1290 Infinity II
Preparative Open-Bed Sampler/Collector

Agilent InfinityLab LC Series

User Manual

Notices

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CAUTION

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WARNING

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

In This Guide

This manual contains technical reference information about the Agilent 1290 Infinity II Preparative Open-Bed Sampler/Collector (G7158B).

1 Introduction

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

2 Site Requirements and Specifications

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

3 Using the Sampler/Collector

This chapter explains the essential operational parameters of the module.

4 Preparing the Sampler/Collector

This chapter explains the operational parameters of the module.

5 Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

6 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.

7 Maintenance

This chapter describes the maintenance of the module.

8 Parts for Maintenance and Repair

This chapter provides information on parts for maintenance and repair.

9 Identifying Cables

This chapter provides information on cables used with the module.

10 Hardware Information

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

11 Appendix

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

Contents

1 Introduction

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

Intended Use

The 1290 Infinity II Preparative Open-Bed Sampler/Collector is designed to be used in combination with other InfinityLab LC modules in a preparative-scale HPLC system to separate and purify inorganic or organic compounds via reversed-phase chromatography applications. The sampler can hold or store samples in containers such as vials, tubes, or well plates, draw a specified sample volume, and inject it into the reversed-phase HPLC system. The collector can collect fractions of desired volume for sample purification or for later analysis.

The product is intended to be used by professional laboratory users.

Product Description

The 1290 Infinity II Preparative Open-Bed Sampler/Collector is the solution for automated, high-capacity management of sample injection and fraction collection in semipreparative and preparative-scale LC purification workflows. The X-Z-theta axis probe uses novel robotic technology to minimize sample carryover during movements between fraction containers. Sample volumes can be injected from microtiter plates, vials, or vessels.

The sampler/collector provides for injection of large volumes and sample loops are available with volumes of 2, 5, 10, and 20 mL. The sampler/collector is equipped with an analytical-to-preparative injector and enables easy handling of a wide variety of collection vessels with a total capacity up to 5.9 L using 150 x 25 mm (l x od) tubes. Optimized for flow rates up to 200 mL/min, the sampler/collector can be integrated seamlessly with any Agilent solvent delivery module, recovery collector, or detector.

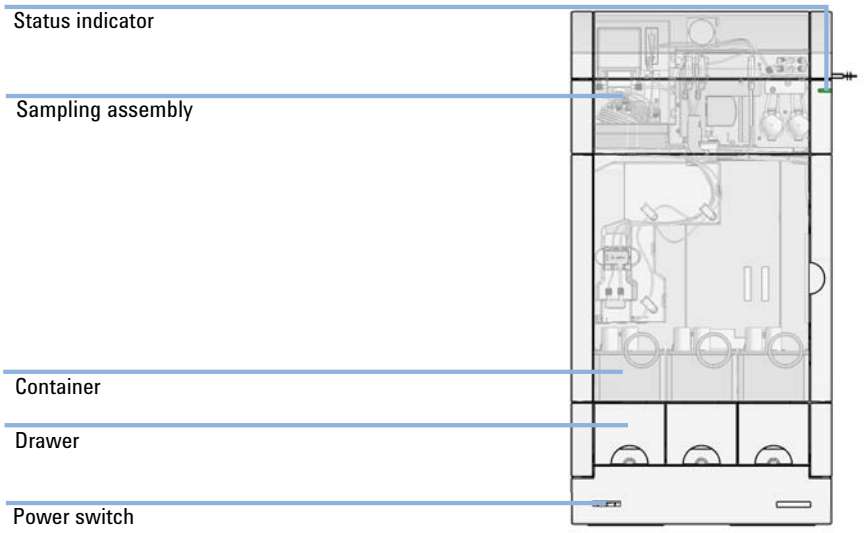


Figure 1 Overview of the Preparative Open-Bed Sampler/Collector

Features

- Fully automated and combined open-bed autosampler and fraction collector with capacity to inject up to 864 samples or collect up to 432 fractions, or combinations of both, in a single module to optimize bench space.
- All sample and fraction vessels offer container recognition by identification tags and are easily accessible and can be exchanged during operation without stopping the instrument.
- One injector with two sample loops allows convenient switching between preparative scale and analytical scale (scouting runs) without the need for hardware modifications.
- Automated sample dilution prior to injection and fraction mixing for reanalysis to support your analytical to preparative workflow.
- Supports 2, 5, 10, and 20 mL sample loops to increase sample loading and your productivity by reducing the number of injections.
- The X-Z-theta axis probe uses novel robotic technology to minimize sample carryover during movements between fraction containers, providing compatibility with existing purification methods.
- Integration of all standard collection modes, plus the proprietary delay volume sensor and automated calibration procedure, ensure optimized sample recovery.
- Flexible bed layout allows sample injection from the vessel types, and fraction collection into the vessel types best suited for your application.
- Preconfigured tubing kits with identification tags allow easy setup and provide optimized substance recovery with minimized peak dispersion at any flow rate.
- Forced fume extraction in combination with the bottom fume hood enables use of the sampler/collector outside a fume cupboard.

Overview of the Module

The Preparative Open-Bed Sampler/Collector combines a preparative sampler with a preparative fraction collector in only one module. Figure 2 on page 12 gives an overview of the main module assemblies. Figure 3 on page 13 shows the sampling assembly and solvent distribution assembly in more detail. The sampling needle, washable needle guide, and fraction valve are located in the robot arm. The wash port assembly consists of draw port, wash port, and nine vial positions.

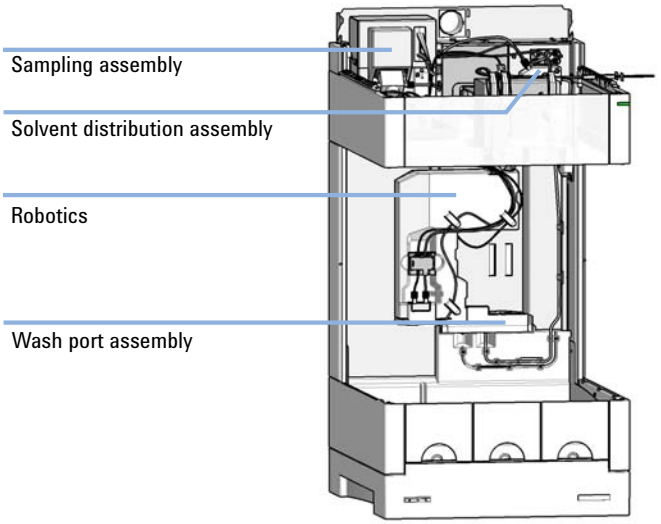


Figure 2 Overview of the module

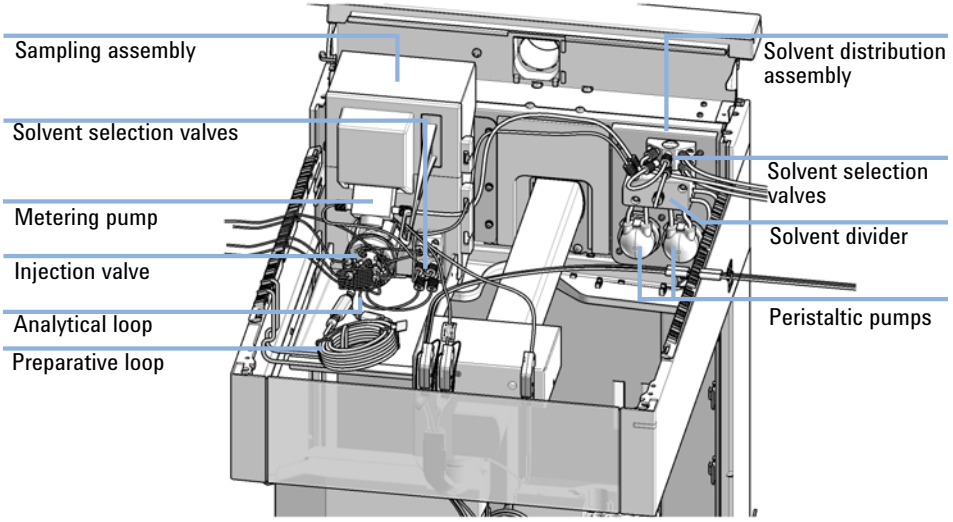
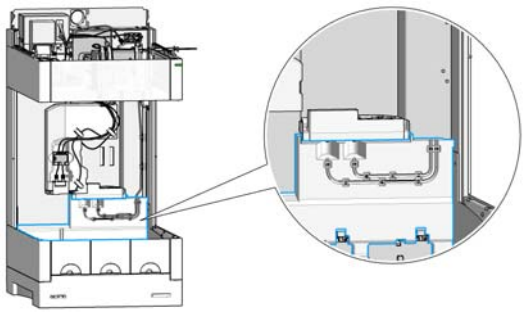
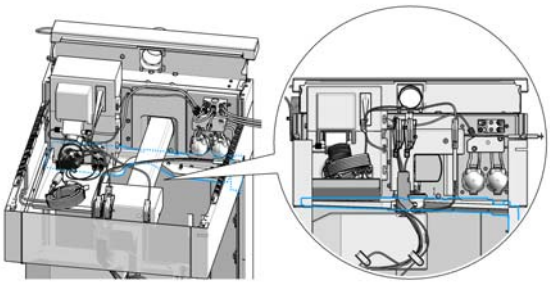
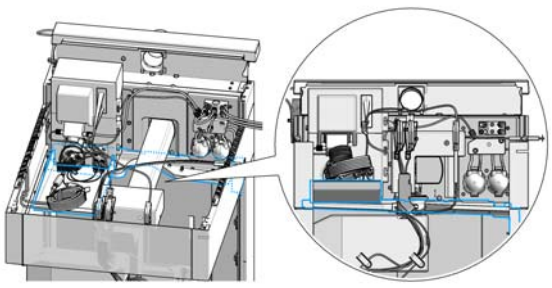
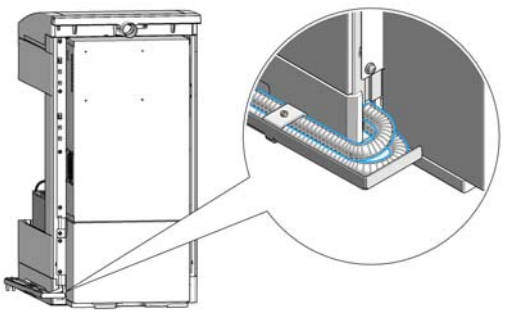


Figure 3 Overview of the sampling assembly and solvent distribution assembly

Leak and Waste Concept

1 Wash port assembly 	**2** Sampler leak plane 
3 Leak plane holder 	**4** Drain Outlet 

Leak Sensor

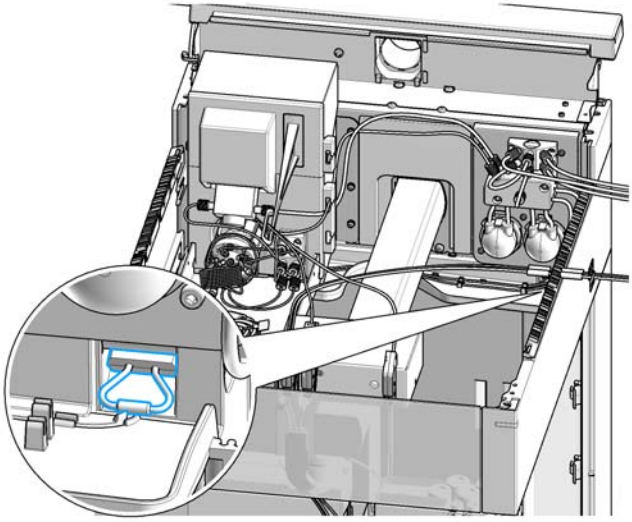


Figure 4 Sampler leak sensor

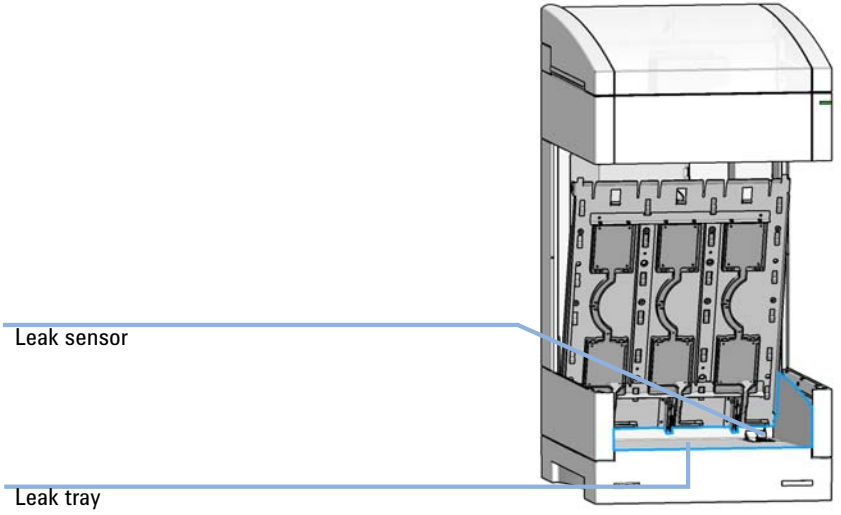


Figure 5 Position of leak tray and leak sensor

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 as mobile phase.**
- ✓ **Check the leak sensor regularly for corrosion.**

2 Site Requirements and Specifications

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

Site Requirements

A suitable environment is important to ensure optimal 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 23. 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 23) 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.

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.**

Exhaust and Vapour Management

You can operate the module in three different scenarios:

1 Under laboratory fume hood:
   - Ensure adequate fume hood ventilation: the recommended ventilation speed is 200 m^3/h with closed sash window and 490 m^3/h with open sash window.

2 On laboratory desk with module-specific fume hood:
   - Connect the exhaust tube to the laboratory's venting system.
   - Ensure a minimum air flow of 6 L/s through the exhaust tube.
   - Ensure an underpressure in the venting system.

3 Without fume hood:
   - Ensure adequate laboratory ventilation: the recommended air exchange rate is 10 times per hour, the minimum required air exchange rate is 8 times per hour.

WARNING

Hazardous or toxic fumes and vapors

Organic solvent vapors can reach harmful, toxic, or explosive concentrations when they are not removed sufficiently with an appropriate venting system.

- ✓ **Ensure that your venting/air exchange solution meets the requirements specified here for your relevant operation scenario.**
- ✓ **Ensure that the solvent temperature is always kept below the specified limit.**

For details, refer to the *Site Preparation Checklist*.

Waste Management

WARNING

Large amount of toxic, explosive, flammable, or corrosive solvents

✓ **Ensure that all waste is safely disposed according to your existing waste management solution.**

For details, refer to the *Site Preparation Checklist*.

Physical Specifications

Table 1 Physical Specifications

Type	Specification	Comments
Weight	32 kg (70.5 lbs)	Without any accessories and options
Dimensions (height × width × depth)	781 x 393 x 622 mm (30.8 x 15.5 x 25.0 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	350 VA, 350 W	
Ambient operating temperature	4-40°C (39 -104°F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	≤80 % r.h. up to 31 °C, decreasing to 50 % r.h. at 40 °C	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Boiling point ≥56 °C (133 °F). Auto-ignition temperature ≥200 °C (394 °F).	Do not use any solvent that is not explicitly mentioned on the "solvent compatibility" list.

Performance Specifications

Table 2 Performance Specifications

Type	Specification	Comment	Method/Conditions
Delay volume	Calculated using Lab Advisor. Dead volume in Valve tip appr. 30 µL		
Time to move from vessel to vessel	0.3 s		Tested with OD 30 mm vessels. Vessels next to each other.
Minimum system flow	1 mL/min		
Maximum system flow	200 mL/min		
Maximum collection volume	78 mL	With 30x150 mm (OD x L) tube	
Maximum capacity	432 fractions 5.9 L	Using 12 mm OD tubes Using 25 x 150 mm (OD x L) tubes	
Trigger modes	Off	Fraction triggering is disabled. No fractions are collected.	
	Peak-based	When a peak is discovered by a peak trigger, fractions are collected. Depending on the max. fill volume, each fraction will use one or more vessel(s).	
	Peak-based, collecting time slices	When a peak is discovered by a peak trigger, fractions are collected and each fraction is split into separate slices of a specified duration. Depending on the max. fill volume, each slice will use one or more vessel(s).	
	Peak-based, collecting volume slices	When a peak is discovered by a peak trigger, fractions are collected and each fraction is split into separate slices of a specified volume. Depending on the max. fill volume, each slice will use one or more vessel(s).	

Table 2 Performance Specifications

Type	Specification	Comment	Method/Conditions
	Peak-based with time slice recovery	The complete output of the fraction collector is recovered into separate slices of a specificed duration. When a peak is discovered by a peak trigger, fractions are collected in dedicated vessels. Depending on the max. fill volume, Recovery and Fractions will use one or more vessel(s).	
	Peak-based with volume slice recovery	The complete output of the fraction collector is recovered into separate slices of a specificed volume. When a peak is discovered by a peak trigger, fractions are collected in dedicated vessels. Depending on the max. fill volume, Recovery and Fractions will use one or more vessel(s).	
	Time-based, collecting a number of fractions	Starting at a given time, the output of the fraction collector is separated into a specified number of fractions. Collecting a specified number of fractions works only when a stop time is set in the fraction collector or the trigger mode is followed by another instruction in the timetable of the fraction collector. Depending on the max. fill volume, each fraction will use one or more vessel(s).	
	Time-based, collecting time slices	Starting at a given time, the output of the fraction collector is collected into separate slices of a specified duration. Depending on the max. fill volume, each slice will use one or more vessel(s).	
	Time-based, collecting volume slices	Starting at a given time, the output of the fraction collector is collected into separate slices of a specified volume. Depending on the max. fill volume, each slice will use one or more vessel(s).	

Table 2 Performance Specifications

Type	Specification	Comment	Method/Conditions
Trigger sources	G7115A, 1260 Infinity II DAD G7165A, 1260 Infinity II MWD G7114A, 1260 Infinity II VWD G6120BA, LC/MS Single Quad VL G6130BA, LC/MS Single Quad SL G7121A, 1260 Infinity II FLD G4260B, 1260 Infinity II ELSD G7162A, 1260 Infinity II RID G6125BA, Agilent LC/MSD System G6135BA, Agilent LC/MSD XT System		
Diverter valve	3/2 valve		
Maximum pressure	6 bar (switching)		
Drawers	Drawer ambient		

Table 2 Performance Specifications

Type	Specification	Comment	Method/Conditions
Fraction/Sampler containers	**Tube Containers, ambient:** Tube Container for 30 x 150 mm tubes, ambient, 10 tubes G9321-60015 Tube Container for 30 x 100 mm tubes, ambient, 10 tubes G9321-60058 Tube Container for 25 x 150 mm tubes, ambient, 18 tubes G9321-60025 Tube Container for 25 x 100 mm tubes, ambient, 18 tubes G9321-60035 Tube Container for 16 x 150 mm tubes, ambient, 36 tubes G9321-60129 Tube Container for 16 x 100 mm tubes, ambient, 36 tubes G9321-60055 Tube Container for 12 x 150 mm tubes, ambient, 72 tubes G9321-60131 Tube Container for 12 x 100 mm tubes, ambient, 72 tubes G9321-60045 **SBS format tray:** for up to 3 SBS conform vessel types (e.g., deep well plates, SBS holder for tubes or vials), height adjustable (max. height 140 mm) G9321-60051 **Customized container** for use with Gilson 207 Racks Only for Tube OD 16 x 100 mm G9321-60201	**compatible SBS containers for fractions and samples:** • 2 mL vial holder (5023-2471) • 5/6 mL vial holder (5043-1826) • 96 wellplate 2.2 mL (5043-9300) • 96 wellplate 2.0 mL (5043-9302) • 96 wellplate 1.0 mL (5043-9305) • 96 wellplate 1.2 mL (5043-9308 and 5043-9309)	
Minimum tube height	50 mm		
Maximum tube height	160 mm		
Instrument control	LC & CE Drivers 3.1 or above Lab Advisor B.02.14 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC & CE Drivers.	

Table 2 Performance Specifications

Type	Specification	Comment	Method/Conditions
Communication	Controller Area Network (CAN), Local Area Network (LAN), ERI: ready, start, stop and shut-down signals		
Maintenance and safety-related features	Extensive diagnostics, error detection and display with Agilent Lab Advisor software. Leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas.		
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors.		
Housing	All materials recyclable		
Carry over	10 ppm		Injection of 100 µL Ethylparaben, 50 mg/mL in DMSO Method Preset: polar sample matrix 5 mL Sample Loop (1/8 in) Flow rate: 20 mL/min Eluent: Water/ACN (55/45), isocratic Column: Agilent 5 Prep C18, 21.2 x 50 mm, 5 µm An Ethylparaben calibration curve is used for quantification of carry-over peaks.

Table 2 Performance Specifications

Type	Specification	Comment	Method/Conditions
Cycle time	< 28 s		100 µL injection volume, wash and plug setting inactive
Injection precision - partial loop filling (preparative scale)	< 2 %		Measured with Caffeine in Water and Ethylparaben in DMSO

3 Using the Sampler/Collector

This chapter explains the essential operational parameters of the module.

Warnings and Cautions

WARNING

Moving needle

Pinch hazard

- ✓ **Do not grab into the robot area during operation.**
- ✓ **Be aware that the needle can move down even if the robot is on hold.**
- ✓ **Do not remove any vials or wellplates during operation.**
- ✓ **To remove any vials or wellplates, stop the operation of the instrument and pull out the drawer.**

WARNING

Leaking solvents

- ✓ **Ensure a safe drain of liquids into the inlet of your waste management system.**
- ✓ **Regularly check all tubing connections for tightness and proper tubing positions.**

Solvent Information

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.**
- ✓ **Avoid high vapor concentrations. Keep the solvent temperature at least 40 K below the boiling point of the solvent used. This includes the solvent temperature in the sample compartment. For the solvents methanol and ethanol keep the solvent temperature at least 25 K below the boiling point.**
- ✓ **Do not operate the instrument in an explosive atmosphere.**
- ✓ **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.**

WARNING

Incompatible Solvents

Incompatible solvents can cause leaking. Leakage can result in fire hazard.

✓ **Use only permitted solvents with this module.**

For details, see sections

- Table 3 on page 34 ,
- and Table 4 on page 34

If in doubt, contact the corresponding Agilent Sales/Service Representative.

Permitted Solvents for Solvent Distribution Assembly

Table 3 Permitted solvents for use in the low pressure area, connected to the Solvent Distribution Assembly (S1, S2, and S3)

Solvent
Acetonitrile
Ethanol
Isopropanol[1]
Methanol
Water

[1] Isopropanol easily dissolves the separating air plugs leading to mixing of the plugs and thus to lower recovery.

Solvents Excluded from Intended Use

The module is *not* designed for normal phase chromatography.

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).

Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).

For security reasons - either dangerous solvent vapour concentrations or incompatibilities of module materials with solvents - the use of the following solvents is *not allowed*.

Table 4 Solvents excluded from use in the low pressure area, connected to the Solvent Distribution Assembly (S1, S2, and S3)

Solvent
Hexan
MTBE
THF

Priming Solvents

Table 5 Choice of priming solvents

Activity	Solvent	Comments
After installation	Methanol Acetonitrile	Best to flush air out of system and metering pump
	Isopropanol[1]	Possible if no other solvent is available
Cleaning the system	Methanol Acetonitrile	Two-step wash (by default) with Water and Organics

[1] Isopropanol easily dissolves the separating air plugs leading to mixing of the plugs and thus to lower recovery.

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.

Solvent Compatibility

Solvent Compatibility for the 1290 Infinity II Preparative Open-Bed Sampler/Collector

Solvents that get in contact with materials used in the 1290 Infinity II Preparative Open-Bed Sampler/Collector can cause corrosion in the module. For an overview of used materials, see "Wetted Materials" on page 36.

Wetted Materials

Table 6 Sample Flow in Mainpath

Component	Material
Loops	SST
Valve Stator	SST / DLC coated
Valve Rotor	PEEK (w/ PTFE)
(Pump Capillary)	Defined by system (SST)
(Column Capillary)	Defined by system (SST)

Table 7 Sample draw

Component	Material
Ceramic Needle	Zirconium Dioxide
Needle Holder	PEEK
Needle Tube	PFA
SSV Manifold	PEEK
SMC Membrane	Kalrez (FFKM)
Connecting Tubings	PFA
(Valve Stator / Rotor)	see above
Tubing to Solvent Distribution	PTFE

Table 8 Washport

Component	Material
Connecting Tubing to Peristaltic Pump	Silicone
Connector Plug (for Connecting Tubing to Peristaltic Pump	Stainless Steel
Wash-Port Base	Polypropylene
Waste Tube	PTFE
L and T Connectors	PEEK

Table 9 Outer needle wash

Component	Material
Tube	PFA
Needle Wash Guide	Polypropylene

Table 10 Solvent distribution

	Component	Material
Solvent Selection Valve	SSV Manifold	PEEK
	SMC Membrane	Kalrez (FFKM)
	Connecting Tubings	PTFE
Solvent Distribution Assembly	SDB Manifold	PEEK
	SMC Membrane	Kalrez (FFKM)
	Connector Plug	Stainless Steel
	Peristaltic Pump Tube	Pharmed
	Closing Ball	Silicon Nitride Ceramic
	Waste Tubing	Silicone
Sampler Leak Plane	Sampler Leak Plane	Polypropylene
	Waste Tube of Leak Plane	PTFE
	L and T Connectors	PEEK

General Information about Solvent/Material Compatibility

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

Disclaimer

Subsequent data was collected from external resources and is meant as a reference. Agilent cannot guarantee the correctness and completeness of such information. Data is based on compatibility libraries, which are not specific for estimating the long-term life time under specific but highly variable conditions of UHPLC systems, solvents, solvent mixtures and samples. Information 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 %, sulfuric acid > 10 %, sulfonic acids, trichloroacetic acid), halogens or aqueous halogen solutions, phenol and derivatives (cresols, salicylic acid, and so on).

When used above room temperature, PEEK is sensitive to bases and various organic solvents, which can cause it to swell. Under such conditions, normal PEEK capillaries are very sensitive to high pressure. Therefore, Agilent uses stainless steel cladded PEEK capillaries in bio-inert systems. The use of stainless steel cladded 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 (SST)

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

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride, and 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:

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

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, 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 µm/year. At room temperature, titanium is resistant to concentrations of about 5 % sulfuric acid (about pH 0.3). Addition of nitric acid to hydrochloric or sulfuric acids significantly reduces corrosion rates. Titanium is sensitive to acidic metal chlorides like $FeCl_3$ or $CuCl_2$. Titanium is subject to corrosion in anhydrous methanol, which can be avoided by adding a small amount of water (about 3 %). Slight corrosion is possible with ammonia > 10 %.

Diamond-Like Carbon (DLC)

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

Fused silica and Quartz (SiO_2)

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

Gold

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

Zirconium Oxide (ZrO_2)

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

Platinum/Iridium

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

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

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

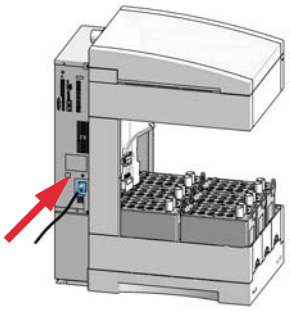
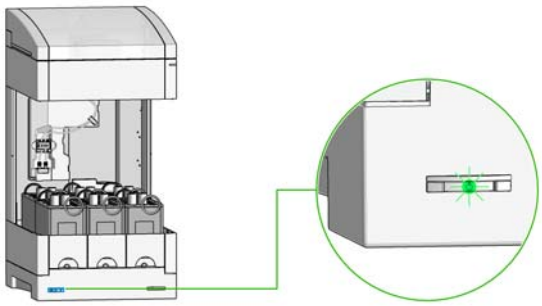
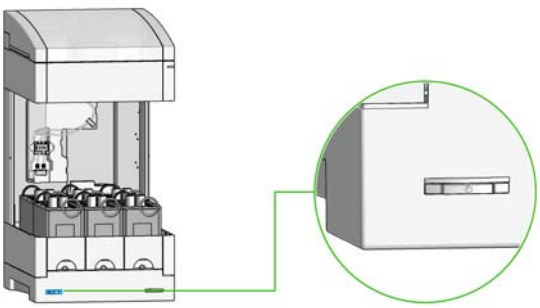
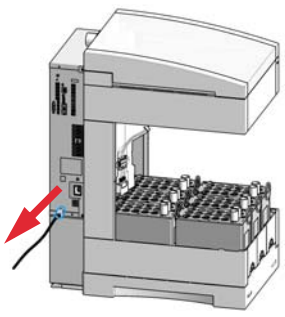
TFE/PDD copolymer tubings, which are used in all Agilent degassers except 1322A/G7122A, are not compatible with fluorinated solvents like Freon, Fluorinert, or Vertrel. They have limited life time in the presence of Hexafluoroisopropanol (HFIP). To ensure the longest possible life with HFIP, it is best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

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

Sapphire, Ruby and Al_2O_3-based ceramics

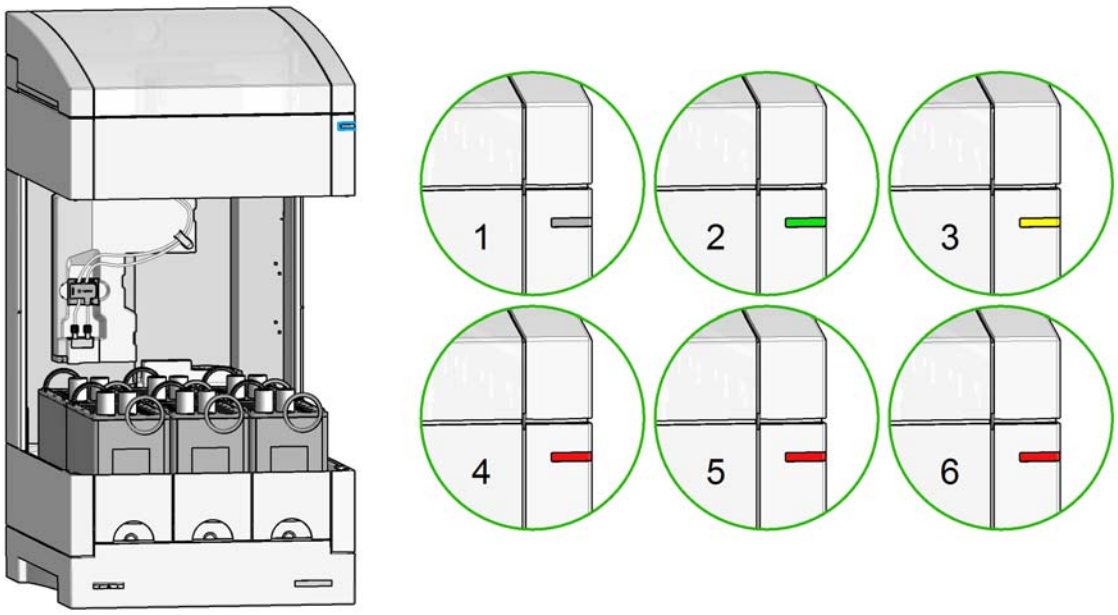
Sapphire, ruby and ceramics based on aluminum oxide Al_2O_3 are inert to almost all common acids, bases and solvents. There are no documented incompatibilities for HPLC applications.

Turn on/off

1 Plug in power cable. 	**2** Power switch: On 
3 Power switch: Off 	**4** Unplug the power cable. 

Status Indicators

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.

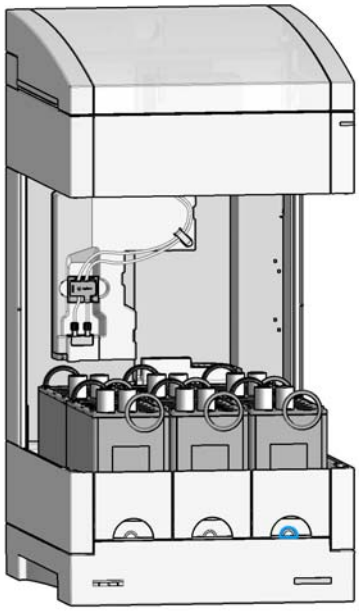
4: Error mode - interrupts the analysis and requires attention (for example a leak or defective internal components).

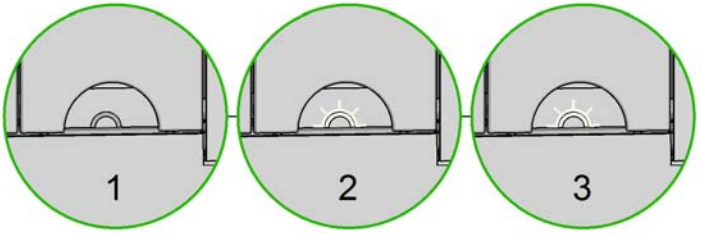
5: Resident mode (blinking) - for example during update of main firmware.

6: Bootloader mode (fast blinking). Try to re-boot the module or try a cold-start. Then try a firmware update.

Drawer Status Indicator

1





The drawer status indicator indicates one of three possible conditions:

1: off: drawer not detected

2: on: drawer detected and not in use = drawer can be pulled out

3: blinking: drawer detected and in use = drawer blocked

NOTE

Do not try to remove the drawer when the drawer status indicator is blinking.

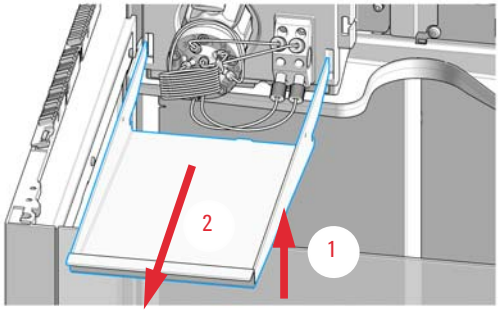
Install the Preparative Loop

Install a 1/16" Preparative Loop

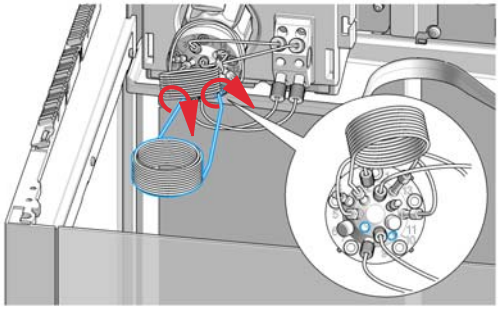
Tools required	p/n	Description
	5810-0000	Hex driver SW-5 slitted
	5023-2500	Spanner double open ended SW-5

Parts required	#	p/n	Description
	1	5068-0350	Preparative sample loop, stainless steel, 2 mL
OR	1	5068-0351	Preparative sample loop, stainless steel, 5 mL, 1/16 inch

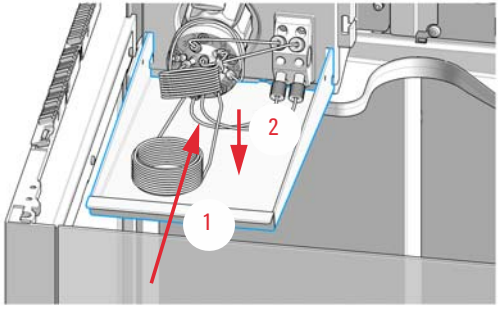
1 Lift (1) and remove (2) the leak plane.



2 Install the preparative loop from port 7 to port 10 using an SW5 wrench or SW5 driver.



3 Insert (1) and push down (2) the leak plane.



Install a 1/8" Preparative Loop

Tools required	p/n	Description
	8710-0510	Open-end wrench 1/4 — 5/16 inch
	8710-0972	Open-end wrench 7/16 inch
	5810-0000	Hex driver SW-5 slitted
	5023-2500	Spanner double open ended SW-5

Parts required	#	p/n	Description
	1	5068-0334	Preparative sample loop, stainless steel, 5 mL
OR	1	5068-0335	Preparative sample loop, stainless steel, 10 mL
OR	1	5068-0336	Preparative sample loop, stainless steel, 20 mL

Each sample loop is shipped including Extension Kit (G9321-68013).

NOTE

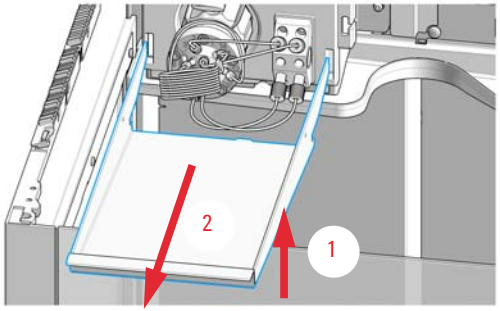
The extension capillaries cannot support the weight of the loops.

For installation of the loops, use the Sample Loop Bracket to hold the preparative sample loop.

NOTE

The illustrations only show the installation. For the replacement, the procedure must first be carried out in reverse order (removal).

1 Lift (1) and remove (2) the leak plane.



2 Install the unions to the loop.

NOTE

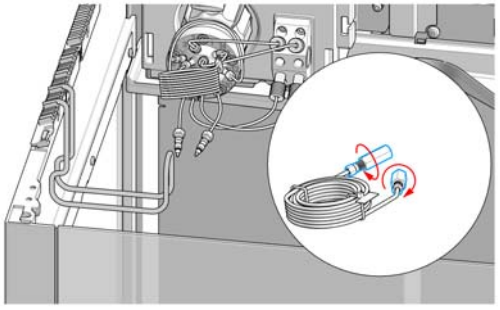
To achieve maximale pressure tightness, always use Ferrule 1/8-in-TBG-DIA SST (0100-1488).

a If another ferrule than Ferrule 1/8-in-TBG-DIA SST (0100-1488) is installed, remove this ferrule from the loop.

b Attach Ferrule 1/8-in-TBG-DIA SST (0100-1488) in front of the loop fitting.

c Swage the loop to the union.

- Use the 7/16" wrench for the union.
- Use the 5/16" wrench for the loop.

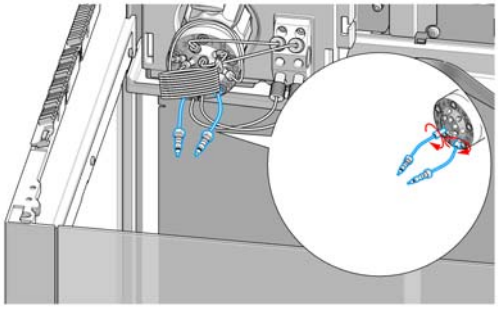


3 Install the extension capillaries.

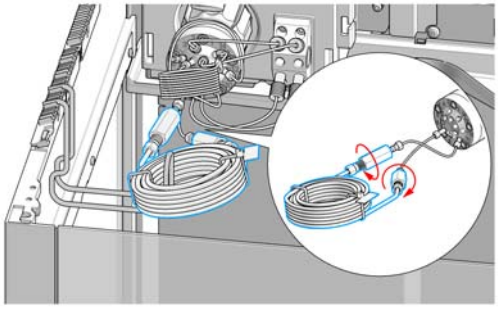
a Swage the extension capillaries to the unions.
- Use the 7/16" wrench for the unions.
- Use the 1/4" wrench for the capillary.

b Remove the extension capillaries again from the union.

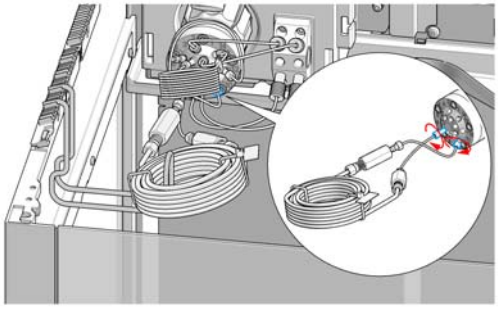
c Install the extension capillaries finger-tight and oriented in the intended direction to the adapter-valve assembly.



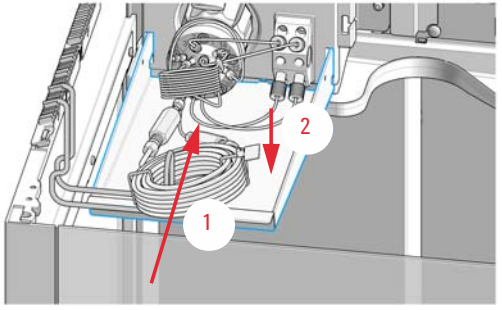
4 Fix the union-loop assembly to the extension capillary-valve assembly.



5 Tighten the fittings to the valve using the SW5 wrench or SW5 driver.



6 Install the leak plane.



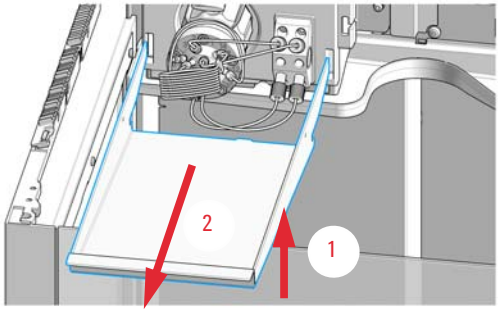
Install or Replace the Analytical Loop

Tools required	p/n	Description
	5810-0000	Hex driver SW-5 slitted
	5023-2500	Spanner double open ended SW-5

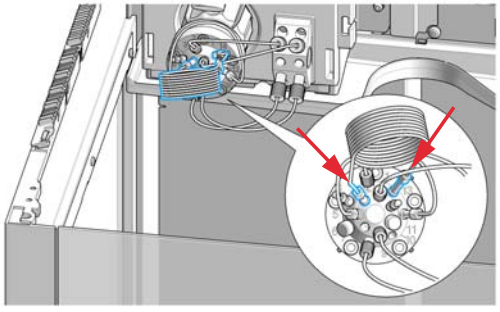
Parts required	p/n	Description
	5068-0348	Analytical sample loop

Preparations Use LabAdvisor to move needle to waste position.

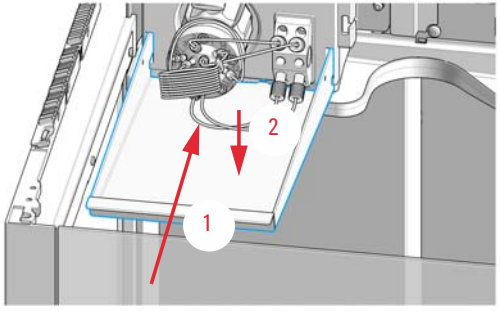
1 Lift up (1) and remove (2) the leak plane.



2 Use Hex driver SW-5 slitted (5810-0000) to install or replace the analytical loop from port 3 to port 14.



3 Insert (1) and push down (2) the leak plane.



Exchange Drawers

Parts required	p/n	Description
	G9321-60085	Drawer ambient
	G9321-60201	InfinityLab Drawer Gilson 207, ambient

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

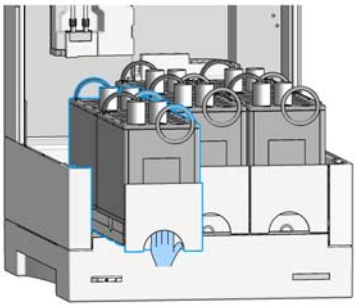
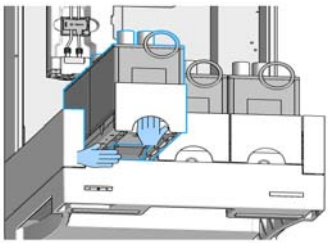
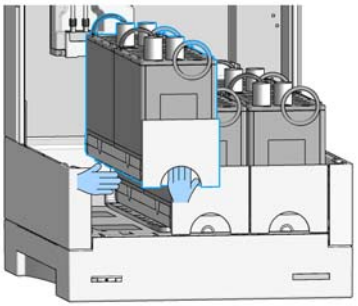
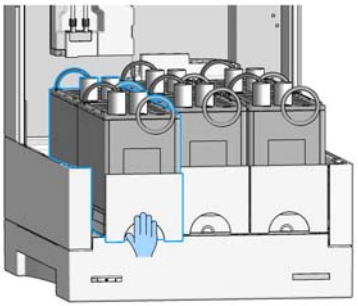
- ✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- ✓ **The volume of substances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

WARNING

Protruding drawers

Open drawers protrude from the module. Crashing into open drawers can lead to injuries and damage to the module.

- ✓ **Always remove or close a drawer completely.**

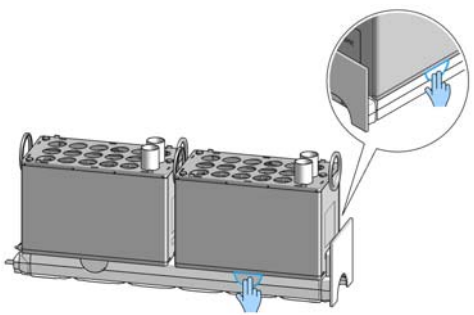
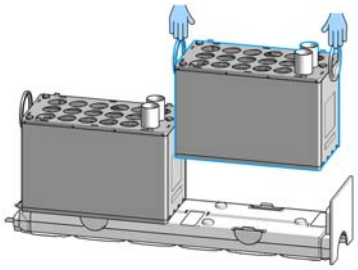
1 Remove the drawer. 	**2** Release the drawer by pushing the metal plate underneath the drawer with the second hand. 
3 Exchange the drawer 	**4** Install the drawer. 

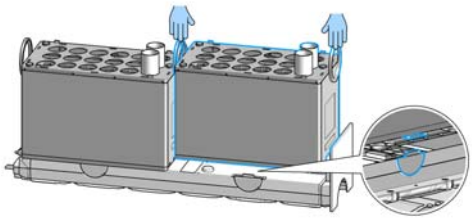
Exchange Containers

Parts required	#	p/n	Description
	1	G9321-60015	Tube Container for 30 mm x 150 mm tubes, ambient, 10 tubes
OR	1	G9321-60058	Tube Container for 30 mm x 100 mm tubes, ambient, 10 tubes
OR	1	G9321-60025	Tube Container for 25 mm x 150 mm tubes, ambient, 18 tubes
OR	1	G9321-60035	Tube Container for 25 mm x 100 mm tubes, ambient, 18 tubes
OR	1	G9321-60129	Tube Container for 16 mm x 150 mm tubes, ambient, 36 tubes
OR	1	G9321-60055	Tube Container for 16 mm x 100 mm tubes, ambient, 36 tubes
OR	1	G9321-60131	Tube Container for 12 mm x 150 mm tubes, ambient, 72 tubes
OR	1	G9321-60045	Tube Container for 12 mm x 100 mm tubes, ambient, 72 tubes
OR	1	G9321-60051	SBS Container, ambient

For a list of further containers, refer to the *Parts* section.

Preparations Remove the drawer from the module.

1 Press the release buttons to release the container from the drawer. 	**2** Lift the container up at the circular handles. 

3 Insert the new container. **NOTE** Mind the correct orientation of the container on the drawer. Check if the container is fixed properly ("Click"). 	

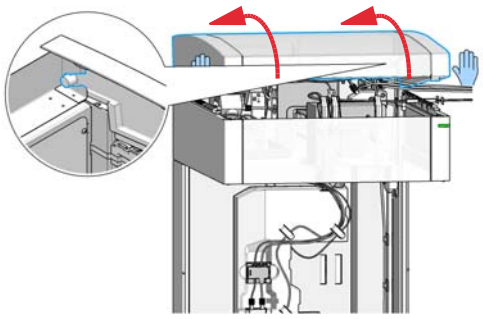
Replace the Fraction Collection Inlet/Outlet Tubings

Parts required	#	p/n	Description
	1	G9321-60951	1290 Inf II PrepFC Tubing Kit 200 for flow rates up to 200 mL/min
OR	1	G9321-60952	1290 Inf II PrepFC Tubing Kit 50 for flow rates up to 50 mL/min
OR	1	G9321-60953	1290 Inf II PrepFC Tubing Kit 8 mL for flow rates up to 8 mL/min
OR	1	G9321-60954	1290 Inf II PrepFC Tubing Kit 150 mL for flow rates up to 150 mL/min

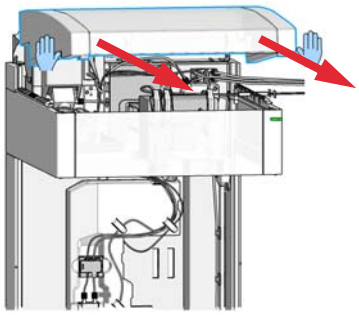
Preparations Move to **Change Tubing Position** via Lab Advisor.

1 Open and remove the top fume hood.

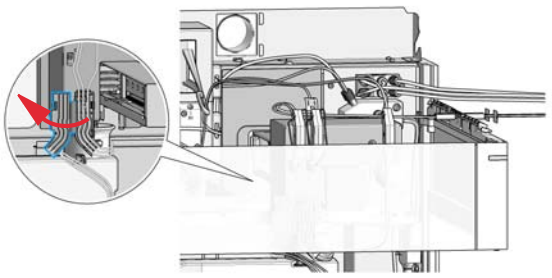
a Swing up the fume hood against the mechanical stop.



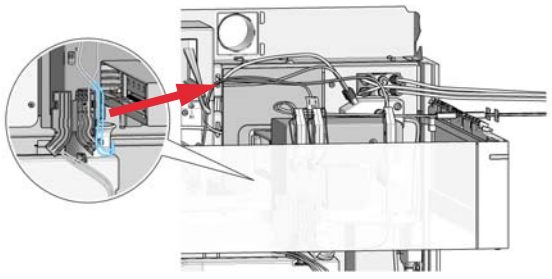
b Remove the fume hood by pulling it toward you.



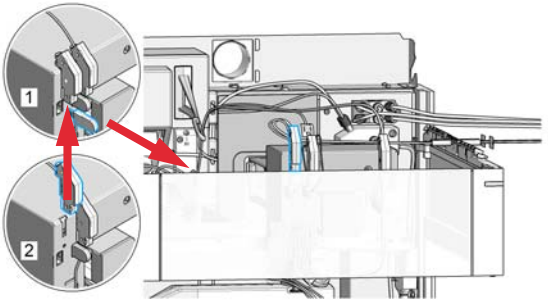
2 Open the tube holder.



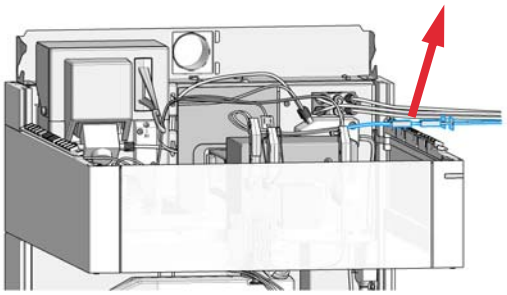
3 Remove the tubings from the tube holder.



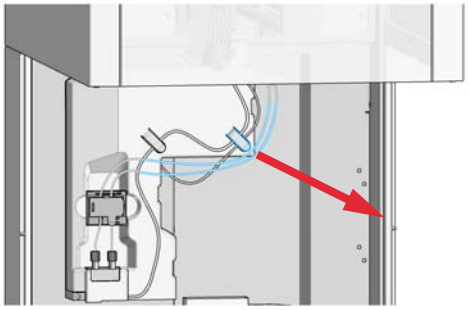
4 Remove tubing clip and dongle from the fraction collector.



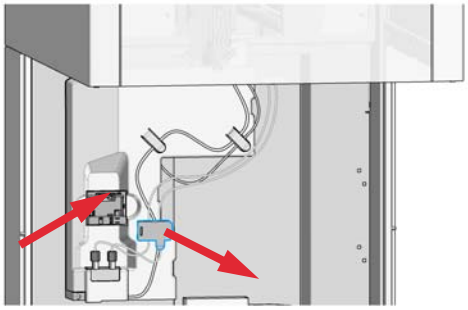
5 Remove the Inlet/Waste Tubings from the capillary holder.



6 Remove the tubings from under the clamp at the robotics arm.



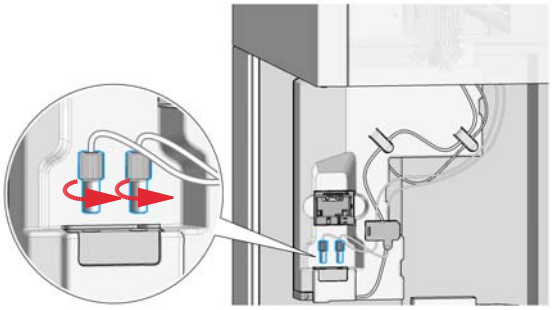
7 Remove the delay sensor holder: Unlock the device with the lever (1.), then pull out (2.).



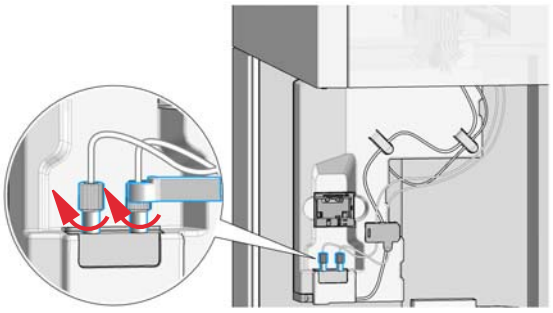
NOTE

Do not remove the delay sensor holder from the tubing.

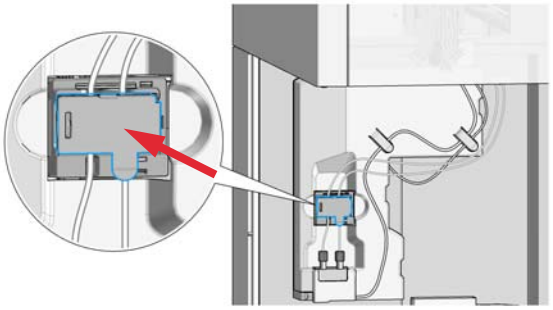
8 Unscrew the tubings from the valve assembly.



9 Screw the tubings of the new inlet/waste tubing kit into the valve assembly. Tighten the fittings finger-tight, then use the Fitting handle (about ¼ turn).



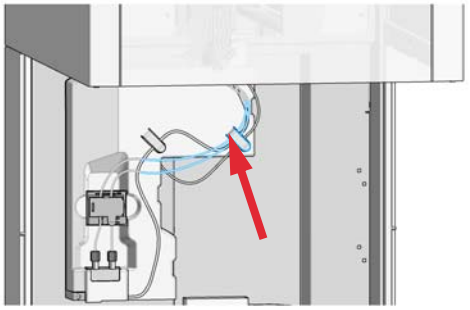
10 Install the delay sensor holder.



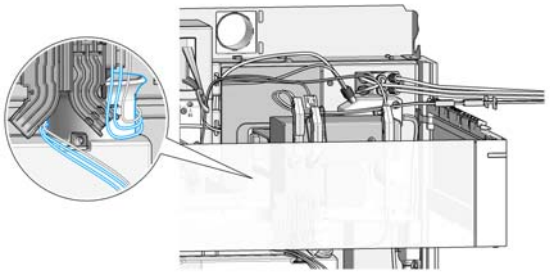
NOTE

Make sure that the holder is fixed properly. Press the small button to insert the tubing properly.

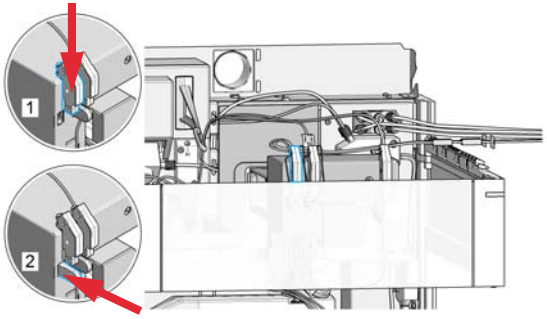
11 Route the tubings under the clamp at the robotics arm.



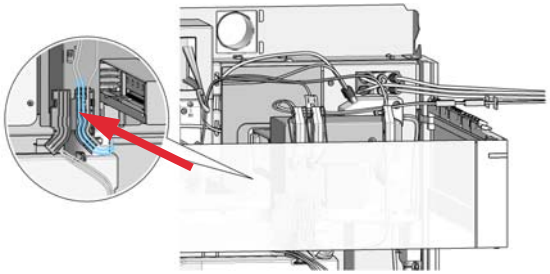
12 Route the tubings clockwise (one turn) around the robotics arm.



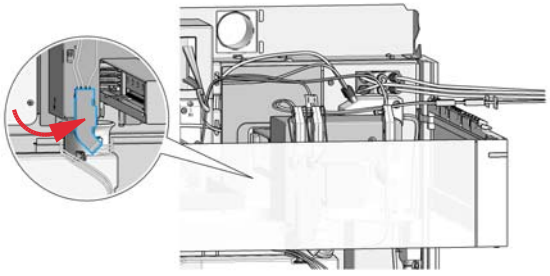
13 Push the clip into the housing and connect the dongle.



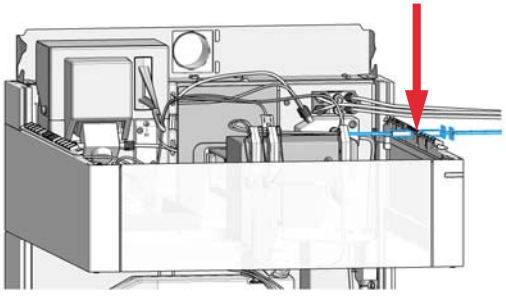
14 Install the tubings to the tube holder.



15 Close the tube holder.

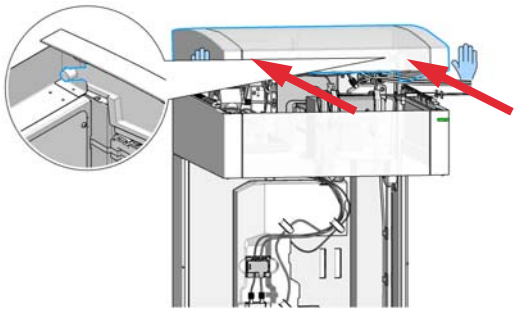


16 Install the Inlet/Waste Tubings to the capillary holder. Position them approximately in the middle of the capillary holder.

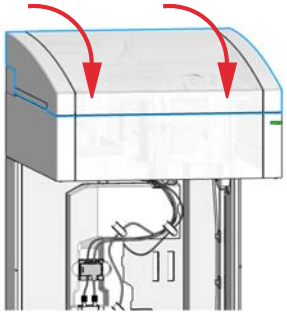


17 Install the top fume hood and close it.

a Push the top fume hood into the recession.



b Close the top fume hood.



Configuration and Operation of the Open-Bed Sampler/Collector

Delay Volumes and Delay Calibration

Once software is installed and the fraction collector is ready to be operated, the fraction delay time needs to be determined. Figure 6 on page 60 shows a schematic drawing of the flow path between the detector and the fraction collector with the two delay volumes V_{D1} and V_{D2}. For peak-based fraction collection the system delay times t_{D1} and t_{D2} can be calculated by dividing the delay volumes by the flow rate.

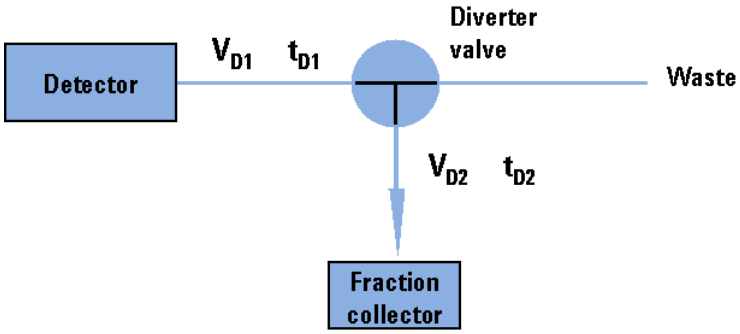


Figure 6 Delay volumes and delay times

The delay volume V_{D2} is a system parameter, it depends on the installed fraction collector tubing. Delay volume V_{D1}, which is specified through the installed Fraction Collector Tubing Kit, is determined using the **Delay Volume Calibration** feature of the Lab Advisor software.

When a peak is detected during a purification run (Figure 7 on page 61) the diverter valve is triggered using the following delay time calculations:

- Start of fraction collection: $t = t_0 + t_{D1}$
- End of fraction collection: $t = t_E + t_{D1} + t_{D2}$

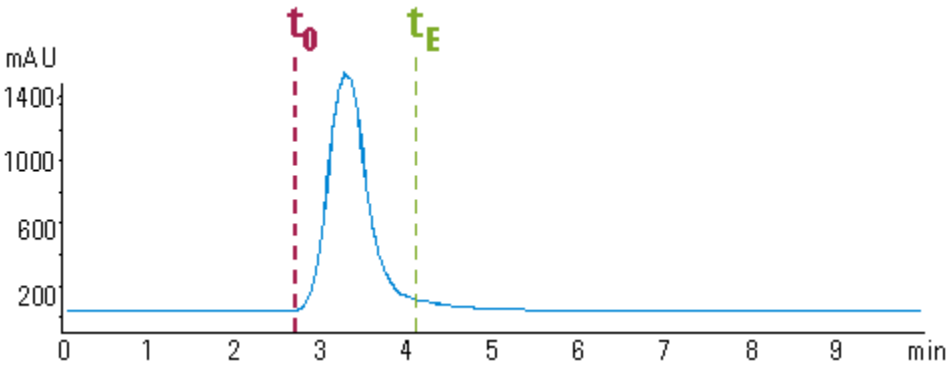


Figure 7 **Chromatogram from a UV-detector with peak starting at t_0 and ending at t_E**

Performing a Delay Calibration with an UV Detector

1. Place a vial containing the Delay Sensor Calibrant (5190-8223) in position 1 of the autosampler.
2. Remove the installed column and replace for the delay coil or union.
3. Connect a bottle of water to Channel A
4. Open a session of Lab Advisor and connect to the system with the Fraction Collector.
5. Navigate to **Service and Diagnostics**, select **Delay Volume Calibration** from the available tests.
6. Click **Run** and follow the prompts from the Wizard.

NOTE

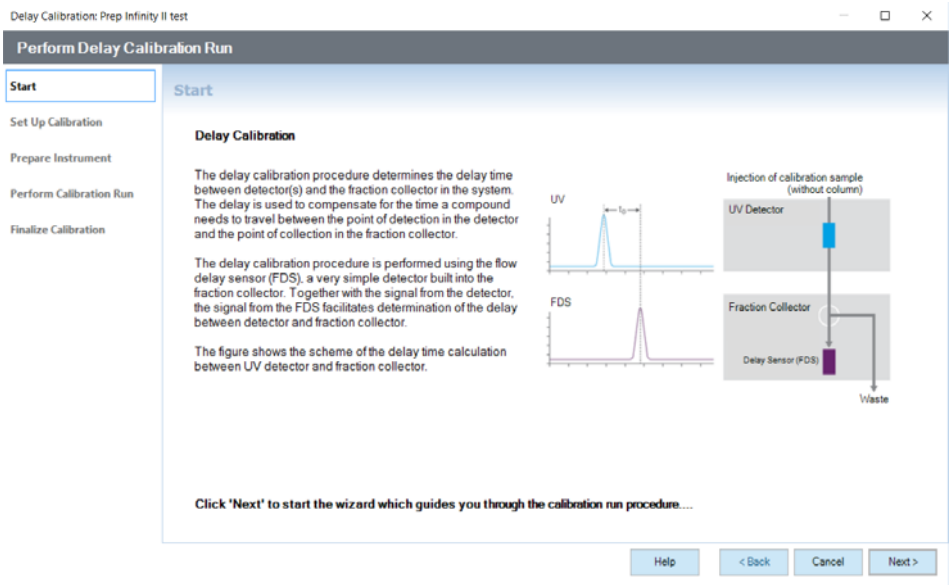
Every Agilent detector that is used for triggering fractions has an internal signal delay caused by filtering the raw data. The signal delay depends on the Peakwidth setting of the detector and is accounted for when the fraction collector is triggered.

Perfom a Delay Calibration Run in OpenLAB CDS Chemstation Edition

The delay calibration procedure determines the delay time between detector(s) and the fraction collector in the system. The delay is used to compensate for the time a compound needs to travel between the point of detection in the detector and the point of collection in the fraction collector.

The delay calibration procedure is performed using the flow delay sensor (FDS), a very simple detector built into the fraction collector. Together with the signal from the detector, the signal from the FDS facilitates determination of the delay between detector and fraction collector.

The figure shows the scheme of the delay time calculation between UV detector and fraction collector.



Help:

Start

The **Start** page of the **Delay Calibration Wizard** contains a description of the fraction collector delay calibration process, together with a schematic diagram of the connections for the detector and fraction collector.

Cancel	Closes the **Delay Calibration Wizard** without consequence.
Next	Displays the Set Up Calibration page of the **Delay Calibration Wizard** ("Set Up Calibration" on page 63).

Set Up Calibration

The **Set Up Calibration** page of the **Delay Calibration Wizard** performs three steps to prepare for the delay calibration:

1 **Instrument Check**

The system checks that the instrument is ready for calibration. If the instrument check fails, an error is displayed and the delay calibration is not possible until the error has been cleared.

2 **Fraction Collector Module Selection**

If you have only one fraction collector configured, its module type ID and serial number are displayed in the field. If you have configured a fraction collector cluster, click the down arrow and select the fraction collector from the drop-down list.

3 **Module Connection Verification**

A connection to the selected module is established, and all required parameters are read from the module. The identities of the **Linked Pump** and **Peak Detectors** are shown (module type ID and serial number); for the peak detectors, the currently stored delay volumes are also shown.

An error is displayed if the selected module does not support Delay Calibration.

Back	Displays the Start page of the **Delay Calibration Wizard** ("Start" on page 63).
Cancel	Closes the **Delay Calibration Wizard** without consequence.
Next	Displays the Prepare Instrument for Calibration page of the **Delay Calibration Wizard** ("Prepare Instrument for Calibration" on page 64). This button is active only when a fraction collector has been selected.

Prepare Instrument for Calibration

The **Prepare Instrument** page of the **Delay Calibration Wizard** leads you through the preparation of the instrument for the delay calibration run.

The required preparation steps are listed in a three-column table:

Activity	A short description of the preparation activity.
Status	The current status of the preparation activity. When the activity is complete, the status is **Done**.
Information	Any additional information about the activity, for example, user interaction.
Start Preparation Procedure	Click to start the preparation of the instrument; follow any on-screen instructions that appear during the process. The instructions given depend on the configuration of the module.

NOTE

Once you have started the preparation of the instrument, clean-up steps are required to bring the instrument back into an operational state. The **Finalize Calibration** page includes the required clean-up steps.

Back	Displays the Set Up Calibration page of the **Delay Calibration Wizard** ("Set Up Calibration" on page 63). This button is active only until you have started the preparation of the instrument.
Cancel	Before preparation Closes the **Delay Calibration Wizard** without consequence. After preparation Displays the Delay Calibration — Close dialog box.
Next	Displays the Perform Calibration Run page of the **Delay Calibration Wizard** ("Perform Calibration Run" on page 65). This button is active only when the preparation of the instrument is complete.

Perform Calibration Run

Use the **Perform Calibration** page of the **Delay Calibration Wizard** to start the delay calibration run using the current method. The run parameters are listed; a warning is given if the method has been changed. You can switch to a different method or edit the sample information before starting the run.

System On	Click to turn the system on.
System Off	Click to turn the system off.
Edit Sample Info	Displays the Sample Info dialog box, which allows you to edit the sample information for the calibration run.
Load Method	Displays the **Method Browser** for master methods, which allows you to select a different master method to load and use for the calibration run.
Automatically activate Delay Sensor Signal	Mark this check box to automatically switch on the collection of the signal from the fraction collector's flow delay sensor. This signal is necessary to calculate the delay time/volume. **NOTE** When you mark this check box, the method is modified.
Start Calibration Run	Starts the delay calibration run. The message line describes the progress of the run. You can perform multiple calibration runs; this button is active after each calibration run has completed.
Delay Evaluation	Opens the Delay Evaluation window to allow you to determine the delay volume(s) ("Delay Evaluation" on page 66). This button is active only when at least one delay calibration run has been performed.

At the end of each calibration run, you can choose to either evaluate the data or start another calibration run.

Back	Displays the Prepare Instrument for Calibration page of the **Delay Calibration Wizard** ("Prepare Instrument for Calibration" on page 64). This button is active only until a calibration run has been started.
Cancel	Displays the Delay Calibration — Close dialog box.
Next	Displays the Finalize Calibration page of the **Delay Calibration Wizard**. This button is inactive until the calibration run is complete.

Delay Evaluation

The **Delay Evaluation** window enables you to determine the delay times/volumes between the peak detector(s) and the fraction collector. The **Delay Evaluation** window is split into two sections:

- the left pane contains the delay calculations
- the right pane shows the signals from the peak detector(s) and the fraction collector delay sensor.

Load Data File — Displays a file selection dialog box that allows you to select a delay calibration data file to use for the calculation of the delay times/volumes.

Delay Calibration

The **Delay Calibration** pane contains the parameters and results of the delay calculations:

Pump Flow — The pump flow as given in the data file or as a user-specified value. The flow specified here is used to calculate the delay volumes.
Click **Change Flow** to display the Change Pump Flow dialog box, which allows you to change the pump flow that is used for the delay calculations.

Delay Volumes — The delay volumes are shown in a four-column table:
Peak Detector
The type ID and serial number of the peak detector.
Calibration Signal
Click the down-arrow and select the signal to use for the delay calibration for this peak detector from the drop-down list.
Calc. Delay Time (min)
The calculated delay time (the difference between the retention time of the target peak given by the fraction collector delay sensor and the retention time of the peak in the selected calibration signal).
Delay Volume (mL)
The calculated delay volume (the product of the delay time and the specified flow).

Apply to Module — Click the down-arrow and select the fraction collector to which to apply the calculated delay volumes.
Click **Apply Delay Volumes** to write the delay volumes to the selected fraction collector.

MSD to Fraction Collector Delay Time — The values used to calculate the delay time between the MSD and the fraction collector.
Click **Copy to Clipboard** to copy the calculated delay time to the clipboard so that you can paste it into the method.

Create Calibration Summary — Displays the delay calibration parameters and results in the Delay Calibration Summary window.

Signals

The **Signals** pane contains a signal plot for each peak detector, and one for the fraction collector delay sensor. By default, the largest peak in each signal plot is identified and highlighted as the target peak, but you can change the identification if there is more than one peak in the plot and the wrong peak has been identified.

Each signal plot can be handled individually, for example, by zooming in.

For each signal, the description of the current signal is given. For detectors with multiple signals, click the down-arrow and select a different signal from the drop-down list, if required.

The peak number of the selected target peak (by default, the largest peak) is also shown. For signal plots with multiple peaks, click the down-arrow and select a different peak from the drop-down liat, if required.

 Displays the Edit Integration Settings dialog box.

The MSD signal is, by default, the TIC, but an additional control allows you to extract and display an EIC.

Unzoom All Sets all signal plots to their original zoom states.

Setting up a Fraction Collector Method

Fraction Trigger Mode

Use Timetable: Enables the **Timetable**, but requires a timetable event.

Peak-based: If **Peak-based** is selected, the collection of a fraction is triggered by the signal of the detector. The detailed trigger conditions are specified in the **Peak Detectors** table. In the peak-based trigger mode all entries in the timetable are ignored.

Max. Peak Duration: Defines a maximum collection time in case that the signal does not reach the condition to cut the fraction as exhibited in Figure 8 on page 68. This could be caused by tailing peaks or if the baseline is drifting during gradient runs. The default value is set to 0.5 minutes. If broad peaks are expected, this value should be increased without exceeding the run time.

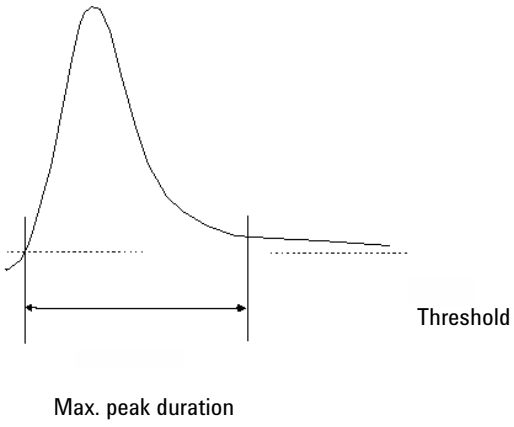


Figure 8 Maximum Fraction Duration

Peak Detectors

In the **Peak Detectors** section a list of all peak detectors that are connected to the system is displayed. Agilent InfinityLab LC Series diode array detectors, multiwavelength detectors, variable wavelength detectors and fluorescence detectors are recognized automatically. Other detectors, e.g. Agilent 6000 mass-selective detectors or HP1050 detectors, are connected through the Universal Interface Box (UIB).

The peak detector table contains seven columns:

Working Mode

For each peak detector **Threshold only, Threshold/Slope** or **Slope only** are possible.

In the **Threshold only** mode the settings for **Up Slope**, **Down Slope** and **Upper Threshold** in the subsequent columns are ignored. Fraction collection is triggered whenever the detector signal exceeds the specified threshold value. When the signal drops below the threshold value fraction collection is stopped.

In the **Slope only** mode fraction collection is triggered on the slope of the detector signal. Adequate values for **Up Slope** and **Down Slope** can be specified in the corresponding fields.

In the **Threshold/Slope** mode fraction collection is triggered on the corresponding values for threshold and slope. The fraction collection is started if the detector signal exceeds both the threshold and the **Up Slope** value. The fraction collection is stopped if the detector signal drops either below the threshold or the **Down Slope** value.

To specify the trigger values **Up Slope**, **Down Slope**, **Threshold** and **Upper Threshold** we recommend to use the **Fraction Preview** tool as described in "Fraction Preview" on page 72.

Upper Threshold

At high absorbance values the light intensity on the detector is extremely low and consequently detector noise will be superimposed on the detector signal. In this case the detector noise might trigger fraction collection. To avoid false fraction collection triggering, we recommend setting an **Upper Threshold** well below the limit where this false triggering effect might occur. As soon as the detector signal exceeds the **Upper Threshold**, settings for **Up Slope** or **Down Slope** will be ignored until the signal drops again below the **Upper Threshold**.

When using more than one peak detector fraction collection can be triggered either when **all selected peak detectors** detect a peak or when **at least one selected peak detector** detects a peak basing on the settings in the peak detectors table above.

If an MSD is used for mass-based fraction collection, **Use MSD for mass-based Fraction Collection** must be checked.

Timetable

The **Timetable** can be used to program changes in the Fraction Trigger Mode during the analysis by entering a Time and specifying the trigger settings.

Trigger Mode Off, Peak Based and Time Based can be selected. If the Off is selected, no fractions are collected. The last entry in the timetable has to be the command Off.

Whenever the **Peak Based** mode is specified fractions will be collected based on the peak detection parameters given in the Peak Detector table. Additionally a **Maximum Peak Duration** in minutes has to be specified. This parameter is mandatory if you use Peak Controlled fraction collection, but is disabled for Time Based fraction collection.

When the Time Based mode is chosen two different options are available:

- The **# of Fractions** can be edited to collect a fixed number of equal fractions in a give time interval. This time interval is defined by the time value in the current and following timetable line.
- **Timeslices [min]** can be edited to collect fractions with a defined collection time. With this option the collection time of the last fraction can be shorter. This depends on the overall runtime.

For editing the Timetable the functions **Insert**, **Append**, **Cut**, **Copy** and **Paste** are offered.

To access the additional sections in the **Setup Fraction Collector** dialog box click **More.**

Time

In the time section of the dialog box the **Stoptime** and the **Posttime** for the fraction collector can be specified. By default the Stoptime is set to as pump and the posttime is switched OFF.

Auxiliary

In the Auxiliary section the **Maximum fill volume** per location can be specified. If as configured is selected, the pre-configured volume is used. This ensures that the location (well, vial or tube) cannot be overfilled during fraction collection. This volume can be further reduced by defining a customized volume.

Fraction Preview

To determine the appropriate fraction collection parameters the Agilent ChemStation provides a valuable tool that becomes accessible by pushing the button labelled Fraction Preview Tool (see Figure 9 on page 72) in the Peak Detectors section.

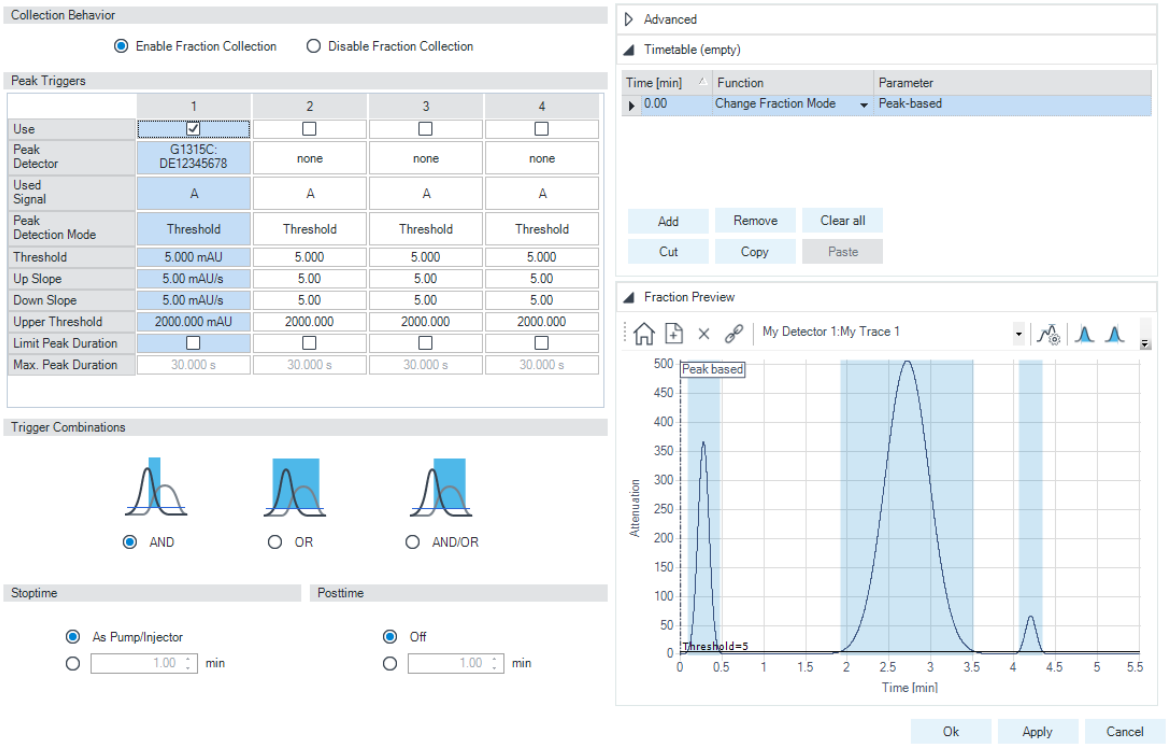


Figure 9 Fraction Preview dialog box

The Fraction Preview screen allows to test the fraction collection parameters against an example chromatogram. It can also be used to optimize the fraction collection parameters interactively. With the help of this tool values for up and down slope as well as for upper and lower threshold can easily be graphically specified. To load a chromatogram (for example a pilot run) click **Load Signal**. Parameters can now be changed either manually in the Detector Table and Timetable or graphically in the **Fraction Preview** screen. By pushing the desired buttons on the right hand side of the **Fraction Preview** screen the chromatogram can be zoomed, the values for up and down slope can be specified and the upper and lower threshold level can be set- up. The graphically specified values are automatically transferred to the Peak Detector Table.

Prepare the Module for Transportation

When

- For transportation within the laboratory
- For shipping the module

Parts required

p/n	Description
G9321-40165	Protect-Foam Y-Axis
G9321-40108	Protect Foam
G9321-22233	Shipping Block

Preparations

- Remove all containers and drawers.
- Remove all vessels from the rinse port.

WARNING

Heavy weight

The module is heavy.

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

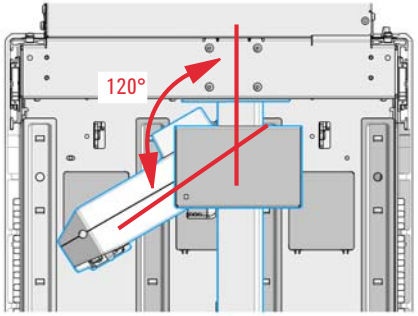
CAUTION

Free movement of Theta-assembly along Y-assembly

Damage of Theta- or Y-assembly

- ✓ **Block the Theta-assembly with the shipping block before transporting the module.**

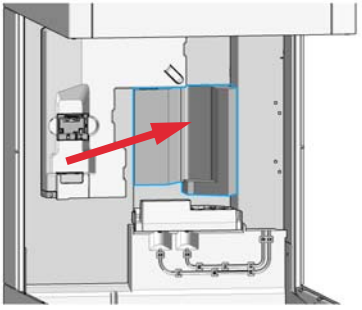
1 Using "Single Steps" from the Service and Diagnostics section in Lab Advisor, move the robotics to the park position.



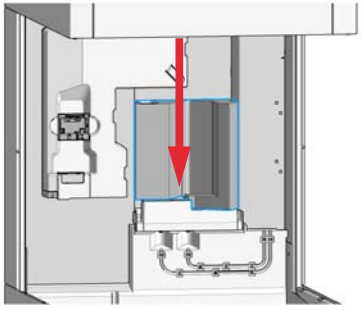
2 Power down the module.

3 Place the Protect-Foam Y-Axis (G9321-40165) in the back of the Y-axis arm.

4 Insert the transportation foam to the rear panel.

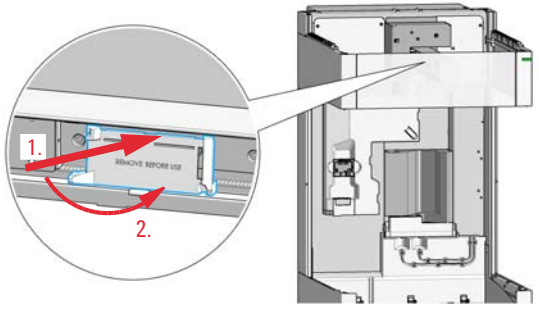


5 Push the transportation foam down to the rinse port.

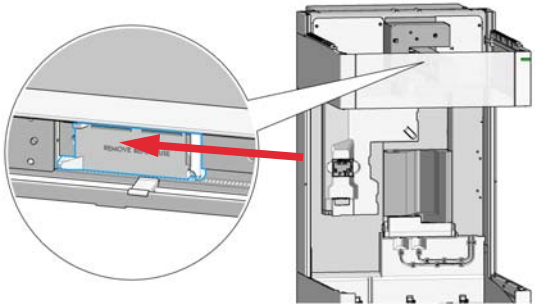


6 Move the robot arm all the way to the back of the module, such that the Z-arm fits into protect foam.

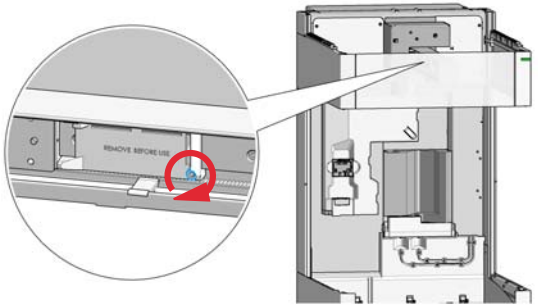
7 Insert the shipping block into the rail on the collector arm.



8 Move the shipping block backward on the rail until the two screwholes of the shipping block and the rail lie on top of each other.



9 Fix the shipping bolt with the M3 screw.



10 For shipping the module to another location, position the module in the transportation box and fix it correctly.

4 Preparing the Sampler/Collector

This chapter explains the operational parameters of the module.

Best Practices

Daily Startup Routine

- Check that the robotics are not obstructed.
- Use the default wash that comprises aqueous and organic wash for ideal performance of sample transport and sample positioning. It allows for:
  - efficient cleaning of the system
  - conditioning of the metering pump
- Use the **Prepare Sampler** function under default parameters:
  - every 24 hours
  - when the instrument was idle over night
  - when the instrument was idle over the weekend

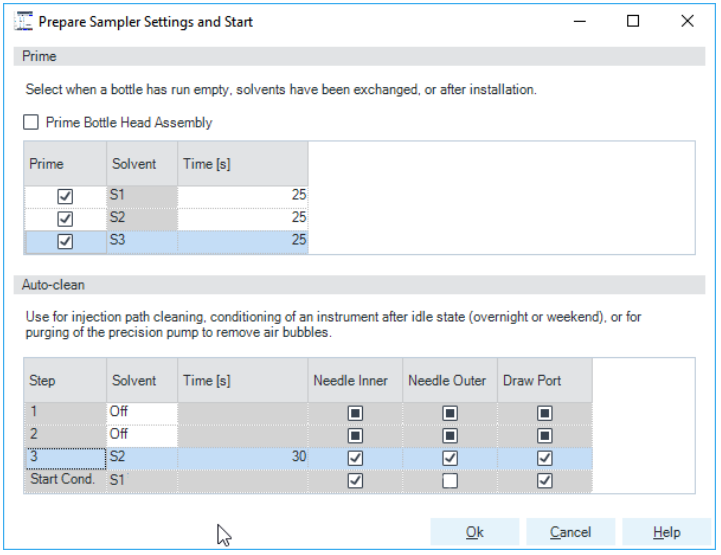


Figure 10 Prepare Sampler: Default settings

Prepare the Sampler/Collector

- Fill the solvent bottles with the following solvents:
  - S1 = draw solvent: water
  - S2: organic wash solvent, use methanol or acetonitrile (see Table 5 on page 35)
  - S3: to be selected by the user
- Use **Prepare Sampler** to:
  - Configure solvents S1 through S3
  - Prime the bottle head assemblies for all solvents used
  - Perform an auto-clean to remove air bubbles
- Make sure to have a stable detector baseline.
- Make sure that fraction tubes are empty or that there is at least enough space for the next fraction.

Refer to Table 5 on page 35 for a choice of priming solvents.

Using the Fraction Collector

- Rinse the dripping adapter between runs.
- Pooling: Make sure that all fraction collection locations are large enough to completely collect all pooled fractions.

Regular Inspections

- Inspect all tubings and exchange them if they are worn out or show visible signs of damage.
- Inspect the peristaltic pump tubing weekly and replace the peristaltic pump cartridge if the tubing has lost its elasticity. Unclip and replace the pump cartridge when the system is not in use.

Capillary Color Coding Guide

Type

Key	Description
Capillary	Connection capillaries
Loop	Loop capillaries
Seat	Autosampler needle seats
Tube	Tubing
Heat exchanger	Heat exchanger

Material

Key	Description
ST	Stainless steel
Ti	Titanium
PK	PEEK
FS/PK	PEEK-coated fused silica*
PK/ST	Stainless steel-coated PEEK**
PTFE	PTFE
FS	Fused silica

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

Fitting Left/Fitting Right

Key	Description
W	Swagelok + 0.8 mm Port id
S	Swagelok + 1.6 mm Port id
M	Metric M4 + 0.8 mm Port id
E	Metric M3 + 1.6 mm Port id
U	Swagelok union
L	Long
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

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

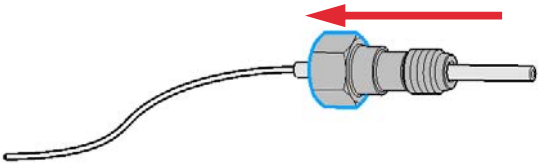
Tip: As you move to smaller-volume, high efficiency columns, you'll want to use narrow id tubing, as opposed to the wider id tubing used for conventional HPLC instruments.

Figure 11 Syntax for capillary description

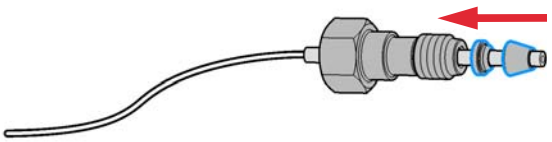
Swage Fittings

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

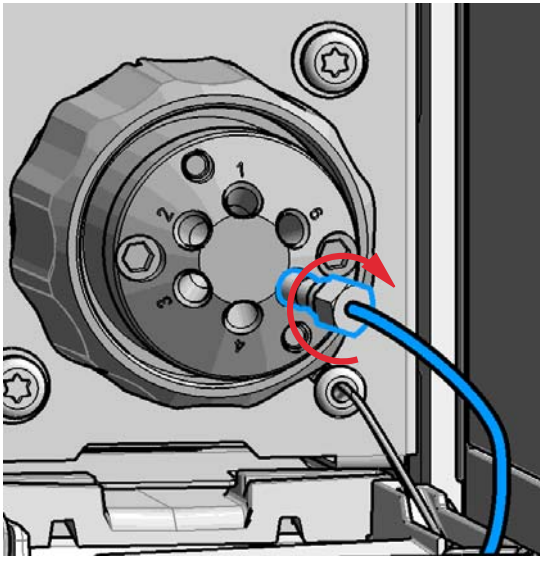
2 Slide the nut over the end of the tubing or capillary.



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.

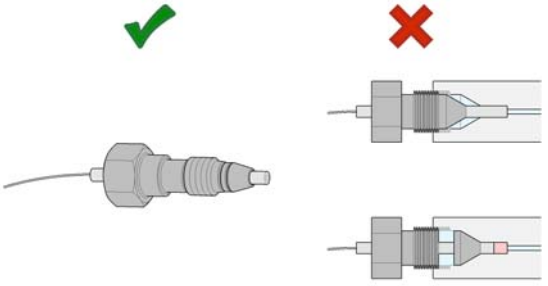


4 Use a column or injection valve to gently tighten the fitting which forces the ferrule to seat onto the tubing or capillary.



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.

Setting up the Sampler/Collector with the Instrument Control Interface

Overview

Parameters described in following sections are offered by the instrument control interface and can usually be accessed through Agilent instrument control software. For details, please refer to manuals and online help of respective user interfaces.

The Preparative Open-Bed Sampler/Collector (G7158B) combines two modules: a preparative sampler (G7169B) and a fraction collector (G7159B).

In order to setup or change the configuration parameters of your Sampler/Collector, select **More Sampler> Configuration** or **More Fraction Collector> Configuration** from the Instrument menu or right-click on the respective icon in the graphical user interface.

Instrument Configuration

Use the **Instrument Configuration** dialog box to examine and, if necessary, modify your instrument configuration. The **Configurable Modules** panel contains a list of all modules available for configuration. The **Selected Modules** panel contains the list of configured modules.

Auto Configuration: Under **Communication settings**, select either the **Host Name** option or the **IP address** option and enter the appropriate value for the host computer to enable automatic detection of the hardware configuration. The system configures the instrument automatically with no further manual configuration necessary.

Instrument Configuration Prep Sampler (G7169B)

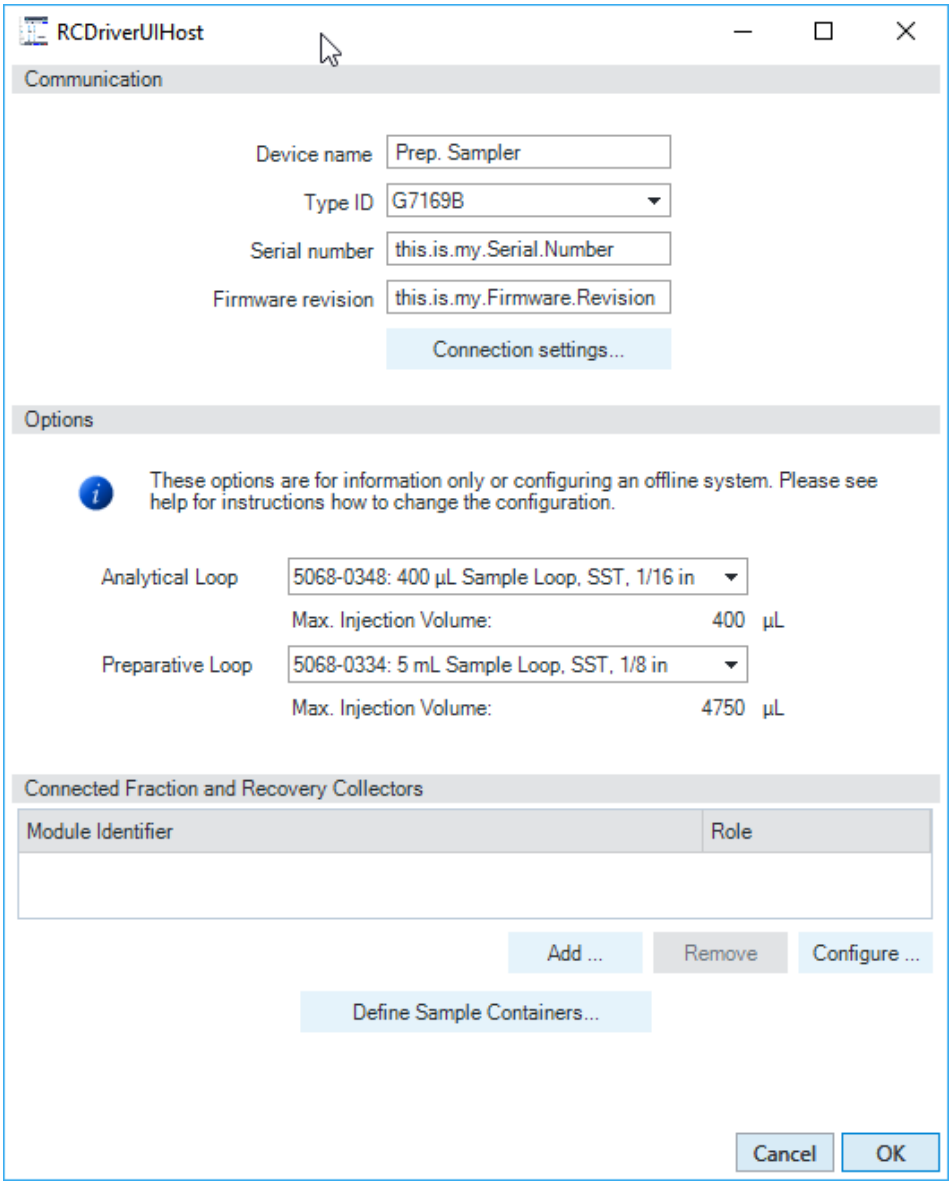
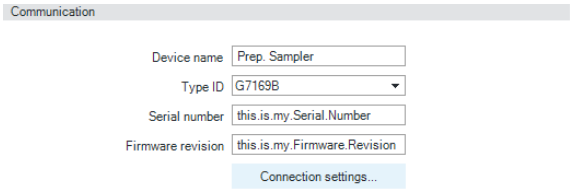
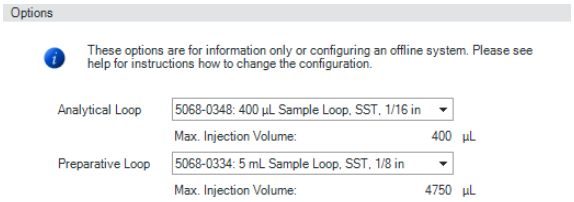
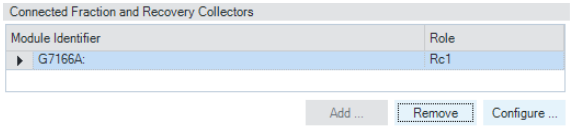


Figure 12 **Instrument configuration (G7169B)**

The Preparative Sampler configuration parameters are in three sections:

- **Communication**
- **Options**
- **Connected Fraction and Recovery Collectors**

Table 11 Instrument configuration parameters (G7169B)

Parameter	Description
	**Communication**: The parameters in this dialog box are detected automatically during autoconfiguration. • **Device name**, • **Type ID**, • **Serial number**, • **Firmware revision** • Button: **Connection settings**
	**Options**: • **Analytical Loop**, • **Preparative Loop**
	**Connected Fraction and Recovery Collectors**: • **Module Identifier**: displays the module type and serial number • **Role**: displays the role of the configured fraction collector, for example, Rc1 is the first recovery collector

Instrument Configuration Fraction Collector (G7159B)

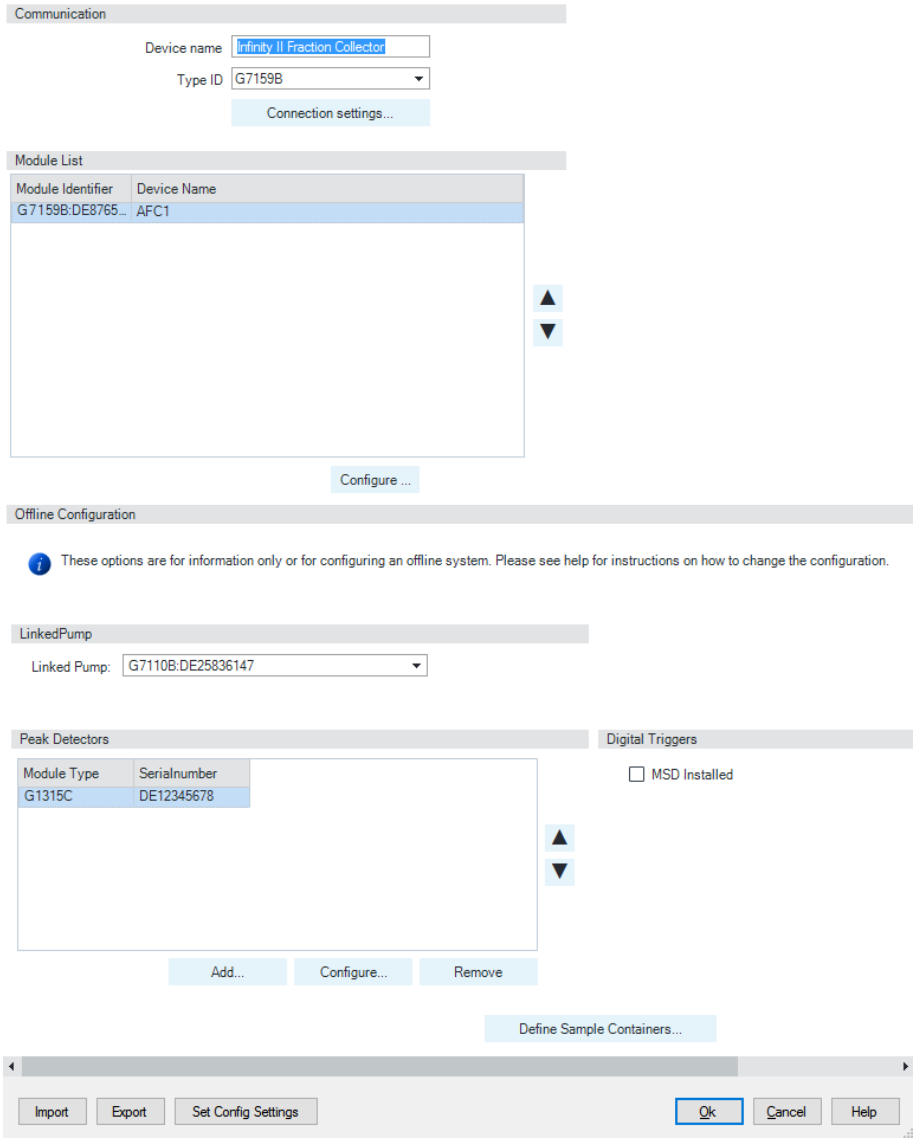


Figure 13 Instrument Configuration

The Fraction Collector configuration parameters are in four sections:

- **Communication**
- **Module List**
- **Peak Detectors**
- **Linked Pump**

Table 12 Instrument configuration parameters

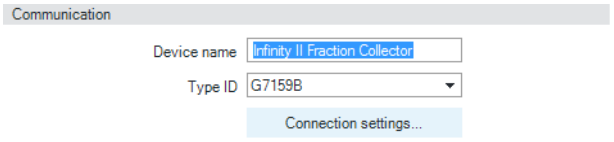
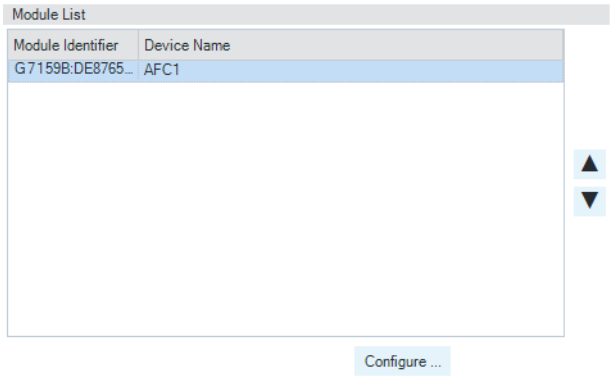
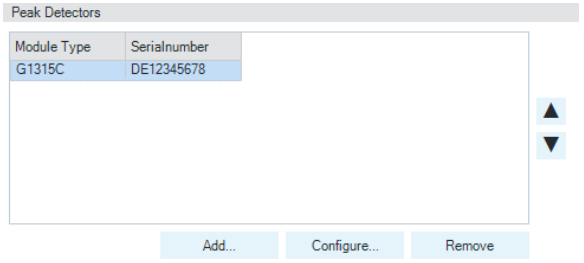
Parameter	Description
	**Communication**: The parameters in this dialog box are detected automatically during autoconfiguration. • **Device name**, • **Type ID**, • Button: **Connection settings**
	**Module List**: • **Module identifier (Type ID: Serial number)**, • **Device name**, • Button: **Configure** (**Device name, Serial number, Firmware revision**)

Table 12 Instrument configuration parameters

Parameter	Description
	**Peak Detectors**: • **Module type**: product number of the peak detector detected during autoconfiguration • **Serial number**: serial number of the peak detector detected during autoconfiguration • **Digital trigger: MSD Installed**, • Buttons: **Add**, **Configure** (**Peak detector**), **Remove** To change the order of the peak detectors, select one from the list and use the up and down arrows to move it to the desired position in the list.
	**Linked Pump**: • If your system is configured with only one Agilent pump, the pump is detected automatically during autoconfiguration and identified as the linked pump. • If your system is configured with more than one Agilent pump, click the down-arrow and select the pump that delivers the main flow to the Infinity II Fraction Collector.

Preparative Sampler User Interface (Dashboard Panel)

Table 13 Preparative Sampler user interface

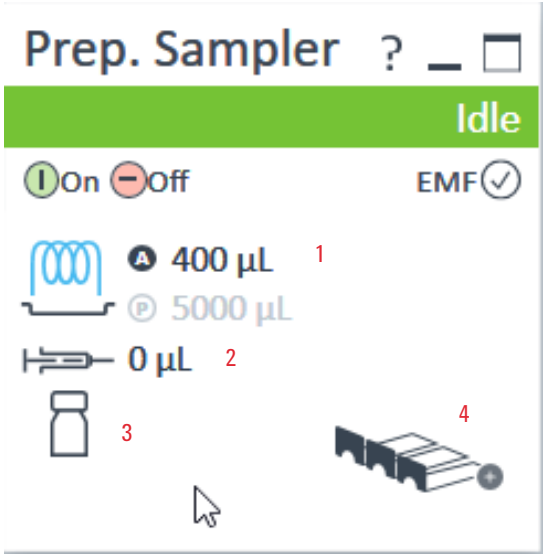
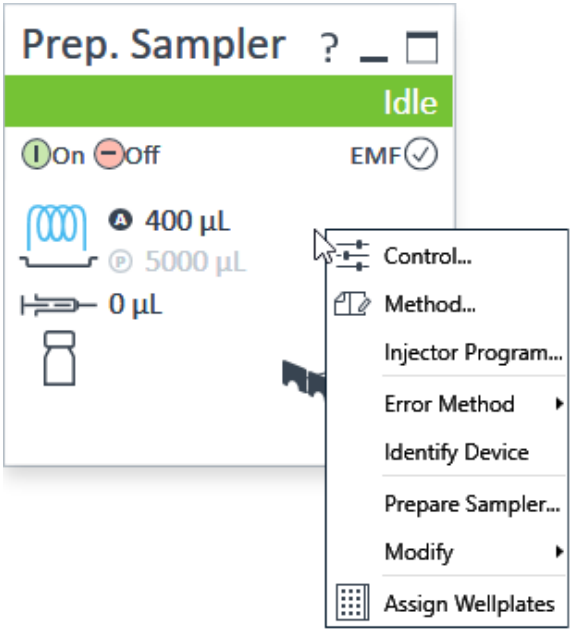
Parameter	Description
	*Module graphic* The items in the Preparative Sampler graphic have the following meaning and function: • 1: Denotes the volume and status of the installed sample loops: A denotes the analytical loop, P denotes the preparative loop. The loop that is not in use is grayed out. • 2: The injection volume of the last sample. • 3: The location of the last sample. • 4: Sample area. When you move the mouse over the graphic, an enlarged graphic of the sample area is displayed, showing the trays and plates that are currently loaded in your instrument (not applicable to custom plates). The sample area graphic is shown with a yellow drawer (lower image) if an open drawer is detected. See Tray and Plate Configuration to edit the tray and plate configuration.
	Instrument Actuals The following Preparative Sampler actuals are displayed: • **Analytical Loop**: The volume of the currently configured analytical loop. • **Preparative Loop**: The volume of the currently configured preparative loop. • **Active Loop**: The loop that is currently in use. • **Injection Volume**: The injection volume of the current sample. • **Sample Location**: The location from which the current sample was drawn. • **Preparation Task**: The current sample preparation task (**Homogenization**, **Dilution**, **Wash** or **Auto-clean**) or None. For **Wash** and **Auto-clean**, the remaining time is shown on a separate line.

Table 13 Preparative Sampler user interface

Parameter	Description
	*Context Menu* The context menu of the dashboard panel contains the following commands: • **Control**: Displays the sampler's **Control** dialog box. See "Preparative Sampler Control Parameters" on page 90 for more details. • **Method**: Displays the sampler's **Method Setup** dialog box. See "Preparative Sampler Method Parameter Settings" on page 93 for more details. • **Injector Program**: Displays the sampler's **Injector Program**. • **Error Method** > **Set Error Method**: Sets the error method to the method that is currently available in the hardware. The error methods are loaded automatically on all modules if an error occurs. • **Error Method** > **Clear Error Method**: Removes the currently loaded error method. • **Identify Device**: Causes the LED on the front of the module to blink for a few seconds. • **Prepare Sampler**: Displays the **Prepare Sampler Settings and Start** dialog box, which allows you to set up parameters for **Prime** and **Auto-clean**. • **Modify** > **Flow Path**: Displays the **Flow Path** dialog box, which allows you to set up the analytical and preparative loop capillaries. These parameters override the Configuration settings. • **Assign Wellplates**: Displays the **Tray and Plate Configuration** dialog box.

Preparative Sampler Control Parameters

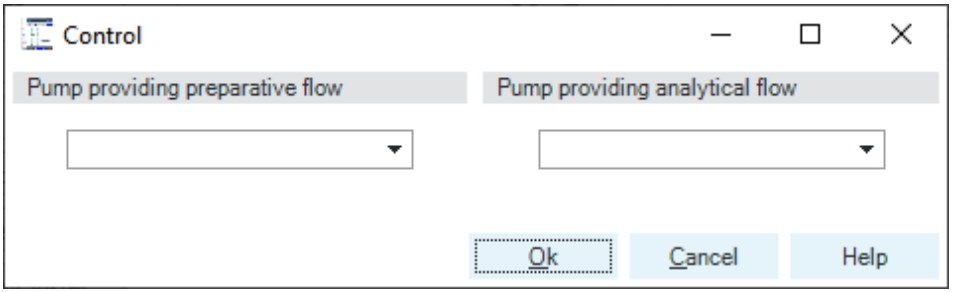


Figure 14 Preparative Sampler Control parameters

The Preparative Sampler **Control** parameters are in two sections:

- **Pump providing preparative flow**:

  Use this section to specify the pump that is used to deliver the flow in Preparative operation mode. Display the drop-down list and select the appropriate pump from the list.

NOTE

If the system only contains a Preparative Pump (G7161A/B), specify this pump both for analytical runs and for preparative runs. Minimum requirement: preparative pump is linked.

If no pumps are linked, the instrument remains in "not ready" state.

- **Pump providing analytical flow**:

  Use this section to specify the pump that is used to deliver the flow in Analytical operation mode. Display the drop-down list and select the appropriate pump from the list.

Fraction Collector User Interface (Dashboard Panel)

Table 14 Fraction Valve User Interface

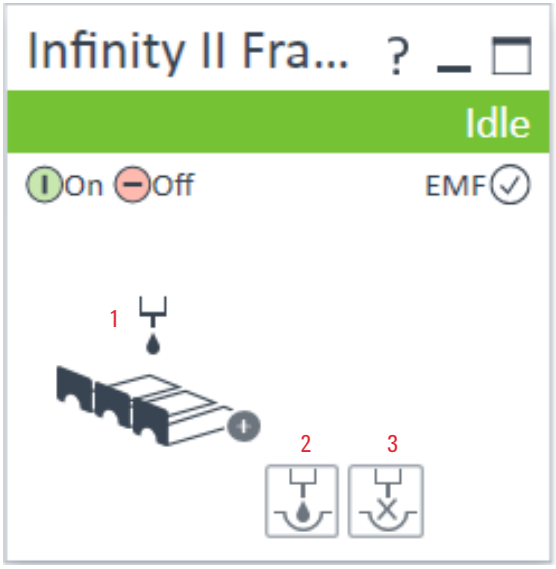
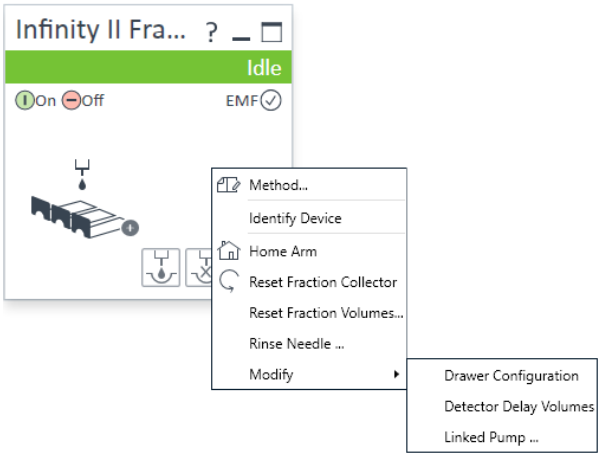
Parameter	Description
	*Module graphic* The items in the Fraction Collector graphic have the following meaning and function: • 1: Denotes collection to a fraction location. The current collection location is shown to the right of the graphic. The tooltip displays the current configuration of fraction locations in your instrument. • 2: Starts manual fraction collection. This button is active only during a run where fraction collection is enabled. • 3: Stops manual fraction collection. This button is active only during a run where fraction collection is enabled.
	Instrument Actuals The following fraction collector actuals are displayed: • **Current location**: The fraction location currently in use. • **Fraction mode**: The current fraction mode. • **Purge Status**: The status of the purge procedure. • **Flush Status**: The status of the Flush procedure.

Table 14 Fraction Valve User Interface

Parameter	Description
	*Context Menu* The context menu of the dashboard panel contains the following commands: • **Method**: Displays the Fraction Collector's Method Setup dialog box. • **Identify Device**: Causes the LED on the front of the module to blink for a few seconds. • **Home Arm**: Moves the robot arm to its home position. • **Reset Fraction Collector**: Sends a reset signal to fraction collector. During the reset, the fraction collector is in a Not Ready state. • **Reset Fraction Volumes**: Informs the fraction collector that the collection bottles and waste bottle are all empty. • **Rinse Needle**: Displays the **Rinse** dialog box, which allows you to specify the rinse parameters. • **Modify** > **Drawer Configuration**: Displays the **Modify Drawer Configuration** dialog box, which allows you to view and (if necessary) modify the drawer configuration of your device. • **Modify** > **Detector Delay Volumes**: The table lists all potential analog peak detection sources configured in your instrument. To modify the delay volume, enter the new delay volume (in µL) in the **Delay Volume (µL)** field of the appropriate peak detector. The changes in delay volumes are registered when you leave the dialog box with **OK**. • **Modify** > **Linked Pump**: Click the down-arrow and select the pump that delivers the main flow from the drop-down list. The list includes all pumps that can be used as linked pump. Choose **None** if the pump that delivers the main flow does not support linking.

Preparative Sampler Method Parameter Settings

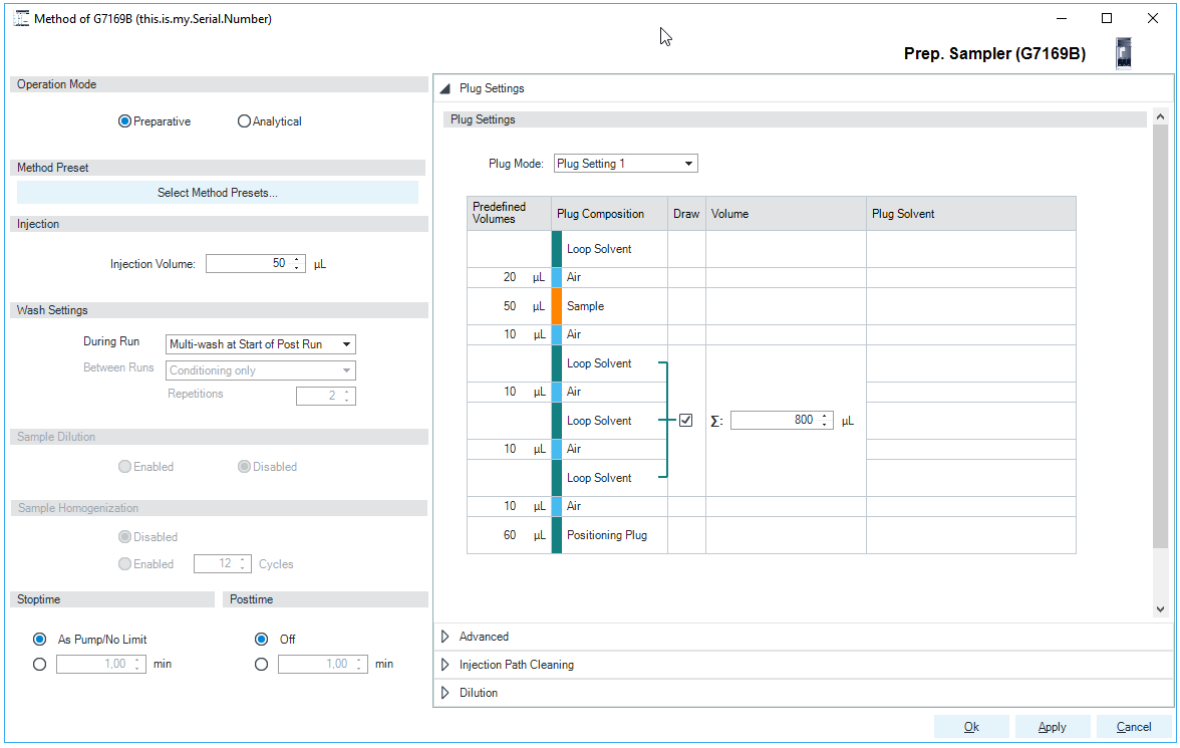


Figure 15 Preparative Sampler method settings

The Preparative Sampler method parameters are in up to twelve sections:

- **Operation Mode**
- **Method Preset**
- **Injection**
- **Wash Settings**
- **Sample Dilution**
- **Sample Homogenization**
- **Stoptime**
- **Posttime**
- **Plug Settings**
- **Advanced**
- **Injection Path Cleaning**
- **Dilution**

Table 15 Method parameter settings

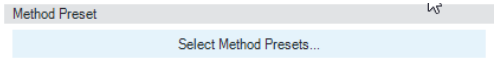
Parameter	Description
	**Operation Mode** The selected operation mode determines the maximum injection volume, based on the configured loop. Select **Preparative mode** to use the currently configured **Preparative Loop**, or **Analytical mode** to use the currently configured **Analytical Loop**.
	**Method Preset** The **Method Presets** section allows you to apply pre-defined settings to your analytical or preparative method. When a method preset is applied, method settings are changed to specific preset values. You can then adapt individual method parameters as needed. Choose the appropriate Method Presets for the nature of your sample matrix and the solubility of your sample. Click **Select Method Presets** to select the appropriate sample matrix from the list: • **Polar Sample Matrix**: Use these presets for samples dissolved in aqueous media • **Non-polar Sample Matrix**: Use these presets for samples dissolved in organic solvents (for example, ACN, MeOH, DMSO). • **Saturated Non-polar Sample Matrix**: Use these presets for samples dissolved in organic solvents at high concentration and/or close to saturation. **NOTE** The Method Presets provide a starting point for method optimization. Further optimization of individual parameters is recommended, based on your specific requirements
	**Injection** Specifies the injection volume. The injection volume limits depend upon the selected operation mode and the associated configuration options of the sampler as well as on the selected plug settings (see "Plug Settings" on page 98). At least 75 % of the preparative loop volume can be filled with sample. For analytical loops, it is recommended not to exceed 50 µL injection volume.

Table 15 Method parameter settings

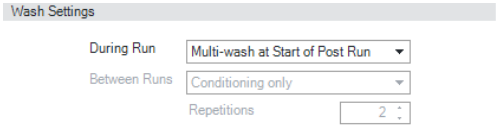
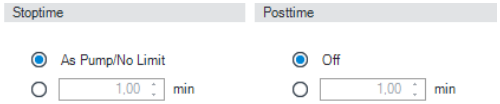
Parameter	Description
	**Wash Settings** • **During Run**: **Off** - no Multi-wash is performed. **Multi-wash at Start of Post Run** - the Multi-wash is executed at the start of the post-run period in accordance with the parameters set up under **Injection Path Cleaning** (see "Injection Path Cleaning" on page 107). • **Between Runs** (Analytical operation mode only): **Conditioning only** - the analytical loop is flushed but no Multi-wash is performed. **When changing Operation Mode** - the Multi-wash is executed when the **Operation Mode** is switched from **Preparative** to **Analytical**. **Repetitions**- enter the number of times to carry out the wash in the field. Valid range is 1 – 10. Conditioning will always be performed and takes about 5 min. It is recommended to use this time to clean the sampling path (see "Analytical to Preparative Switching Procedure" on page 120). The number of repetitions is calculated with the multi-wash parameters and times selected in the injection path cleaning section of the analytical method. To switch off the wash between operation mode change, select **Conditioning only**. Repetitions are only performed for multi-wash steps 1-3, if applicable.
	**Sample Dilution** (Analytical operation mode only): • **Enabled**: Activates the **Dilution** section of the method parameters, which allows you to specify the conditions for the dilution of the sample. • **Disabled**: Disables the **Dilution** section of the method parameters.
	**Sample Homogenization** (Analytical operation mode only): • **Disabled**: Switches off sample homogenization. • **Enabled**: The sample is homogenized; specify the number of times this process is carried out in the **Cycles** field. Homogenization is carried out immediately before the sample is drawn.

Table 15 Method parameter settings

Parameter	Description
	**Stoptime** The **Stoptime** sets a time limit for your analysis. Limits: 0.01 – 99999 min or **As Pump/No Limit**. **Posttime** You can set the **Posttime** so that your 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 your column to equilibrate after changes in solvent composition (for example after gradient elution). Limits: 0.01 – 99999 min or **Off** (0.0 min) If multi-wash is switched on, it will be performed at the start of the post run so that it does not interfere with fraction collection. You can either set a defined **Posttime** or switch it off. If **Posttime** is switched off, the multi-wash will still be performed.
Plug Settings	See "Plug Settings" on page 98.
Advanced	See "Advanced Settings" on page 105.
Injection Path Cleaning	See "Injection Path Cleaning" on page 107.
Dilution	See "Dilution" on page 108.

Plug Settings

Plug settings are automatically set depending on your sample matrix when using the **Method Presets**.

It is recommended to use the plug settings as mentioned in **Select Method Preset**:

- Plug setting 1 for polar sample matrix
- Plug setting 2 for non-polar sample matrix
- Plug setting 3 for saturated non-polar sample matrix (potentially precipitating samples)

Generally, plug settings 2 and 3 use water/organic or pure organic plugs which are necessary to prevent samples from precipitating in the sampling path.

Segmentation provides an increased transport efficiency and ensures quantitative sample transfer from the needle tip to the injector valve. It further minimizes risks of precipitation for samples of high concentration.

Plug Setting 1

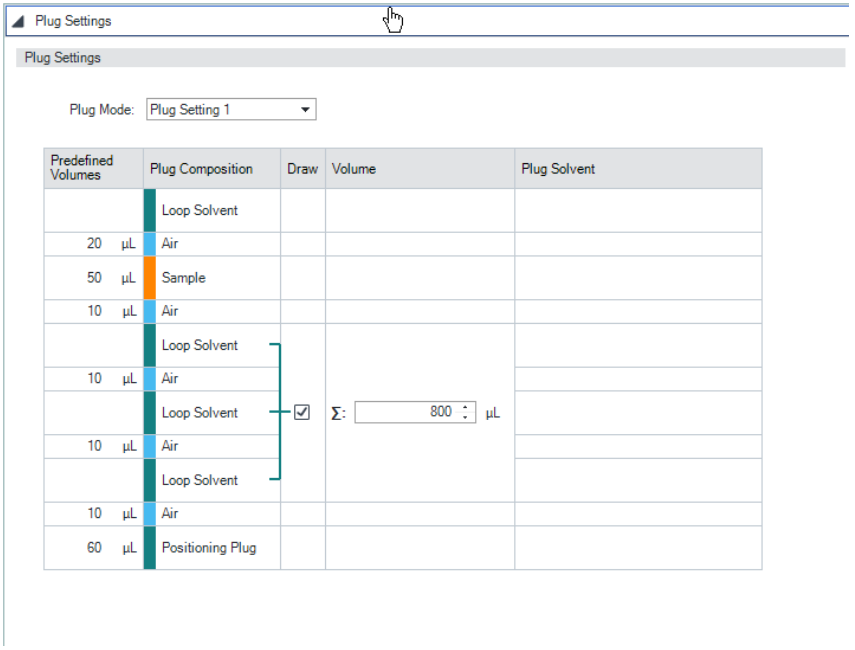


Figure 16 Plug Setting 1

The **Sample** plug is followed by an optional three-part **Loop Solvent** plug and **Positioning Plug**. The **Loop Solvent** plugs and **Positioning Plug** use the current solvent composition from the method. All volumes except the **Sample** injection volume and the solvent plug are fixed. Specify the total volume of the solvent plug in the adjacent field; the volume you specify is divided by three for each of the parts. Clear the check box to remove the **Loop Solvent** plug and **Positioning Plug**.

Default settings:

- Preparative operation mode: 800 µL
- Analytical operation mode: 180 µL

Plug Setting 2

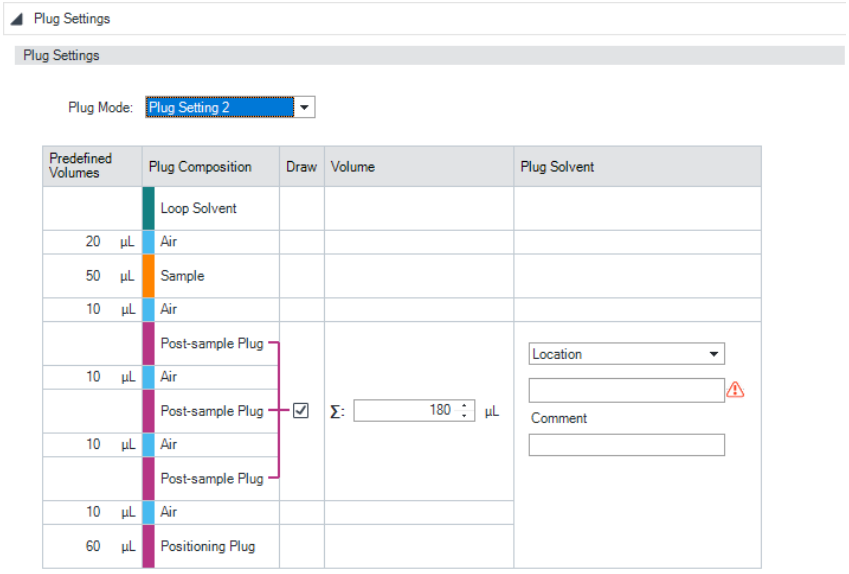


Figure 17 Plug Setting 2

The **Post-sample Plug** can either be a pure organic solvent or a mixture of organic solvent and water. It provides a higher transport capacity of sample through the tubing to the injector valve for cases where the polarity of the analytes and of the loop content, which is based on the start gradient, do not match. Further, high concentrated samples require the usage of post-sample plugs due to their elevated transport capacity.

The **Sample** plug is followed by an optional three-part **Post-sample Plug** and **Positioning Plug**. The **Post-sample Plug** and **Positioning Plug** use a different solvent from the **Loop Solvent**, which is the current solvent composition from the method. All volumes except the **Sample** injection volume and the **Post-sample Plug** are fixed. Specify the total volume of the **Post-sample Plug** in the adjacent field; the volume you specify is divided equally between the parts. Click the down-arrow and specify the location of the solvent for the **Post-sample Plug** from the drop-down list; you can select from **Location**, **Current Container**, **Sample+** and **Location+**. Add a comment in the **Comment** column, if necessary. The **Comment** is limited to 20 characters; however, the use of some special characters may reduce this limit. Clear the check box to remove the **Post-sample Plug** and **Positioning Plug**.

Default settings (preparative and analytical operation mode): 180 µL with 25 % methanol.

If precipitation occurs in the sampling flow path, increase the organic composition of the post-sample plug for preparative applications or switch to plug setting 3. Be aware that the increase of organic composition decreases the amount of sample that can be injected on the column. The impact is more severe for analytical injections.

Plug Setting 3

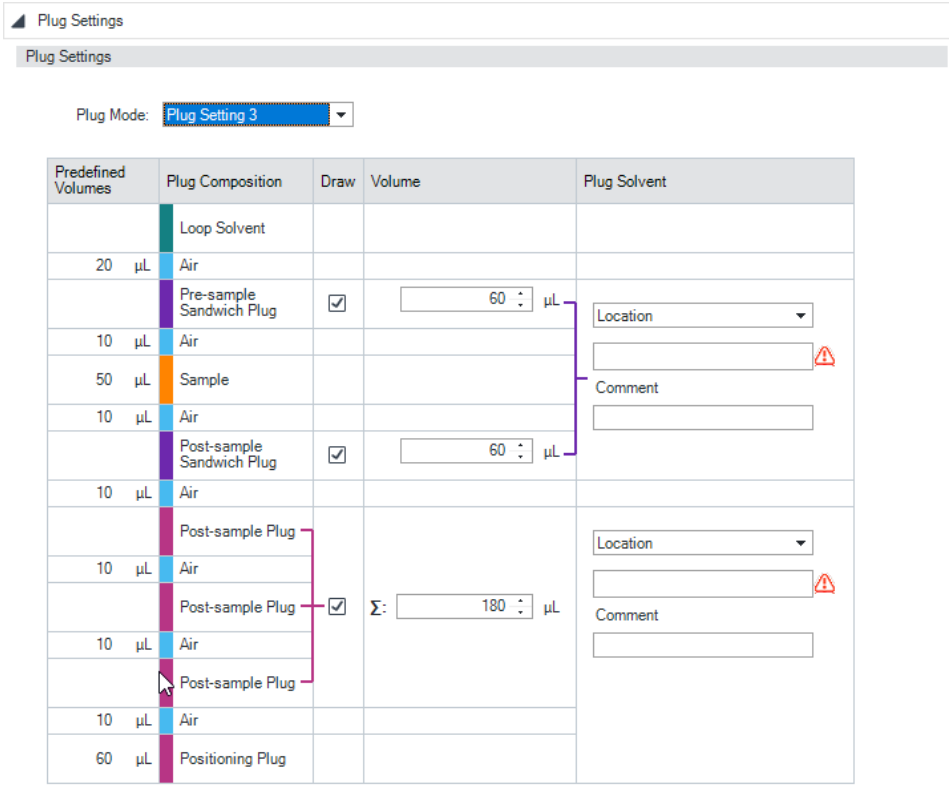


Figure 18 Plug Setting 3

The **Sample** plug is preceded by an optional **Pre-sample Sandwich Plug**, and followed by an optional **Post-sample Sandwich Plug**. These are followed by an optional three-part **Post-sample Plug** and **Positioning Plug**. In **Preparative** operating mode, all of these plugs use the same solvent. In **Analytical** operation mode, the **Pre-sample** and **Post-sample Sandwich Plugs** use the same kind of solvent, but different from the loop solvent. The **Post-sample Plug** and **Positioning Plug** use a different solvent from both the two **Sandwich Plugs** and the **Loop Solvent** (the current solvent composition from the method). All volumes except the **Sample** injection volume, **Sandwich Plugs** and **Post-sample Plug** are fixed. Specify the volumes of the **Pre-sample Sandwich Plug** and **Post-sample Sandwich Plug** in the adjacent fields. Click the down-arrow and specify the location of the solvent for the **Sandwich Plugs** from the drop-down list; you can select from **Location**, **Current Container**, **Sample+** and **Location+**. Add a comment in the **Comment** column, if necessary. The **Comment** is limited to 20 characters;

however, the use of some special characters may reduce this limit. Specify the total volume of the **Post-sample Plug** in the adjacent field; the volume you specify is divided equally between the parts. Click the down-arrow and specify the location of the solvent for the **Post-sample Plug** from the drop-down list; you can select from **Location**, **Current Container**, **Sample+** and **Location+**. Add a comment in the **Comment** column, if necessary. The **Comment** is limited to 20 characters; however, the use of some special characters may reduce this limit. Clear the check boxes to remove the **Pre-sample Sandwich Plug** and/or **Post-sample Sandwich Plug** and/or **Post-sample Plug** and **Positioning Plug**.

Default values:

- Preparative operation mode:
  - Pre- and post-sample sandwich plug: 30 µL / 100 % MeOH
  - Post-sample plugs: 180 µL / 100 % MeOH
- Analytical operation mode:
  - Pre- and post-sample sandwich plug: 15 µL / 100 % MeOH
  - Post-sample plugs: 180 µL / 25 % MeOH

If precipitation occurs in the sampling flow path, increase the organic composition of the post-sample plug (analytical operation mode) or increase the volume of the post-sample plug (preparative operation mode).

Increasing the organic composition decreases the amount of sample that can be injected on the column as the column can only handle a certain amount of organic solvent. The impact is more severe for analytical injections.

If fronting of peaks occurs in your chromatogram and your sample has rather low concentrations, use plug setting 2 with 25 % methanol or reduce the organic composition of the post-sample plug in plug setting 3. This enables you to inject more sample without changing to a bigger column.

For highly concentrated samples, peak fronting is typically not observed. To increase column load, the organic composition of the post-sample plugs must be reduced if precipitation is not expected.

Some organic solvents are not recommended to be used as sandwich and post-sample plug solvents, mainly due to their physicochemical properties:

- Isopropanol easily dissolves the separating air plugs leading to mixing of the plugs and thus to lower recovery.
- DMSO has a higher viscosity than most other organic solvents commonly used in LC. This can result in disintegration of larger DMSO plugs and buildup of more air plugs at the end of the sample/solvent plug. The total length of the whole sandwich plug is thereby increased. As a result, the plug is not completely transferred to the sample loop, leading to reduced recovery.
- Other low viscous or highly volatile solvents could disintegrate as well when the draw and/or positioning speed is too high. Reducing the draw/positioning speed will help a lot in such cases.

Use preferably acetonitrile or methanol as pre- and post-sample plug sandwich solvents.

Advanced Settings

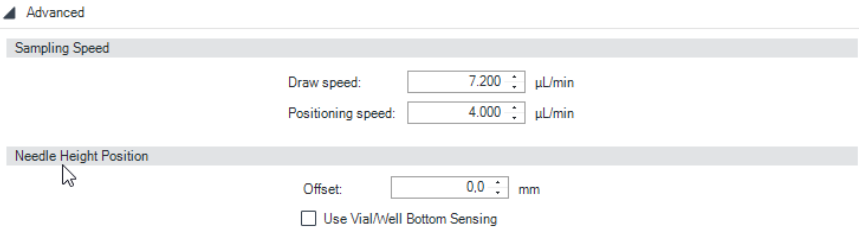


Figure 19 Advanced settings

The Preparative Sampler advanced method parameters are in two sections:

- **Sampling Speed**
- **Needle Height Position**

Table 16 Advanced parameters description

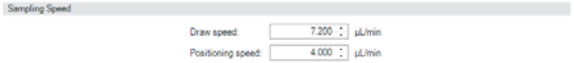
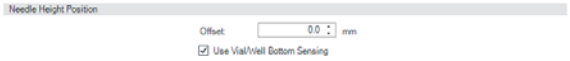
Parameter	Description
	**Sampling Speed** • **Draw Speed** The **Draw Speed** determines the rate at which the plunger draws sample from the vial. Set the speed to an appropriate value for your sample. For viscous samples, use a slow **Draw Speed**. • **Positioning Speed** The **Positioning Speed** determines the rate at which the sample is positioned in the loop. For viscous samples, use a slow **Positioning Speed**. The recommended range for **Draw Speed** and **Positioning Speed** depends on the configured sample loop. • Sampling Speed Range (0 – 10000 µl/min): 400 µL Sample Loop SST, 1/16 in (5068-0348) 20 mL Sample Loop SST, 1/8 in (5068-0336) 10 mL Sample Loop, SST, 1/8 in (5068-0335) 5 mL Sample Loop, SST, 1/8 in (5068-0334) 2 mL Sample Loop, SST, 1/16 in (5068-0350) • Sampling Speed Range (0 – 6000 µl/min): 5 mL Sample Loop, SST, 1/16 in (5068-0351)

Table 16 Advanced parameters description

Parameter	Description
	**Needle Height Position** • **Offset**: This is 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. • **Use Vial/Well Bottom Sensing**: Using the **Use Vial/Well Bottom Sensing** feature is recommended to draw the maximum volume of sample out of the vial. This feature allows the needle to detect non-uniform well bottoms, and adjusts the depth of the needle position above the bottom of the vial or well. You can use **Vial/Well Bottom Sensing** in combination with the **Offset** to customize the draw position of the needle. You may want to turn off **Vial/Well Bottom Sensing** to increase speed of injection, or to avoid the needle touching the bottom of the well if a sample precipitate could clog it. ◦ **Vial/Well Bottom Sensing** disabled: the offset is calculated from the stored dimensions of the plate. ◦ **Vial/Well Bottom Sensing** enabled: the offset is calculated from the bottom position determined by the bottom sensing of the instrument.

Injection Path Cleaning

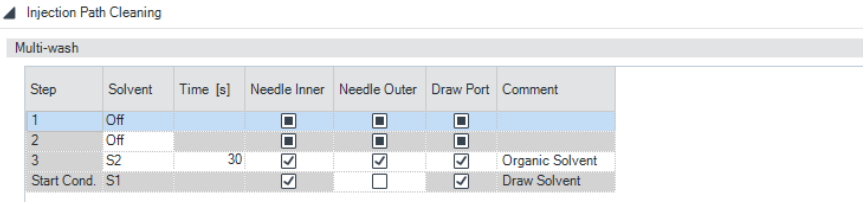


Figure 20 Injection path cleaning

The **Multi-wash** table allows you to specify up to four steps that will be used to clean the system. The **Start Cond.** step is obligatory; you cannot switch it off. However, you can switch off the **Needle Outer** wash if it is not required to avoid precipitation of high concentrated sample at the needle tip.

For each cleaning step,

- Click the **Solvent** down arrow and select the solvent to use (**S1**, **S2**, **S3**) or switch the step **Off**.
- Specify a duration (in seconds) in the **Time [s]** field.
- Mark the check boxes for **Needle Inner** (the inside of the needle),**Needle Outer** (the outside of the needle) and/or **Draw Port** to include these actions. If all three are selected, they are carried out simultaneously; if none is selected, the step is ignored (equivalent to selecting **Off**).
- Add a comment in the **Comment** column, if necessary. The **Comment** is limited to 20 characters; however, the use of some special characters may reduce this limit.

Make sure you connect at least one additional organic wash solvent besides water (draw solvent), preferably methanol and/or acetonitrile.

The minimum settable time is 15 s. This is the time the solvent needs to travel through the flow path.

The default is 20 s respectively 30 s full wash with S2 and reconditioning without outer needle wash.

Reconditioning with solvent 1 is mandatory and cannot be unchecked.

If carry over occurs first check the contribution of column and sample/blank vial. Check for proper connections and adequate washing procedure using different organic wash solvents and washing time.

To save wash solvent, the wash of draw port is unchecked by default in the multi-wash table when using plug settings 2 or 3, as the draw port is not in use.

Dilution

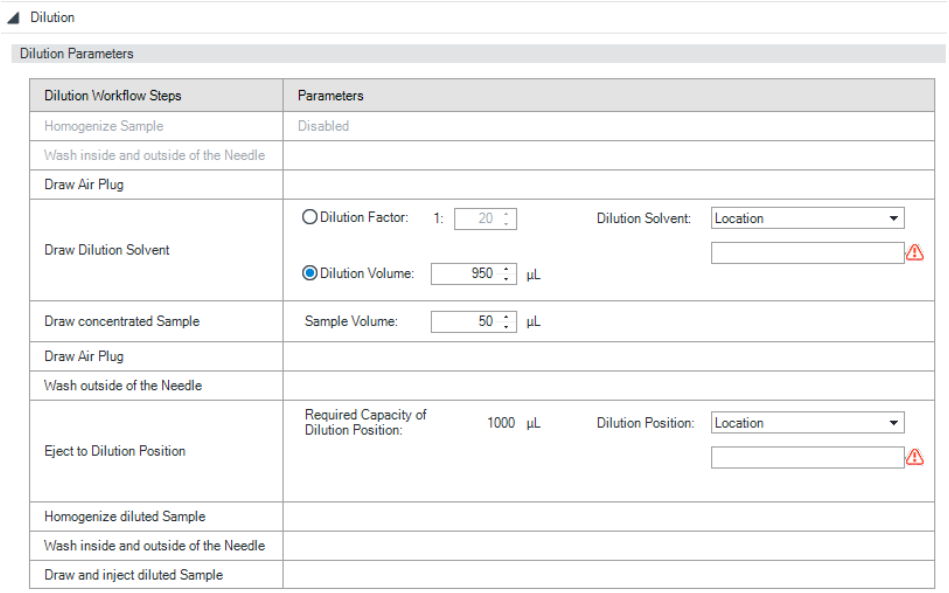


Figure 21 Dilution settings

The **Dilution** section is available only for the **Analytical** operation mode, and only when enabled in the **Sample Dilution** section. It allows you to dilute concentrated samples before injection.

NOTE

Ensure using a vessel with sufficient volume to hold the diluted sample. The maximum amount of diluted sample is 1 mL.

The following parameters must be specified:

- **Draw Dilution Solvent**
  - **Dilution Factor**: Choose this option to specify a dilution factor in the adjacent field.

    Valid range: 2 – 200
  - **Dilution Volume**: Choose this option to specify a volume of solvent with which to dilute the sample. Specify the volume in the adjacent field.

    Valid range: 1 – 1000 µL. Use a minimum volume of 5 µL for accurate results.
  - **Dilution Solvent**: Click the down-arrow and select how to specify the location of the dilution solvent from the drop-down list. You can select from Location, Current Container, Sample+ and Location+.
- **Draw Concentrated Sample**: Specify the volume of concentrated sample to draw (in µL) in the **Sample Volume** field.

  Valid range: 1 – 500 µL. Use a minimum volume of 5 µL for accurate results.
- **Eject to Dilution Position**: Specify the location for the diluted sample.
  - **Required Capacity of Dilution Position**: This field shows the minimum required volume of the vessel.

    The maximum required volume must not exceed 1000 µL.
  - **Dilution Position**: Click the down-arrow and select how to specify the location of the dilution solvent from the drop-down list. You can select from Location, Current Container, Sample+, Location+, Container and Drawer.

Use high recovery vials if the volume of the dilution is less than the following:

- <150 µL: use 2 mL vials
- <350 µL: use 5 mL vials

Dilution can be used for the analysis of concentrated samples during a scouting run, or for reinjection of high concentrated fractions. After dilution, the diluted sample is injected immediately. Dilution cannot be performed outside or without a consecutive run. Dilution shows best performance when samples are drawn out of tubes. Diluting from vials with slitted septa could lead to a larger dilution error (typically 1 out of 10 – 20). Good sample and dilution solvents are water and methanol; DMSO can show increased errors. Enable vial bottom sensing to draw properly, especially for concentrated samples with low volume.

NOTE

After dilution, multi-wash is performed using the method parameters defined under **Injection Path Cleaning**, even if **During Run** is switched off under **Wash Settings**.

Fraction Collector Method Parameter Settings

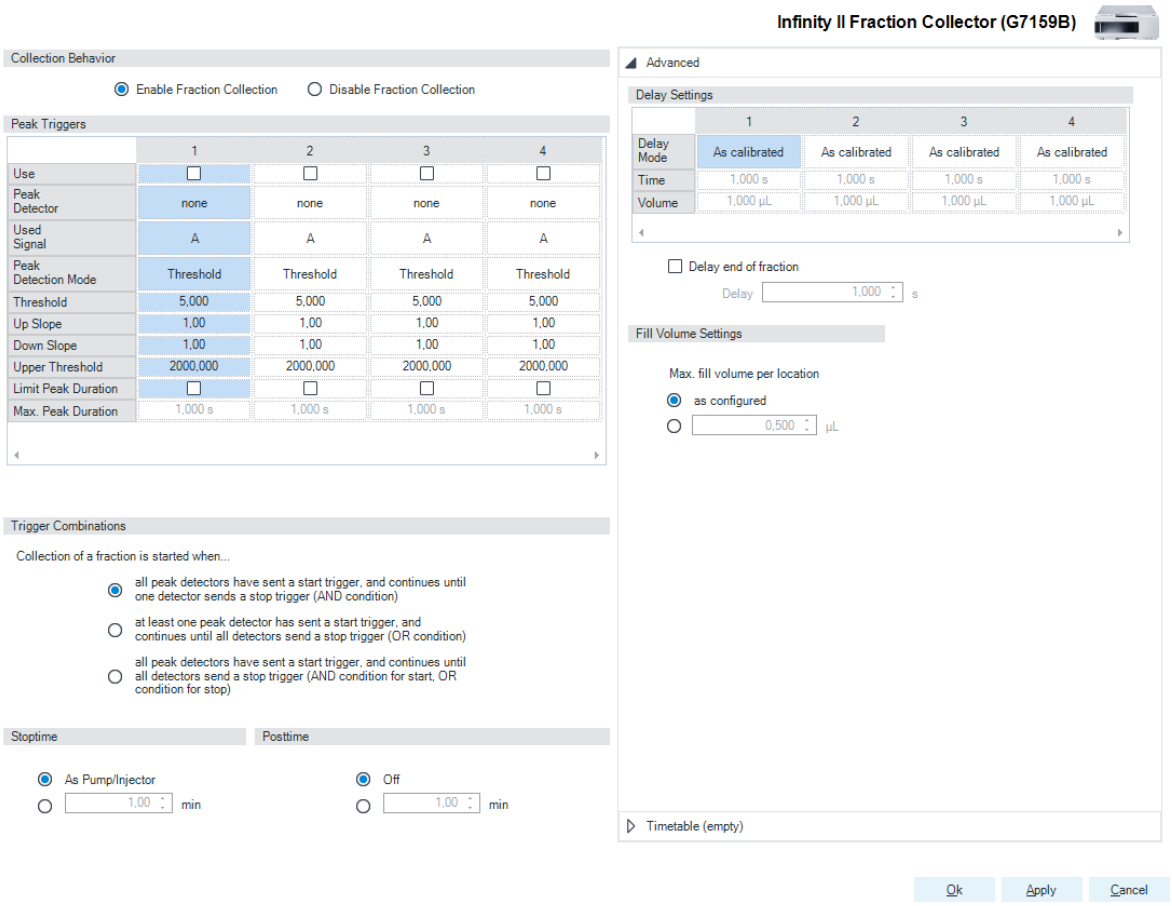


Figure 22 Method settings

The Fraction Collector method setup parameters are in eight sections:

- **Collection Behavior**
- **Peak Triggers**
- **Trigger Combinations**
- **Stoptime**
- **Posttime**
- **Advanced**
- **Timetable**
- **Fraction Preview**

Table 17 Method Parameter Settings

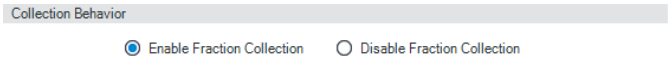
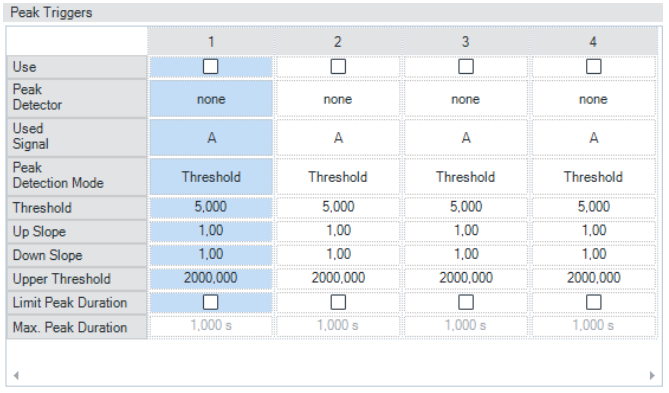
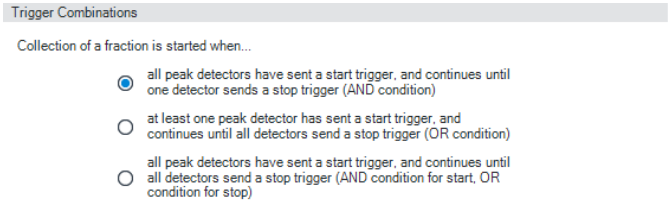
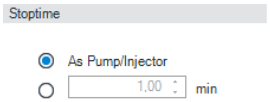
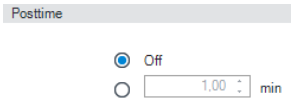
Parameter	Description
	**Collection Behavior** Use this setting to either enable or disable the fraction collection parameters of the instrument.
	**Peak Triggers** Use the Peak Triggers table to specify the detection settings of the peak detectors available in your system. • **Peak Detection Mode** The following detection modes are available: ◦ **Off** (The peak detector is not used) ◦ **Slope** (Detects peaks based on slope values only) Limits: **Up slope**: 0.01 – 10000 units/s, **Down slope**: 0.01 – 10000 units/s ◦ **Threshold** (Detects peaks based on threshold values only) Limits: **Threshold**: -10000 – 10000 units,**Upper threshold**: 0.01 – 10000 units ◦ **Threshold and Slope** (Detects peaks based on both threshold and slope values) • **Max Peak Duration** ◦ You can **Limit Peak Duration** to stop the fraction collection in cases where the baseline drifts and the signal does not drop below the specified threshold value. Limits: 1 – 10000 s

Table 17 Method Parameter Settings

Parameter	Description
	**Trigger Combinations** Use the **Trigger Combinations** to specify how multiple peak triggers are combined to start or stop Fraction Collection. You can choose that: • Collection of a fraction is started when **all peak detectors** have sent a start trigger, and continues until **one detector** sends a stop trigger (AND condition) • Collection of a fraction is started when at least **one peak detector** has sent a start trigger, and continues until **all detectors** send a stop trigger (OR condition) • Collection of a fraction is started when **all peak detectors** have sent a start trigger, and continues until **all detectors** send a stop trigger (AND condition for start, OR condition for stop)
	**Stoptime** Enables you to set a time at which the fraction collector stops an analysis. If the fraction collector is used with other Agilent Modular LC modules, the fraction collector stoptime stops the fraction collector only and does not stop any other modules. Limits: 0.01 – 99999.00 min or **As Pump/Injector**
	**Posttime** You can set the **Posttime** so that your fraction collector remains in the post-run state during the **Posttime** to delay the start of the next analysis. When the **Posttime** has elapsed, the fraction collector is ready for the next analysis. Limits: 0.01 – 99999.00 min or **Off** (0.0 min)
Advanced	See "Advanced Settings" on page 113
Timetable	See "Timetable Settings" on page 115
Fraction Preview	Use the **Fraction Preview** screen to test the fraction collection parameters against one or more reference signals. You can also use the **Fraction Preview** to optimize the fraction collection parameters interactively.

Advanced Settings

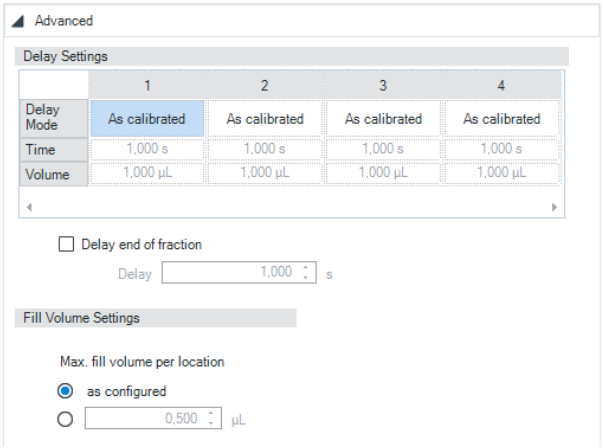
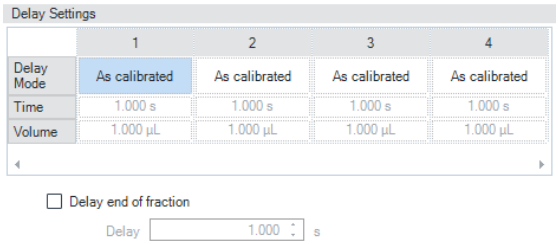
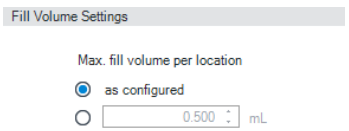


Figure 23 Advanced settings

The Fraction Collector method setup advanced parameters are in three sections, depending on the configuration:

- **Delay Settings**
- **Fill Volume Settings**
- **3rd Party Pump Flow** (only visible if there is no Agilent pump recognized.)

Table 18 Advanced Parameters Description

Parameter	Description
	**Delay Settings** Use the **Delay Settings** table to specify the delay that is applied to a peak trigger signal. You can specify this setting for each peak detector separately. You can choose from: • **Off** (No delay is applied to fraction collection and collection starts as soon as the trigger conditions are met) • **As calibrated** (Delays fraction collection by a pre-defined delay volume, where for each peak trigger, the delay volume can be displayed (and edited) using the **Modify Detector Delay Volumes** dialog box, accessed from the context menu of the instrument's dashboard panel) • **Use Time** (Enables the **Time** field to allow you to set a delay time) • **Use Volume** (Enables the **Volume** field to allow you to set a delay volume) **Delay end of fraction**: An additional delay can be set if you want to delay the end of fraction collection by an additional amount of time. Specify the additional time used to delay the end of fraction collection in seconds.
	**Fill Volume Settings** Use the **Fill Volume Settings** to specify the **Maximum fill volume** used in your method.
3rd Party Pump Flow	If your Fraction Collector is not connected to a Linked Pump, specify a Pump Flow for the Fraction Collection method. **NOTE** This section is only visible if there is no Agilent pump recognized.

Timetable Settings

NOTE A timetable entry is crucial to enable any fraction collection.

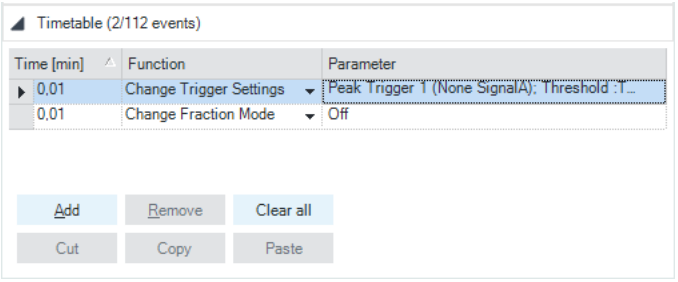


Figure 24 Timetable settings

Use the Timetable to program changes in the fraction collector parameters during the analysis by entering a time in the Time field and appropriate values in the following fields of the timetable. The values in the fraction collector timetable change instantaneously at the time defined in the timetable.

The following parameters can be changed:

- **Fraction Mode**
- **Trigger Settings**

Table 19 Timetable Functions

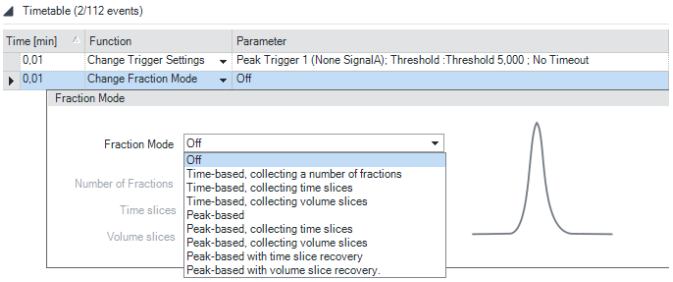
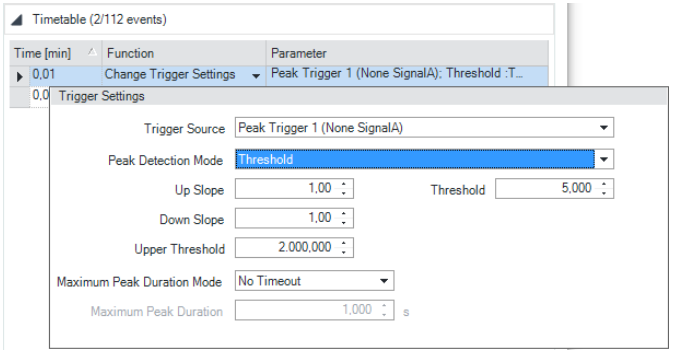
Function	Parameters
	**Fraction Mode** • **Off** (Turns off the current fraction collection, where you use Off to turn off fraction collection at the end of the run if you have not specified a **Stoptime**) • **Time-based, collecting a number of fractions** (Fractions are collected between this time and the next change of fraction mode or Off, where you specify the number of fractions to collect in the **Number of Fractions** field) • **Time-based, collecting time slices** (Time-slice fractions are collected between this time and the next change of fraction mode or Off. where you specify the duration of the time-slices to collect in the **Time slices** field) • **Time-based, collecting volume slices** (Volume-slice fractions are collected between this time and the next change of fraction mode or Off, where you specify the volume of the fractions to collect in the **Volume slices** field) • **Peak-based** (Fractions are collected based on the peak detection settings) • **Peak-based, collecting time slices** (Time-slice fractions are collected during the elution of a peak, based on the peak detection settings, where you specify the duration of the time-slices to collect in the **Time slices** field) • **Peak-based, collecting volume slices** (Volume-slice fractions are collected during the elution of a peak, based on the peak detection settings, where you specify the volume of the fractions to collect in the **Volume slices** field) • **Peak-based with time-slice recovery** (Time-slice fractions are collected between this time and the next change of fraction mode or Off, where when the peak detector encounters a peak, the peak is collected independently of the time slices, specified by the duration of the time-slices to collect in the **Time slices** field) • **Peak-based with volume-slice recovery** (Volume-slice fractions are collected between this time and the next change of fraction mode or Off, where when the peak detector encounters a peak, the peak is collected independently of the volume slices, specified by the volume of the fractions to collect in the **Volume slices** field)

Table 19 Timetable Functions

Function	Parameters
	**Trigger Settings** • **Trigger Source** (Click the down-arrow and select the trigger source from the drop-down list) • **Peak Detection Mode** (Click the down-arrow and select the peak detection mode from the drop-down list). You can select from: ◦ **Slope** (Detects peaks based on slope values only) Limits: **Up Slope**: 0.01 – 10000 units/s, **Down Slope**: 0.01 – 10000 units/s ◦ **Threshold** (Detects peaks based on threshold values only) Limits: **Threshold**: -10000 – 10000 units, **Upper Threshold**: 0.01 – 10000 units ◦ **Threshold and Slope** (Detects peaks based on both threshold and slope values) • **Maximum Peak Duration Mode** (Click the down-arrow and select the mode from the drop-down list). You can select from: ◦ **No Timeout** (The peak duration has no limit) ◦ **Use Max Peak Duration** (The peak has a maximum duration, set in the **Maximum Peak Duration** field)

NOTE

In order to collect fractions, three criteria are required:

1 Collection Behavior must be enabled.

2 At least one Peak Trigger channel must be selected.

3 At least one Timetable event must be specified, to Change Fraction Mode to one of the Time Based or Peak Based modes.

Pooling

Pooling is the collection of multiple fractions into the same collection vessel. You can pool fractions from either multiple injections of the same sample or single injections of different samples.

Fractions are pooled automatically when you specify multiple injections from the same location in one line of the sequence table, or if the same fraction start location is specified for sequential locations in the sequence table.

If a location exceeds its maximum fill volume during pooling, the fraction collection is stopped with an error condition.

Challenging Samples

If the transfer of sample/solvent from the needle to the injection valve shows disintegrating air plugs and/or mixing of sample, post-sample plugs and/or start gradient, reducing the positioning speed is the most effective parameter to reduce these effects. Increasing organic composition of plugs or increasing plug volumes are very effective as well. Use “fresh” samples and septa (max. 5 injections from vial) to prevent dilution errors by residual (wash) solvents on the needle.

Precipitation in the sample vial or on the needle tip can happen if the needle wash solvent is incompatible with the sample; that is, the sample is poorly soluble in draw solvent, which is used in the latest step of washing to equilibrate the system with draw solvent (water in reversed phase chromatography). To avoid this, apply the outer needle wash with organic solvent and do not re-equilibrate the outer needle with draw solvent (water). This is set-up as default in the **Multi-wash** section under **Injection Path Cleaning** (unchecked **Start Cond.** for outer needle wash).

Analytical to Preparative Switching Procedure

Switch from Analytical to Preparative Flow Path

When switching from analytical to preparative flow path of the system, no specific wash or conditioning procedure takes place. The preparative part of the system remains flushed in the final solvent composition of the last preparative run. The conditioning to the solvent composition of the following preparative run needs to be performed by the operator.

Switch from Preparative to Analytical Flow Path

Within the switch from preparative to analytical flow path of the system, the analytical flow path is reconditioned to the new composition as defined in the analytical method; particularly the analytical pump, analytical loop, and connecting capillaries are reconditioned. Reconditioning always starts with the beginning of the first analytical run after the switch from preparative to analytical flow path is performed. Flow rate and initial composition of the analytical method is used for reconditioning. The duration of this procedure depends on the configuration of the system and flow rate defined in the analytical method. Be sure that the flow rate of the analytical pump is set in the method and that the pump is switched on. If the flow rate of the analytical pump is not defined in the method, or the pump is turned off, a wait time of approximately 5 min applies. After this time, the analytical method proceeds without performing the reconditioning of the analytical flow path. The reconditioning of the analytical column is then under the responsibility of the operator.

Simultaneously, the multi-wash of the needle and needle tubing is performed after switch from preparative to analytical flow path to reduce carryover in the analytical flow path. If carryover in the analytical run still occurs, it is recommended to prolong the multiwash accordingly by increasing the number of repetitions (see **Wash Settings** in Table 15 on page 95). Wash is only performed if **Between Runs** is selected under **Wash Settings**.

Note:

NOTE

If G7161B is used as analytical and preparative pump, the flow in the analytical part of the system is limited to maximum 3 mL/min to avoid overpressure on individual parts of the system after the preparative to analytical switch.

Recommended Vials, Well Plates, and Containers

Vials

- Always use the Vial bracket (G9321-40160) for vials that are covered by a septum. As the robot has no pusher, the vials are lifted in every exit needle operation.
- For critical applications: Select **Use Vial/Well Bottom Sensing** in the **Advanced** section of the **Method**.

Well Plates

- Always use the Wellplate bracket (G9321-40140) if wellplates are covered by a mat. For fraction collection no holder is needed.
- Cover 96-well plates with a supported Aluminum foil (G3009-41000) or with a pre-slitted silicone mat (Closing mat for all 96 Agilent plates (5042-1389)).

Containers

- For proper sampling, the correct plate and vial height within the 3-plate container needs to be defined.
- For information on usage of height adjustable containers and supported vials/wellplates in the SBS Container, refer to *Agilent 1290 Infinity II Preparative Open-Bed Sampler/Collector SBS Container Configuration and Application Technical Note*. See also Table 20 on page 122.
- The x-y-positions of the well plate loading locations and the known well-plates are supported, and the container gets correctly calibrated for 2 mL/5 mL vials and 96-well plates.
- Containers with ≤ 12 mm tubes as well as the height adjustable container are always automatically calibrated upon insertion.

Overview on SBS Container Plates

Table 20 Overview of SBS container plates

Agilent part number	ChemStation name	Name	Compatible sealing	Max. allowed fill volume [mL]	SBS level
5043-9300	A_5043-9360_96_2.2mL	96 wellplate 2.2 mL		1.98	2nd highest
5043-9302	A_5043-9361_96_2.0mL	96 wellplate 2.0 mL		1.70	3rd highest
5043-9305	A_5043-9362_96_1.0mL	96 wellplate 1.0 mL		0.90	highest
5043-9308 5043-9309	A_5043-9363_96_1.2mL	96 wellplate 1.2 mL		1.00	highest
5023-2471	40VialPlate	2 mL Vial Plate	5185-5824	1.50	2nd highest
5043-1826	5043-1826 15x6mL Vials	5 mL HR and 6 mL Vial Plate	5188-2758 9301-1379	5.00 6.00	2nd highest

5 Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

User Interfaces

- Depending on the user interface, the available tests and the screens/reports may vary.
- Preferred tool should be Agilent Lab Advisor Software, see "Agilent Lab Advisor Software" on page 125.
- The Agilent OpenLAB ChemStation C.01.03 and above do not include any maintenance/test functions.
- Screenshots used within these procedures are based on the Agilent Lab Advisor Software.

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.

6 Error Information

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

What Are Error Messages

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

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

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

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

General Error Messages

General error messages are generic to all Agilent series HPLC modules and may show up on other modules as well.

Timeout

Error ID: 0062

The timeout threshold was exceeded.

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

Shutdown

Error ID: 0063

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

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

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

Remote Timeout

Error ID: 0070

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

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

Lost CAN Partner

Error ID: 0071

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

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

Probable cause	Suggested actions
1 CAN cable disconnected.	• Ensure all the CAN cables are connected correctly. • Ensure all CAN cables are installed correctly.
2 Defective CAN cable.	Exchange the CAN cable.
3 Defective 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 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.

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 main 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.

Compensation Sensor Open

Error ID: 0081

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

The resistance across the temperature compensation sensor (NTC) on the main 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 Defective main board.	Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 0080

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

The resistance across the temperature compensation sensor (NTC) on the main 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 main board.	Please contact your Agilent service representative.

Fan Failed

Error ID: 0068

The cooling fan in the module 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.

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 main board.	Please contact your Agilent service representative.

Leak

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.

7 Maintenance

This chapter describes the maintenance of the module.

Introduction to Maintenance

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

NOTE

There are no serviceable parts inside.

Do not open the module.

Warnings and Cautions

WARNING

Moving needle

Pinch hazard

- ✓ **Do not grab into the robot area during operation.**
- ✓ **Be aware that the needle can move down even if the robot is on hold.**
- ✓ **Do not remove any vials or wellplates during operation.**
- ✓ **To remove any vials or wellplates, stop the operation of the instrument and pull out the drawer.**

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.

CAUTION

Overpressure at inlet tubing

Overpressure can burst the inlet tubing

- ✓ Use the provided Pressure Restriction Valve (PRV) to protect the inlet tubing.
- ✓ Regularly inspect the inlet / waste tubing assembly and the valve to needle tubing for kinks and blockages.
- ✓ Exchange them if they are worn out or show visible signs of damage.

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.**

Overview of Maintenance

The procedures described in this section can be done with the Sampler/Collector in place in the stack. These procedures can be done on a more frequent basis.

Table 21 Overview of maintenance procedures.

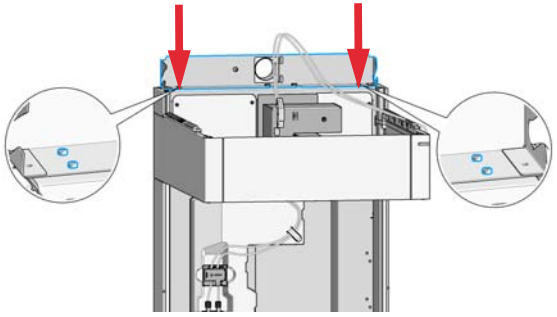
Procedure	Typical Frequency	Notes
Replacing the inlet / outlet tubings	When worn out, when showing visual signs of damage, typically once per year.	See "Replace the Fraction Collection Inlet/Outlet Tubings" on page 55
Replace the dripping adapter	When worn out, when showing visual signs of damage, typically once per year.	See "Replace the Dripping Adapter for the Fraction Valve" on page 143
Replace the rotor seal	When worn out, when showing visual signs of damage, typically once per year.	See "Replace the Rotor Seal" on page 145
Replace the peristaltic pump cartridges	When worn out, when showing visual signs of damage, typically every three months.	See "Replace the two Peristaltic Pump Cartridges" on page 151
Replace the needle plug assembly	When worn out, when showing visual signs of damage, typically once per year.	See "Replace the Needle Wash Plug Assembly" on page 153
Replace the sampling unit tubing	When worn out, when showing visual signs of damage, typically once per year.	See "Install or Replace the Sampling Unit Tubing Kit" on page 156
Replace the solvent distribution tubing	When worn out, when showing visual signs of damage, typically once per year.	See "Install or Replace the Solvent Distribution Tubing" on page 157
Replace the needle tubing	When worn out, when showing visual signs of damage, typically once per year.	See "Install or Replace the Needle Tubing" on page 159

Install and Remove the Top Fume Hood

Parts required	p/n	Description
	G9321-68200	Top Fume Hood Kit

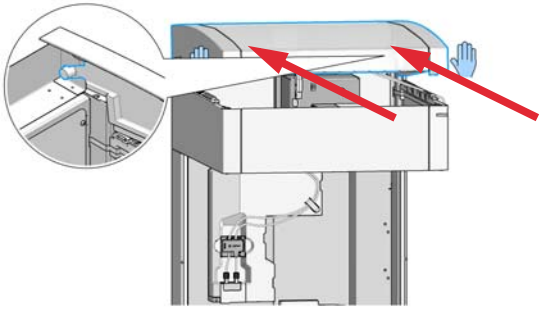
See chapter *Parts* for details.

1 Install the exhaust sheet by fixing the four screws to the fraction collector.

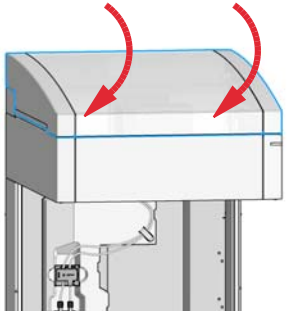


2 Install the top fume hood and close it.

a Push the top fume hood into the recession.

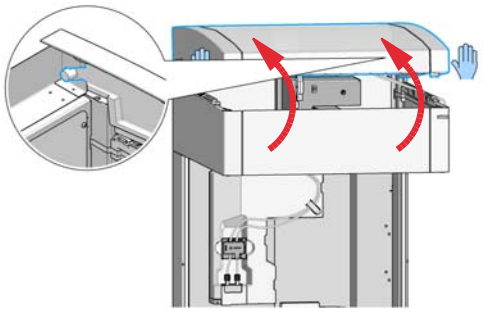


b Close the top fume hood.

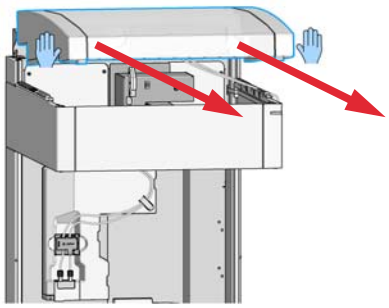


3 Open and remove the top fume hood.

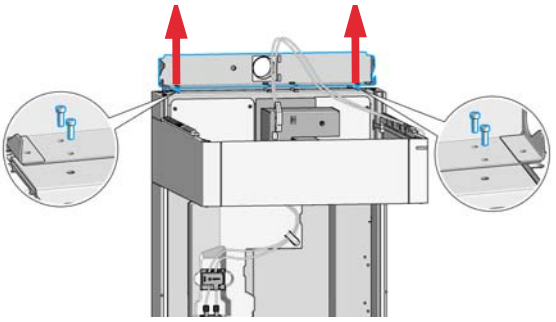
a Swing up the fume hood against the mechanical stop.



b Remove the fume hood by pulling it toward you.



4 Remove the screws fixing the exhaust sheet to the fraction collector, then remove the exhaust sheet.

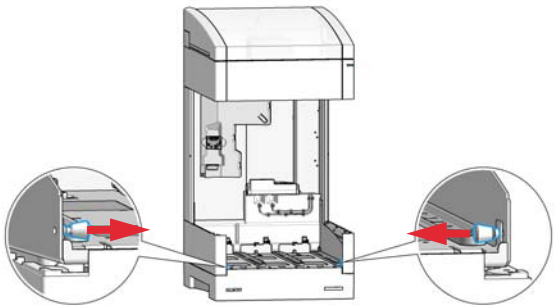


Clean the Leak Pan

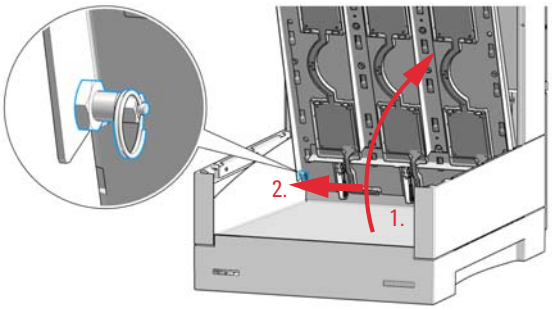
Preparations

- Turn off the flow and the instrument.
- Remove all drawers from the module.
- Move the robotics to the home position.

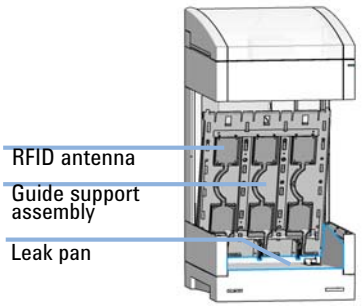
1 Pull the release knobs on both sides at the front of the guide support assembly.



2 Open the guide support assembly (1.) and fix it at the back with the spring-loaded pin (2.).



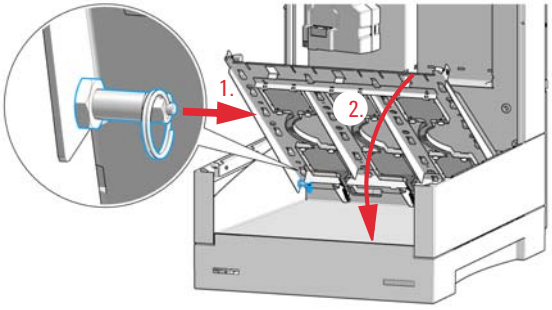
3 Clean the leak pan.



NOTE

Don't touch or clean the RFID antennas on the back side (lower side) of the guide support assembly.

4 Release the spring-loaded pin and lower the guide support into its original position.



5 If the release knobs do not snap in, slightly turn them.

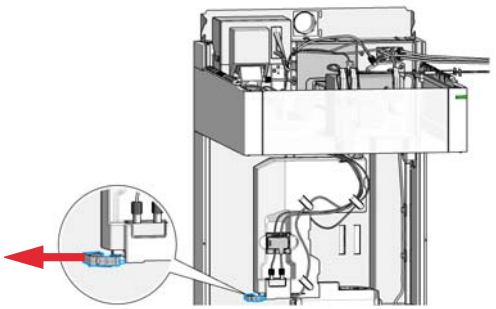
Replace the Dripping Adapter for the Fraction Valve

Tools required	p/n	Description
	5067-7028	Z-Axe Maintenance Tool

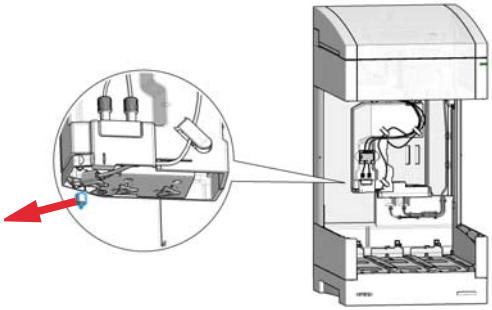
This tool has a bifunctional shank. One side serves as a tool for exchanging the needle tubing. The other side is designed for removing and installing of the dripping adapter. When the former functionality is desired the shank is plugged into a handle. Then the tool for the dripping adapter is covered by the handle. In that case removal of the handle is required to obtain the other side of the shank for operation.

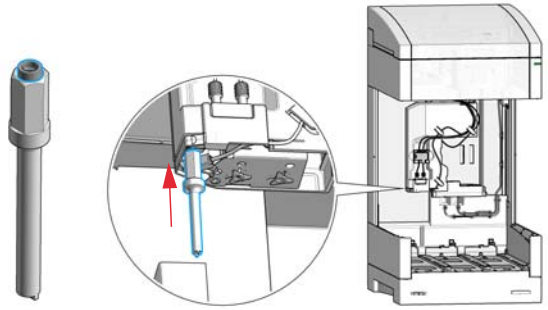
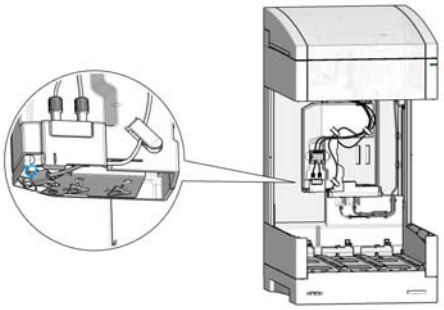
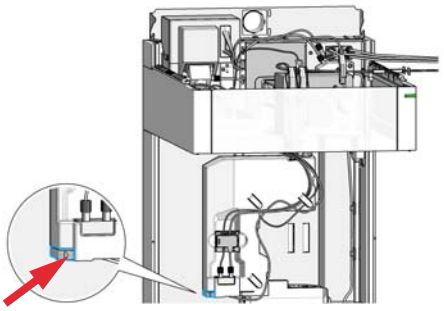
Parts required	p/n	Description
	G9321-26600	Dripping-Adapter for Fraction-Valve

1 Unclip the Needle Wash Plug Assembly to completely remove it, while feeding the needle wash tubing.



2 Use the Z-Axe Maintenance Tool (5067-7028) to remove the dripping adapter from the fraction valve.



3 Use Z-Axe Maintenance Tool (5067-7028) to clip the new dripping adapter on to the end of the fraction valve. 	**4** Remove Z-Axe Maintenance Tool (5067-7028). 
5 Clip and lock the Needle Wash Plug Assembly Holder back in place at the bottom of the Z-Arm Assembly. 	

Replace the Rotor Seal

When

- Poor injection volume reproducibility
- Leaking injection valve

Parts required

p/n	Description
5068-0323	Rotor seal

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

CAUTION

Reduced life time of the injection valve

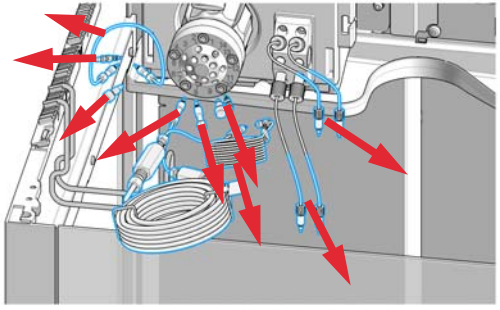
Component cleanliness is crucial for the life time of the injection valve.

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

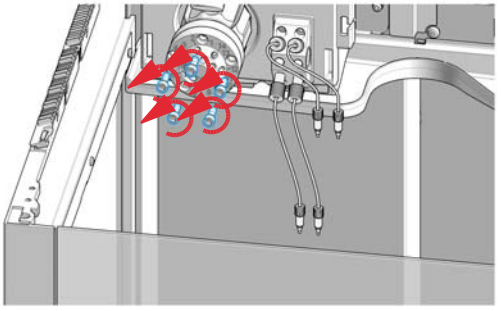
NOTE

After three rotor seal replacements, the stator should be replaced.

1 Remove the loops, capillaries, and tubings from the injection valve with a 1/4 inch wrench.



2 Use a torx screwdriver to unscrew the socket screws which hold the stator head in place.



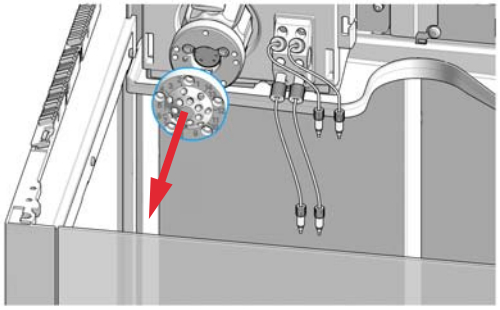
CAUTION

Damage to the stator head
The polished sealing surface of the stator head contains thirteen ports that excessive handling can easily damage.

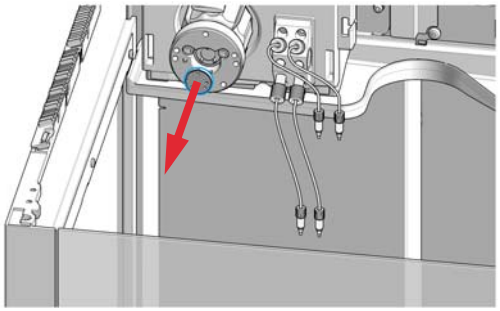
✓ **Avoid touching the polished surface of the stator head.**

✓ **Never place the polished surface on a hard surface.**

3 Carefully remove the stator head. To ensure that the sealing surface of the stator head is not damaged, place it on its outer face.



4 Remove the rotor seal.

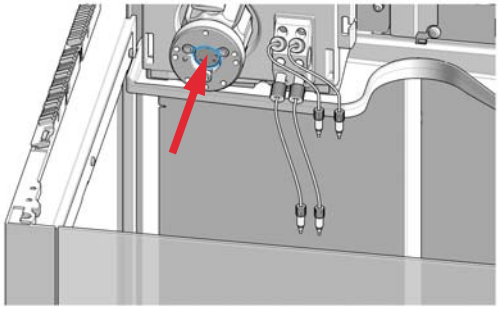


CAUTION

Damage to the rotor seal and cross-port leaks

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

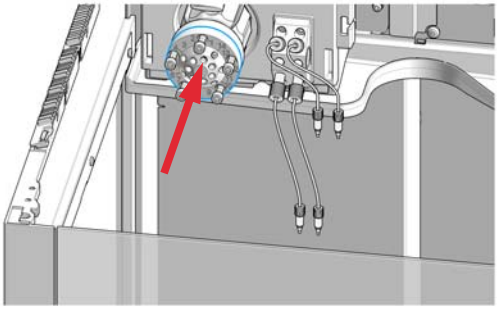
5 Install the new rotor seal.



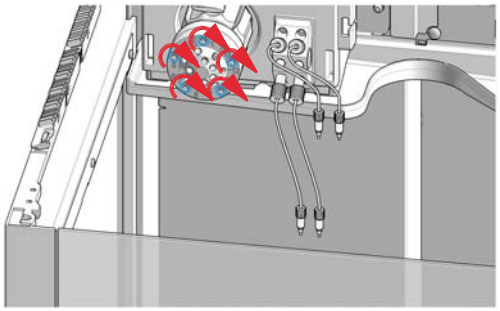
NOTE

Make sure that the rotor sealing surface with its engraved flow passages is facing out.

6 Reinstall the stator head. The index pins on the drive and the stator head must engage in the corresponding holes. Insert the socket head screws.



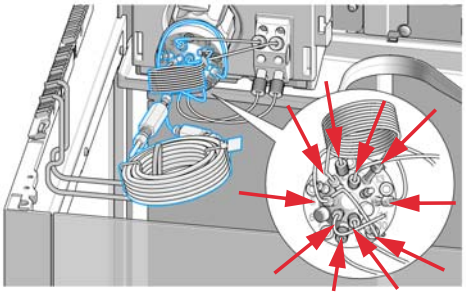
7 Using a torx screwdriver, tighten each screw gently until you feel resistance (approximately fingertight). Tighten each screw by 1/8 turn, and then tighten each screw again, until the stator is secured to the driver.



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.

8 Reconnect the loops, capillaries, and tubings to the injection valve with a 1/4 inch wrench.



9 Perform a pressure test.

Replace the Stator

When After three rotor seal replacements

Parts required

p/n	Description
5068-0322	Stator

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

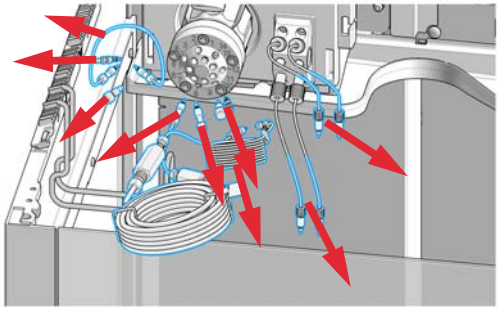
CAUTION

Reduced life time of the injection valve

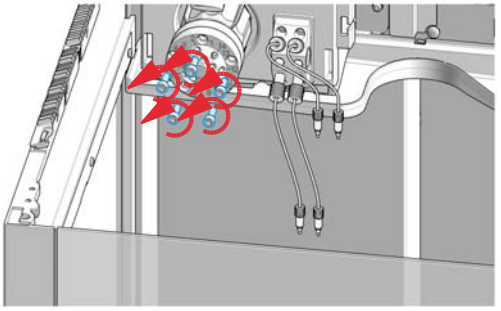
Component cleanliness is crucial for the life time of the injection valve.

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

1 Remove the loops, capillaries, and tubings from the injection valve with a 1/4 inch wrench.



2 Use a torx screwdriver to unscrew the socket screws which hold the stator head in place.



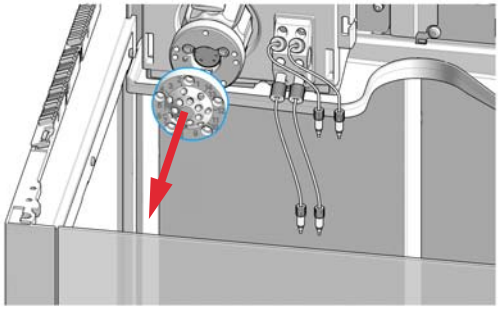
CAUTION

Damage to the stator head
The polished sealing surface of the stator head contains thirteen ports that excessive handling can easily damage.

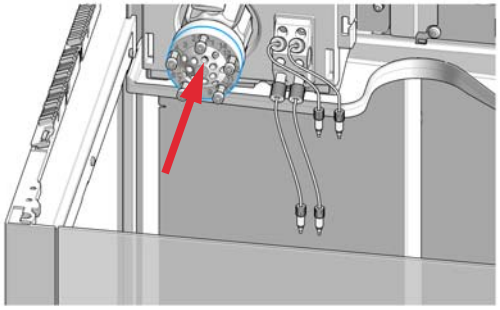
✓ **Avoid touching the polished surface of the stator head.**

✓ **Never place the polished surface on a hard surface.**

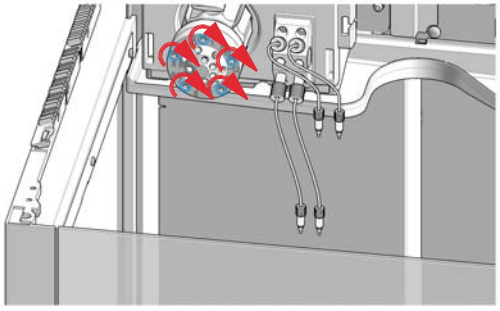
3 Carefully remove the stator head. To ensure that the sealing surface of the stator head is not damaged, place it on its outer face.



4 Reinstall the stator head. The index pins on the drive and the stator head must engage in the corresponding holes. Insert the socket head screws.



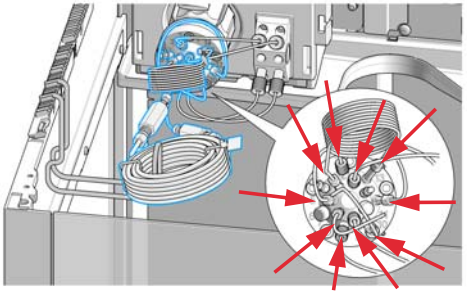
5 Using a torx screwdriver, tighten each screw gently until you feel resistance (approximately fingertight). Tighten each screw by 1/8 turn, and then tighten each screw again, until the stator is secured to the driver.



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.

6 Reconnect the loops, capillaries, and tubings to the injection valve with a 1/4 inch wrench.



7 Perform a pressure test.

Replace the two Peristaltic Pump Cartridges

When

- Every 3 months of operation
- Tubing blocked or broken

Parts required

p/n	Description
5067-6668	Peristaltic pump head

Preparations

To avoid spilling of solvents, remove the solvent lines from the bottles.

WARNING

When opening capillary or tube fittings solvents may leak out.

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

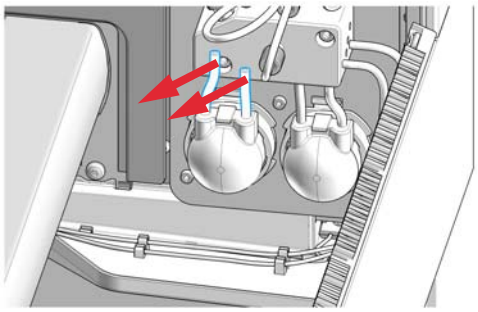
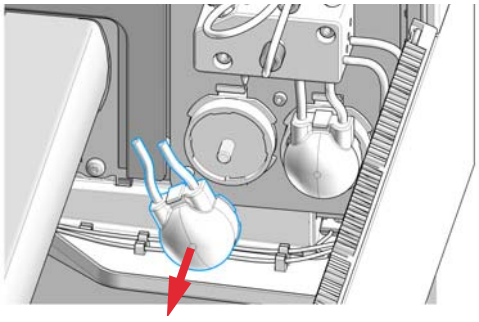
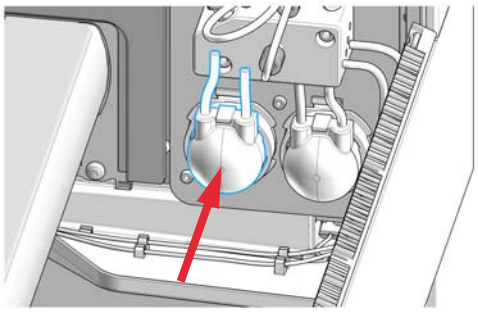
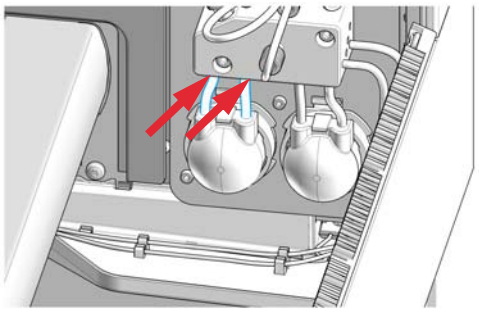
✓ **Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.**

NOTE

The procedure exemplarily shows the replacement of one peristaltic pump cartridge. The other cartridge can be replaced in a similar way.

NOTE

The peristaltic pump cartridges are replaceable units. The tubing inside the pump is not replaceable.

1 Disconnect the tubing couplers. 	**2** Twist and then pull the cartridge forward off the motor shaft. 
3 Push and then twist the new cartridge onto the motor shaft until the clips click into place. 	**4** Reconnect the tubing couplers and the tubings. 

Replace the Needle Wash Plug Assembly

Parts required	p/n	Description
	G9321-60036	Needle Wash Plug Assembly

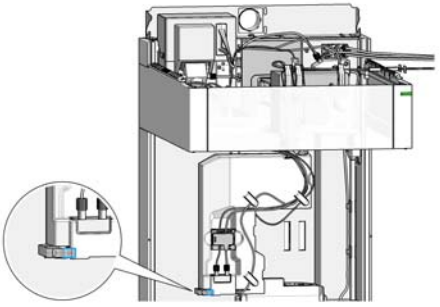
Remove the needle wash plug assembly

CAUTION

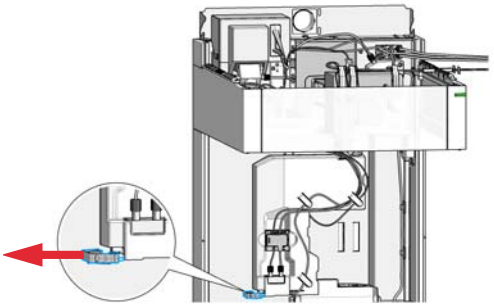
Damage to the clip

- ✓ **Do not open the Needle Wash Plug Assembly Holder too far.**
- ✓ **Carefully remove the Needle Wash Plug Assembly Holder from the Z-arm.**

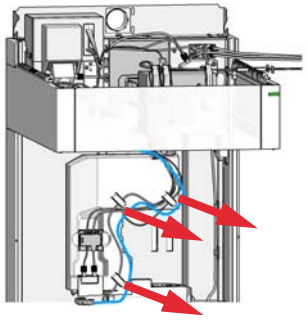
1 Unlock the Needle Wash Plug Assembly Holder from the Z-Arm Assembly.



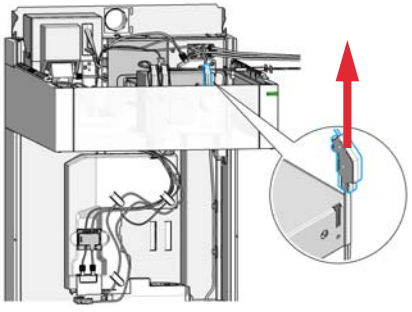
2 Unclip the Needle Wash Plug Assembly to completely remove it, while feeding the needle wash tubing.

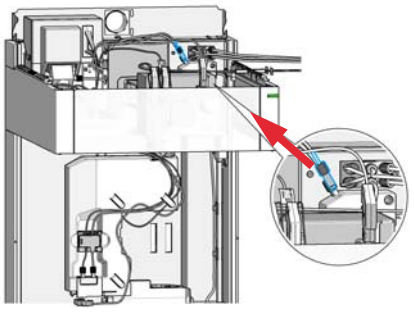


3 Unwind the tubing from the Z-Arm.

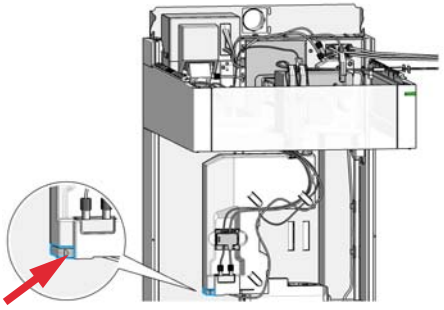
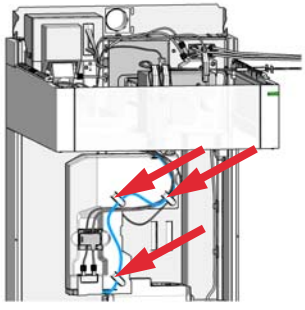
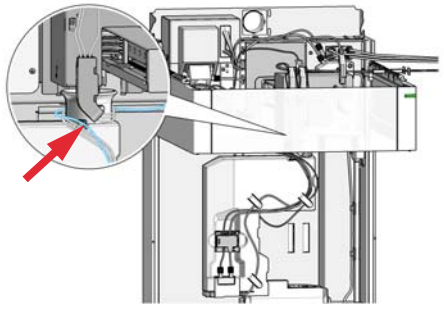
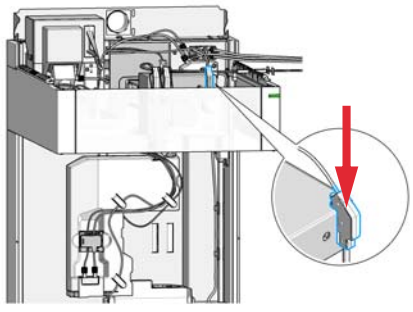


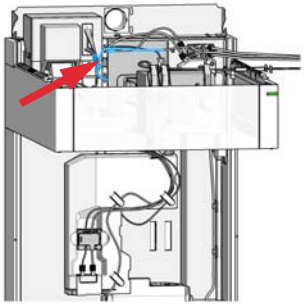
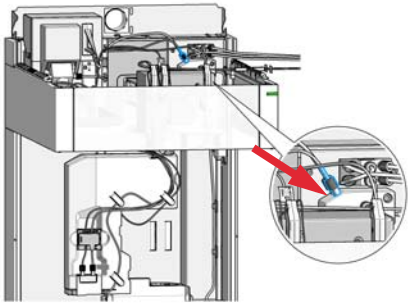
4 Remove the tubing holder from the Theta Assembly.



5 Disconnect the 1/8 tubing from the Solvent Divider assembly. 	

Install the needle wash plug assembly

1 Clip and lock the Needle Wash Plug Assembly Holder back in place at the bottom of the Z-Arm Assembly. 	**2** Reroute the tubing around the Z-Arm. 
3 Route the tubing to the left of the Theta Interface and around the back towards the front of Theta to mount the tubing clip. 	**4** Slide the new Tube Holder in place on the Theta Assembly. 

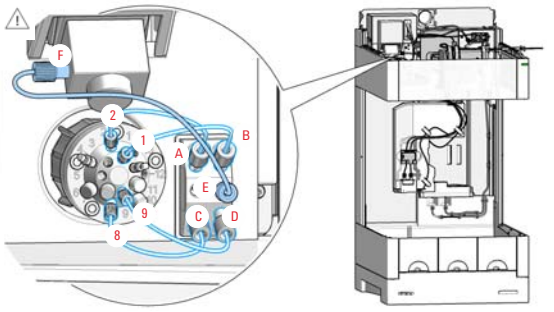
5 Guide the tubing through the tubing holder next to the metering pump and then in the direction of the solvent divider assembly. 	**6** Plumb the 1/8 fitting into the Solvent Divider Assembly. 

Install or Replace the Sampling Unit Tubing Kit

Tools required	p/n	Description
	5043-1471	Fitting Handle

Parts required	p/n	Description
	G9321-68006	Sampling Unit Tubing Kit Contains Sample Tubing Short (5500-1417), and Sample Tubing Long (5500-1418)

Preparations Use Lab Advisor to move the needle to the waste position.

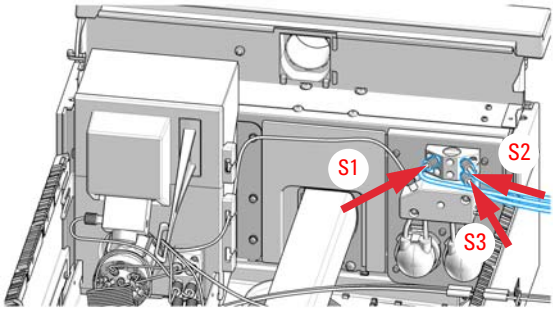
1 Lift up and remove the leak plane. **2** Identify the four short sample tubings and the one long sample tubing. Use finger-tight fittings provided for the connection of short tubings to the valve. Do not use any further tools to tighten these fittings.	Connect the sample tubes as shown in. 

Install or Replace the Solvent Distribution Tubing

Tools required	p/n	Description
	5043-1471	Fitting Handle

Parts required	p/n	Description
	G7120-60007	Bottle Head Assembly
	5500-1429	Solvent Distribution Tubing Kit

1 Install Bottle Head Assemblies (G7120-60007).

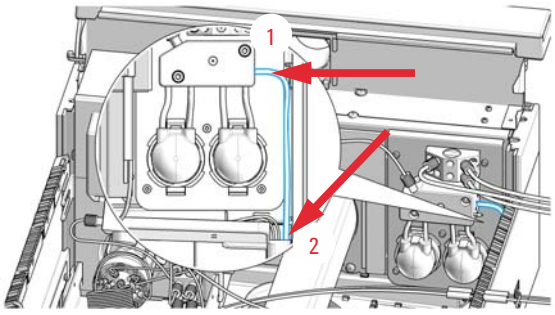


NOTE

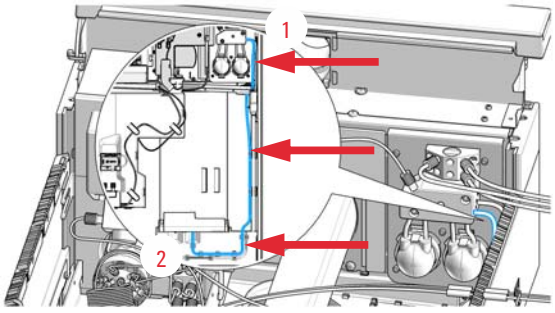
Connect up to three Bottle Head Assemblies to the three inlet ports.

S1 is required to be the draw solvent.

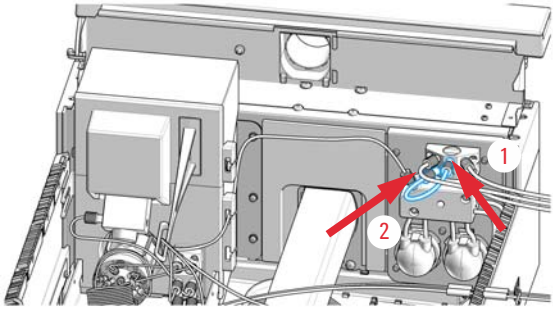
2 Install the short silicon tubing to the rear exit port of the solvent divider block (1). Guide the end of the tubing to the waste port of the upper leak plane (2).



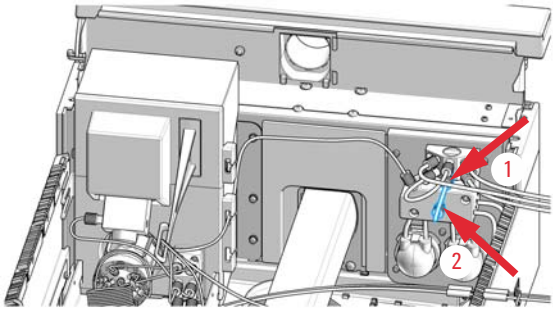
3 Install the long silicon tubing to the front exit port of the solvent divider block (1). Guide the end of the tubing to the draw port (2).



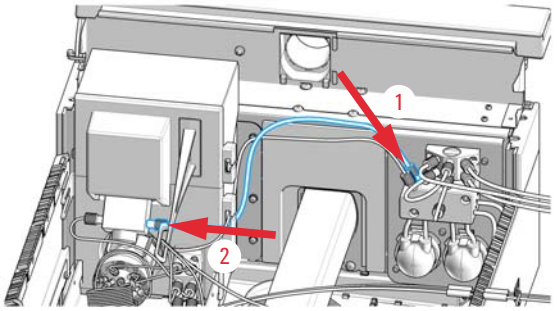
4 Install the 1st tubing between upper outlet (1) and lower left inlet (2) of the solvent selection valve (bridge, Solvent Distribution tubing).



5 Install the 2nd tubing between lower outlet of the Solvent Selection Valve (1) to front of the Solvent Divider Block (2) (Solvent Distribution tubing).



6 Install the long tubing between the left rear connector of the Solvent Divider Block (1) to the inlet of the Metering Pump (2).



Install or Replace the Needle Tubing

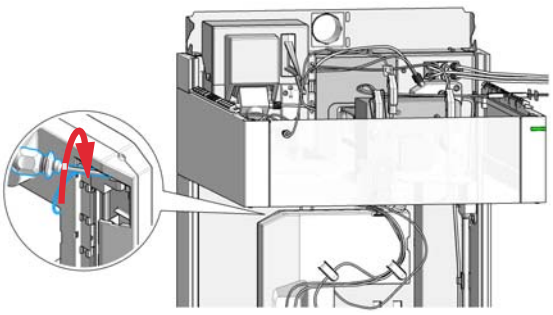
Tools required	p/n	Description
	5043-1471	Fitting Handle
	5067-7028	Z-Axe Maintenance Tool

Parts required	p/n	Description
	G9321-60737	Needle Tubing Kit

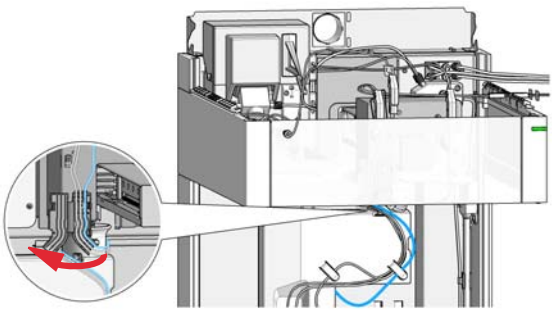
Preparations Use Lab Advisor procedure "Change needle or needle tubing" and follow the on-screen instructions.

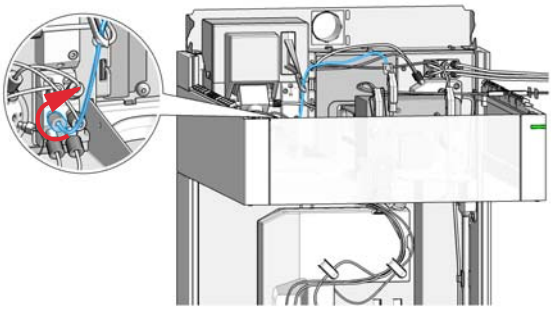
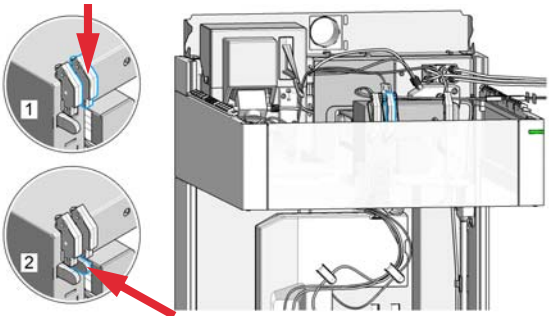
NOTE The illustrations only show the installation. For the replacement, the procedure must first be carried out in reverse order (removal).

1 To install the needle tubing on the needle, connect the tubing first finger tight and then add one 1/4 turn with the Z-Axe Maintenance Tool (5067-7028).



2 Guide the tubing around the robot arm and through the tube holder.



3 Connect the fitting on the solvent selection valve left outlet position with Fitting Handle (5043-1471). 	**4** Mount the black clip in the middle position (second slot on the left side) on the Theta housing and insert the dongle. 

Replace the Module Firmware

When

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

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

Tools required

Description
Agilent Lab Advisor software

Parts required

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

Preparations

Read update documentation provided with the Firmware Update Tool.

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

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

Module Specific Information

There is no specific information for this module.

8 Parts for Maintenance and Repair

This chapter provides information on parts for maintenance and repair.

Supported Containers

p/n	Description
G9321-60015	Tube Container for 30 mm x 150 mm tubes, ambient, 10 tubes
G9321-60058	Tube Container for 30 mm x 100 mm tubes, ambient, 10 tubes
G9321-60025	Tube Container for 25 mm x 150 mm tubes, ambient, 18 tubes
G9321-60035	Tube Container for 25 mm x 100 mm tubes, ambient, 18 tubes
G9321-60129	Tube Container for 16 mm x 150 mm tubes, ambient, 36 tubes
G9321-60055	Tube Container for 16 mm x 100 mm tubes, ambient, 36 tubes
G9321-60131	Tube Container for 12 mm x 150 mm tubes, ambient, 72 tubes
G9321-60045	Tube Container for 12 mm x 100 mm tubes, ambient, 72 tubes
G9321-60051	SBS Container, ambient

List of Recommended Fraction Tubes

p/n	Description
5190-9090	Fraction Tubes 150 mm x 30 mm, 78 mL (pack of 100) fits with p/n G9321-60015
5042-6458	Fraction Tubes 100 mm x 30 mm, 50 mL (pack of 100) fits with p/n G9321-60058
5190-9091	Fraction Tubes 150 mm x 25 mm, 55 mL (pack of 100) fits with p/n G9321-60025
5042-6459	Fraction Tubes 100 mm x 25 mm, 35 mL (pack of 100) fits with p/n G9321-60035
5190-9092	Fraction Tubes 150 mm x 16 mm, 21 mL (pack of 250) fits with p/n G9321-60129
5022-6532	Fraction Tubes 100 mm x 16 mm, 14 mL (pack of 250) fits with p/n G9321-60055
5190-9093	Fraction Tubes 150 mm x 12 mm, 11 mL (pack of 250) fits with p/n G9321-60131
5022-6531	Fraction Tubes 100 mm x 12 mm, 7 mL (pack of 250) fits with p/n G9321-60045

Sampler/Collector Accessory Kit

Fraction Collector Accessory Kit

The Fraction Collector Accessory Kit (G9321-68002) contains the following items:

#	p/n	Description
1	5065-9971	Barbed Y-Connector, PP for 3/16 in ID Tube
1	5181-1519	CAN cable, Agilent module to module, 1 m
1	5500-1155	Tube Connector, 90 degree, ID 6.4
2	5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6/9 mm
1	8710-0510	Open-end wrench 1/4 — 5/16 inch
1	5067-6840	Back Pressure Regulator
1	8710-1930	Plastic tubing cutter
1	5067-7028	Z-Axe Maintenance Tool
1	5067-6857	PREP Pressure Relief Valve Kit
1	5067-7022	Bend Protection Spring
1	G9321-60046	Waste Tube Guide

Accessory Kit Combined

The Accessory Kit Combined (G9321-68001) contains the following items:

#	p/n	Description
1	G9321-68002	Fraction Collector Accessory Kit
3	9301-6524	Solvent bottle, clear, 1000 mL
3	G7158-60000	Bottle Head Assembly
1	G9321-60024	Leak Plane Assembly

Tubing Kits

Tubing Kit G9321-60951

1290 Inf II PrepFC Tubing Kit 200 (G9321-60951) contains the following parts:

#	p/n	Description
1	G9321-40081	Delay Sensor Clip
1	G9321-40128	Tube holder
1	5023-2878	2.4 m Tubing ESD PTFE (OD2/ID1.2)
1	5023-2636	2.4 m Tubing ESD PTFE (OD2.5/OD1.6)
2	5023-2871	Fitting 1/4-28 for Tube-OD 2.5 mm ESD-PEEK
2	5023-2872	Fitting 1/4-28 for Tube-OD 2.0 mm ESD-PEEK
1	5043-1471	Fitting Handle
5	G9321-20052	Tubing Segment
1	G9321-87712	Label Tubing IN ID1.2
1	G9321-87716	Label Tubing Out To Waste
1	5067-6785	EEPROM tag assembly
1	G9321-90120	Fract.Tubing Inl.2 Outl.6 TechNote ENG

Tubing Kit G9321-60952

1290 Inf II PrepFC Tubing Kit 50 (G9321-60952) contains the following parts:

#	p/n	Description
1	G9321-40081	Delay Sensor Clip
1	G9321-40128	Tube holder
1	5067-6785	EEPROM tag assembly
1	5023-2637	2.4 m Tubing ESD PTFE (OD1.6/ID0.8)
1	5023-2636	2.4 m Tubing ESD PTFE (OD2.5/OD1.6)
2	5023-2871	Fitting 1/4-28 for Tube-OD 2.5 mm ESD-PEEK
2	5023-2874	Fitting 1/4-28 for Tube-OD 1.6 mm ESD-PEEK
1	5043-1471	Fitting Handle
5	G9321-20052	Tubing Segment
1	G9321-87708	Label Tubing IN ID0.8
1	G9321-87716	Label Tubing Out To Waste
1	G9321-90120	Fract.Tubing Inl.2 Outl.6 TechNote ENG

Tubing Kit G9321-60953

1290 Inf II PrepFC Tubing Kit 8 mL (G9321-60953) contains the following parts:

#	p/n	Description
1	G9321-40081	Delay Sensor Clip
1	G9321-40128	Tube holder
1	5067-6785	EEPROM tag assembly
1	5023-3072	2.4 m Tubing ESD PTFE (OD1.6/ID0.5)
1	5023-2636	2.4 m Tubing ESD PTFE (OD2.5/OD1.6)
2	5023-2874	Fitting 1/4-28 for Tube-OD 1.6 mm ESD-PEEK
2	5023-2871	Fitting 1/4-28 for Tube-OD 2.5 mm ESD-PEEK
1	5043-1471	Fitting Handle
5	G9321-20052	Tubing Segment
1	G9321-87716	Label Tubing Out To Waste
1	G9321-87705	Label PrepFC Tubing IN ID 0.5
1	G9321-90120	Fract.Tubing Inl.2 Outl.6 TechNote ENG

Tubing Kit G9321-60954

1290 Inf II PrepFC Tubing Kit 150 mL (G9321-60954) contains the following parts:

#	p/n	Description
1	G9321-40081	Delay Sensor Clip
1	G9321-40128	Tube holder
1	5067-6785	EEPROM tag assembly
1	5023-2878	2.4 m Tubing ESD PTFE (OD2/ID1.2)
1	5023-2636	2.4 m Tubing ESD PTFE (OD2.5/OD1.6)
1	G9321-87713	Label Tubing IN ID1.2
1	G9321-87716	Label Tubing Out To Waste
5	G9321-20052	Tubing Segment
2	5023-2871	Fitting 1/4-28 for Tube-OD 2.5 mm ESD-PEEK
2	5023-2872	Fitting 1/4-28 for Tube-OD 2.0 mm ESD-PEEK
1	5043-1471	Fitting Handle
1	G9321-90120	Fract.Tubing Inl.2 Outl.6 TechNote ENG

Top Fume Hood Kit

Item	p/n	Description
	G9321-68200	Top Fume Hood Kit contains the following items:
1	G9321-60830	Top Fume Hood
2	0515-1753	SCREW-MACH-M3X0.5-8MM-LG-PAN-HD
3	G9321-00100	Exhaust Sheet
4	G1364-03201	Exhaust Tube Adapter
5	5067-5406	Screw Tx20, M4 x 8 mm

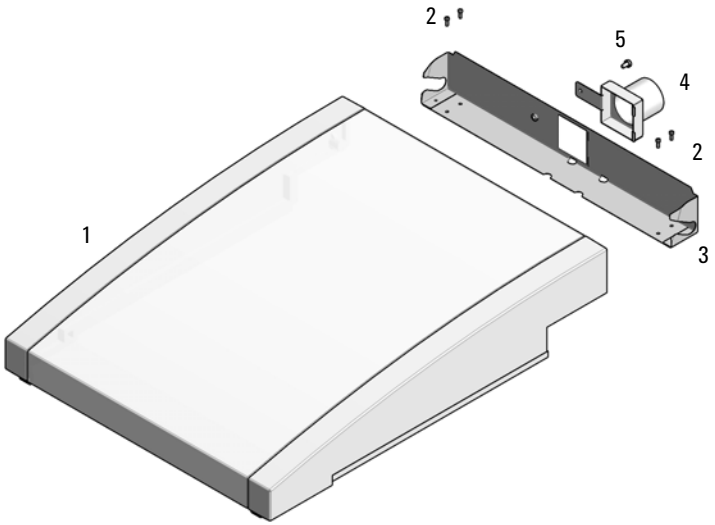


Figure 25 Top Fume Hood Kit

9 Identifying Cables

This chapter provides information on cables used with the module.

Cable Overview

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

Analog cables

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

Remote cables

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

CAN cables

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

LAN cables

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

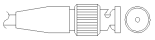
RS-232 cables (not for FUSION board)

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

USB cables

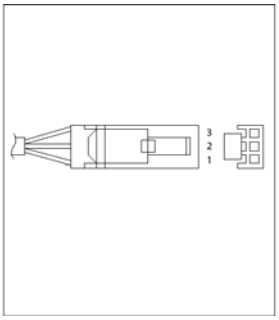
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

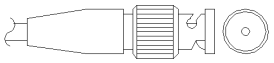


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

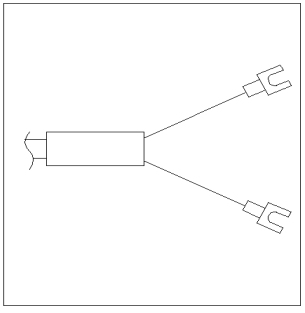
Agilent Module to 35900 A/D converters

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

Agilent Module to BNC Connector

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

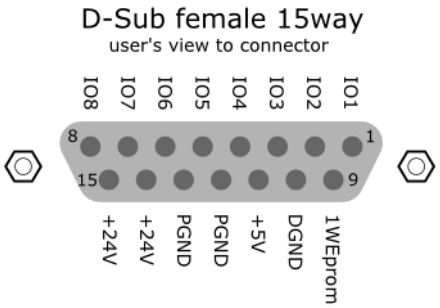
Agilent Module to General Purpose

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

Remote Cables

ERI (Enhanced Remote Interface)

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

p/n 5188-8029	pin	Color code	Enhanced Remote	Classic Remote	Active (TTL)
	1	white	IO1	START REQUEST	Low
	2	brown	IO2	STOP	Low
	3	green	IO3	READY	High
	4	yellow	IO4	POWER ON	High
	5	grey	IO5	NOT USED	
	6	pink	IO6	SHUT DOWN	Low
	7	blue	IO7	START	Low
	8	red	IO8	PREPARE	Low
	9	black	1wire DATA		
	10	violet	DGND		
	11	grey-pink	+5V ERI out		
	12	red-blue	PGND		
	13	white-green	PGND		
	14	brown-green	+24V ERI out		
	15	white-yellow	+24V ERI out		
	NC	yellow-brown			

- 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	

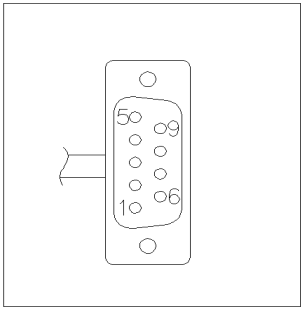
- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

Table 22 5188-8057 ERI to APG and RJ45

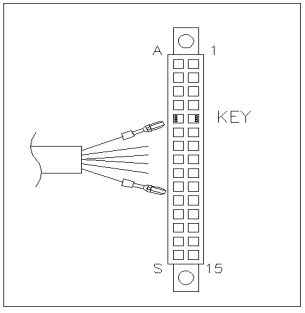
p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trig-ger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shield-ing	NC		

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.

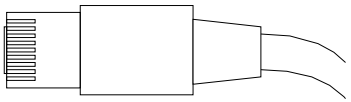
Agilent Module to Agilent 35900 A/D Converters

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)

10 Hardware Information

This chapter describes the module 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.

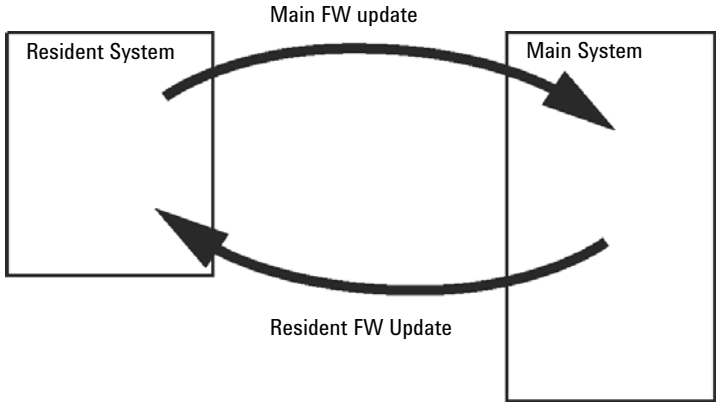


Figure 26 Firmware Update Mechanism

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 ± 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.

Serial Number Information (ALL)

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

CCXZZ00000	Format
CC	Country of manufacturing • DE = Germany • JP = Japan • CN = China
X	Alphabetic character A-Z (used by manufacturing)
ZZ	Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)
00000	Serial number

Side View of the Module

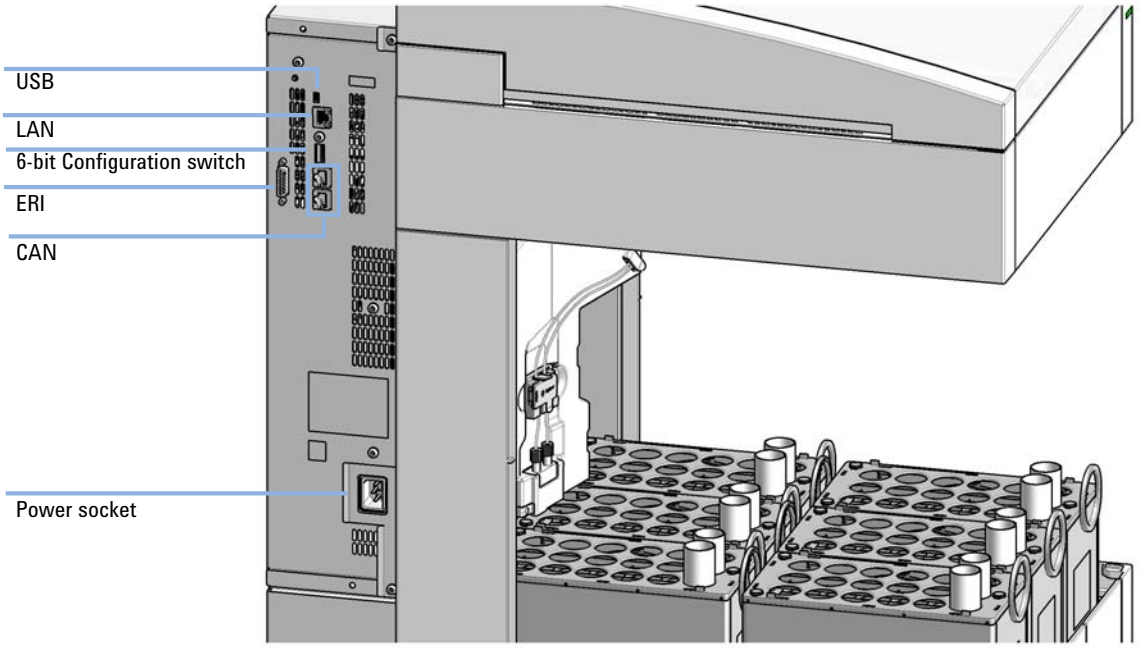


Figure 27 Side view of the fraction collector

Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

Table 23 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 23 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 195.

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 24 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.

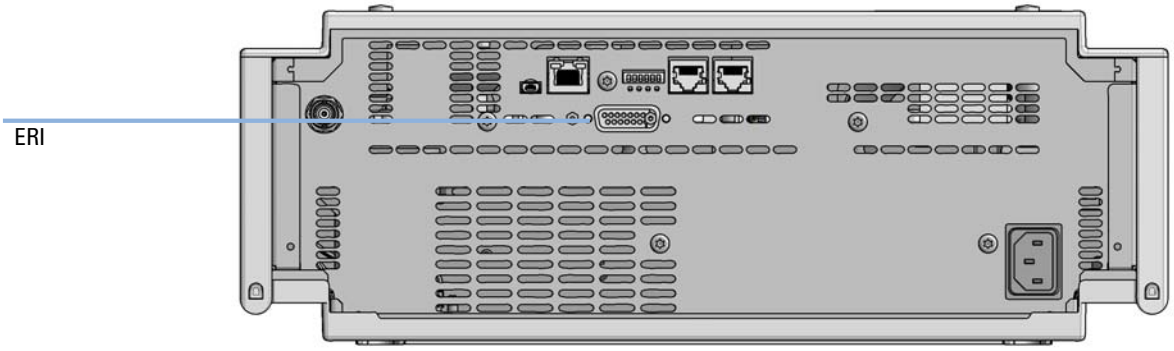
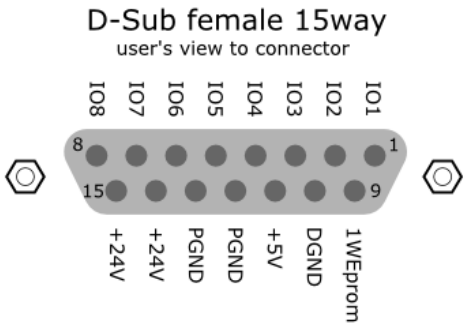


Figure 28 Location of the ERI interface (example shows a G7114A/B VWD)



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 oft 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.

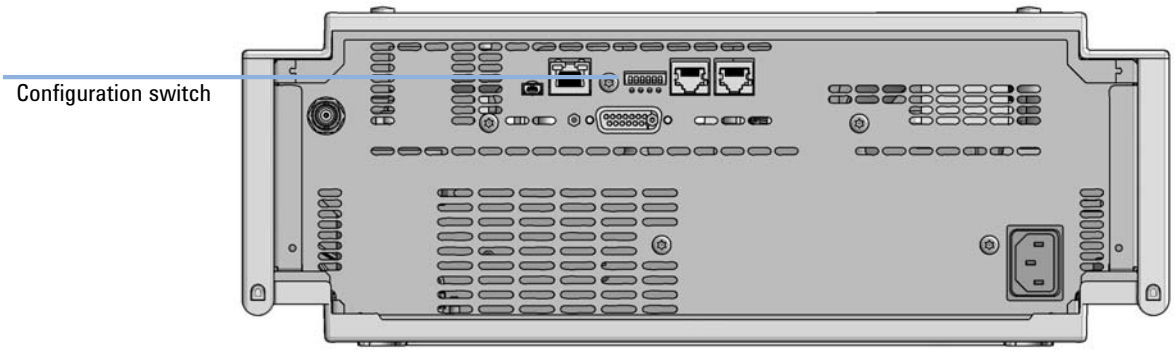


Figure 29 Location of Configuration switch (example shows a G7114A/B VWD)

Table 25 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 26 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.						

Early Maintenance Feedback

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.

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.

11 Appendix

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

General Safety Information

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

✓ **The operator of this instrument is advised to use the equipment in a manner as specified in this manual.**

Safety Standards

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

WARNING

Wrong voltage range, frequency or cabling

Personal injury or damage to the instrument

- ✓ **Verify that the voltage range and frequency of your power distribution matches to the power specification of the individual instrument.**
- ✓ **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**
- ✓ **Make all connections to the unit before applying power.**

NOTE

Note the instrument's external markings described under "Safety Symbols" on page 207.

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.**

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

- ✓ **Do not operate the instrument in the presence of flammable gases or fumes.**

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

- ✓ **Do Not Remove the Instrument Cover**
- ✓ **Only Agilent authorized personnel are allowed to remove instrument covers. Always disconnect the power cables and any external circuits before removing the instrument cover.**

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

- ✓ **Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.**

Solvents

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

NOTE

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

Safety Symbols

Table 27 Symbols

	The apparatus is marked with this symbol when the user shall refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.
	Sample Cooler unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.
	Flammable Material For Sample Thermostat which uses flammable refrigerant consult Agilent Information Center / User Manual before attempting to install or service this equipment. All safety precautions must be followed.
	Confirms that a manufactured product complies with all applicable European Community directives. The European Declaration of Conformity is available at: **http://regulations.corporate.agilent.com/DoC/search.htm**
	Manufacturing date.
	Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the power switch is in the Off position
	Pacemaker Magnets could affect the functioning of pacemakers and implanted heart defibrillators. A pacemaker could switch into test mode and cause illness. A heart defibrillator may stop working. If you wear these devices keep at least 55 mm distance to magnets. Warn others who wear these devices from getting too close to magnets.

Table 27 Symbols

	Magnetic field Magnets produce a far-reaching, strong magnetic field. They could damage TVs and laptops, computer hard drives, credit and ATM cards, data storage media, mechanical watches, hearing aids and speakers. Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.
	Indicates a pinching or crushing hazard
	Indicates a piercing or cutting hazard.

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

- ✓ **Do not proceed beyond a warning until you have fully understood and met the indicated conditions.**

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

- ✓ **Do not proceed beyond a caution until you have fully understood and met the indicated conditions.**

Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the European WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

NOTE

Do not dispose of in domestic household waste

To return unwanted products, contact your local Agilent office, or see **http://www.agilent.com** for more information.

Radio Interference

Cables supplied by Agilent Technologies are screened to provide optimized protection against radio interference. All cables are in compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with unscreened cables, 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 Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

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 1290 Infinity II Preparative Open-Bed Sampler/Collector. The manual describes the following:

- introduction,
- requirements and specifications,
- using the sampler/collector,
- preparing the sampler/collector,
- troubleshooting and diagnostics,
- errors,
- test functions,
- maintenance,
- parts and materials,
- hardware information,
- safety and related information.

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