Agilent InfinityLab LC Series

1260 Infinity II Analytical Fraction Collector & 1260 Infinity II Bio-inert Fraction Collector

User Manual

Agilent Technologies

Notices

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

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

In This Guide

This manual contains technical reference information about:

- Agilent InfinityLab LC Series 1260 Infinity II Analytical Fraction Collector (G1364F)
- Agilent InfinityLab LC Series 1260 Infinity II Bio-inert Fraction Collector (G5664B)

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

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3 Using the Module

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This chapter explains the operational parameters of the module.

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

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1 Introduction

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

Product Description

Product Description (G1364F)

The 1260 Infinity II Analytical Fraction Collector is designed for optimized fraction collection at flow rates between 100 µL/min and 10 mL/min. This module fits within any Infinity II LC stack and is ideal for compound purification in the nanogram to milligram range using columns with internal diameters between 2.1 and 9.4 mm. For lower flow rates and smaller column inner diameters, a low-dispersion tubing kit is available, which helps to maintain the post-column integrity of the separated peaks. Unique fraction delay sensor technology determines fraction delay volumes automatically and ensures that fractions are collected just-in-time without the need to collect extra volume. The optional 1260 Infinity II Multicolumn Thermostat enables precise control of column temperature from cooling down to 10 degrees below ambient up to 85 °C for applications involving thermally-labile chemical or biochemical samples.

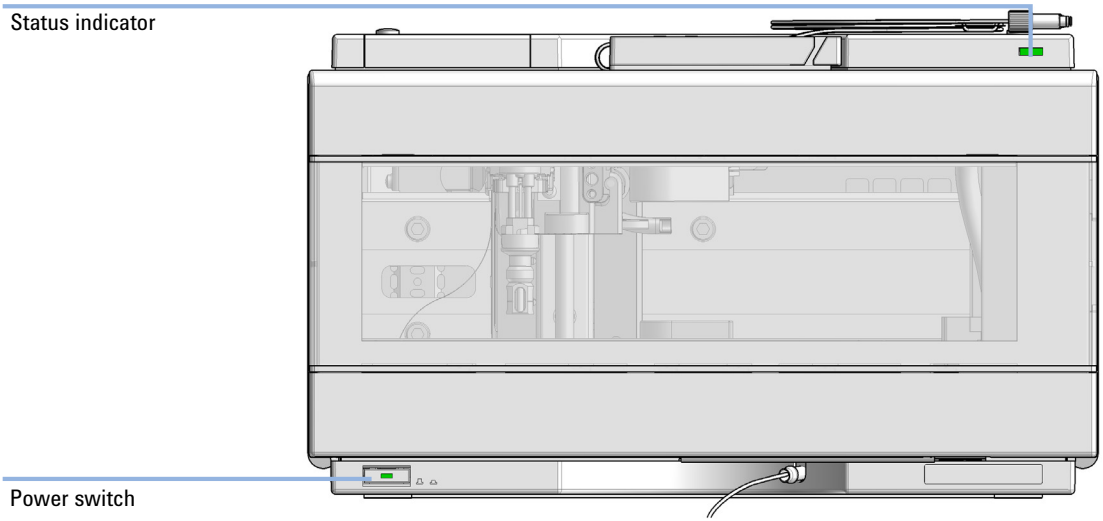


Figure 1 Overview of the fraction collector

Product Description (G5664B)

The 1260 Infinity II Bio-inert Fraction Collector is the ideal extension to your system when you need to investigate separated compounds further. It fits perfectly in Agilent's modular LC design and does not require extra bench space. Patented fraction delay calibration and time- or peak-triggered fraction collection facilitates superior recovery and purity.

A wide range of collection vessels, including vials, microtiter plates or custom vessels, provide highest collection flexibility. With flow rates up to 10 mL/min even run separations using columns with larger inside diameters for small scale prep applications are possible. An additional cooling module is available to prevent degradation of thermally-labile bio-molecules.

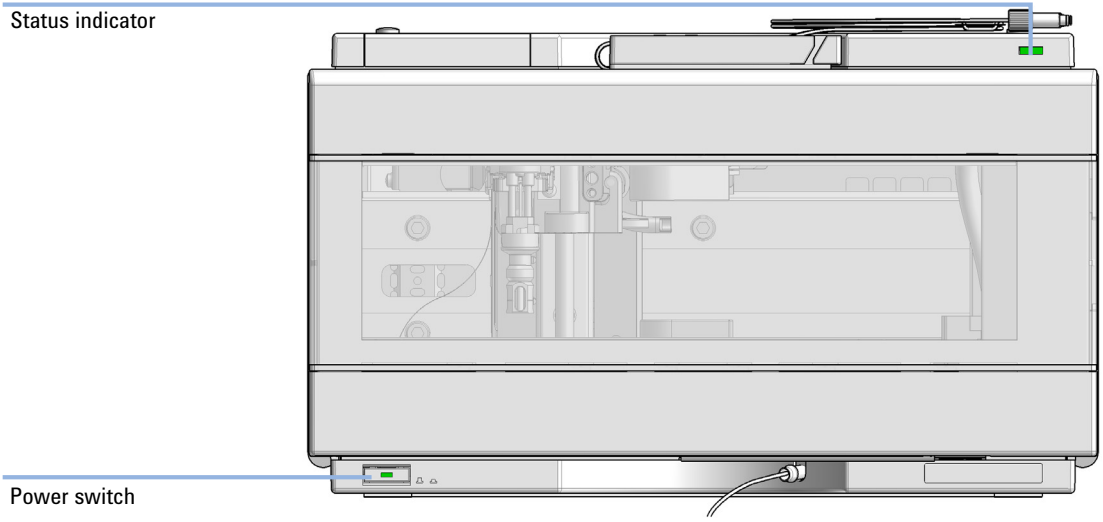


Figure 2 Overview of the fraction collector

Features

Features (G1364F)

Purification efficiency

- Lowest delay volumes for minimum peak dispersion and carryover
- Automated delay calibration facilitates highest fraction purity while maintaining high-precision sample recovery

Instrument efficiency

- Per module collection of up to 216 fractions in glass tubes with 4 outer diameters of tubes available, or in microtiter plates
- Multiple collection modes with fraction triggering based on time, peak, or mass for exact collection of required fractions

Laboratory efficiency

- Expandable capacity up to 864 fractions within the same footprint
- Smooth upgrade paths allow you to increase capacity based on demand
- Forced fume extraction enables use of fraction collector outside a fume cupboard

Features (G5664B)

- Bio-inert fraction collection for automated bio-purification and semi-prep work with larger column dimensions
- Automated peak based fraction collection facilitates bio-analysis workflows
- Novel capillary and connection design
- High salt tolerance (2 M) and wide pH range (1 – 13, short term 14) for increased flexibility
- Steel and iron-free wetted parts ensure the integrity of bio-molecules and minimize unwanted surface interactions
- Peltier temperature control from 4 to 40 °C for thermally labile samples (upgrade from non-thermostatted to thermostatted version possible)
- Controlled by OpenLAB CDS software

Overview of the Module

Overview of the Analytical and Bio-inert Fraction Collector

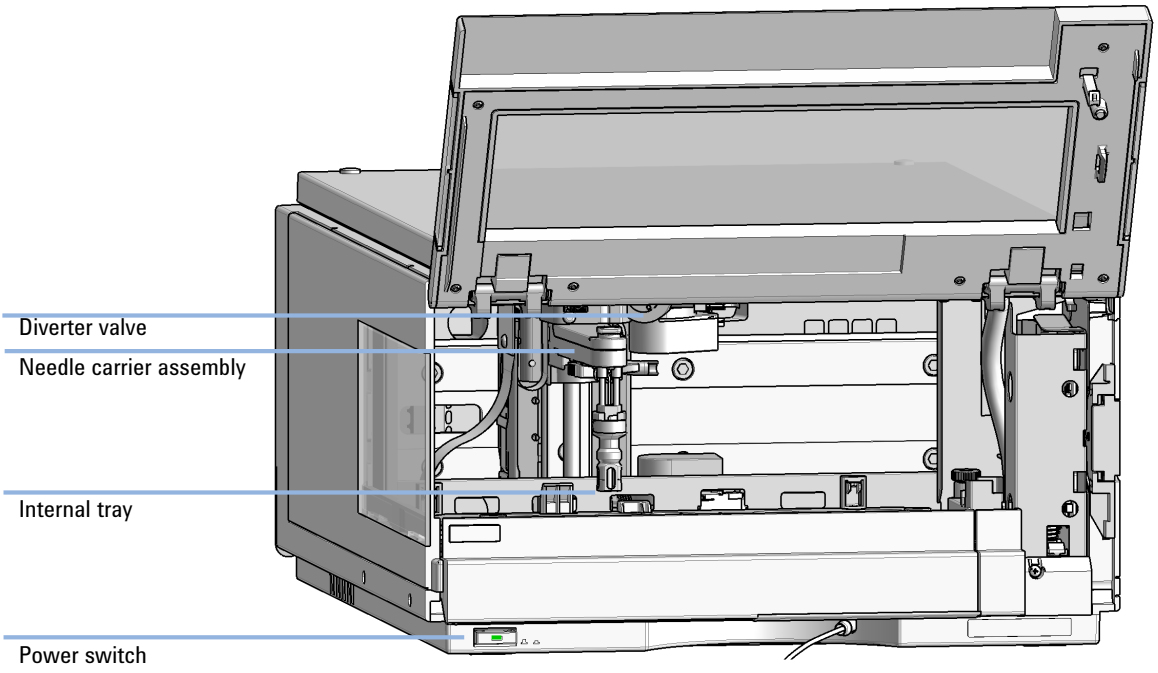


Figure 3 Overview of the Analytical and Bio-inert Fraction Collector

Fraction Collector Principle

The movements of the Fraction Collector components during the sequence are monitored continuously by the Fraction Collector processor. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sequence is not completed successfully, an error message is generated.

The standard fractioning sequence occurs in the following order:

1. The Fraction Collector starts always from the home position.
2. When the sample is injected, the fraction probe with diverter valve moves to the required position.
3. When the trigger is given by the detector, the diverter valve opens to collect the fraction.
4. When the trigger is given by the detector, the diverter valve closes and the arm moves to the next fraction position or back to the home position if this function is chosen in the CDS.

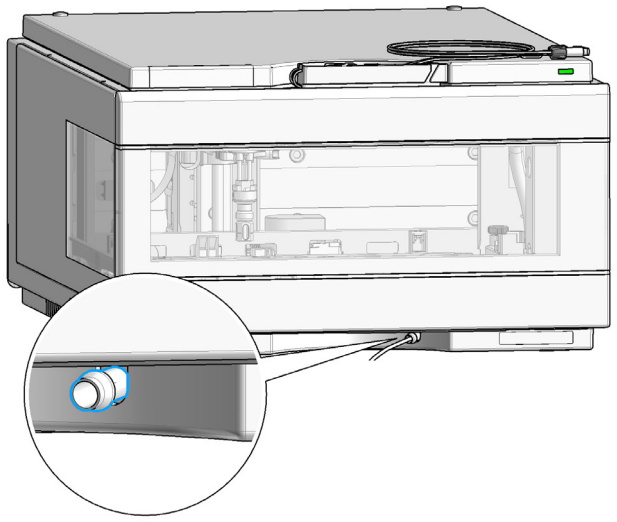
Fractioning Sequence

Before the start of the sequence, and during an analysis, the diverter valve is in the fraction start position. In this position, the mobile phase flows through the diverter valve towards waste.

Leak and Waste Handling

Leak and Waste

1



Waste Concept

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

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.

Bio-inert Materials

For the Bio-inert LC system, Agilent Technologies uses highest quality materials in the flow path (also referred to as wetted parts), which are widely accepted by life science scientists, as they are known for optimum inertness to biological samples and ensure best compatibility with common samples and solvents over a wide pH range. Explicitly, the complete flow path is free of stainless steel and free of other alloys containing metals such as iron, nickel, cobalt, chromium, molybdenum or copper, which can interfere with biological samples. The flow downstream of the sample introduction contains no metals whatsoever.

Table 1 Used Bio-inert materials

Module	Materials
Agilent 1260 Infinity II Bio-inert Pump (G5654A)	Titanium, gold, platinum-iridium, ceramic, ruby, PTFE, PEEK
Agilent 1260 Infinity II Bio-inert Multisampler (G5668A)	Upstream of sample introduction: • Titanium, gold, PTFE, PEEK, ceramic Downstream of sample introduction: • PEEK, ceramic
Agilent 1260 Infinity II Bio-inert Manual Injector (G5628A)	PEEK, ceramic
Agilent 1260 Infinity II Bio-inert Analytical Fraction Collector (G5664B)	PEEK, ceramic, PTFE
Bio-inert Flow Cells:	
Standard flow cell bio-inert, 10 mm, 13 µL, 120 bar (12 MPa) for MWD/DAD, includes Capillary Kit Flow Cells BIO (p/n G5615-68755) (G5615-60022) (*for Agilent 1260 Infinity II Diode Array Detectors DAD G7115A*)	PEEK, ceramic, sapphire, PTFE
Bio-inert flow cell, 8 µL, 20 bar (pH 1–12) includes Capillary Kit Flow Cells BIO (p/n G5615-68755) (G5615-60005) (*for Agilent 1260 Infinity II Fluorescence Detector FLD G7121A/B*)	PEEK, fused silica, PTFE

Table 1 Used Bio-inert materials

Module	Materials
Bio-inert Heat Exchangers, Valves and Capillaries:	
Quick-Connect Heat Exchanger Bio-inert (G7116-60009) (*for Agilent 1260 Infinity II Multicolumn Thermostat G7116A*)	PEEK (steel-cladded)
Bio-inert Valve heads (G4235A, G5631A, G5632A, G5639A)	PEEK, ceramic (Al_2O_3 based)
Bio-inert Connection capillaries	Upstream of sample introduction: • Titanium Downstream of sample introduction: • Agilent uses stainless-steel-cladded PEEK capillaries, which keep the flow path free of steel and provide pressure stability to more than 600 bar.

NOTE To ensure optimum bio-compatibility of your Agilent 1260 Infinity II Bio-inert LC system, do not include non-inert standard modules or parts to the flow path. Do not use any parts that are not labeled as Agilent "Bio-inert". For solvent compatibility of these materials, see "Material Information" on page 64.

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 2 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

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

Repair work at the module can lead to personal injuries, e.g. electrical shock, when the cover is opened and the module is connected to power.

➔ Always unplug the power cable before opening the cover.

➔ Do not connect the power cable to the instrument while the covers are removed.

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

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

Unintended use of supplied 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

Power cords

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 2 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.

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

Condensation

CAUTION Condensation within the module

Condensation can damage the system electronics.

➔ Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.

➔ If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.

Physical Specifications

Table 2 Physical Specifications

Type	Specification	Comments
Weight	13.5 kg (29.8 lbs)	w/o Thermostat
Dimensions (height × width × depth)	200 x 345 × 440 mm (8 x 13.5 × 17 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	200 VA / 180 W	
Ambient operating temperature	4 – 40 °C (41 – 104 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 95 %, at 25 – 40 °C (77 – 104 °F)[1]	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15092 ft)	For storing the module
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Boiling point ≥56 °C Auto-ignition temperature ≥200 °C Ignition Class IIA, IIB (IEC60079-20-1)	

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

Performance Specifications

Performance Specifications (G1364F)

Table 3 Performance Specifications 1260 Infinity II Analytical Fraction Collector (G1364F)

Type	Specification	Comment
Delay Volume (in µL)	Fraction collector inlet to diverter valve: ~50 (typical, depends on length of the tubing) Diverter valve: ~15 Diverter valve to needle: ~10 Needle: ~4	
Minimum system flow	Depending on the recommended flowrates of the installed tubing kit	
Maximum system flow	10 mL/min	
Maximum collection volume	~20 mL with 30 x 48 mm (OD x L) tube ~30 mL with 30 x 75 mm (OD x L) tube	
Maximum capacity	3 fraction collectors in parallel plus one recovery fraction collector	LC and CE drivers A.02.19 (or above) are required for clustering
Cooling	Optional (with additional G1330B), performance depending on ambient conditions and the volume of collected fractions	
Trigger modes	Time slices Peak (threshold, up- / downslope) Timetable (combination of time intervals and peak) Manual trigger (supported only with Agilent Instant Pilot G4208A)	
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 Other detectors can be used but are not supported for fraction collection.	

Table 3 Performance Specifications 1260 Infinity II Analytical Fraction Collector (G1364F)

Type	Specification	Comment
Operating Modes	**Discrete fractions: default mode for all vessels.** The flow is diverted to waste, while moving from one vessel position to the next vessel position **Continuous flow: optional, available only when using deep well plates.** It is possible to move from one well plate position to the next one without diverting the flow into the well plate to waste **Needle into location:** Needle pushes into the vessel as deep as specified, for the use with capped vials and test tubes and well plates with closing mats **Droplet setup mode:** enables the fraction collector to collect small fractions without bubbles. The tip of the fraction collector needle initially moves down to the bottom of the well. Then it slowly moves upwards while the fraction is collected.	
Maximum time to move between neighboring vessels	Movement in x-direction: < 0.15 s Movement in y-direction: < 0.3 s	
Diverter valve	3/2 valve, with switching time < 100 ms	
Maximum pressure	6 bar at the diverter valve during switching	
Plates/Trays	4 x well-plates full tray (MTP)[1] 2 × well-plates std. tray + 10 funnels with external containers[1] (+ 1 half tray) 2 × well-plates std. tray (MTP) + 10 × 2 mL vials[1] (+ 1 half tray) 100 x 2 mL in std. tray (+ 1 half tray)[1] 3 x 40 x 2 mL in half tray[1] 3 x 40 funnels in half tray 3 x 15 x 6 mL in half tray[1] Full tray with 40 test tubes (30 mm OD, max. height 48 mm, ~20 mL / tube) Full tray with 60 test tubes (25 mm OD, max. height 48 mm, ~15 mL / tube) Full tray with 126 test tubes (16 mm OD, max. height 48 mm, ~11 mL / tube) Full tray with 215 test tubes (12 mm OD, max. height 48 mm, ~8 mL / tube) Installed trays are automatically detected and identified. In operation mode "Needle into location" installed plates and vials can be detected. *Only one type of well-plates can be used at a time in one tray.*	

Table 3 Performance Specifications 1260 Infinity II Analytical Fraction Collector (G1364F)

Type	Specification	Comment
Fraction Containers	30 x 48 mm (OD x L) tubes, ~20 mL / tube 25 x 48 mm (OD x L) tubes, ~15 mL / tube 16 x 48 mm (OD x L) tubes, ~11 mL / tube 12 x 48 mm (OD x L) tubes, ~8 mL / tube Vials, well plates, capped vials, and well plates with closing mats can be used as recommended by Agilent Technologies	
Maximum tube height	48 mm with long needle assembly G1367-87200 75 mm with short needle assembly G1364-87202	
Instrument Control	LC and CE Drivers A.02.17 or above Instrument Control Framework (ICF) A.02.04 or above Instant Pilot (G4208A) with firmware B.02.22 or above Lab Advisor B.02.10 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC and CE Drivers
Communications	Controller-area network (CAN), Local Area Network (LAN) ERI: ready, start, stop and shut-down signals	
Maintenance and safety-related features	Extensive diagnostics, error detection and display with Agilent Lab Advisor software Leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user- settable limits and feedback messages. Electronic records of maintenance and errors	
Housing	All materials recyclable.	

[1] max. height can be extended by using the short needle assembly G1364-87202

Performance Specifications (G5664B)

Table 4 Performance Specifications 1260 Infinity II Bio-inert Fraction Collector (G5664B)

Type	Specification	Comment
Delay Volume (in µL)	Fraction collector inlet to diverter valve: ~50 (typical, depends on length of the tubing) Diverter valve: ~15 Diverter valve to needle: ~10 Needle: ~4	
Minimum system flow	Depending on the recommended flowrates of the installed tubing kit	
Maximum system flow	10 mL/min	
Maximum collection volume	~20 mL with 30 x 48 mm (OD x L) tube	
Maximum capacity	3 fraction collectors in parallel plus one recovery fraction collector	LC and CE drivers A.02.19 (or above) are required for clustering
Cooling	Optional (with additional G1330B), performance depending on ambient conditions and the volume of collected fractions	
Trigger modes	Time slices Peak (threshold, up- / downslope) Timetable (combination of time intervals and peak) Manual trigger (supported only with Agilent Instant Pilot G4208A)	
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 Other detectors can be used but are not supported for fraction collection.	

Table 4 Performance Specifications 1260 Infinity II Bio-inert Fraction Collector (G5664B)

Type	Specification	Comment
Operating Modes	**Discrete fractions: default mode for all vessels.** The flow is diverted to waste, while moving from one vessel position to the next vessel position **Continuous flow: optional, available only when using deep well plates.** It is possible to move from one well plate position to the next one without diverting the flow into the well plate to waste **Needle into location:** Needle pushes into the vessel as deep as specified, for the use with capped vials and test tubes and well plates with closing mats **Droplet setup mode:** enables the fraction collector to collect small fractions without bubbles. The tip of the fraction collector needle initially moves down to the bottom of the well. Then it slowly moves upwards while the fraction is collected.	
Maximum time to move between neighboring vessels	Movement in x-direction: < 0.15 s Movement in y-direction: < 0.3 s	
Diverter valve	3/2 valve, with switching time < 100 ms	
Maximum pressure	6 bar at the diverter valve during switching	
Plates/Trays	4 x well-plates full tray (MTP) 2 × well-plates std. tray + 10 funnels with external containers (+ 1 half tray) 2 × well-plates std. tray (MTP) + 10 × 2 mL vials (+ 1 half tray) 100 x 2 mL in std. tray (+ 1 half tray) 3 x 40 x 2 mL in half tray 3 x 40 funnels in half tray 3 x 15 x 6 mL in half tray Full tray with 40 test tubes (30 mm OD, max. height 48 mm, ~20 mL / tube) Full tray with 60 test tubes (25 mm OD, max. height 48 mm, ~15 mL / tube) Full tray with 126 test tubes (16 mm OD, max. height 48 mm, ~11 mL / tube) Full tray with 215 test tubes (12 mm OD, max. height 48 mm, ~8 mL / tube) Installed trays are automatically detected and identified. In operation mode "Needle into location" installed plates and vials can be detected. *Only one type of well-plates can be used at a time in one tray.*	

Table 4 Performance Specifications 1260 Infinity II Bio-inert Fraction Collector (G5664B)

Type	Specification	Comment
Fraction Containers	30 x 48 mm (OD x L) tubes, ~20 mL / tube 25 x 48 mm (OD x L) tubes, ~15 mL / tube 16 x 48 mm (OD x L) tubes, ~11 mL / tube 12 x 48 mm (OD x L) tubes, ~8 mL / tube Vials, well plates, capped vials, and well plates with closing mats can be used as recommended by Agilent Technologies	
Maximum tube height	48 mm (with bio-inert needle assembly G5667-87200)	
Instrument Control	LC and CE Drivers A.02.17 or above Instrument Control Framework (ICF) A.02.04 or above Instant Pilot (G4208A) with firmware B.02.22 or above Lab Advisor B.02.10 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC and CE Drivers
Communications	Controller-area network (CAN), Local Area Network (LAN) ERI: ready, start, stop and shut-down signals	
Maintenance and safety-related features	Extensive diagnostics, error detection and display with Agilent Lab Advisor software Leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user- settable limits and feedback messages. Electronic records of maintenance and errors	
Housing	All materials recyclable.	

3 Using the Module

This chapter explains the essential operational parameters of the module.

Configuration and Operation of the Fraction 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 4 on page 32 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.

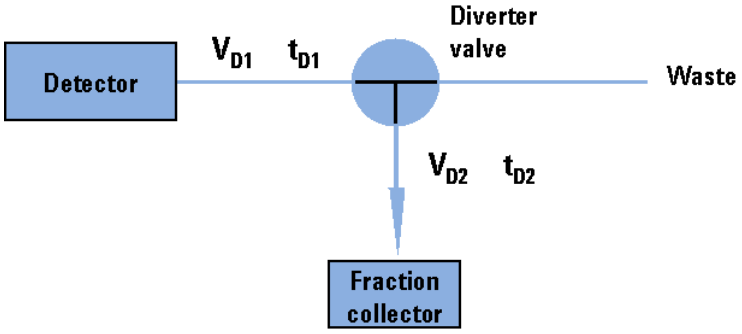


Figure 4 Delay volumes and delay times

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 5 on page 33) the diverter valve is triggered using the following delay time calculations:

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

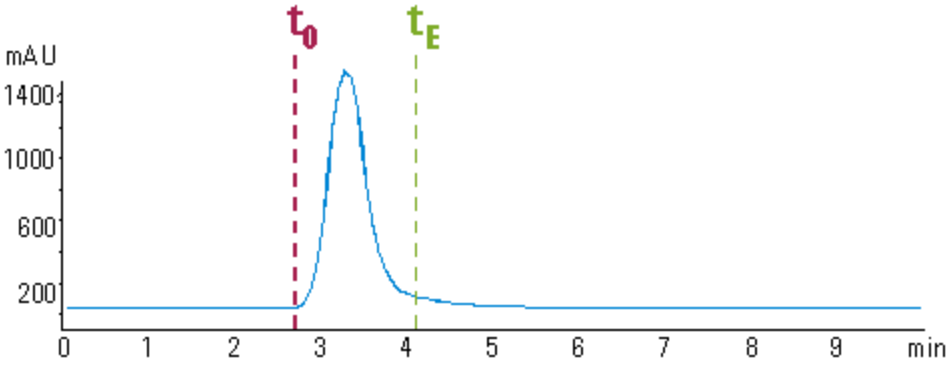


Figure 5 Chromatogram from a UV-detector with peak starting at t_0 and ending at t_E

Performing a Delay Calibration with an UV Detector

1. Place a vial containing the Delay Sensor Calibrant (5190-8223 or G1946-85020) 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 1260 Infinity II 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.

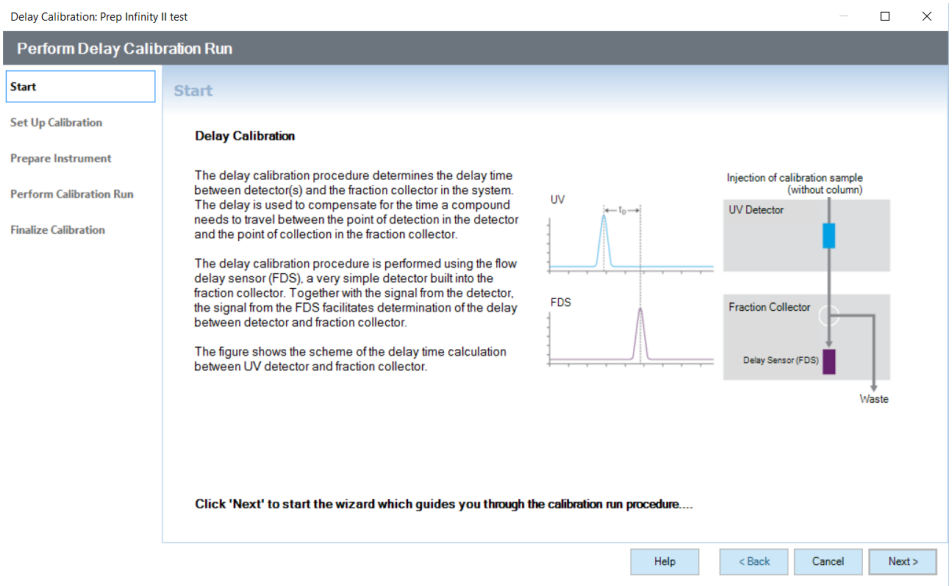
NOTE Every Agilent 1260 Infinity detector that is used for triggering fractions has an internal signal delay caused by filtering the raw data. The signal delay depends on the Peakwidth setting of the detector and is accounted for when the fraction collector is triggered.

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 35).

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 35).
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 36). 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 35). 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" on page 38 dialog box.
Next	Displays the Perform Calibration Run page of the **Delay Calibration Wizard** ("Perform Calibration Run" on page 37). 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 40). 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 36). This button is active only until a calibration run has been started.
Cancel	Displays the "Delay Calibration - Close" on page 38 dialog box.
Next	Displays the Finalize Calibration page of the **Delay Calibration Wizard** ("Finalize Calibration" on page 38). This button is inactive until the calibration run is complete.

Finalize Calibration

The **Finalize Calibration** page of the **Delay Calibration Wizard** leads you through the clean-up of the instrument back to its pre-calibration state.

The required clean-up 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**.
Info	Any additional information about the activity, for example, user interaction.
Start Clean-Up Procedure	Click to start the clean-up of the instrument; follow any on-screen instructions that appear during the process.
Back	Displays the Perform Calibration Run page of the **Delay Calibration Wizard** ("Perform Calibration Run" on page 37).
Cancel	Displays the "Delay Calibration - Close" on page 38 dialog box.
Finish	Closes the **Delay Calibration Wizard**. This button is not displayed until the clean-up is complete.

Delay Calibration - Close

This dialog box is displayed when you click **Cancel** after the delay calibration preparation procedure has been started. It allows you to select the action to take when the calibration procedure is canceled:

Perform Finalize Calibration	Carries out the clean-up steps required to bring the instrument back to its original state. *This is the recommended action.*
Cancel Calibration	Aborts the calibration immediately. **NOTE** If you select this option, the instrument may not be in a usable state.
Continue Calibration	Continues with the delay calibration procedure.

Recommended Calibrants

Table 5 Recommended calibrants (P/N) for Agilent Fraction Collectors using ChemStation

Fraction Collector type	UV	UV and MSD
G1364 B/C/D/E/F, *G7159B* and *G7166A*	5190-8223	5190-8223
G5664 A/B	G1946-85020 or 5190-8223	5190-6887 or 5190-8223

Table 6 Calibrants and recommended wavelength settings for UV-based delay calibration

Part No.	Name	Dye	Wavelength
5190-8223	Agilent delay and checkout calibrant	Patent Blue VF	600 nm
5190-6887	Prep LC Standard #2	Thionin acetate	600 nm
G1946-85020	Delay Sensor Calibration Sample Kit	FD&C Green 3 (Caffeine for MSD)	600 nm

Table 7 Calibrants and target masses for MSD delay calibration

Part No.	Name	Dye	Target Mass
5190-8223	Agilent delay and checkout calibrant	Patent Blue VF	m/z 543.1 (neg) m/z 545.1 (pos) m/z 589.1 (pos, Na adduct)
5190-6887	Prep LC Standard #2	Thionin acetate	m/z 228.1 (without acetate)
G1946-85020	Delay Sensor Calibration Sample Kit	FD&C Green 3 (for UV and fraction delay sensor) Caffeine (for MSD)	m/z 195.1 (pos)

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 6 on page 42. 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.

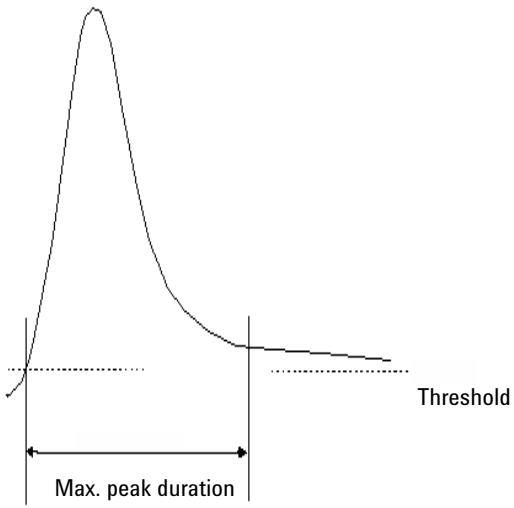


Figure 6 Maximum Fraction Duration

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 46.

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 7 on page 46) in the Peak Detectors section.

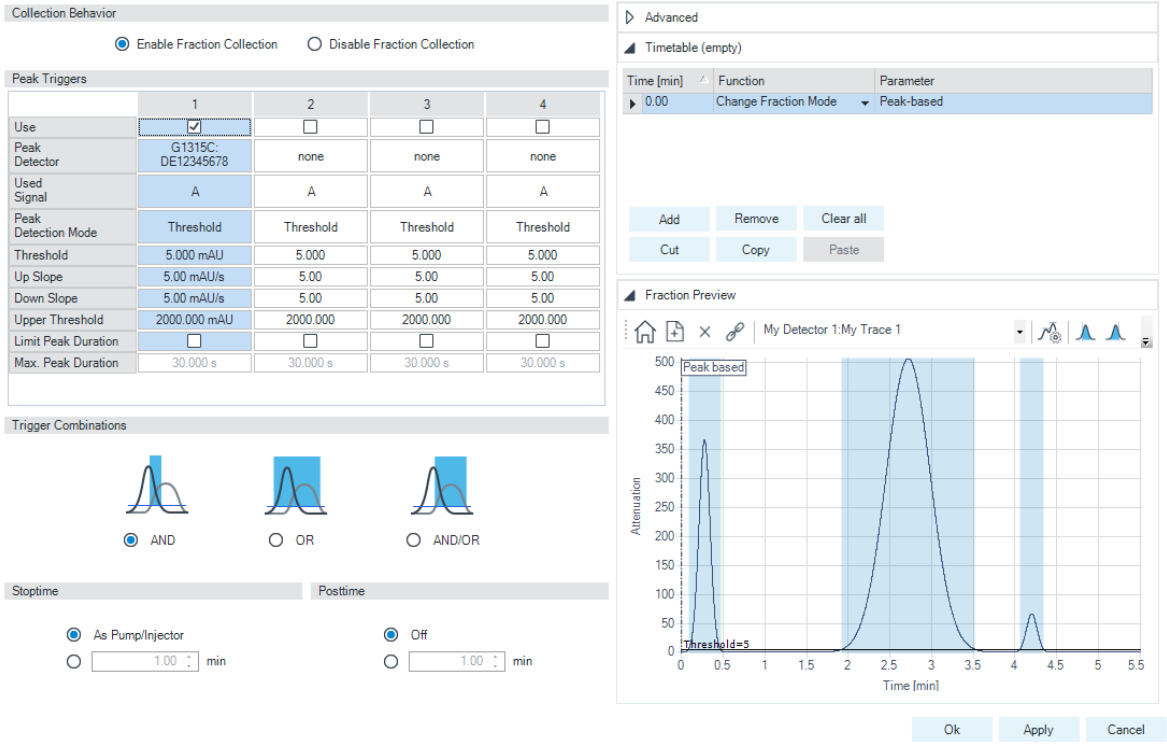


Figure 7 **Fraction Preview** dialog box

The Fraction Preview screen allows to test the fraction collection parameters a-gainst 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.

Viewing Your Results

Data Analysis

In order to display the tick marks for the collected fractions on the screen, click **Signal options** from the **Graphics** menu. Then choose **Separated** in the **Layout dropdown list**.

To review your chromatograms, file information and a fraction list, select the **Data Analysis** view and click **Fraction Task** as displayed below.

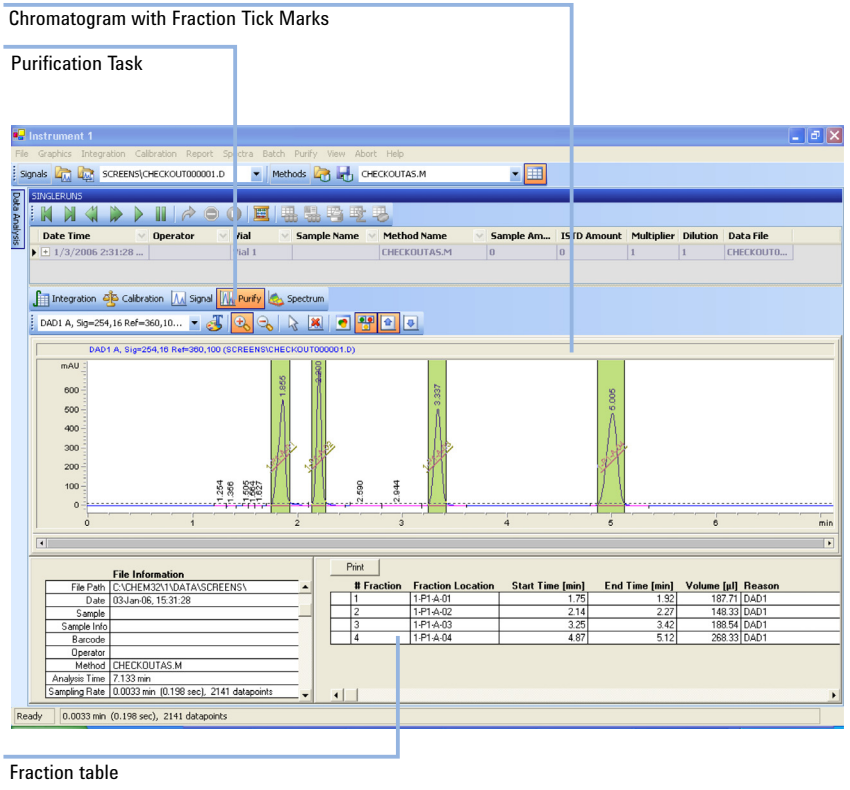
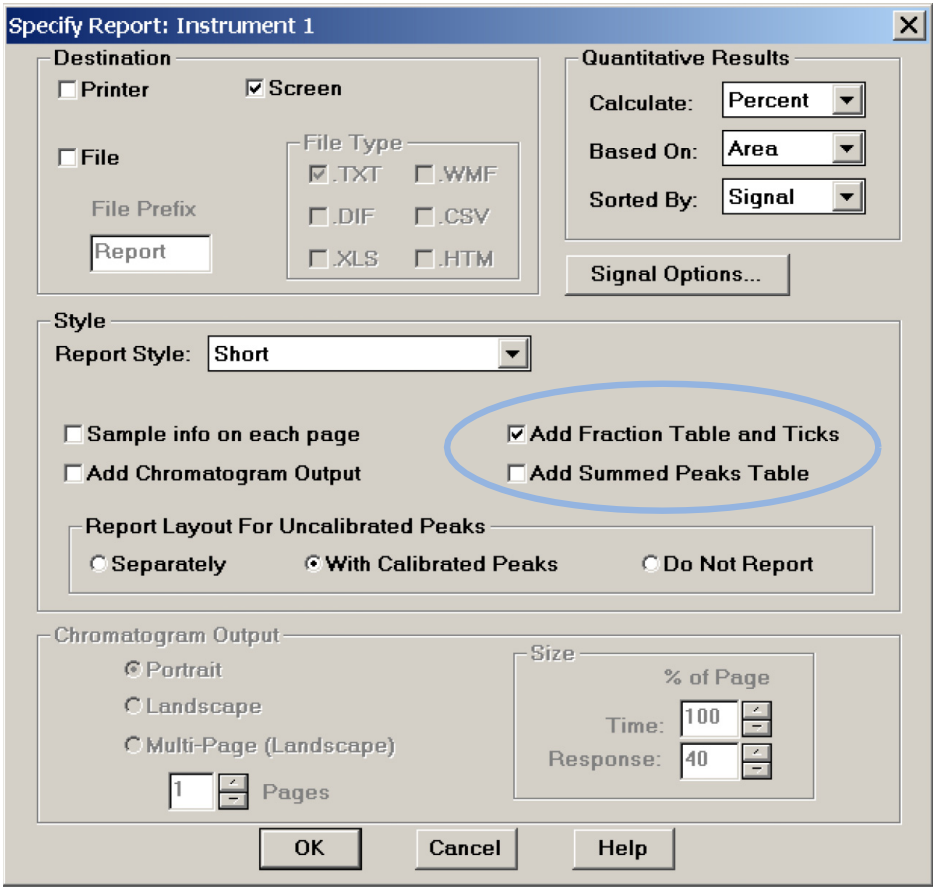


Figure 8 Fraction Task button

In order to display the tick marks for the collected fractions on the screen, click **Signal options** from the **Graphics** menu. Then choose **Separated** in the Layout dropdown list.

Report

In order to create reports with a fraction table and tick marks the item **Add Fraction Table and Ticks** in the **Specify Report** box has to be checked.



Special Applications

Pooling

We define pooling as collecting fractions from multiple injections into the same fraction locations. In the Agilent ChemStation, there are two ways to initiate pooling:

- If you want to collect multiple injections from the one sample vial or sample well into the same fraction location, specify multiple injections in the **Sequence Table**.
- In case you want to collect multiple injections from the several sample vials or sample wells into the same fraction location, specify the same **Fract. Start** for multiple samples in the **Sequence Table**. An example is displayed in Figure 9 on page 49. In this sequence the sample 1 will be injected from plate 1 position A1 of the Autosampler and fraction collection will start at plate 1 position A1 of the fraction collector.

  For the next sample 2, which is injected from a different location in the high performance autosampler, the fraction collection will start again at plate 1 position A1 of the fraction collector.

Line	Location	Sample Name	Dilution	Datafile	Inj Volume	Frac. Start	LimsID	Target Masses
1	P1-A-01	Sample 1				1-P1-A-01		
2	P1-A-02	Sample 2				1-P1-A-01		
3	P1-A-03	Sample 3				1-P1-A-01		
4								

Figure 9 Pooling sequence

CAUTION

Data loss due to pump shut-down

If you specify multiple injections for pooling, the overfill protection is not activated. If a fraction collection location is overfilled, an error message occurs and the pump is shut OFF.

➔ Make sure that all fraction collection locations are large enough to completely collect all pooled fractions.

Sample Recovery

The fraction collector offers different possibilities for sample recovery:

- The preferred recovery strategy is to install two fraction collectors in your LC systems and use the last of those fraction collectors for recovery. This recovery fraction collector can be selected in the Configuration dialog box. The fourth fraction collector in your systems will always be used for sample recovery.
- For the following tray configurations fixed recovery location will be assigned from the ChemStation. In order to disable the recovery the tray configuration has to be changed.

  a Standard tray for two well plates + 10 x 2 ml vials (G2258-60011) and Halftray for 40 x 2 mL vials (G1313-44512).

  In this configuration the forty 2 ml vials on the half will automatically be used for recovery.

  b Standard tray for two well plates + 10 x 2 ml vials (G2258-60011) and Halftray for 15 x 6 mL vials (G1313-44513).

  In this configuration the fifteen 6 mL vials on the half will automatically be used for recovery.

CAUTION

Fraction contamination

With each start of a new sequence the recovery will start at the same position. This can lead to fraction contamination, if the vessels containing the recovery fractions are not exchanged.

➔ Exchange the vessels containing the recovery fractions before starting a new sequence.

NOTE

The number of recovery locations automatically defines the maximum number of injections. When using the standard tray for two well plates and 10 funnels, only ten injections per sequence are executed.

Using High Test Tubes in the Analytical Fraction Collector

In the standard configuration of the analytical fraction collector, the maximum test tube height is limited to 48 mm. This limitation can be extended to 75 mm if

- the standard 50 mm needle assembly (Analytical needle assembly (G1367-87200)) is replaced by the 20 mm needle assembly (Analytical needle assembly (G1364-87202)),
- the wellplate adapter is removed.

Optimizing Fraction Collection

Time-based fraction collection

- *Time slices* must have a length of at least 0.05 min.
- Set *# of Fractions* such that length of resulting fractions is at least 0.05 min.

Peak-based fraction collection

- Set threshold and slope values such that length of fractions is at least 0.05 min.
- Unresolved peaks can be separated using appropriate threshold and slope values. If two unresolved peaks are to be collected as one fraction, collect based on threshold only.
- If the baseline of the chromatogram is below or above 0 mAU, this offset is not accounted for when triggering peaks using a threshold value. The threshold value is always added to 0 mAU.

Limitations and How to Avoid Problems

Rinse Fraction Collection Needle

If *Rinse Fraction Collection Needle* is set to *Between fraction collection*, at least 0.3 min are required to perform this task.

When doing time-based fraction collection rinsing the needle is only possible between two time table entries, which must have a gap of at least 0.3 min. For peak-based fraction collection a time gap of also at least 0.3 min is required. If a new peak is detected during the rinse process, it is aborted and the needle moves back to the next free fraction position. Depending on flow rate and delay volume VD1 the beginning of this peak may be lost.

If you have recovery positions in your fraction collector or if you are using one fraction collector for sample recovery in a multiple fraction collector configuration, the rinse function **between fraction collection** is ignored.

Needle Movement

The option **into location** under **Needle Movement** in the fraction collector configuration must only be used for capped 2 or 5 mL vials or well-plates. Using other or open vials with this command can lead to a **Movement failed** error.

Replacing fraction containers

When replacing filled tubes, vials or well-plates from the fraction collector make sure to remove and re-insert the complete tray. Otherwise the fraction collector will not recognize that the fraction containers were emptied.

Pooling

When pooling fractions, overfill protection no longer exists. It is the user's responsibility to make sure that all fraction collection locations are large enough to completely collect all pooled fractions. If a fraction collection location is overfilled, an error message occurs and the pump is shut OFF.

Application Notes

More information about the Agilent InfinityLab LC Series fraction collectors and purification systems are available from a of application notes. Printed versions can be ordered from Agilent or pdf-files can be downloaded from the Agilent Website

http://www.chem.agilent.com

Table 8 Selected Agilent Technologies Application Notes

Title	Publication Number
An optimized system for analytical and preparative work	5988-9649EN
Recovery collection with the Agilent LC purification system	5988-9650EN
Solutions for preparative HPLC-Application Compendium	5988-9646EN
Innovative fraction collection with the Agilent LC purification platform	5988-9250EN
Automated fraction re-analysis - does it really make sense?	5988-8653EN
Injection of high-concentration samples with the Agilent LC purification system	5988-8654EN
Sophisticated peak-based fraction collection - working with up and down slope	5988-7895EN
Strategies for purification of compounds from non-baseline separated peaks	5988-7460EN
Method scale-up from analytical to preparative scale with the Agilent LC purification system PS	5988-6979EN
Peak-based fraction collection with the Agilent LC purification system AS - Influence of delay volume on recovery	5988-5747EN

Solvent Information

Observe the following recommendations on the use of solvents.

- Follow recommendations for avoiding the growth of algae, see 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 like flow cells, valve materials etc. and recommendations in subsequent sections.

Solvent compatibility for stainless steel in standard LC systems

Stainless steel is inert against many common solvents. It is stable in the presence of acids and bases in the pH range specified for standard HPLC (pH 1 – 12.5). It can be corroded by acids below pH 2.3. In general following solvents may cause corrosion and should be avoided with stainless steel:

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride, and so on) and aequous solutions of halogenes
- 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:

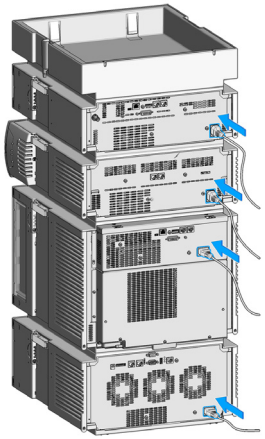
  $2\ CHCl_3 + O_2 \rightarrow 2\ COCl_2 + 2\ HCl$

  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, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.

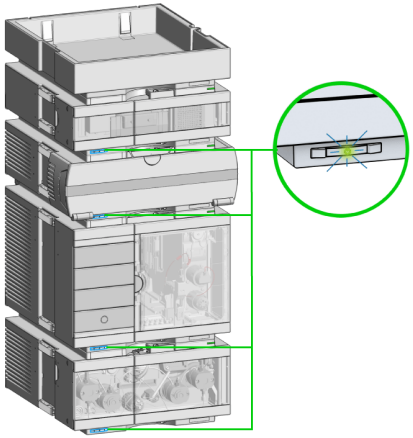
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1 % solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Turn on/off

1

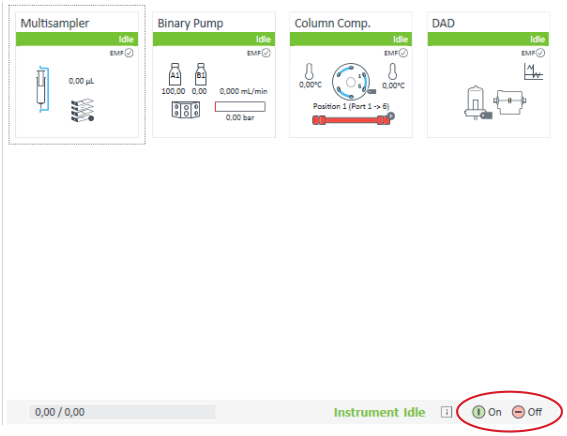


2

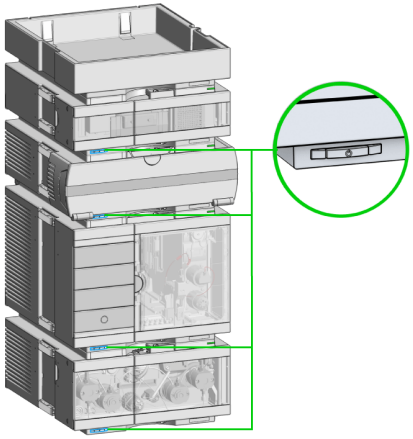


Power switch: On

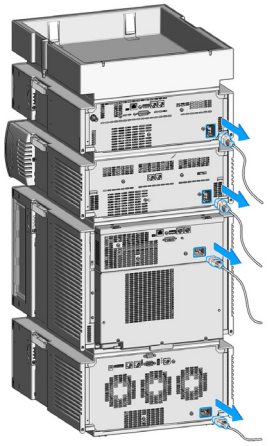
3 Turn instrument **On/Off** with the control software.



4

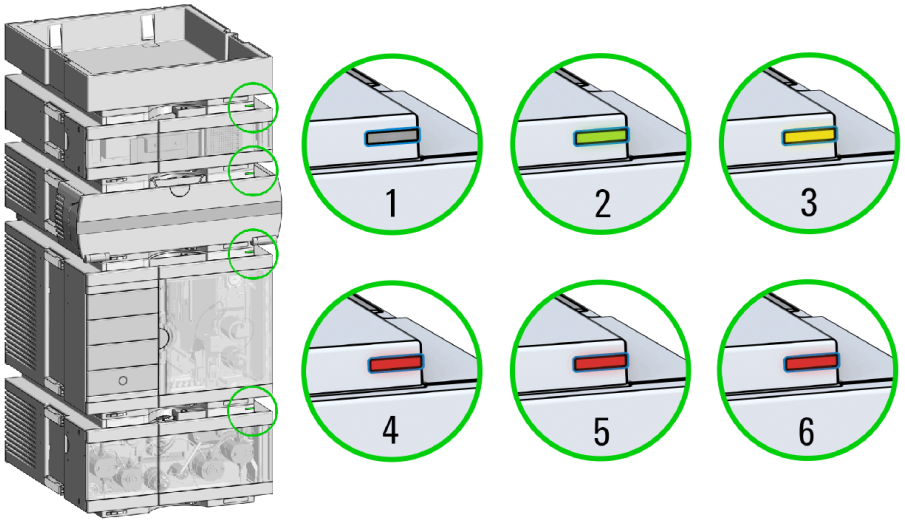


Power switch: Off

5 	

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.

Agilent Local Control Modules

Agilent InfinityLab LC Companion G7108AA

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

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

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

Features:

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

The InfinityLab LC Companion provides:

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

4
Preparing the Fraction Collector

This chapter explains the operational parameters of the module.

Best Practices

Regular Inspections

Inspect the inlet/waste tubings and exchange them if they are worn out or show visible signs of damage.

Power up / Shut down

Power up

- Check that the robotics is not obstructed.

Shut down

- Remove filled containers from the fraction collector after use.
- Pump a rinse solution through the fraction collector at the end of a run to avoid clogging.
- Use recommended solvents to store the system.

Prepare the Fraction Collector

- Flush the LC system.
- 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.

Using the Fraction Collector

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

Solvent Information

Observe the following recommendations on the use of solvents.

- Follow recommendations for avoiding the growth of algae, see 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 like flow cells, valve materials etc. and recommendations in subsequent sections.

Recommended Wash Solvents

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

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

Material Information

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

Disclaimer

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

PEEK

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

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

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

When used above room temperature, PEEK is sensitive to bases and various organic solvents, which can cause it to swell. Under such conditions normal PEEK capillaries are very sensitive to high pressure. Therefore Agilent uses stainless-steel 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 to many organic solvents used in chromatographic systems like methanol, acetonitrile and isopropanol. It has limited stability with aliphatic, aromatic and halogenated hydrocarbons, THF, phenol and derivatives, concentrated acids and bases. For normal phase applications, the maximum pressure should be limited to 200 bar.

Tantalum (Ta)

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

Stainless Steel (ST)

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

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride, and so on) and aqueous solutions of halogens.
- High concentrations of inorganic acids like nitric acid, sulfuric acid and organic solvents especially at higher temperatures (replace, if your

chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).

- Halogenated solvents or mixtures which form radicals and/or acids, for example:

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

  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, di-isopropylether). 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, 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 to 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.

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 10 Syntax for capillary description

Install Capillary Connections

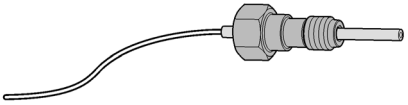
For correct installation of capillary connections of the sampler it's important to choose the correct fittings, see “Capillary Color Coding Guide” on page 69.

Parts required	p/n	Description
	5067-4650	Capillary ST 0.12 mm x 150 mm SL/SX
	5067-4651	Capillary ST 0.12 mm x 280 mm SL/SX
	5067-4720	Capillary ST 0.17 mm x 150 mm SL/SX
	5067-4722	Capillary ST 0.17 mm x 280 mm SL/SX
	5065-4454	Fitting screw long 10/pk Quantity depends on configuration of the module (number of connections to the multisampler).

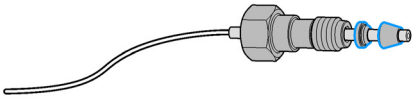
The capillaries mentioned above are examples only.

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

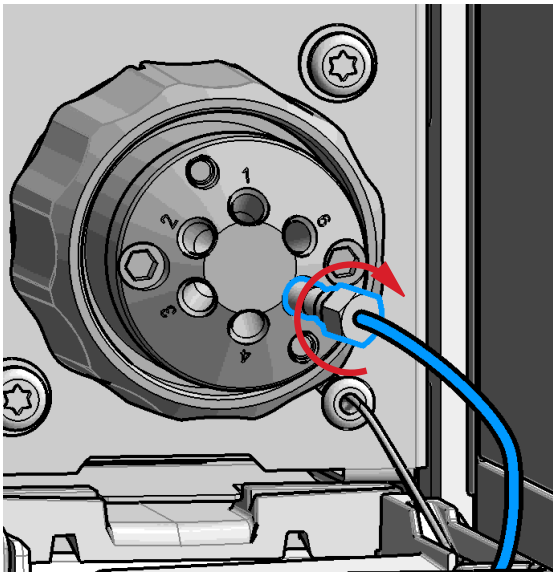
2 Slide the nut over the end of the tubing.



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.

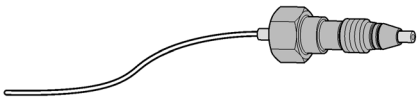


NOTE

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

5 Once you believe you have the fitting complete, loosen the nut, and inspect the ferrule for the correct position on the tubing.

Example of a perfect fitting



Examples of incorrect fittings

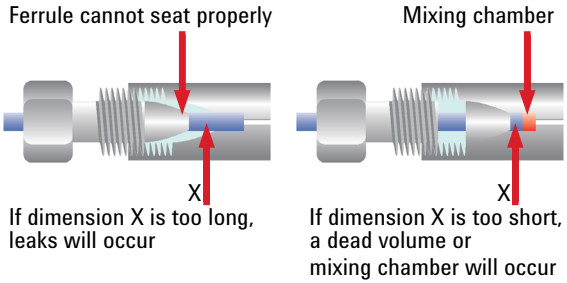


Figure 11 Examples of incorrect fittings

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.

Setting up the Fraction 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.

In order to setup or change the configuration parameters of your fraction collector select **More Fraction Collector > Configuration** from the Instrument menu or right-click on the fraction collector 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.

The Fraction Collector configuration parameters are in four sections:

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

Table 9 Instrument configuration parameters

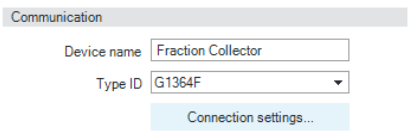
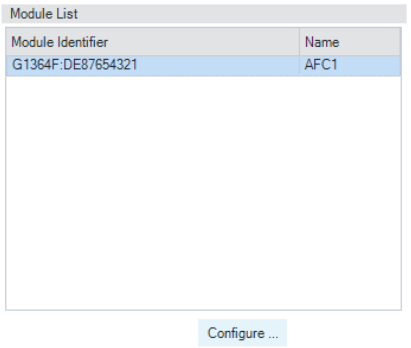
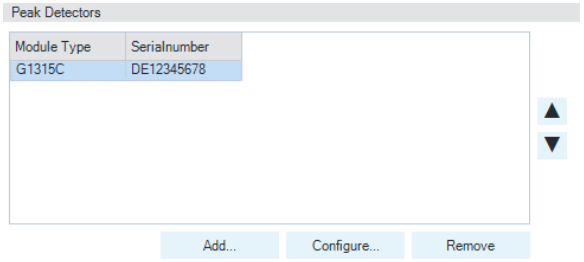
Parameter	Description
	**Communication**: The parameters in this dialog box are detected automatically during autoconfiguration. • **Device name**, • **Type ID**, • Button: **Connection settings**
	**Module List**: • **Module identifier (Type ID: Serial number)**, • **Device name**, • Button: **Configure**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

Table 9 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.

Fraction Collector User Interface (Dashboard Panel)

Table 10 Fraction Collector User Interface

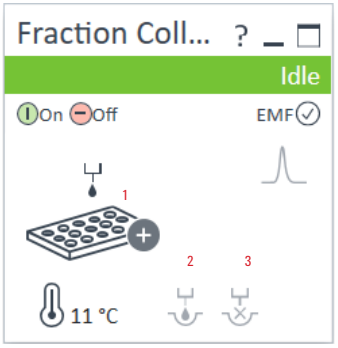
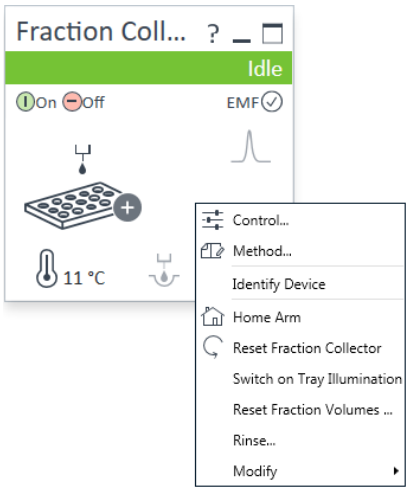
Parameter	Description
	*Module graphic* The items in the Fraction Collector graphic have the following meaning and function: • 1: Denotes collection to a fraction location. The current collection location is shown to the right of the graphic. • 2: Starts manual fraction collection. This button is active 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. • **Rinse Status**: The status of the Rinse procedure • **Temperature**: G1364F and G5664B with thermostat configured. The fraction thermostat temperature (in ° C). In the case of an FCC, the module name is also displayed

Table 10 Fraction Collector User Interface

Parameter	Description
	*Context Menu* The context menu of the dashboard panel contains the following commands: • **Control**: Displays the Fraction Collector's Control dialog box. • **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. • **Switch on Tray Illumination** Toggles the illumination of the fraction collection area, on or off. • **Reset Fraction Volumes**: Displays the **Reset Fraction Volumes** dialog box, which allows you to reset the fill volumes currently stored in the device. • **Rinse**: Displays the **Rinse** dialog box, which allows you to specify the rinse parameters. • **Modify** > **Wellplate Assignment**: Displays the **Modify Wellplate Assignment** dialog box, which allows you to view and (if necessary) change the wellplate assignment of the containers. • **Modify** > **Collection Settings**: Displays the **Modify Collection Settings** dialog box, which allows you to select the collection order and forbidden locations. • **Modify** > **Detector Delay Volumes**: Displays the Modify Detector Delay Volumes dialog box, which allows you to view and (if necessary) modify the delay volumes stored in your device. • **Modify** > **Linked Pump**: Displays the Modify Linked Pump dialog box, which allows you to view and (if necessary) change the pump that delivers the flow to your device. • **Modify** > **Needle and Tubing**: Displays the Modify Needle and Tubing dialog box which allows you to register changes to the needle and/or tubing kit in the module's firmware. • **Modify** > **Needle Position** • **Modify** > **Vessel Dimensions**

Method Parameter Settings

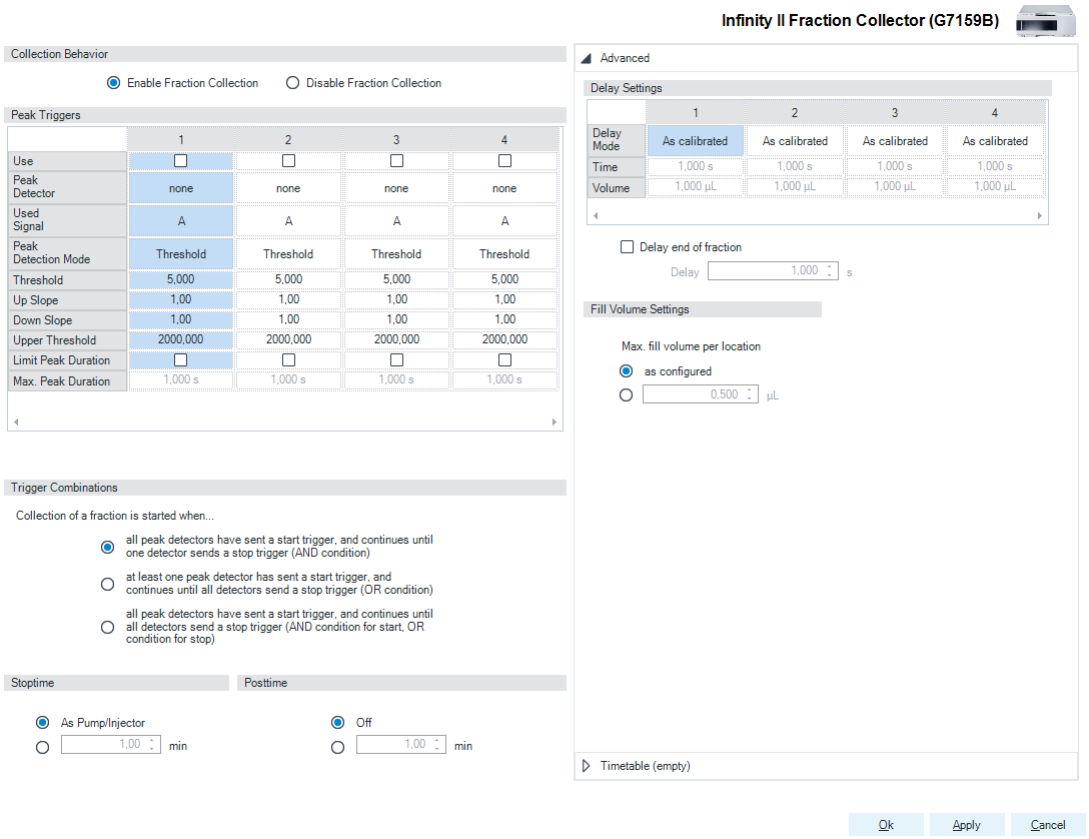


Figure 12 Method settings

The Fraction Collector method setup parameters are in eight sections:

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

Table 11 Method Parameter Settings

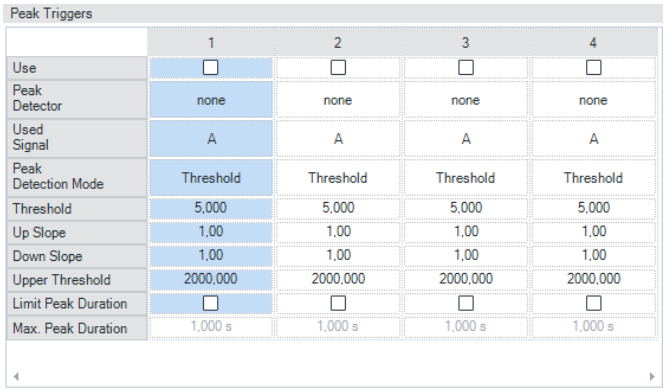
Parameter	Description
	**Collection Behavior** Use this setting to either enable or disable the fraction collection parameters of the instrument.
	**Peak Triggers** Use the Peak Triggers table to specify the detection settings of the peak detectors available in your system. • **Peak Detection Mode** 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 11 Method Parameter Settings

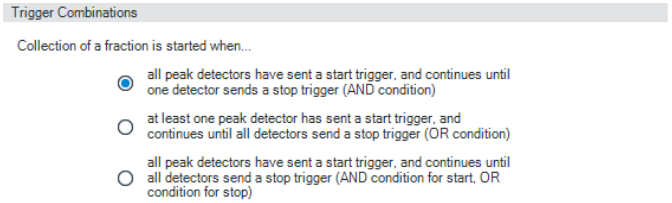
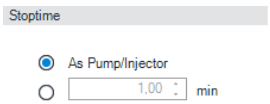
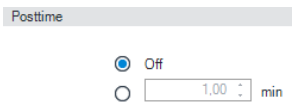
Parameter	Description
	**Trigger Combinations** Use the **Trigger Combinations** to specify how multiple peak triggers are combined to start or stop Fraction Collection. You can choose that: • Collection of a fraction is started when **all peak detectors** have sent a start trigger, and continues until **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)

Table 11 Method Parameter Settings

Parameter	Description
Advanced	See "Advanced Settings" on page 82
Timetable	See "Timetable Settings" on page 84
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

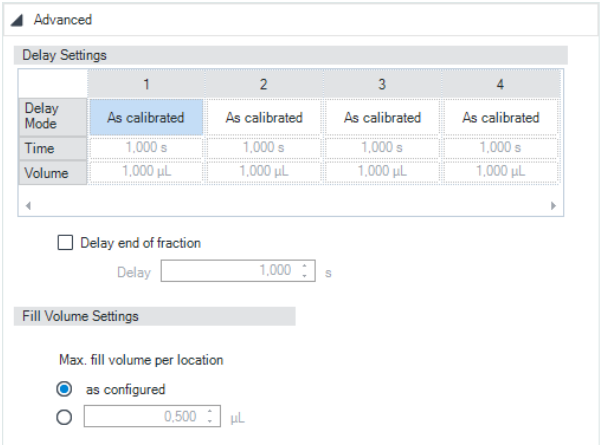
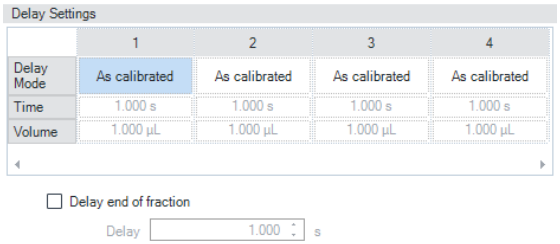
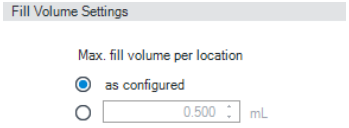


Figure 13 Advanced settings

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 12 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.

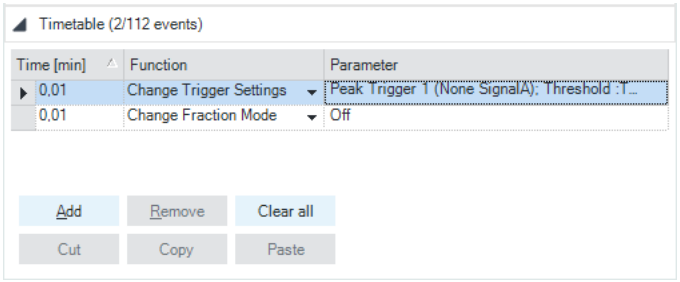


Figure 14 Timetable settings

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 13 Timetable Functions

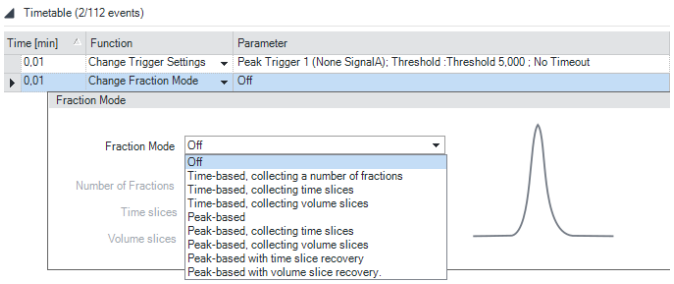
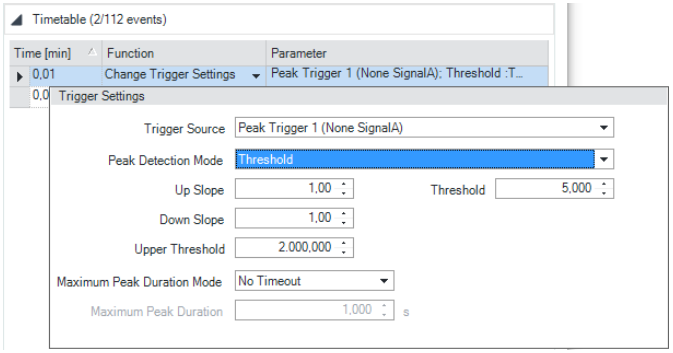
Function	Parameters
	**Fraction Mode** • **Off** (Turns off the current fraction collection, where you use Off to turn off fraction collection at the end of the run if you have not specified a **Stoptime**) • **Time-based, collecting a number of fractions** (Fractions are collected between this time 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 13 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)

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 89.
- 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 optional Agilent Maintenance Wizard Add-on provides an easy-to-use, step-by-step multimedia guide for performing preventive maintenance on Agilent 1200 Infinity and Agilent InfinityLab LC Series instrument.

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.

Open Cover

Error ID: 0205

The top foam has been removed.

Probable cause	Suggested actions
1 Foam not activating the sensor.	Please contact your Agilent service representative.
2 Defective sensor or main board.	Please contact your Agilent service representative.

Module Error Messages

Exhaust Fan Failed

Error ID: 4456, 4457

The exhaust 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 value the error message is generated and the module shuts down.

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.

Front Door Error

Error ID: 4750

The front door and/or the SLF board are damaged.

Probable cause	Suggested actions
1 The flat ribbon cable from MTP main board to the SLF board is not connected correctly.	Please contact your Agilent service representative.
2 The sensor on the SLF board is defective.	Please contact your Agilent service representative.
3 The door is bent or the magnet is misplaced/broken.	Change the side door.
4 Defective MTP main board.	Please contact your Agilent service representative.

Side Door Error

Error ID: 4750

The side door and/or the MTP board are damaged. This error message is not displayed before the initilization is finished.

Probable cause	Suggested actions
1 The side door is not installed.	Install the side door.
2 The door is bent or the magnet is misplaced/broken.	Change the side door.
3 The sensor on the MTP board is defective.	Please contact your Agilent service representative.
4 Excessive weight on top of the fraction collector (see also "Initialization Failed" on page 108)	Check stack configuration and reduce weight on top of the fraction collector.

Arm Movement Failed or Arm Movement Timeout

Error ID: 4002

The transport assembly was unable to complete a movement in one of the axes.

The processor defines a certain time window for the successful completion of a movement in any particular axis. The movement and position of the transport assembly is monitored by the encoders on the stepper motors. If the processor does not receive the correct position information from the encoders within the time window, the error message is generated.

Axes identification:

- Arm Movement 0 Failed: X-axis.
- Arm Movement 1 Failed: Z-axis.
- Arm Movement 2 Failed: Theta (needle carrier rotation).

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

Needle to Needle Rinse / Funnel Position Failed

Error ID: 4955, 4980, 4981-4990

The needle failed to reach the needle rinse / funnel position.

The position of the needle is monitored by a position encoder on the needle carrier. If the needle fails to reach the end point, or if the encoder fails to recognize the needle carrier movement, the error message is generated.

Probable cause		Suggested actions
1	Bad sample transport unit alignment	Do a self-alignment
2	Bent needle.	Check and exchange the needle assembly if necessary.
3	Missing needle.	Check and exchange the needle assembly if necessary.
4	Blocked rinse or funnel position.	Clean or change the funnel or rinse port assembly if necessary.
5	Defective needle carrier assembly.	Exchange the needle carrier assembly.
6	Disconnected needle carrier connector.	Connect needle carrier connector correctly.
7	Defective MTP main board.	Please contact your Agilent service representative.

Needle Carrier Failed

Error ID:

The needle carrier on the transport unit assembly failed to move correctly.

Probable cause	Suggested actions
1 Defective position sensor in the needle carrier assembly.	Exchange the needle carrier assembly.
2 Bad needle carrier positioning in X or Theta.	Perform a self-alignment.
3 Disconnected needle carrier connector.	Connect needle carrier connector correctly.
4 Defective MTP main board.	Please contact your Agilent service representative.
5 Defective Z-motor.	Please contact your Agilent service representative.

Missing Vial or Missing Well-plate

Error ID:

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

When the needle carrier moves to a vial or well-plate and the needle is lowered into the vial or well-plate, the position of the needle is monitored by an encoder behind the vial pusher. If no vial or well-plate is present, the encoder detects an error and the message “missing vial or well plate” is generated.

Probable cause	Suggested actions
1 No vial in the position defined in the method or sequence.	Install the sample vial in the correct position, or edit the method or sequence accordingly.
2 Defective needle carrier assembly.	Exchange the needle carrier assembly.
3 Defective transport unit assembly flex board.	Please contact your Agilent service representative.
4 Defective MTP main board.	Please contact your Agilent service representative.

Calib delay vol two peaks

Error ID: 4759

Two peaks have been detected during the delay calibration.

Probable cause	Suggested actions
1 Wrong sample has been used for the delay calibration.	Check method and delay calibration procedure.
2 Wrong method has been used for the delay calibration.	Check method and delay calibration procedure.
3 Air bubbles are in the flow path.	Check flow path for leaks and air bubbles.

Valve Switch Failed

Error ID: 4959

If multiple fraction collectors are configured, an external valve is used to switch between the fraction collectors.

The error message is displayed if the external valve failed to switch to next position.

Probable cause	Suggested actions
1 Valve is blocked. Possible if eluents with highly concentrated electrolytes are used.	Purge valve to dissolve crystals.
2 Power cord for the valve is not connected.	Check power cord connection.
3 Valve drive or valve electronics are defective.	• Synchronize the valve. • Exchange the valve.

Adapter Required

Error ID: 4961

The wellplate adapter is required for the following operation.

Probable cause	Suggested actions
1 Wellplate adapter not attached.	Attach wellplate adapter.
2 Cable between needle carrier assembly to transport unit assembly disconnected or defective.	Check cable between needle carrier assembly to transport unit assembly.
3 Needle carrier assembly defective.	Exchange needle carrier assembly.

Funnel Not Supported

Error ID: 4962

Funnels are only supported for the analytical/bio-inert fraction collector. Consequently the error message is displayed, if a tray with funnels is configured for the preparative fraction collector.

Probable cause	Suggested actions
1 Fraction collector type and tray not compatible.	• Check the tray configuration in your CDS. Funnel trays are only supported for the analytical scale fraction collector. • Check the system configuration in your CDS, and verify that an analytical scale fraction collector is configured.

Pusher Wrong or Defect

Error ID: 4965

Probable cause	Suggested actions
1 Wellplate adapter not attached.	Attach wellplate adapter.
2 Needle carrier assembly defective.	Exchange needle carrier assembly.

Wrong or Missing Needle (Analytical Scale)

Error ID: 4966

Probable cause	Suggested actions
1 No needle installed.	Check which needle has been installed.
2 Short needle for high flow rates installed, but the wellplate adapter hasn't been removed.	Remove wellplate adapter if short needle for semi-preparative operation is installed.

Initialization Failed

Error ID: 4950

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

Probable cause	Suggested actions
1 Transport unit not aligned correctly	Perform an auto-alignment.
2 Mechanical obstruction.	Ensure unobstructed movement of the transport assembly.
3 Defective transport assembly flex board.	Please contact your Agilent service representative.
4 Defective MTP main board.	Please contact your Agilent service representative.
5 Excessive weight on top of the fraction collector (see also "Side Door Error" on page 101)	Check stack configuration and reduce weight on top of the fraction collector.

Vessel Stuck to Needle

Error ID: 4453

The vessel sticks to the needle when the needle moves up.

Probable cause	Suggested actions
1 Closing mat to rigid/thick.	Check that the closing mat is not too thick.
2 Bad X or Theta positioning and the needle sticks into the wall between two holes.	Please contact your Agilent service representative.
3 Defective encoder on the needle carrier assembly.	Please contact your Agilent service representative.

Cluster Partner Lost During Analysis

Error ID:

There was a problem with the inter module communication.

Probable cause	Suggested actions
1 Disconnected or defective CAN cable.	Check the interconnection between the modules.
2 Disconnected or defective 24V-CAN-DC-OUT cable for an external valve.	Reconnect the UIB / Valve. Start a test analysis/run.
3 Defective UIB, external Valve or MTP board.	• Switch power off / on (complete system off, then on). Start a test analysis / run. • Please contact your Agilent service representative.

Movement to Next Position Failed

Error ID: 4957

The transport mechanism detected an unexpected situation during the movement to the next fraction position.

Probable cause	Suggested actions
1 Mismatch between tray configuration and the loading of the trays, e.g. 4 well plates are configured in the UI, but only three are loaded, or shallow plates are configured, but deep well-plates are used, or tube height doesn't match the configuration.	Check the configuration and the loading of the tray.

Could Not Find a Valid Next Position

Error ID: 4958

There has been more fractions than fraction positions.

Probable cause	Suggested actions
1 Unexpected number of fractions.	• If possible use a tray with more positions. • Add an additional fraction collector to the system.
2 Start of an analysis / sequence / run without changing of the tray of the previous run.	Ensure that there are enough fraction positions for the complete analysis / sequence / run.

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 stack.

NOTE

There are no serviceable parts inside.

Do not open the module.

Warnings and Cautions

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

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

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.

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

Sample degradation and contamination of the instrument

Metal parts in the flow path can interact with the bio-molecules in the sample leading to sample degradation and contamination.

➔ For bio-inert applications, always use dedicated bio-inert parts, which can be identified by the bio-inert symbol or other markers described in this manual.

➔ Do not mix bio-inert and non-inert modules or parts in a bio-inert system.

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 fraction collector in place in the stack. These procedures can be done on a more frequent basis.

Table 14 Simple repair procedures (Analytical and Bio-inert Fraction Collectors)

Procedure	Typical Frequency	Notes
Replacing the inlet / waste tubings	When worn out, when showing visual signs of damage, typically once per year.	See "Replace the Inlet/Waste Tubings (Analytical and Bio-inert)" on page 117
Replacing the valve to needle tubings	When worn out, when showing visual signs of damage, typically once per year	See "Replace the Valve to Needle Tubing (Analytical and Bio-inert)" on page 122
Exchanging the analytical needle assembly	When needle shows indication of damage or blockage Or when using the short needle assembly for operation with high test tubes (>45 mm)	See "Exchange the Analytical Needle Assembly" on page 125
Exchanging the needle/capillary carrier assembly	When the needle carrier is defective	See "Exchange the Needle/Capillary Carrier Assembly (Analytical and Bio-inert)" on page 128
Exchanging the diverter valve	When defective (internal / external leak, valve not switching any more)	See "Exchange the Diverter Valve" on page 132
Exchanging the internal tray	When flow delay sensor defective	See "Exchange the Internal Tray" on page 135
Repairing or exchanging a funnel of the internal tray or funnel tray	When defective (leaky, blocked or contaminated)	See "Repair or Exchange a Funnel of the Internal Tray" on page 137
Exchanging the leak sensor	When defective	See "Exchange the Leak Sensor" on page 139

Replace the Inlet/Waste Tubings (Analytical and Bio-inert)

For bio-inert modules use bio-inert parts only!

When

- When contaminated, worn out or visibly damaged
- Typically once every year

Parts required

#	p/n	Description
1	G1364-68602	Tubing Kit 1 – 5 mL/min, 0.25 mm ID Standard tubing kit for Analytical and Bio-inert Fraction Collector
1	G1364-68601	Tubing Kit 1 mL/min, 0.15 mm ID (OPTIONAL)
1	G1364-68603	Tubing Kit 4 – 8 mL/min, 0.5 mm ID (OPTIONAL)

Preparations

- Position the transport unit of the fraction collector in the **Home** position.
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the **Change Parts** position.
- Turn OFF the instrument.
- Remove the rear end of the fraction collector's waste tubing from the waste container, unscrew the front end of the fraction collector's inlet tubing from the flow cell of the detector.

WARNING

Personal injury

Risk of personal injury caused by the needle arm movement.

➔ Keep fingers away from the needle area.

CAUTION

Liquid spills or fraction losses

Worn or damaged tubings can cause potential spills or lead to fraction losses.

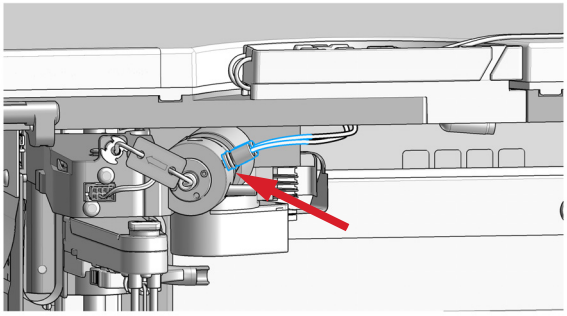
➔ Explicitly follow the described installation procedures to maximize the lifetime of inlet / waste tubing assembly and the valve to needle tubing, and to avoid potential spills or fraction losses.

➔ Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.

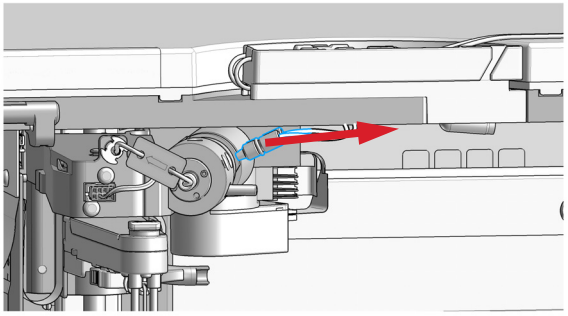
NOTE

Connect the tubings as described in order to maximize their lifetime and operating security.

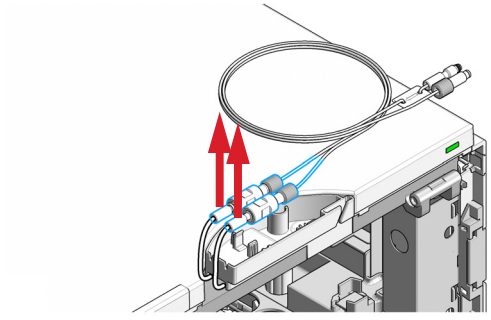
1 Locate the diverter valve with the finger tight fittings of the inner tubing kit.



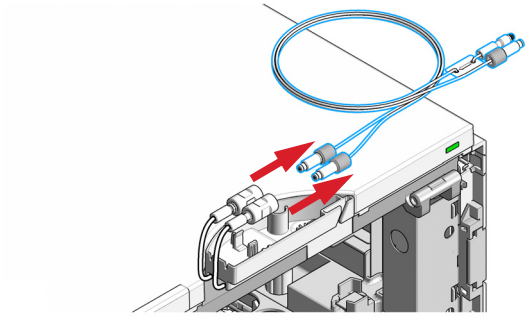
2 Unscrew the two finger-tight fittings of the inner tubing kit at the diverter valve.



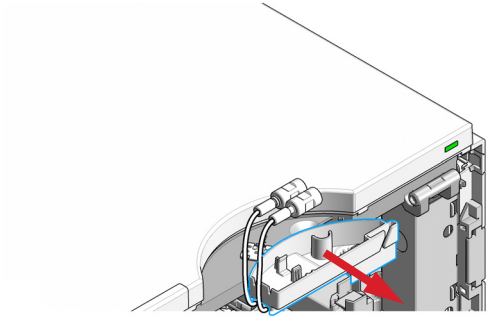
3 Unclip the inlet / waste tubing assembly from the leak adapter.



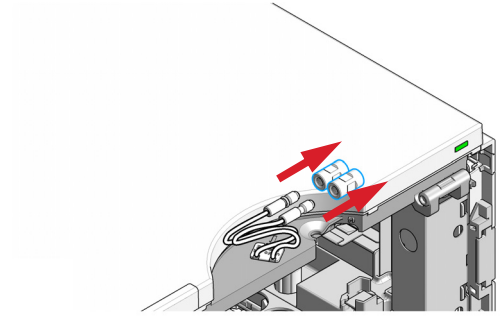
4 Remove the outer tubing kit from the unions.



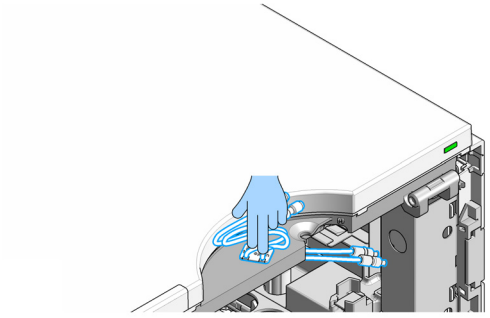
5 Remove the leak adapter from the module housing.



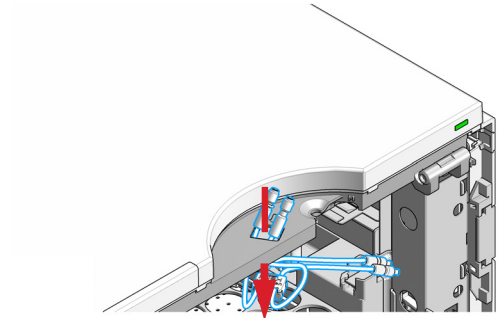
6 Remove the unions from the inner tubing kit.



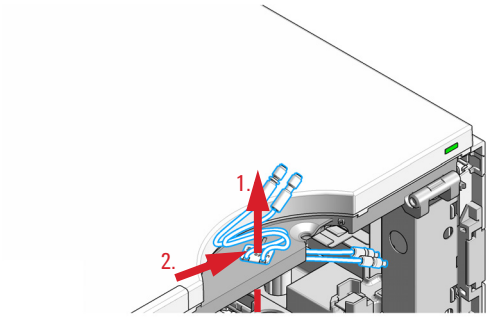
7 Remove the clip by pushing it down through the module housing.



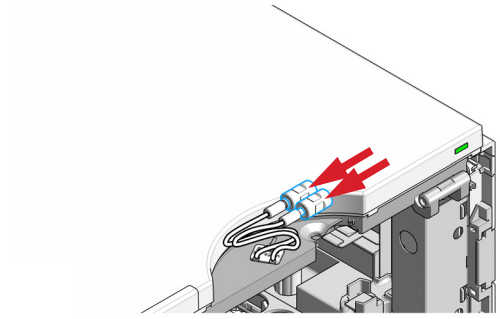
8 Remove the inner tubing kit by pulling it down through the opening in the module housing.



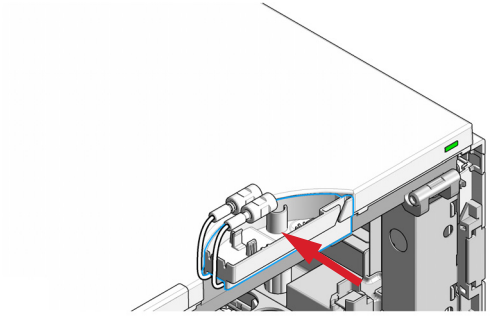
9 Slide in the new inner tubing kit from bottom to top (1.) and let the clip click into position (2.).



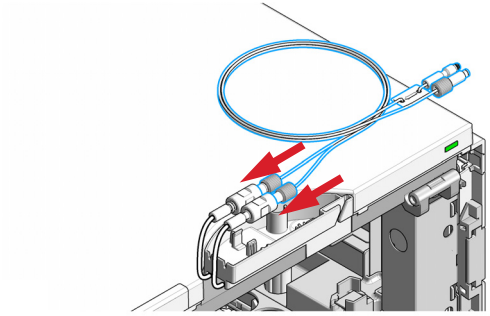
10 Install the unions to the inner tubing kit.



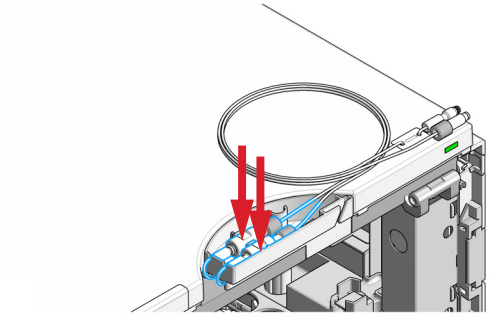
11 Install the leak adapter to the module housing.



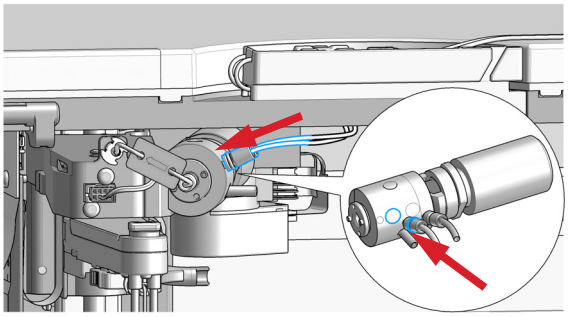
12 Connect the outer tubing kit to the unions.



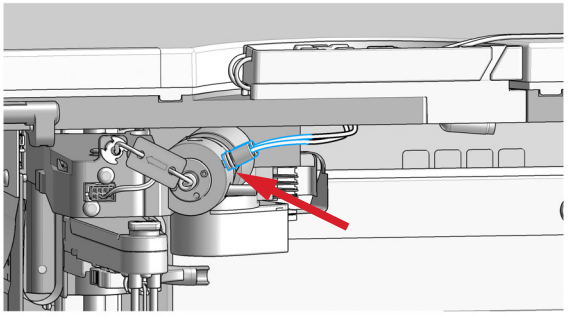
13 Clip the inlet / waste tubing assembly into the leak adapter.



14 A color coded ring on one of the tubings and the valve body indicates, which tubing belongs to which port.



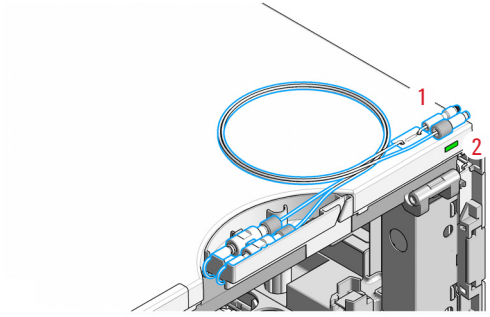
15 Connect the finger-tight fittings of the inner tubing kit to the ports of the diverter valve. The tubings must run into the ports of the diverter valve in horizontal, parallel lines.



NOTE

The tubings must not be bent or twisted.

16 Connect the tubing with the label with the arrow (1) to the flow cell of the detector. Insert the other tubing (2) into the waste container.



Next Steps:

17 Re-install the tray(s) in the tray base.

18 Start the instrument.

19 Close the front cover.

Replace the Valve to Needle Tubing (Analytical and Bio-inert)

For bio-inert modules use bio-inert parts only!

When

- When contaminated, worn out or visibly damaged
- Typically once every year

Tools required

p/n	Description
8710-1534	Wrench, open end, 4 mm
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

#	p/n	Description
1	G1364-68602	Tubing Kit 1 – 5 mL/min, 0.25 mm ID Standard tubing kit for Analytical and Bio-inert Fraction Collector
1	G1364-68601	Tubing Kit 1 mL/min, 0.15 mm ID (OPTIONAL)

Preparations

- Position the transport unit of the fraction collector in the **Home** position.
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the **Change Parts** position and turn off the instrument.
- It might be more convenient to remove the needle from its carrier before unscrewing the needle tubing.

WARNING

Personal injury

Risk of personal injury caused by the needle arm movement.

➔ Keep fingers away from the needle area.

CAUTION

Liquid spills or fraction losses

Worn or damaged tubings can cause potential spills or lead to fraction losses.

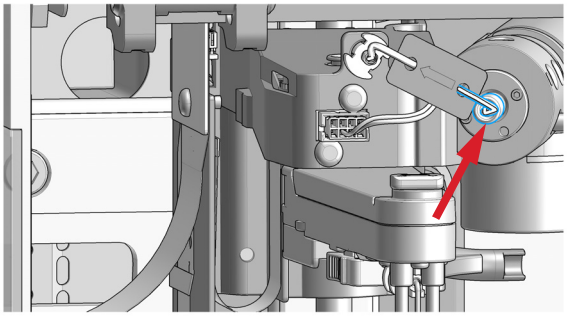
➔ Explicitly follow the described installation procedures to maximize the lifetime of inlet / waste tubing assembly and the valve to needle tubing, and to avoid potential spills or fraction losses.

➔ Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.

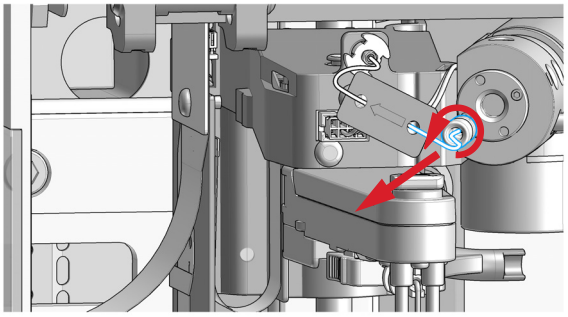
NOTE

Install the tubing as described to maximize its lifetime.

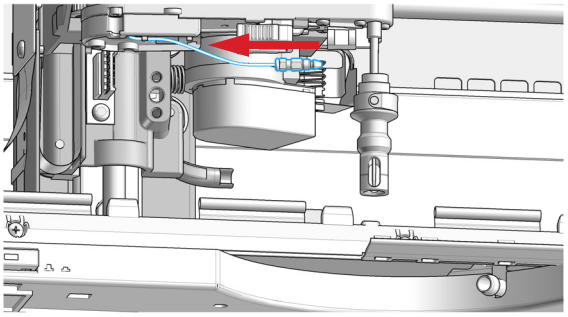
1 Locate the diverter valve with the finger-tight fittings of the valve to needle tubing assembly.



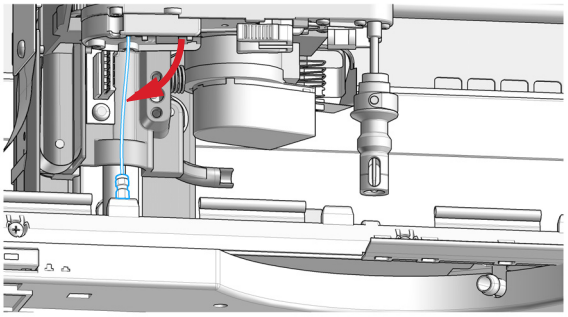
2 Unscrew the finger-tight fitting of the valve to needle tubing assembly at the diverter valve.



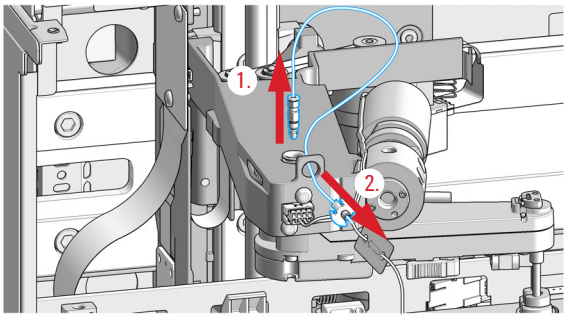
3 Using the 4 mm wrench and the 5/16“ wrench for counter-holding, unscrew the valve to needle tubing from the needle.



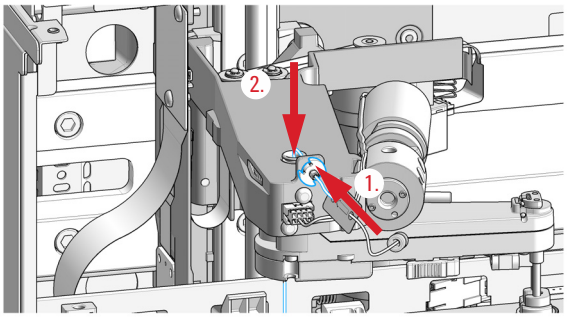
4 Un-clip the tubing from the bottom of the needle carrier assembly.



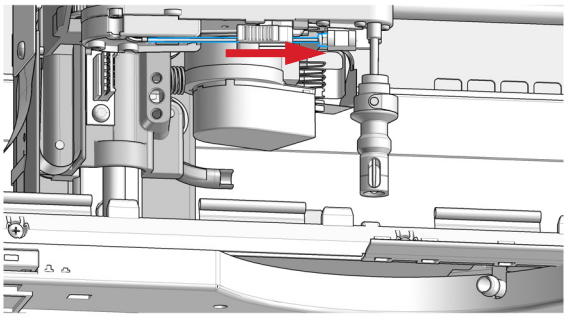
5 Slide the tubing through the hole in the needle carrier assembly (from bottom to top) (1.) and out of the holder in the z-arm assembly (2.).



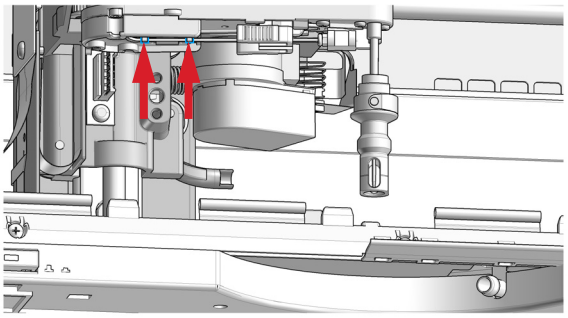
6 Install the new valve to needle tubing assembly by clipping it in to the holder in the z-arm assembly (1.), and sliding it through the hole in the z-arm (2.) and out on the bottom of the needle carrier assembly (top to bottom).



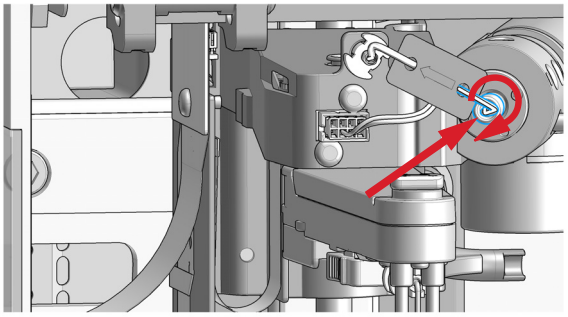
7 Using the 4 mm wrench and the 5/16“ wrench for counter-holding, connect the valve to needle tubing to the needle.



8 After fixing the screw, clip the tubing into the guide on the bottom of the needle carrier assembly.



9 Screw the finger-tight fitting into the port of the diverter valve.



Next Steps:

10 Re-install the tray(s) in the tray base.

11 Start the instrument.

12 Close the front cover.

Exchange the Analytical Needle Assembly

For bio-inert modules use bio-inert parts only!

When

- When the needle is visibly damaged
- When the needle is blocked or contaminated

Tools required

p/n	Description
8710-1534	Wrench, open end, 4 mm
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

#	p/n	Description
1	G1367-87200	Analytical needle assembly
1	G5667-87200	Needle assembly (bio-inert)

Preparations

- Position the transport unit of the fraction collector in the **Home** position.
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the **Change Parts** position and turn off the instrument.
- Remove the needle from its carrier before unscrewing the needle tubing.

WARNING

Personal injury

Risk of personal injury caused by the needle arm movement.

➔ Keep fingers away from the needle area.

CAUTION

Liquid spills or fraction losses

Worn or damaged tubings can cause potential spills or lead to fraction losses.

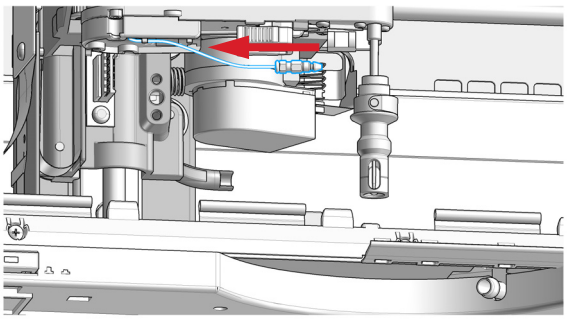
➔ Explicitly follow the described installation procedures to maximize the lifetime of inlet / waste tubing assembly and the valve to needle tubing, and to avoid potential spills or fraction losses.

➔ Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.

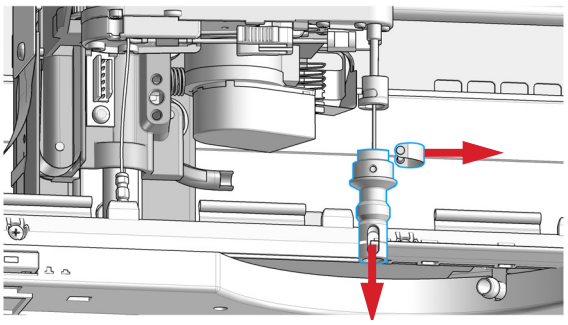
NOTE

Install the tubing as described to maximize its lifetime.

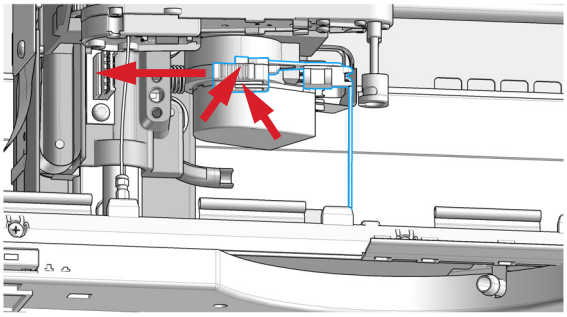
1 Using the 4 mm wrench and the 5/16" wrench for counter-holding, unscrew the valve to needle tubing from the needle.



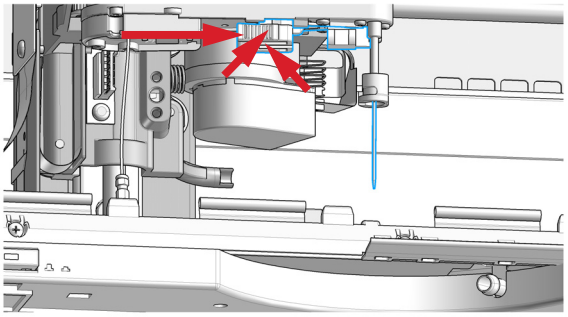
2 Remove the wellplate adapter and the clip.



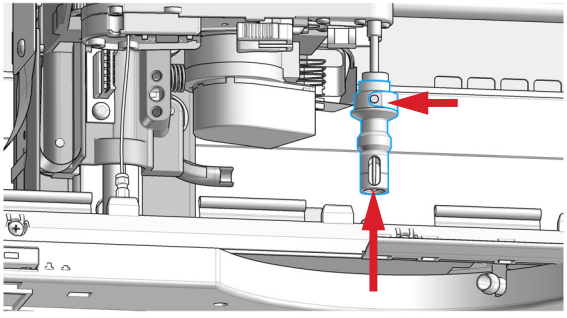
3 Hold the needle assembly between your thumb and forefinger, slide out the assembly towards the rear of the needle carrier assembly.



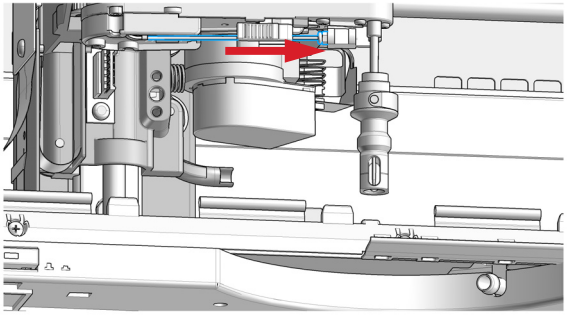
4 Insert the new needle assembly into the holder of the needle carrier assembly. Make sure to push it all the way to the front.



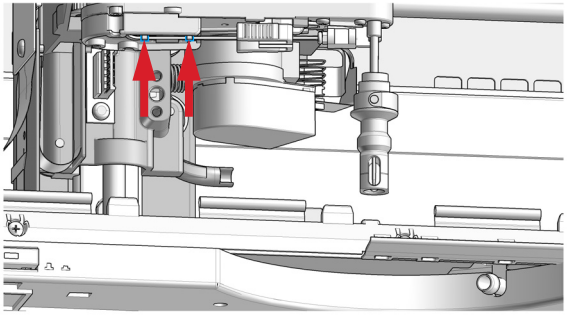
5 Reassemble the wellplate adapter.



6 Using the 4 mm wrench and the 5/16“ wrench for counter-holding, connect the valve to needle tubing to the needle.



7 After fixing the screw, clip the tubing into the guide on the bottom of the needle carrier assembly.



Next Steps:

8 Re-install the tray(s) in the tray base.

9 Start the instrument.

10 Close the front cover.

Exchange the Needle/Capillary Carrier Assembly (Analytical and Bio-inert)

When If defective

Tools required

p/n	Description
8710-2438	Hex key 2.0 mm

Parts required

#	p/n	Description
1	G1364-60022	Needle carrier assembly, analytical scale

Preparations

- Position the transport unit of the fraction collector in the **Home** position.
- Remove all installed trays from the tray base.
- Position the transport unit of the fraction collector in the **Change Parts** position and turn OFF the instrument.
- Remove the needle from its carrier before unscrewing the needle tubing.

WARNING

Personal injury

Risk of personal injury caused by the needle arm movement.

➔ Keep fingers away from the needle area.

CAUTION

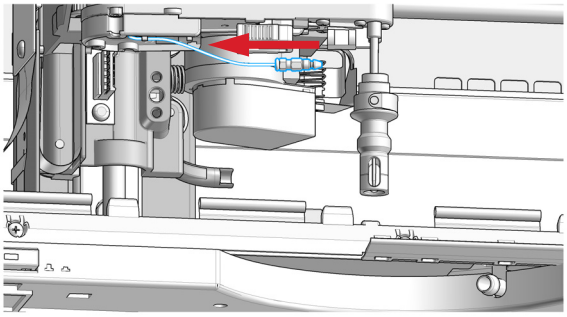
Liquid spills or fraction losses

Worn or damaged tubings can cause potential spills or lead to fraction losses.

➔ Explicitly follow the described installation procedures to maximize the lifetime of inlet / waste tubing assembly and the valve to needle tubing, and to avoid potential spills or fraction losses.

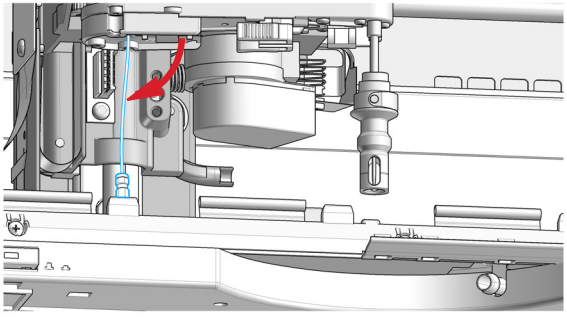
➔ Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.

1 Using the 4 mm wrench and the 5/16" wrench for counter-holding, unscrew the valve to needle tubing from the needle.

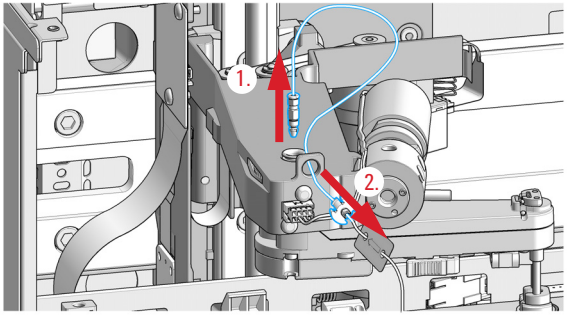


2 Hold the needle/capillary guiding assembly between your thumb and forefinger and slide out the assembly towards the rear of the needle carrier assembly.

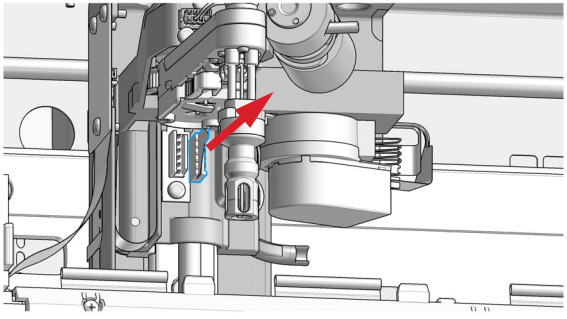
3 Un-clip the tubing from the bottom of the needle carrier assembly.



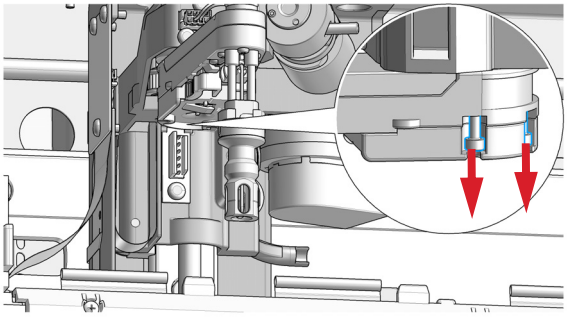
4 Slide the tubing through the hole in the needle carrier assembly (from bottom to top) (1.) and out of the holder in the z-arm assembly (2.).



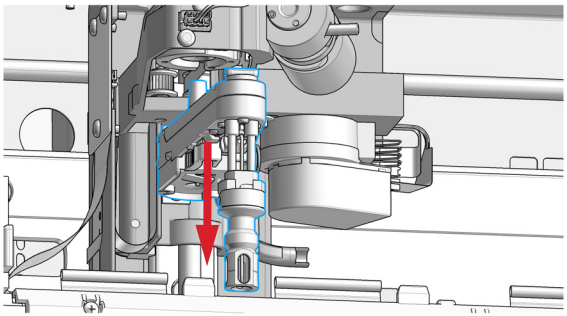
5 Unplug the blue connector of the brown flat band cable of the needle carrier assembly from its plug at the z-arm.



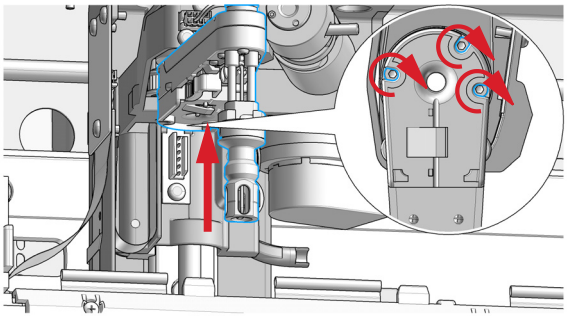
6 Locate the three holding screws of the needle carrier assembly and unscrew them.



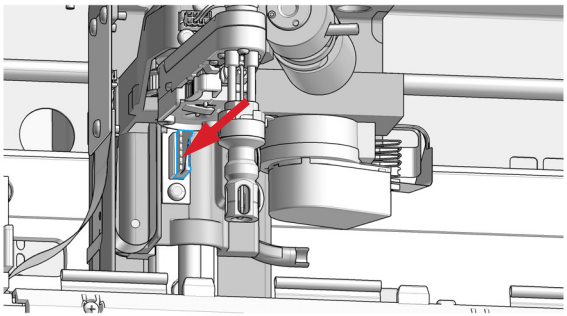
7 Slide out the needle carrier assembly to the bottom.



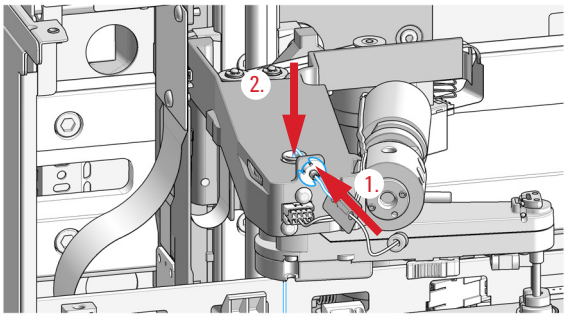
8 Install the new carrier assembly and secure it with its three holding screws. The carrier is held in position with a pin / slot - fit. Push it all the way up to the top for correct orientation and installation.



9 Plug in the blue connector of the brown flat band cable of the needle carrier assembly to its plug at the z-arm.



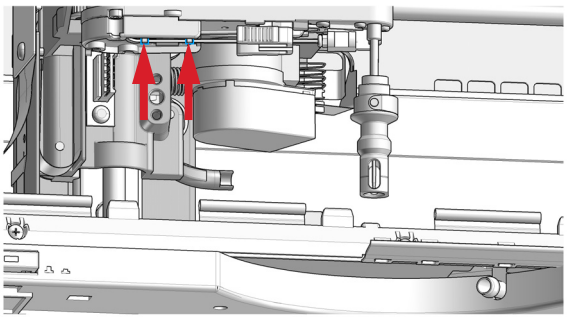
10 Slide the valve to needle tubing assembly through the hole in the z-arm (1.) and out on the bottom of the needle carrier assembly (top to bottom, 2.).



11 With the needle held underneath the needle carrier assembly and using the 4 mm wrench and the 5/16" wrench for counter-holding connect the valve to needle tubing to the needle.

12 Insert the needle or capillary guiding assembly into the holder of the new needle carrier assembly. Make sure to push it all the way to the front (clicks into position).

13 After fixing the screw, clip the tubing into the guide on the bottom of the needle carrier assembly.



Next Steps:

14 Re-install the tray(s) in the tray base.

15 Start the instrument.

16 Close the front cover.

Exchange the Diverter Valve

For bio-inert modules use bio-inert parts only!

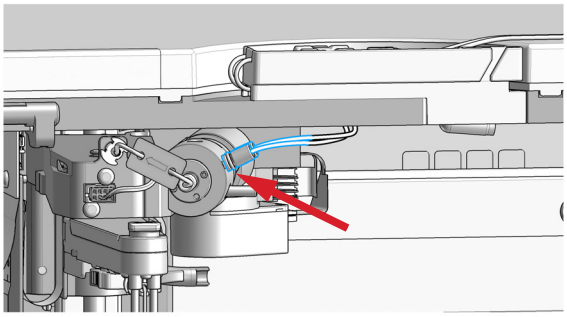
When	If leaky or defective	
Tools required	**p/n**	**Description**
	8710-2438	Hex key 2.0 mm
Parts required	**p/n**	**Description**
	G5664-60901	Diverter valve

Preparations

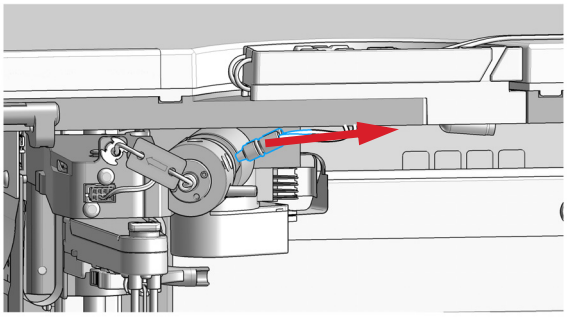
- Position the transport unit of the fraction collector in the Home position.
- Remove all installed trays from the tray base.
- Turn OFF the instrument.

NOTE Connect the tubings as described in order to maximize their lifetime and operating security.

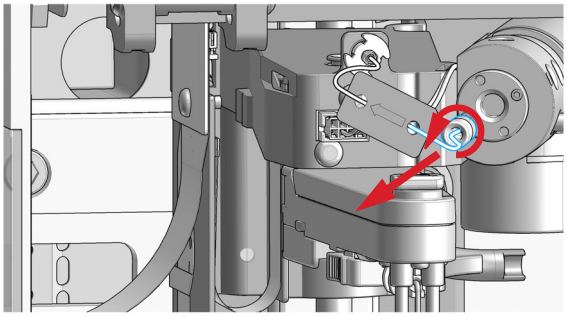
1 Locate the diverter valve with the finger tight fittings of the inner tubing kit.



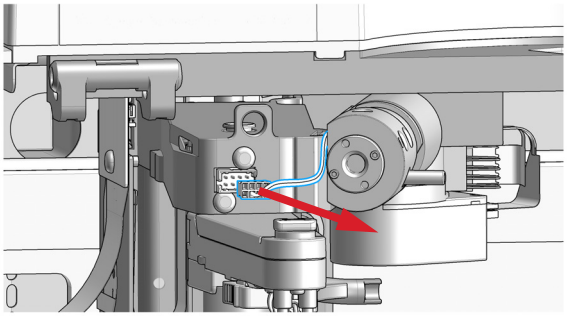
2 Unscrew the two finger-tight fittings of the inner tubing kit at the diverter valve.



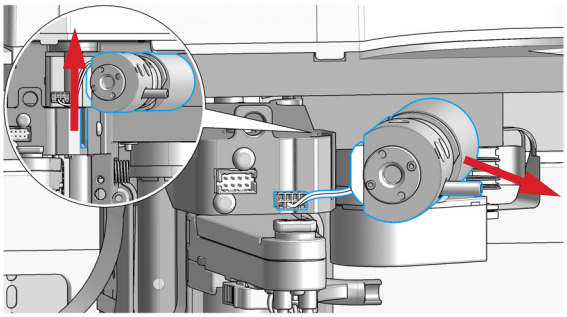
3 Unscrew the finger-tight fitting of the valve to needle tubing assembly at the diverter valve.



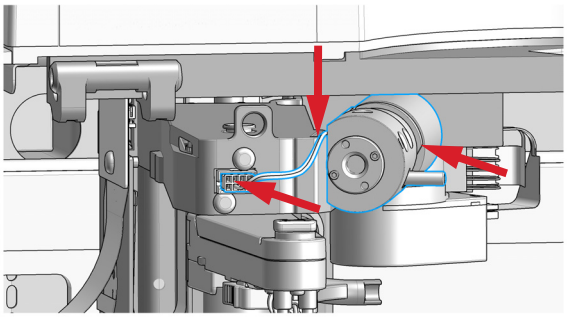
4 Disconnect the power cable of the diverter valve from the connector on the front of the z-arm.



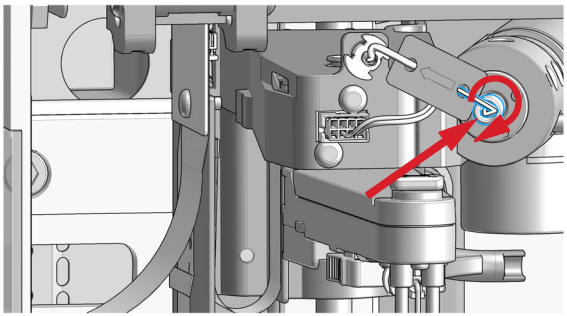
5 Using the 2 mm hex key loosen the holding screw of the diverter valve and remove the diverter valve from the z-arm.



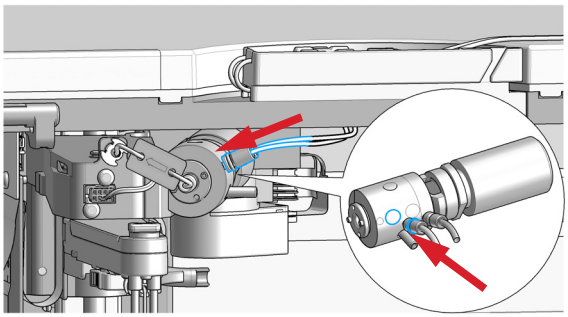
6 Install the new diverter valve to the z-arm with its holding screw. Plug in the new diverter valve power cable to the z-arm.



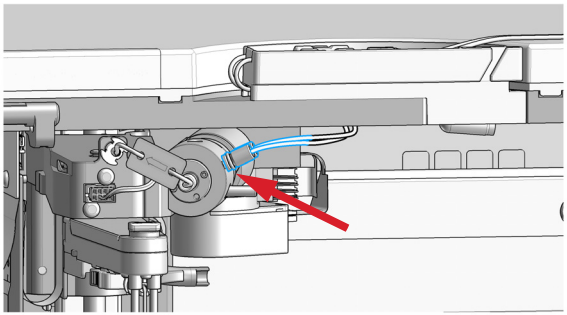
7 Install the valve to needle tubing at the new diverter valve.



8 A color coded ring on one of the tubings and the valve body indicates, which tubing belongs to which port.



9 Connect the finger-tight fittings of the inner tubing kit to the ports of the diverter valve. The tubings must run into the ports of the diverter valve in horizontal, parallel lines.



NOTE

The tubings must not be bent or twisted.

Next Steps:

10 Re-install the tray(s) in the tray base.

11 Start the instrument.

12 Close the front cover.

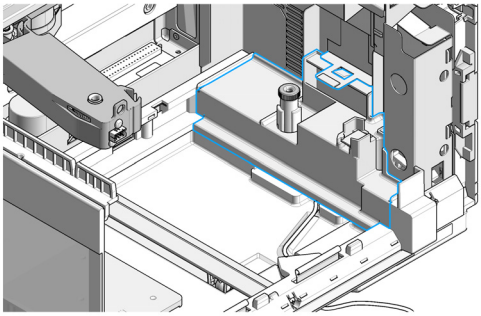
Exchange the Internal Tray

When	If defective		
Parts required	**#**	**p/n**	**Description**
	1	G1364-63123	Internal tray preparative scale
OR	1	G1364-63124	Internal tray analytical scale

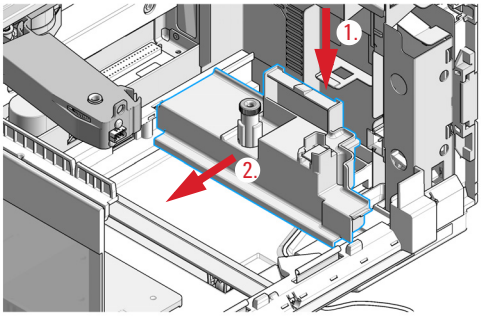
Preparations

- Position the transport unit of the fraction collector in the **Home** position.
- Remove all installed trays from the tray base.
- Turn OFF the instrument.

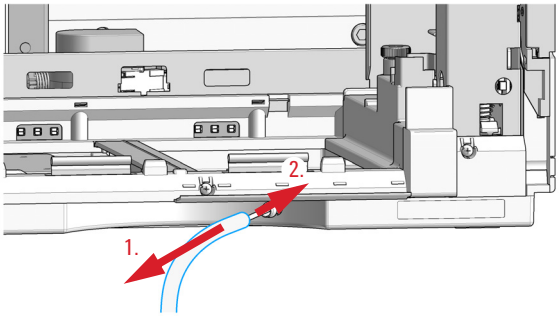
1 Locate the internal tray assembly with the rinse funnel and flow delay sensor in the bottom of the right front corner of the instrument.



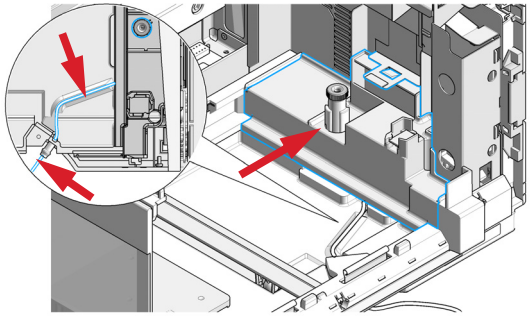
2 Remove the internal tray by pushing down the plastic holder that holds it in position underneath the metal leash (1.) and sliding the tray to the left at the same time (2.).



3 Remove the waste tubing from the front of the instrument (1.) and slide the internal tray's waste tubing to the rear of the outlet (2.) before sliding the tray out.



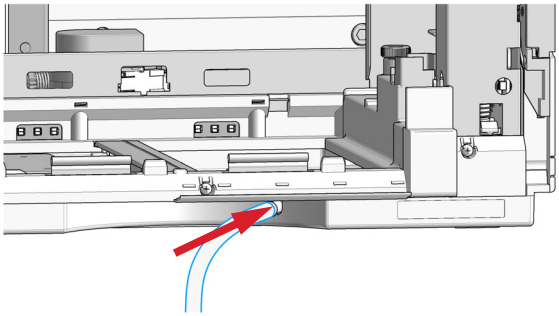
4 Install the new tray by sliding it into position underneath the metal leash that holds it. The waste tubing from the internal tray should be guided as shown in detail.



NOTE

Make sure that the waste tubing is slid all the way through the outlet. Its end should be over the edge and below the level of the laboratory desk to avoid back flow of solvent.

5 Re-install the waste tubing.



Next Steps:

6 Re-install the tray(s) in the tray base.

7 Start the instrument.

8 Close the front cover.

Repair or Exchange a Funnel of the Internal Tray

When When leaky or contaminated

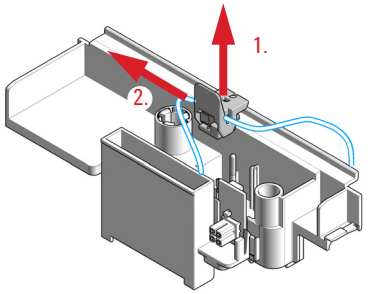
Parts required

p/n	Description
G1364-68730	Funnel seal kit (pack of 10)
G1364-43201	Funnel coupler
G1364-86708	Waste tubing kit 0.5T (analytical scale)
5022-2200	Funnel

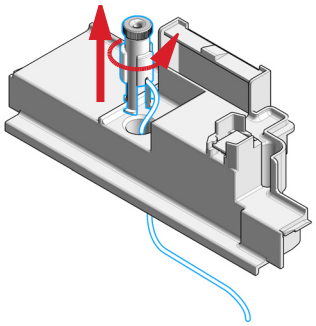
Preparations

- Position the transport unit of the fraction collector in the **Home** position and remove all installed trays from the tray base.
- Turn OFF the instrument.
- Remove the internal tray, see "Exchange the Internal Tray" on page 135.

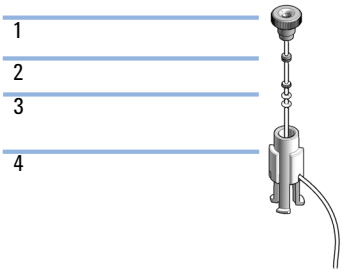
1 Turn the internal tray upside down, lift the flow delay sensor (1.) and remove the funnel's waste tubing through the flow delay sensor (2.).



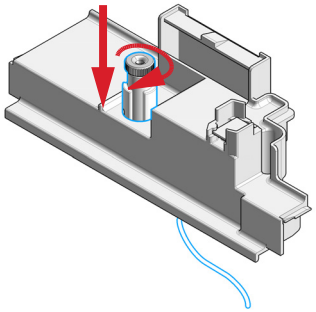
2 Remove the funnel assembly from the internal tray by screwing it counter clockwise and lifting it out.



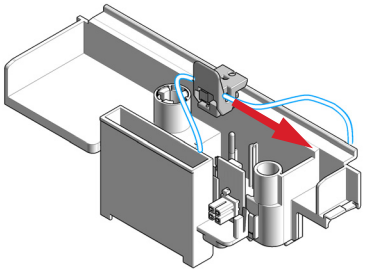
3 Exploded view for the parts of the internal tray. Once the funnel has been removed from the internal tray, it can be disassembled and defective parts can be replaced (funnel screw (1), seals (2), tubing (3) or funnel holder (4)).



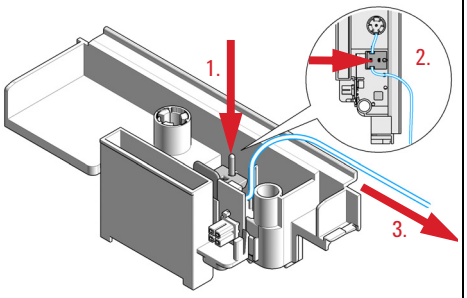
4 Insert the funnel into the tray and screw it tight (clockwise).



5 Turn the internal tray upside down and guide the funnel's waste tubing through the flow delay sensor.



6 Re-install the plug that holds the flow delay sensor (1.), pull the waste tubing tight through the flow delay sensor (2.) and mount the waste tubing (3.).



Next Steps:

7 Reinstall the internal tray and make sure to route the waste tubing out through the outlet of the instrument correctly (see "Exchange the Internal Tray" on page 135).

8 Re-install the tray(s) in the tray base.

9 Start the instrument.

10 Close the front cover.

Exchange the Leak Sensor

When If defective

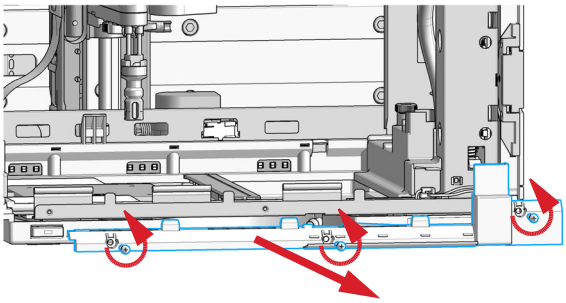
Parts required

p/n	Description
5061-3356	Leak Sensor Assembly

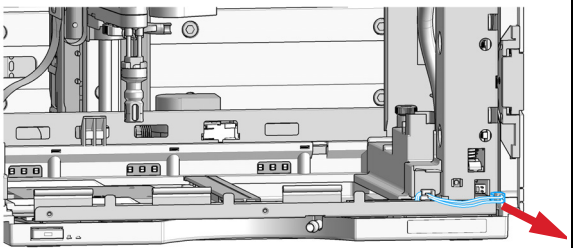
Preparations

- Position the transport unit of the fraction collector in the **Home** position.
- Remove all installed trays from the tray base.
- Turn OFF the instrument.

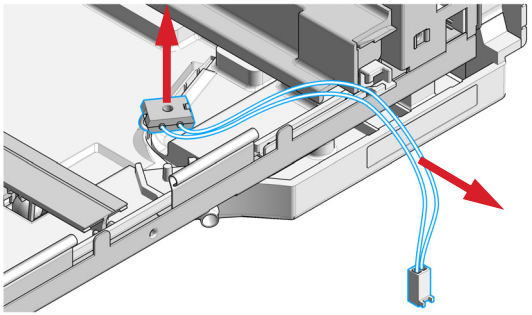
1 Unscrew the three screws at the front tray guide and remove the tray guide.



2 Unplug the leak sensor from the SLF board.



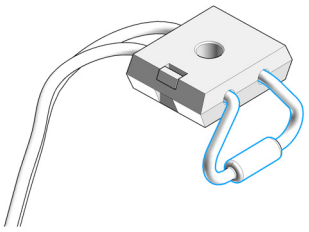
3 Notice the position of the leak sensor and pull out the old leak sensor and its cable from the instrument.



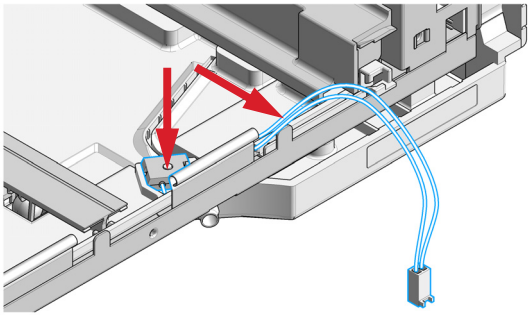
4 Bend the new leak sensor, so that it has a 90 ° angle to its plastic holder.

NOTE

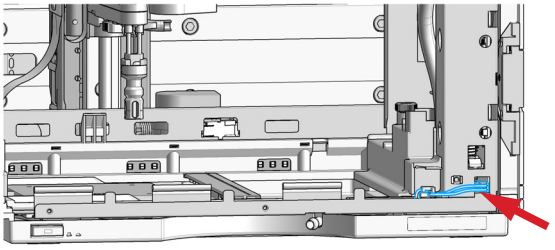
The bend must be sharp enough that the sensor reaches all the way down to the bottom of the leak plane, but the cables must not be damaged!



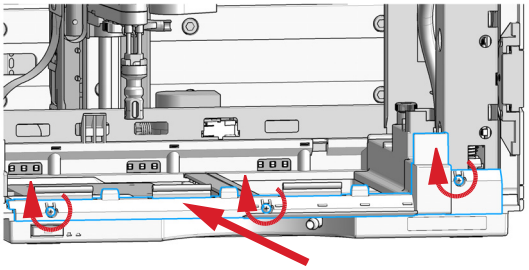
5 Install the new leak sensor into its position in the leak plane.



6 Route the leak sensor cable nicely into the recess at the front of the instrument. Plug the leak sensor into its connector on the SLF board.



7 Re-install the front tray guide and fasten it with the three screws. Be careful not to pinch the leak sensor cable.



Next Steps:

8 Re-install the tray(s) in the tray base.

9 Start the instrument.

10 Close the front cover.

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.

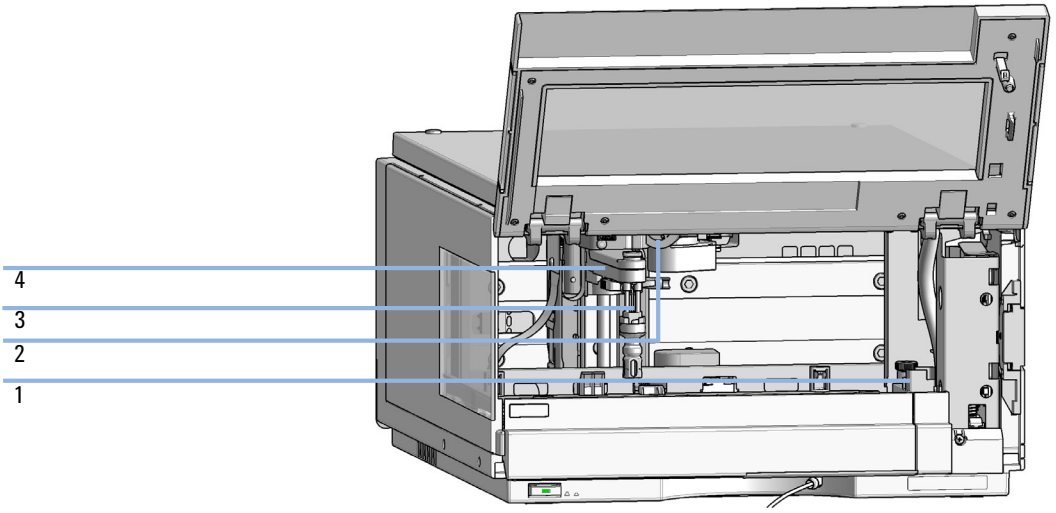
8
Parts for Maintenance and Repair

This chapter provides information on parts for maintenance and repair.

Analytical-Scale Fraction Collector Parts

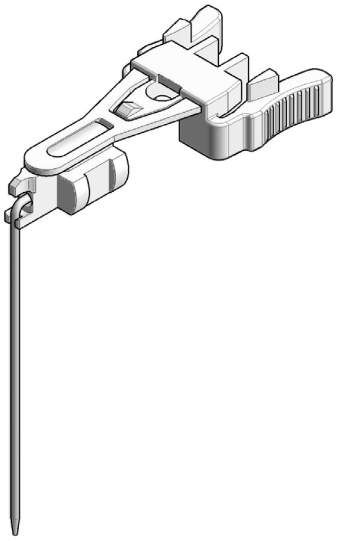
Analytical Fraction Collector Main Assemblies

Item	p/n	Description
1	G1364-63124	Internal tray analytical scale
2	G5664-60901	Diverter valve
3	G1367-87200	Analytical needle assembly
OR	G1364-87202	Analytical needle assembly (for extended flow rates and high test tubes)
4	G1364-60022	Needle carrier assembly, analytical scale
	G1364-43701	Tray compartment divider (not shown)
	G1367-47200	Plug channel (not shown)
	G1329-43200	Adapter air channel (not shown)



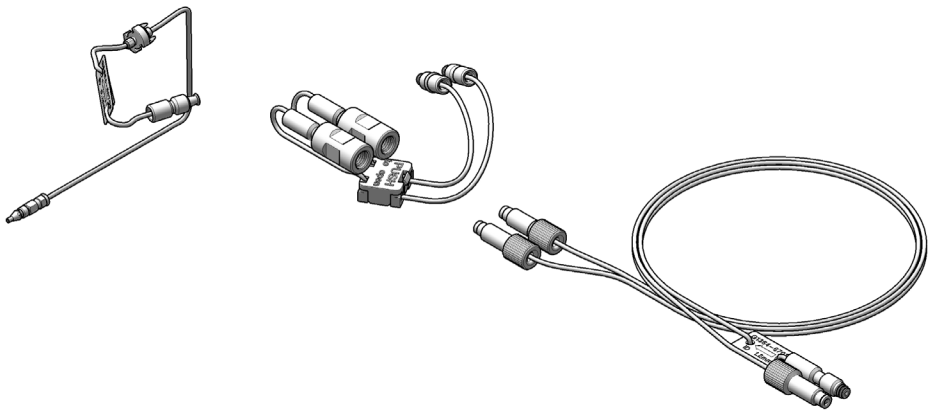
Needle Assemblies

p/n	Description
G1364-87202	Analytical needle assembly (for extended flow rates and high test tubes)
G1367-87200	Analytical needle assembly



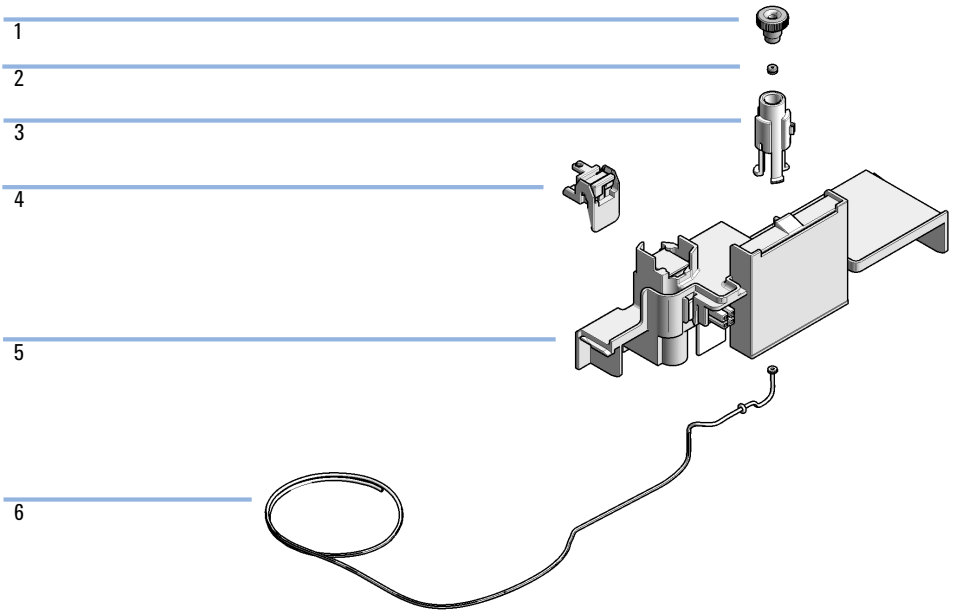
Tubing Kits

p/n	Description
G1364-68602	Tubing Kit 1 – 5 mL/min, 0.25 mm ID Standard tubing kit for Analytical and Bio-inert Fraction Collector
G1364-68601	Tubing Kit 1 mL/min, 0.15 mm ID (OPTIONAL)
G1364-68603	Tubing Kit 4 – 8 mL/min, 0.5 mm ID (OPTIONAL)



Internal Tray Assembly

Item	p/n	Description
	G1364-63124	Internal tray analytical scale
1	5022-2200	Funnel
2	G1364-68730	Funnel seal kit (pack of 10)
3	G1364-43201	Funnel coupler
4		Flow delay sensor
5		Tray internal
	G1364-86708	Waste tubing kit 0.5T (analytical scale)

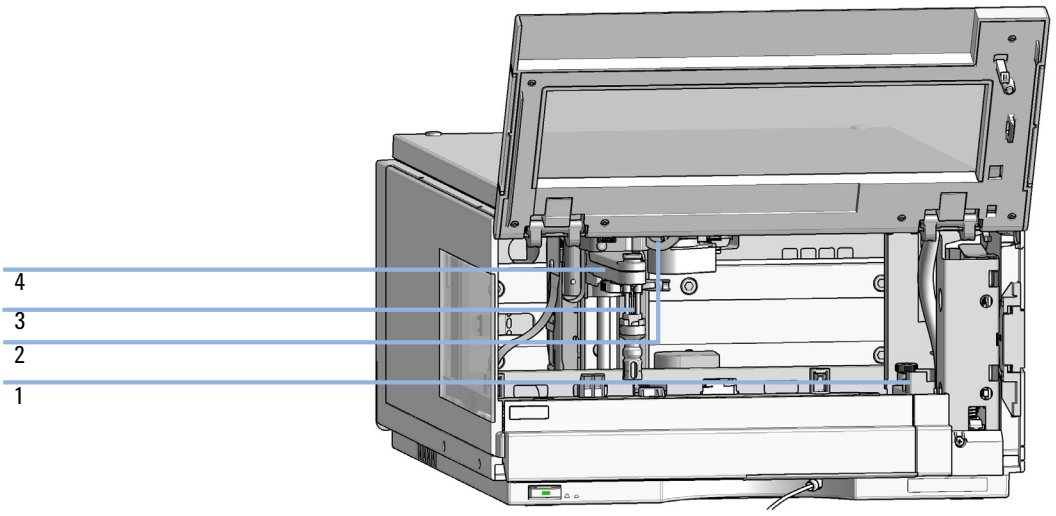


Bio-inert Fraction Collector Parts

Bio-inert Fraction Collector Main Assemblies

For bio-inert modules use bio-inert parts only!

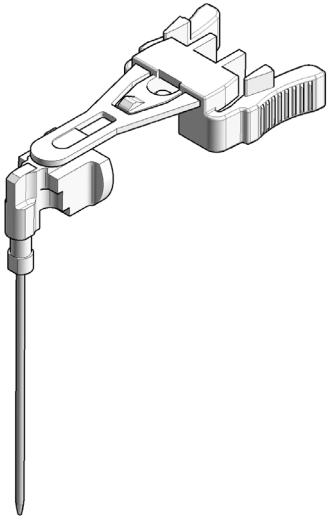
Item	p/n	Description
1	G1364-63124	Internal tray analytical scale
2	G5664-60901	Diverter valve
3	G5667-87200	Needle assembly (bio-inert)
4	G1364-60022	Needle carrier assembly, analytical scale
	G1364-43701	Tray compartment divider (not shown)
	G1367-47200	Plug channel (not shown)
	G1329-43200	Adapter air channel (not shown)


4
3
2
1

Needle Assembly

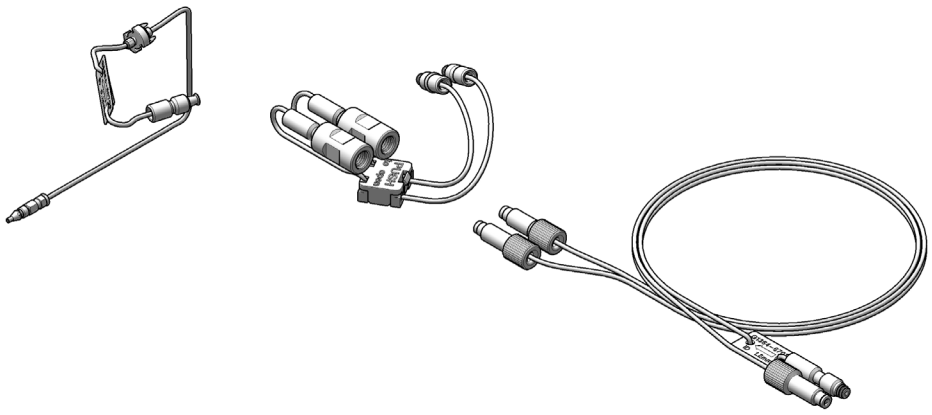
For bio-inert modules use bio-inert parts only!

p/n	Description
G5667-87200	Needle assembly (bio-inert)



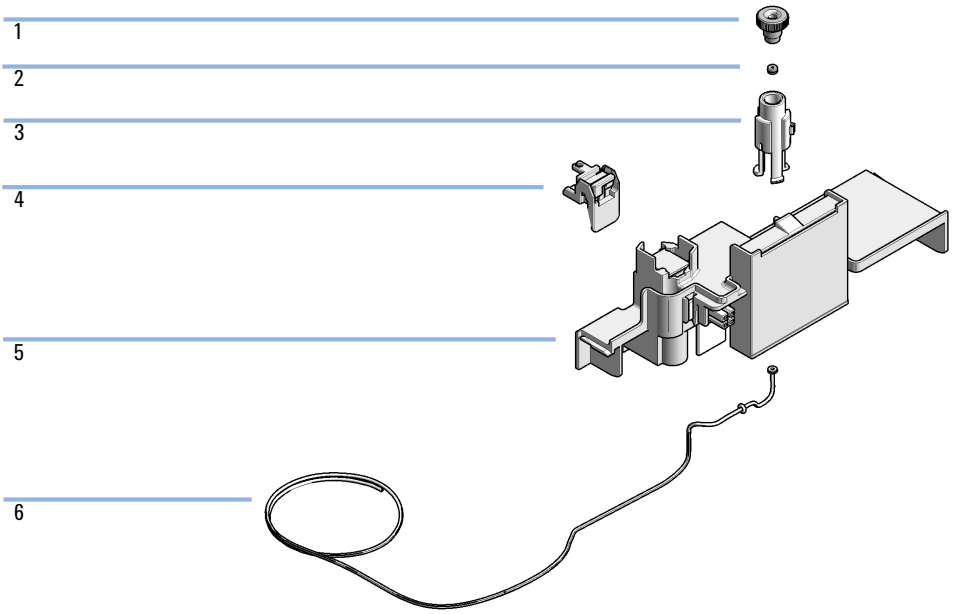
Tubing Kit

p/n	Description
G1364-68602	Tubing Kit 1 – 5 mL/min, 0.25 mm ID Standard tubing kit for Analytical and Bio-inert Fraction Collector
G1364-68601	Tubing Kit 1 mL/min, 0.15 mm ID (OPTIONAL)
G1364-68603	Tubing Kit 4 – 8 mL/min, 0.5 mm ID (OPTIONAL)



Internal Tray Assembly

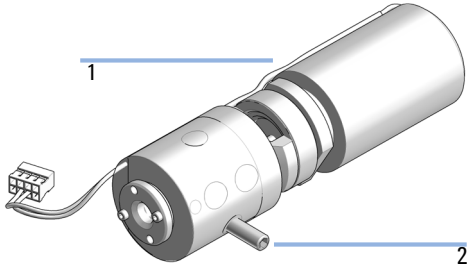
Item	p/n	Description
	G1364-63124	Internal tray analytical scale
1	5022-2200	Funnel
2	G1364-68730	Funnel seal kit (pack of 10)
3	G1364-43201	Funnel coupler
4		Flow delay sensor
5		Tray internal
	G1364-86708	Waste tubing kit 0.5T (analytical scale)



Diverter-Valve Assembly

For bio-inert modules use bio-inert parts only!

p/n	Description
G5664-60901	Diverter valve
0515-1211	PIN screw



Supported Trays for a Fraction Collector

For more information on trays, well-plates and collecting tubes for an LC Fraction Collector, refer to the Agilent Web site:

- http://www.chem.agilent.com/store/en_US/LCat-SubCat2ECS_31825/Collecting-Tubes-and-Trays
- http://www.chem.agilent.com/store/en_US/LCat-SubCat2ECS_31826/Well-Plates-and-Trays

p/n	Description
G1364-84541	Full Tray for 4 Well Plates
G1364-84543	Tray Holding 40 Tubes 30 x 100 mm50 mL
G1364-84544	Tray Holding 60 Tubes 25 x 100 mm35 mL
G1364-84545	Tray Holding 126 Tubes 16 x 100 mm14 mL
G1364-84536	Tray Holding 215 Tubes 12 x 100 mm7 mL

p/n	Description
G1313-44513	Halftray for 15 x 6 mL vials
G1313-44512	Halftray for 40 x 2 mL vials
G1329-60011	Thermostattable tray for 100 x 2 mL vials
G2258-60011	Tray for 2 plates + 10 x 2 mL vials
G1313-44510	Tray for 100 x 2 mL vials
G1364-84522	Std. tray for 2 well plates + 10 collecting funnels

List of Recommended Test Tubes

Table 15 Round Bottom Test Tubes

outer diameter	height	Volume	recommended tray type	Part Number
30 mm	100 mm	45 ml	G1364-84503 (40 tubes)	5042-6459 (100/pk)
30 mm	48 mm	20 ml	G1364-84503 (40 tubes)	5042-6458 (100/pk)
25 mm	100 mm	35 ml	G1364-84504 (60 tubes)	5042-6470 (100/pk)
16 mm	100 mm	19 ml	G1364-84505 (126 tubes)	5022-6532 (250/pk)
16 mm	48 mm	9 ml	G1364-84505 (126 tubes)	5022-6533 (100/pk)
12 mm	100 mm	11 ml	G1364-84506 (215 tubes)	5022-6431 (250/pk)
12 mm	48 mm	5 ml	G1364-84506 (215 tubes)	5022-6435 (100/pk)

List of Recommended Vials and Caps

Crimp Top Vials

NOTE Caps for Use with the Analytical Scale Fraction Collector, only!

p/n	Description
5181-3375	Crimp Top Vial, 2 mL, clear glass, 100/Pack
5183-4491	Crimp Top Vial, 2 mL, clear glass, 1000/Pack
5182-0543	Crimp Top Vial, 2 mL, clear glass, write-on spot, 100/Pack
5183-4492	Crimp Top Vial, 2 mL, clear glass, write-on spot, 1000/Pack
5183-4494	Crimp Top Vial, 2 mL, clear glass, write-on spot, 100/Pack (silanized)
5181-3376	Crimp Top Vial, 2 mL, amber glass, write-on spot, 100/Pack
5183-4493	Crimp Top Vial, 2 mL, amber glass, write-on spot, 1000/Pack
5183-4495	Crimp Top Vial, 2 mL, amber glass, write-on spot, 100/Pack (silanized)

SnapTop Vials

NOTE Caps for Use with the Analytical Scale Fraction Collector, only!

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

Screw Top Vials

NOTE Caps for Use with the Analytical Scale Fraction Collector, only!

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

Crimp Caps

NOTE Caps for Use with the Analytical Scale Fraction Collector, only!

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

Snap Caps

NOTE Caps for Use with the Analytical Scale Fraction Collector, only!

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

Screw Caps

NOTE Caps for Use with the Analytical Scale Fraction Collector, only!

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

List of Recommended Plates and Closing Mats

Warnings

WARNING

Explosive gas mixtures

There is a risk of explosive gas mixtures in the instrument if flammable solvents are used.

➔ Cover the plates.

➔ Remove the plates from the fraction collector after turning it OFF.

➔ Only use solvents with a flash point higher than 200 °C.

CAUTION

Contamination with adhesives

Closing mats with adhesives can give some contamination in the system. The adhesive is soluble in most of the solvents used in HPLC.

➔ In general do not use closing mats with adhesive. The fraction collector has no prepunch needle, therefore the adhesive will clog the needle after several injections.

Recommended Plates and Closing Mats (Std. Well Plates and Closing Mats for Use with the Analytical Scale Fraction Collector, only!)

p/n	Description
5042-1386	96 well plate 0.5 ml, PP (pack of 10)
5042-1385	96 well plate 0.5 ml, PP (pack of 120)
5042-6454	96DeepAgilent31mm
5065-4402	96CappedAgilent
5188-5321	Glass inserts, 0.35 ml, 1000/Pack
5042-1388	384Agilent
5042-8502	96Agilent conical
G2255-68700	Vial plate for 54 x 2 mL vials (6/pk)
5022-6539	Vial plate for 15 x 6 mL vials (1/pk)
5022-6538	Vial plate for 27 Eppendorf tubes (1/pk)
5042-1389	Closing mat for all 96 Agilent plates

NOTE Only one type of well-plates can be used at a time in one tray.

Fraction Collector Accessory Kits

p/n	Description
G1364-68755	Accessory Kit
0100-1711	Male Nut PK 1/16" x 10-32
0100-1856	3/16 ID Tube Barb Y Ftg PP/OBS
5042-6421	Micro Clamp
5042-6472	Clamp Waste Tube
5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
5181-1519	CAN cable, Agilent module to module, 1 m
8710-2476	HEX-ALLEN-KEY 2.0-MM-A/F
G1313-44512	Halftray for 40 x 2 mL vials
G1313-44513	Halftray for 15 x 6 mL vials
G1329-43200	Adapter air channel

Fraction Collector Thermostat

Item	p/n	Description
1	G1330-69030	FRC thermostat, exchange assembly

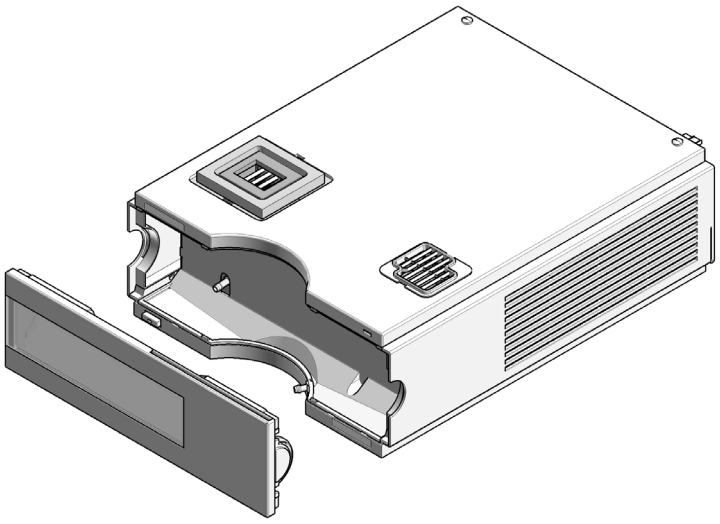


Figure 15 Fraction Collector Thermostat

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)

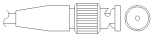
RS-232 cables (not for FUSION board)

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's 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

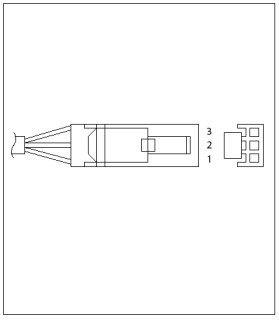
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

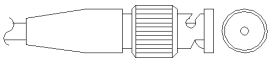


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

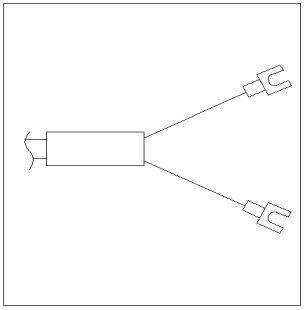
Agilent Module to 35900 A/D converters

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 +

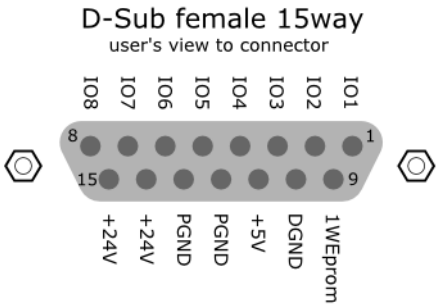
Agilent Module to General Purpose

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	

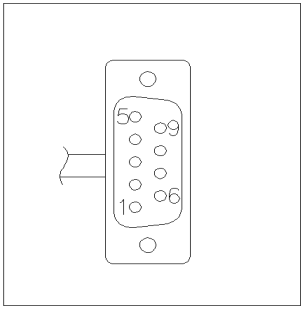
- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

Table 16 5188-8057 ERI to APG and RJ45

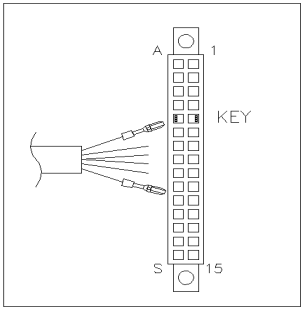
p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trigger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shielding	NC		

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

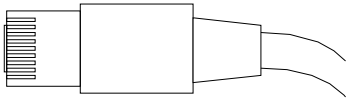
Agilent Module to Agilent 35900 A/D Converters

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's 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.

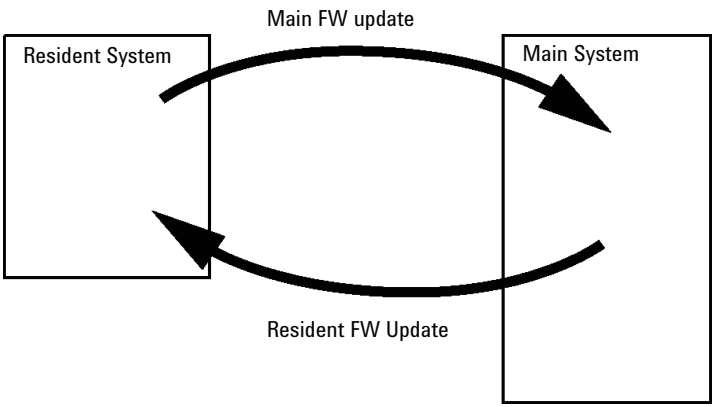


Figure 16 Firmware Update Mechanism

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 are use and the feature set of the original are lost. After re-branding (e.g. from G1314B to G1314C), the original feature set is available again.

All these specific informations are 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.

Rear View of the Module

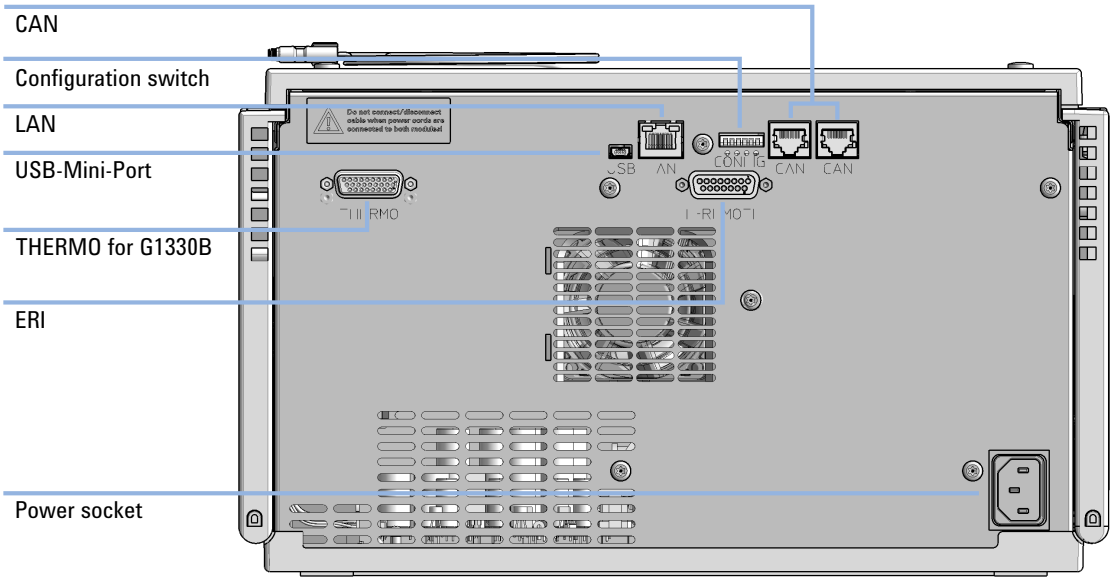


Figure 17 Fraction collector electrical connections

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

Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

Table 17 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 17 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Fraction Collectors							
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 an 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 Flex 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 191.

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 18 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.

THERMOSTAT for G1330B.

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.

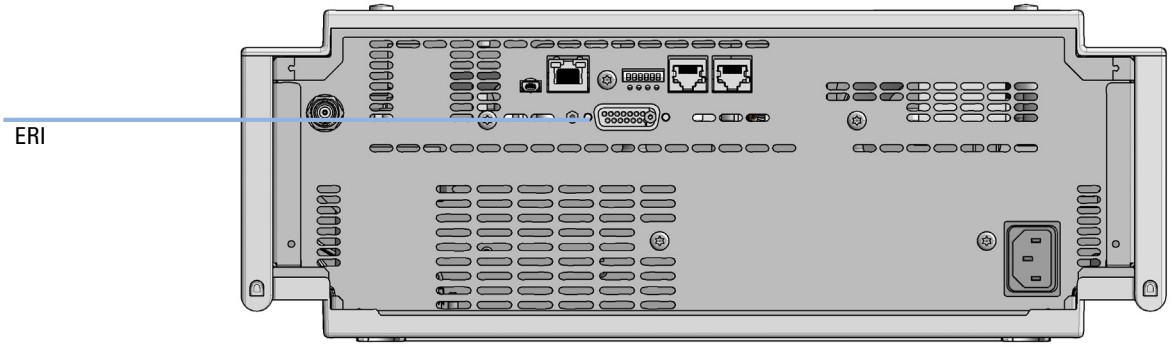
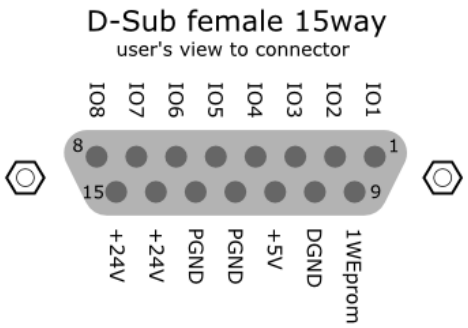


Figure 18 Location of the ERI interface (example shows a G7114A/B VWD)



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.

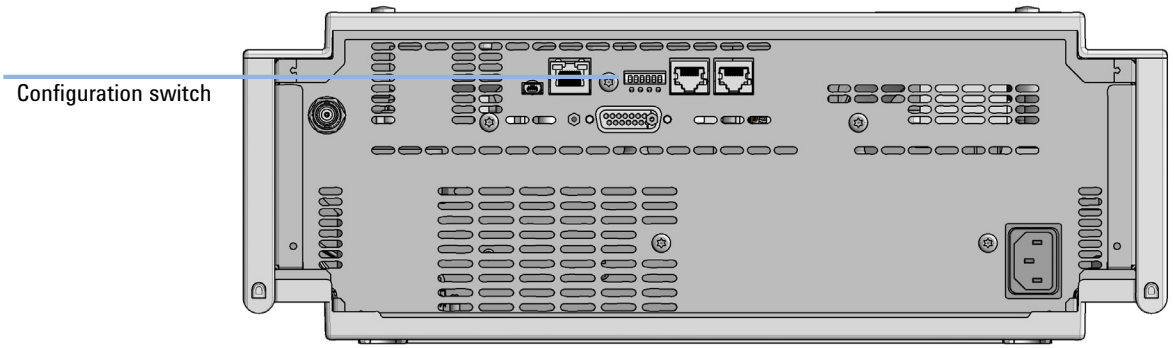


Figure 19 Location of Configuration switch (example shows a G7114A/B VWD)

Table 19 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 20 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 204.

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. Always keep the temperature in the sample compartment at least 25 K below the boiling point of the solvent used.
- ➔ Do not operate the instrument in an explosive atmosphere.
- ➔ Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).
- ➔ Reduce the volume of substances to the minimum required for the analysis.
- ➔ Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.
- ➔ Ground the waste container.
- ➔ Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.
- ➔ To achieve maximal safety, regularly check the tubing for correct installation.

NOTE

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

Safety Symbols

Table 21 Symbols

	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.
	Cooling unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.
	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 21 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 Directive

Abstract

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC), adopted by EU Commission on 13 February 2003, is introducing producer responsibility on all electric and electronic appliances starting with 13 August 2005.

NOTE

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category:

With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a Monitoring and Control Instrumentation product.

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)

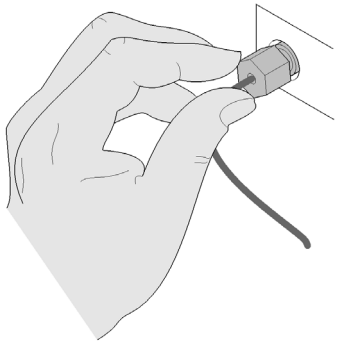
Installation of Stainless Steel Cladded PEEK Capillaries

The 1260 Infinity Bio-inert LC system uses PEEK capillaries that are cladded with stainless steel. These capillaries combine the high pressure stability of steel with the inertness of PEEK. They are used in the high pressure flow path after sample introduction (loop/needle seat capillary) through the thermostatted column compartment/heat exchangers to the column. Such capillaries need to be installed carefully in order to keep them tight without damaging them by over-tightening.

The installation consists of two steps. In the first step, the fitting is installed finger-tight without using tools. Finger-tight means that the fitting will grip and hold the capillary. This brings the fitting to the appropriate start position (marked as 0 ° below) for the second step.

First Step: Finger-tight Fitting

1 Tighten the fitting using your fingers.



Second Step: Installation to Connector

In the second step ("Second Step: Installation to Hard Connectors" on page 210 or "Second Step: Installation to Soft Connectors" on page 211), a wrench is used to rotate the fitting relative to the finger-tight position by a defined angle. For each of the cases mentioned above, there is a recommended range in which the fitting is tight.

Staying below this range could create a leak, either a visible one or a micro-leak, potentially biasing measurement results. Exceeding the recommended range could damage the capillary.

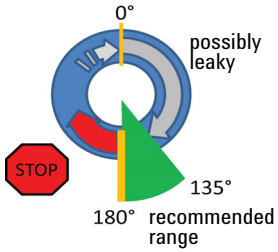
Alternatively, a torque wrench may be used. The target torque for all connections is about 0.7 Nm. When using a torque wrench, read instructions for that tool carefully, as wrong handling may easily miss the correct torque.

Second Step: Installation to Hard Connectors

Use this procedure for hard connectors made from metal (titanium) or ceramics. In the system, these are connections to and from the analytical head of the autosampler (connections to injection valve and needle), and to a metal column.

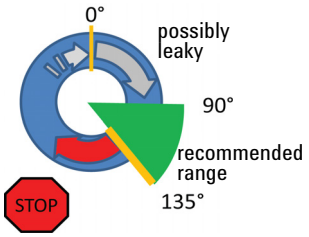
First installation of a capillary to a hard connector

1 When tightening a fitting for the first time, start from the finger-tight position (which is not necessarily a vertical wrench position) and rotate the wrench by 135 – 180 °. Staying below 135 ° (grey arrow) will be insufficiently tight, more than 180 ° (red arrow) could damage the capillary.



Second and subsequent installations of a capillary to a hard connector

1 When tightening the fitting for the second and subsequent times, again start from the finger-tight position (which is not necessarily a vertical wrench position) and rotate the wrench by 90 – 135 °. Staying below 90 ° (grey arrow) could be insufficiently tight, more than 135 ° (red arrow) could damage the capillary.



Second Step: Installation to Soft Connectors

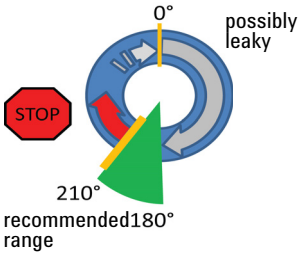
Use this procedure for soft connectors, which are typically made from PEEK. These are the following connections:

- to and from all bio-inert valves (injection valve in the autosampler and valves in the thermostatted column compartment and 1290 Infinity Valve Drive),
- bio-inert ZDV unions (detector flow cells, multi-draw upgrade kit, capillary to capillary connections, for example, for heat exchangers),
- to the autosampler needle and
- to PEEK columns (like many bio-inert columns).

For the installation of bio-inert ZDV unions, refert to the Technical Note *"Installation of stainless steel cladded PEEK capillaries" (p/n G5611-90120).*

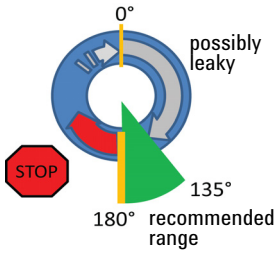
First installation of a capillary to a soft connector

1 When tightening a fitting for the first time, start from the finger-tight position (which does not necessarily need to be a vertical wrench position) and rotate the wrench by 180 – 210 °. Staying below 180 ° (grey arrow) will not be sufficiently tight, more than 210 ° (red arrow) could damage the capillary.



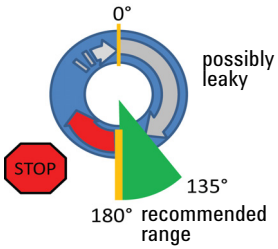
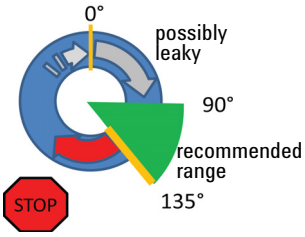
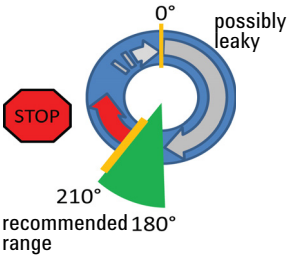
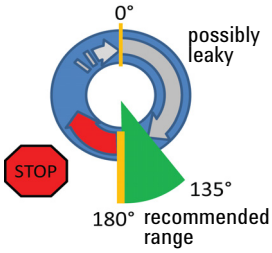
Second and subsequent installations of a capillary to a soft connector

1 When tightening the fitting for the second and subsequent times, again start from the finger-tight position (which is not necessarily a vertical wrench position) and rotate the wrench by 135 – 180 °. Staying below 135 ° (grey arrow) could be insufficiently tight enough, more than 180 ° (red arrow) could damage the capillary.



Summary for Second Step

Table 22 Summary for second step

2nd Step	First installation	Subsequent installations
Hard connectors		
Soft connectors		

Removing Capillaries

CAUTION

Potential damage of capillaries

➔ Do not remove fittings from used capillaries.

To keep the flow path free of stainless steel, the front end of the capillary is made of PEEK. Under high pressure, or when in contact with some solvents, PEEK can expand to the shape of the connector where the capillary is installed. If the capillary is removed, this may become visible as a small step. In such cases, do not try to pull the fitting from the capillary, as this can destroy the front part of the capillary. Instead, carefully pull it to the rear. During installation of the capillary, the fitting will end up in the correct position.

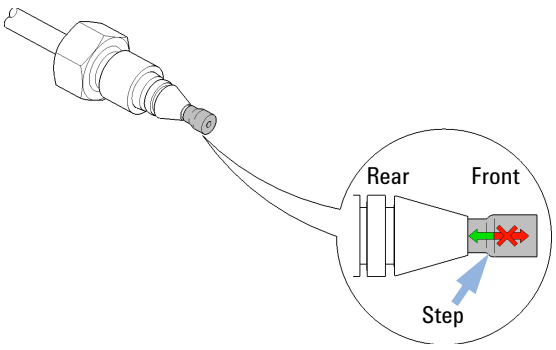


Figure 20 Capillary fitting

Agilent Technologies on Internet

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http://www.agilent.com

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www.agilent.com

In This Book

This manual contains technical reference information about the Agilent InfinityLab LC Series 1260 Infinity II Analytical Fraction Collector (G1364F) and 1260 Infinity II Bio-inert Fraction Collector (G5664B). The manual describes the following:

- introduction,
- requirements and specifications,
- installation,
- using the fraction collector,
- preparing,
- troubleshooting and diagnostics,
- errors,
- maintenance,
- parts and materials,
- cables,
- hardware information,
- safety and related information.

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