



Agilent InfinityLab LC Series
1260 Infinity II Preparative Autosampler

User Manual



Notices

Document Information

Document No: SD-29000227 Rev. D

EDITION 10/2019

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Safety Notices

CAUTION

A **CAUTION** 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 damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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 Installation of the Optional Sample Cooler/Sample Thermostat

This chapter describes the installation of the optional Sample Cooler/Sample Thermostat.

5 Preparing the Module

This chapter explains the operational parameters of the module.

6 Optimizing Performance

This chapter provides information on how to optimize the module.

7 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

8 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.

9 Maintenance

This chapter describes the maintenance of the module.

10 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

11 Identifying Cables

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

12 Hardware Information

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

13 LAN Configuration

This chapter provides information on connecting the module to the Agilent ChemStation PC.

14 Appendix

This chapter provides additional information on safety, legal and web.

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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.

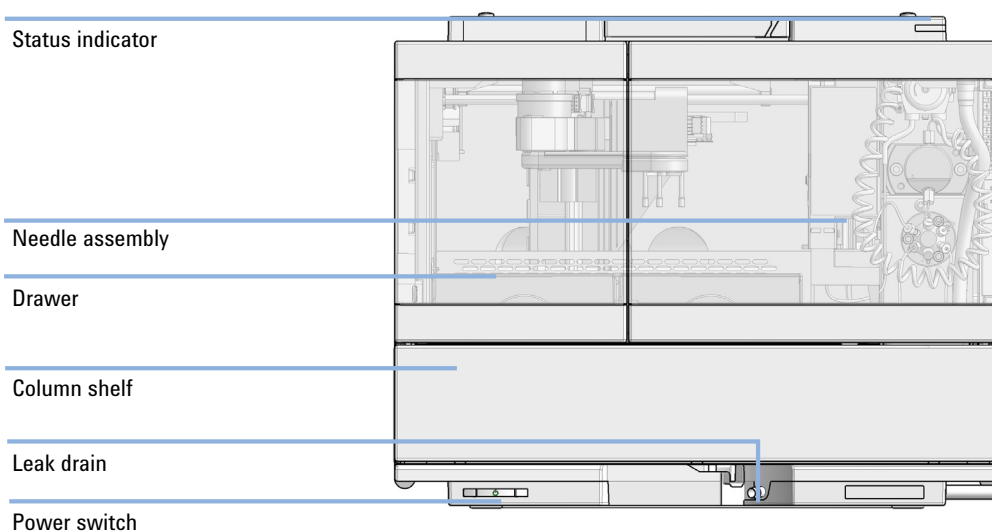


Figure 1 Overview of the sampler

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 μ L to 3.6 mL
- Support of flow rates up to 100 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 position¹.
- 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.

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.

Introduction

Operating Principle

- 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.

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.

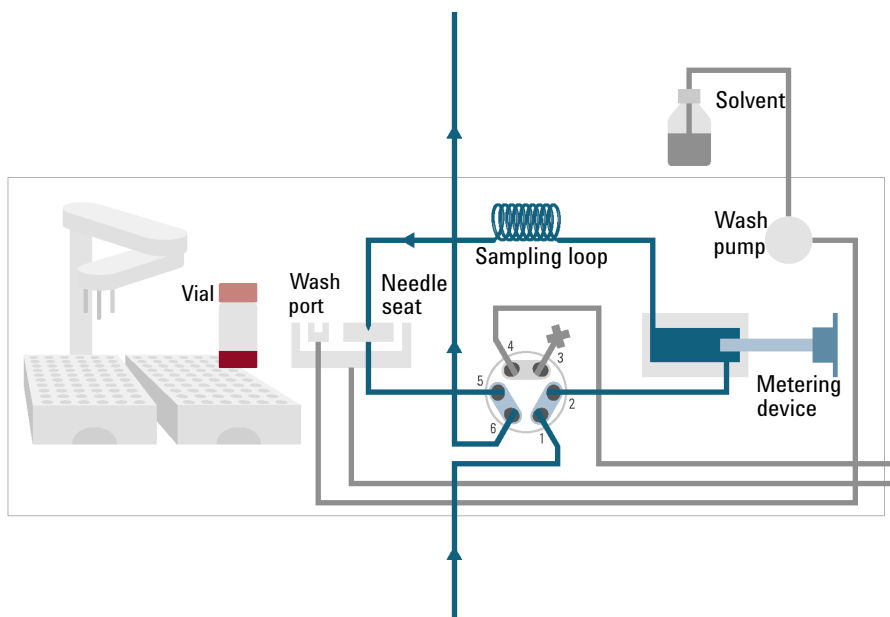


Figure 2 Mainpass (main path) Position - standard position during runs and when the sampler is idle

Introduction

Operating Principle

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.

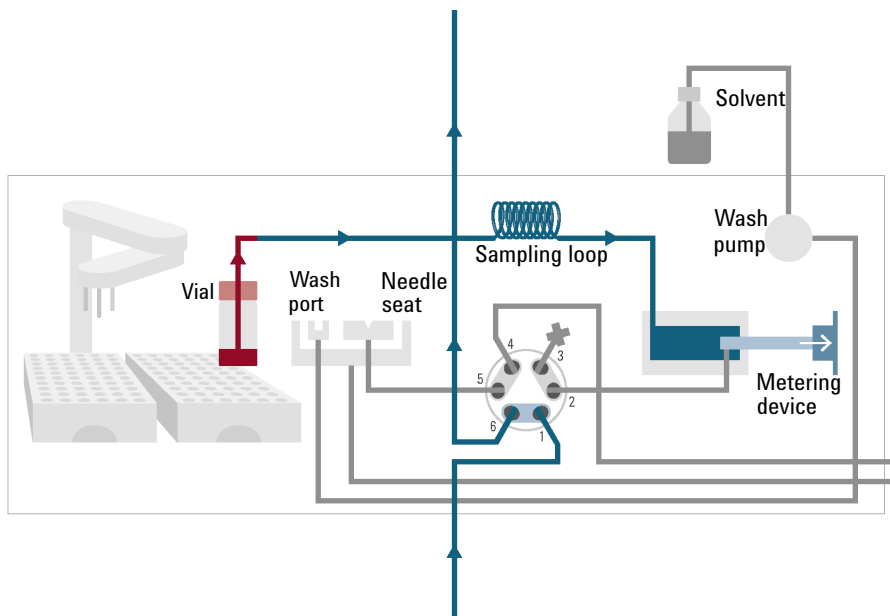


Figure 3 Valve in bypass - needle in vial, metering device aspirates sample volume

Introduction

Operating Principle

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).

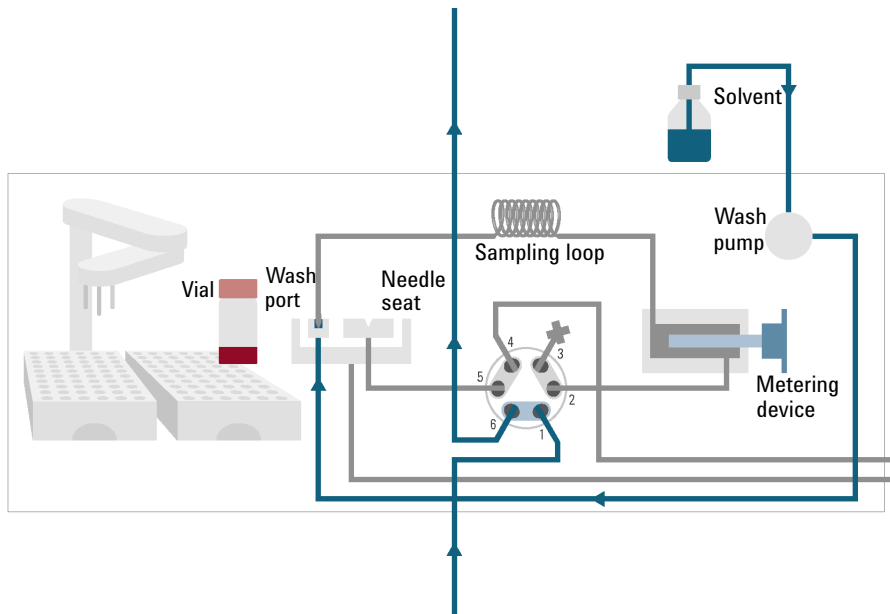


Figure 4 Outer face of needle getting washed in wash port

Introduction

Operating Principle

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 the sample onto the column (see [Figure 5](#) on page 17).

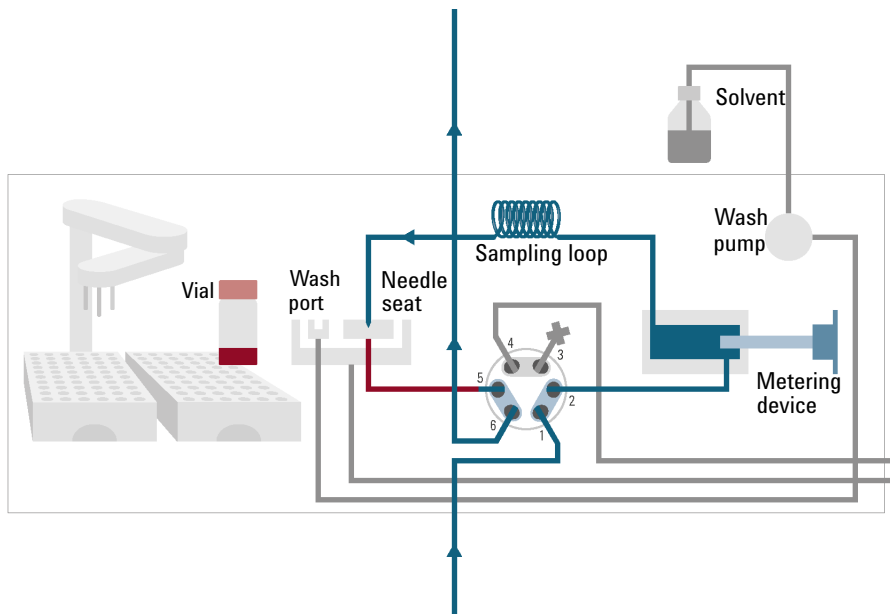


Figure 5 Valve switches to mainpass (main path) - sample is transferred towards the LC column

Needle Parkstation

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

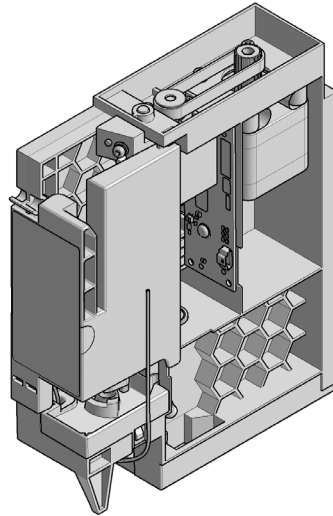


Figure 6 Needle Station

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.

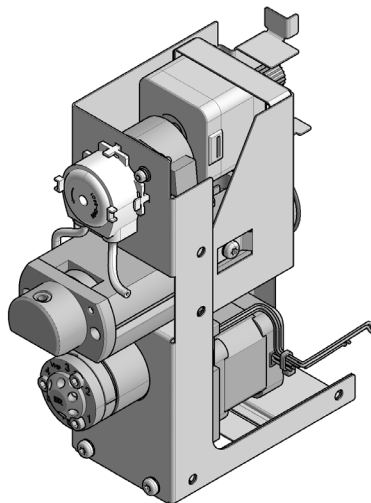


Figure 7 Hydraulic Unit

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).

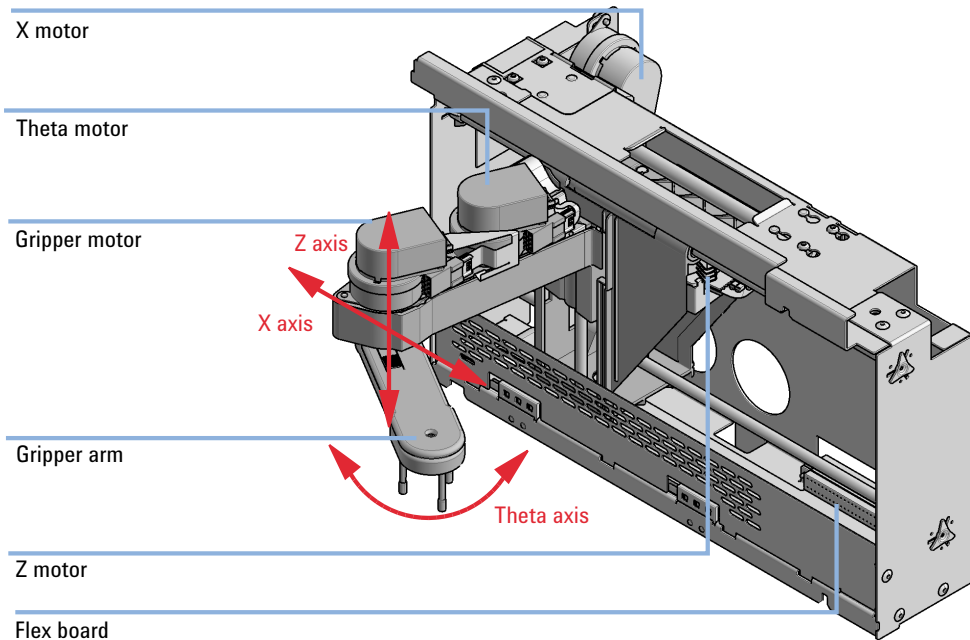


Figure 8 Transport Assembly

Introduction

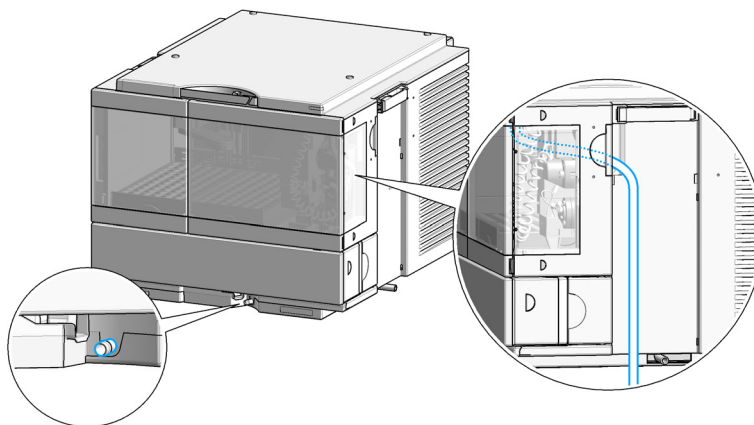
Operating Principle

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

1



Leak Sensor

CAUTION

Solvent incompatibility

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

✓ Do not use DMF.

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

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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 x width x 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	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Auto-ignition temperature ≥200 °C Boiling point ≥56 °C	

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 1260 Infinity II Preparative Autosampler (G7157A)

Type	Specification	Comment
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
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)	
Carry over	<0.005 % (50 ppm)	<p>Method</p> <ul style="list-style-type: none"> • Column: Agilent 5 Prep-C18, 21.2 mm x 50 mm, 5 µm (446905-102) • Eluent: Water/ACN (85/15) isocratic • Flow rate: 30 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 <p>Sample</p> <ul style="list-style-type: none"> • Caffeine 5 g/L in Water /ACN (98/2)
Injection cycle time	<60 s for injection volume 900 µL	
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

Table 2 Performance Specifications 1260 Infinity II Preparative Autosampler (G7157A)

Type	Specification	Comment
Communications	Controller-area network (CAN), Local Area Network (LAN) ERI: ready, start, stop and shut-down signals	
Safety and maintenance	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

Cooling 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.

Table 3 Physical Specification of the Sample Cooler

Type	Specification	Comments
Weight	< 6 kg	
Dimensions (height × width × depth)	205 mm x 340 mm x 370 mm	
Refrigerant gas	HFC-134a (0.042 kg)	Ozone depletion potential (ODP) = 0
Supply voltage	24 VDC (nominal)	
Current	10 A max.	
Ambient operating temperature	4 – 40 ° C (39.2 – 104 ° F)	
Ambient non-operating temperature	-40 – 70 ° C (-20 – 158 ° F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15091 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 Agilent 1290 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

Specifications of the Sample Thermostat

The sample thermostat is designed as a combination of a heater and vapor-compression refrigeration system. It uses non-Freon refrigerant (isobutane). This material 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

Type	Specification	Comment
Weight	<6 kg	
Dimensions (height x width x depth)	205 mm x 340 mm x 370 mm	
Refrigerant gas	R600a (0.030 kg)	Ozone depletion potential (ODP) =0 Global warming potential (GWP) =3
Supply voltage	24VDC	
Current	10 A max.	
Ambient operating temperature	4 – 40 °C (39.2 – 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)	
Non-operating altitude	Up to 4600 m (15091 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

Site Requirements and Specifications

Specifications of the Sample Thermostat

Table 6 Performance Specifications for the Sample Thermostat

Type	Specifications
Operating principle	High performance, low-energy consumption micro-compressor based cooler with natural R600a coolant (Butane 30 g), user-upgradable
Temperature range	from 4 – 40 °C
Temperature settable	from 4 – 40 °C in 1 ° increments
Temperature accuracy	2 – 6 °C at a setpoint of 4 °C (<25 °C, <50 % r.H.)



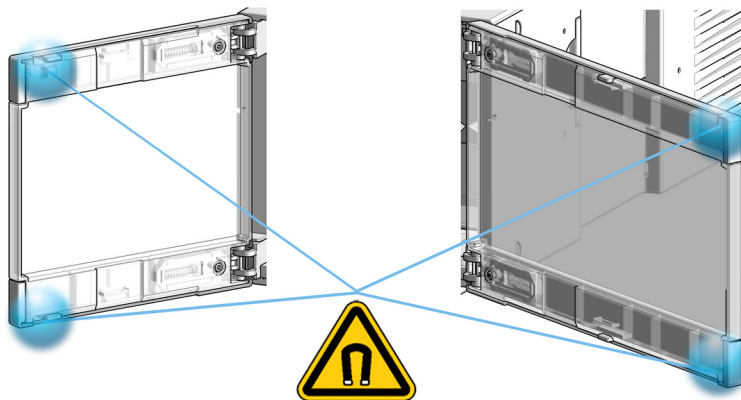
3 Using the Module

Magnets	36
Turn on/off	37
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Choice of Vials and Caps	49
Transporting the Sampler with a Sample Cooler or Sample Thermostat Installed	52
Agilent Local Control Modules	54

This chapter provides information on how to use the module.

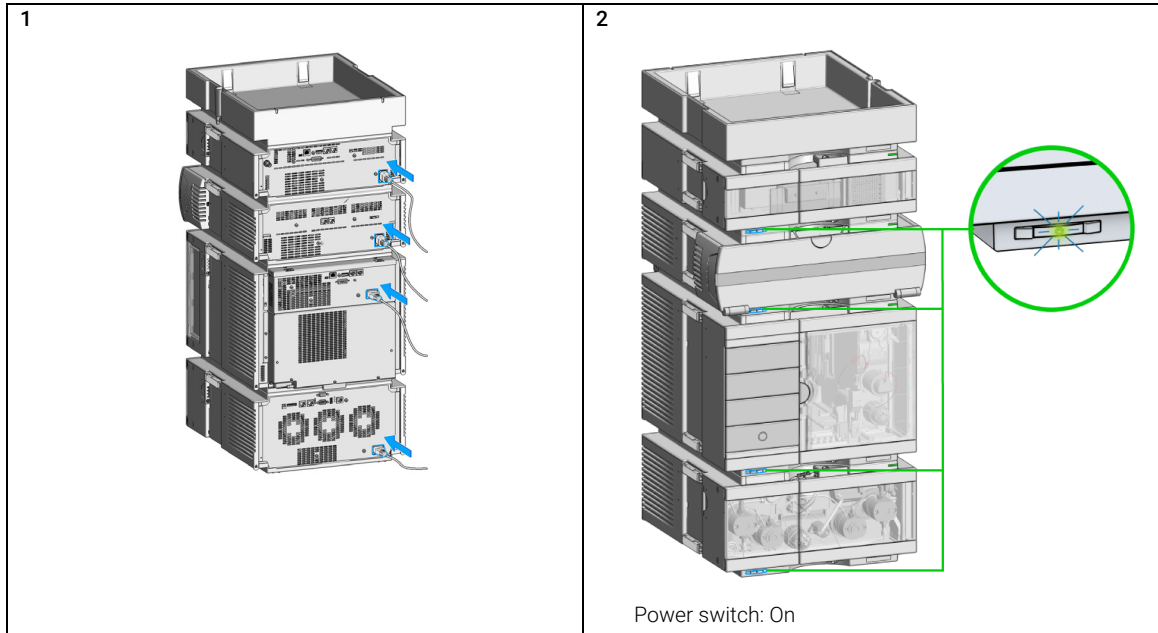
Magnets

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

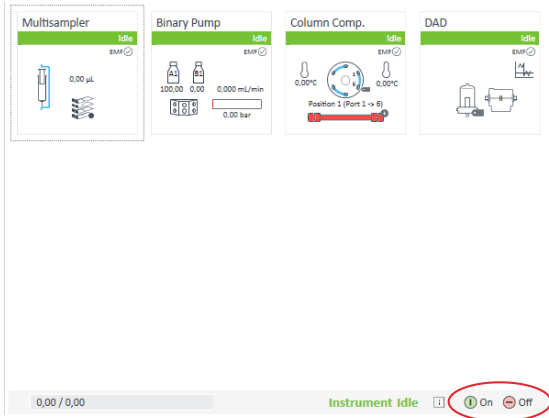


Turn on/off

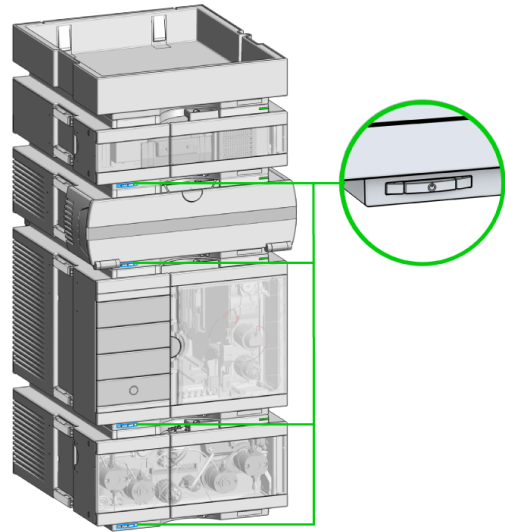
This procedure exemplarily shows an arbitrary LC stack configuration.



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

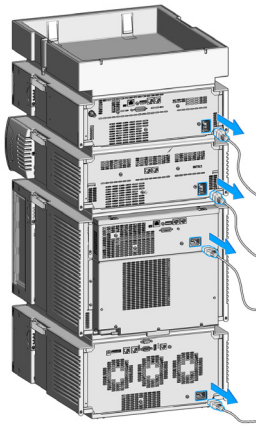


4



Power switch: Off

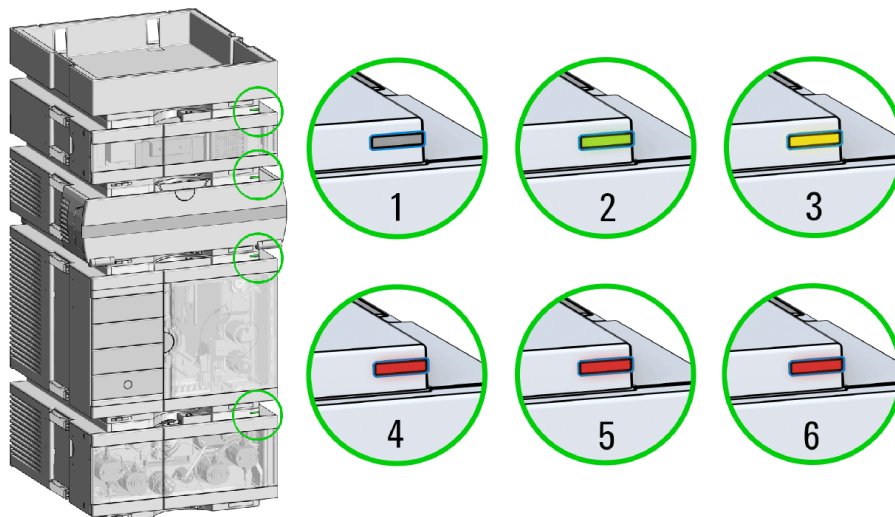
5



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.

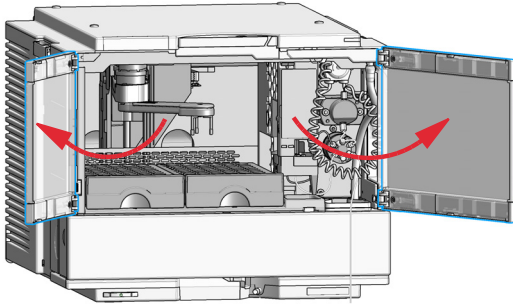
NOTE

Do not mix standard and classic drawers.

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

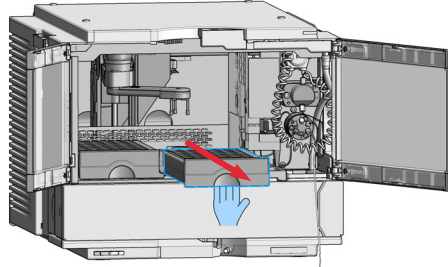
Using the Module Exchange Drawers

1 Open the front door.

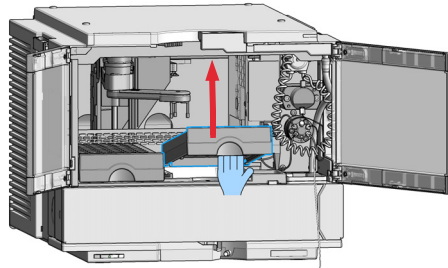


2 Remove the drawer.

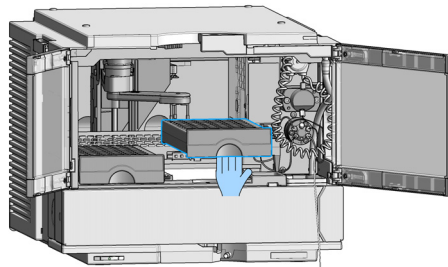
a Pull the drawer out.



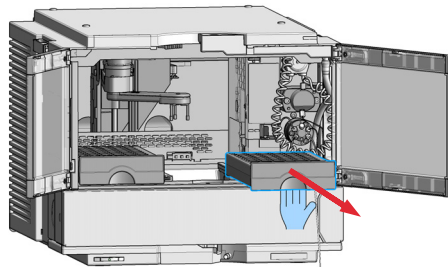
b Lift the front of the drawer.



c Lift the drawer out.

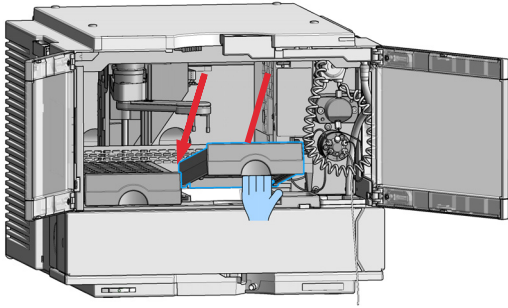


d Remove the drawer.

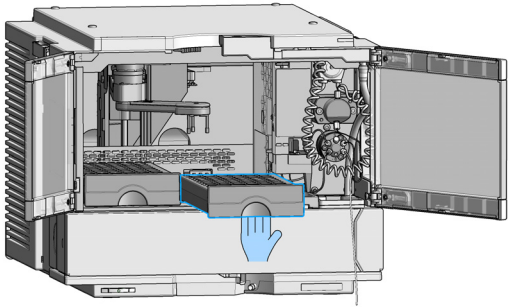


3 Install the drawer.

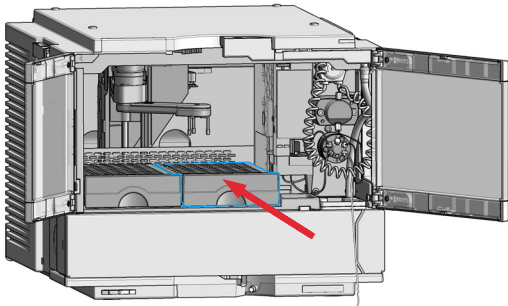
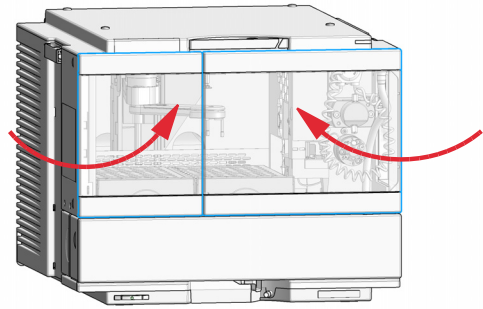
- a**
- Insert the back of the drawer.



- b**
- Align the drawer.



- c**
- Push in the drawer.

**4** Close the doors.

Install the External Tray

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

Preparations	
	<ul style="list-style-type: none">• Turn the sampler off• Open the doors• Remove the samples

NOTE

Keep foam and plastic cover in a safe place.

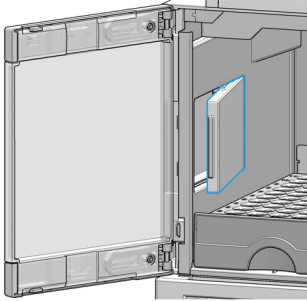
For best temperature performance, and if the external tray is not in use, it is best to cover the opening for the external tray with the original parts.

Using the Module

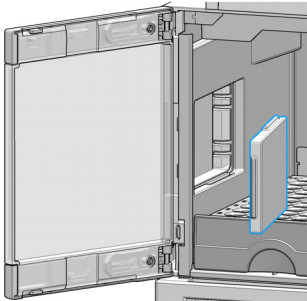
Install the External Tray

1 Remove the foam and the plastic cover.

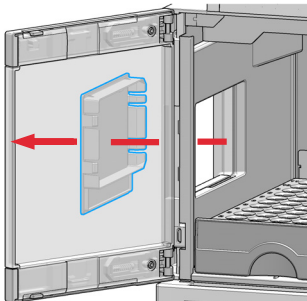
a Lift the foam with a flathead screwdriver.



b Remove the foam.



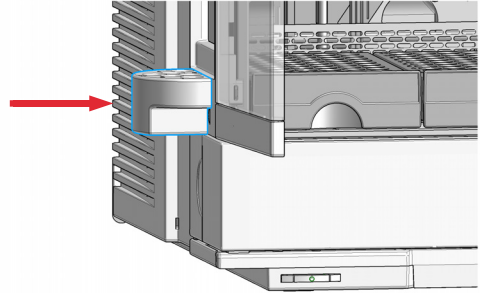
c Push out the plastic cover.



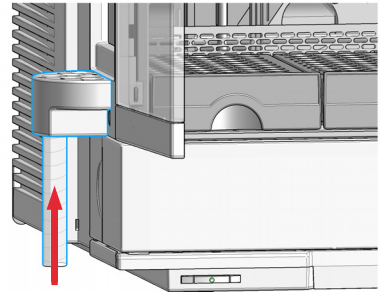
Vent for the external tray is open.

2

a Insert the external tray.



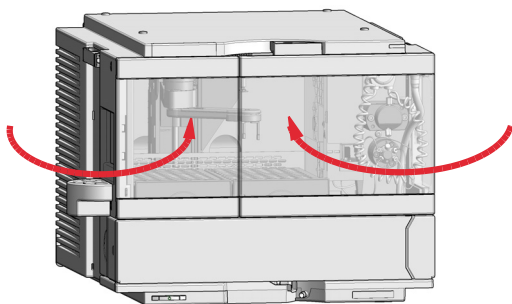
b Install the disposal tube.



Using the Module

Install the External Tray

3 Close the door.



4 Configure the External Tray in the online view of the Chromatographic Data System.

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	Drawer-Kit 100 x 2 mL Vials Classic
G7129-60210	Drawer for 50 x 2 mL Vials Classic Left
G7129-60220	Drawer for 50 x 2 mL Vials Classic Right
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

Using the Module

Sample Trays

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)

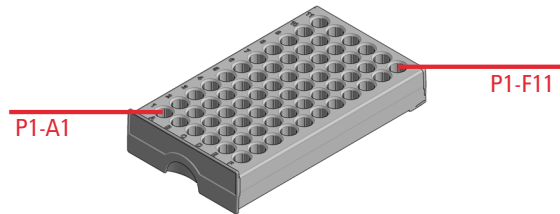


Figure 9 Numbering of drawer position (left-hand Drawer for 66 x 2 mL Vials)

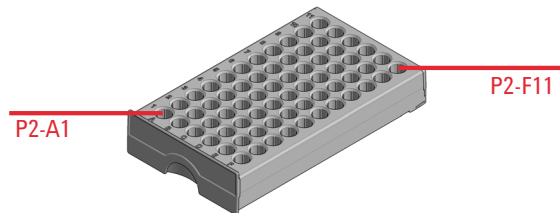


Figure 10 Numbering of drawer position (right-hand Drawer for 66 x 2 mL Vials)

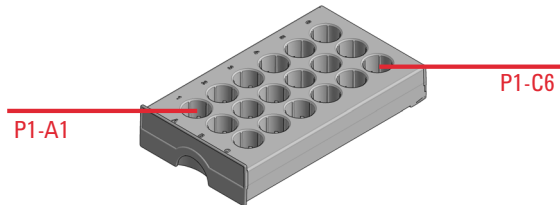


Figure 11 Numbering of drawer position (left-hand Drawer for 18 x 6 mL Vials)

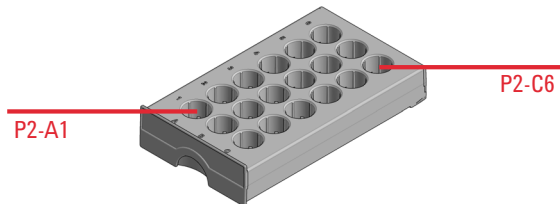


Figure 12 Numbering of drawer position (right-hand Drawer for 18 x 6 mL Vials)

Using the Module Sample Trays

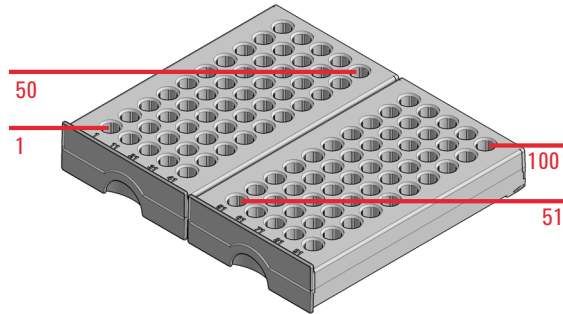


Figure 13 Numbering of drawer position (Drawer for 50 x 2 mL Vials Classic)

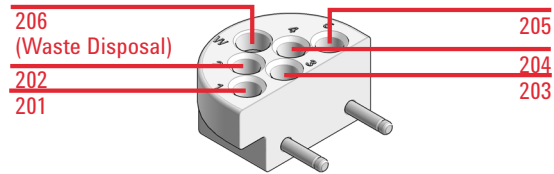


Figure 14 Numbering of tray position (External tray)

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 49, “Snap Top Vials” on page 50 and “Screw Top Vials” on page 50 and caps in “Crimp Caps” on page 51, “Snap Caps” on page 51 and “Screw Caps” on page 51 (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, 0.3 mL, polypropylene, wide opening, 1000/pack

Snap Top Vials

p/n	Description
5182-0544	Snap Top Vial, 2 mL, clear glass, 100/Pack
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/pk
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

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 m³ (1 m³ for every 8 g of R600a refrigerant inside of the Sample Thermostat).
- ✓ Ensure adequate ventilation: typical air exchange of 25 m³/h per m² 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**Mechanical damage of the module**

If the transport assembly is not parked and not protected by the transport foam, the module could be damaged due to excessive shock of the shipping container during transport.

- ✓ **Always park the transport assembly before shipment.**
- ✓ **Protect the instrument by Transport-Protection (G7129-40050)**
- ✓ **Store the installation foam in a save place, to use it for later transport of the module.**

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 1200 Infinity Series Instant Pilot G4208A

The Agilent 1200 Infinity Series Instant Pilot controller gives you complete control, system monitoring, signal plotting and diagnostic capabilities for a virtually unlimited number of LC system modules. It is connected to the LC system with a CAN cable for power supply and communication.

Features:

- Complete local control and monitoring of an Agilent 1200 Series, 1260 Infinity and 1290 Infinity system or a single module from a single point. However, not for Agilent 1220 Compact LC.
- Mixed system configurations supported, e.g. 1200 Series, 1200 Series SL- and 1100 Series.
- Excellent readability and usability by large colored display with background light, high resolution and contrast.
- Convenient, ergonomic operation either handheld or at the stack with newly developed, secure attachment.
- Handheld or attached to a module in a stack to facilitate operator preferences.

The 1200 Infinity Series Instant Pilot provides:

- Easy automation – recalibration intervals and multi-method sequences satisfy the most stringent automation routines.
- Transfer and archiving of methods, sequences and logbooks via standard USB memory sticks.
- Factory installed software – flat dialog structure, user configurable interface, enhanced sequence engine, for example with wait for baseline stabilization, diagnosis with passed/failed.
- GLP – System logbook and module log-books record errors, unusual events and maintenance activities for GLP traceability.

4

Installation of the Optional Sample Cooler/Sample Thermostat

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Install the Sample Cooler/Sample Thermostat	57
Using the Sample Cooler or Sample Thermostat in an Infinity II Sampler	63
Control Interface	64
Control	65
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This chapter describes the installation of the optional Sample Cooler/Sample Thermostat.

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.**
-

Install the Sample Cooler/Sample Thermostat

Parts required	#	p/n	Description
	1		Sampler
	1	G7167-60005	Sample Cooler
OR	1	G7167-60101	Sample Thermostat
	1		Power cord
	1	5067-6208	Condensate Drainage Kit
	1	G7167-90171	Installation of the Infinity II Cooler/Thermostat Condensate Drainage Tubing Kit

Preparations Sampler is installed in the stack.

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 m³ (1 m³ for every 8 g of R600a refrigerant inside of the Sample Thermostat).
- ✓ Ensure adequate ventilation: typical air exchange of 25 m³/h per m² 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.

Installation of the Optional Sample Cooler/Sample Thermostat

Install the Sample Cooler/Sample Thermostat

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

Do not open the Sample Thermostat. There are no serviceable parts inside.

NOTE

If the Sample Cooler/Sample Thermostat is disconnected from the power supply, you should 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 in order to avoid overflow.

NOTE

For best performance of the Sample Cooler/Sample Thermostat all drawers must be installed in the sampler.

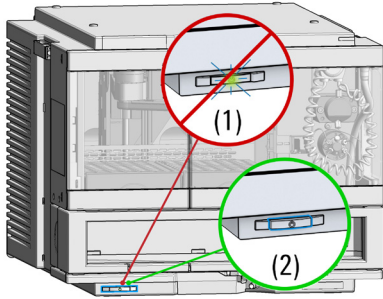
NOTE

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

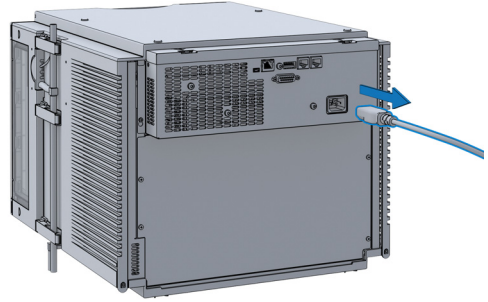
Installation of the Optional Sample Cooler/Sample Thermostat

Install the Sample Cooler/Sample Thermostat

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



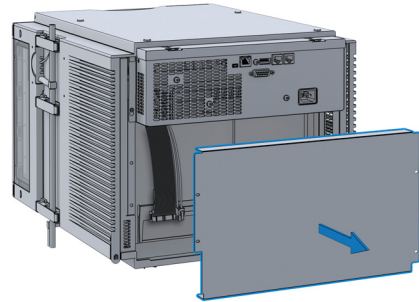
- 2 Ensure that the power cable is removed from the instrument.



- 3 Open the 4 screws on the rear of the module.



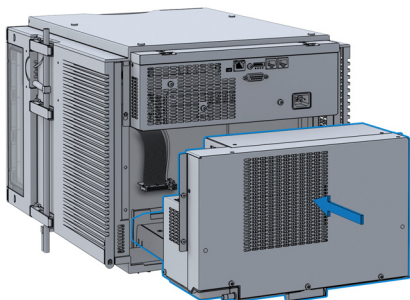
- 4 Remove the Sample Cooler/Sample Thermostat mainframe cover.



Installation of the Optional Sample Cooler/Sample Thermostat

Install the Sample Cooler/Sample Thermostat

- 5 Slide in the Sample Cooler/Sample Thermostat the halfway.



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.

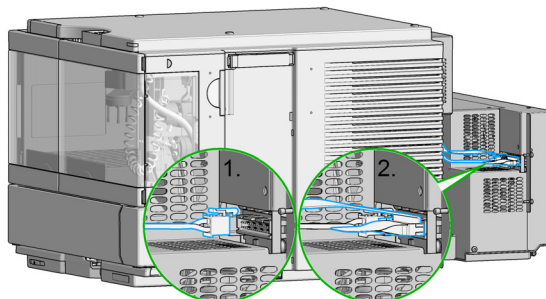
- ✓ Make sure that it is always possible to access the power plug.
- ✓ Do not use the Sample Cooler/Sample Thermostat if it is not operating correctly or has been damaged. Disconnect it from the power supply and call your local service center.
- ✓ Remove the power cable from the module before opening 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 power cable and signal/data cable.



Installation of the Optional Sample Cooler/Sample Thermostat

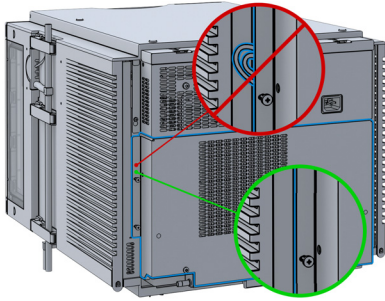
Install the Sample Cooler/Sample Thermostat

CAUTION

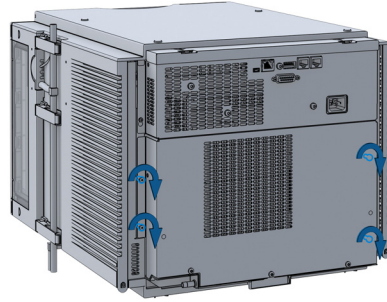
Damage to the cables

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

7 Slide in the whole unit.



8 Tighten the four screws which hold the Sample Cooler/Sample Thermostat unit in place.

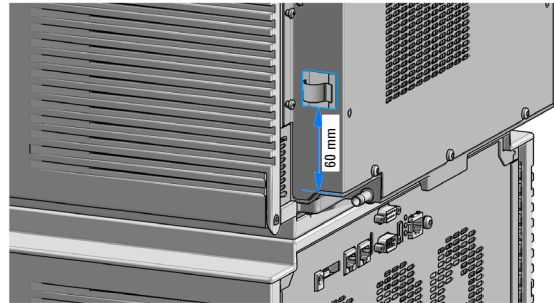


9 Use a bubble level to check the leveling of the sampler.

NOTE

The module should be operated in a proper horizontal position.

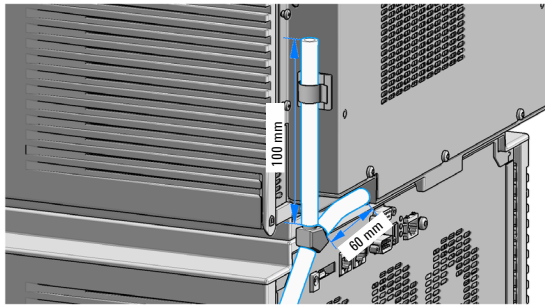
10



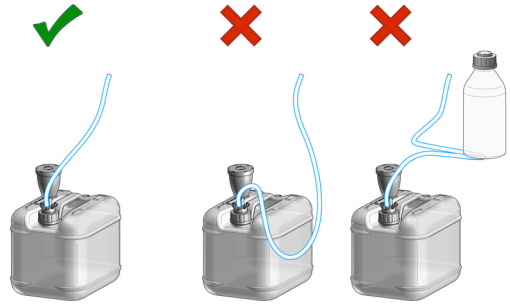
Installation of the Optional Sample Cooler/Sample Thermostat

Install the Sample Cooler/Sample Thermostat

11



12



NOTE

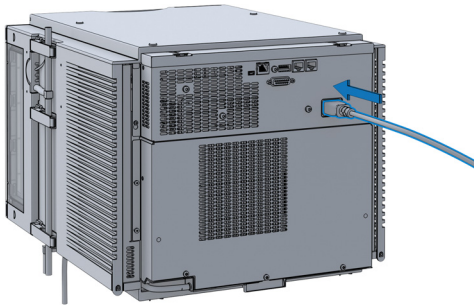
Check leak waste handling for further info.

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.

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



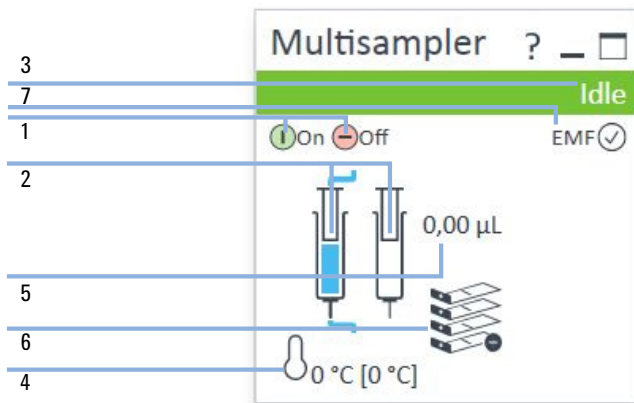
14 Configure the Sample Cooler/Sample Thermostat in the CDS.

Using the Sample Cooler or Sample Thermostat in an Infinity II Sampler

The following section describes exemplarily how to use the Sample Cooler/Sample Thermostat in the multisampler. The principle is the same for other sampler types.

After successfully loading the Agilent CDS, the module should appear as an active item in the graphical user interface (GUI).

Within the autosampler GUI, there are active areas. If the mouse cursor is moved across the icons the cursor will change, see the following figure.



1	ALS: turn on and off
2	ALS configuration
3	ALS Status
4	Sample Cooler/Sample Thermostat Status (on/off)
5	Injection Volume
6	Drawer Configuration
7	EMF Status

Installation of the Optional Sample Cooler/Sample Thermostat

Using the Sample Cooler or Sample Thermostat in an Infinity II Sampler

ALS configuration is displayed when moving with the mouse cursor over the syringe. The information provides ALS related information like

- Part number
- ALS setup

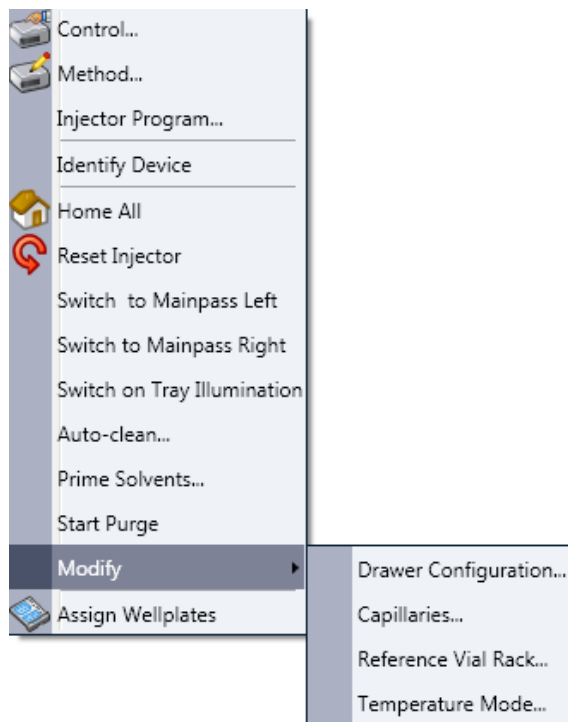
and other details.

NOTE

Depending on the autosampler temperature set point and the environment the autosampler temperature can deviate by up to 3 degrees. If the system is not in the range of ± 2 °C you will see a yellow bar over the temperature values.

Control Interface

A right-click into the active area will open a menu to show the Control Interface.



Control

The **Thermostat** section of the **Control** dialog box is available when you have a Sample Cooler/Sample Thermostat installed. It allows you to switch the cooler/thermostat on and off manually.

The screenshot shows the 'Control' dialog box with the following sections and controls:

- Missing Vessel**: Ignore missing vessel
- Illumination**: On, Off
- At Power On**: Turn on Thermostat
- Thermostat**: On, Off, and a temperature input field set to 40 °C.
- Automatic Turn On**: Turn on at, with a date/time dropdown set to 'Donnerstag, 9. November 2017 00:00:0'.
- Pump connected to Sampler**: A dropdown menu set to 'not linked'.
- Clear Workspace**: A dropdown menu set to 'Immediately'.
- Enable Analysis**: With any temperature, Temperature within +/- 2 degrees Celsius.
- Buttons: Ok, Cancel, Help.

Select **On** to switch on the cooler/thermostat. Specify the required temperature in the adjacent field. Note that the specified temperature must be at least 5 °C below ambient for proper temperature control.

Select **Off** to switch off the cooler/thermostat.

Temperature Mode

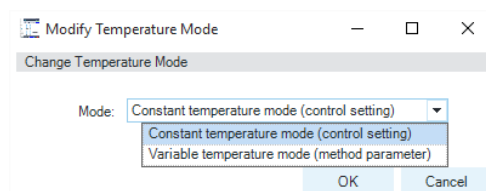
Temperature control for autosampler thermostats.

Since driver A.02.04, users could decide whether the *temperature of the thermostats* should be a *control setting* or a *method parameter*. With the introduction of Multisamplers, it has been decided that the thermostat should not be a method parameter for the following reasons:

- Changing the temperature from method to method changes the ALS temperature for ALL samples, not only for the one in the current method.
- The sample temperature can not be directly controlled, only the temperature of the air stream from the thermostat. If the air stream has the correct temperature during method execution, it may have been stored at higher temperatures with previous methods.

As a result, we are now introducing two modes which can be configured in the dashboard:

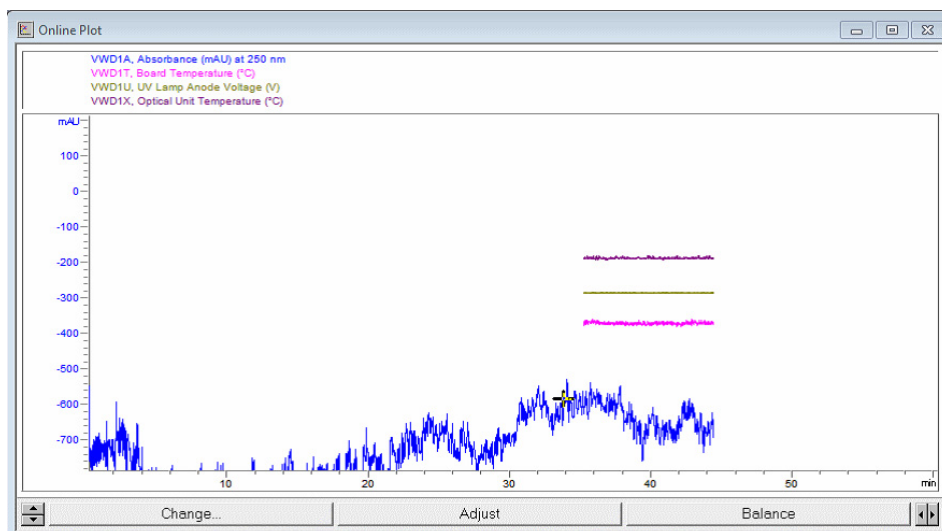
- *Constant temperature mode*: this mode uses the control setting for keeping samples at a fixed temperature. This is the default and recommended for most customers.
- *Variable temperature mode*: this mode allows changing the temperature as a method parameter. This mode may be used for degradation experiments (this solution is not officially recommended by Agilent) or as a workaround for reporting. Reporting of control parameters will become available with the CDS and ICF.



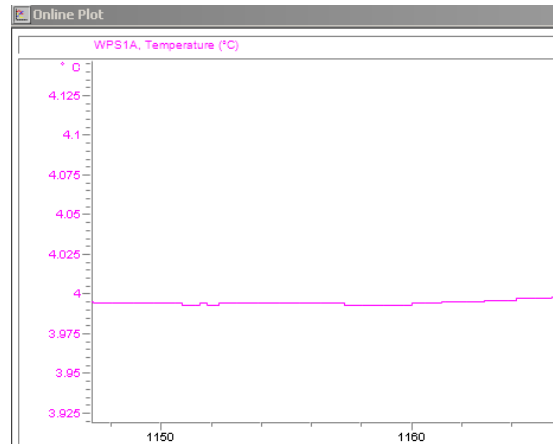
Online Signal Monitor

The online signal monitor for the chiller is also available and allows you to monitor the WPS1A temperature signals.

The Online Plot Window should look like this:



If the change button is pressed you can select the Chiller signal WPS1A in the online plot.



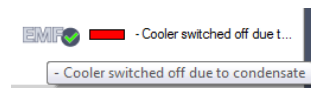
Operation Information

Initial start-up: When the Sample Cooler/Sample Thermostat starts back up after being shut down for a while (installation, moving, etc.), moisture can build up inside. This is normal and should disappear after about 24 hours or once the chiller has stabilized at a specific temperature.

Frequent opening of door/drawers: If the doors are opened frequently, warm and/or humid air enters the workspace of the autosampler. Try to limit opening the door/drawers in extremely hot or humid weather.

Temperature rise: Due to the warm air temperatures generated during heating from a cold to a warm chiller set point, it is possible to see moisture forming on the shelves and the vials. This moisture is caused by the warm air coming into contact with the colder temperatures in the workspace or the sample hotel. This will disappear after the unit comes out of the heating cycle and goes back into normal operation.

Shut down of the Sample Cooler/Sample Thermostat at low temperatures will build up some condensate inside the autosampler.



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.



5 Preparing the Module

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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. Always keep the temperature in the sample compartment at least 25 K below the boiling point of the solvent used.
 - ✓ 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 High pressure filter kit (5067-4638) 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 74.
- 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 7 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 8 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
• aromatised		•not recommended
• halogenated		•not recommended

Material Information

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 can also not 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 non-conductive 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.

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 is still a number of known incompatibilities with chemicals such as chloroform, methylene chloride, THF, DMSO, strong acids (nitric acid > 10 %, sulphuric acid > 10 %, sulfonic acids, trichloroacetic acid), halogenes or aqueous halogene solutions, phenol and derivatives (cresols, salicylic acid etc.).

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 very 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 to at least 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.

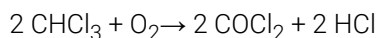
Tantalum (Ta)

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 (ST)

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 so on) 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:



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, diisopropylether). Such ethers should be filtered through dry aluminium 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, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol 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 $\mu\text{m}/\text{year}$. 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.

Preparing the Module

Solvent Information

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 (dimethyl formamide).

Sapphire, Ruby and Al₂O₃-based ceramics

Sapphire, ruby and ceramics based on aluminum oxide Al₂O₃ are inert to almost all common acids, bases and solvents. There are no documented incompatibilities for HPLC applications.

Capillary Color Coding Guide

Type		Material		Fitting Left/Fitting Right	
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*	E	Metric M3 + 1.6 mm Port id
Heat exchanger	Heat exchanger	PK/ST	Stainless steel-coated PEEK**	U	Swagelok union
		PTFE	PTFE	L	Long
		FS	Fused silica	X	Extra long
				H	Long head
				G	Small head SW 4 mm
				N	Small head SW 5 mm
				F	Fingertight
				V	1200 bar
				B	Bio
				P	PEEK

*Fused silica in contact with solvent
**PEEK in contact with solvent

The **type** gives some indication on the primary function, like a loop or a connection capillary.
The **material** indicates which raw material is used.
The **fitting** left/right indicate which fitting is used on both ends of the capillary.

At-a-glance color-coding keys

The color of your capillary will help you quickly identify the capillary id – see the chart to the right for reference.

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
0.1	Purple
0.12	Red
0.17	Green
0.20/0.25	Blue
0.3	Grey
0.50	Bone White

Tip: 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.

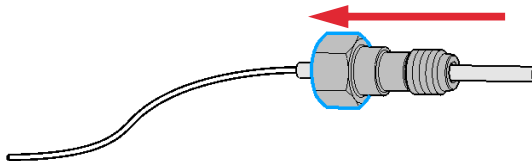
Figure 15 Syntax for capillary description

Swage Fittings

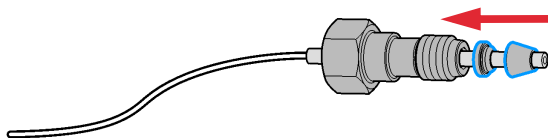
- 1 Select a nut that is long enough for the fitting you'll be using.



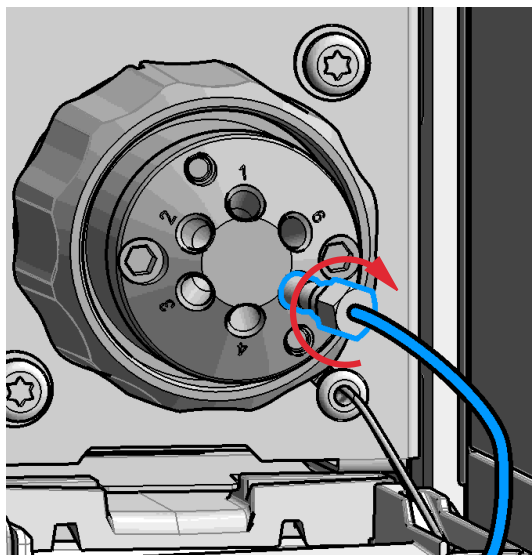
- 2 Slide the nut over the end of the tubing or capillary.



- 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.

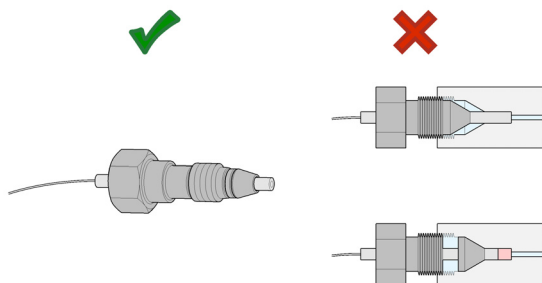


- 4 Use a column or injection valve to gently tighten the fitting which forces the ferrule to seat onto the tubing or capillary.

**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 swagelock 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.

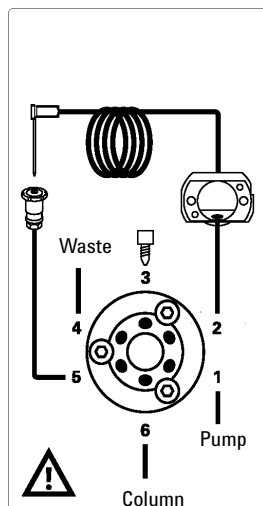
Use an appropriate solvent based on the sample and mobile phase chemistries.

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 Needle Wash 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

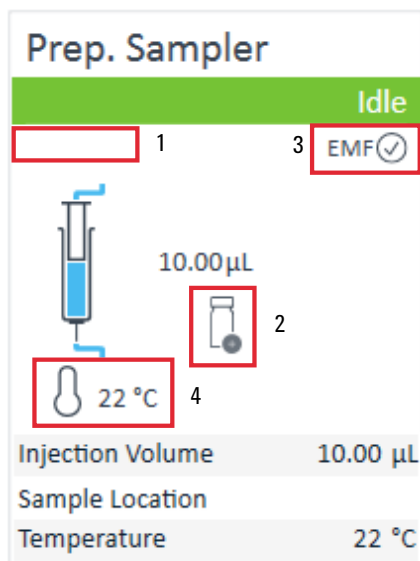
The correct plumbing is shown in the figure below and is attached to the module.



- 8 Prime and purge the complete sampler.

Setting up the Sampler

Table 9 The Vialsampler User Interface



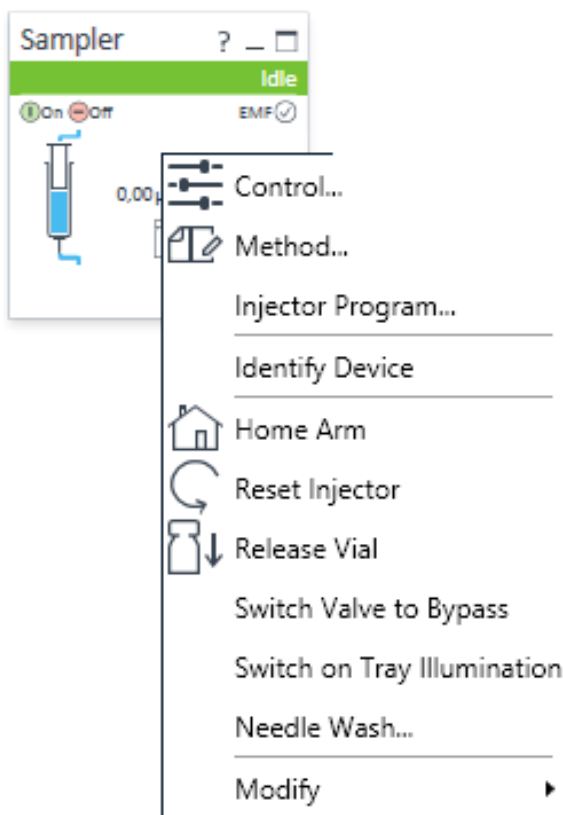
Within the sampler user interface, there are active areas. If you move the mouse cursor across the icons (tray, EMF button), the cursor will change and you may click on the icon to

- 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:

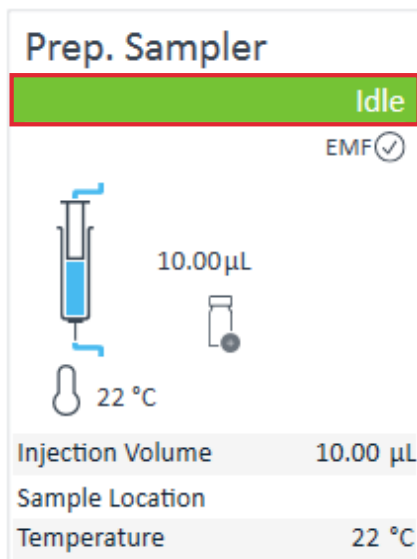
- **Injection volume**
- **Sample location**

Table 9 The Vialsampler User Interface



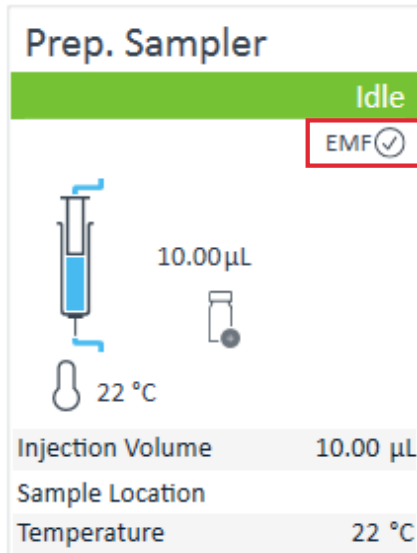
A right-click into the Active Area will open a menu with the option to adjust the following parameters:

- Show the **Control** User Interface (special module settings). See “Control Settings” on page 87.
- Show the **Method** User interface (same as via menu **Instrument> Set up Instrument Method> Setup G7129B**). See “Method Parameter Settings” on page 89.
- **Injector Program**
When you activate a pretreatment/injector program, it replaces the standard injection cycle. See “Using an Injector Program” on page 98
- **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 9 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)

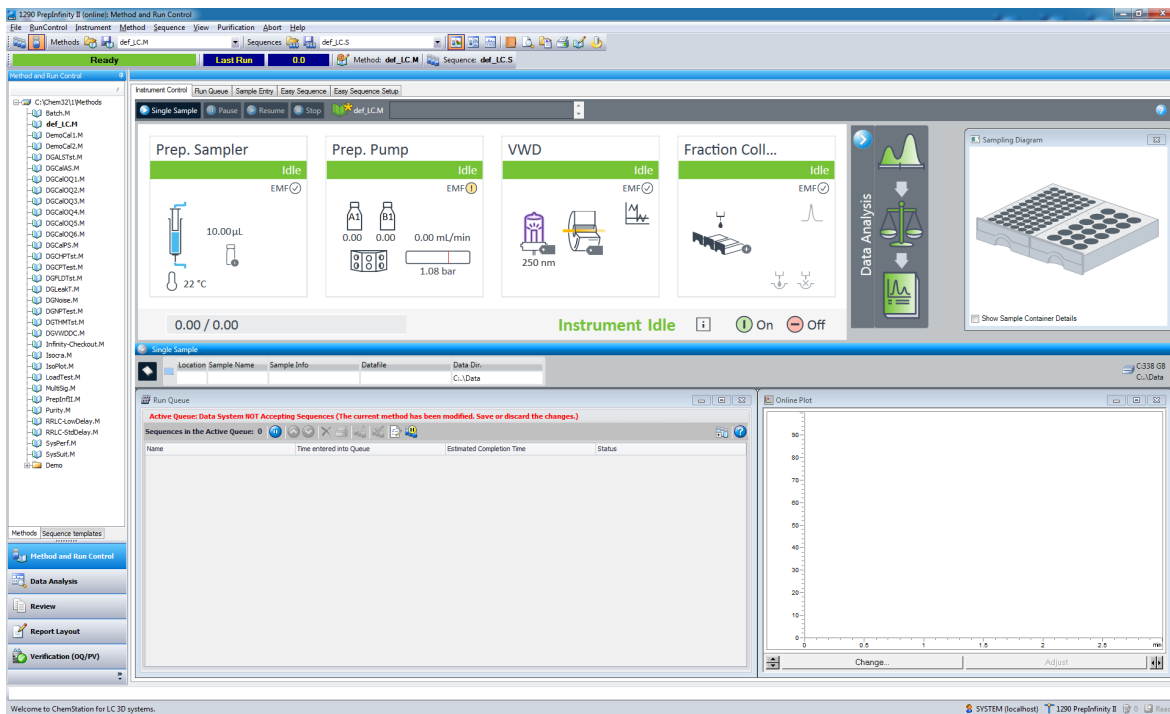
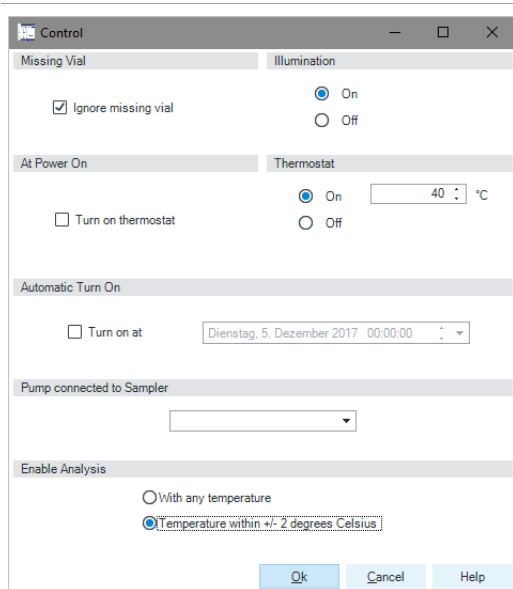


Figure 16 ChemStation Method and Run Control

Control Settings

The control settings are available via right click on the active area of the graphical user interface, see [Table 9](#) on page 84.

Table 10 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 Vialsampler. If more than one pump is configured, display the drop-down list and select the appropriate pump from the list.

- **Enable Analysis**

This section is available when you have a thermostated autosampler with a thermostat element connected and enabled only when the **Thermostat controlled by method** check box in the **Options** section of the **Configuration** dialog box is cleared. It indicates the temperature conditions under which an analysis will be made. Select the **With Any Temperature** option to specify that the analysis can be started irrespective of the temperature of the sample. Select the **Temperature within +/- 1°C** option to specify that the analysis can be started only when the temperature of the sample is within 1 °C of the specified value.

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 graphical user interface.

The screenshot displays the 'Method of G7129B' window with the following settings:

- Injection:** Injection volume: 5.00 μL
- Needle wash:**
 - Enable Needle Wash
 - Mode: Flush Port
 - Time: 3 s
 - Location: [Empty]
 - Repeat: 3
- Stoptime:**
 - As Pump/No Limit
 - 1.00 min
- Posttime:**
 - Off
 - 1.00 min
- Advanced:**
 - Auxiliary:**
 - Draw speed: 100.0 $\mu\text{L}/\text{min}$
 - Eject speed: 400.0 $\mu\text{L}/\text{min}$
 - Wait Time After Draw: 1.2 s
 - Needle Height Offset: 0.0 mm
 - High throughput:**
 - Injection Valve to Bypass for Delay Volume Reduction
 - Sample Flush-Out Factor: 5.0 times injection volume
 - Overlapped Injection Mode: Off
 - 0.00 minutes after injection

Buttons at the bottom: Ok, Apply, Cancel

Figure 18 Method parameter settings

Table 11 Method parameter settings

<p>Injection</p> <p>Injection volume: <input type="text" value="5.00"/> μL</p>	<p>Injection</p> <p>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.</p>
<p>Needle wash</p> <p><input checked="" type="checkbox"/> Enable Needle Wash</p> <p>Mode: <input type="text" value="Flush Port"/></p> <p>Time: <input type="text" value="3"/> s</p> <p>Location: <input type="text"/></p> <p>Repeat: <input type="text" value="3"/></p>	<p>Needle Wash</p> <p>Mark the Enable Needle Wash check box to specify an injection with needle wash.</p> <p>The following wash parameters can be specified:</p> <ul style="list-style-type: none"> • 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.
<p>Stoptime Posttime</p> <p><input checked="" type="radio"/> As Pump/No Limit <input checked="" type="radio"/> Off</p> <p><input type="radio"/> <input type="text" value="1.00"/> min <input type="radio"/> <input type="text" value="1.00"/> min</p>	<p>Stoptime: enables you to set the time that the analysis stops. Limits: 0.01 through 99999 min or As Pump/No Limit.</p> <p>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.</p>

Table 11 Method parameter settings

Auxiliary	
Draw speed:	<input type="text" value="100.0"/> μL/min
Eject speed:	<input type="text" value="400.0"/> μL/min
Wait Time After Draw:	<input type="text" value="1.2"/> s
Needle Height Offset:	<input type="text" value="0.0"/> mm

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 11 Method parameter settings

High throughput	
<input type="checkbox"/> Injection Valve to Bypass for Delay Volume Reduction Sample Flush-Out Factor: <input type="text" value="5.0"/> times injection volume Overlapped Injection Mode: <input type="text" value="Off"/> <input type="text" value="0.00"/> minutes after injection	<p>High Throughput</p> <p>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.</p> <p>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 carry-over.</p> <p>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:</p> <ul style="list-style-type: none"> • 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**

The screenshot shows a window titled "RCDriverUIHost" with two main sections: "Communication" and "Options".

Communication Section:

- Device name:
- Type ID:
- Serial number:
- Firmware revision:
- Connection settings... (button)

Options Section:

These options are for information only or configuring an offline system. Please see help for instructions how to change the configuration.

- Metering:
- Loop:
- Seat:
- Max. Injection Volume: 20,00 µL
- (Multi-draw disabled)
- Cooler installed
- Mode:
- External tray installed

Buttons: Cancel, OK

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.

6

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This chapter provides information on how to optimize the module.

Optimization for Lowest Carry-over

Several parts of an injection system can contribute to carry-over:

- 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 flow line. 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 carry-over in some instances. When using small injection volumes or when injecting samples of low concentration immediately after samples of high concentration, carry-over may become noticeable. Using the automated needle wash enables the carry-over to be minimized and prevents also 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 carry-over, 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.

Optimizing Performance

Optimization for Lowest Carry-over

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 μ L from Sample Location P1-A1
- 3 INJECT

Line 1 moves the needle to vial P2-A1 or the flushport. Line 2 draws 5 μ L 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 groove 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 groove 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) μ l 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 additional wash vial can be used for cleaning.

In case the needle seat has got contaminated and carry-over 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 will set 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 2 or 3 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, as soon as 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 carry-over 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 sec. 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 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 additional "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 may form in the sample loop during the injection sequence. When using injection volumes $< 2 \mu\text{L}$, these gas bubbles may affect the injection-volume precision. Use degassed mobile phases for best injection-volume precision with injection volumes $< 2 \mu\text{L}$.

Also, using the automated needle wash (see [“Optimization for Lowest Carry-over”](#) on page 96) between injections reduces carry-over 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 $\mu\text{L}/\text{min}$. 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 $\mu\text{L}/\text{min}$. 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.

7

Troubleshooting and Diagnostics

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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 106).

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 113).

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 115).

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

For the needle exchange procedure, the needle arm moves slowly down while the safety cover is removed.

Risk of personal injury due to moving needle.

- ✓ Keep fingers off the moving needle.
- ✓ Wear safety goggles, when removing the needle assembly.

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 description 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 Select **Start**. Ensure the safety cover is removed
- 2 **Next** moves the needle arm to the top level. Flap the safety wash port out of its origin position.

WARNING

For the needle exchange procedure, the needle arm moves slowly down while the safety cover is removed.

Risk of personal injury due to moving needle.

- ✓ Keep fingers off the moving needle.
- ✓ Wear safety goggles, when removing the needle assembly.

-
- 3 **Next** moves the needle slowly down and positions the needle approximately 5 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 152 and “Exchange the Needle Seat Assembly” on page 157.
 - 5 **Next** positions the needle to the top level. Flap the safety wash port back in its origin position.
 - 6 Reinstall the safety cover and complete the procedure.
 - 7 Select **Next** to move the needle into the needle seat.
 - 8 Select **Back** to complete the procedure.

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 171).
- 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 (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 175).
- 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 (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 12 **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 μ L 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 can be used as a simple verification that the Sample Cooler is functioning.

After the test has been started, it begins to acquire data from the cooler's PT1000 temperature sensor. As soon as the temperature has equilibrated (that is, the temperature does not change by more than 0.5 °C over a 10 s period) the cooler is turned on and measurement is started.

For the test to succeed, three temperature checkpoints must be reached within a specified time.

If a Sample Thermostat with heating function is available, the electrical resistance is also checked.

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 13](#) on page 118 summarizes the injector steps, and lists the associated error messages and probable causes of step failures.

Table 13 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 113).
Draw	Sum of all draw volumes exceeds 100 μ L. 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 113).
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 49.

- 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 175.

- 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 Board (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 175.
- 3 Exchange Transport assembly (Sample Transport Assembly (G7129-60600)).
- 4 Exchange the Autosampler Main Board (Autosampler Specific Board (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 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. By 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.

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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 <i>Service Manual</i> 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.	<ul style="list-style-type: none"> 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 main board 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.	<ul style="list-style-type: none">• Exchange the metering seal.• <i>Make sure the leak sensor is thoroughly dry before restarting the autosampler.</i>
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 main board	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 main board	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.

The hall sensor on the fan shaft is used by the main board 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 fan.	Please contact your Agilent service representative.
3 Defective Sample Cooler/Sample Thermostat fan	Replace the Sample Cooler/Sample Thermostat.
4 Defective main board.	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 main board.	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 main board.	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 main board.	Please contact your Agilent service representative.

Metering Home Failed

Error ID: 34202, 34201, 34224

The metering piston has failed to move back to the home position.

The home position sensor on the hydraulic unit flex board monitors the home position of the piston. If the piston fails to move to the home position, or if the sensor fails to recognize the piston position, the error message is generated.

Probable cause	Suggested actions
1 Blockage in the flow path.	Change needle or needle seat.
2 Defective sensor.	Please contact your Agilent service representative.
3 Broken piston.	Exchange the metering piston and seal.
4 Defective metering-drive motor.	Please contact your Agilent service representative.
5 Defective main board.	Please contact your Agilent service representative.
6 Loose belt.	Please contact your Agilent service representative.

Motor Temperature

Error ID: 34307

One of the motors of the transport assembly has drawn excessive current, causing the motor to become too hot. The processor has switched OFF the motor to prevent damage to the motor.

See figure [Figure 8](#) on page 20 for motor identification.

- **Motor 0 temperature:** X-axis motor.
- **Motor 1 temperature:** Z-axis motor.
- **Motor 2 temperature:** Theta (gripper rotation) motor.
- **Motor 3 temperature:** Gripper motor (motor for gripper fingers).

The processor monitors the current drawn by each motor and the time the motor is drawing current. The current drawn by the motors is dependent on the load on each motor (friction, mass of components etc.). If the current drawn is too high, or the time the motor draws current is too long, the error message is generated.

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 Motor belt tension too high.	Switch OFF the autosampler at the power switch. Wait at least 10 min before switching on again.
4 Defective motor.	Please contact your Agilent service representative.
5 Defective transport assembly flex board.	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

Error ID: 34309

The vial position defined in the method or sequence does not exist.

The reflection sensors on the transport assembly flex board are used to automatically check which sample trays are installed (coding on tray). If the vial position does not exist in the current sample tray configuration, the error message is generated.

Probable cause	Suggested actions
1 Incorrect tray or trays installed.	Install the correct trays, or edit the method or sequence accordingly.
2 Incorrect vial positions defined in the method or sequence.	Check method settings vs. installed tray.
3 Tray recognition defective (dirty sample tray or defective transport assembly flex board).	Ensure the coding surfaces of the sample tray are clean (located at the rear of the sample tray). If this does not solve the problem, 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 metering 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 Loose belt.	Please contact your Agilent service representative.
3 Rear wheel in the hydraulic unit is loose.	Please contact your Agilent service representative.
4 Defective metering-drive motor.	Please contact your Agilent service representative.
5 Defective metering device	Please contact your Agilent service representative.

Sample Cooler/Sample Thermostat Error Messages

Cooler Voltage Failure

Error ID: 30722

The Sample Cooler board has detected a voltage failure.

Probable cause	Suggested actions
1 Blown fuses, defective cable	<ul style="list-style-type: none"> Check the power cable from the ALS to the Sample Cooler. Please contact your Agilent service representative.
2 Voltage issue in the Sample Cooler	Please contact your Agilent service representative.

Cooler PCB Error State

Error ID: 30724, 30275

The Sample Cooler PCB board seems to be defective.

Probable cause	Suggested actions
1 Blown fuses, defective cable	<ul style="list-style-type: none"> Check the power cable from the ALS to the Sample Cooler. Please contact your Agilent service representative.
2 Defective PCB boards	Replace the Sample Cooler.

Cooler temperature below or above target temperatur.

Error ID: 30705, 30706

The Sample Cooler temperature is above or below the target temperature.

Probable cause	Suggested actions
1 Condensate inside of the chiller	Check if the drainage is ok.
2 Defective cable	Check the signal cable from the ALS to the Sample Cooler.
3 Defective temperature sensor	Replace the Sample Cooler.

Cooler Overpressure Failure

Error ID: 30712

The Sample Cooler pressure sensor has detected an overpressure.

Probable cause	Suggested actions
1 Overpressure in the chiller	Switch off the instrument and wait for 15 min. Restart the instrument and check the signals in Lab Advisor.
2 Defective compressor	Replace the Sample Cooler.

Cooler Condensate Error

Error ID: 30702, 30709, 30710

The Sample Cooler has detected condensate inside of the leak pane.

Probable cause	Suggested actions
1 Blocked drainage	Switch off the instrument and remove the condensate tubings. Place a beaker underneath the waste outlet. Check the waste container. There should be no kinked and sealed tubing.
2 Defective condensate sensor	Switch the Sample Cooler off/on and check if after 8 min the error shows up again.
3 Defective leak sensor	Replace the Sample Cooler.

9

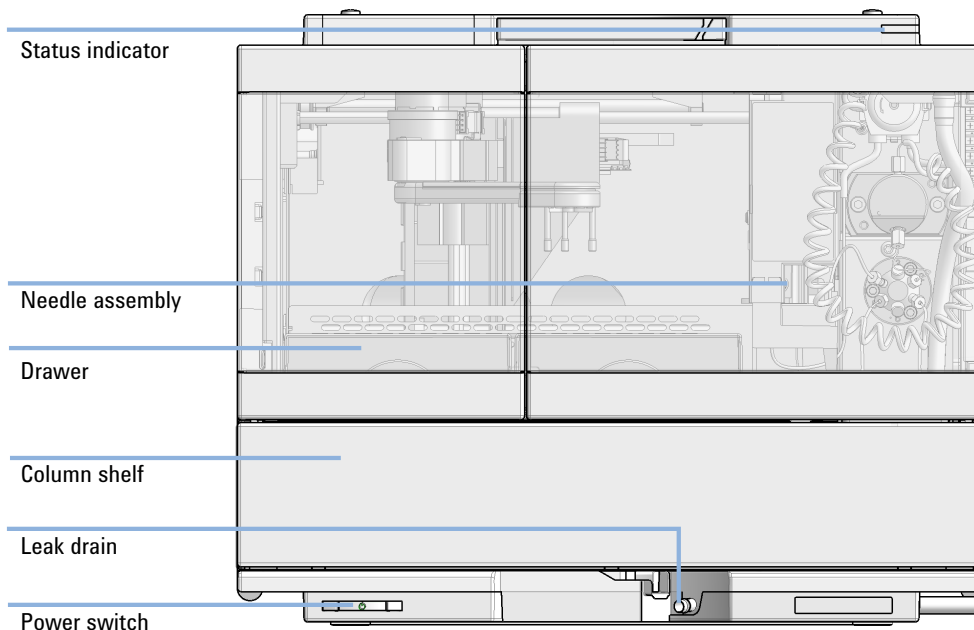
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This chapter describes the maintenance of the module.

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 14 Overview of maintenance

Procedure	Typical interval (minimum)	Notes
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.

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.
-

Remove and Install Doors

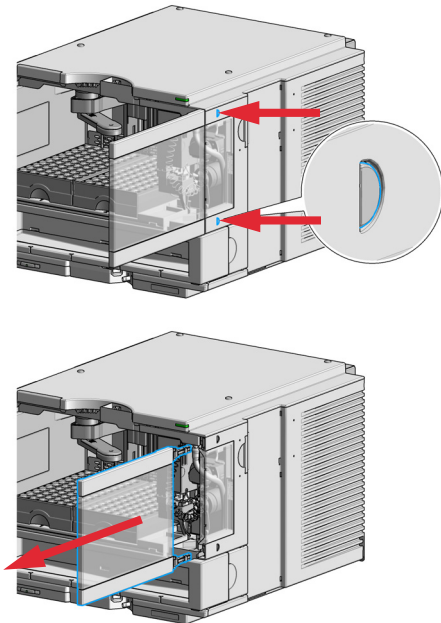
When If the front door is defective or a hinge is damaged.

Tools required **Description**
Flat screwdriver

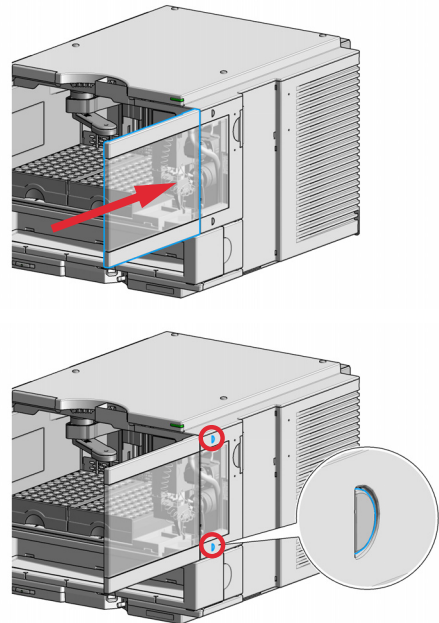
Parts required **p/n** **Description**
G7129-68702 Door Assy

Preparations Finish any pending acquisition job and return any plate on the workspace back to the hotel.

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 move the door in until the release buttons click into their final position.



Exchange the Needle Assembly

When When the limit in the needle into seat counter in the EMF is exceeded or when needle shows indications of damage, blockage or leaks.

Tools required	p/n	Description
	8710-1924	Open-end wrench 14 mm
	8710-2140	Screwdriver Torx TX-10
		Pair of pliers

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

Preparations In order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves.

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

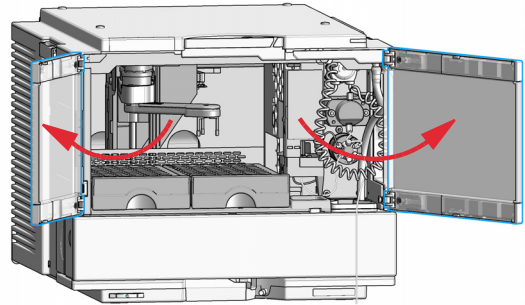
It is recommended to always exchange the needle assembly and the needle seat at the same time to prevent premature leakage.

Maintenance

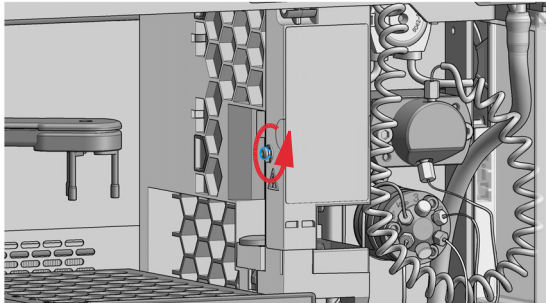
Exchange the Needle Assembly

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

2 Open the front door.



3 Unscrew the safety cover screw.

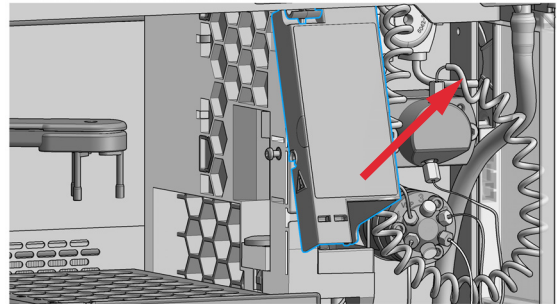


WARNING

Sharp needle
Uncovered needles may cause injuries

✓ Do not touch the tip of the needle.

4 Remove the safety cover.



WARNING

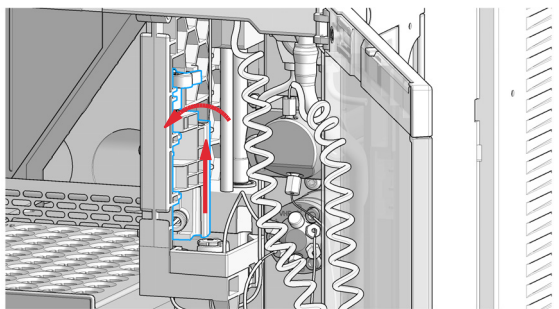
Sharp needle

Uncovered needles may cause injuries.

✓ Do not change the needle seat at this point.

✓ Do not touch the tip of the needle.

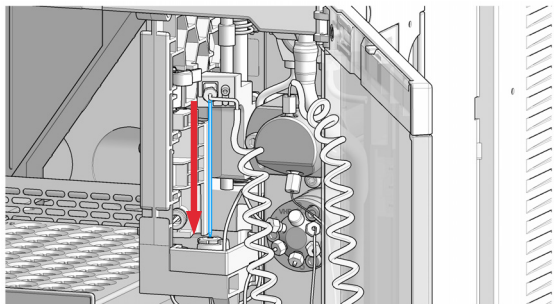
5 Move the wash port to the service position by slightly lifting it up and then flapping to the left.



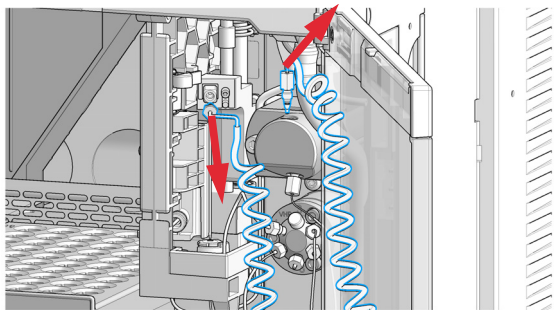
6 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

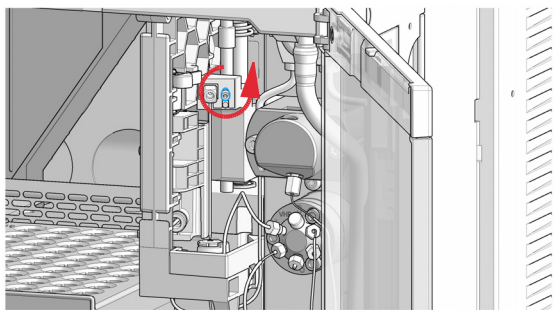
In the Local Controller, move the needle down until the needle tip is ca. 2 – 4 mm above the seat.



7 Disconnect the sample loop from the needle.



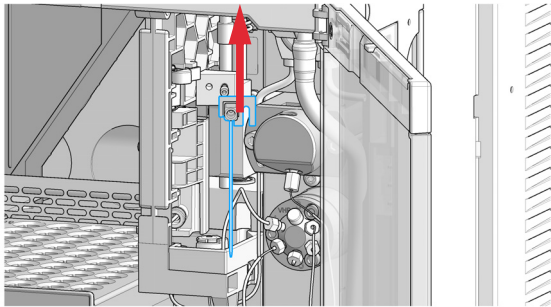
8 Loosen the fixing screw.



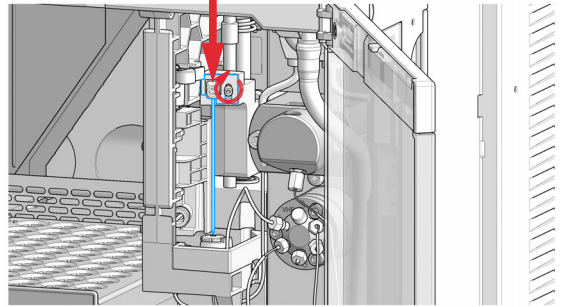
Maintenance

Exchange the Needle Assembly

9 Lift out the needle.

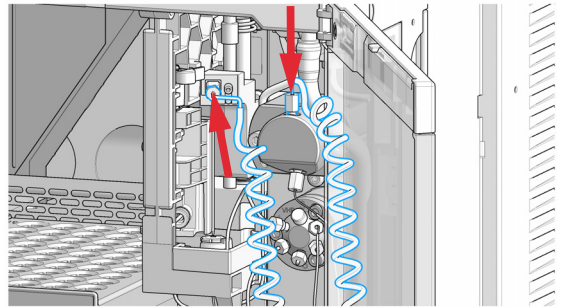


10 Mount and align the needle on its fixture, then tighten the screw firmly. Make sure that the needle tip is concentric with the seat.



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 and breaking the sample loop.

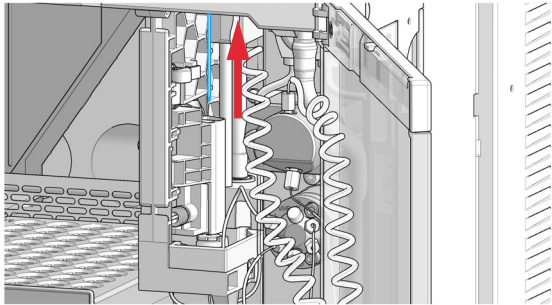
Maintenance

Exchange the Needle Assembly

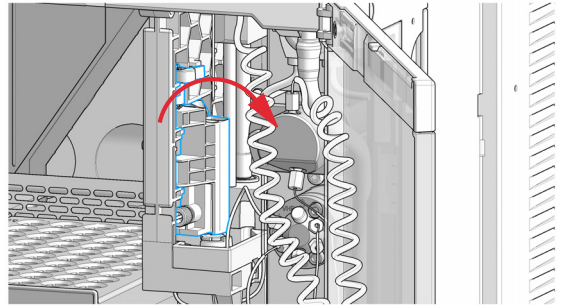
13 In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

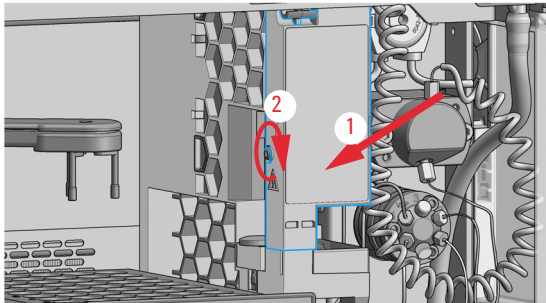
In the Local Controller, move the needle up to the uppermost position.



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



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

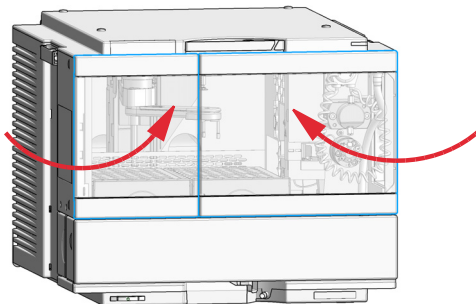


16 In Lab Advisor, select **Next** to move the needle into the needle seat and then **Back** to finish the maintenance procedure.

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 **Pressure Test**.

Exchange the Needle Seat Assembly

When When the seat is visibly damaged, blocked or leaks.

Tools required	p/n	Description
	8710-1924	Open-end wrench 14 mm
	8710-2140	Screwdriver Torx TX-10 Flat 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

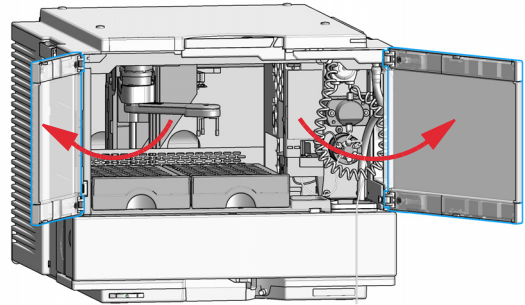
When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See [Table 9](#) on page 84

Maintenance

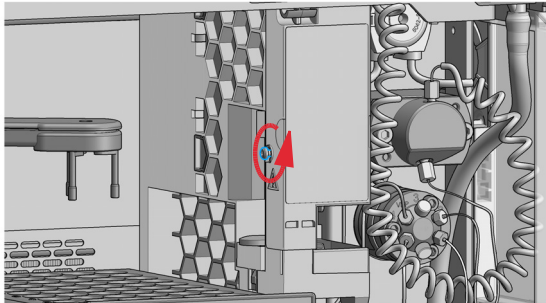
Exchange the Needle Seat Assembly

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

2 Open the front door.



3 Unscrew the safety cover screw.

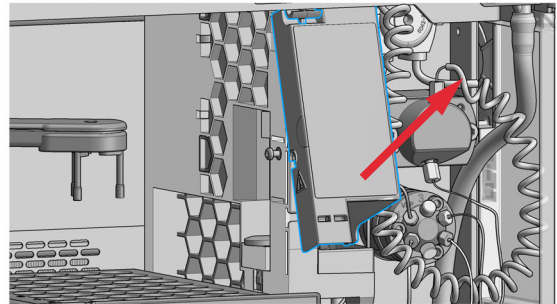


WARNING

Sharp needle
Uncovered needles may cause injuries

✓ Do not touch the tip of the needle.

4 Remove the safety cover.



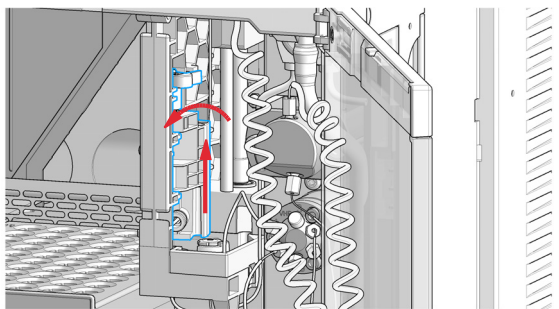
WARNING

Sharp needle

Uncovered needles may cause injuries.

- ✓ Do not change the needle seat at this point.
- ✓ Do not touch the tip of the needle.

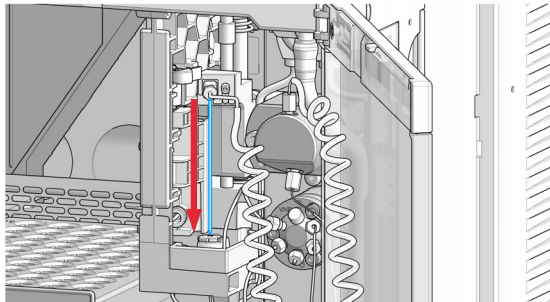
- 5 Move the wash port to the service position by slightly lifting it up and then flapping to the left.



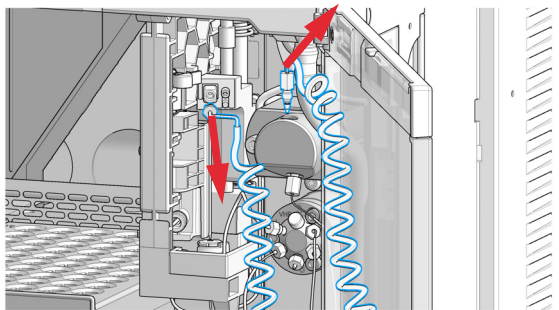
- 6 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

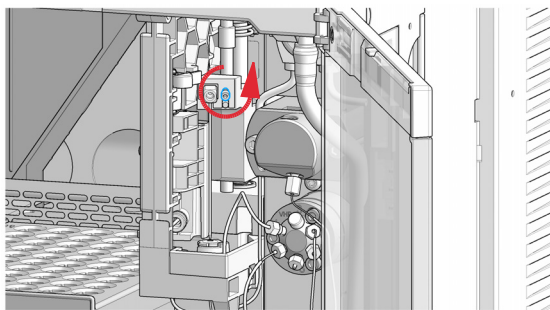
In the Local Controller, move the needle down until the needle tip is ca. 2 – 4 mm above the seat.



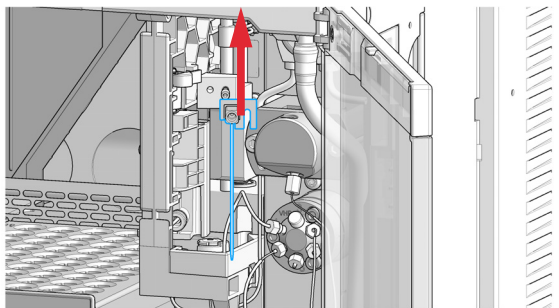
- 7 Disconnect the sample loop from the needle.



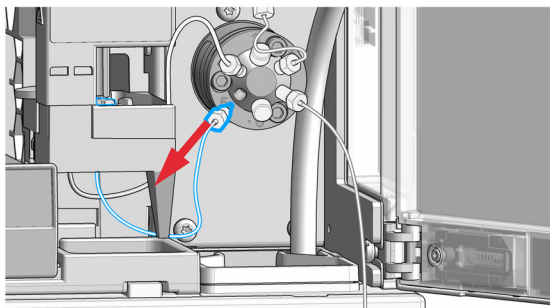
- 8 Loosen the fixing screw.



- 9 Lift out the needle.



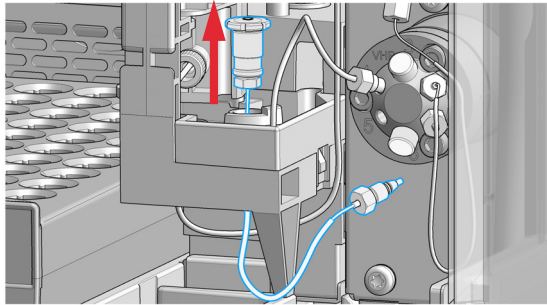
- 10 Disconnect the seat-capillary fitting from the injection valve (port 5).



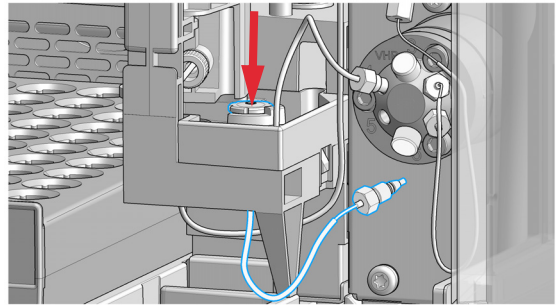
Maintenance

Exchange the Needle Seat Assembly

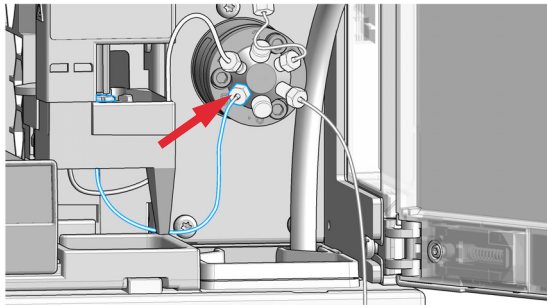
11 Use a small flat-head screwdriver to ease out the needle seat.



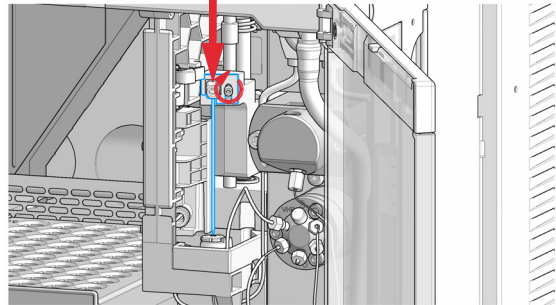
12 Insert the new needle-seat assembly. Press the seat firmly into position.



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



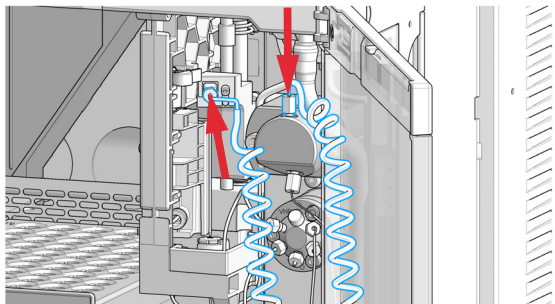
14 Mount and align the needle on its fixture, then tighten the screw firmly. Make sure that the needle tip is concentric with the seat.



Maintenance

Exchange the Needle Seat Assembly

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



NOTE

Do not overtighten the fitting!

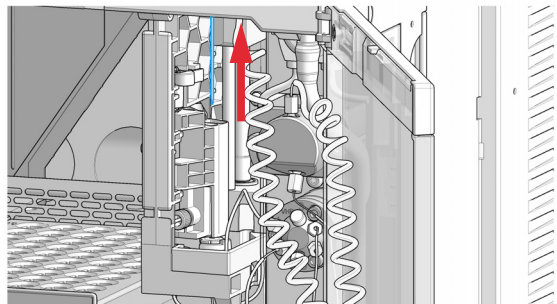
NOTE

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

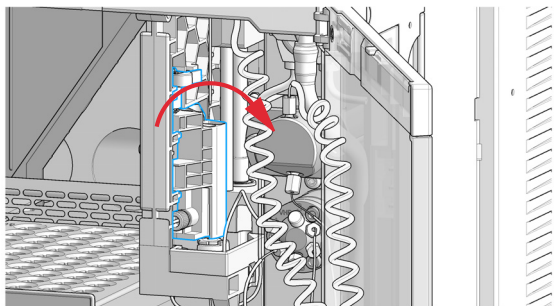
- 16** In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

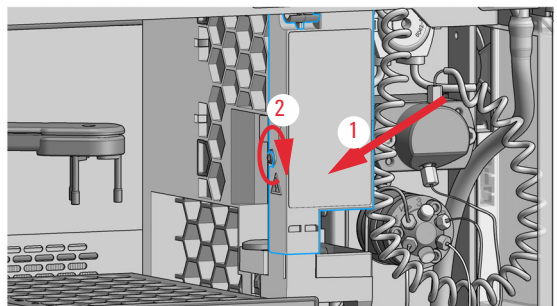
In the Local Controller, move the needle up to the uppermost position.



- 17** Move the wash port back to its normal position by turning it to the right.



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



Maintenance

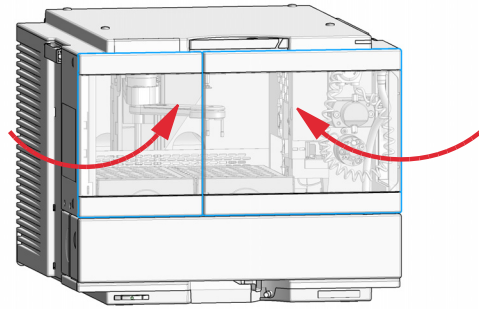
Exchange the Needle Seat Assembly

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 **Pressure Test**.

Exchange the Sample Loop Assembly

When When sample loop is visibly damaged, blocked or leaks.

Tools required	p/n	Description
	8710-1924	Open-end wrench 14 mm

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.

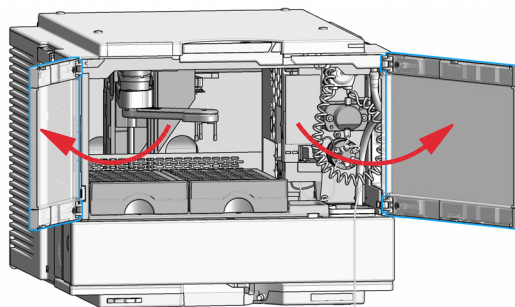
- ✓ Do not open the safety cover of the needle station during normal operation.
- ✓ Wear safety goggles and safety gloves when removing the needle assembly.

NOTE

When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See [Table 9](#) on page 84.

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.

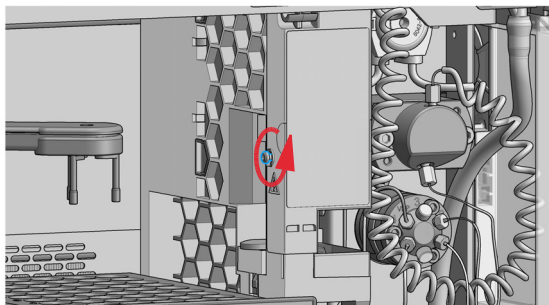
2 Open the front door.



Maintenance

Exchange the Sample Loop Assembly

- 3 Unscrew the safety cover screw.

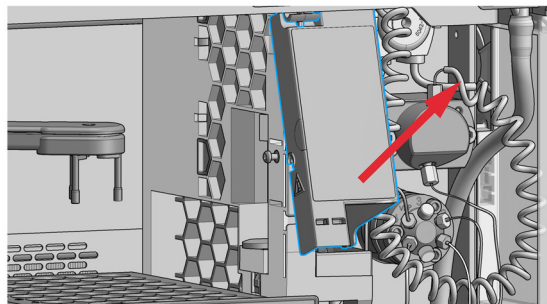


WARNING

Sharp needle
Uncovered needles may cause injuries

- ✓ Do not touch the tip of the needle.

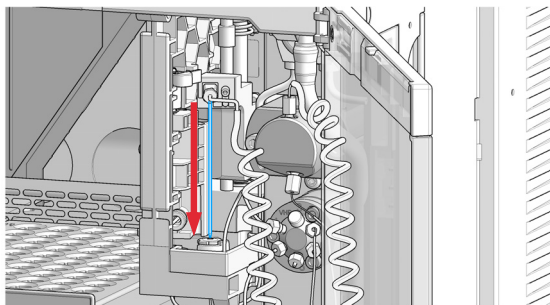
- 4 Remove the safety cover.



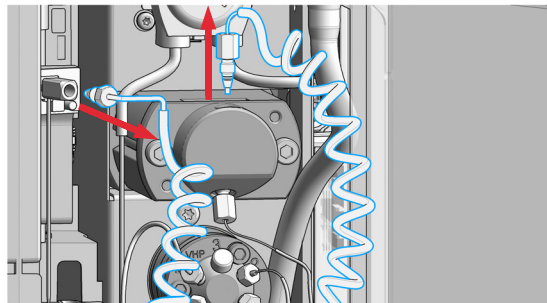
- 5 In Lab Advisor use **Next** to move the needle in the down position (ca. 2 mm above the seat).

OR

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



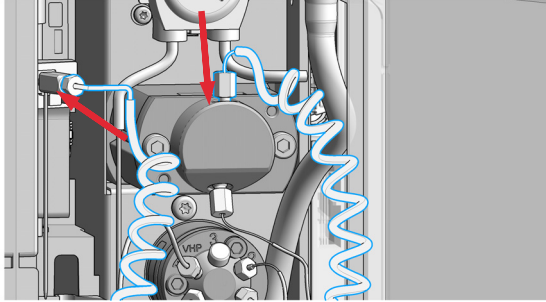
- 6 Disconnect the loop capillary from the metering device and from the needle.



Maintenance

Exchange the Sample Loop Assembly

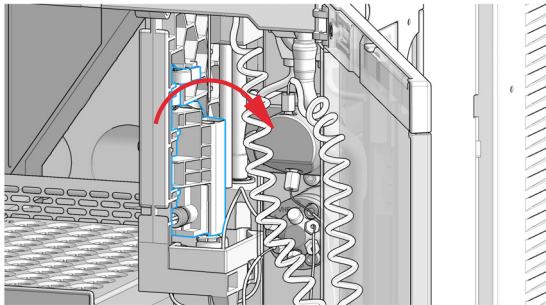
- 7** Reinstall the new sample loop. Make sure of the correct positioning of the loop capillary, the uncoated part of the capillary must be horizontal.



NOTE

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

- 9** Move the wash port back to its normal position by turning it to the right.



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

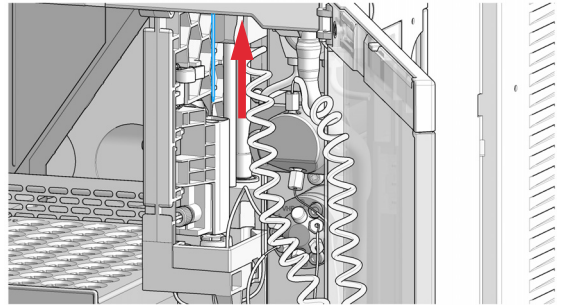
OR

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

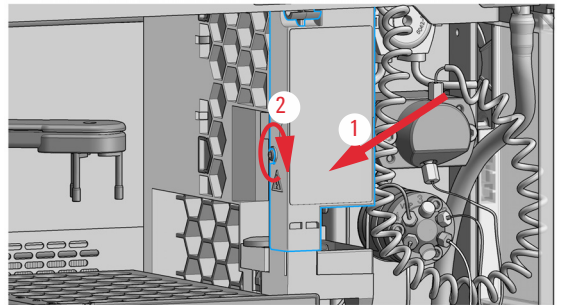
- 8** In Lab Advisor use **Next** to lift the needle slowly into the up position.

OR

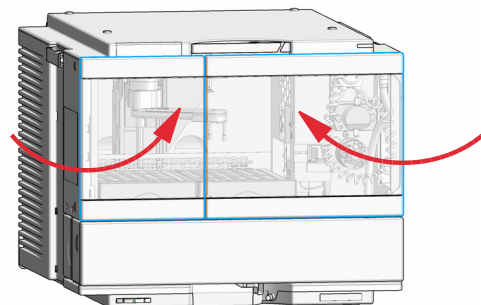
In the Local Controller, move the needle up to the uppermost position.



- 10** Install the safety cover (1) and fix the screw (2).



- 12** Close the doors.



- 13** Perform a **Pressure Test**.

Exchange the Rotor Seal

When When poor injection volume reproducibility or when injection valve is leaking.

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
		Cleaning tissue and appropriate solvent like isopropanol or methanol

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

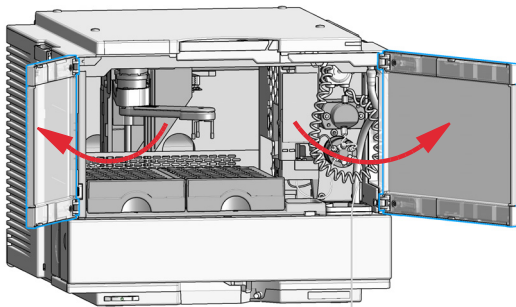
The stator face is held in place by the stator head. When you remove the stator head, the stator face can fall out of the valve.

- ✓ Carefully handle the valve to prevent damage to the stator face.
- ✓ Carefully handle the stator face during sonication.

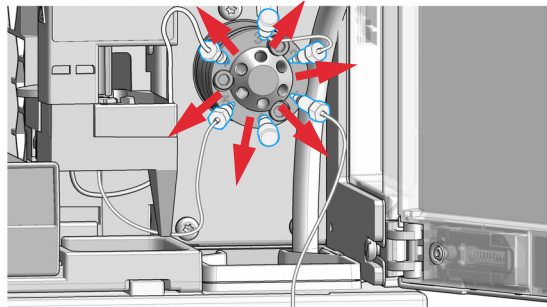
Maintenance

Exchange the Rotor Seal

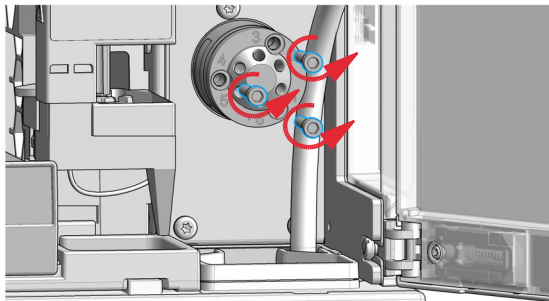
1 Open the front door.



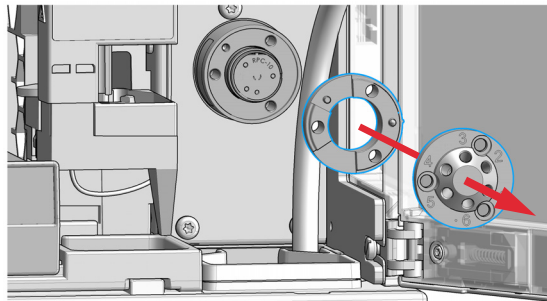
2 Remove all capillaries from the injection valve with a 1/4 inch wrench.



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



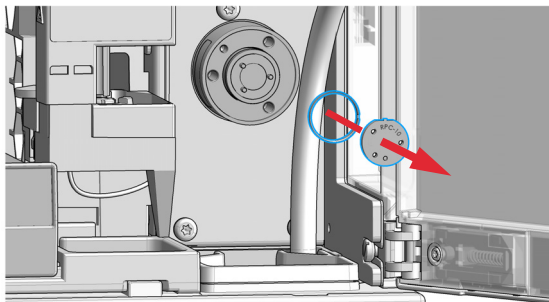
4 Remove the stator head and stator ring.



Maintenance

Exchange the Rotor Seal

5 Remove the rotor seal and isolation seal.

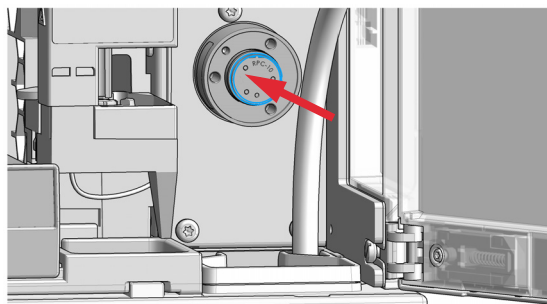


CAUTION

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 the valve.

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



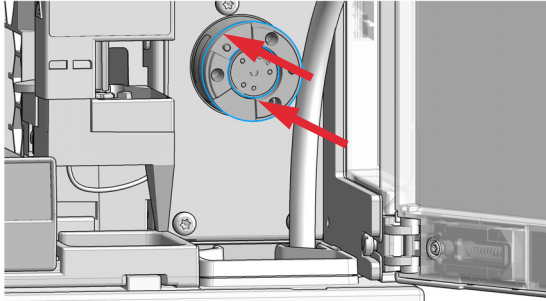
NOTE

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

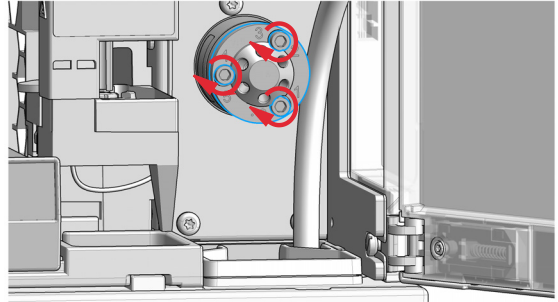
Maintenance

Exchange the Rotor Seal

- 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.



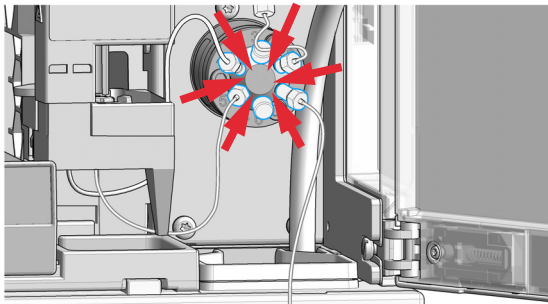
NOTE

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.

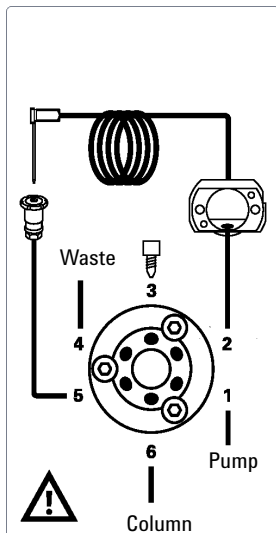
Maintenance

Exchange the Rotor Seal

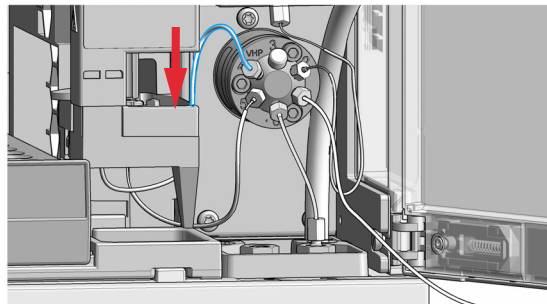
9 Reconnect the capillaries and tubes to the valve ports.



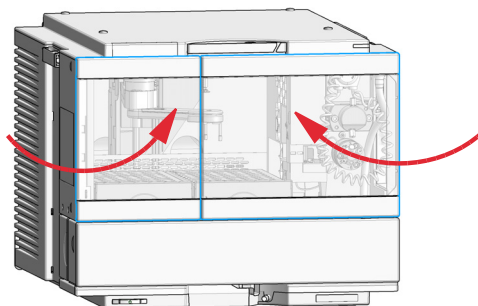
The correct plumbing is shown below and on the safety cover of the module.



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



11 Close the doors.



12 Perform a **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
	8710-2392	4 mm Hex key
	8710-2411	3 mm Hex key, 12 cm long
	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 Assembly, 900 µL

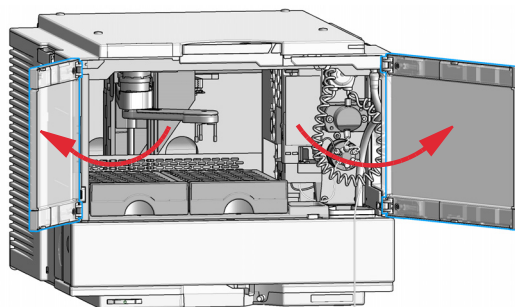
Preparations Finish any pending acquisition job and in order to avoid leaks, stop the pump running.

NOTE

When the instrument setup has changed, configure the new setup in the online view of the Chromatographic Data System. See [Table 9](#) on page 84

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.

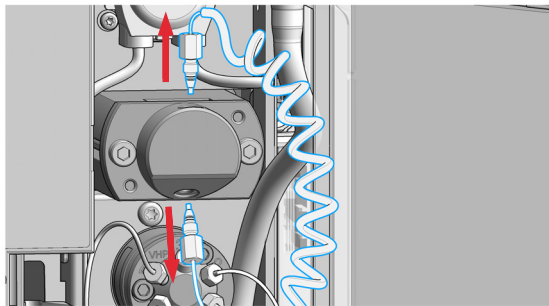
2 Open the front door.



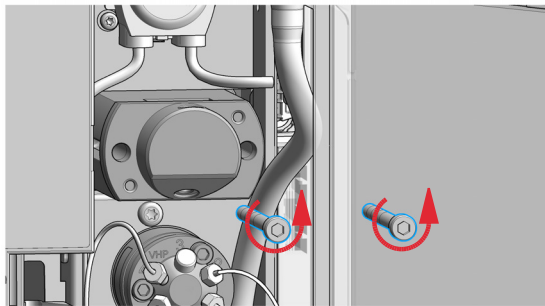
Maintenance

Exchange the Metering Seal and Piston

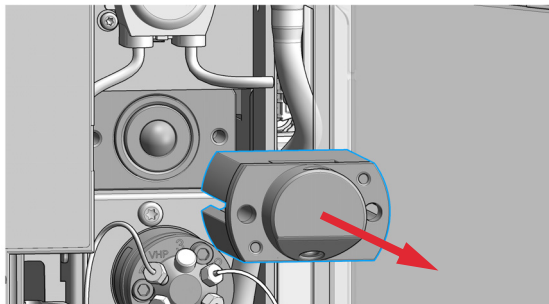
- 3 Disconnect the two capillaries from the metering device.



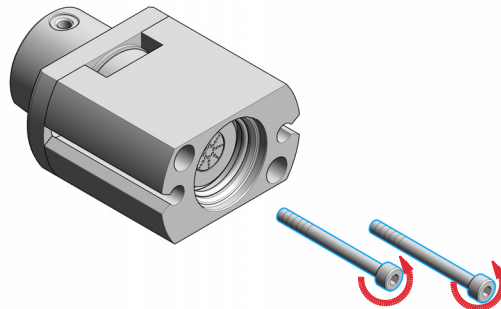
- 4 Remove the two fixing bolts.



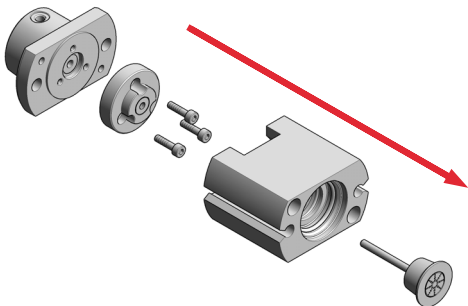
- 5 Pull the metering head assembly away from the sampler.



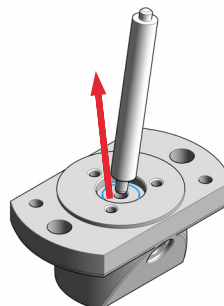
- 6 Remove the two fixing bolts from the base of the metering head assembly.



- 7 Disassemble the metering head assembly.



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

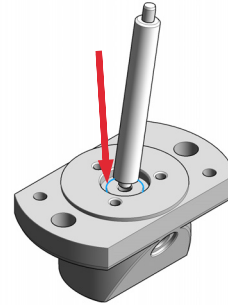


Maintenance

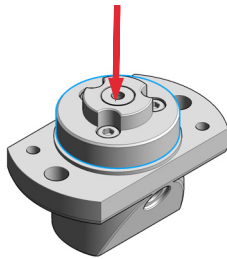
Exchange the Metering Seal and Piston

9 Clean the chamber with lint-free cloth and an appropriate solvent. Ensure all particulate matter is removed.

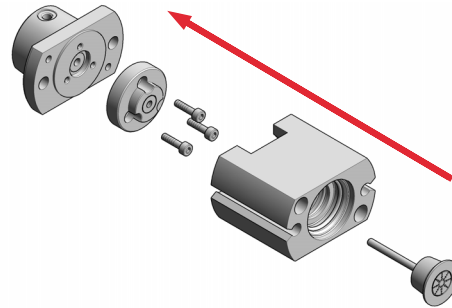
10 Use the plastic side of the insert tool to install the new seal. Press the seal firmly into position.



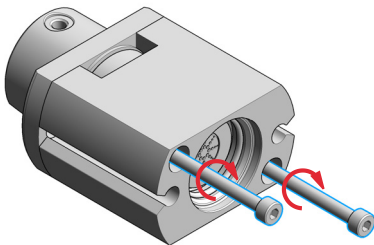
11 Place the piston guide on top of the seal.



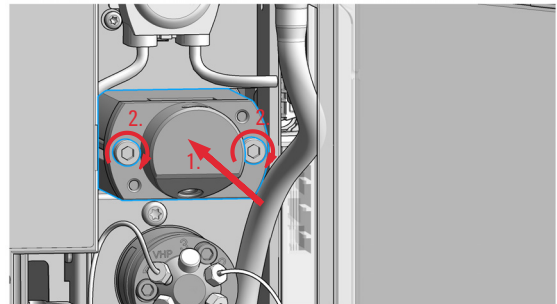
12 Reassemble the metering head assembly. Carefully insert the piston into the base. The closed side of the metering head must be on the same side as the lower one of the two capillary drillings.



13 Install the fixing bolts. Tighten the bolts securely. Tighten the bolts alternately two turns at a time until the stator head is secure. The housing must be flush with the metering head.

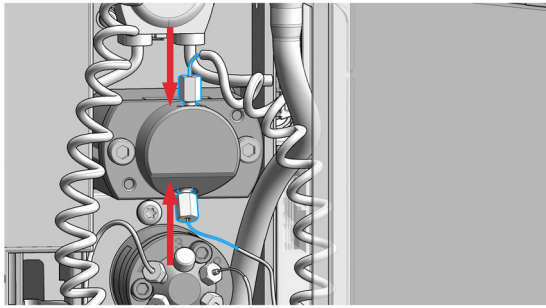


14 Install the metering head assembly in the autosampler. Ensure the large hole in the metering head is facing downwards. Tighten the bolts alternately two turns at a time until the metering device is secure.



Exchange the Metering Seal and Piston

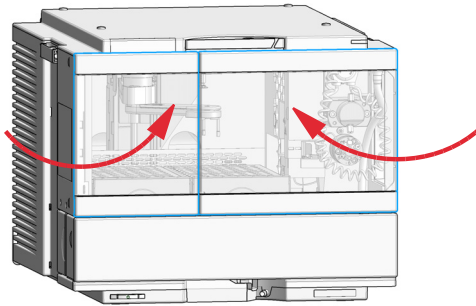
15 Reinstall the capillaries.



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 **Pressure Test**.

Exchange the Gripper Arm

When Defective gripper arm

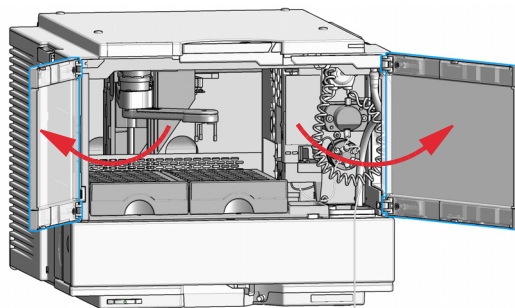
Tools required **Description**
Straightened paper clip.

Parts required **p/n** **Description**
G1313-60010 Gripper assembly

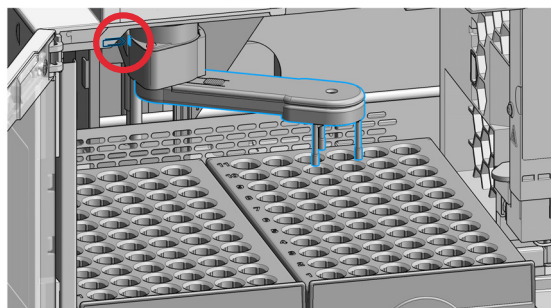
Preparations Finish any pending acquisition job

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

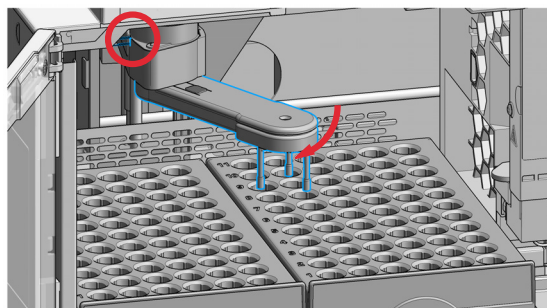
2 Open the front door.



3 Identify the slit below the gripper motor and the gripper arm release button.



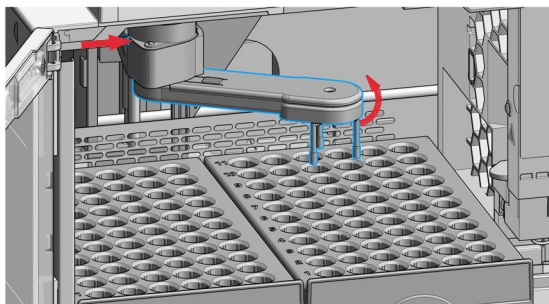
4 Rotate the arm approximately 2.5 cm (1 inch) to the left and insert the straightened paper clip into the slit.



Maintenance

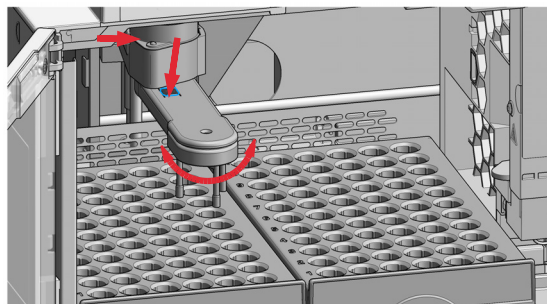
Exchange the Gripper Arm

- 5 Rotate the gripper arm slowly from left to right and apply a gentle pressure to the paper clip.

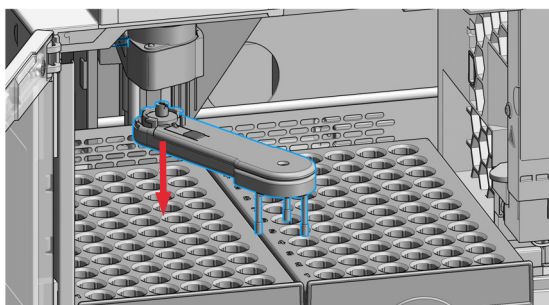


The clip will engage on an internal catch and the rotation of the arm will be blocked.

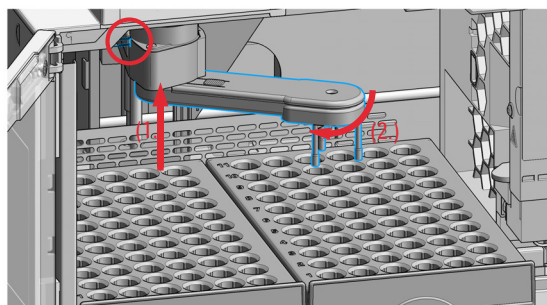
- 6 Hold the paper clip in place, press the gripper release button and rotate the gripper arm to the right.



- 7 The gripper arm will come off.



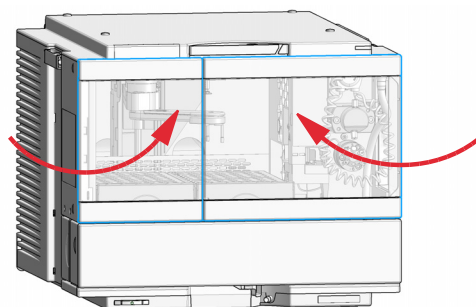
- 8 Replace the gripper arm by holding the paper clip in place, pushing the gripper arm into the holder and rotating the gripper arm to the left.



- 9 In the Agilent Lab Advisor software select **Change gripper**> **Next**, click **Next** and wait until the gripper is in the default position.

- 10 Select **Back** to finish the procedure.

- 11 Close the doors.



Replace the Peristaltic Pump Cartridge

When Tubing blocked or broken

Tools required Description

Parts required	p/n	Description
	5065-4445	Peristaltic pump with Pharmed tubing

Preparations Remove the inlet filter of the solvent bottle which guides the solvent to the peristaltic pump to avoid syphoning effects.

WARNING

When opening capillary or tube fittings solvents may leak out.

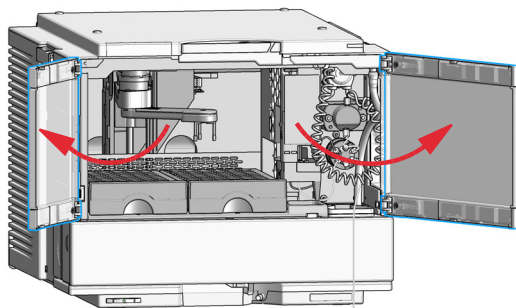
The handling of toxic and hazardous solvents and reagents can hold health risks.

- ✓ 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.

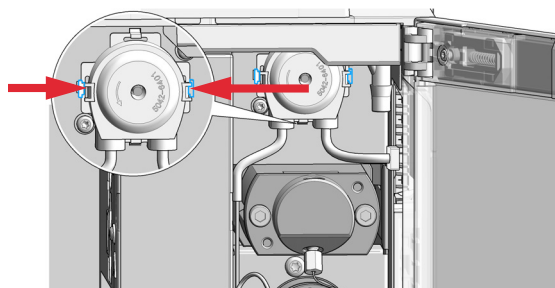
NOTE

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

1 Open the front door.

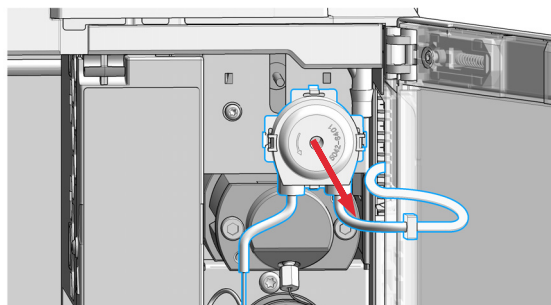


2 Press the two clips on the front of the peristaltic pump cartridge.

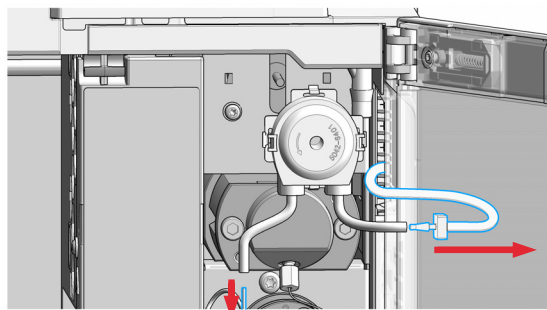


Replace the Peristaltic Pump Cartridge

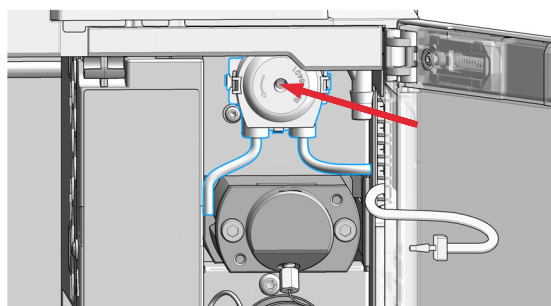
- 3 Pull the cartridge forward off the motor shaft.



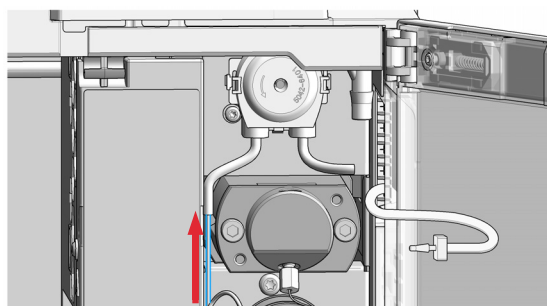
- 4 Disconnect the tubing coupler leading to the wash port and the tubing coupler coming from the solvent bottle.



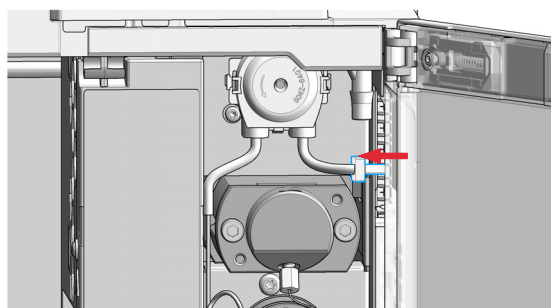
- 5 Push the new cartridge onto the motor shaft until the clips click into place.



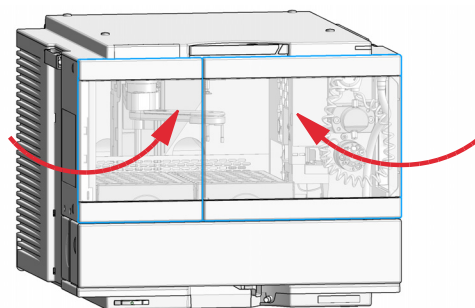
- 6 Connect the wash port tubing to the upper tubing of the new cartridge (use sand paper to get a good grip on the tubing).



- 7 Connect the inlet filter of the solvent bottle. Use the syringe to draw enough solvent for completely filling of the peristaltic pump tubing before continuing to prime the peristaltic pump.



- 8 Close the doors.



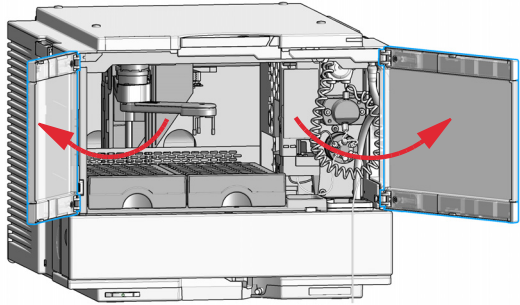
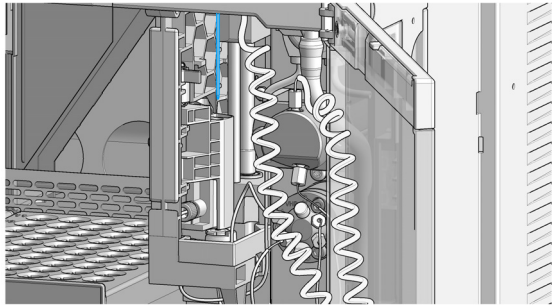
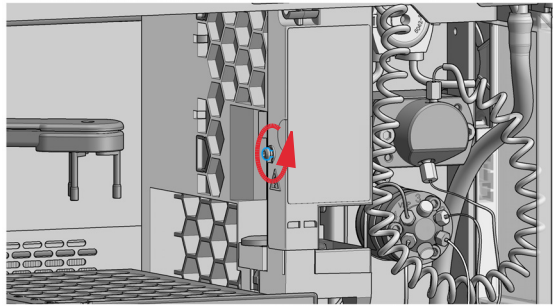
Exchange the Wash Port Assembly

When Defective flapper

Tools required	p/n	Description
	5182-3466	Torx screwdriver T10
OR	5023-3089	Torx key set

Parts required	p/n	Description
	G7129-60033	Safety Wash Port (needle station)

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.

<p>1 In the Agilent Lab Advisor software select Service & Diagnostics in the system screen Maintenance Positions > Change Needle, Loop and Seat, click Start and wait until the needle assembly is in maintenance position.</p>	<p>2 Open the front door.</p> 
<p>3 Verify that the needle is in the uppermost position before continuing.</p> 	<p>4 Unscrew the safety cover screw.</p> 

Maintenance

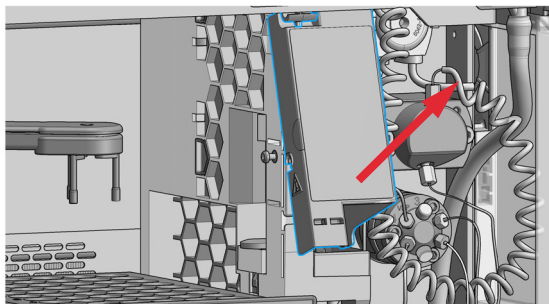
Exchange the Wash Port Assembly

WARNING

Sharp needle
Uncovered needles may cause injuries

✓ Do not touch the tip of the needle.

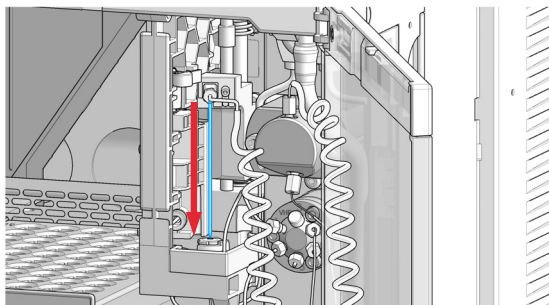
5 Remove the safety cover.



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.



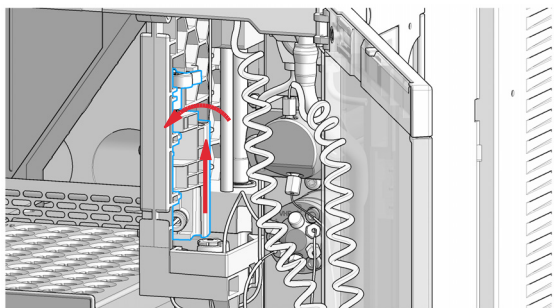
WARNING

Sharp needle
Uncovered needles may cause injuries.

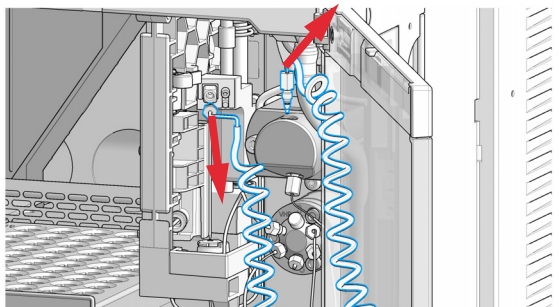
✓ Do not change the needle seat at this point.

✓ 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.



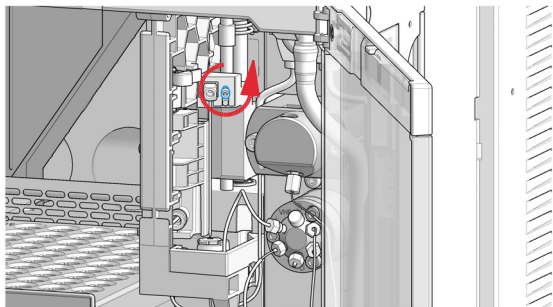
8 Disconnect the sample loop from the needle.



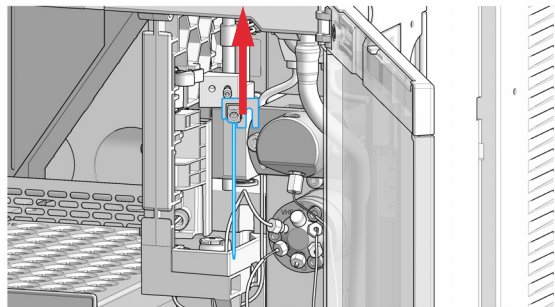
Maintenance

Exchange the Wash Port Assembly

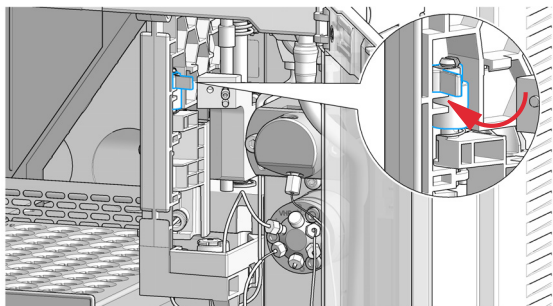
9 Loosen the fixing screw.



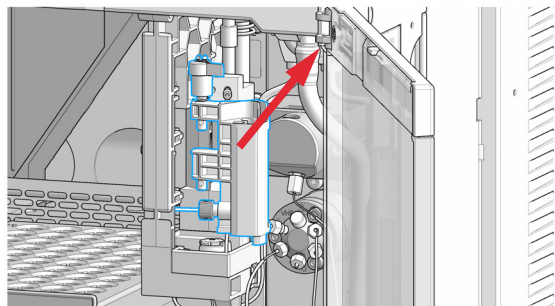
10 Lift out the needle.



11 Release the spring loaded pin.



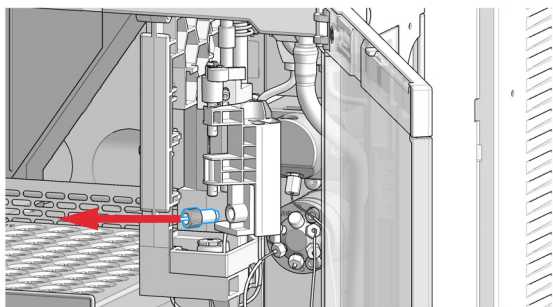
12 Flap the wash port to the right and lift it out of the bracket. Be careful not to squeeze the wash tubing.



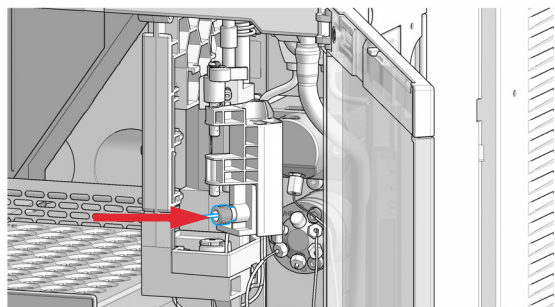
NOTE

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.



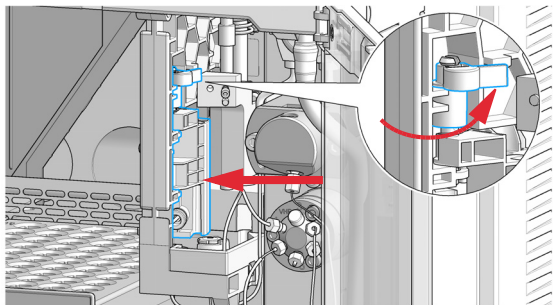
14 Connect the wash tubing fitting to the new wash port assembly.



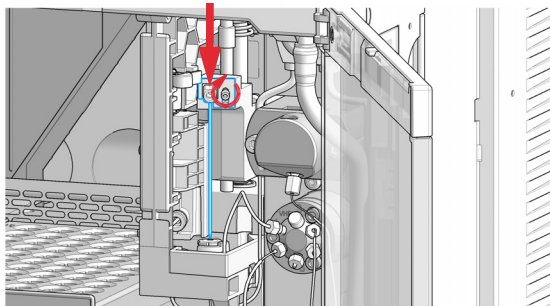
Maintenance

Exchange the Wash Port Assembly

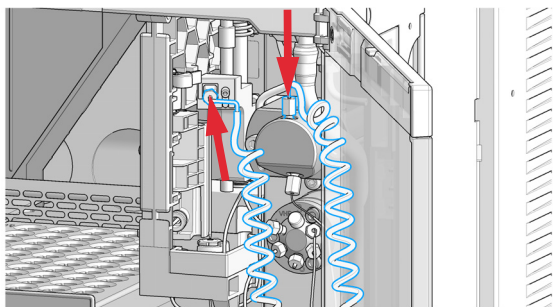
- 15** Install the new wash port by mounting it in the respective brackets of the needle station housing. The pin must be latched on the housing. Check the movement of the flapping mechanism. Check if the tension on the spring is high enough to move the wash port back to position in time. When everything 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. Make sure that the needle tip is concentric with the seat.



- 17** Reconnect the sample-loop to the needle. Make sure of the correct positioning of the loop capillary, the uncoiled part of the capillary must be horizontal.



NOTE

Do not overtighten the fitting!

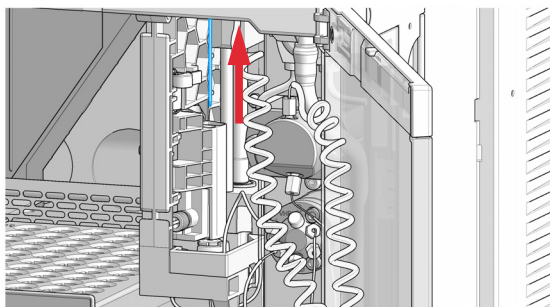
NOTE

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

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

OR

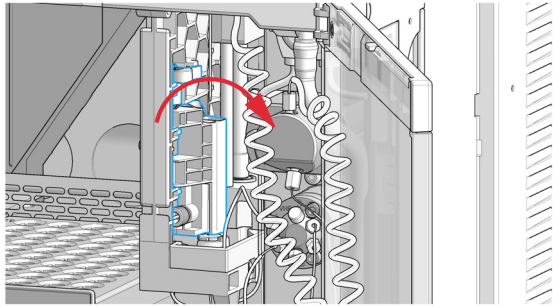
In the Local Controller, move the needle up to the uppermost position.



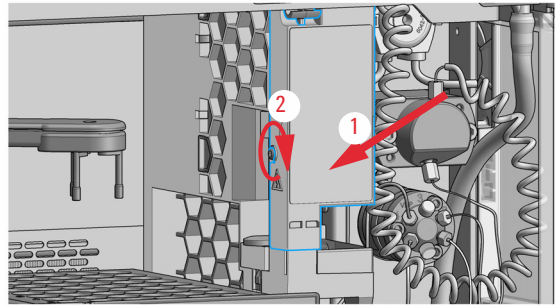
Maintenance

Exchange the Wash Port Assembly

- 19** Move the wash port back to its normal position by turning it to the right.



- 20** Install the safety cover (1) and fix the screw (2).

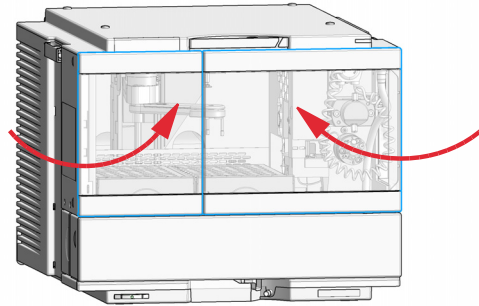


- 21** In Lab Advisor, select **Next** to move the needle into the needle seat and then **Back** to finish the maintenance procedure.

OR

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

- 22** Close the doors.



- 23** Purge the wash port. Check if solvent will be delivered from the peristaltic pump.

Replace the Module Firmware

When	<p>The installation of newer firmware might be necessary</p> <ul style="list-style-type: none"> • if a newer version solves problems of older versions or • to keep all systems on the same (validated) revision. <p>The installation of older firmware might be necessary</p> <ul style="list-style-type: none"> • 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	<p>Description</p> <p>Agilent Lab Advisor software</p>				
Parts required	<table> <thead> <tr> <th>#</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Firmware, tools and documentation from Agilent web site</td> </tr> </tbody> </table>	#	Description	1	Firmware, tools and documentation from Agilent web site
#	Description				
1	Firmware, tools and documentation from Agilent web site				
Preparations	<p>Read update documentation provided with the Firmware Update Tool.</p> <p>To upgrade/downgrade the module's firmware carry out the following steps:</p> <ol style="list-style-type: none"> 1 Download the required module firmware, the latest FW Update Tool and the documentation from the Agilent web. http://www.agilent.com/en-us/firmwareDownload?whid=69761 2 For loading the firmware into the module follow the instructions in the documentation. <p><i>Module Specific Information</i></p> <p>There is no specific information for this module.</p>				



10

Parts and Materials for Maintenance

Main Assemblies	186
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External Tray	190
Analytical-Head Assembly (900 μ L)	191
Prep Valve	192
Standard Prep Sampler Accessory Kit	193
Multi-Draw Kit	194
Additional Part List	195

This chapter provides information on parts for maintenance.

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	Drawer-Kit 100 x 2 mL Vials Classic
	G7129-60210	Drawer for 50 x 2 mL Vials Classic Left
	G7129-60220	Drawer for 50 x 2 mL Vials Classic Right
2	5067-4277	2pos/6port Injection Valve, prep, 600 bar
3	G1313-60010	Gripper assembly
4	G7129-60083	Analytical Head Assembly 900 μ L
5	5065-4445	Peristaltic pump with Pharmed tubing

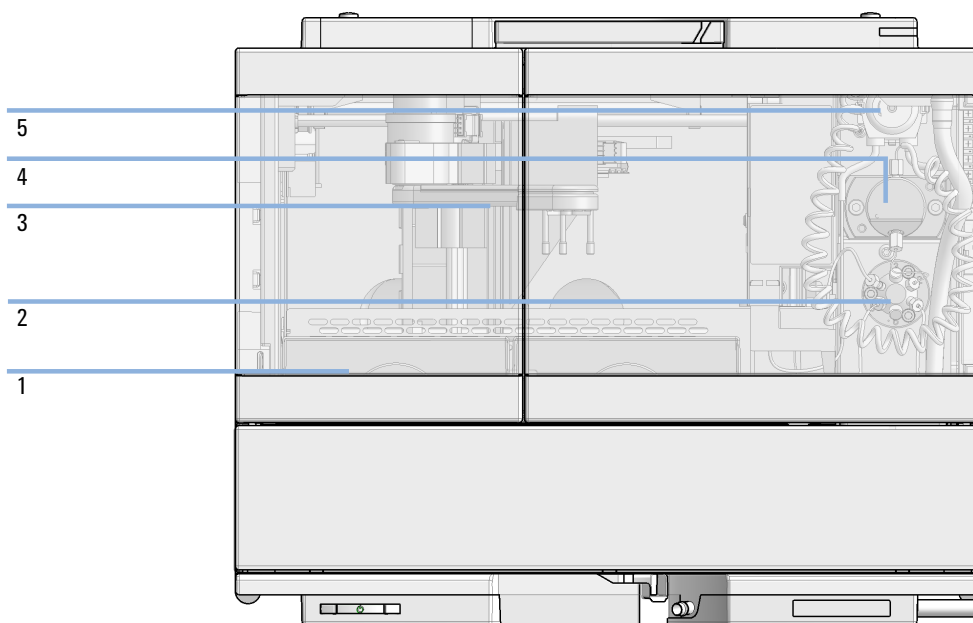


Figure 20 Main assemblies

Standard Parts

p/n	Description
5065-4445	Peristaltic pump with Pharmed tubing
5063-6506	Finger caps (x3) ¹
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	2pos/6port Injection Valve, prep, 600 bar

¹ Reorder gives pack of 15

Drawer Assembly

Item	p/n	Description
	G7129-60010	Drawer for 66 x 2 mL Vials
	G7129-60110	Drawer for 18 x 6 mL Vials
	G7129-68210	Drawer-Kit 100 x 2 mL Vials Classic
1	G7129-60210	Drawer for 50 x 2 mL Vials Classic Left
2	G7129-60220	Drawer for 50 x 2 mL Vials Classic Right
	G7129-68210	Drawer-Kit 100 x 2 mL Vials Classic

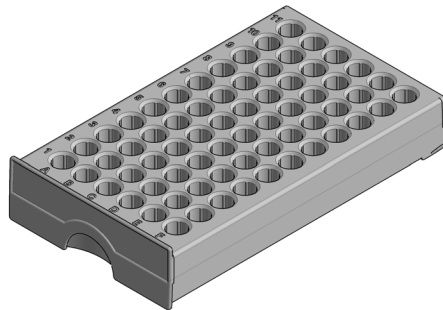


Figure 21 Drawer for 66 x 2.0 mL Vials

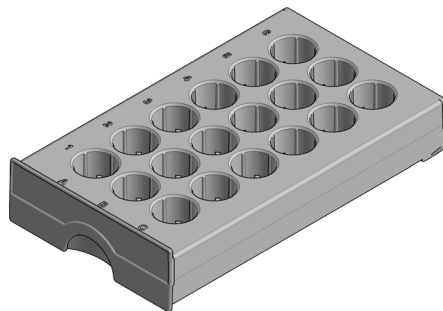


Figure 22 Drawer for 18 x 6 mL Vials

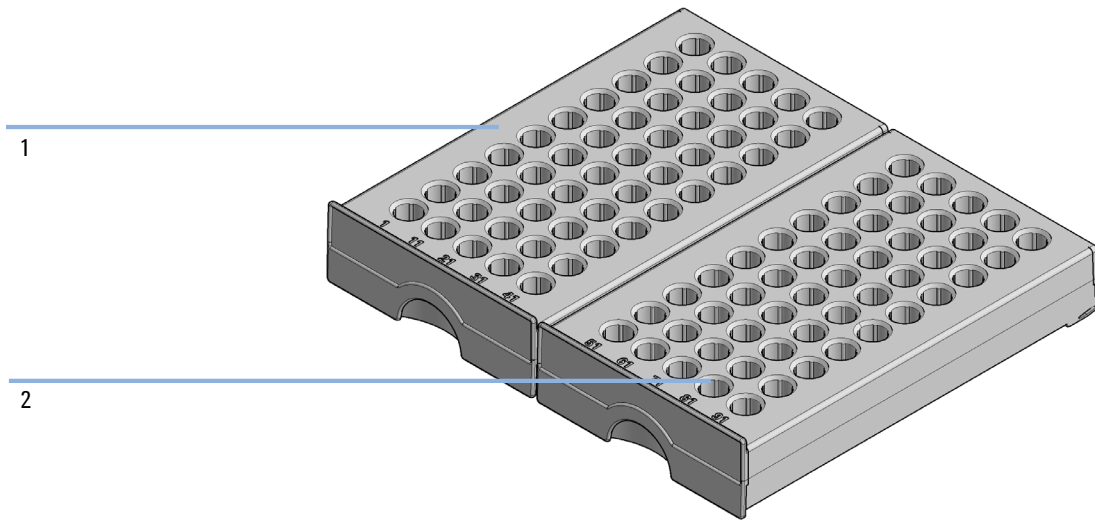


Figure 23 Drawer-Kit 100 x 2 mL Vials Classic

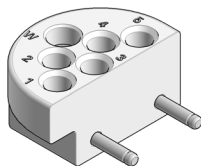
1	Drawer for 50 x 2 mL Vials Classic Left
2	Drawer for 50 x 2 mL Vials Classic Right

NOTE

It is required that all drawers are put into correct positions, that is, classical drawer 1-50 must be on the left side and classical drawer 51-100 on the right side.

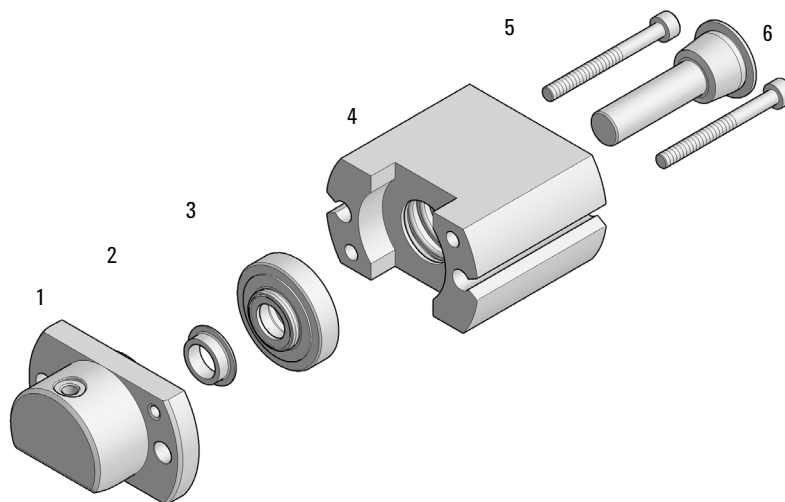
External Tray

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

**Figure 24** 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	Support seal assembly, 900 µL
4	G7129-60006	Adapter-Assembly Analytical-Head
5	0515-0850	Screws
6	G4267-60462	Piston Assembly, 900 µL

**Figure 25** Analytical head assembly (900 µL)

Prep Valve

Item	p/n	Description
	5067-4277	2pos/6port Injection Valve, prep, 600 bar
1	5068-0018	Stator screws
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

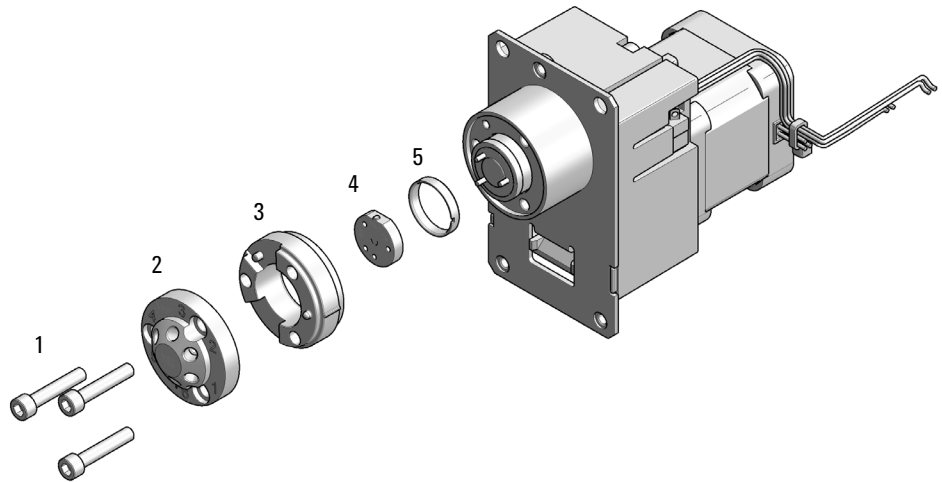
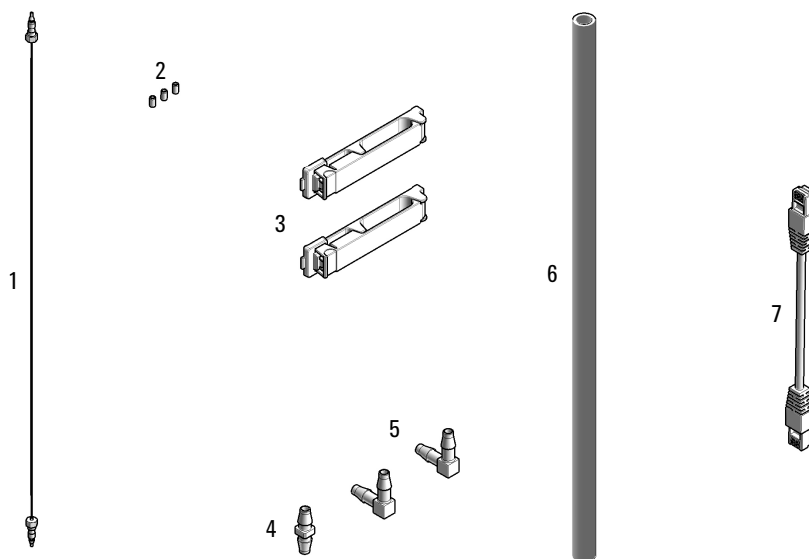


Figure 26 2ps 6pt Injection Valve 600 bar

Standard Prep Sampler Accessory Kit

Standard Vialsampler/Prep sampler Accessory Kit (G7129-68705) contains the following parts:

Item #	#	p/n	Description
1	1	5500-1251	Capillary ST 0.12 mmX 400 mm SL/SL
2	3	G1313-44101	Finger Cap
3	1	5043-1013	Tubing Clip
4	1	5500-1254	Tube connector 180 °
5	1	5500-1155	Tube Connector, 90 degree, ID 6.4
6	1	5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
7	1	5181-1519	CAN cable, Agilent module to module, 1 m
	1	5067-5967	Tubing Clip Tube Connector (not shown)



Multi-Draw Kit

The Multi-Draw Kit (G7157-68711) extends injection volumes up to 3600 μL . The Kit contains the following items:

p/n	Description
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.

Additional Part List

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



11

Identifying Cables

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CAN/LAN Cables	205
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USB	207

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)

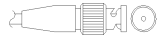
RS-232 cables
(not for
FUSION board)

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



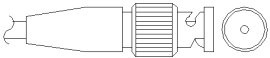
One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

Agilent Module to 35900 A/D converters

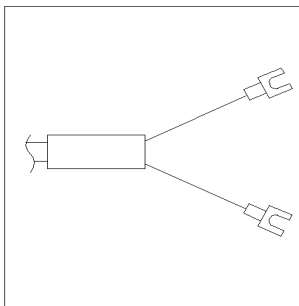
p/n 35900-60750	35900	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

Identifying Cables
Analog Cables

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)
<p>D-Sub female 15way user's view to connector</p>	1	white	I01	START REQUEST	Low
	2	brown	I02	STOP	Low
	3	green	I03	READY	High
	4	yellow	I04	POWER ON	High
	5	grey	I05	NOT USED	
	6	pink	I06	SHUT DOWN	Low
	7	blue	I07	START	Low
	8	red	I08	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			

Identifying Cables


Remote Cables

- 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 15 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		

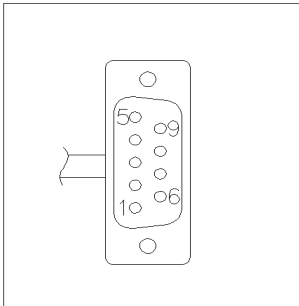


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

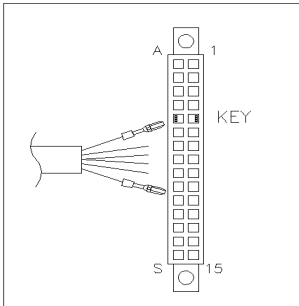
Identifying Cables

Remote Cables

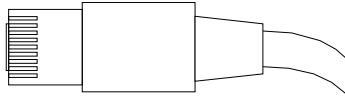
Agilent Module to Agilent 35900 A/D Converters

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)

12

Hardware Information

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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: <http://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.

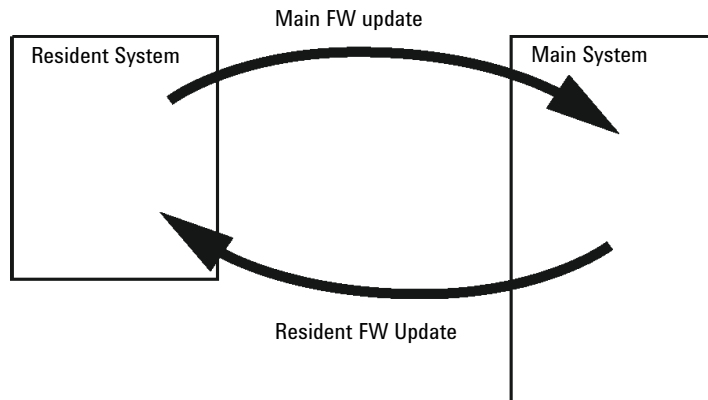


Figure 27 Firmware Update Mechanism

NOTE

Some modules are limited in downgrading due to their main board 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.

- <http://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 \pm 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

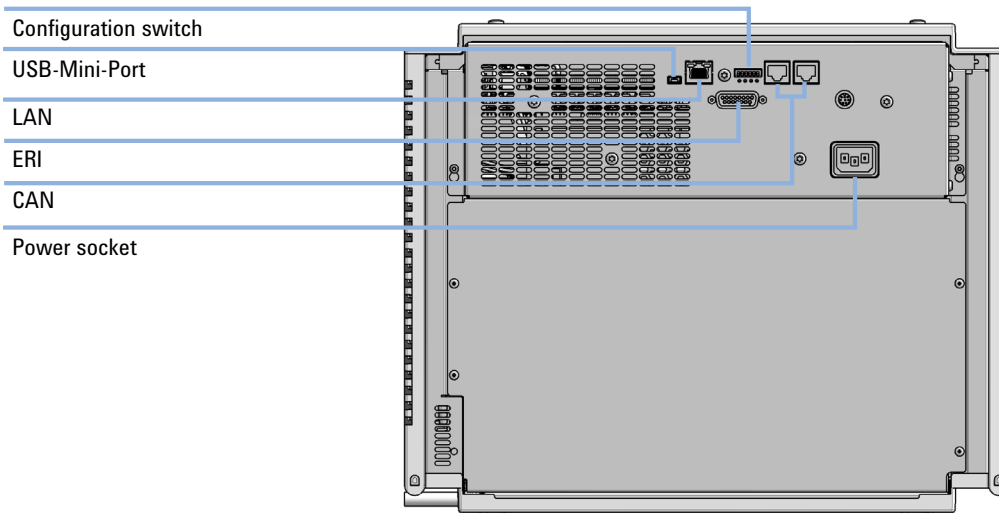


Figure 28 Rear view of the sampler - electrical connections and label

Serial Number Information

The serial number information on the instrument labels provide the following information:

CCXZZ00000	Format
CC	Country of manufacturing <ul style="list-style-type: none"> • 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 16 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	2	No	Yes	Yes	1	A	
G7161A/B	2	Yes	Yes	No	No	E	
Samplers							
G7129A/B/C	2	Yes	Yes	No	No	E	
G7167B/C, G5667A	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 16 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							
G7116A/B	2	No	No	No	No	No	Requires a HOST module via CAN
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 220.

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module’s main board.

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 17 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.

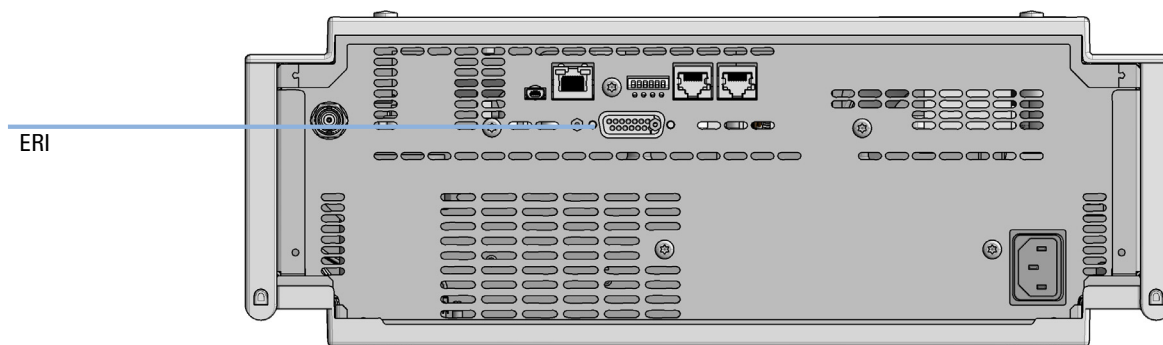


Figure 29 Location of the ERI interface (example shows a G7114A/B VWD)

	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 turn on of the hosting module (assures that certain base functionality of the device can be detected by firmware).
- For digital circuits or similar.
- Provided 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.

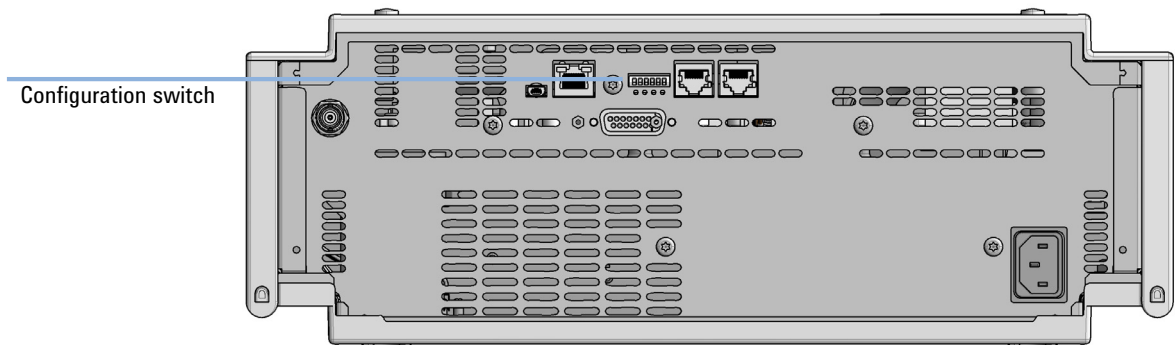


Figure 30 Location of Configuration switch (example shows a G7114A/B VWD)

Table 18 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 19 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 which are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the module and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (**EMF**) feature monitors the usage 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.

13

LAN Configuration

What You Have to Do First	228
TCP/IP parameter configuration	229
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PC Setup for Local Configuration	240
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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 228).

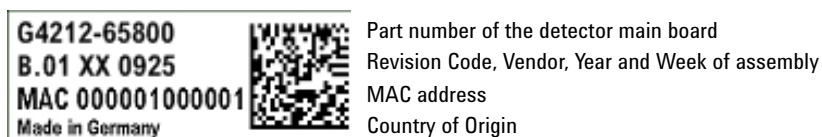


Figure 31 MAC-Label

- 2 Connect the instrument's LAN interface (see [Figure 32](#) on page 228) to
 - the PC network card using a crossover network cable (point-to-point) or
 - a hub or switch using a standard LAN cable.

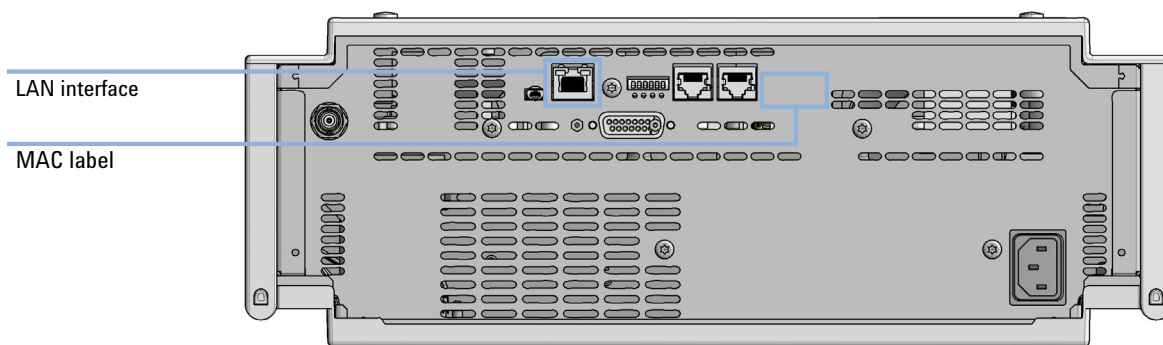


Figure 32 Location of LAN interfaces and MAC label

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 234
- 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 20](#) on page 231.

Configuration Switches

The configuration switch can be accessed at the rear of the module.

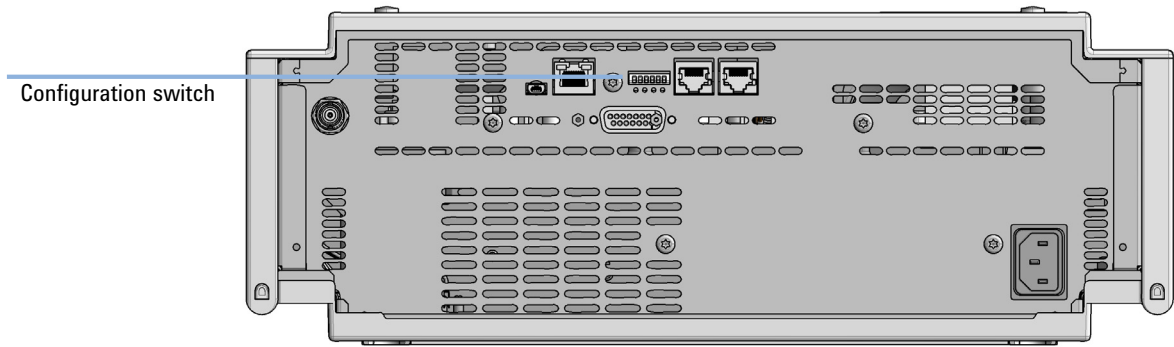


Figure 33 Location of Configuration switch (example shows a G7114A/B VWD)

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 20 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.

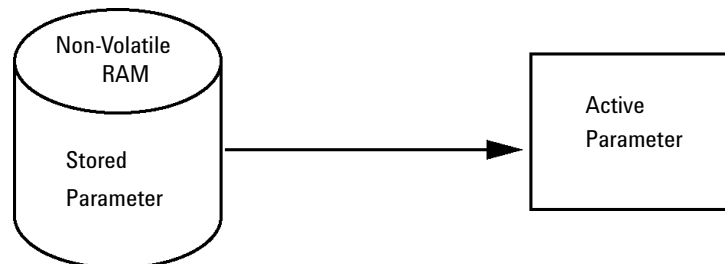


Figure 34 Using Stored (Principle)

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 21](#) on page 232.

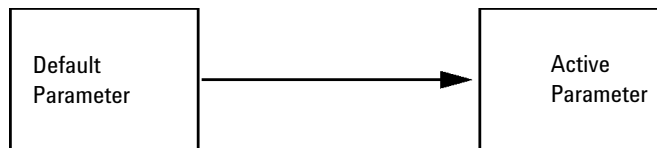


Figure 35 Using Default (Principle)

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 21 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).

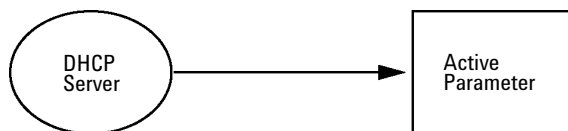


Figure 36 DHCP (Principle)

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.

- Note the MAC address of the LAN interface (provided with G1369C LAN Interface Card or Main Board). This MAC address is on a label on the card or at the rear of the main board, e.g. *0030d3177321*.

On the Local Controller the MAC address can be found under **Details** in the LAN section.

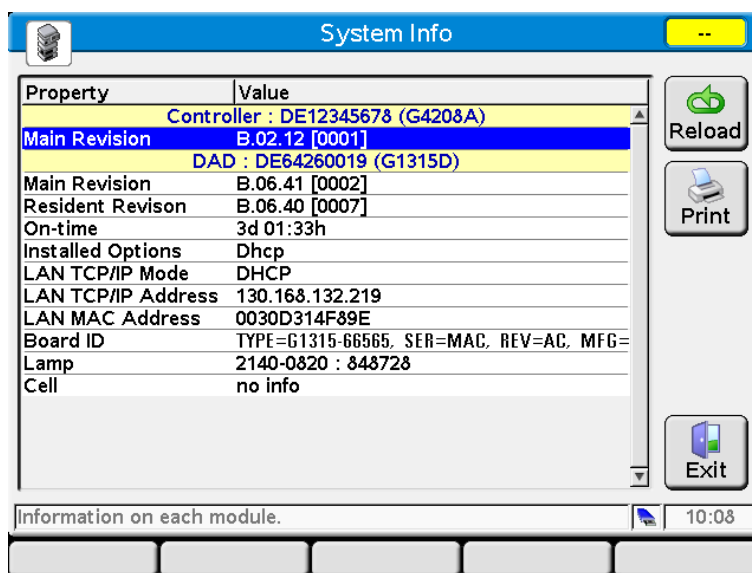


Figure 37 LAN Setting on Instant Pilot

- Set the Configuration Switch to DHCP either on the G1369C LAN Interface Card or the main board of above mentioned modules.

Table 22 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 23 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 233).

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.

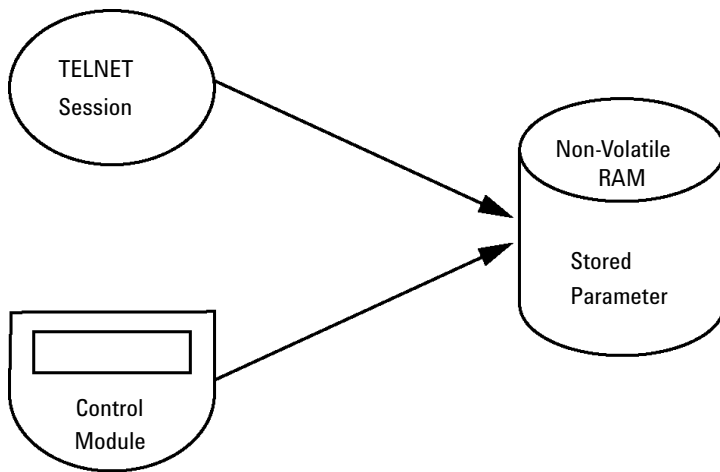
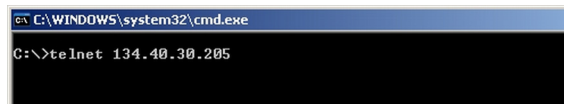


Figure 38 Manual Configuration (Principle)

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>

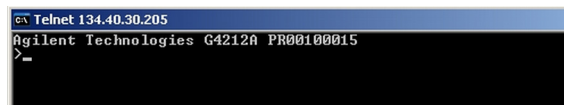


```
C:\WINDOWS\system32\cmd.exe
C:\>telnet 134.40.30.205
```

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 230).

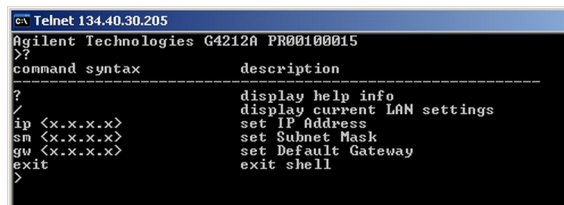
When the connection was established successfully, the module responds with the following:



```
Telnet 134.40.30.205
Agilent Technologies G4212A PR00100015
>_
```

Figure 40 A connection to the module is made

- 3 Type ? and press enter to see the available commands.



```
Telnet 134.40.30.205
Agilent Technologies G4212A PR00100015
>?
command syntax      description
-----
?                    display help info
/                    display current LAN settings
ip <x.x.x.x>          set IP Address
sn <x.x.x.x>          set Subnet Mask
gw <x.x.x.x>          set Default Gateway
exit                exit shell
>
```

Figure 41 Telnet Commands

Table 24 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.

```

c:\ Telnet 134.40.30.205
>/
LAN Status Page
-----
MAC Address   : 0030D317521C
-----
Init Mode    : Using Stored
-----
TCP/IP Properties
- active -
IP Address   : 134.40.30.205
Subnet Mask  : 255.255.240.0
Def. Gateway : 134.40.24.1
-----
TCP/IP Status : Ready
-----
Controllers  : no connections
>_

```

Figure 42 Telnet - Current settings in "Using Stored" mode

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

- 6 Change the IP address (in this example 192.168.254.12) and type "/" to list current settings.

```

c:\ Telnet 134.40.30.205
>ip 192.168.254.12
>/
LAN Status Page
-----
MAC Address   : 0030D317521C
-----
Init Mode    : Using Stored
-----
TCP/IP Properties
- active -
IP Address   : 134.40.30.205
Subnet Mask  : 255.255.248.0
Def. Gateway : 134.40.24.1
- stored -
IP Address   : 192.168.254.12
Subnet Mask  : 255.255.248.0
Def. Gateway : 134.40.24.1
-----
TCP/IP Status : Ready
-----
Controllers  : no connections
>_

```

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.

```

c:\WINDOWS\system32\cmd.exe
Agilent Technologies G4212A PR00100015
>exit

Connection to host lost.
C:\>_

```

Figure 44 Closing the Telnet Session

NOTE

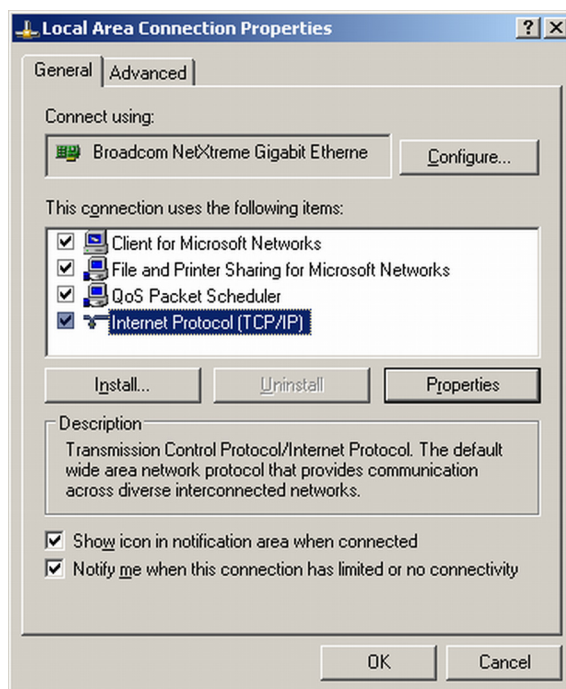
If the Initialization Mode Switch is changed now to "Using Stored" mode, the instrument will take the stored settings when the module is re-booted. In the example above it would be 192.168.254.12.

PC and Agilent ChemStation Setup

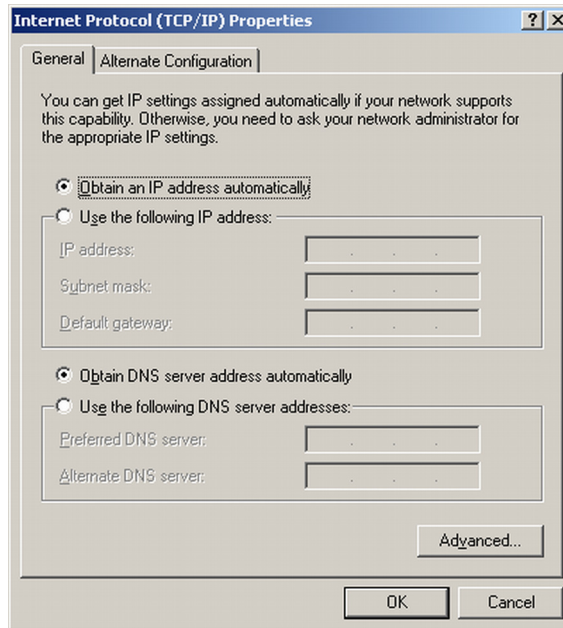
PC Setup for Local Configuration

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 21](#) on page 232).

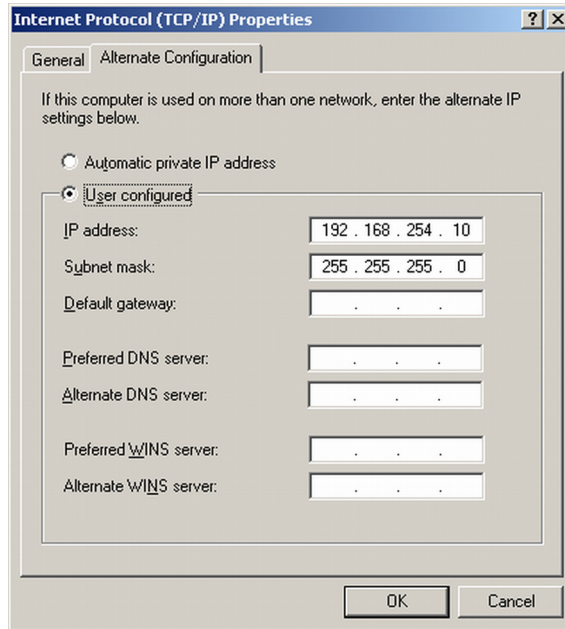
- 1 Open the Local Area Connection Properties and select **Internet Protocol (TCP/IP)**. Then click on **Properties**.



- 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.

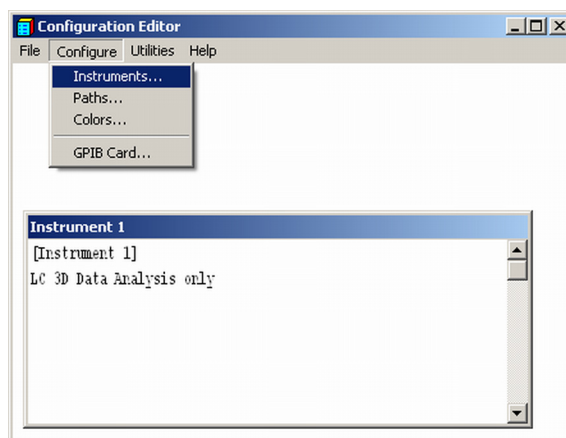
Agilent ChemStation Setup

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

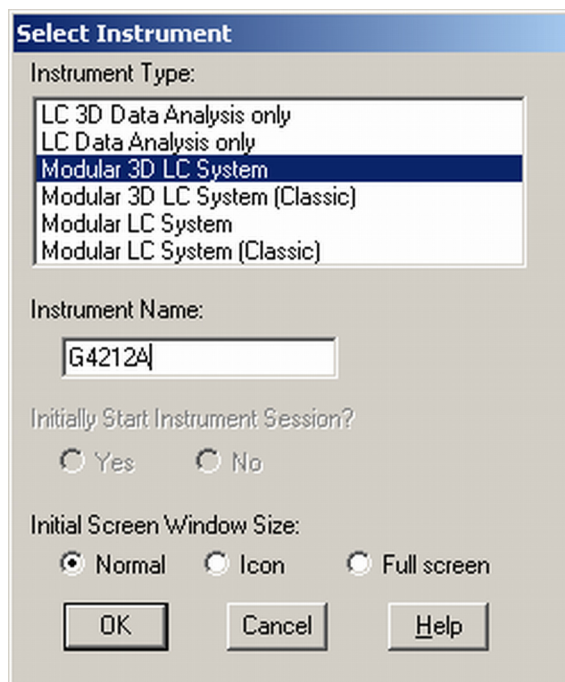
The LAN must be connected to detector due to high data load on communication to Control Software.

- 1 Open the ChemStation Configuration Editor.

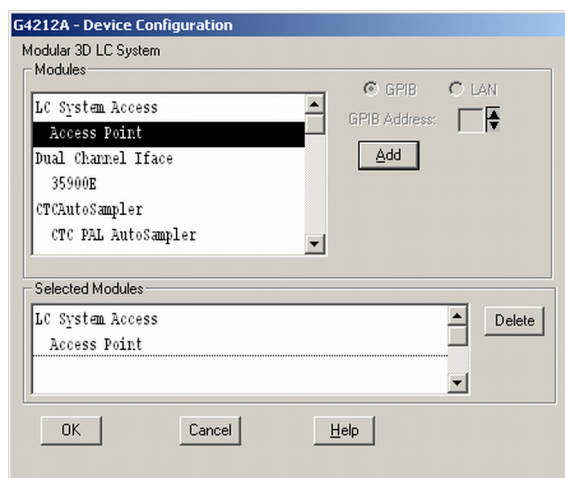


- 2 Select from the menu **Configure - Instruments**.
- 3 Select **Modular 3D LC System**.
- 4 Give the Instrument a name.

- Click on **OK**.



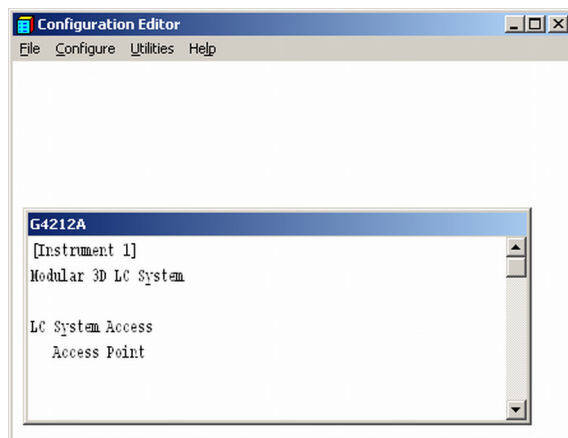
- Select **LC System Access – Access Point** and click on **Add**.



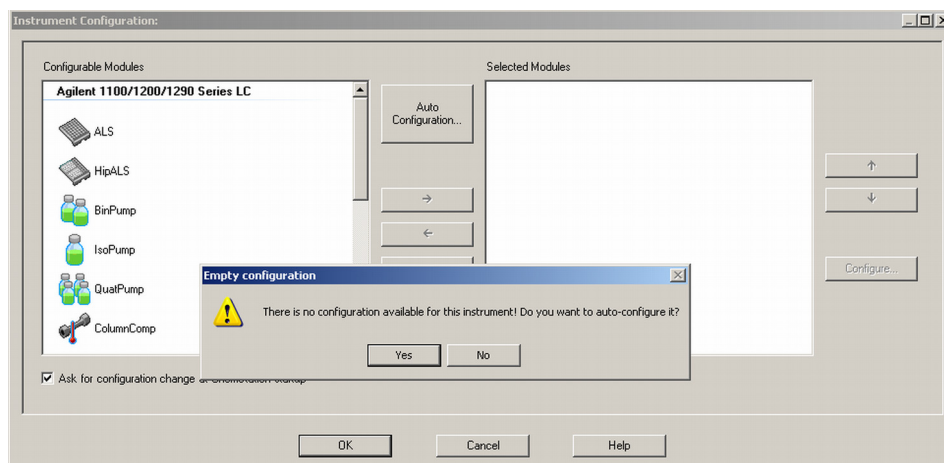
- Click on **OK**.

The Configuration Editor shows now the new instrument.

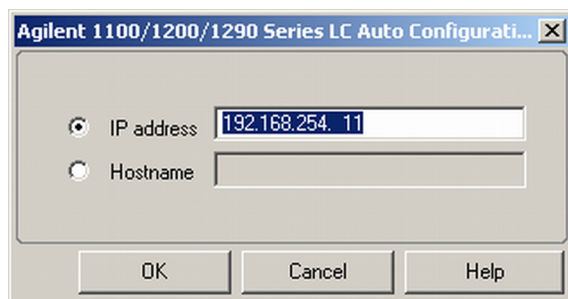
- 8 If required, change under **Configure – Path** the folder locations.
- 9 Save the current configuration via **File – Save**.



- 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**.



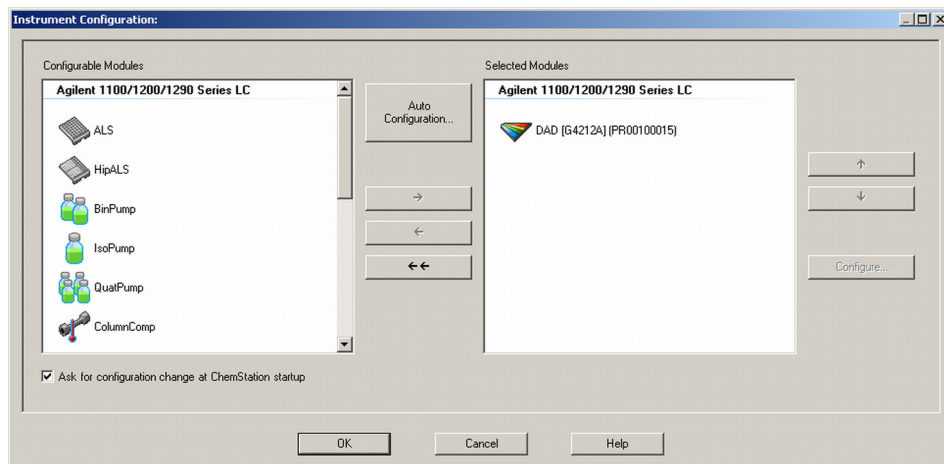
13 Enter the IP address or the Hostname of the module with the LAN-access.



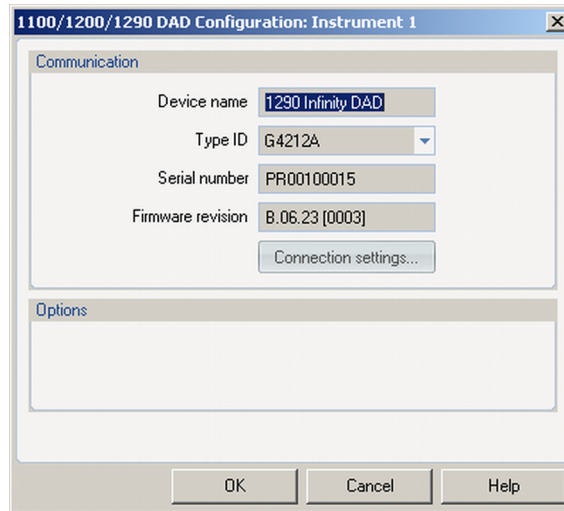
14 Click on **OK**.

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).

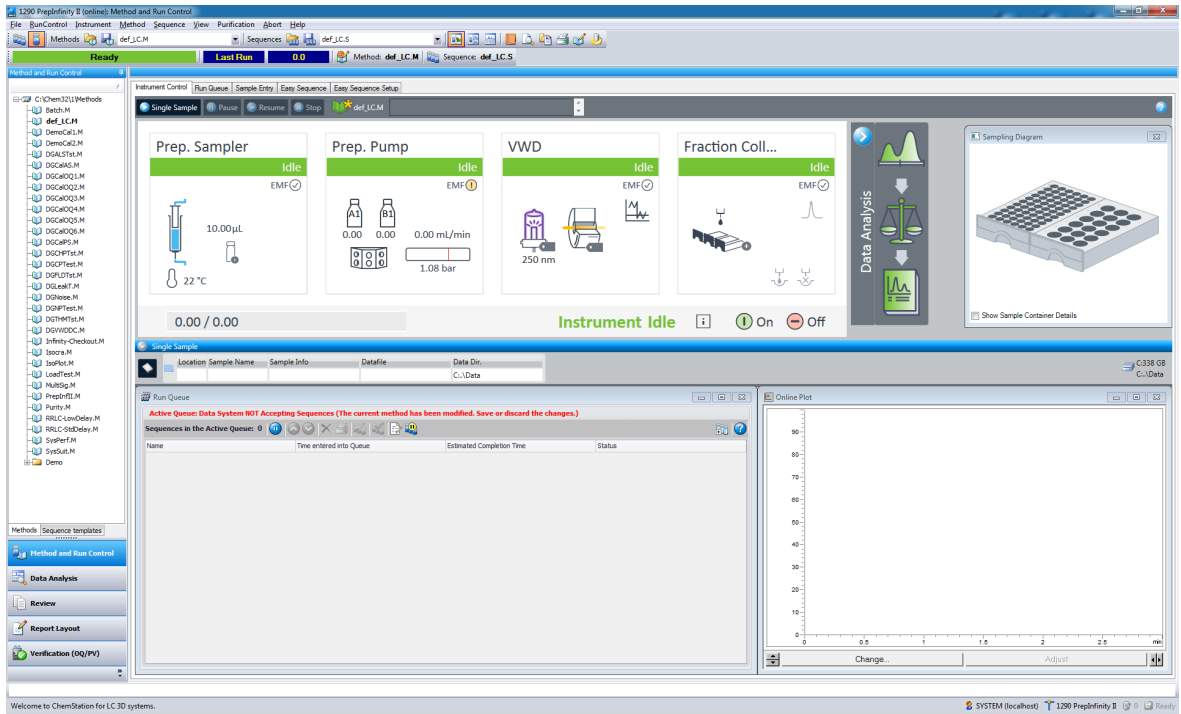


Figure 45 Screen After Successful Load of ChemStation

General Safety Information	250
General Safety Information	250
Safety Standards	250
General	250
Before Applying Power	251
Ground the Instrument	251
Ground Solvent Lines	252
Do Not Operate in an Explosive Atmosphere	252
Do Not Remove the Instrument Cover	252
Do Not Modify the Instrument	252
In Case of Damage	253
Solvents	254
Symbols	255
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Radio Interference	261
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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 255.

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. Always keep the temperature in the sample compartment at least 25 K below the boiling point of the solvent used.
- ✓ 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 25 Symbols














	The apparatus is marked with this symbol when the user should 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.
	Cooling 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 Sampler 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 25 Symbols

	<p>Magnetic field</p> <p>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.</p>
	<p>Indicates a pinching or crushing hazard</p>
	<p>Indicates a piercing or cutting hazard.</p>

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 <http://www.agilent.com> for more information.

Refrigerant

The refrigerant HFC-134a is used only in the Agilent Infinity II Sample Cooler.

Table 26 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 27 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 unshielded 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

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure $L_p < 70$ dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

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:
$$2\text{CHCl}_3 + \text{O}_2 \rightarrow 2\text{COCl}_2 + 2\text{HCl}$$

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) 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.

Agilent Technologies on Internet

For the latest information on products and services visit our worldwide web site on the Internet at:

<http://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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Published in Germany
10/2019

