you can:

- shorten the column length
- use high flow rates
- apply a steep gradient

Having optimized these parameters, further reduction of cycle times can be obtained using the overlapped injection mode.

Overlapped Injection Mode

In this process, when the sample has reached the column, the injection valve is switched back to bypass, and the next injection cycle starts but waits with switching to mainpass (main path) until the actual run is finished. You gain the sample preparation time when using this process.

Switching the valve into the bypass position reduces the system delay volume. The mobile phase is directed to the column without passing sample loop, needle, and needle seat capillary. This can help to have faster cycle times especially if low flow rates have to be used like it is mandatory in narrow bore and micro bore HPLC.

NOTE Having the valve in bypass position can increase the carryover in the system.

The injection cycle times also depend on the injection volume. In identically standard condition, injecting 100 µL instead of 1 µL, increase the injection time by approximately 8 s. In this case and if the viscosity of the sample allows it, the draw and eject speed of the injection system has to be increased.

NOTE For the last injection of the sequence with overlapped injections, it has to be considered that for this run the injection valve is not switched as for the previous runs and consequently the injector delay volume is not bypassed. This means that the retention times are prolonged for the last run. Especially at low flow rates this can lead to retention time changes which are too big for the actual calibration table. To overcome this, it is recommended to add an extra “blank” injection as last injection to the sequence.

General Recommendations for Fast Injection Cycle Times

As described in this section, the first step to provide short cycle times are optimizing the chromatographic conditions. If this is done the autosampler parameter should be set to:

- Overlapped injection mode
- Increase of draw and eject speed for large injection volumes
- Add at last run a blank, if overlapped injection is used

To reduce the injection time, the detector balance has to be set to OFF.

Precise Injection Volume

Injection Volumes Less Than 2 µL

When the injection valve switches to the BYPASS position, the mobile phase in the sample loop is depressurized. When the syringe begins drawing sample, the pressure of the mobile phase is decreased further. If the mobile phase is not degassed adequately, small gas bubbles can form in the sample loop during the injection sequence. When using injection volumes < 2 µL, these gas bubbles can affect the injection-volume precision. Use degassed mobile phases for best injection-volume precision with injection volumes < 2 µL.

Also, using the automated needle wash (see "Optimization for Lowest Carry-over" on page 103) between injections reduces carryover to a minimum, further improving the injection volume precision.

Draw and Eject Speed

Draw Speed

The speed at which the metering unit draws sample out of the vial may have an influence on the injection volume precision when using viscous samples. If the draw speed is too high, air bubbles may form in the sample plug, affecting precision. The default draw speed is 100 µL/min. This speed is suitable for the majority of applications, however, when using viscous samples, set the draw speed to lower speed for optimum results. A DRAW statement in an injector program also uses the draw speed setting which is configured for the autosampler.

Eject Speed

The default eject speed setting is 400 µL/min. When using large injection volumes, setting the eject speed to a higher value speeds up the injection cycle by shortening the time the metering unit requires to eject solvent at the beginning of the injection cycle (when the piston returns to the home position).

An EJECT statement in an injector program also uses the eject speed setting which is configured for the autosampler. A faster eject speed shortens the time required to run the injector program. When using viscous samples, a high eject speed should be avoided.

6 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

Overview of the Module's Indicators and Test Functions

Status Indicators

The module is provided with two status indicators which indicate the operational state of the module. The status indicators provide a quick visual check of the operation of the module.

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the module generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided (see chapter Error Information).

Maintenance Functions

The maintenance functions position the needle arm, gripper assembly, and metering device for easy access when doing maintenance (see "Maintenance Functions" on page 112).

Tray Alignment

Tray alignment is required after repair of internal components. The procedure aligns the gripper arm correctly to ensure the positioning of the gripper arm is correct for all vials (see "Automatic Referencing" on page 119).

Step Commands

The step functions provide the possibility to execute each step of the sampling sequence individually. The step functions are used primarily for troubleshooting, and for verification of correct autosampler operation after repair (see "Step Commands" on page 121).

Maintenance Functions

Certain maintenance procedures require the needle arm, metering device, and gripper assembly to be moved to specific positions to enable easy access to components. The maintenance functions move these assemblies into the appropriate maintenance position. In the Data System the ALS maintenance positions can be selected from the **Maintenance Positions** menu in the **Service & Diagnostics** display.

In the Lab Advisor Diagnostic SW the ALS maintenance positions can be selected from the **Service & Diagnostic >Maintenance Positions** menu in the **Diagnosis** display.

User Interface

The functions for the control software are:

Change Needle, Sample Loop or Needle Seat:

The needle moves slowly down and positions the needle arm for easy access to the needle, the sample loop or the needle seat.

Change Metering Seal or Piston:

relieves the tension on the metering spring (draws the piston to the outer position), enabling easy disassembly of the metering head assembly).

Park Arm:

secures the gripper arm to the park position behind the sampling unit. ready for transport or shipping of the autosampler.

Change Gripper:

The change gripper function moves the gripper to the front of the autosampler enabling easy access to the gripper release mechanism.

Change Needle

WARNING

Sharp needle

Risk of injury due to moving needle.

- ✓ **Do not touch the tip of the needle.**
- ✓ **Keep your fingers off the moving needle.**
- ✓ **Wear safety goggles when handling an uncovered needle.**

User Interface

The commands for the Data System are:

NOTE

The autosampler safety cover must be in place when **Start** and **End** are selected.

Start

Needle raises up then you have to manually remove the safety cover to have access to the wash port. Now the safety wash port can be flapped manually to the left. The wash port is out of its origin position.

Next

The needle arm moves in the desired position and guide the user to the next procedure step.

NOTE

Read carefully the desciption in the Lab Advisor user interface.

Move Down

The needle arm moves slowly down.

Move Up

The needle arm slowly moves up.

Back

Completes the needle, needle seat procedure.

Using the Change Needle Function

1 Under **Task Selection**, select **Change, Needle, Loop and Seat** and click **Start**.

2 Remove the safety cover and move the wash port safety flap to the service position by slightly lifting it up and then flapping it to the left.

WARNING

Sharp needle

Risk of injury due to moving needle.

- ✓ **Do not touch the tip of the needle.**
- ✓ **Keep your fingers off the moving needle.**
- ✓ **Wear safety goggles when handling an uncovered needle.**

3 Wait until the needle moves down and stops ca. 2 mm above the needle seat.

4 In this maintenance position remove the needle assembly first. Then replace the needle seat assembly. After the exchanging of the needle seat reinstall the new needle assembly. See "Exchange the Needle Assembly" on page 163 and "Exchange the Needle Seat Assembly" on page 168.

5 Click **Next** and wait until the needle arm moves into the upper position.

6 Reinstall the safety cover back to the needle station and click **Next** to continue.

7 Wait until the needle moves back to the needle seat. In the following pop-up window, specify whether or not the EMF counters of the needle and the needle seat should be reset, then click **OK**.

8 Select **Back** in the bottom right corner to exit the **Maintenance Positions** function.

Change Metering Seal or Piston

The change-metering seal/piston function draws the piston away from the home position, relieving the tension on the spring. In this position, the analytical head assembly can be removed and reinstalled easily after maintenance.

User Interface

The commands for the control software are:

Start

Draws the piston away from the home position, relieving the tension on the spring.

Next

Repositions the piston at the home position.

NOTE

Read carefully the description in the Lab Advisor user interface.

Back

Completes the procedure.

Using the **Change Seal** Function

1. Select **Start** to move the piston to the maintenance position.
2. Exchange the metering seal (see "Exchange the Metering Seal and Piston" on page 183).
3. Select **Next** to move the piston back to the home position.

NOTE

Read carefully the description in the Lab Advisor user interface.

4. Select **Back** to finish the procedure.

Park Arm

User Interface

In the control software the Park Arm command is part of the ALS positions that can be selected from the special commands menu in the Instrument Control display.

The commands for the control software are:

Park Arm

moves the gripper arm to the park position.

Home

moves the gripper arm out of the park position to the home position.

To prepare autosampler for transportation

The park arm function moves the gripper and transport slider to the home position. Reinstall the transport foam to secure the instrument against a mechanical stop. The autosampler can be switched OFF after the preparation.

When Before transporting or shipping the module.

CAUTION

Unsecured Transportation of the module

Unsecured transportation of the module may result in mechanical damage to the gripper and transport slider.

✓ **Always secure the arm in the park position plus transport foam.**

NOTE

Before parking the gripper arm, ensure there is no vial in the gripper. Use the Release Gripper function to remove the vial.

1 Select **Park Arm**.

2 When the arm is in the park position, install Transport Protection Foam (G7129-40050) . Then the autosampler is ready for shipment, and can be switched OFF.

Change Gripper

The change gripper function moves the gripper to the front of the autosampler enabling easy access to the gripper release mechanism.

User Interface

The commands for the control software are:

Start

Moves the transport assembly and gripper arm to the position required to change the gripper arm.

Next

Repositions the transport assembly and gripper arm to the home position.

NOTE

Read carefully the description in the Lab Advisor user interface.

Back

Completes the procedure.

Using the **Change Gripper** Function

1. Select **Start** to move the gripper arm to the maintenance position.
2. Exchange the gripper arm, see "Exchange the Gripper Arm" on page 190.
3. Select **Next** to move the gripper arm to the home position.
4. Select **Back** to finish the gripper procedure.

Automatic Referencing

Automatic Referencing is required to compensate for small deviations in positioning of the gripper which may occur after disassembling the module for repair.

The Automatic Referencing procedure requires Calibration Tool Kit (including gripper adapter) (G7129-60014) and uses several tray positions as reference points.

NOTE

Only the default drawers can be used for this referencing procedure.

Because the tray is a rectangle, a four-point alignment is sufficient to correct all other vial positions within the tray. On completion of the procedure, the corrected gripper positions are stored in the instrument firmware.

Start

Moves the transport assembly and gripper arm to the position required to install the calibration tools.

Next

Mount the calibration fixture. Position P1-C6 and P2-F6.

NOTE

Please check help for further explanation.

Next

Mount a 2 mL vial or gripper adapter from the calibration tool.

Next

Perform autoreferencing.

Next

Remove the gripper adapter.

Next

Remove the gripper adapter.

Next

Remove calibration fixture.

Back

Completes the procedure.

Sampler Gripper Verification Test

Gripper Verification Description

The verification procedure uses several vial positions as reference points to verify the gripper alignment is correct. If verification indicates one or more positions are out of alignment, the Automatic Referencing procedure should be done.

Allows you to select a vial position. You can select from positions 1, 11, 39, 56, 66, 101, 111, 139, 156 and 166.

Step Commands

Each movement of the sampling sequence can be done under manual control. This is useful during troubleshooting, where close observation of each of the sampling steps is required to confirm a specific failure mode or verify successful completion of a repair.

Each injector step command actually consists of a series of individual commands that move the autosampler components to predefined positions, enabling the specific step to be done.

Table 17 **Injector step commands**

Step	Action	Comments
Valve Bypass	Switches injection valve to the bypass position.	
Piston Home	Moves the piston to the home position.	
Needle Up	Lifts the needle arm to the upper position.	Command also switches the valve to bypass if it is not already in that position.
Vial to Seat	Moves the selected vial to the seat position.	Command also lifts the needle to the upper position.
Needle into Sample	Lowers the needle into the sample.	Command also positions the vial at the seat, and lifts the needle to the upper position.
Draw	Metering device draws the defined injection volume.	Command also positions the vial at the seat, lifts the needle, and lowers the needle into vial. Command can be done more than once (maximum draw volume of 100 µL cannot be exceeded). Use **Plunger Home** to reset the metering device.
Needle Up	Lifts the needle out of the vial.	Command also switches the valve to bypass if it is not already in that position.
Vial to Tray	Returns the selected vial to the tray position.	Command also lifts the needle to the upper position.
Needle into Seat	Lowers the needle arm into the seat.	Command also returns the vial to the tray position.
Valve Mainpass	Switches the injection valve to the mainpass (main path) position.	
Reset	Resets the injector.	

Tests

Sample Cooler Function Test

The **Sample Cooler Function Test** is a diagnostic test to verify the correct functioning of the Sample Cooler/Sample Thermostat. The test takes up to 15 min to complete and returns a pass/fail type result. If the test failed or was aborted by the system, the final report will include some information on the possible root causes.

Before the test starts, the compressor is turned off to allow the system to reach the initial conditions. The test starts with acquiring data from the evaporator temperature sensor. If the reading is stable for at least 10 s ($\Delta T < 0.5$ °C), the compressor turns on and the temperature inside the cooler/thermostat starts to drop.

For the test to succeed, the system must pass three temperature checkpoints in a timely manner. These checkpoints are the following:

- Checkpoint 1: The temperature drops by 1/3 of the difference between the starting temperature and 5 °C.
- Checkpoint 2: The temperature drops below 5 °C.
- Checkpoint 3: The temperature stabilizes at a value below 5 °C and stays stable for at least 60 s ($\Delta T < 1.0$ °C).

For a Sample Thermostat, the heater resistance of the heating elements will also be tested and checked if the measured value is within the acceptance range (5 – 9 Ohm).

NOTE Lab Advisor B.02.11 or higher is needed for testing the heater resistance of the G7167-60101 Sample Thermostat.

NOTE Lab Advisor 2.19 or higher is needed to execute the Sample Cooler Function Test for the G7167-60201 Sample Thermostat.

Troubleshooting

If the autosampler is unable to perform a specific step due to a hardware failure, an error message is generated. You can use the injector steps to do the injection sequence, while observing how the instrument responds. Table 18 on page 123 summarizes the injector steps, and lists the associated error messages and probable causes of step failures.

Table 18 Step Failures

Step Function	Probable Failure Modes
Bypass	Valve already in bypass. Valve not connected. Defective injection valve.
Piston Home	Defective or dirty sensor on the hydraulic unit flex board. Defective metering-drive motor.
Needle Up	Needle already in the upper position. Defective or dirty sensor on the needle station flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Vial to Seat	No vial in selected position. Vial already in seat position. Defective transport assembly motors. Sticking transport assembly. Defective gripper assembly. Gripper not aligned (see "Automatic Referencing" on page 119).
Draw	Sum of all draw volumes exceeds 100 µL. Defective metering-drive motor.
Needle Up	Needle already in the upper position. Needle already in the upper position. Defective or dirty sensor on the needle station flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Vial to Tray	Defective transport assembly motors. Sticking transport assembly. Defective gripper assembly. Gripper not aligned (see "Automatic Referencing" on page 119).

Table 18 Step Failures

Step Function	Probable Failure Modes
Needle Down	Needle already in the lower position. Defective or dirty sensor on the needle station flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Mainpass (main path)	Valve already in mainpass (main path). Valve not connected. Defective injection valve.
Needle Up/Mainpass (main path)	Blockage in the sample loop or needle (no solvent flow). Needle already in the upper position. Defective or dirty sensor on the needle station flex board. Sticking needle-arm assembly. Defective needle-drive motor. Valve already in mainpass (main path). Valve not connected. Defective injection valve.

Troubleshooting Guide for the Sample Transport Assembly

This troubleshooting guide is meant to help you diagnose and repair autosampler problems.

In general, autosampler problems can be divided into three categories.

1 Intermittent lock-ups with or without vial in the gripper fingers with error messages

Many times the sampler is being used very heavily.

- **motor overtemp** (0 or 1 or 2 or 3)
- **movement failed** (0 or 1 or 2 or 3)
- **missing vial**

2 Jittery (shaky) movement in X and/or theta axes and/or when the needle goes through the gripper arm into the vial with error messages

- **motor overtemp** (0 or 2)
- **movement failed** (0 or 2)

3 Poor alignment, seen during vial pickup and vial replacement and/or when the needle hits the gripper arm with error messages

- **motor overtemp** (0 or 2 or 3)
- **movement failed** (0 or 2 or 3)
- **missing vial**

NOTE

Motor 0=X; 1=Z; 2=Theta; 3=Gripper.

Intermittent lock-ups with or without vial in the gripper fingers

With error messages

- **motor overtemp** (0 or 1 or 2 or 3)
- **movement failed** (0 or 1 or 2 or 3)
- **missing vial**

WARNING

Personal damage, damage to the module

✓ **Some of these procedures require a trained service engineer. Persons who are not qualified MUST NOT perform these procedures.**

NOTE

When a motor over temperature message has occurred, the sampler must be turned OFF for about 10 min to allow the motor to cool down.

1 Check the vials and the caps.

   For reliable operation, vials used with the autosampler must not have tapered shoulders or caps that are wider than the body of the vial. For more details, see "List of Compatible Vials and Caps" on page 51.

2 Reset the sampler and check the tension of the belts.

3 Exchange the gripper arm assembly (Gripper assembly (G1313-60010)), see "Exchange the Gripper Arm" on page 190.

4 Start automatic referencing in Lab Advisor. For this procedure it is mandatory to use the calibration tool.

   On completion of the procedure, the corrected values are stored in the instrument firmware.

5 Exchange Transport assembly (Sample Transport Assembly (G7129-60600)).

6 Exchange the Autosampler Main Board (Autosampler Specific Mainboard (G7129-65800)) or the fusion board (Fusion Board (G4200-65880)).

7 For both steps (step 5 and 6), you have to do an automatic referencing again to store the correct values in the instrument firmware again.

Poor alignment

With Error messages

- **motor overtemp** (0 or 2 or 3)
- **movement failed** (0 or 2 or 3)

WARNING

Personal damage, damage to the module

✓ **Some of these procedures require a trained service engineer. Persons who are not qualified MUST NOT perform these procedures.**

NOTE

When a motor over temperature message has occurred, the sampler must be turned OFF for about 10 min to allow the motor to cool down.

1. Start automatic referencing in Lab Advisor. For this procedure it is mandatory to use the calibration tool.

   On completion of the procedure, the corrected values are stored in the instrument firmware.
2. Exchange the gripper arm assembly (Gripper assembly (G1313-60010)), see "Exchange the Gripper Arm" on page 190.
3. Exchange Transport assembly (Sample Transport Assembly (G7129-60600)).
4. Exchange the Autosampler Main Board (Autosampler Specific Mainboard (G7129-65800)) or the fusion board (Fusion Board (G4200-65880)).
5. For all three steps (step 2, 3, and 4) you have to do an automatic referencing again to store the correct values in the instrument firmware again.

Agilent Lab Advisor Software

The Agilent Lab Advisor Software (basic license, shipped with an Agilent LC pump) is a standalone product that can be used with or without a chromatographic data system. Agilent Lab Advisor helps to manage the lab for high-quality chromatographic results by providing a detailed system overview of all connected analytical instruments with instrument status, Early Maintenance Feedback counters (EMF), instrument configuration information, and diagnostic tests. With the push of a button, a detailed diagnostic report can be generated. Upon request, the user can send this report to Agilent for a significantly improved troubleshooting and repair process.

The Agilent Lab Advisor software is available in two versions:

- Lab Advisor Basic
- Lab Advisor Advanced

Lab Advisor Basic is included with every Agilent 1200 Infinity Series and Agilent InfinityLab LC Series instrument.

The Lab Advisor Advanced features can be unlocked by purchasing a license key, and include real-time monitoring of instrument actuals, all various instrument signals, and state machines. In addition, all diagnostic test results, calibration results, and acquired signal data can be uploaded to a shared network folder. The Review Client included in Lab Advisor Advanced allows to load and examine the uploaded data no matter on which instrument it was generated. This makes Data Sharing an ideal tool for internal support groups and users who want to track the instrument history of their analytical systems.

The tests and diagnostic features that are provided by the Agilent Lab Advisor software may differ from the descriptions in this manual. For details, refer to the Agilent Lab Advisor software help files.

7 Error Information

This chapter describes the meaning of error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

What are Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the module is switched on, and an entry is written into the module logbook.

If an error occurs outside a method run, other modules will not be informed about this error. If it occurs within a method run, all connected modules will get a notification, all LEDs get red and the run will be stopped. Depending on the module type, this stop is implemented differently. For example, for a pump the flow will be stopped for safety reasons. For a detector, the lamp will stay on in order to avoid equilibration time. Depending on the error type, the next run can only be started, if the error has been resolved, for example liquid from a leak has been dried. Errors for presumably single time events can be recovered by switching on the system in the user interface.

Special handling is done in case of a leak. As a leak is a potential safety issue and may have occurred at a different module from where it has been observed, a leak always causes a shutdown of all modules, even outside a method run.

In all cases, error propagation is done via the CAN bus or via an APG/ERI remote cable (see documentation for the APG/ERI interface).

General Error Messages

Timeout

Error ID: 0062

The timeout threshold was exceeded.

Probable cause	Suggested actions
1 The analysis was completed successfully, and the timeout function switched off the module as requested.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

Error ID: 0063

An external instrument has generated a shutdown signal on the remote line.

The module continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable cause	Suggested actions
1 Leak detected in another module with a CAN connection to the system.	Fix the leak in the external instrument before restarting the module.
2 Leak detected in an external instrument with a remote connection to the system.	Fix the leak in the external instrument before restarting the module.
3 Shut-down in an external instrument with a remote connection to the system.	Check external instruments for a shut-down condition.
4 The degasser failed to generate sufficient vacuum for solvent degassing.	Check the vacuum degasser for an error condition. Refer to the *Service Manual* for the degasser or the pump that has the degasser built-in.

Remote Timeout

Error ID: 0070

A not-ready condition is still present on the remote input. When an analysis is started, the system expects all not-ready conditions (for example, a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable cause	Suggested actions
1 Not-ready condition in one of the instruments connected to the remote line.	Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2 Defective remote cable.	Exchange the remote cable.
3 Defective components in the instrument showing the not-ready condition.	Check the instrument for defects (refer to the instrument's documentation).

Lost CAN Partner

Error ID: 0071

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed.

The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable cause	Suggested actions
1 CAN cable disconnected.	• Ensure all the CAN cables are connected correctly. • Ensure all CAN cables are installed correctly.
2 Defective CAN cable.	Exchange the CAN cable.
3 Defective mainboard in another module.	Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak Sensor

Error ID: 0064

A leak was detected in the module.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak sensor circuit on the main board.

Probable cause	Suggested actions
1 Loose fittings.	Ensure all fittings are tight.
2 Broken capillary.	Exchange defective capillaries.
3 Leaking rotor seal or needle seat.	Exchange the rotor seal or seat capillary.
4 Defective metering seal.	• Exchange the metering seal. • *Make sure the leak sensor is thoroughly dry before restarting the autosampler.*
5 Leaking peristaltic pump.	Exchange the peristaltic pump.

NOTE

The leak sensor in the sampler is hidden under the Column Shelf.

Leak Sensor Open

Error ID: 0083

The leak sensor in the module has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Leak sensor not connected to the power switch board.	Please contact your Agilent service representative.
2 Defective leak sensor.	Please contact your Agilent service representative.
3 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.
4 Power switch assembly defective.	Please contact your Agilent service representative.

Leak Sensor Short

Error ID: 0082

The leak sensor in the module has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Defective leak sensor.	Please contact your Agilent service representative.
2 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.
3 Power switch assembly defective.	Please contact your Agilent service representative.
4 Cable or contact problem.	Please contact your Agilent service representative.

Compensation Sensor Open

Error ID: 0081

The ambient-compensation sensor (NTC) on the power switch board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the power switch board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Loose connection between the power switch board and the mainboard.	Please contact your Agilent service representative.
2 Defective power switch assembly.	Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 0080

The ambient-compensation sensor (NTC) on the power switch board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the power switch board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Defective power switch assembly.	Please contact your Agilent service representative.
2 Loose connection between the power switch board and the mainboard.	Please contact your Agilent service representative.

Fan Failed

Error ID: 0068

The fan in the autosampler module or in the Sample Cooler/Sample Thermostat has failed.

- Error ID: 68,0 → Sampler fan defect
- Error ID: 68,1 → Evaporator fan defect
- Error ID: 68,2 → Condenser fan defect

The hall sensor on the fan shaft is used by the mainboard to monitor the fan speed. If the fan speed falls below a certain limit for a certain length of time, the error message is generated.

This limit is given by 2 revolutions/second for longer than 5 seconds.

Depending on the module, assemblies (e.g. the lamp in the detector) are turned off to assure that the module does not overheat inside.

Probable cause	Suggested actions
1 Fan cable disconnected.	Please contact your Agilent service representative.
2 Defective sampler fan.	Please contact your Agilent service representative.
3 Defective evaporator fan.	Please contact your Agilent service representative.
4 Defective condenser fan.	Please contact your Agilent service representative.
5 Blown fuses.	Please contact your Agilent service representative.
6 Defective mainboard.	Please contact your Agilent service representative.

Sampler Error Messages

Defective Gripper Assembly

Probable cause	Suggested actions
1 Mechanical obstruction.	Ensure unobstructed movement of the transport assembly.
2 High friction in the transport assembly.	Please contact your Agilent service representative.
3 Defective motor assembly.	Please contact your Agilent service representative.
4 Defective sample transport assembly flex board.	Please contact your Agilent service representative.
5 Defective mainboard.	Please contact your Agilent service representative.

Valve Failed

Error ID: 34219, 34220

The injection valve failed to switch to the mainpass (main path) position.

The switching of the injection valve is monitored by two microswitches on the valve assembly. The switches detect the successful completion of the valve movement. If the valve fails to reach the mainpass (main path) position, or if the microswitch does not close, the error message is generated.

Probable cause	Suggested actions
1 Defective injection valve.	Please contact your Agilent service representative.
2 Defective mainboard.	Please contact your Agilent service representative.

Needle Movement Failed

Error ID: 34213, 34214

The needle arm failed to move down into the needle seat.

The lower position of the needle arm is monitored by a position sensor on the sampling unit flex board. The sensor detects the successful completion of the needle movement to the needle seat position. If the needle fails to reach the end point, or if the sensor fails to recognize the needle arm movement, the error message is generated.

Probable cause	Suggested actions
1 Defective or dirty position sensor.	Please contact your Agilent service representative.
2 Defective motor.	Please contact your Agilent service representative.
3 Sticking spindle assembly.	Please contact your Agilent service representative.

Missing Vial

Error ID: 34305

No vial was found in the position defined in the method or sequence.

When the gripper arm picks a vial out of the sample tray, the processor monitors the gripper motor encoder. If a vial is present, the closing of the gripper fingers is limited by the vial. However, if no vial is present, the gripper fingers close too far. This is sensed by the processor (encoder position), causing the error message to be generated.

Probable cause	Suggested actions
1 No vial in the position defined in the method or sequence.	Install the sample vial in the correct position, or edit the method or sequence accordingly.
2 Incorrect gripper alignment.	Align gripper.
3 Defective gripper assembly (defective gripper fingers or belt).	Exchange the gripper assembly.
4 Defective transport assembly flex board.	Please contact your Agilent service representative.

Initialization Failed

Error ID: 34392, 34391

The sampler failed to complete initialization correctly.

The sampler initialization procedure moves the needle arm and transport assembly to their home positions in a predefined sequence. During initialization, the processor monitors the position sensors and motor encoders to check for correct movement. If one or more of the movements is not successful, or is not detected, the error message is generated.

Probable cause	Suggested actions
1 Mechanical obstruction.	Ensure unobstructed movement of the transport assembly.
2 Defective needle station board.	Please contact your Agilent service representative.
3 Defective transport assembly flex board.	Please contact your Agilent service representative.
4 Defective hydraulic unit motor.	Please contact your Agilent service representative.
5 Defective mainboard.	Please contact your Agilent service representative.

Metering home failed

Error ID: 34224

The home position of the metering plunger is not found or the plunger is unable to move.

Probable cause	Suggested actions
1 Blockage in the flow path.	Check if there is a significant pressure difference (> 10 – 15 bar) between the mainpass and the bypass position of the injection valve. If yes, systematically replace the components of the mainpass: Needle seat, Needle, Rotor seal, Sample loop
2 Potential hardware error.	Please contact your Agilent service representative.

Motor overtemp

Error ID: 34307

The ongoing transport movement is aborted because the transport assembly stepper motors are overheated.

- *34307,0* corresponds to the X-axis stepper motor.
- *34307,1* corresponds to the Z-axis stepper motor.
- *34307,2* corresponds to the theta stepper motor.
- *34307,3* corresponds to the gripper stepper motor.

Probable cause	Suggested actions
1 Physical blockage.	• Look for potential sources of physical blockage in the path of the gripper arm and eliminate them. • Verify that no obstacle hinders the X-axis movement, for example, a vial that is stuck below the transport rods in the transport assembly body. • Restart the sampler and observe if the problem persists.
2 Broken gripper.	Verify the correct functioning of the gripper using the **Gripper Verification** tool. Replace the gripper if needed.
3 Contaminated transport rods.	Inspect the X- and Z-axis transport rods and clean them if you observe contamination or dust accumulation on them. Use isopropanol and lint-free cloth for this purpose.
4 Misaligned gripper arm.	Verify the correct functioning of the gripper arm using the **Gripper Verification** and **Injector Steps** tools. If the gripper arm appears to be out of alignment, contact Agilent for more information.
5 Potential hardware error.	Please contact your Agilent service representative.

Initialization with Vial

Error ID: 34372

The autosampler attempted to initialize with a vial still in the gripper.

During initialization, the autosampler checks correct operation of the gripper by closing and opening the gripper fingers while monitoring the motor encoder. If a vial is still in the gripper when initialization is started, the gripper fingers cannot close causing the error message to be generated.

Probable cause	Suggested actions
1 Vial still in gripper.	Remove the vial using the **Release Vial** function in the user interface. Reinitialize the autosampler.

Vial in Gripper

Error ID: 34308

The gripper arm attempted to move with a vial still in the gripper.

During specific stages of the sampling sequence, no vial should be held by the gripper. The autosampler checks if a sample vial is stuck in the gripper by closing and opening the gripper fingers while monitoring the motor encoder. If the gripper fingers are unable to close, the error message is generated.

Probable cause	Suggested actions
1 Vial still in gripper.	Remove the vial using the **Release Vial** function in the user interface. Reinitialize the autosampler.

Missing Wash Vial

Error ID: 34306

The wash vial programmed in the method was not found.

When the gripper arm picks a vial out of the sample tray, the processor monitors the gripper motor encoder. If a vial is present, the closing of the gripper fingers is limited by the vial. However, if no vial is present, the gripper fingers close too far. This is sensed by the processor (encoder position), causing the error message to be generated.

Probable cause	Suggested actions
1 No wash vial in the position defined in the method.	Install the wash vial in the correct position, or edit the method accordingly.

Invalid vial position errors

Error ID: 34309, 34313

The vial position defined in the method/sequence is invalid.

The error is also triggered when the source vial tray is not inserted during fetching a vial or returning it to the tray after sample injection. Do not remove the vial drawers the sampler is injecting or in the prerun or postrun state.

The vial drawers are automatically recognized by the reflection sensors on the transport assembly when they are installed in the Vialsampler. The vial drawers are distinguished based on the tag information on their rear side (white markers). If the information from the optical sensors is not in agreement with the vial position defined in the method/sequence, the ongoing analysis will be aborted and the respective error ID reported.

- Error ID: 34309 → Invalid vial position
- Error ID: 34313 → Invalid wash vial position

Probable cause	Suggested actions
1 Missing vial tray.	Verify that the correct vial drawer type is installed and both drawers are pushed in. Restart the sampler and observe if the problem persists.
2 Missing tag information.	Verify that the white markers are still intact and not covered by dirt or dust. If necessary, clean the markers with isopropanol or replace the vial tray.
3 Misaligned gripper arm.	Verify the correct functioning of the gripper arm using the **Gripper Verification** and **Injector Steps** tools. If the gripper arm appears to be out of alignment, contact Agilent for more information.
4 Potential hardware error.	Please contact your Agilent service representative.

Valve switch not found

Error ID: 34319

The injection valve has failed to switch into the position. The valve position sensor monitors the position of the valve. If the valve fails to switch into the position (mainpass (main path) or bypass), or if the sensor fails to recognize the valve position, the error message is generated.

Probable cause	Suggested actions
1 Defective rotor seal/stator head.	Exchange the rotor seal/stator head.
2 Defective injection valve.	Please contact your Agilent service representative.

Metering Initialization Failed

Error ID: 34322

The metereing device has failed to do the initialization. If the piston fails to move to the home position, or if the metering device is not recognized by the instrument.

Probable cause	Suggested actions
1 Metering device is not recognized.	Configure the metering device in LabAdvisor
2 Rear wheel in the hydraulic unit is loose.	Please contact your Agilent service representative.
3 Defective metering-drive motor.	Please contact your Agilent service representative.
4 Defective metering device	Please contact your Agilent service representative.

Sample Cooler/Sample Thermostat Error Messages

Sample temperature control voltage too low, check fuses and wires

Error ID: 30713

The compressor voltage is below the lower threshold value.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Sample temperature control switched off due to condensate

Error ID: 30715

The cooler/thermostat was switched off due to a condensate event.

Probable cause	Suggested actions
1 Overfilled container.	Empty the condensate container. Verify that the open end of the tubing doesn't immerse in the liquid.
2 Drainage issues.	• Verify the correct plumbing of the condensate drainage system. • Make sure that no kinks or mechanical blocks are present in the drainage system. • Avoid the formation of the siphoning effect. • Make sure that the hosting sampler is level.

Sample temperature control switched off due to overpressure

Error ID: 30716

The pressure in the refrigerant circuit exceeded the maximum allowed level. To prevent any damage to the system, the compressor was turned off.

Probable cause	Suggested actions
1 Overheated condenser.	Turn off the cooler/thermostat and wait for 15 min to allow the system to cool down. Verify if there is enough space around the sampler for adequate ventilation and the cooler/thermostat is not exposed to direct sunlight.
2 Potential hardware error.	Please contact your Agilent service representative.

Sample temperature control sensor electronics calibration failed

Error ID: 30717

The system is in an error state because the calibration of the analog temperature sensor has failed.

Probable cause	Suggested actions
1 Sampler incompatibility.	If the hosting sampler is a Vialsampler, verify its compatibility with the Sample Cooler installed. Units with the serial number DEBAT02000 or below are equipped with an analog temperature sensor that is not compatible with the Vialsampler.
2 Potential hardware error.	Please contact your Agilent service representative.

Sample temperature control switched off due to supply voltage drop

Error ID: 30718

The compressor is turned off due to an unexpected drop in the supply voltage.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Cooler condensate sensor defect

Error ID: 30719

The condensate sensor of the cooler/thermostat is not working properly.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Cooler PCB is in error mode

Error ID: 30725

The system is in an error state because the compressor control board has encountered an unexpected error.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Cooler condenser fan failed

Error ID: 30726

The condenser fan of the cooler is not working properly.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Thermostat communication error

Error ID: 30738

The system is in an error state because the communication between the sampler and the thermostat has failed.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Heater defect

Error ID: 30739

One of the heating elements is malfunctioning or broken.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Heater in operating error

Error ID: 30744

The system is in an error state because the thermostat heater has encountered an unexpected error.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Heater has power supply failure

Error ID: 30745

The voltage measured at the electric amplifier is below the expected level.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Thermostat sensor defect

Error ID: 30751

One of the digital temperature sensors of the cooler/thermostat is not working properly.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Compressor has error

Error ID: 30756

The system is in an error state because the control board of the compressor has encountered an unexpected error.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Sample Thermostat type unknown, update firmware

Error ID: 30768

The system is in an error state because the type of the thermostat is unsupported by the current firmware revision.

Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

Thermostat fan defect

Error ID: 30771

One of the cooling fans of the cooler/thermostat is not working properly.

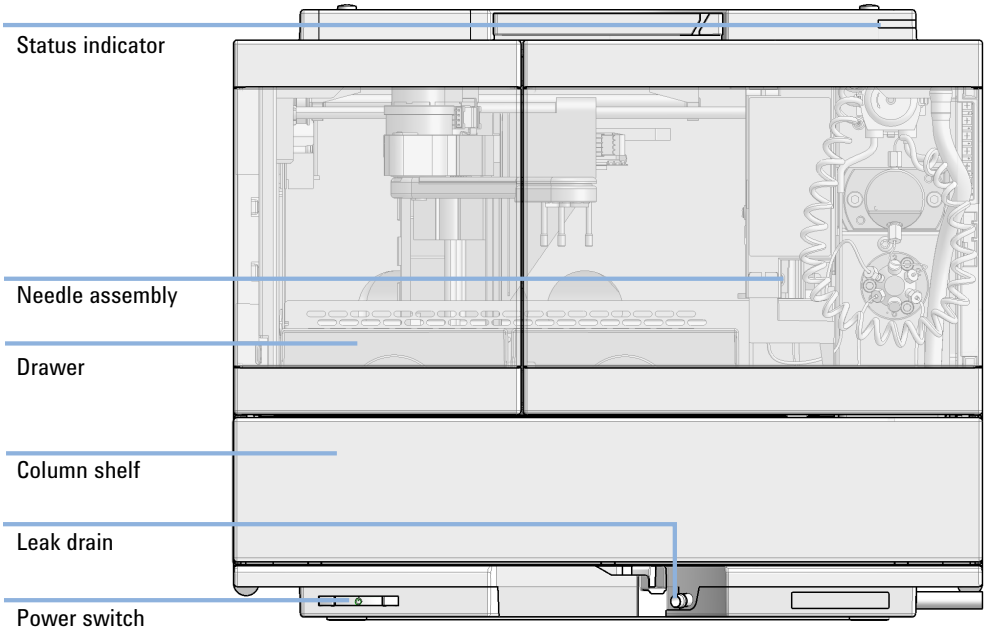
Probable cause	Suggested actions
1 Potential hardware error.	Please contact your Agilent service representative.

8 Maintenance

This chapter describes the maintenance of the module.

Introduction to Maintenance

The module is designed for easy maintenance. Maintenance can be done from the front with module in place in the system stack.



NOTE

There are no serviceable parts inside.

Do not open the module.

Warnings and Cautions

WARNING

Personal injury or damage to the product

Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

- ✓ **Use your Agilent products only in the manner described in the Agilent product user guides.**

WARNING

Electrical shock

Repair work at the module can lead to personal injuries, e.g. shock hazard, when the cover is opened.

- ✓ **Do not remove the cover of the module.**
- ✓ **Only certified persons are authorized to carry out repairs inside the module.**

WARNING

Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

- ✓ **To prevent personal injury, be careful when getting in contact with sharp metal areas.**

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- ✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- ✓ **The volume of substances should be reduced to the minimum required for the analysis.**
- ✓ **Do not operate the instrument in an explosive atmosphere.**

CAUTION

Safety standards for external equipment

- ✓ **If you connect external equipment to the instrument, make sure that you only use accessory units tested and approved according to the safety standards appropriate for the type of external equipment.**

WARNING

Heavy weight

The module is heavy.

- ✓ **Carry the module at least with 2 people.**
- ✓ **Avoid back strain or injury by following all precautions for lifting heavy objects.**
- ✓ **Ensure that the load is as close to your body as possible.**
- ✓ **Ensure that you can cope with the weight of your load.**

Overview of Maintenance

It is necessary to perform periodic inspection of this instrument to ensure its safe use. It is possible to have these periodic inspections performed by Agilent service representatives on a contractual basis. For information regarding the maintenance inspection contract, contact your Agilent representative.

The following pages describe the maintenance (simple repairs) of the module that can be carried out without opening the main cover.

Table 19 Overview of maintenance

Procedure	Typical interval (minimum)
Change needle/needle seat	30000 needle into seat movements
Change peristaltic pump cartridge	3000 h on time
Change rotor seal	30000 injections
Change metering seal	30000 injections

Cleaning the Module

To keep the module case clean, use a soft cloth slightly dampened with water, or a solution of water and mild detergent. Avoid using organic solvents for cleaning purposes. They can cause damage to plastic parts.

WARNING **Liquid dripping into the electronic compartment of your module can cause shock hazard and damage the module**

- ✓ **Do not use an excessively damp cloth during cleaning.**
- ✓ **Drain all solvent lines before opening any connections in the flow path.**

NOTE A solution of 70 % isopropanol and 30 % water might be used if the surface of the module needs to be disinfected.

Remove and Install Doors

When The instrument doors or the hinges are broken.

Tools required

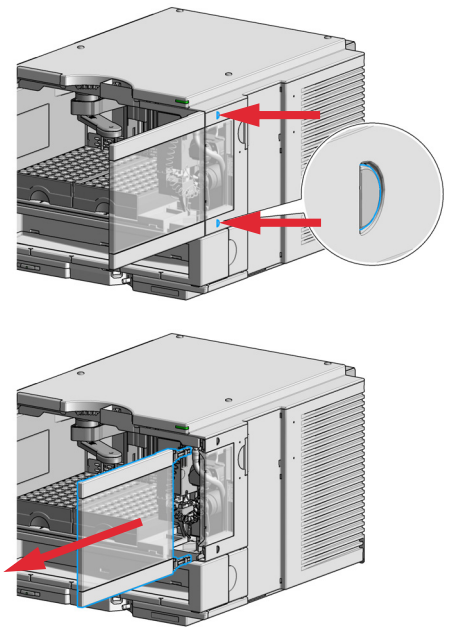
Description
Flathead screwdriver

Parts required

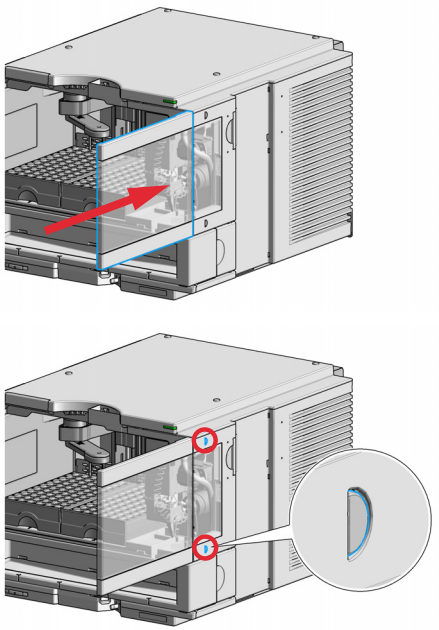
p/n	Description
G7129-68702	Door Kit for Infinity II Vialsampler/Preparative Autosampler

Preparations Finish any pending acquisition job.

1 Press the release buttons and pull the front door out.



2 For the Installation of the front door, insert the hinges into their guides and push the door in until the release buttons click into their final position.



Exchange the Needle Assembly

When

- The needle is visibly damaged.
- Leaks or blockages are observed.
- The limit for the needle interaction EMF counter is exceeded.
- The needle needs to be replaced as part of the yearly maintenance.

Tools required

p/n	Description
8710-0510	Open-end wrench 1/4 — 5/16 inch
8710-2140	Screwdriver Torx TX-10

Parts required

p/n	Description
G7157-87201	Needle High Flow Infinity II Autosampler

Preparations

- Finish any pending acquisition job.
- Stop the flow at the pump and remove the solvent lines from the eluent bottles to avoid spilling solvent.
- Close the shutoff valves at the pump if available.

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

✓ **Do not open the safety cover of the needle station during normal operation.**

✓ **Wear safety goggles and safety gloves when removing the needle assembly.**

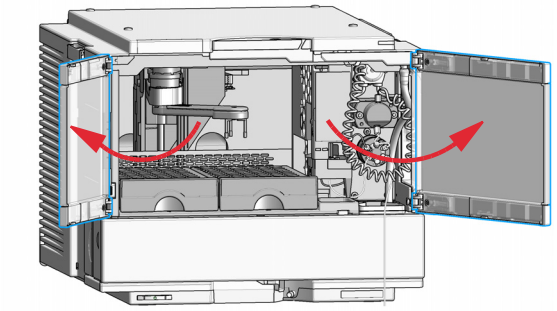
NOTE It is recommended to always exchange the needle assembly and the needle seat at the same time to prevent premature leakage.

1 In the Agilent Lab Advisor software select **Service & Diagnostics >Maintenance Positions >Change Needle, Loop and Seat**, click **Start** and wait until the needle assembly is in maintenance position.

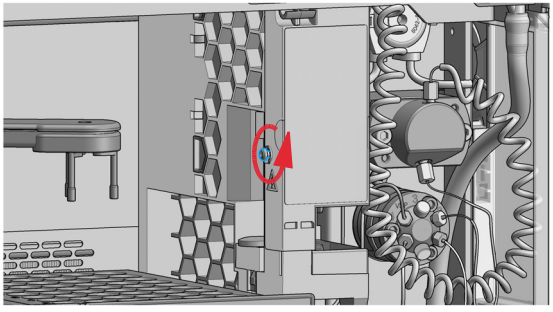
OR

In the Local Controller start the maintenance mode and select **Change Needle, Loop and Seat** function.

2 Open the doors of the module.



3 Loosen the safety cover screw.



WARNING

Sharp needle
Uncovered needles may cause injuries

✓ **Do not touch the tip of the needle.**

4 Remove the safety cover.

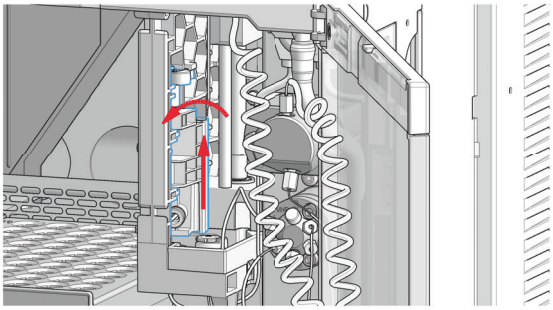
WARNING

Sharp needle
Uncovered needles may cause injuries.

✓ **Do not change the needle seat at this point.**

✓ **Do not touch the tip of the needle.**

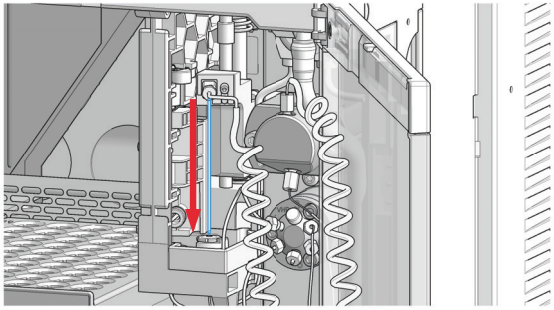
5 Move the wash port to the service position by slightly lifting it up and then flapping to the left.



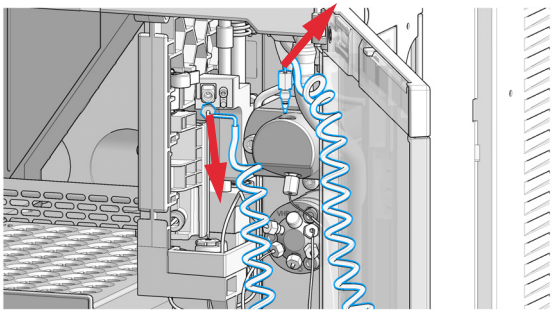
6 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

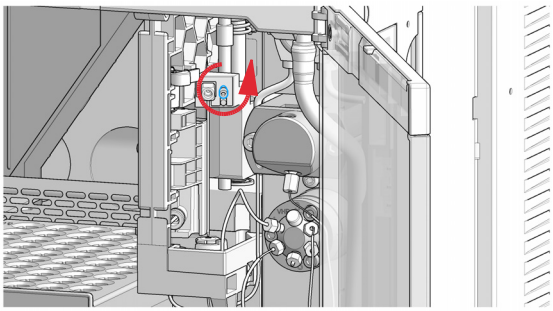
In the Local Controller, move the needle down until the needle tip is ca. 2 – 4 mm above the seat.



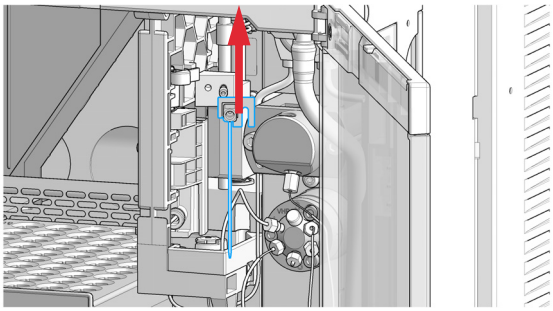
7 Disconnect the sample loop from the needle, and, if needed, also from the metering device.



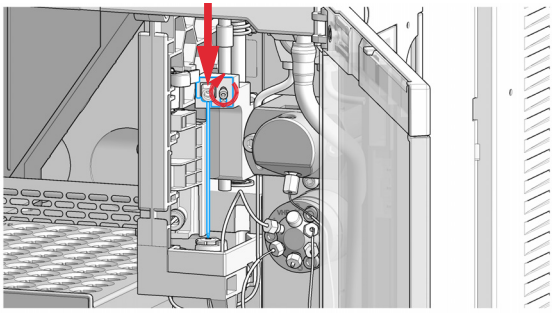
8 Loosen the fixing screw.



9 Lift out the needle.

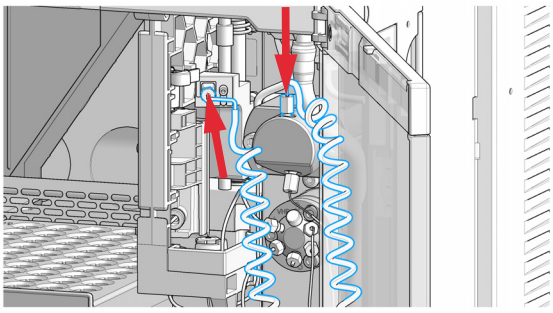


10 Mount and align the needle on its fixture, then tighten the screw firmly. Make sure that the needle tip is concentric with the seat.



11 Align the needle in the seat (needle may be bent slightly manually, if not aligned properly).

12 Reconnect the sample loop to the needle. Make sure of the correct positioning of the loop capillary, the uncoated part of the capillary must be horizontal.



NOTE

Do not overtighten the fitting!

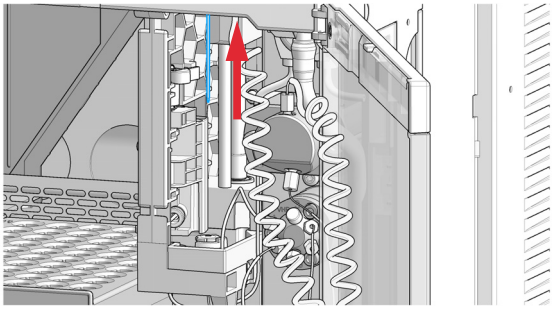
NOTE

Incorrect positioning and installation of the needle/loop connection can result in damaging or breaking the sample loop.

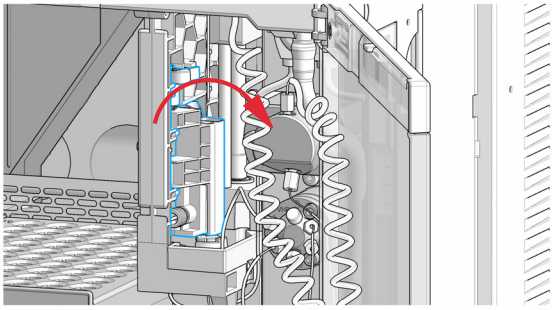
13 In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

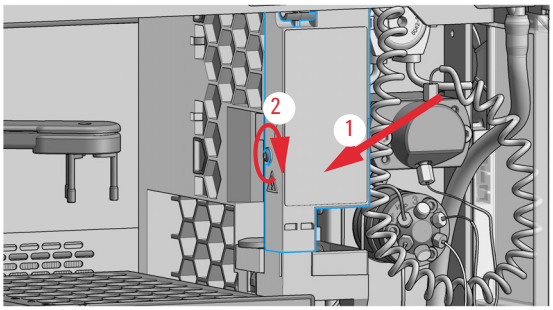
In the Local Controller, move the needle up to the uppermost position.



14 Move the wash port back to is normal position by turning it to the right.



15 Install the safety cover (1) and fix the screw (2).

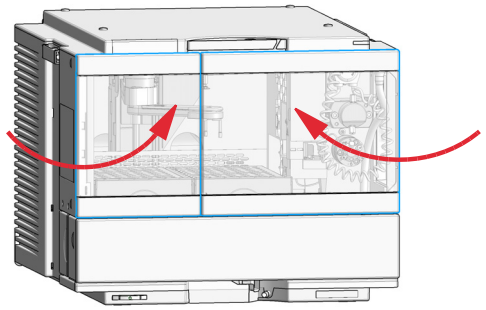


16 In Lab Advisor, select **Next** to move the needle into the needle seat and then **Back** to finish the maintenance procedure.

OR

In the Local Controller, select **Continue** to move the needle into the needle seat and then **Exit** to finish the maintenance procedure.

17 Close the doors.



18 Perform a **System Pressure Test**.

Exchange the Needle Seat Assembly

When

- The seat is visibly damaged.
- Leaks or blockages are observed.
- The limit for the seat interaction EMF counter is exceeded.
- The needle seat needs to be replaced as part of the yearly maintenance.

Tools required

p/n	Description
8710-0510	Open-end wrench 1/4 — 5/16 inch
8710-2140	Screwdriver Torx TX-10
	Flathead screwdriver

Parts required

p/n	Description
G7157-87101	Needle Seat Assembly High Flow

Preparations

Finish any pending acquisition job and in order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

- ✓ **Do not open the safety cover of the needle station during normal operation.**
- ✓ **Wear safety goggles and safety gloves when removing the needle assembly.**

NOTE

When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See Table 14 on page 91

NOTE

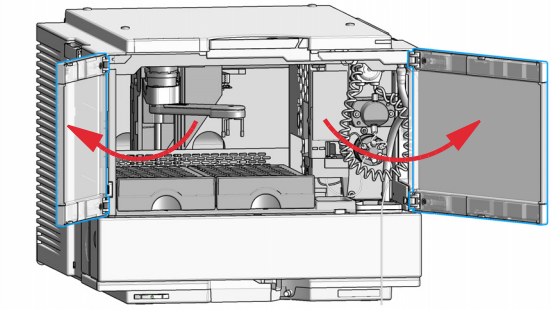
It is recommended to always exchange the needle assembly and the needle seat at the same time to prevent premature leakage.

1 In the Agilent Lab Advisor software select **Service & Diagnostics >Maintenance Positions >Change Needle, Loop and Seat**, click **Start** and wait until the needle assembly is in maintenance position.

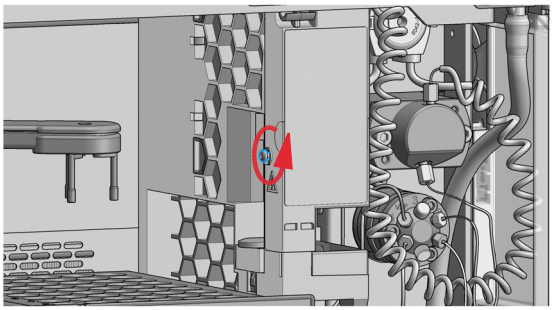
OR

In the Local Controller start the maintenance mode and select **Change Needle, Loop and Seat** function.

2 Open the doors of the module.



3 Loosen the safety cover screw.

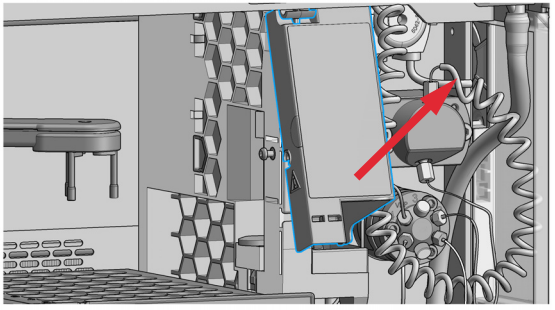


WARNING

Sharp needle
Uncovered needles may cause injuries

✓ **Do not touch the tip of the needle.**

4 Remove the safety cover.



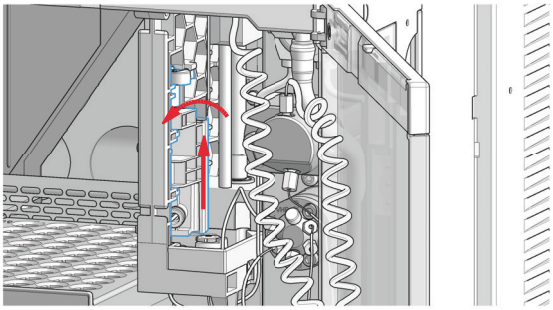
WARNING

Sharp needle
Uncovered needles may cause injuries.

✓ **Do not change the needle seat at this point.**

✓ **Do not touch the tip of the needle.**

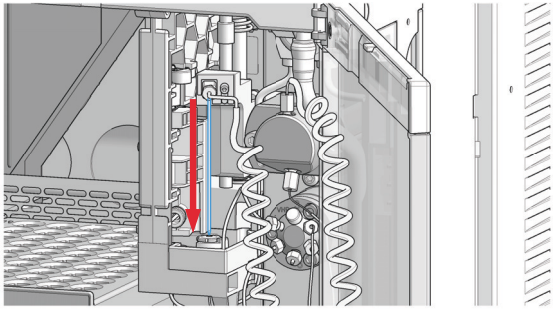
5 Move the wash port to the service position by slightly lifting it up and then flapping to the left.



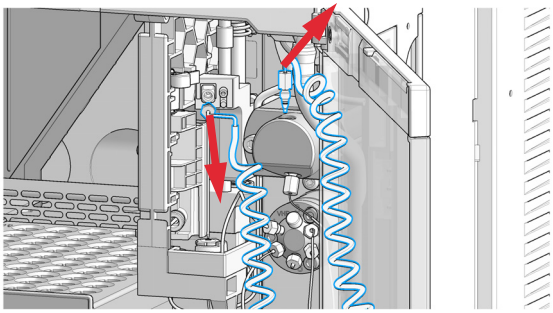
6 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

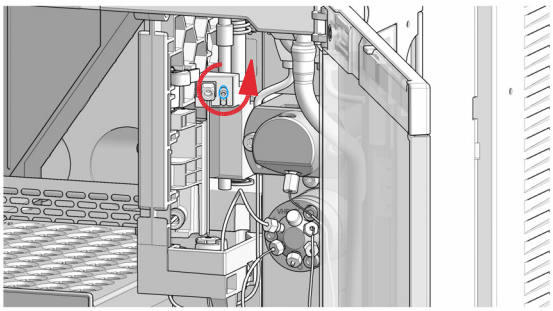
In the Local Controller, move the needle down until the needle tip is ca. 2 – 4 mm above the seat.



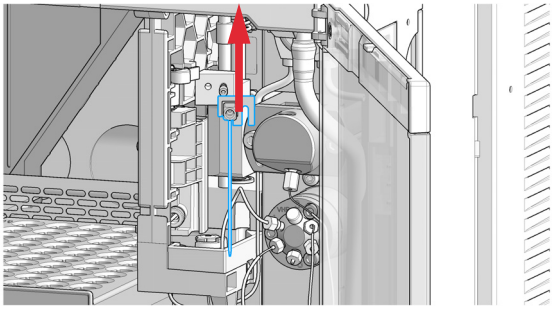
7 Disconnect the sample loop from the needle, and, if needed, also from the metering device.



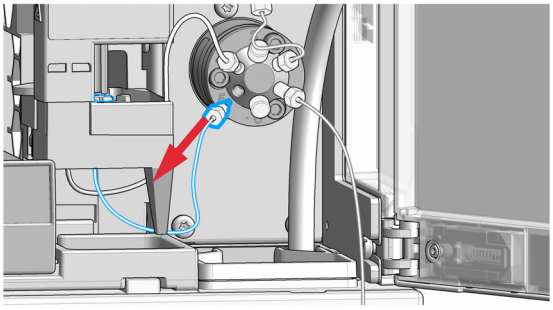
8 Loosen the fixing screw.



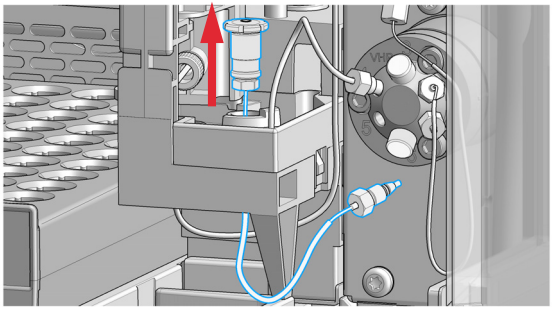
9 Lift out the needle.



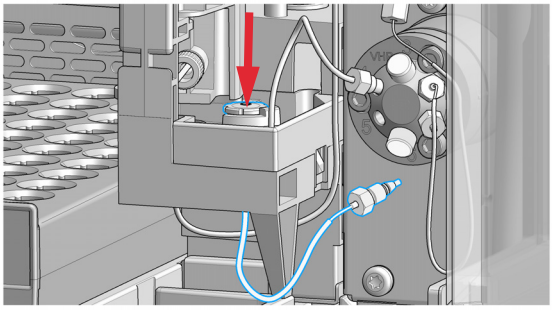
10 Disconnect the seat-capillary fitting from the injection valve (port 5).



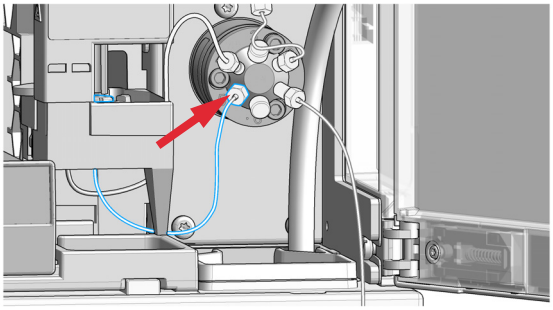
11 Use a small flat-head screwdriver to ease out the needle seat.



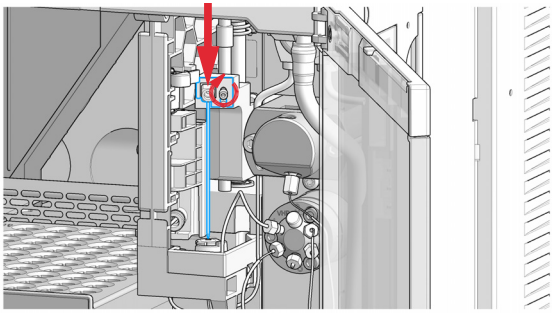
12 Insert the new needle-seat assembly. Press the seat firmly into position.



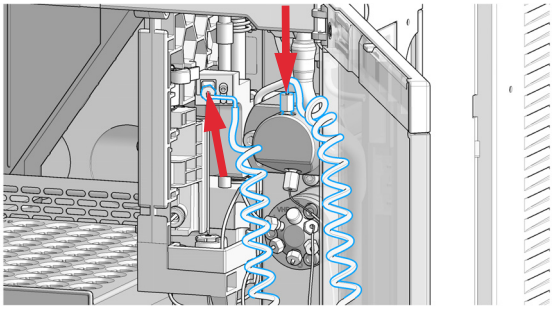
13 Connect the seat-capillary fitting to port 5 of the injection valve.



14 Mount and align the needle on its fixture, then tighten the screw firmly. Make sure that the needle tip is concentric with the seat.



15 Reconnect the sample loop to the needle. Make sure of the correct positioning of the loop capillary, the uncoated part of the capillary must be horizontal.



NOTE

Do not overtighten the fitting!

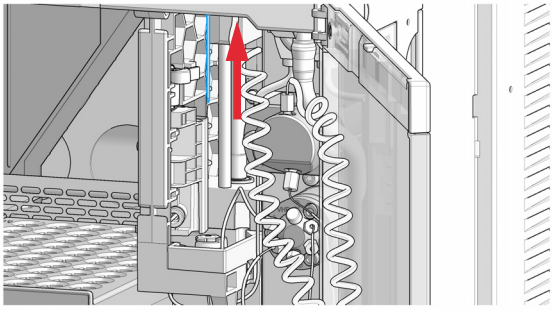
NOTE

Incorrect positioning and installation of the needle/loop connection can result in damaging or breaking the sample loop.

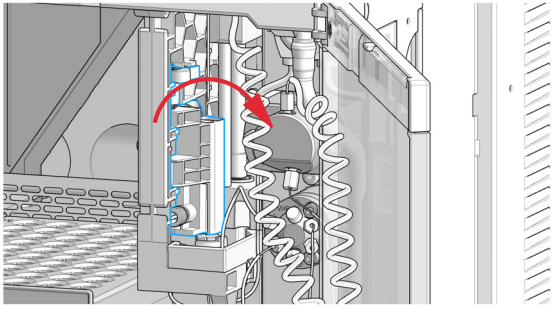
16 In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

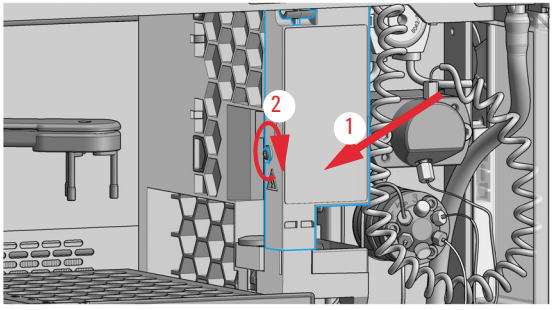
In the Local Controller, move the needle up to the uppermost position.

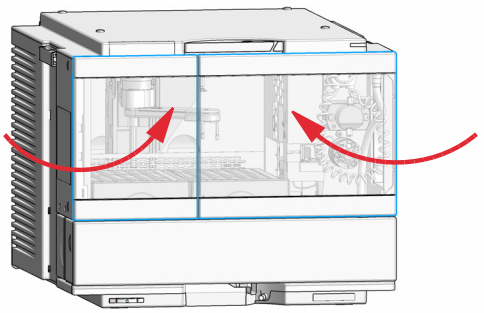


17 Move the wash port back to is normal position by turning it to the right.



18 Install the safety cover (1) and fix the screw (2).



19 In Lab Advisor, select **Next** to move the needle into the needle seat and then **Back** to finish the maintenance procedure. OR In the Local Controller, select **Continue** to move the needle into the needle seat and then **Exit** to finish the maintenance procedure.	**20** Close the doors. 
21 Perform a **System Pressure Test**.	

Exchange the Sample Loop Assembly

When

- The sample loop is visibly damaged.
- Leaks or blockages are observed.

Tools required

p/n	Description
8710-0510	Open-end wrench 1/4 — 5/16 inch

Parts required

p/n	Description
G7157-60515	Loop for Prep Autosampler

Preparations

Finish any pending acquisition job and in order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

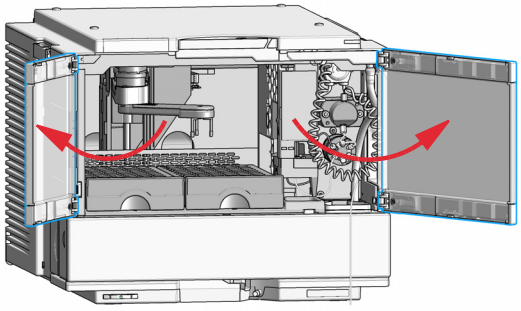
- ✓ **Do not open the safety cover of the needle station during normal operation.**
- ✓ **Wear safety goggles and safety gloves when removing the needle assembly.**

NOTE

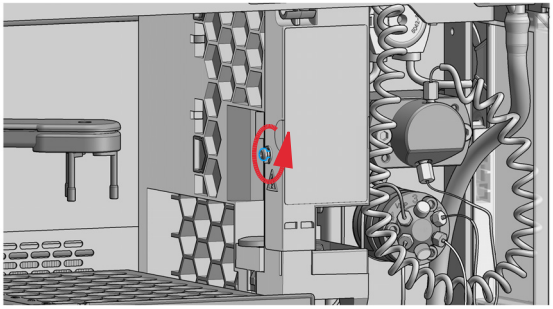
When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See Table 14 on page 91.

1 In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen **Maintenance Positions >Change loop**, click **Start** and wait until the needle assembly is in maintenance position.

2 Open the doors of the module.



3 Loosen the safety cover screw.

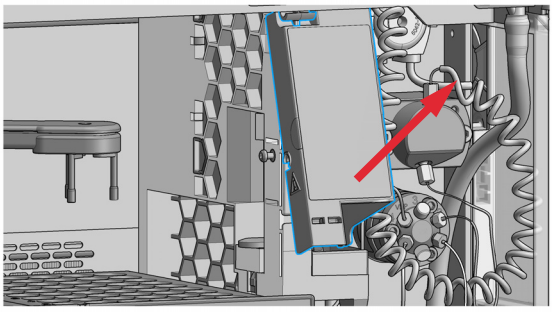


WARNING

Sharp needle
Uncovered needles may cause injuries

✓ **Do not touch the tip of the needle.**

4 Remove the safety cover.



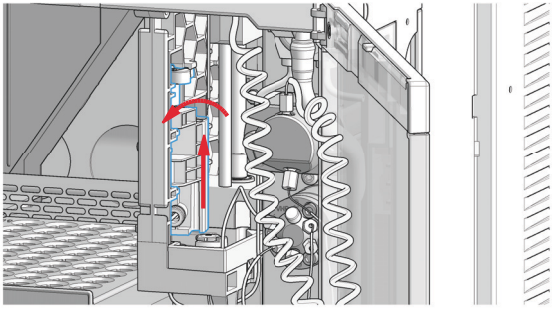
WARNING

Sharp needle
Uncovered needles may cause injuries.

✓ **Do not change the needle seat at this point.**

✓ **Do not touch the tip of the needle.**

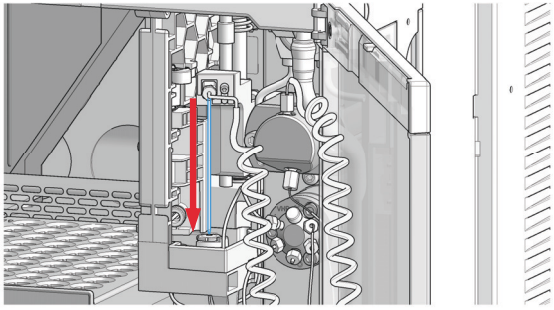
5 Move the wash port into the service position by slightly lifting it up and then flapping to the left.



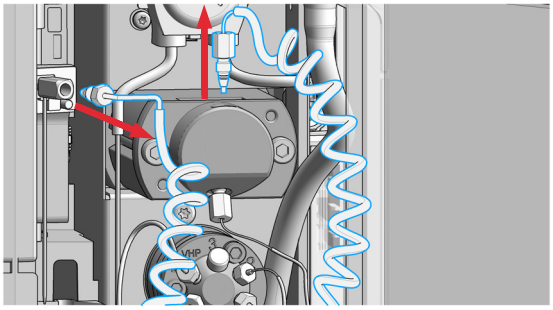
6 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

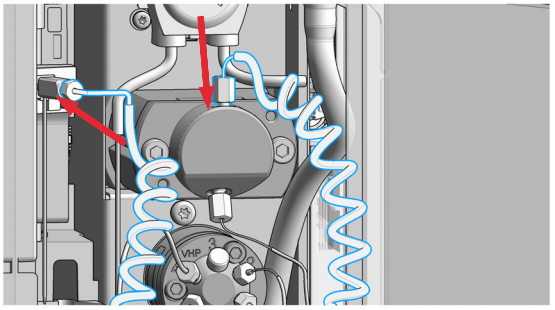
In the Local Controller, move the needle down until the needle tip is ca. 2 – 4 mm above the seat.



7 Disconnect the loop capillary from the metering device and from the needle.



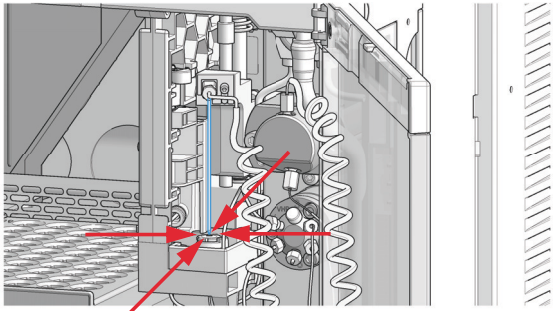
8 Reinstall the new sample loop. Make sure of the correct positioning of the loop capillary, the uncoated part of the capillary must be horizontal.



NOTE

Incorrect positioning and installation of the needle/loop connection can result in damaging and breaking the sample loop.

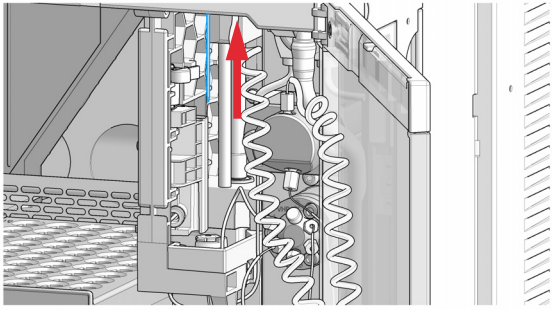
9 After installing the new sample loop, ensure that the needle tip is concentric with the seat.



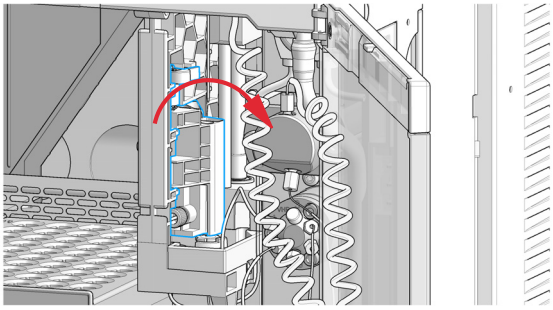
10 In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

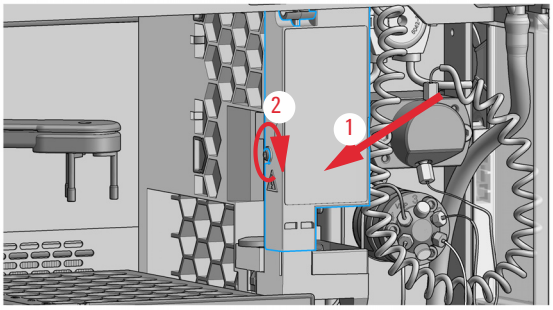
In the Local Controller, move the needle up to the uppermost position.



11 Move the wash port back to is normal position by turning it to the right.



12 Install the safety cover (1) and fix the screw (2).

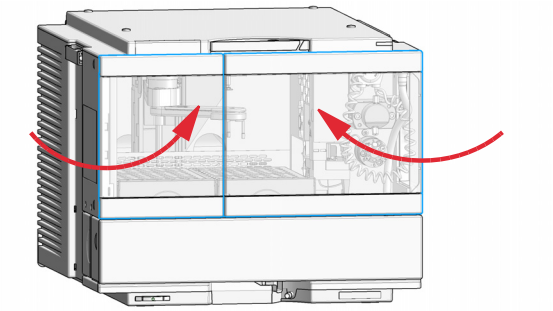


13 In Lab Advisor, select **Next** to move the needle into the needle seat and then **Back** to finish the maintenance procedure.

OR

In the Local Controller, select **Continue** to move the needle into the needle seat and then **Exit** to finish the maintenance procedure.

14 Close the doors.



15 Perform a **System Pressure Test**.

Exchange the Rotor Seal

When

- Injection volume reproducibility problems are observed.
- Leaks or blockages are observed.
- The limit for the rotor seal EMF counter is exceeded.
- The rotor seal needs to be replaced as part of the yearly maintenance.

Tools required

p/n	Description
8710-0510	Open-end wrench 1/4 — 5/16 inch
8710-2394	Hex key 9/64 inch 15 cm long T-handle
05980-60051	Cloths, clean, lint-free 15/pk Isopropanol or any other appropriate solvent

Parts required

p/n	Description
5068-0268	Rotor Seal
5068-0267	Stator

Preparations

Finish any pending acquisition job and in order to avoid leaks, stop the pump running.

CAUTION

Reduced life time of the injection valve

Component cleanliness is crucial for the life time of the injection valve.

✓ **Replace the rotor seal in a clean environment.**

CAUTION

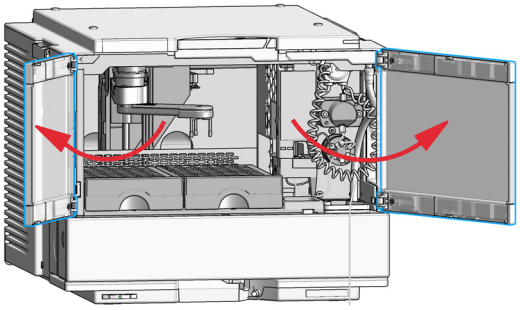
Removing the stator head

The stator face is held in place by the stator head. When you remove the stator head, the stator face can fall out of the valve.

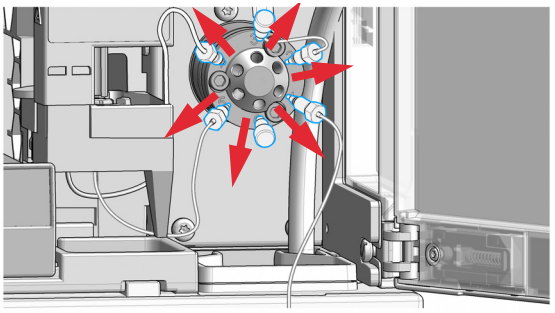
✓ **Carefully handle the valve to prevent damage to the stator face.**

✓ **Carefully handle the stator face during sonication.**

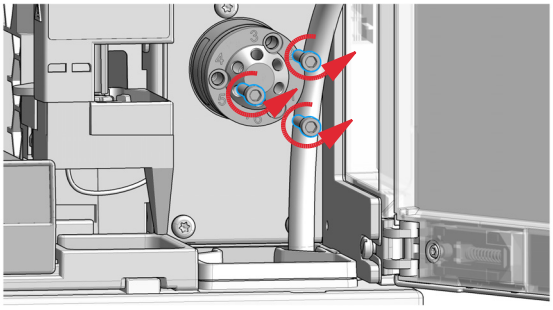
1 Open the doors of the module.



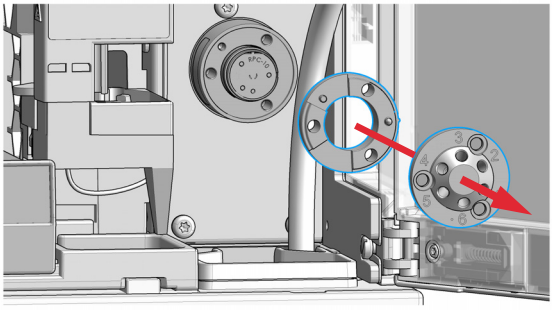
2 Remove all capillaries from the injection valve with a 1/4 inch wrench.



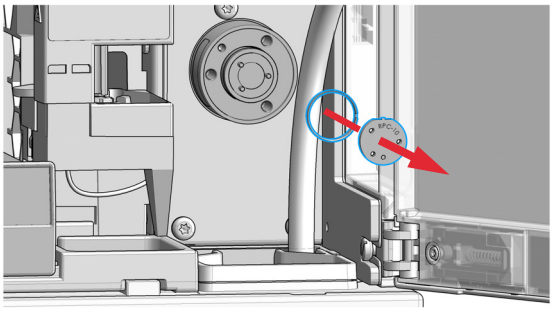
3 Loosen each fixing bolt two turns at a time. Remove the bolts from the head.



4 Remove the stator head and stator ring.



5 Remove the rotor seal and isolation seal.



CAUTION

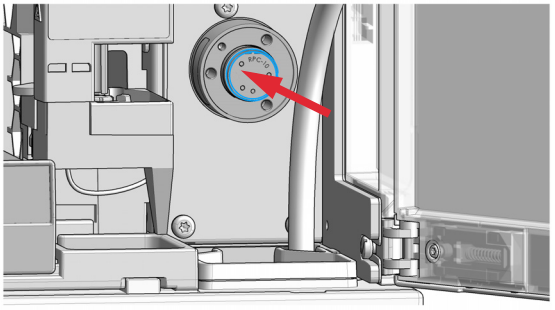
Damage to the rotor seal and cross-port leaks

✓ **Before you replace the rotor seal, clean the stator.**

✓ **Inspect the stator head and swab it with the appropriate solvent. If more stringent cleaning is required, use a sonicator. Inspect the remaining valve components for contamination. Clean them as necessary.**

✓ **If the stator head is scratched, replace it.**

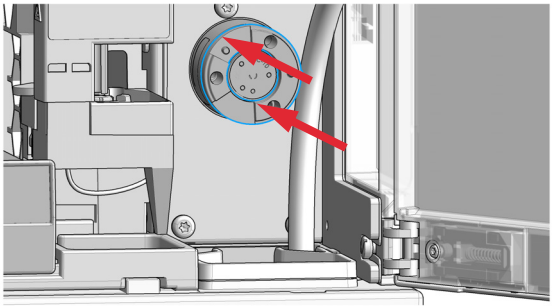
6 Install the new rotor seal and isolation seal. Ensure the metal spring inside the isolation seal faces towards the valve body.



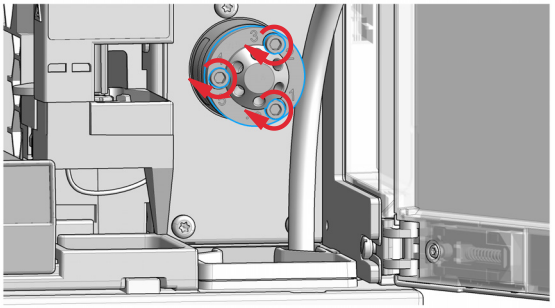
NOTE

Make sure that the rotor sealing surface with its engraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.

7 Install the stator ring with the short of the two pins facing towards you at the 12 o'clock position. Ensure the ring sits flat on the valve body.



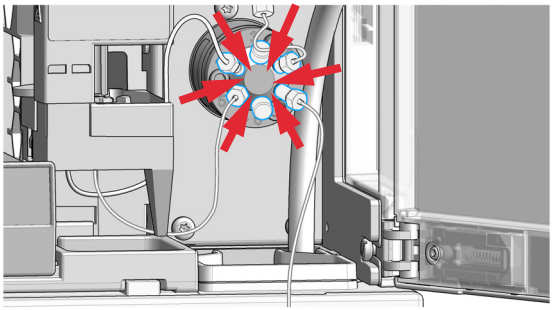
8 Install the stator head. Tighten the bolts alternately two turns at a time until the stator head is secure.



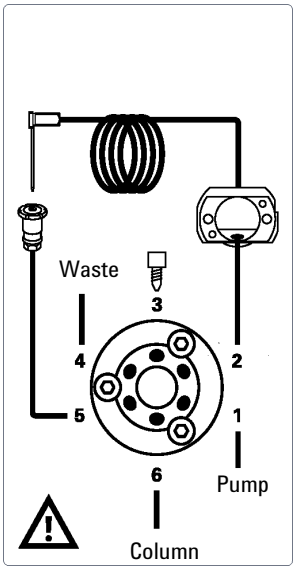
NOTE

Do not over-tighten the screws. The screws hold the assembly together and do not affect the sealing force. The sealing force is automatically set as the screws close the stator head against the valve body.

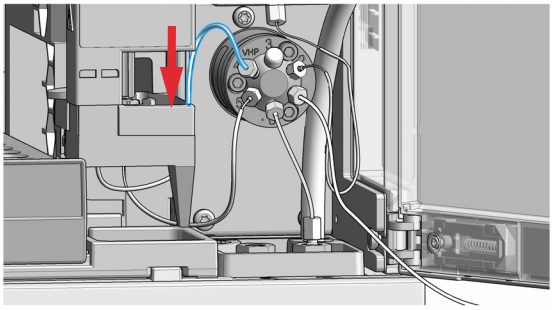
9 Reconnect the capillaries and tubes to the valve ports.



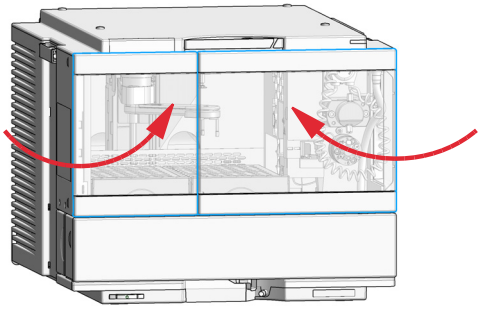
The correct plumbing is shown below and on the safety cover of the module.



10 Slide the waste tube into the waste holder in the leak plane.



11 Close the doors.



12 Perform a **System Pressure Test**.

Exchange the Metering Seal and Piston

When

- Poor injection-volume reproducibility.
- Leaking metering device.

Tools required

p/n	Description
8710-0510	Open-end wrench 1/4 — 5/16 inch
5023-2524	Hex Key Set (part of the G7120-62708 InfinityLab LC Series Tool Kit)
01018-23702	Insert tool
	Cleaning tissue and appropriate solvent like isopropanol or methanol

Parts required

p/n	Description
0905-1294	Metering Seal, 900 µL
G4267-60462	Piston, 900 µL, Sapphire

Preparations

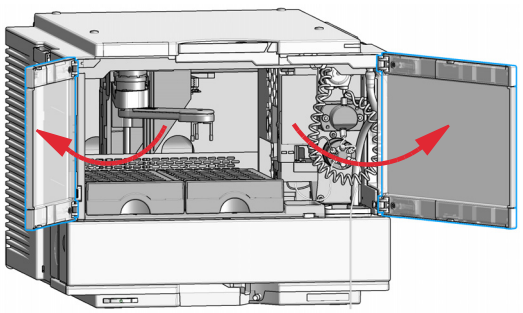
- Finish any pending acquisition job.
- Stop the flow at the pump and remove the solvent lines from the eluent bottles to avoid spilling solvent.
- Close the shutoff valves at the pump if available.

NOTE

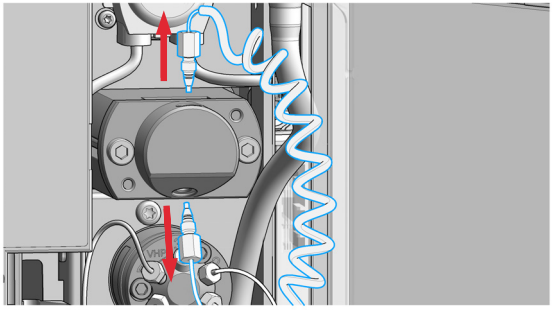
When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See Table 14 on page 91

1 In the **Tools** section of the Agilent Lab Advisor software select **Service & Diagnostics >Maintenance Positions >Change Metering Device**, click **Start** and wait until the metering device is in maintenance position.

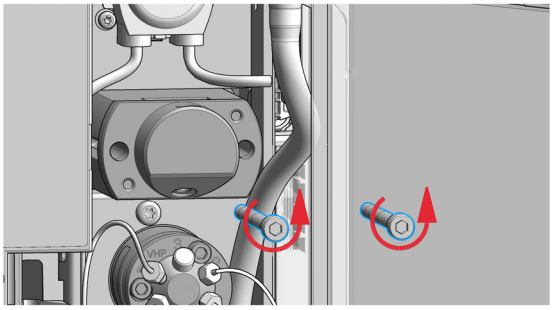
2 Open the doors of the module.



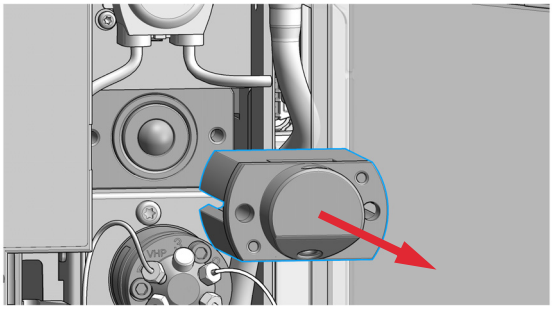
3 Disconnect the two capillaries from the metering device.



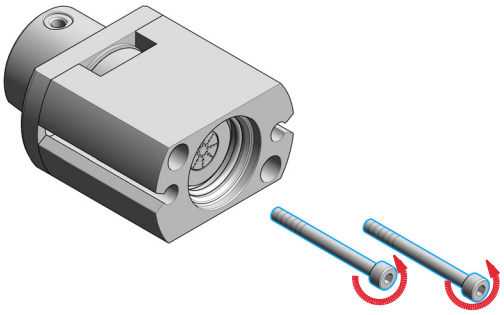
4 Remove the two fixing bolts (4 mm hex).



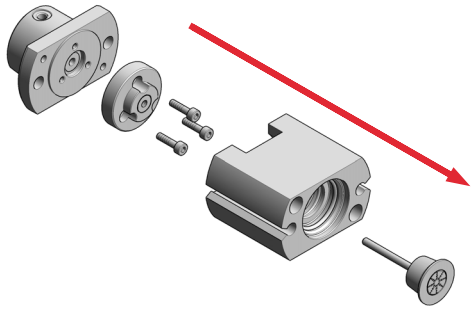
5 Remove the metering head assembly from the sampler.



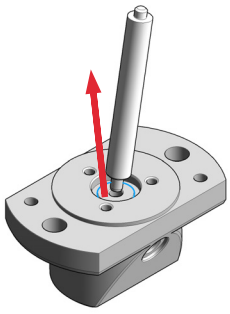
6 Remove the two fixing bolts (3 mm hex) from the base of the metering head assembly.



7 Disassemble the metering head assembly (2.5 mm hex).

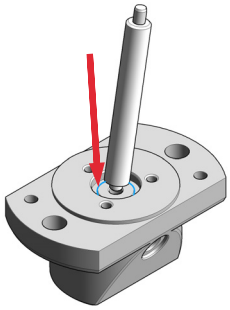


8 Use a seal insert tool to carefully remove the seal.



9 Clean the chamber and the plunger with a piece of lint-free cloth and an appropriate solvent, such as isopropanol. Check the plunger for sings of scratches or damage and if necessary, replace it. Ensure that all particulate matter is removed from the chamber.

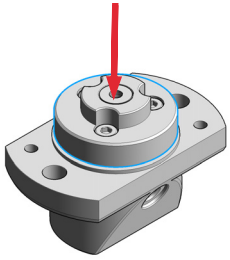
10 Use the plastic side of the insert tool to install the new seal. Press the seal firmly into position.



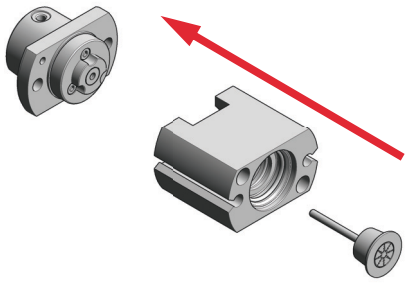
11 Place the seal support ring on top of the seal and fix the screws (2.5 mm hex).

NOTE

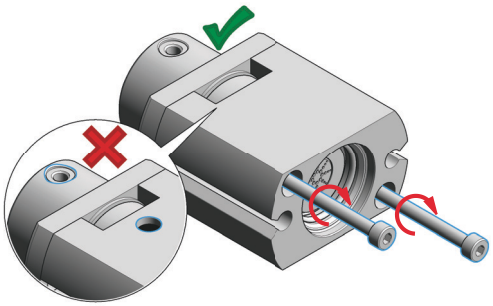
There are no seal support screws for the 900 µL analytical head.



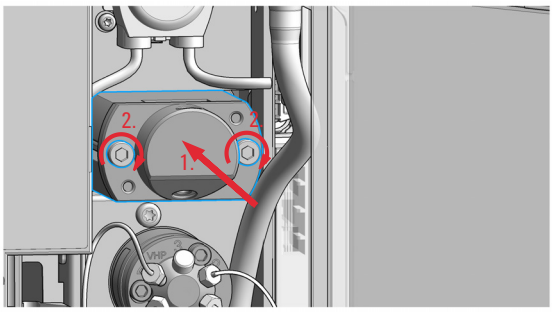
12 Reassemble the metering head assembly. Carefully insert the piston into the base.



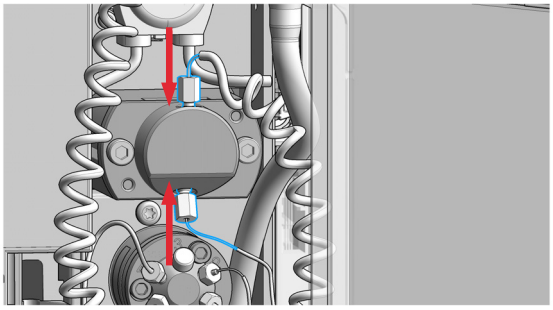
13 Install the fixing bolts (3 mm hex) and tighten them alternately two turns at a time until the stator head is secure. The side without the drain hole must be matching with the capillary port sitting on the non-truncated side of the analytical head.



14 Install the metering head assembly in the autosampler. Ensure that the drain hole of the metering body is facing downwards. Tighten the bolts (4 mm hex) alternately two turns at a time until the metering device is secure.



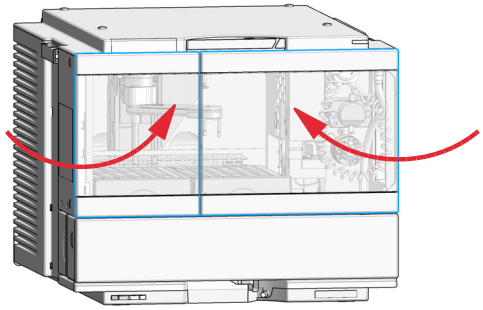
15 Reinstall the capillaries.



16 In the **Tools** section of the Agilent Lab Advisor software system screen exit **Service & Diagnostics >Maintenance Positions >Change Metering Device**: click **Next** and wait until the metering device is in Home position.

17 Select **Back** to finish the procedure.

18 Close the doors.



19 Perform a **System Pressure Test**.

Replace the Analytical Head

Tools required	p/n	Description
	5023-2524	Hex Key Set (part of the G7120-62708 InfinityLab LC Series Tool Kit)

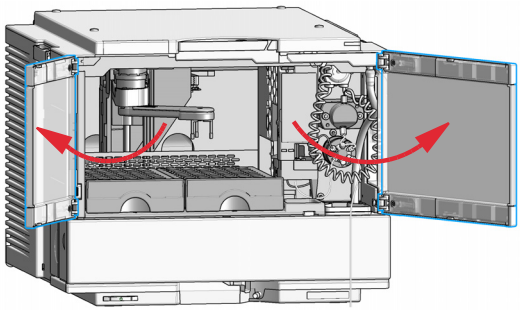
Parts required	#	p/n	Description
	1	G7129-60083	Analytical Head Assembly 900 µL

Preparations

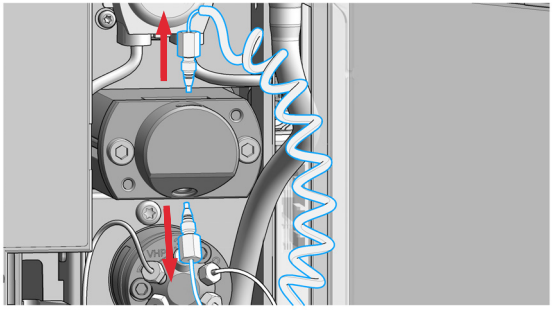
- Finish any pending acquisition job.
- Stop the flow at the pump and remove the solvent lines from the eluent bottles to avoid spilling solvent.
- Close the shutoff valves at the pump if available.

NOTE If the sampler with 900 µL metering device is linked to a 1260 pump, such as the G7112B Binary Pump, the 400 bar pressure limit must be set manually in the method parameter settings of the pump (see *Setup of Basic Pump Parameters* chapter in the pump user manual). For all 1290 pumps, the pressure limit will be set automatically.

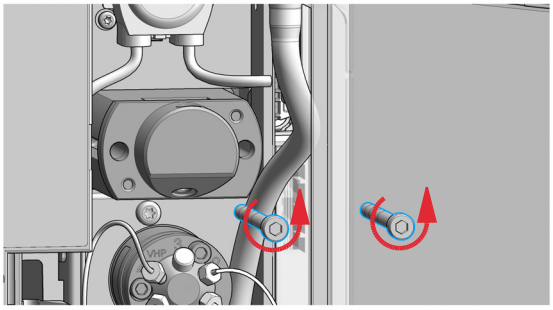
NOTE When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See Table 14 on page 91.

1 In the Agilent Lab Advisor software, select **Service & Diagnostics >Maintenance Positions >Change Metering Seal and Piston**, click **Start** and wait until the metering plunger is in maintenance position. OR In the Local Controller start the maintenance mode and select **Change Metering Device** function.	2 Open the doors of the module. 

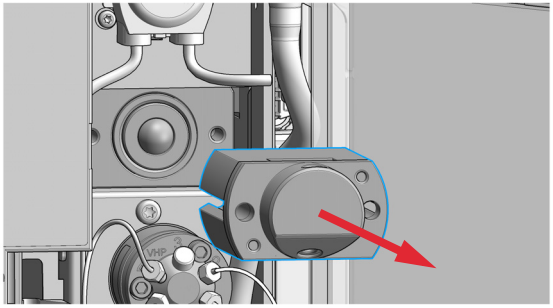
3 Disconnect the two capillaries from the metering device.



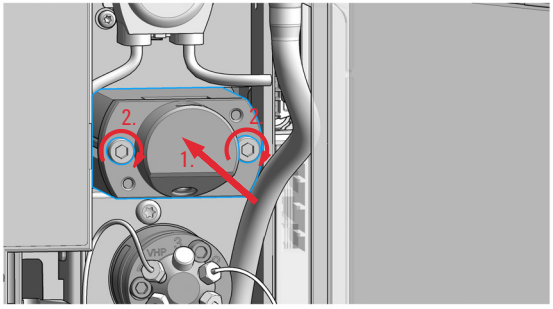
4 Remove the two fixing bolts (4 mm hex).



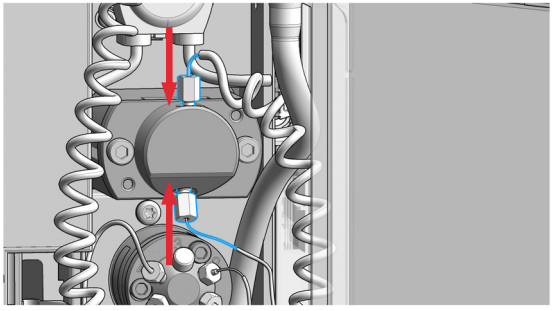
5 Remove the metering head assembly from the sampler.



6 Install the metering head assembly in the autosampler. Ensure that the drain hole of the metering body is facing downwards. Tighten the bolts (4 mm hex) alternately two turns at a time until the metering device is secure.



7 Reinstall the capillaries.

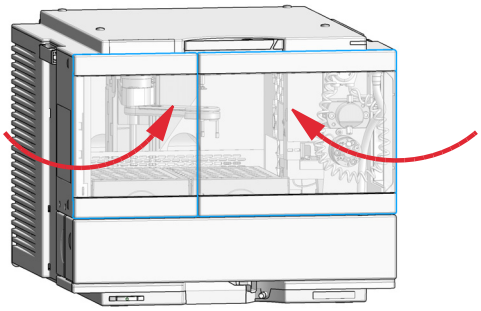


8 In Lab Advisor, select **Next** to move the piston back into its normal position and then **Back** to finish the maintenance procedure.

OR

In the Local Controller, select **Continue** to move the piston back into its normal position and then **Exit** to finish the maintenance procedure.

9 Select **Back** to finish the procedure.

10 Close the doors. 	**11** Perform a **System Pressure Test**.

Exchange the Gripper Arm

When The gripper arm needs to be replaced due to malfunctioning.

Tools required

p/n	Description
5023-2524	Hex Key Set (part of the G7120-68708 InfinityLab LC Series Tool Kit, the 1.5 mm hex key is needed)

Parts required

p/n	Description
G1313-60010	Gripper assembly

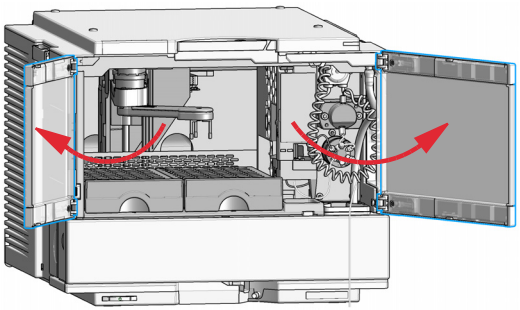
Preparations Finish any pending acquisition job

1 In the Agilent Lab Advisor software, select **Service & Diagnostics >Maintenance Positions >Change Gripper** and wait until the gripper is in maintenance position (see also "Maintenance Functions" on page 112).

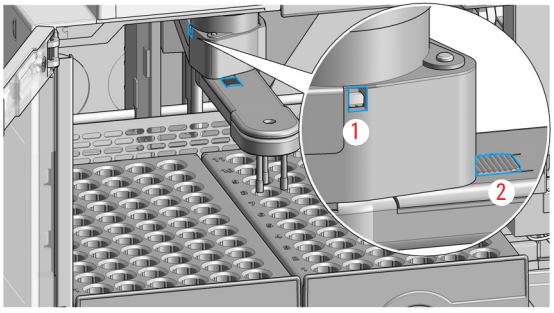
OR

In the Local Controller start the maintenance mode and select **Change Gripper** function.

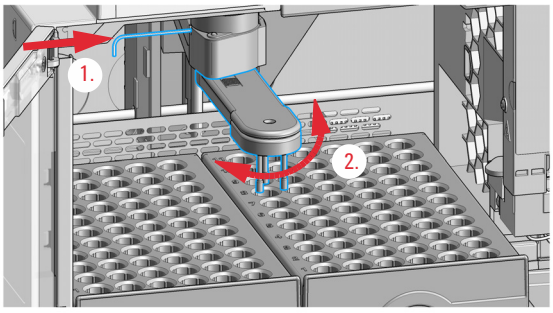
2 Open the doors of the module.



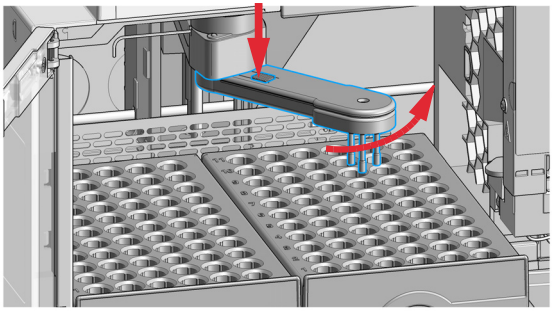
3 Identify the slot for blocking the gripper arm rotation on the left side of the transport arm (1) and the gripper arm release button (2).



4 Place the hex key (1.5 mm) into the slot and rotate the gripper arm slightly to the left or right until you find the block position.

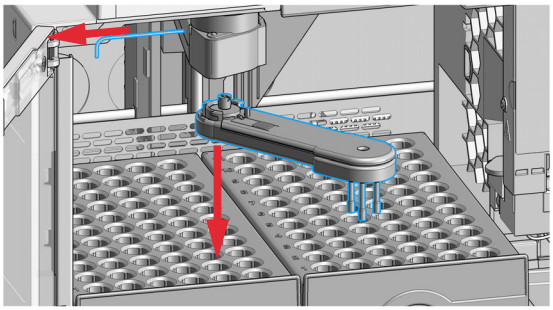


5 Press in the gripper arm release button and carefully rotate the gripper arm approximately 40 – 50 ° to the right, while firmly holding the hex key in place.



You should feel that the lock mechanism releases the gripper arm.

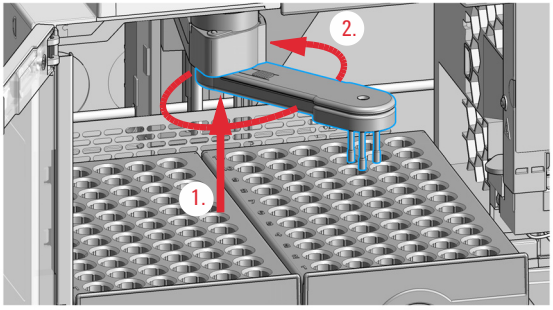
6 Remove the gripper arm and the hex key.



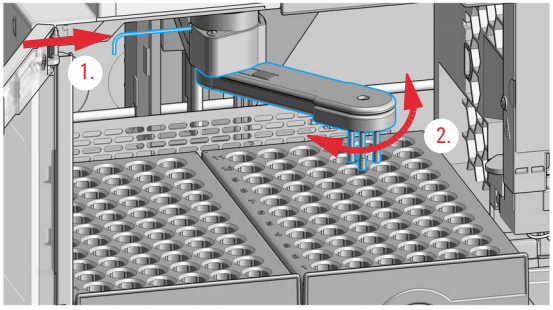
NOTE

With firmware version D.07.28 or older, it is recommended to turn off the sampler to complete the rest of the procedure.

7 Fit the new gripper arm into the socket of the transport arm (1.) and rotate it by 360 ° while firmly holding it against the transport arm (2.) to find the matching position for the lock mechanism.



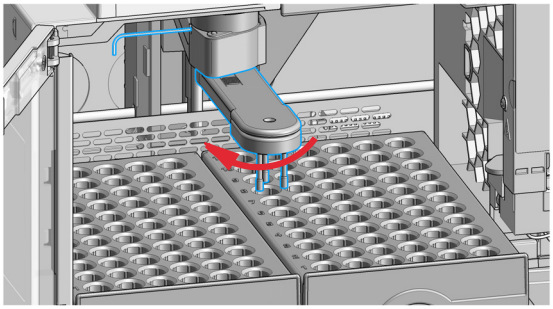
8 Place the hex key back into the slot (1.) and rotate the gripper arm slightly to the left or right until you find the block position (2.).



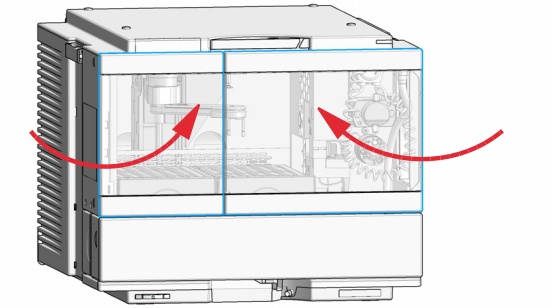
NOTE

The gripper arm orientation is slightly different compared to before taking it off.

9 Rotate the gripper arm approximately 40 – 50 ° to the left while firmly holding the hex key in place to snap it into the lock position.



10 Remove the hex key from the block position slot and close the instrument doors.



NOTE

With firmware version D.07.28 or older, turn on the sampler and wait until it initializes.

11 Complete the remaining steps prompted in the user interface of the Local Controller or the Agilent Lab Advisor software.

Replace the Peristaltic Pump Cartridge

When

- The tubing is blocked or damaged.
- The peristaltic cartridge needs to be replaced as part of the yearly maintenance.

Parts required

p/n	Description
5065-4445	Peristaltic pump with PharMed tubing

Preparations

- Finish any pending acquisition job.
- Remove the solvent line from the wash bottle to avoid spilling solvent.

WARNING

When opening capillary or tube fittings solvents may leak out.

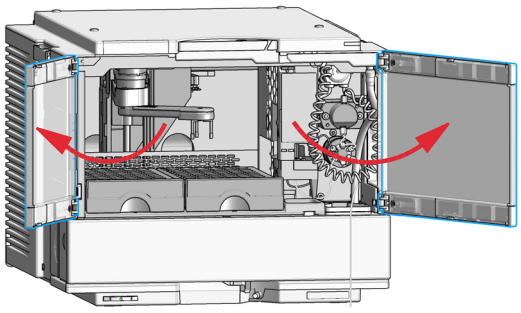
The handling of toxic and hazardous solvents and reagents can hold health risks.

✓ **Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.**

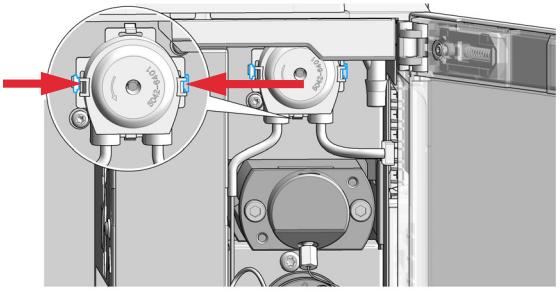
NOTE

The peristaltic pump cartridge is a replaceable unit. The tubing inside the pump is not replaceable.

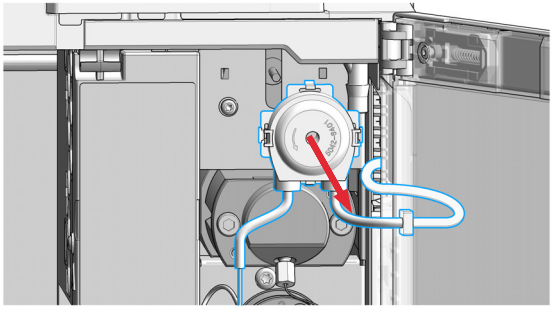
1 Open the doors of the module.



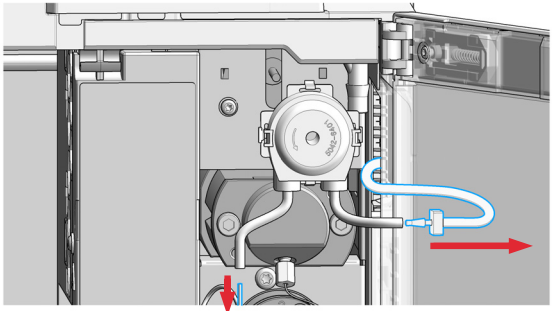
2 Press the two clips on the front of the peristaltic pump cartridge.



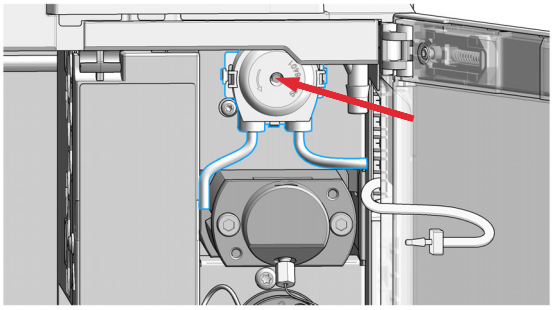
3 Pull the cartridge forward off the motor shaft.



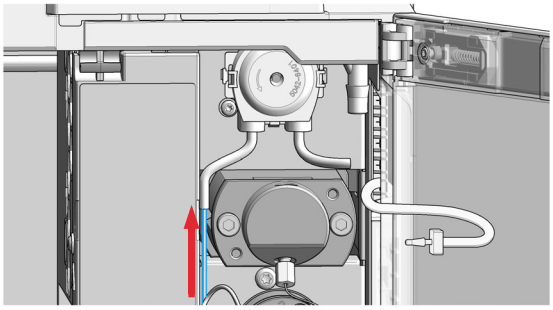
4 Disconnect the tubing leading to the wash port and the tubing coming from the solvent bottle.



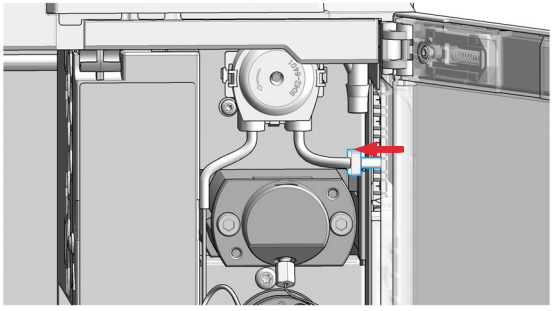
5 Push the new cartridge onto the motor shaft until the clips click into place.



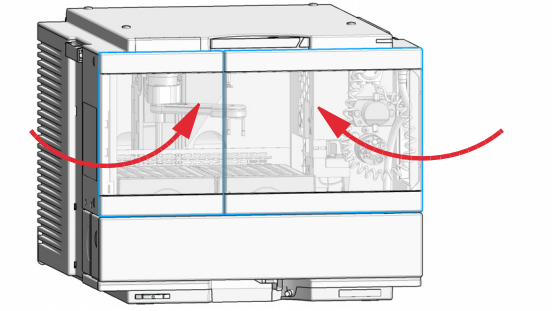
6 Connect the wash port tubing to the left side of the cartridge tubing (use sand paper to get a good grip on the tubing).



7 Connect the wash solvent line with the plastic fitting to the right side of the cartridge tubing.



8 Close the doors.



Exchange the Wash Port Assembly

When

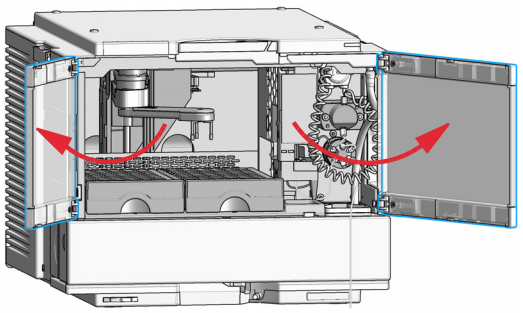
- The safety wash port is broken or damaged.
- Carryover problems are observed while needle wash is used.

Tools required	**p/n**	**Description**
	5182-3466	Torx screwdriver T10
OR	5023-3089	Torx key set (part of the G7120-68708 InfinityLab LC Series Tool Kit)

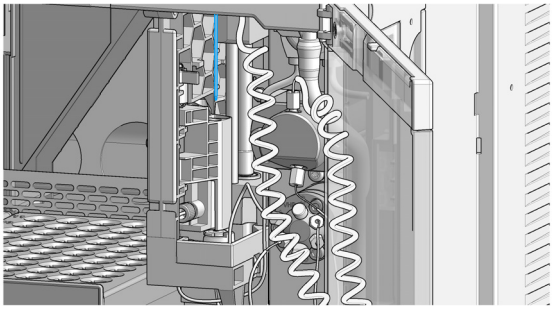
Parts required	**p/n**	**Description**
	G7129-60033	Safety Wash Port for Needle Station

Preparations

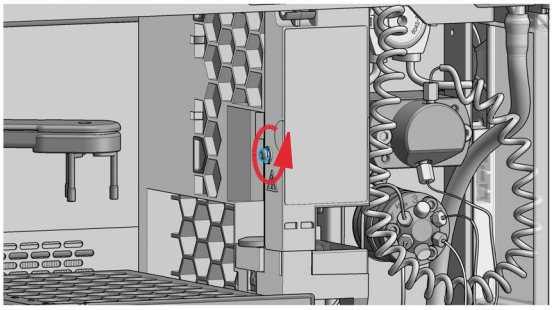
- Finish any pending acquisition job.
- Stop the flow at the pump and remove the solvent lines from the eluent bottles to avoid spilling solvent.
- Close the shutoff valves at the pump if available.

1 In the Agilent Lab Advisor software select **Service & Diagnostics >Maintenance Positions >Change Needle, Loop and Seat**, click **Start** and wait until the needle assembly is in maintenance position. OR In the Local Controller start the maintenance mode and select **Change Needle, Loop and Seat** function.	**2** Open the doors of the module. 

3 Verify that the needle in the uppermost position before continuing.



4 Loosen the safety cover screw.

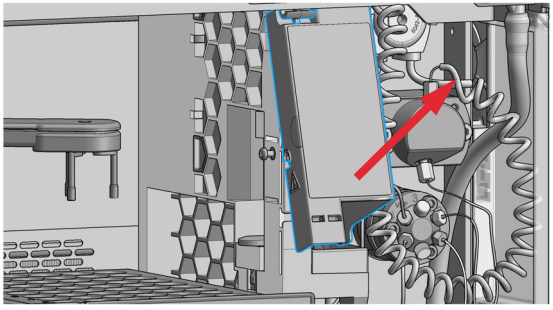


WARNING

Sharp needle
Uncovered needles may cause injuries

✓ **Do not touch the tip of the needle.**

5 Remove the safety cover.



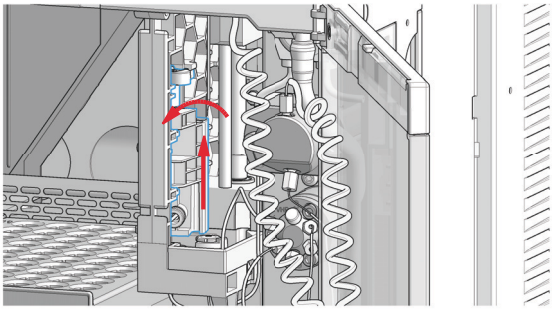
WARNING

Sharp needle
Uncovered needles may cause injuries.

✓ **Do not change the needle seat at this point.**

✓ **Do not touch the tip of the needle.**

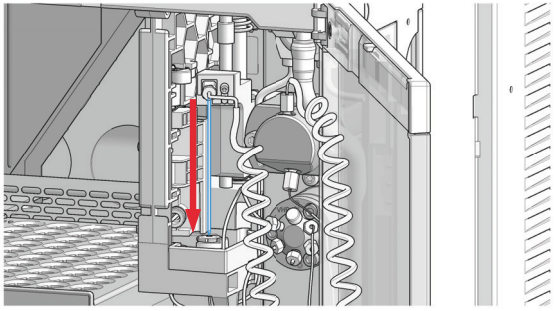
6 Move the wash port to the service position by slightly lifting it up and then flapping to the left.



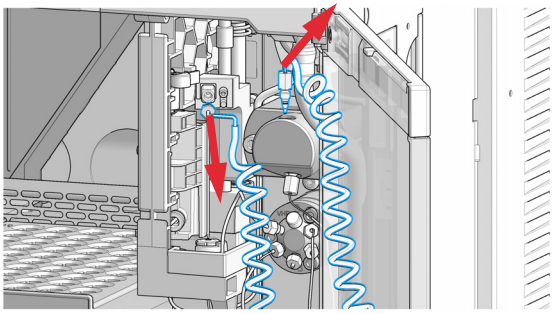
7 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

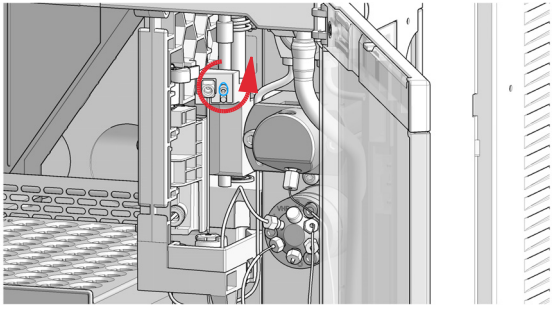
In the Local Controller, move the needle down until the needle tip is ca. 2 – 4 mm above the seat.



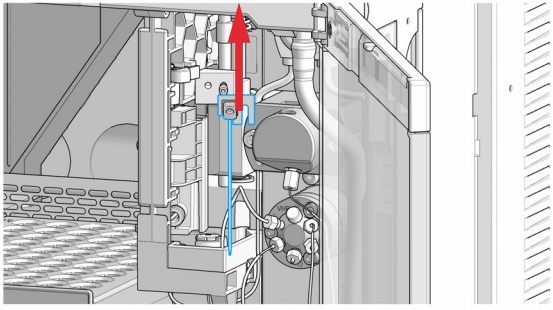
8 Disconnect the sample loop from the needle, and, if needed, also from the metering device.



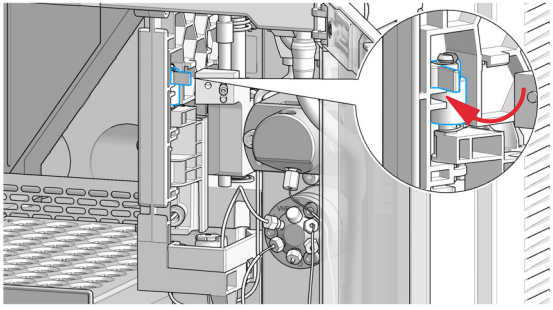
9 Loosen the fixing screw.



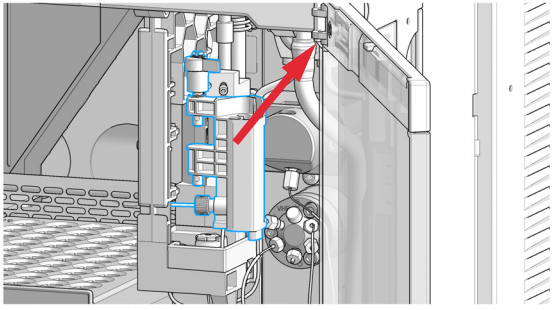
10 Lift out the needle.



11 Release the spring loaded pin.



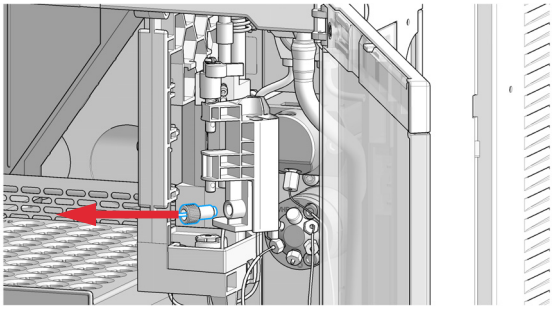
12 Flap the wash port to the right and lift it out of the bracket. Be careful not to squeeze the wash tubing.



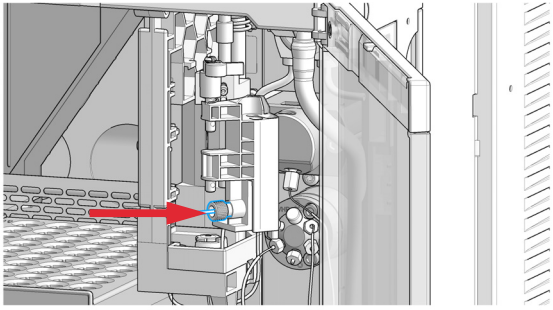
NOTE

Move the needle holder arm up by a couple of mm if you are facing difficulties with moving the wash port to the right.

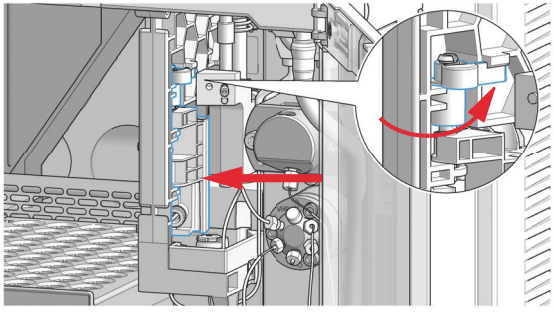
13 Disconnect the wash tube fitting and then move the old wash port completely out of the sampler.



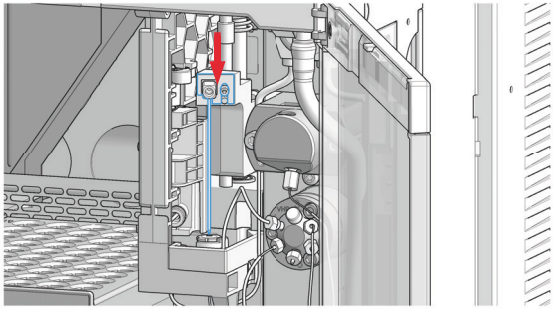
14 Connect the wash tubing fitting to the new wash port assembly.



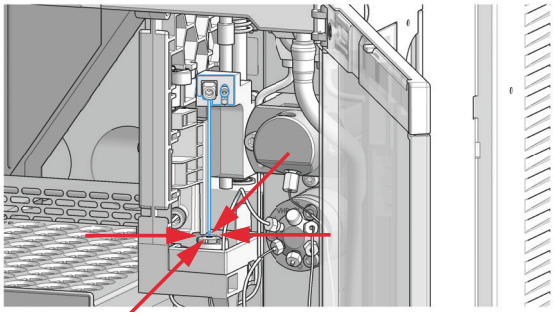
15 Install the new wash port by mounting it in the respective brackets of the needle station housing. The pin must be latched on the housing. Check the movement of the flapping mechanism. Check if the tension on the spring is high enough to move the wash port back into position in time. When everything seems to be in order, move the wash port into the service position (see step 6).



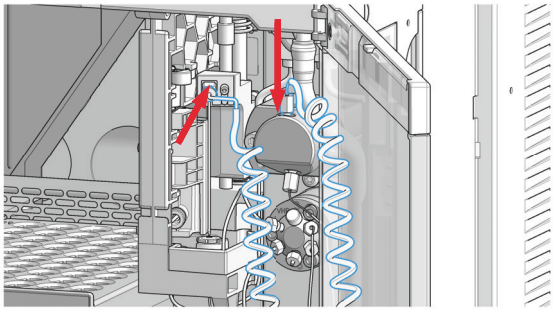
16 Mount and align the needle on its fixture, then tighten the screw firmly.



17 Align the needle tip with the seat and ensure that they are concentric. If needed, carefully bend the needle into the right position with your fingers.



18 Reconnect the sample loop to the needle. Make sure of the correct positioning of the loop capillary, the uncoated part of the capillary must be horizontal.



NOTE

Do not overtighten the fitting!

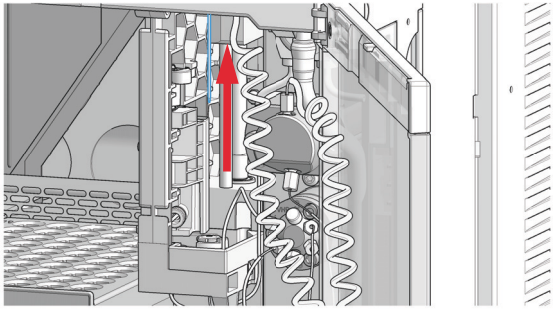
NOTE

Incorrect positioning and installation of the needle/loop connection can result in damaging or breaking the sample loop.

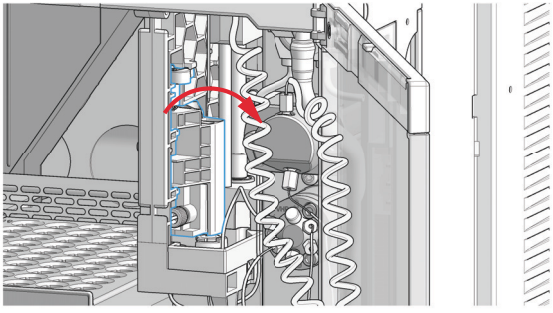
19 In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

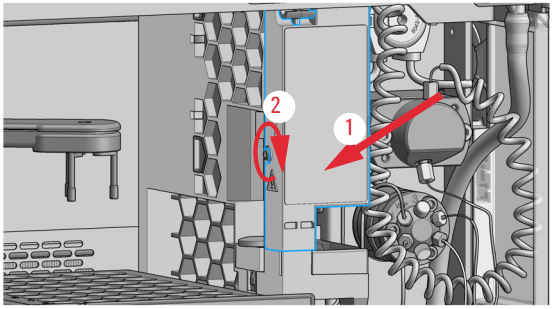
In the Local Controller, move the needle up to the uppermost position.



20 Move the wash port back into its normal position by turning it to the right.



21 Install the safety cover (1) and fix the screw (2).

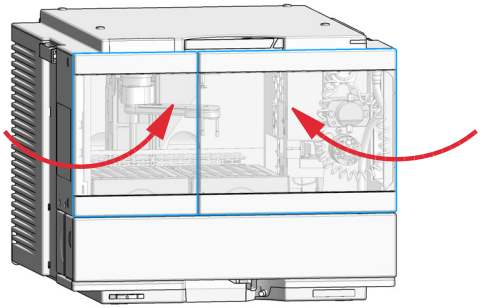


22 In Lab Advisor, select **Next** to move the needle into the needle seat and then **Back** to finish the maintenance procedure.

OR

In the Local Controller, select **Continue** to move the needle into the needle seat and then **Exit** to finish the maintenance procedure.

23 Close the doors.



Next Steps:

24 Purge the wash port. Check if solvent is delivered from the peristaltic pump.

25 Perform a **System Pressure Test**.

Replace the Module Firmware

When

The installation of newer firmware might be necessary
- if a newer version solves problems of older versions or
- to keep all systems on the same (validated) revision.

The installation of older firmware might be necessary
- to keep all systems on the same (validated) revision or
- if a new module with newer firmware is added to a system or
- if third party control software requires a special version.

Tools required

Description
Agilent Lab Advisor software

Parts required

#	Description
1	Firmware, tools and documentation from Agilent web site

Preparations

Read update documentation provided with the Firmware Update Tool.

To upgrade/downgrade the module's firmware carry out the following steps:

1. Download the required module firmware, the latest FW Update Tool and the documentation from the Agilent web.
   https://www.agilent.com/en-us/firmwareDownload?whid=69761
2. For loading the firmware into the module follow the instructions in the documentation.

Module Specific Information

There is no specific information for this module.

Replace the Sample Cooler/Sample Thermostat

When

The Sample Cooler/Sample Thermostat is damaged or defective.

Tools required

	p/n	Description
	8710-0899	Screwdriver Pozidrive Shaft (for the Sample Cooler)
	5182-3466	Torx screwdriver T10 (for the Sample Thermostat)
OR	5023-3089	Torx key set (part of the G7120-68708 InfinityLab LC Series Tool Kit)

Parts required

	#	p/n	Description
	1	G7167-60005	Sample Cooler
OR	1	G7167-60101	Sample Thermostat
OR	1	G7167-60201	Sample Thermostat

For the Sample Cooler installation in a Vialsampler the serial number of the Sample Cooler must be DEBAT02001 or higher.

Preparations

If needed, update the firmware of the hosting sampler to ensure that it supports the type of thermostat you are about to install, see "Specifications of the Sample Thermostat" on page 34.

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the Sample Thermostat and laboratory.

- ✓ **Keep open fire or sources of ignition away from the device.**
- ✓ **Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the Sample Thermostat).**
- ✓ **Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.**
- ✓ **Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the Sample Thermostat.**

WARNING

Flammable refrigerant used

- ✓ When handling, installing and operating the Sample Thermostat, care should be taken to avoid damage to the refrigerant tubing or any part of the Sample Thermostat.

WARNING

In the event of a damage

- ✓ Keep open fire or sources of ignition away from the device.
- ✓ Ventilate the room for several minutes.
- ✓ Do not use the Sample Thermostat any more.

WARNING

Heavy weight

The module is heavy.

- ✓ Carry the module at least with 2 people.
- ✓ Avoid back strain or injury by following all precautions for lifting heavy objects.
- ✓ Ensure that the load is as close to your body as possible.
- ✓ Ensure that you can cope with the weight of your load.

CAUTION

Routing of the condensation tubing

Proper routing of the condensation tubing is critical for correct condensate drainage.

- ✓ Do not place the sampler directly on the bench.

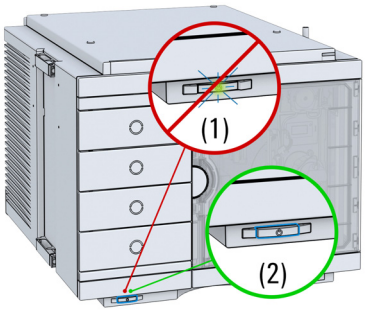
CAUTION

Condensate inside the cooler or thermostat

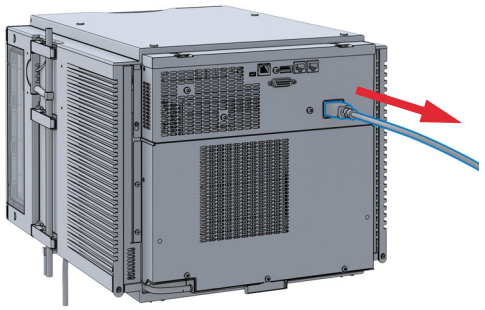
Damage to the electronics

- ✓ Unplug the power cords.
- ✓ Drain off all condensate before dismounting the sample cooler or thermostat.
- ✓ Make sure that there is no condensate left.

1 Ensure that the power switch on the front of the module is OFF (switch stands out).



2 Disconnect the power cable from the sampler.

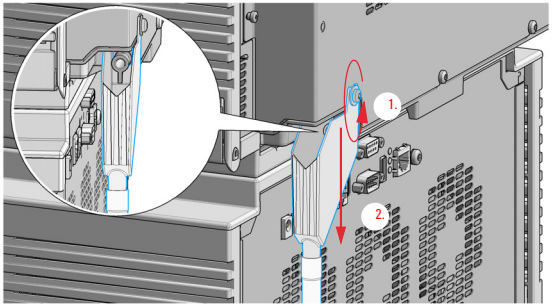


3 Ensure that no condensate remains inside the cooler/thermostat before proceeding forward.

NOTE

Gently tapping on the sides of the sampler can help to remove the last traces of condensate from the system.

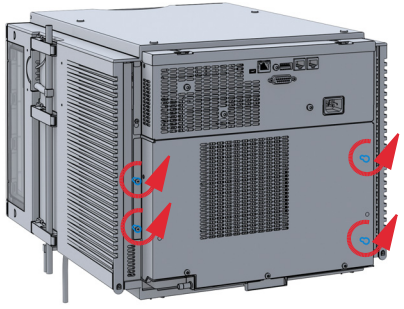
4 Loosen the screw (1) and remove the condensate funnel (2) from the back of the cooler/thermostat.



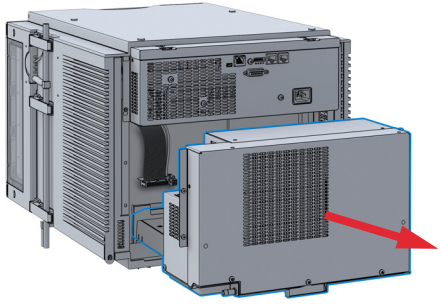
NOTE

If there is still some condensate inside the cooler/thermostat, place a suitable container underneath the outlet tube, and keep tapping on the sides of the sampler until no more water comes out.

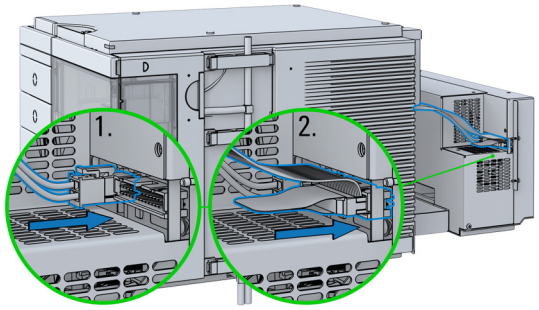
5 Remove the fixation screws on the back of Sample Cooler/Sample Thermostat.



6 Pull the cooler/thermostat halfway out, disconnect the power and the data cable and then remove the unit completely from the sampler.



7 Slide the new cooler/thermostat halfway into the sampler and connect the power and the data cable.

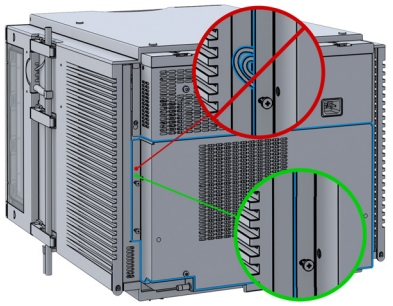


CAUTION

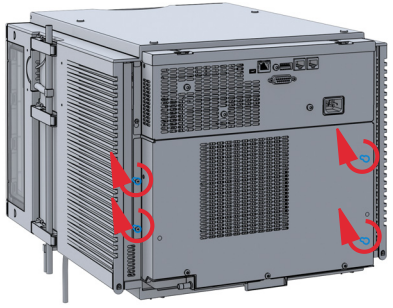
Damage to the cables

- ✓ **Do not bend or pinch the cables.**
- ✓ **Make sure that the Sample Cooler/Sample Thermostat fits perfectly in the sampler.**

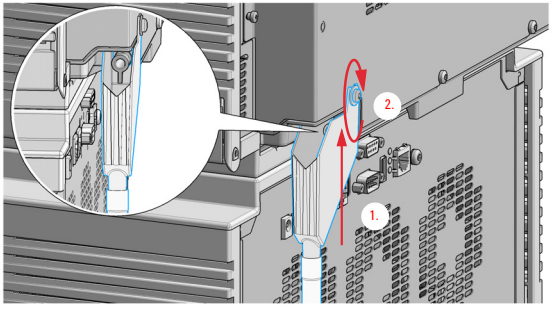
8 Slide the cooler/thermostat all the way into the sampler, making sure that the cables don't get jammed between the metal parts.



9 Fix the unit with the four screws.



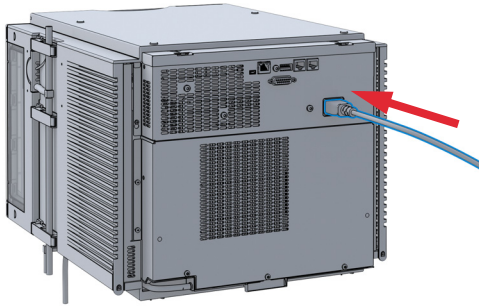
10 Position the condensate collector funnel underneath the condensate drainage outlet tube (1) and fix it to the back of the cooler/thermostat by tightening the screw (2). Ensure correct orientation and avoid overtightening the screw.



NOTE

For information on proper condensate handling, see "Install the Sample Cooler/Sample Thermostat" on page 55.

11 Connect the power cable to the power connector at the rear of the module.



CAUTION

Damage to the Sample Cooler/Sample Thermostat

- ✓ **Wait at least 30 min before switching on the compressor of the cooler/thermostat.**
- ✓ **This allows the refrigerant and system lubrication to reach equilibrium.**

12 Switch on the sampler and perform the **Sample Cooler Function Test** to verify the correct functioning of the new cooler/thermostat (see "Sample Cooler Function Test" on page 122).

9 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance and repair.

Main Assemblies

Item	p/n	Description
1	G7129-60010	Drawer for 66 x 2 mL Vials
OR 1	G7129-60110	Drawer for 18 x 6 mL Vials
OR 1	G7129-68210	Classic Vial Drawer Kit
	G7129-60210	Classic Drawer for 50 x 2 mL Vials, Left
	G7129-60220	Classic Drawer for 50 x 2 mL Vials, Right
2	5067-4277	2-position/6-port injection valve, prep, 600 bar
3	G1313-60010	Gripper assembly
4	G7129-60083	Analytical Head Assembly 900 µL
5	5065-4445	Peristaltic pump with PharMed tubing

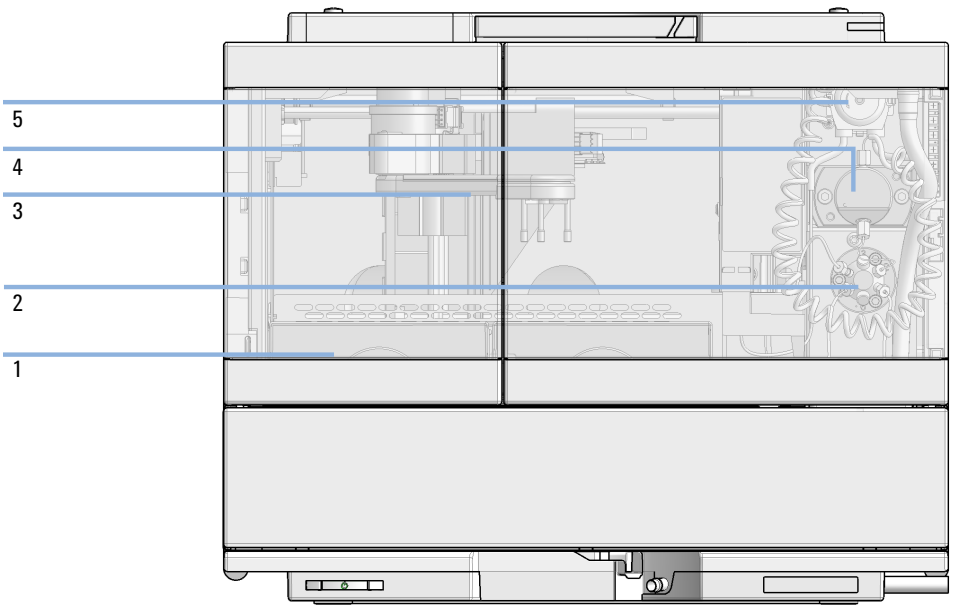


Figure 20 Main assemblies

Standard Parts

p/n	Description
5065-4445	Peristaltic pump with PharMed tubing
5063-6506	Finger Caps
G7157-60515	Loop for Prep-Autosampler
G7157-87101	Needle Seat Assembly High Flow
G7157-87201	Needle High Flow (slotted), indicated by a white ring
5067-4277	2-position/6-port injection valve, prep, 600 bar

Drawer Assembly

Item	p/n	Description
1	G7129-60010	Drawer for 66 x 2 mL Vials
2	G7129-60110	Drawer for 18 x 6 mL Vials

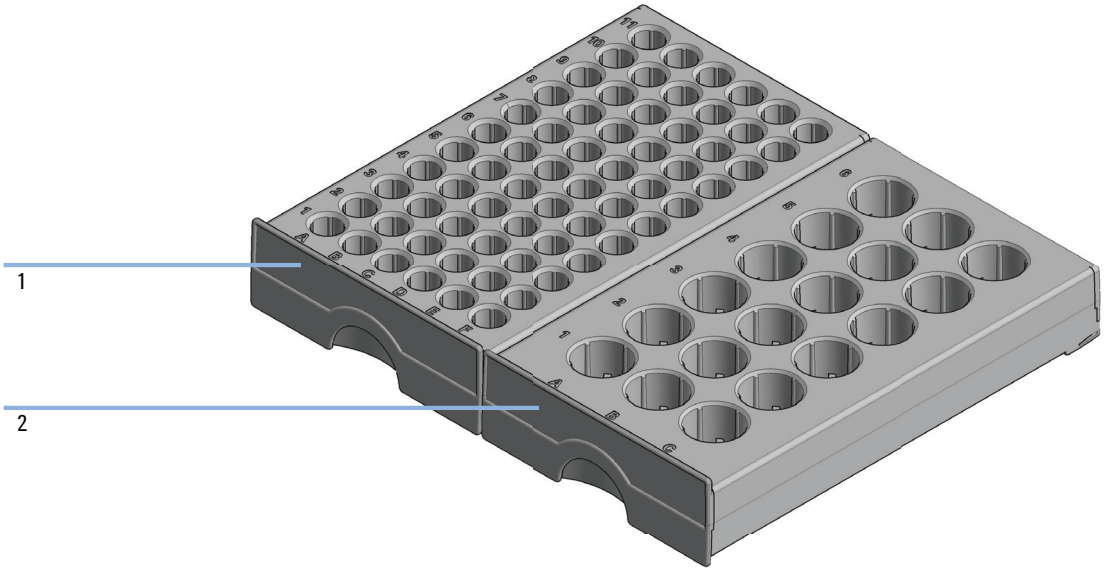


Figure 21 Cartesian Vial Drawers

NOTE Do not use cartesian vial drawers in combination with classic vial drawers.

External Tray

p/n	Description
G7129-60000	External Tray for 5 x 2 mL Vials
G1313-27302	Disposal tube (not shown)

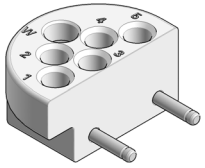


Figure 22 External tray

Analytical-Head Assembly (900 µL)

Item	p/n	Description
	G7129-60083	Analytical Head Assembly 900 µL
1	G7129-27790	Analytical-Head 900 µL
2	0905-1294	Metering Seal, 900 µL
3	5001-3764	Seal Support, 900 µL
4	G7129-60006	Analytical Head Adapter
5	0515-0850	Screw, ST, M4x0.7, 40 mm, Hex 3 mm
6	G4267-60462	Piston, 900 µL, Sapphire
	0515-2118	Screw, ST, M5 x 0.8, 60 mm, Hex 4 mm (not show)

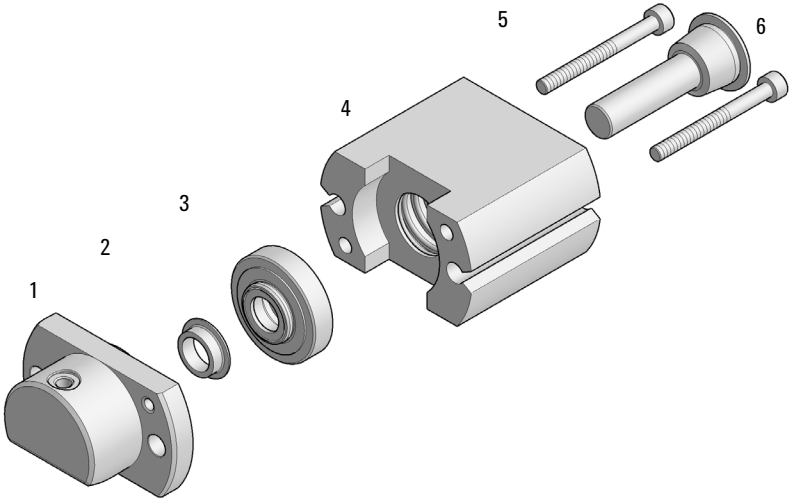


Figure 23 Analytical head assembly (900 µL)

NOTE With the 900 µL analytical head, the maximum system pressure is limited to 400 bar.

Prep Valve

Item	p/n	Description
	5067-4277	2-position/6-port injection valve, prep, 600 bar
1	5068-0018	Screws, ST, 8-32, Hex 9/64, 10/pk
2	5068-0267	Stator 6 port injector prep, 600 bar
3	5068-0118	Stator ring
4	5068-0268	Rotor Seal 6 port injector prep, 600 bar
5	1535-4045	Bearing ring

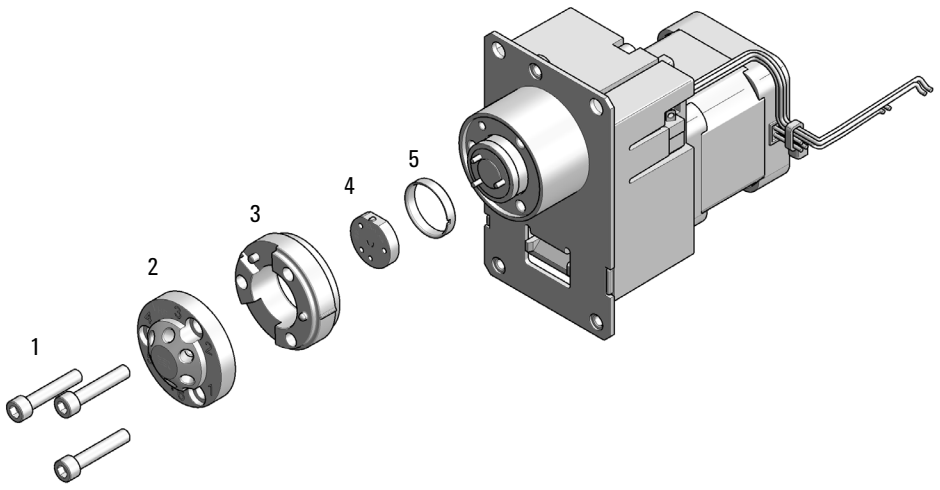


Figure 24 2ps 6pt Injection Valve 600 bar

Standard Prep Sampler Accessory Kit

Item	#	p/n	Description
	1	G7129-68705	Accessory Kit for 1290 Infinity II Vialsampler contains:
1	1	5500-1251	Capillary ST 0.12 mm x 400 mm SL/SL
2	3	5063-6506	Finger Caps (15/pk, if ordered separately)
3	2	5043-1013	Tubing Clip IF-II
4	1	5500-1411	Tubing Connector, 180 °, ID 6.4 mm (5/pk, if ordered separately)
5	2	5500-1223	Tubing Connector, 90°, ID 6.4 mm (5/pk, if ordered separately)
6	1	5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6/9 mm
7	1	5181-1519	CAN cable, Agilent module to module, 1 m
	1	5182-0716	Screw Cap Vial, 2 mL, amber glass, write-on spot, 100/Pack (not shown)
	1	5190-7024	Screw Cap, PTFE/silicone, 100/pk (not shown)

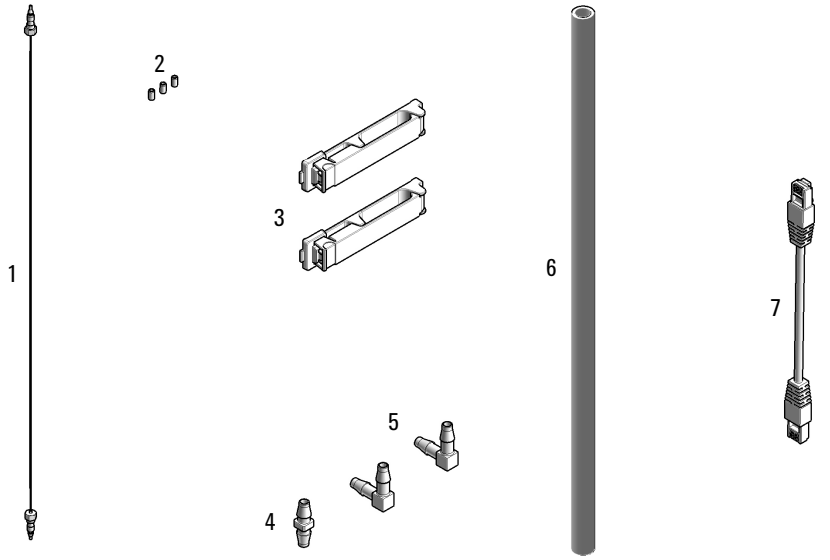


Figure 25 Accessory Kit for Vialsamplers

Multi-Draw Kit

The Multi-Draw Kit (G7157-68711) extends injection volumes up to 3600 µL.

p/n	Description
G7157-68711	Multi-Draw Kit contains:
0101-1243	Sample loop 5 mL
5022-2133	High Flow union, ST, no fitting

NOTE The internal volume of the seat capillary is 400 µL or 1400 µL. With the sample loop, the maximum draw volume of 3600 µL can be reached.

NOTE The maximum draw volume can be extended to 5400 µL, by combining the Multi-Draw Kit (G7157-68711) with Seat Capillary, ST, 1500 µL, ID 0.94 mm (G1313-87308).

Sample Thermostat Upgrade

p/n	Description
G4761A	InfinityLab Sample Thermostat Upgrade Kit contains:
G7167-60201	Sample Thermostat
5067-6208	Condensate Drainage Kit (not shown)

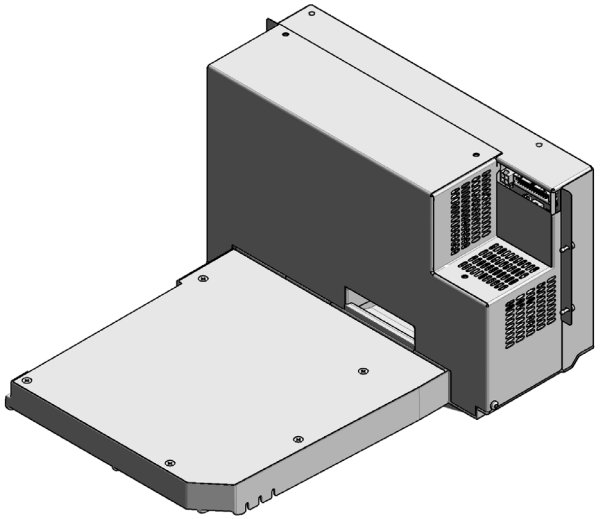


Figure 26 Sample Thermostat

NOTE

The Sample Thermostat contains flammable refrigerant R600a. Please check further details for installation.

Additional Part List

p/n	Description
G7129-68001	Insulation Kit
G7129-68000	Air guide kit
G7129-60014	Calibration Tool Kit (including gripper adapter)
5023-2540	Diffuser Adapter for ICC
G7129-40050	Transport Protection Foam

10 Identifying Cables

This chapter provides information on cables used with the Agilent InfinityLab LC Series modules.

Cable Overview

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Analog cables

p/n	Description
35900-60750	Agilent 35900A A/D converter
01046-60105	Analog cable (BNC to general purpose, spade lugs)

Remote cables

p/n	Description
5188-8029	ERI to general purpose
5188-8044	Remote Cable ERI – ERI
5188-8045	Remote Cable APG – ERI
5188-8059	ERI-Extension-Cable 1.2 m
5061-3378	Remote Cable to 35900 A/D converter
01046-60201	Agilent module to general purpose
5188-8057	Fraction Collection ERI remote Y-cable

CAN cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

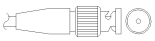
RS-232 cables (not for FUSION board)

p/n	Description
RS232-61601	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It is also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

USB cables

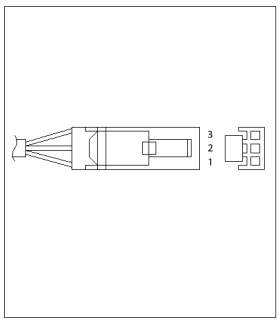
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

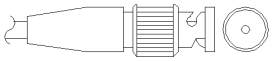


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

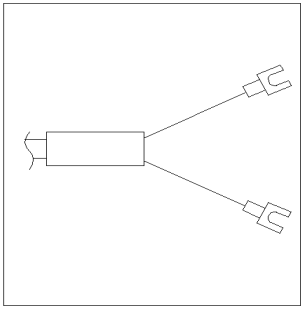
Agilent Module to 35900 A/D converters

p/n 35900-60750	35900	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

Agilent Module to BNC Connector

p/n 8120-1840	Pin BNC	Pin Agilent module	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

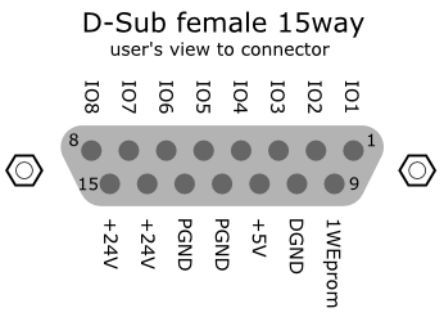
Agilent Module to General Purpose

p/n 01046-60105	Pin	Pin Agilent module	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables

ERI (Enhanced Remote Interface)

- 5188-8029 ERI to general purpose (D-Sub 15 pin male - open end)
- 5188-8044 ERI to ERI (D_Sub 15 pin male - male)
- 5188-8059 ERI-Extension-Cable 1.2 m (D-Sub15 pin male / female)



p/n 5188-8029	pin	Color code	Enhanced Remote	Classic Remote	Active (TTL)
	1	white	IO1	START REQUEST	Low
	2	brown	IO2	STOP	Low
	3	green	IO3	READY	High
	4	yellow	IO4	PEAK DETECT	Low
	5	grey	IO5	POWER ON	High
	6	pink	IO6	SHUT DOWN	Low
	7	blue	IO7	START	Low
	8	red	IO8	PREPARE	Low
	9	black	1wire DATA		
	10	violet	DGND		
	11	grey-pink	+5V ERI out		
	12	red-blue	PGND		
	13	white-green	PGND		
	14	brown-green	+24V ERI out		
	15	white-yellow	+24V ERI out		
	NC	yellow-brown			

NOTE

Configuration is different with old firmware revisions.

The configuration for IO4 and IO5 is swapped for modules with firmware lower than D.07.10.

NOTE

Peak Detection is used for LCMS systems connected with the Fraction Collection Remote Y-Cable (5188-8057).

- 5188-8045 ERI to APG (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG))

p/n 5188-8045	Pin (ERI)	Signal	Pin (APG)	Active (TTL)
	10	GND	1	
	1	Start Request	9	Low
	2	Stop	8	Low
	3	Ready	7	High
	5	Power on	6	High
	4	Future	5	
	6	Shut Down	4	Low
	7	Start	3	Low
	8	Prepare	2	Low
	Ground	Cable Shielding	NC	

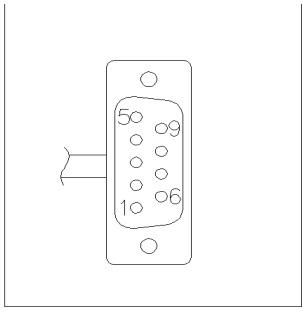
- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

Table 20 5188-8057 ERI to APG and RJ45

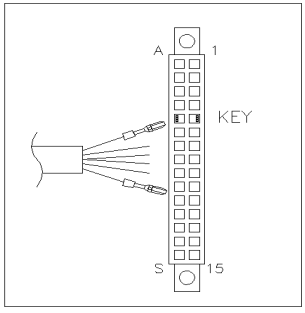
p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trigger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shielding	NC		

One end of these cables provides an Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

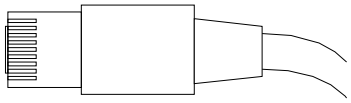
Agilent Module to Agilent 35900 A/D Converters

p/n 5061-3378	Pin 35900 A/D	Pin Agilent module	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent Module to General Purpose

p/n 01046-60201	Wire Color	Pin Agilent module	Signal Name	Active (TTL)
	White	1	Digital ground	
	Brown	2	Prepare run	Low
	Gray	3	Start	Low
	Blue	4	Shut down	Low
	Pink	5	Not connected	
	Yellow	6	Power on	High
	Red	7	Ready	High
	Green	8	Stop	Low
	Black	9	Start request	Low

CAN/LAN Cables



Both ends of this cable provide a modular plug to be connected to Agilent modules CAN or LAN connectors.

CAN Cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN Cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

RS-232 Cables

p/n	Description
RS232-61601	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It is also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

USB

To connect a USB Flash Drive use a USB OTG cable with Mini-B plug and A socket.

p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

11 Hardware Information

This chapter describes the detector in more detail on hardware and electronics.

Firmware Description

The firmware of the instrument consists of two independent sections:

- a non-instrument specific section, called *resident system*
- an instrument specific section, called *main system*

Resident System

This resident section of the firmware is identical for all Agilent 1100/1200/1220/1260/1290 series modules. Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- memory management
- ability to update the firmware of the 'main system'

Main System

Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- memory management
- ability to update the firmware of the 'resident system'

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG/ERI remote,
- error handling,
- diagnostic functions,
- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.

Firmware Updates

Firmware updates can be done with the Agilent Lab Advisor software with files on the hard disk (latest version should be used).

Required tools, firmware and documentation are available from the Agilent web:
https://www.agilent.com/en-us/firmwareDownload?whid=69761

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

- PPPP is the product number, for example, 1315B for the G1315B DAD,
- R the firmware revision, for example, A for G1315B or B for the G1315C DAD,
- VVV is the revision number, for example 650 is revision 6.50,
- XXX is the build number of the firmware.

For instructions on firmware updates refer to section *Replacing Firmware* in chapter *"Maintenance"* or use the documentation provided with the *Firmware Update Tools*.

NOTE

Update of main system can be done in the resident system only. Update of the resident system can be done in the main system only.

Main and resident firmware must be from the same set.

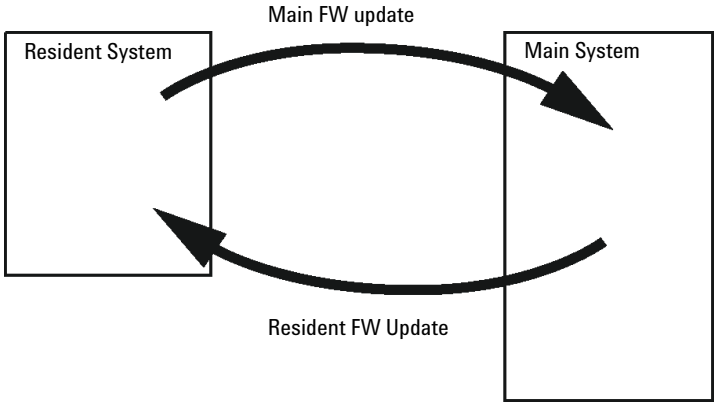


Figure 27 Firmware Update Mechanism

NOTE

Some modules are limited in downgrading due to their mainboard version or their initial firmware revision. For example, a G1315C DAD SL cannot be downgraded below firmware revision B.01.02 or to a A.xx.xx.

Some modules can be re-branded (e.g. G1314C to G1314B) to allow operation in specific control software environments. In this case, the feature set of the target type is used and the feature set of the original one is lost. After re-branding (e.g. from G1314B to G1314C), the original feature set is available again.

All this specific information is described in the documentation provided with the firmware update tools.

The firmware update tools, firmware and documentation are available from the Agilent web.

- **https://www.agilent.com/en-us/firmwareDownload?whid=69761**

Electrical Connections

- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.
- The ERI/REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shutdown, prepare, and so on.
- With the appropriate software, the LAN connector may be used to control the module from a computer through a LAN connection. This connector is activated and can be configured with the configuration switch.
- With the appropriate software, the USB connector may be used to control the module from a computer through a USB connection.
- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses because automatic electronic fuses are implemented in the power supply.

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Rear View of the Module

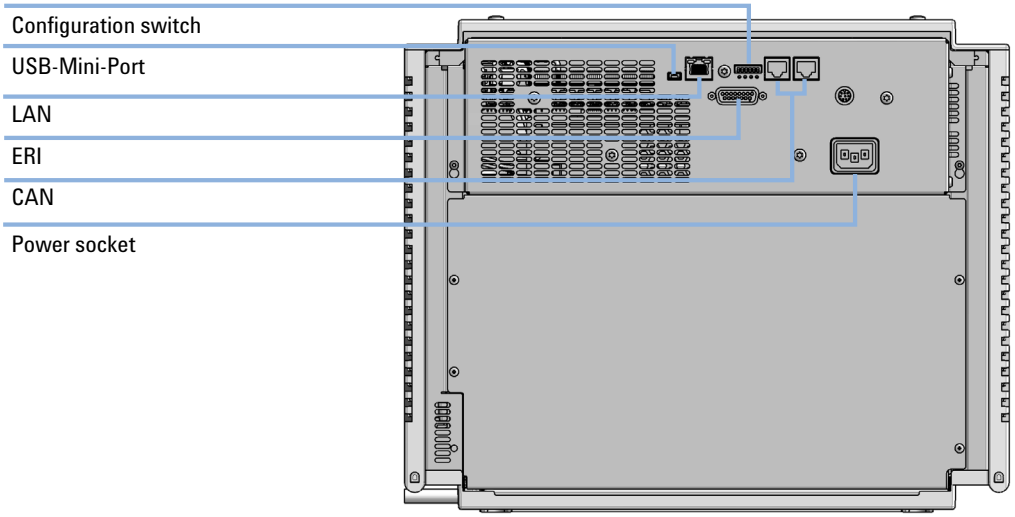


Figure 28 Rear view of the sampler - electrical connections and label

Serial Number Information

The serial number information on the instrument labels provide the following information:

CCXZZ00000	Format
CC	Country of manufacturing • DE = Germany • JP = Japan • CN = China
X	Alphabetic character A-Z (used by manufacturing)
ZZ	Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)
00000	Serial number

Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

Table 21 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Pumps							
G7104A/C	2	No	Yes	Yes	1	A	
G7110B	2	Yes	Yes	No	No	E	
G7111A/B, G5654A	2	Yes	Yes	No	No	E	
G7112B	2	Yes	Yes	No	No	E	
G7120A, G7132A	2	No	Yes	Yes	1	A	
G7161A/B	2	Yes	Yes	No	No	E	
Samplers							
G7129A/B/C	2	Yes	Yes	No	No	E	
G7167A/B, G7137A, G5668A, G3167A	2	Yes	Yes	No	No	E	
G7157A	2	Yes	Yes	No	No	E	
Detectors							
G7114A/B	2	Yes	Yes	No	1	E	
G7115A	2	Yes	Yes	No	1	E	
G7117A/B/C	2	Yes	Yes	No	1	E	
G7121A/B	2	Yes	Yes	No	1	E	
G7162A/B	2	Yes	Yes	No	1	E	
G7165A	2	Yes	Yes	No	1	E	

Table 21 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Fraction Collectors							
G7158B	2	Yes	Yes	No	No	E	
G7159B	2	Yes	Yes	No	No	E	
G7166A	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card
G1364E/F, G5664B	2	Yes	Yes	No	No	E	THERMOSTAT for G1330B
Others							
G1170A	2	No	No	No	No	No	
G7116A/B	2	No	No	No	No	No	Requires a host module with on-board LAN or with additional G1369C LAN Card.
G7122A	No	No	No	Yes	No	A	
G7170B	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card

NOTE The detector (DAD/MWD/FLD/VWD/RID) is the preferred access point for control via LAN. The inter-module communication is done via CAN.

- CAN connectors as interface to other modules
- LAN connector as interface to the control software
- RS-232C as interface to a computer
- USB (Universal Series Bus) as interface to a computer
- REMOTE connector as interface to other Agilent products
- Analog output connector(s) for signal output

Overview Interfaces

CAN

The CAN is inter-module communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

LAN

The modules have either an interface slot for a LAN card (e.g. Agilent G1369B/C LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a PC with the appropriate control software. Some modules have neither on-board LAN nor an interface slot for a LAN card (e.g. G1170A Valve Drive or G4227A Flexible Cube). These are hosted modules and require a Host module with firmware B.06.40 or later or with additional G1369C LAN Card.

NOTE

If an Agilent detector (DAD/MWD/FLD/VWD/RID) is in the system, the LAN should be connected to the DAD/MWD/FLD/VWD/RID (due to higher data load). If no Agilent detector is part of the system, the LAN interface should be installed in the pump or autosampler.

USB

The USB interface replaces the RS-232 Serial interface in new FUSION generation modules. For details on USB refer to "USB (Universal Serial Bus)" on page 244.

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module's mainboard.

Remote (ERI)

The ERI (Enhanced Remote Interface) connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features as common shut down, prepare, and so on.

It allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired- or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to **SHUT DOWN** the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the **POWER ON** state of all connected modules. Control of analysis is maintained by signal readiness **READY** for next analysis, followed by **START** of run and optional **STOP** of run triggered on the respective lines. In addition **PREPARE** and **START REQUEST** may be issued. The signal levels are defined as:

- standard TTL levels (0 V is logic true, + 5.0 V is false),
- fan-out is 10,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

NOTE

All common TTL circuits operate with a 5 V power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5.0 V (with respect to the ground terminal).

Table 22 ERI signal distribution

Pin	Signal	Description
1	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.
2	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
3	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
4	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
5		Not used
6	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
7	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
8	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.

Special Interfaces

There is no special interface for this module.

ERI (Enhanced Remote Interface)

ERI replaces the AGP Remote Interface that is used in the HP 1090/1040/1050/1100 HPLC systems and Agilent 1100/1200/1200 Infinity HPLC modules. All new InfinityLab LC Series products using the FUSION core electronics use ERI. This interface is already used in the Agilent Universal Interface Box 2 (UIB2)

ERI Description

The ERI interface contains eight individual programmable input/output pins. In addition, it provides 24 V power and 5 V power and a serial data line to detect and recognize further add-ons that could be connected to this interface. This way the interface can support various additional devices like sensors, triggers (in and out) and small controllers, etc.

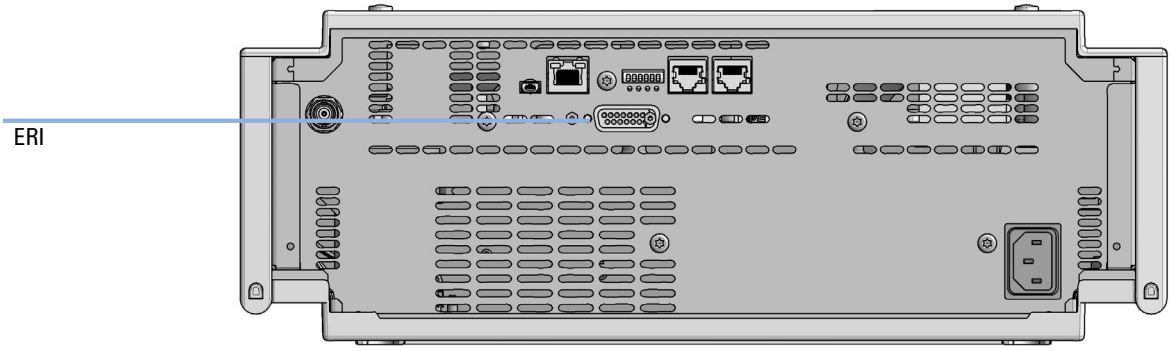
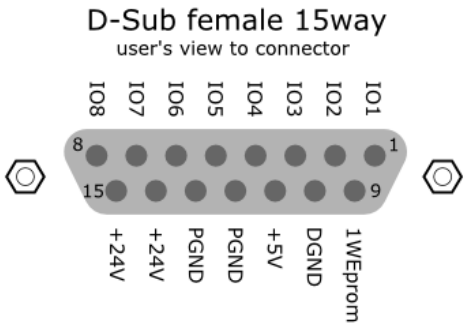


Figure 29 Location of the ERI interface (example shows a G7114A/B VWD)



Pin	Enhanced Remote
1	IO 1 (START REQUEST)
2	IO 2 (STOP)
3	IO 3 (READY)
4	IO 4 (POWER ON)
5	IO 5 (NOT USED)
6	IO 6 (SHUT DOWN)
7	IO 7 (START)
8	IO 8 (PREPARE)
9	1 wire DATA
10	DGND
11	+5 V ERI out
12	PGND
13	PGND
14	+24 V ERI out
15	+24 V ERI out

IO (Input/Output) Lines

- Eight generic bi-directional channels (input or output).
- Same as the APG Remote.
- Devices like valves, relays, ADCs, DACs, controllers can be supported/controlled.

1-Wire Data (Future Use)

This serial line can be used to read out an EPROM or write into an EPROM of a connected ERI-device. The firmware can detect the connected type of device automatically and update information in the device (if required).

5V Distribution (Future Use)

- Available directly after turning on the hosting module (assures that the firmware can detect certain basic functionality of the device).
- For digital circuits or similar.
- Provides 500 mA maximum.
- Short-circuit proof with automatic switch off (by firmware).

24V Distribution (Future Use)

- Available by firmware command (defined turn on/off).
- For devices that need higher power
  - Class 0: 0.5 A maximum (12 W)
  - Class 1: 1.0 A maximum (24 W)
  - Class 2: 2.0 A maximum (48 W)
- Class depends on hosting module's internal power overhead.
- If a connected device requires more power the firmware detects this (overcurrent detection) and provides the information to the user interface.
- Fuse used for safety protection (on board).
- Short circuit will be detected through hardware.

USB (Universal Serial Bus)

USB (Universal Serial Bus) - replaces RS232, supports:

- a PC with control software (for example Agilent Lab Advisor)
- USB Flash Disk

Setting the 6-bit Configuration Switch

The 6-bit configuration switch is located at the rear of the module with FUSION electronics. Switch settings provide configuration parameters for LAN and instrument specific initialization procedures.

All modules with FUSION electronics:

- Default is ALL switches DOWN (best settings).
  - Default IP address for LAN 192.168.254.11
- For specific LAN modes switches 4-5 must be set as required.
- For boot resident/cold start modes switches 1+2 or 6 must be UP.

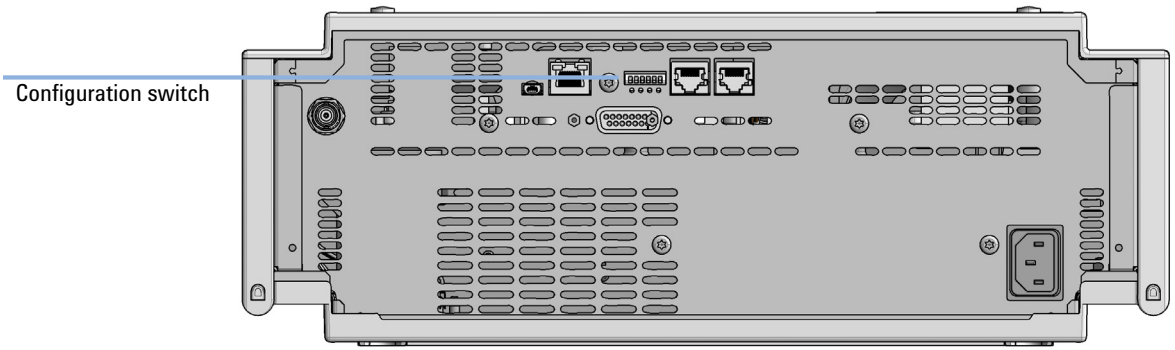


Figure 30 Location of Configuration switch (example shows a G7114A/B VWD)

Table 23 6-bit Configuration Switch

	Mode	Function/Setting				
	Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**
COM[1]	**0**	n.a.[2]	n.a.	LAN Init Mode		n.a.
Use Default IP Address[3]		0	0	0	0	0
Use Stored IP Address		0	0	0	1	0
Use DHCP to request IP Address[4]		0	0	1	0	0
Test	**1**	**System**	**n.a.**	**n.a.**	**n.a.**	**ColdStart**
Boot Main System / Keep Data		0	0	0	0	0
Boot Resident System / Keep Data		1	0	0	0	0
Boot Main System / Revert to Default Data		0	0	0	0	1
Boot Resident System / Revert to Default Data		1	0	0	0	1

1 When selecting mode COM, settings are stored to non-volatile memory. When selecting mode Test, COM settings are taken from non-volatile memory.

2 not assigned - Always keep these switches on position '0' (off)

3 Default IP Address is 192.168.254.11

4 Host Name will be the MAC address.

Special Settings

Boot-Resident/Main

Firmware update procedures may require this mode in case of firmware loading errors (main/resident firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident/main mode. In resident mode, it is not operable as a module. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Forced Cold Start

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

- Boot Main System / Revert to Default Data

  The instrument will boot to main mode and changes to the module's default parameter. May be also required to load resident firmware into the module.
- Boot Resident System / Revert to Default Data

  The instrument will boot to resident mode and changes to the module's default parameter. May be also required to load main firmware into the module.

CAUTION

Loss of data

Forced cold start erases all methods and data stored in the non-volatile memory. Exceptions are calibration settings, diagnosis and repair log books which will not be erased.

✓ **Save your methods and data before executing a forced cold start.**

If you use the following switch settings and power the instrument up again, it will start as described above.

Table 24 Boot Resident / Forced Coldstart

	SW1	SW2	SW3	SW4	SW5	SW6	Init Mode
	1	0	0	0	0	0	Boot Main System / Keep Data
	1	1	0	0	0	0	Boot Resident System / Keep Data
	1	0	0	0	0	1	Boot Main System / Revert to Default Data
	1	1	0	0	0	1	Boot Resident System / Revert to Default Data
	Note: The setting '0' (down) is essential.						

Instrument Layout

The industrial design of the module incorporates several innovative features. It uses Agilent's E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers of foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components that are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of use of the module and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the use of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

EMF counters increment with use and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Some counters can be reset to zero after the required maintenance procedure.

Using the **EMF Counters**

The user-settable **EMF** limits for the **EMF Counters** enable the early maintenance feedback to be adapted to specific user requirements. The useful maintenance cycle is dependent on the requirements for use. Therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the **EMF Limits**

The setting of the **EMF** limits must be optimized over one or two maintenance cycles. Initially the default **EMF** limits should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by the **EMF counters**. Enter these values (or values slightly less than the displayed values) as **EMF** limits, and then reset the **EMF counters** to zero. The next time the **EMF counters** exceed the new **EMF** limits, the **EMF** flag will be displayed, providing a reminder that maintenance needs to be scheduled.

12 LAN Configuration

This chapter provides information on connecting the module to the Agilent ChemStation PC.

What You Have to Do First

The module has an on- board LAN communication interface.

NOTE

This chapter is generic and may show figures that differ from your module. The functionality is the same.

1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear of the module underneath the configuration switch (see Figure 32 on page 252).

Figure 31 MAC-Label

2 Connect the instrument's LAN interface (see Figure 32 on page 252) to
- the PC network card using a crossover network cable (point-to-point) or
- a hub or switch using a standard LAN cable.

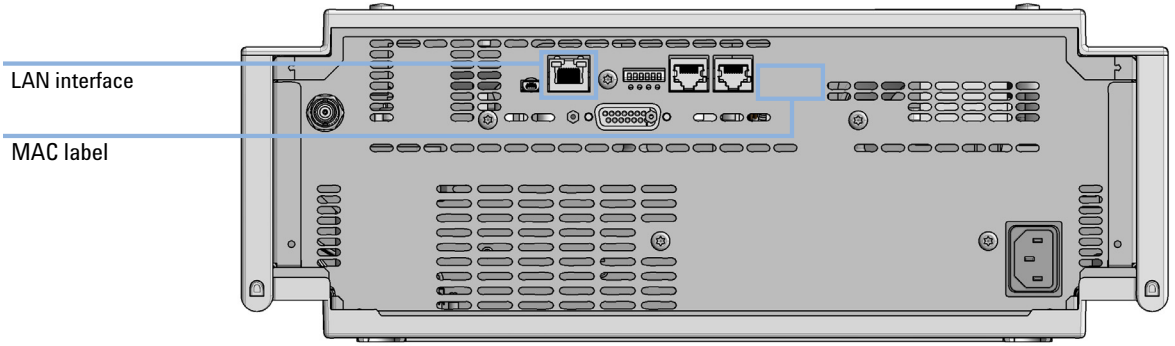


Figure 32 Location of LAN interfaces and MAC label

TCP/IP parameter configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet Mask
- Default Gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based DHCP Server (using the so-called Dynamic Host Configuration Protocol). This mode requires a LAN-onboard Module or a G1369C LAN Interface card, see "Setup (DHCP)" on page 258
- by manually setting the parameters using Telnet
- by manually setting the parameters using the Local Controller

The LAN interface differentiates between several initialization modes. The initialization mode (short form 'init mode') defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see Table 25 on page 255.

Configuration Switches

The configuration switch can be accessed at the rear of the module.

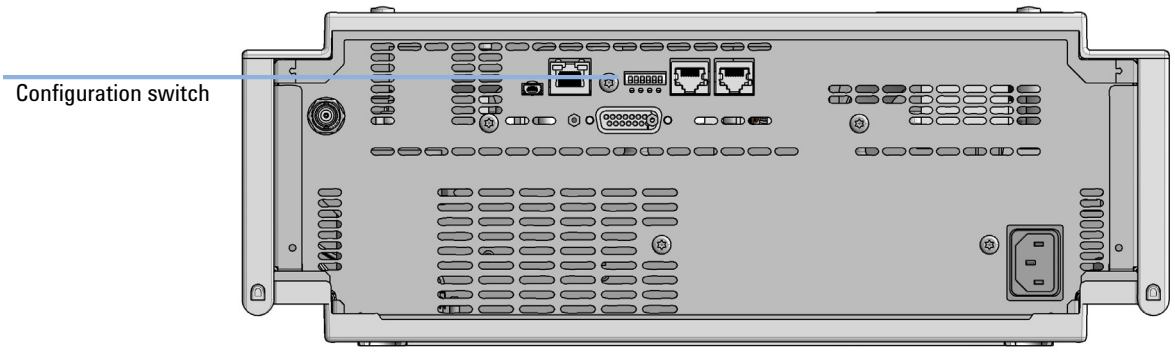


Figure 33 Location of Configuration switch (example shows a G7114A/B VWD)

The module is shipped with all switches set to OFF, as shown above.

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF.

Initialization Mode Selection

The following initialization (init) modes are selectable:

Table 25 Initialization Mode Switches

	SW1	SW2	SW3	SW4	SW5	SW6	Init Mode
	0	0	0	0	0	0	Use Default IP Address
	0	0	0	0	1	0	Use Stored IP Address
	0	0	0	1	0	0	Use DHCP
	Note: The setting '0' (down) is essential.						

Default IP address for LAN is 192.168.254.11.

DHCP address is the module's LAN MAC address.

Using Stored

When initialization mode **Using Stored** is selected, the parameters are taken from the non-volatile memory of the module. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

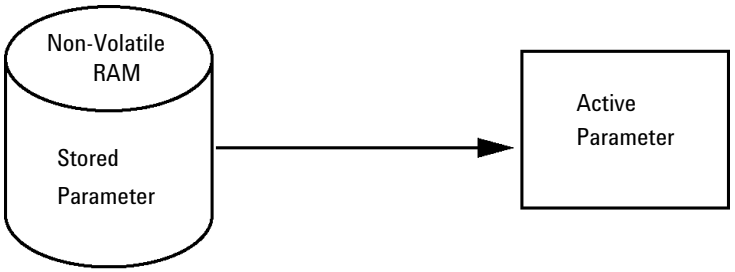


Figure 34 Using Stored (Principle)

Using Default

When **Using Default** is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see Table 26 on page 256.

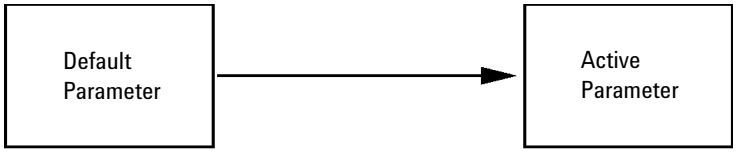


Figure 35 Using Default (Principle)

NOTE

Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately.

Table 26 Using Default Parameters

IP address:	192.168.254.11
Subnet Mask:	255.255.255.0
Default Gateway	not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the module must reside in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the module. He may then close the session, select the initialization mode Using Stored, power-on again and establish the TCP/IP connection using the new parameters.

When the module is wired to the PC directly (e.g. using a cross-over cable or a local hub), separated from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE

In the **Using Default** mode, the parameters stored in the memory of the module are not cleared automatically. If not changed by the user, they are still available, when switching back to the mode Using Stored.

Dynamic Host Configuration Protocol (DHCP)

General Information (DHCP)

The Dynamic Host Configuration Protocol (DHCP) is an auto configuration protocol used on IP networks. The DHCP functionality is available on all Agilent HPLC modules with on-board LAN Interface or LAN Interface Card G1369C, and “B”-firmware (B.06.40 or above) or modules with "D"-firmware. All modules should use latest firmware from the same set.

When the initialization mode “DHCP” is selected, the card tries to download the parameters from a DHCP Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the card.

Besides requesting the network parameters, the card also submits its hostname to the DHCP Server. The hostname equals the MAC address of the card, e.g. *0030d3177321*. It is the DHCP server's responsibility to forward the hostname/address information to the Domain Name Server. The card does not offer any services for hostname resolution (e.g. NetBIOS).

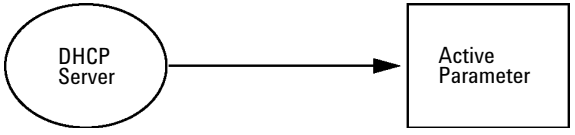


Figure 36 DHCP (Principle)

NOTE

1. It may take some time until the DHCP server has updated the DNS server with the hostname information.
2. It may be necessary to fully qualify the hostname with the DNS suffix, e.g. *0030d3177321.country.company.com*.
3. The DHCP server may reject the hostname proposed by the card and assign a name following local naming conventions.

Setup (DHCP)

The DHCP functionality is available on all Agilent HPLC modules with on-board LAN Interface or LAN Interface Card G1369C, and “B”-firmware (B.06.40 or above) or modules with "D"-firmware. All modules should use latest firmware from the same set.

1 Note the MAC address of the LAN interface (provided with G1369C LAN Interface Card or mainboard). This MAC address is on a label on the card or at the rear of the mainboard, for example, *0030d3177321*.

On the Local Controller the MAC address can be found under **Details** in the LAN section.

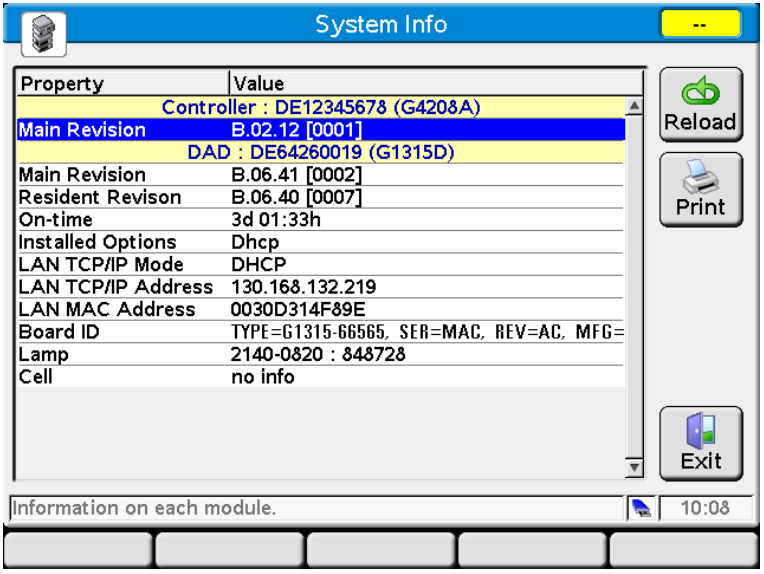


Figure 37 LAN Setting on Instant Pilot

2 Set the configuration switch to DHCP either on the G1369C LAN Interface Card or the mainboard of above mentioned modules.

Table 27 G1369C LAN Interface Card (configuration switch on the card)

SW 4	SW 5	SW 6	SW 7	SW 8	Initialization Mode
ON	OFF	OFF	OFF	OFF	DHCP

Table 28 LC Modules with 8-bit configuration switch (B-firmware) (configuration switch at rear of the instrument)

SW 6	SW 7	SW 8	Initialization Mode
ON	OFF	OFF	DHCP

3 Turn on the module that hosts the LAN interface.

4 Configure your Control Software (e.g. OpenLAB CDS ChemStation Edition, Lab Advisor, Firmware Update Tool) and use MAC address as host name, e.g. *0030d3177321*.

The LC system should become visible in the control software (see Note in section "General Information (DHCP)" on page 257).

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the module. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, given that the initialization mode selection switches are allowing it.

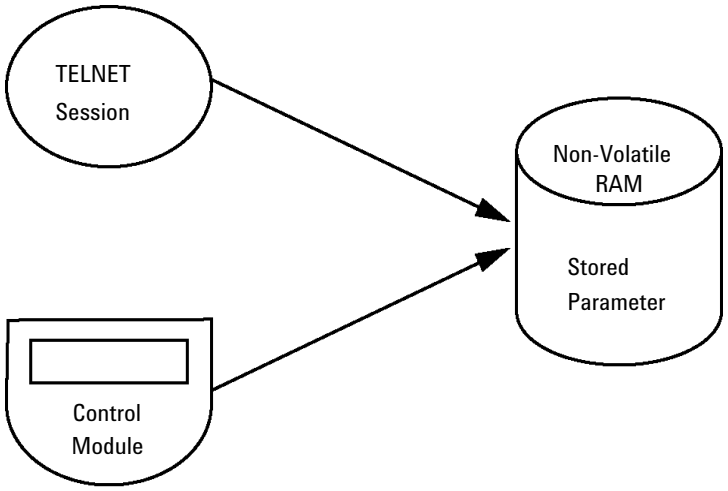


Figure 38 Manual Configuration (Principle)

With Telnet

Whenever a TCP/IP connection to the module is possible (TCP/IP parameters set by any method), the parameters may be altered by opening a Telnet session.

1 Open the system (DOS) prompt window by clicking on Windows **START** button and select **"Run..."**. Type "cmd" and press OK.

2 Type the following at the system (DOS) prompt:

- `c:\>telnet <IP address>` or
- `c:\>telnet <host name>`

Figure 39 Telnet - Starting a session

where <IP address> may be the assigned address from a Bootp cycle, a configuration session with the Handheld Controller, or the default IP address (see "Configuration Switches" on page 254).

When the connection was established successfully, the module responds with the following:

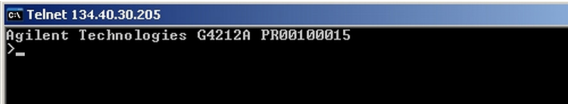


Figure 40 A connection to the module is made

3 Type
? and press enter to see the available commands.

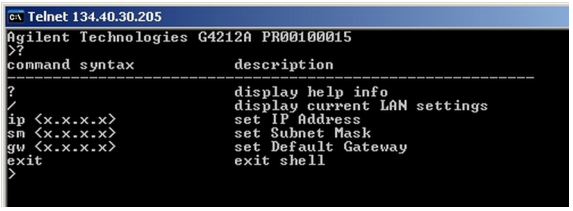


Figure 41 Telnet Commands

Table 29 Telnet Commands

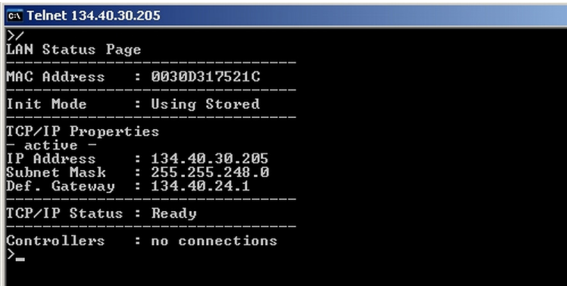
Value	Description
?	displays syntax and descriptions of commands
/	displays current LAN settings
ip <x.x.x.x>	sets new ip address
sm <x.x.x.x>	sets new subnet mask
gw <x.x.x.x>	sets new default gateway
exit	exits shell and saves all changes

4 To change a parameter follows the style:

- parameter value, for example:
  `ip 134.40.28.56`

Then press [Enter], where parameter refers to the configuration parameter you are defining, and value refers to the definitions you are assigning to that parameter. Each parameter entry is followed by a carriage return.

5 Use the "/" and press Enter to list the current settings.

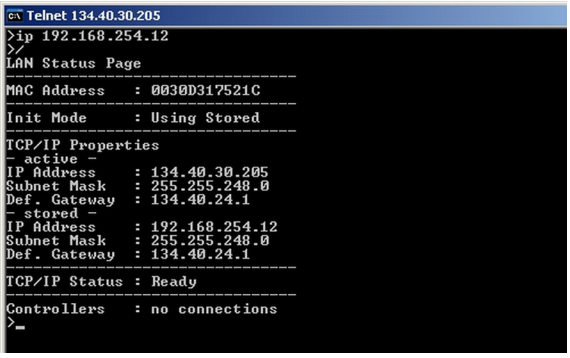


information about the LAN interface
MAC address, initialization mode
Initialization mode is Using Stored
active TCP/IP settings

TCP/IP status - here ready
connected to PC with controller software (e.g. Agilent ChemStation), here not connected

Figure 42 Telnet - Current settings in "Using Stored" mode

6 Change the IP address (in this example 192.168.254.12) and type "/" to list current settings.



change of IP setting to
Initialization mode is Using Stored

active TCP/IP settings

stored TCP/IP settings in non-volatile memory

connected to PC with controller software (e.g. Agilent ChemStation), here not connected

Figure 43 Telnet - Change IP settings

7 When you have finished typing the configuration parameters, type `exit` and press **Enter** to exit with storing parameters.

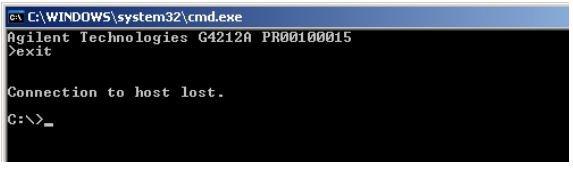


Figure 44 Closing the Telnet Session

NOTE

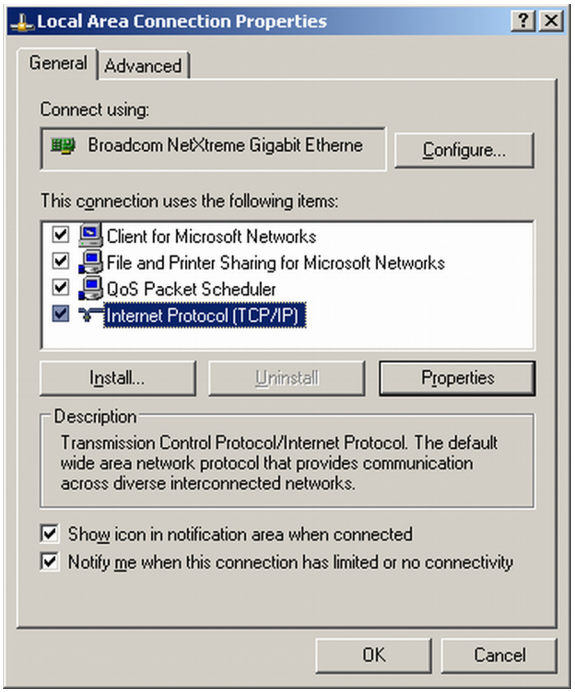
If the Initialization Mode Switch is changed now to "Using Stored" mode, the instrument will take the stored settings when the module is re-booted. In the example above it would be 192.168.254.12.

PC and Agilent ChemStation Setup

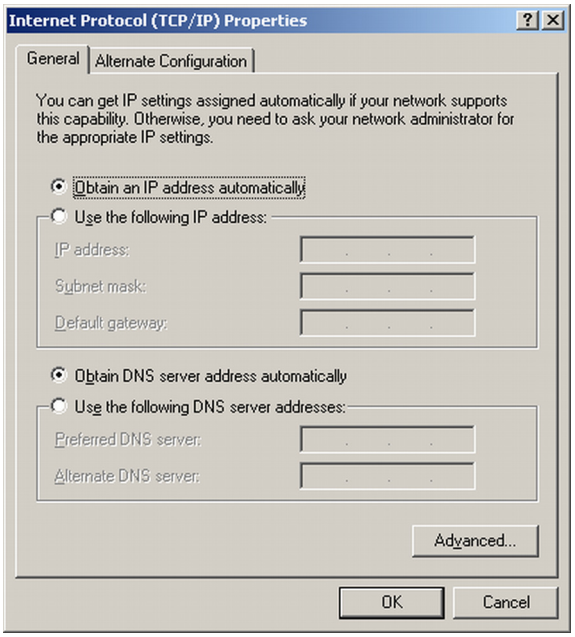
PC Setup for Local Configuration

This procedure describes the change of the TCP/IP settings on your PC to match the module's default parameters in a local configuration (see Table 26 on page 256).

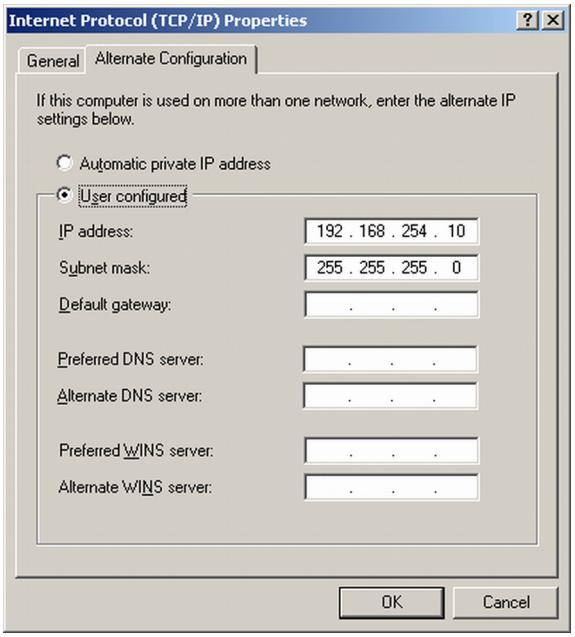
1 Open the Local Area Connection Properties and select **Internet Protocol (TCP/IP)**. Then click on **Properties**.



2 You may enter here the fixed IP address of the module or use the **Alternative Configuration**.



3 We will use the direct LAN access via Cross-over LAN cable with the module's IP address.



4 Click on **OK** to save the configuration.

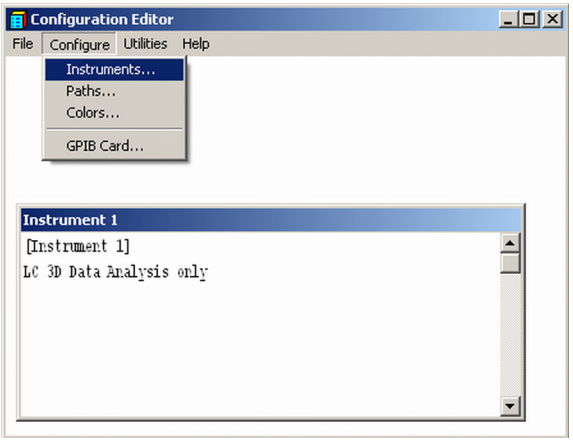
Agilent ChemStation Setup

This procedure describes the Agilent ChemStation B.04.02 setup for the 1290 Infinity system using the 1290 Infinity DAD (G4212A) as the interfacing module. The setup works in the same way for all other systems.

NOTE

The LAN must be connected to detector due to high data load on communication to Control Software.

1 Open the ChemStation Configuration Editor.

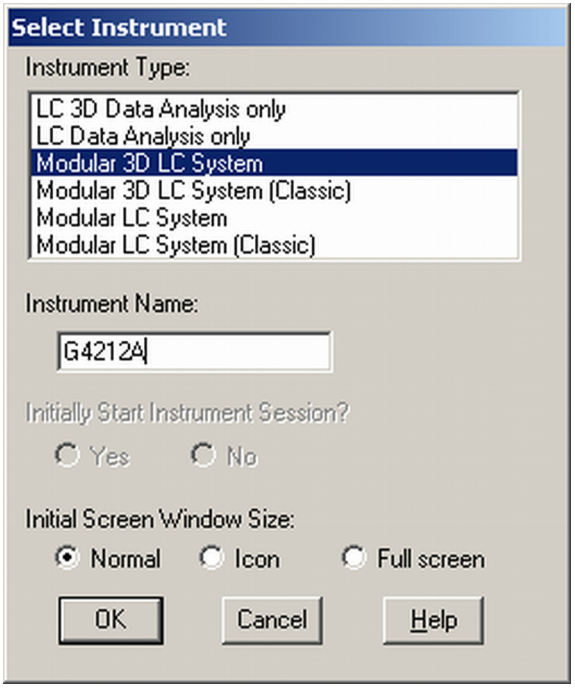


2 Select from the menu **Configure - Instruments**.

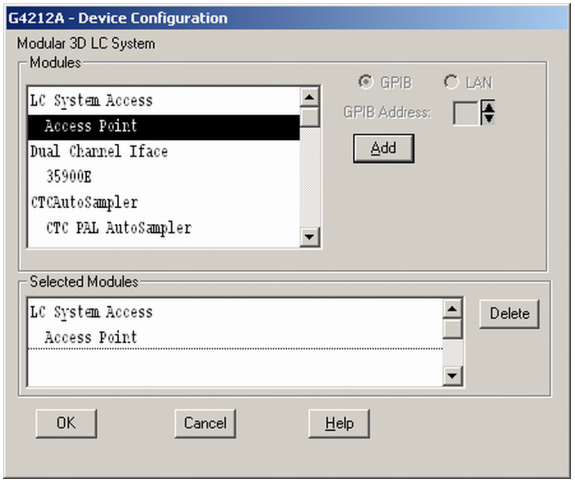
3 Select **Modular 3D LC System**.

4 Give the Instrument a name.

5 Click on **OK**.



6 Select **LC System Access — Access Point** and click on **Add**.

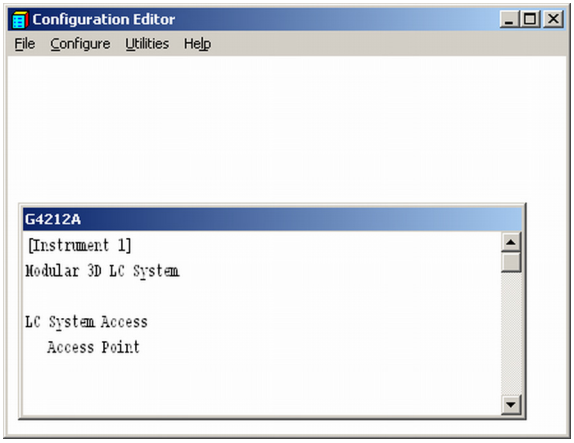


7 Click on **OK**.

The Configuration Editor shows now the new instrument.

8 If required, change under **Configure – Path** the folder locations.

9 Save the current configuration via **File – Save**.

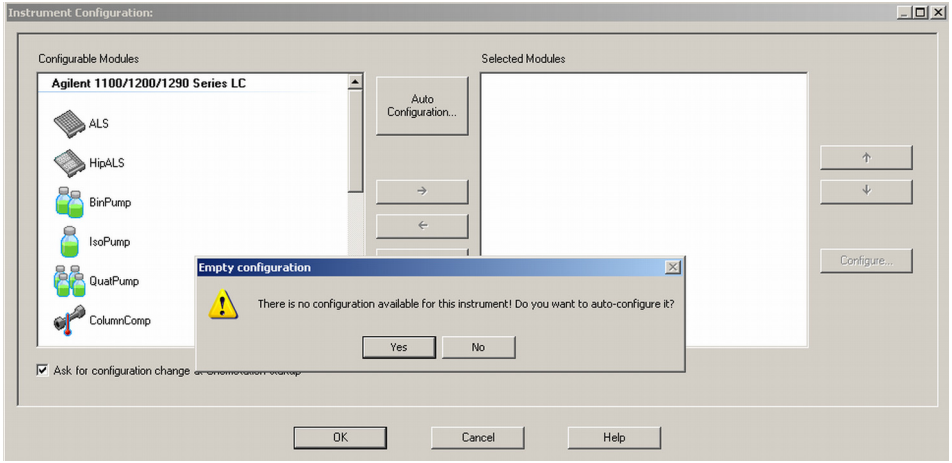


10 Exit the Configuration Editor.

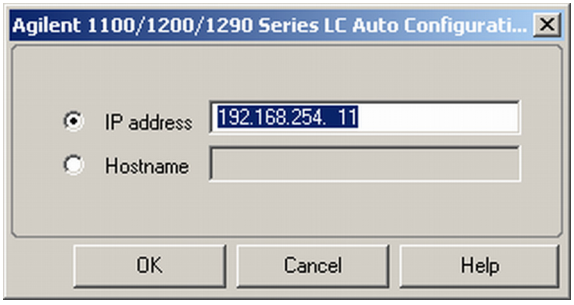
11 Start the Agilent ChemStation.

During first startup or when the system configuration has changed, a notification shows up.

12 The left column shows the modules that could be configured. You may select the module manually from the list. We use the Auto Configuration mode. Click on **Yes**.



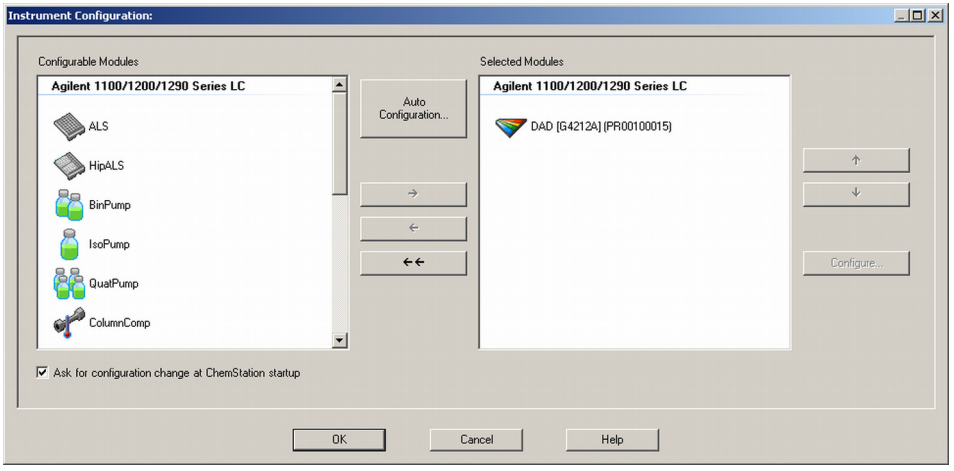
13 Enter the IP address or the Hostname of the module with the LAN-access.



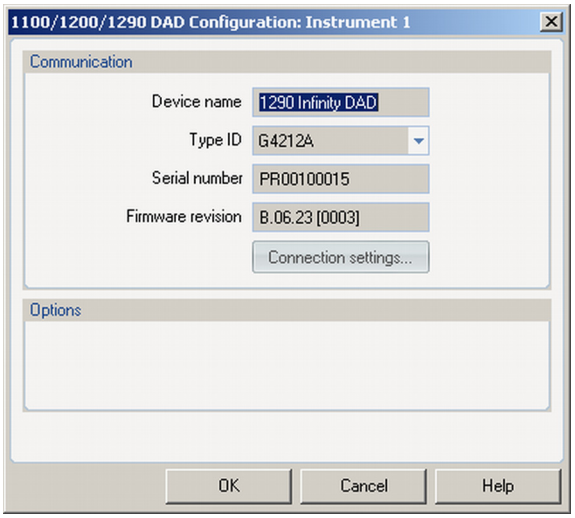
14 Click on **OK**.

The selected module is shown now in the right window (with serial number). In addition all other modules connected via CAN to the detector are shown as well.

15 Click on **OK** to continue the ChemStation loading.



16 You may see the details of the module by **selecting the module** and clicking on **Configure**.



Under **Connection Settings** you may change the IP/Hostname of the module (may require a re-start of the ChemStation).

After successful load of the ChemStation, you should see the module(s) as active item in the graphical user interface (GUI).

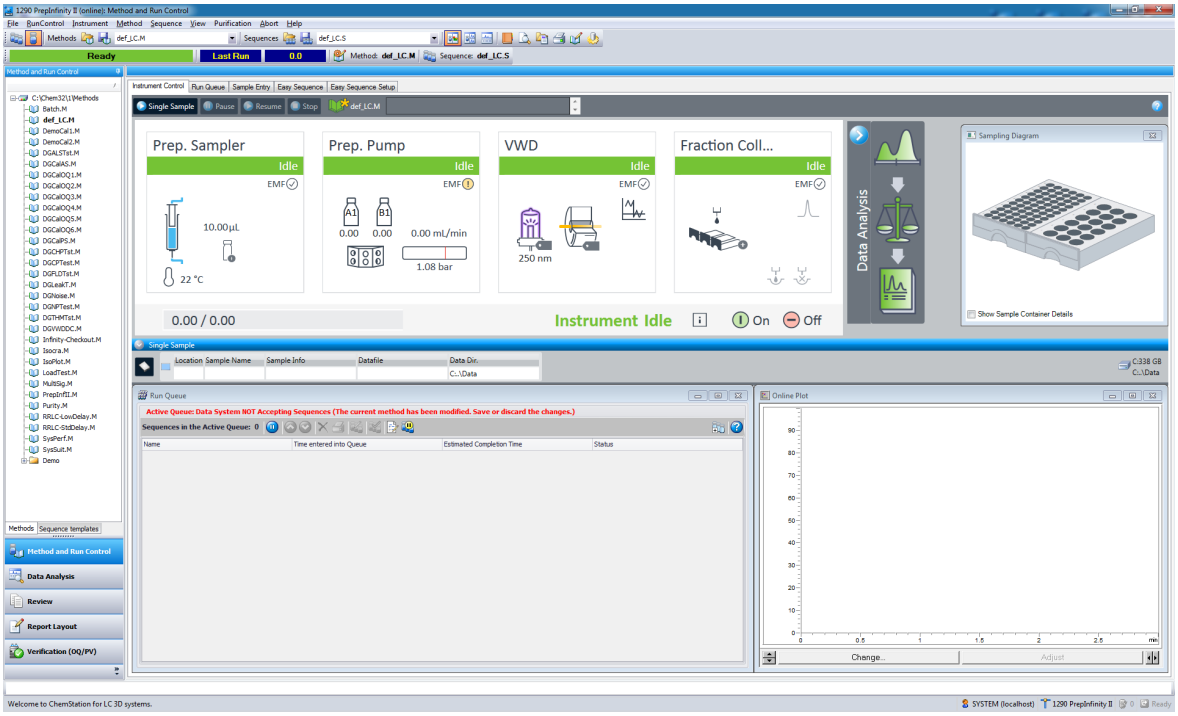


Figure 45 Screen After Successful Load of ChemStation

13 Appendix

This chapter provides additional information on safety, legal and web.

General Safety Information

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

- ✓ **The operator of this instrument is advised to use the equipment in a manner as specified in this manual.**

Safety Standards

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

WARNING

Wrong voltage range, frequency or cabling

Personal injury or damage to the instrument

- ✓ **Verify that the voltage range and frequency of your power distribution matches to the power specification of the individual instrument.**
- ✓ **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**
- ✓ **Make all connections to the unit before applying power.**

NOTE

Note the instrument's external markings described under "Symbols" on page 279.

Ground the Instrument

WARNING

Missing electrical ground

Electrical shock

- ✓ **If your product is provided with a grounding type power plug, the instrument chassis and cover must be connected to an electrical ground to minimize shock hazard.**
- ✓ **The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.**

Ground Solvent Lines

Ground all solvent guiding tubes and capillaries.

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

- ✓ **Do not operate the instrument in the presence of flammable gases or fumes.**

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

- ✓ **Do Not Remove the Instrument Cover**
- ✓ **Only Agilent authorized personnel are allowed to remove instrument covers. Always disconnect the power cables and any external circuits before removing the instrument cover.**

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

- ✓ **Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.**

Solvents

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- ✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- ✓ **Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).**
- ✓ **Avoid high vapor concentrations. Keep the solvent temperature at least 40 °C (72 °F) below the boiling point of the solvent used. This includes the solvent temperature in the sample compartment. For the solvents methanol and ethanol keep the solvent temperature at least 25 °C (45 °F) below the boiling point.**
- ✓ **Do not operate the instrument in an explosive atmosphere.**
- ✓ **Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).**
- ✓ **Reduce the volume of substances to the minimum required for the analysis.**
- ✓ **Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.**
- ✓ **Ground the waste container.**
- ✓ **Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.**
- ✓ **To achieve maximal safety, regularly check the tubing for correct installation.**

NOTE

For details, see the usage guideline for the solvent cabinet. A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available in the Agilent Information Center or via the Internet.

Symbols

Table 30 Symbols

	The apparatus is marked with this symbol when the user shall refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.
	Sample Cooler unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.
	Flammable Material For Sample Thermostat which uses flammable refrigerant consult Agilent Information Center / User Manual before attempting to install or service this equipment. All safety precautions must be followed.
	Confirms that a manufactured product complies with all applicable European Community directives. The European Declaration of Conformity is available at: **http://regulations.corporate.agilent.com/DoC/search.htm**
	Manufacturing date.
	Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the power switch is in the Off position
	Pacemaker Magnets could affect the functioning of pacemakers and implanted heart defibrillators. A pacemaker could switch into test mode and cause illness. A heart defibrillator may stop working. If you wear these devices keep at least 55 mm distance to magnets. Warn others who wear these devices from getting too close to magnets.

Table 30 Symbols

	Magnetic field Magnets produce a far-reaching, strong magnetic field. They could damage TVs and laptops, computer hard drives, credit and ATM cards, data storage media, mechanical watches, hearing aids and speakers. Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.
	Indicates a pinching or crushing hazard
	Indicates a piercing or cutting hazard.

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

✓ **Do not proceed beyond a warning until you have fully understood and met the indicated conditions.**

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

✓ **Do not proceed beyond a caution until you have fully understood and met the indicated conditions.**

Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the European WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

NOTE

Do not dispose of in domestic household waste

To return unwanted products, contact your local Agilent office, or see **https://www.agilent.com** for more information.

Refrigerant

The refrigerant HFC-134a is used only in the Agilent Infinity II Sample Cooler.

Table 31 Physical properties of refrigerant HFC-134a

Molecular weight	102
Critical temperature	101.1 °C
Critical pressure	40.6 bar
Boiling point	-26.5 °C

Table 32 Physical properties of refrigerant R600a (isobutane)

Molecular weight	58.12
Critical temperature	134.98 °C
Critical pressure	36.6 bar
Boiling point	-11.7 °C

WARNING

Refrigerant

Refrigerant HFC-134a is known as a safe refrigerant, however accidents can occur if it is handled incorrectly. For this reason, the following instructions must be observed:

- ✓ **Avoid contact with liquid refrigerant HFC-134a. At atmospheric pressure HFC-134a evaporates at approximately -26 °C and causes frost bite.**
- ✓ **After skin contact, rinse the affected area with water.**
- ✓ **After eye contact, rinse the eye(s) with plenty of water for at least 15 minutes and consult a doctor.**
- ✓ **HFC-134a must not be allowed to escape in enclosed areas. Although HFC-134a is not toxic, there is a danger of suffocation as gaseous refrigerant is heavier than air.**
- ✓ **Please observe the following first aid instructions. After inhalation, move the affected person to fresh air, keep him warm and allow him to rest. If necessary, he should be supplied with oxygen. If he has stopped breathing or is breathing erratically, he should be given artificial respiration. In the case of cardiac arrest, carry out heart massage. Send for a doctor immediately.**
- ✓ **Moreover, it must be noted that HFC-134a must always be extracted from the system and collected. It must never be discharged into the atmosphere on environmental grounds (greenhouse effect).**

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

- ✓ The disposal or scrapping of the Sample Cooler or the Sample Thermostat must be carried out by a qualified disposal company.
- ✓ All media must be disposed of in accordance with national and local regulations.
- ✓ Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance or check www.agilent.com for more info.

CAUTION

Risk of fire or explosion

- ✓ Dispose of properly in accordance with federal or local regulations. Flammable Refrigerant Used.
- ✓ Do not dispose of in domestic household waste.
- ✓ To return unwanted products, contact your local Agilent office, or see http://www.agilent.com for more information.

Radio Interference

Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with equipment unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Sound Emission

Sound pressure

Sound pressure Lp <70 db(A) according to DIN EN ISO 7779

Schalldruckpegel

Schalldruckpegel Lp <70 db(A) nach DIN EN ISO 7779

Solvent Information

Observe the following recommendations on the use of solvents.

- Brown glass ware can avoid growth of algae.
- Avoid the use of the following steel-corrosive solvents:
  - solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on),
  - high concentrations of inorganic acids like sulfuric acid and nitric acid, especially at higher temperatures (if your chromatography method allows, replace by phosphoric acid or phosphate buffer which are less corrosive against stainless steel),
  - halogenated solvents or mixtures which form radicals and/or acids, for example:

    $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

    This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol,
  - chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, diisopropyl ether) should be filtered through dry aluminium oxide which adsorbs the peroxides,
  - solvents containing strong complexing agents (e.g. EDTA),
  - mixtures of carbon tetrachloride with 2-propanol or THF.
- Avoid the use of dimethyl formamide (DMF). Polyvinylidene fluoride (PVDF), which is used in leak sensors, is not resistant to DMF.

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https://www.agilent.com

In This Book

This manual contains technical reference information about the Agilent 1260 Infinity II Preparative Autosampler (G7157A).

The manual describes the following:

- Introduction,
- site requirements and specifications,
- using the module,
- optimizing performance,
- troubleshooting and diagnostics,
- error information,
- maintenance,
- parts and materials,
- hardware information,
- LAN configuration,
- safety and related information.

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