# Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector

## User Manual

# Notices

## Manual Part Number

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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 the Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector.

## 1 Introduction to the Valve-Based Fraction Collector

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

## 2 Site Requirements and Specifications

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

## 3 Installing the Preparative Valve-based Fraction Collector

This chapter gives information about the installation of the module.

## 4 Using the Preparative Valve-Based Fraction Collector

This chapter explains the essential operational parameters of the module.

## 5 Preparing the Preparative Valve-Based Fraction Collector

This chapter explains the operational parameters of the module.

## 6 Troubleshooting and Diagnostics

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

## 7 Error Information

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

## 8 Maintenance

This chapter gives you an overview and instructions about the possible maintenance and repair procedures that can be performed by the user.

## 9 Parts and Materials

This chapter provides information on parts and materials.

## 10 Identifying Cables

This chapter provides information on cables used with the module.

## 11 Hardware Information

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

## 12 Appendix

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

# Contents

# 1 Introduction to the Valve-Based Fraction Collector



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

# Product Description

The Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector (G7166A) comprises 11 collection valves, one waste valve and one solvent inlet port. Solvent coming from a preparative HPLC system can be diverted into 11 different fractions depending on the software/firmware settings. The valves can then be blown clean by allowing compressed air or nitrogen to be passed through the same valves.

To increase your productivity you can cluster up to three fraction collectors in a single LC system. In addition you can use the module for a recovery solution. Recover anything from the sample that was not triggered as a fraction in the first purification run. But it is also a safety feature to recover, for example, the target compound if the purification system did not collect fractions as expected.

No fraction racks are required, as collection takes place into larger collection bottles that can be placed anywhere within reach of the tubing outlets. The Preparative Valve-Based Fraction Collector can be used in addition to a fraction collector.

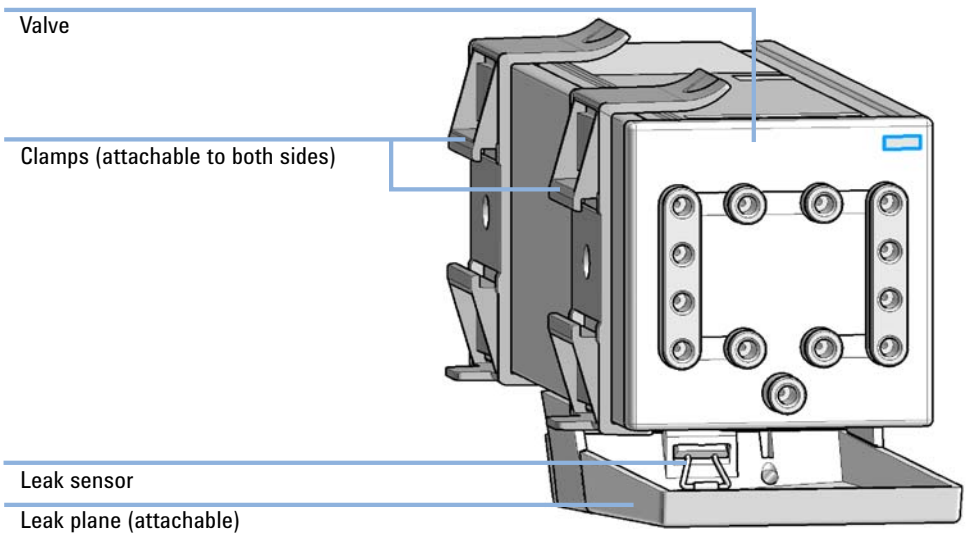



**Figure 1 Overview of front**

# Features

The 1260 Infinity II Preparative Valve-Based Fraction Collector (G7166A) includes the following features:

- Built-in power supply
- Leak handling with a leak plane and a leak sensor underneath the valve head
- Flexible mounting bracket, for left- or right-side mounting on LC stacks or at the Agilent Column Organizer (G1383A)
- Automated delay volume calibration

# Typical Applications

The Preparative Valve-based Fraction Collector allows the user to collect large fractions from a preparative HPLC run, at high flow rates, while minimizing carry-over, due to compressed air (or nitrogen) blowing clean the fraction lines.

The valve's wetted parts include PEEK and FFKM, which allow for a pH range of 2 – 13, short term 14[1,2].

[1] For solvent compatibility, refer to section "Solvent information for parts of the 1260 Infinity Bio-inert LC system" in the Bio-inert system manual.

[2] Solvents with a pH of 1, in particular any halogenated acids, can only be used for the cleaning of each of the ports.

# Mounting Examples

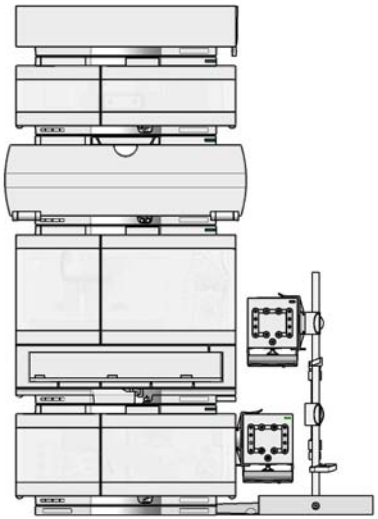


Figure 2 Mounting Examples for the Preparative Valve-based Fraction Collector

# 2 Site Requirements and Specifications



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

# Site Requirements

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

## Power Considerations

The module power supply has wide ranging capability. It accepts any line voltage in the range described in Table 1 on page 17. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

**WARNING**

**Hazard of electrical shock or damage of your instrumentation**

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

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

**WARNING**

**Electrical shock hazard**

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

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

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

**WARNING**

**Inaccessible power plug.**

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

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

## Power Cords

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

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

**WARNING**

**Unintended use of power cords**

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

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

**WARNING**

**Absence of ground connection**

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

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

**WARNING**

**Electrical shock hazard**

**Solvents may damage electrical cables.**

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

## Bench Space

The module dimensions and weight (see Table 1 on page 17) 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 1 Physical Specifications**

| Type | Specification | Comments |
|---|---|---|
| Weight | 1.9 kg (4.2 lbs) | |
| Dimensions (height × width × depth) | 95 x 95 × 300 mm (3.7 x 3.7 × 11.8 inches) | |
| Line voltage | 100 – 240 V~, ± 10 % | Wide-ranging capability |
| Line frequency | 50 or 60 Hz, ± 5 % | |
| Power consumption | 23 VA / 7 W | |
| Ambient operating temperature | 4 – 40 °C (39 – 104 °F) | |
| Ambient non-operating temperature | -40 – 70 °C (-40 – 158 °F) | |
| Humidity | <80 % r.h. at 4 – 31 °C, decreasing to 50 % r.h. at 40 °C | Non-condensing |
| Operating altitude | Up to 3000 m (9842 ft) | |
| Non-operating altitude | Up to 4600 m (15092 ft) | For storing the module |
| Safety standards: IEC, EN, CSA, UL | Installation category II, Pollution degree 2 | For indoor use only. |
| ISM Classification | ISM Group 1 Class B | According to CISPR 11 |
| Permitted solvents | Auto-ignition temperature ≥200 °C<br>Boiling point ≥56 °C<br>Ignition Class IIA, IIB (IEC60079-20-1) | |

# Performance Specifications

**Table 2 Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector (G7166A) Performance Specifications**

| Type | Specification | Comment |
|---|---|---|
| Number of solvent channels | 13 (including inlet and waste) | |
| Fittings | ¼-28 | |
| External leak sensor | YES, same function as internal sensor | |
| Solvent Flow Range | 0 – 200 mL/min per channel | |
| Operating pressure (gas and solvent) | 2 bar (29 psi) per channel | |
| Maximum pressure (gas and solvent) | 2.5 bar (36 psi) per channel | |
| Gas specification | Dry filtered compressed air or nitrogen | |
| Gas flow range | 0.9 – 3.25 SLM (controlled gas shut-off) | |
| Maximum inlet gas pressure | 7 bar (101 psi) | |
| Internal volume per channel | 200 µL per channel | |
| Fuse | 2.0 A / 250 V High breaking capacity fuse, exchangeable | |
| Materials in contact with solvent | PEEK, FFKM | |
| pH range | 2 – 13, short term 14[1,2] | |
| Instrument Control | LC & CE Drivers A.02.17 or above<br>Instrument Control Framework (ICF) A.02.04 or above<br>Lab Advisor B.02.10 or above | LC & CE Drivers A.02.19 or above is required for clustering |
| Communications | CAN (2 x) | G7166A is a hosted module.<br>The LC stack needs to contain a LAN interface for communication and control. |

**Table 2 Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector (G7166A) Performance Specifications**

| Type | Specification | Comment |
|---|---|---|
| Maintenance and safety-related features | Extensive diagnostics, error detection and display with Agilent Lab Advisor software<br>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.<br>Electronic records of maintenance and errors | |
| Housing | All materials recyclable. | |

[1] For solvent compatibility, refer to section "Solvent information for parts of the 1260 Infinity Bio-inert LC system" in the Bio-inert system manual.

[2] Solvents with a pH of 1, in particular any halogenated acids, can only be used for the cleaning of each of the ports

# 3 Installing the Preparative Valve-based Fraction Collector



This chapter gives information about the installation of the module.

# Unpacking the module

## Damaged Packaging

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

**CAUTION**

**"Defective on arrival" problems**

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

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

# Delivery Checklist

Ensure all parts and materials have been delivered with your module. The delivery checklist is shown below. For parts identification please check the illustrated parts breakdown in Parts and Materials. Please report any missing or damaged parts to your local Agilent Technologies sales and service office.

**Table 3 Delivery Checklist**

| Description | Quantity |
|---|---|
| 1260 Infinity II Preparative Valve-Based Fraction Collector | 1 |
| Valve rail assembly for G7159B (5067-4634) | Optional |
| Rail assy for column organizer (5067-1510) | Optional |
| Delay Calibrant and Checkout Mix for LC (5190-8223) | Optional |
| User Documentation (G9300-64500) | 1 |
| Power cable | 1 |
| LAN Interface Card (G1369-60012) | Optional (required if no proper hosting module is available, see Table 14 on page 102) |
| Accessory Kit (G9352-68100) | 1 |

# Accessory Kit

The 1260 Infinity II Preparative Valve-Based Fraction Collector is shipped with Accessory Kit (G9352-68100) (see "Accessory Kit" on page 86).

# Installing the Preparative Valve-Based Fraction Collector

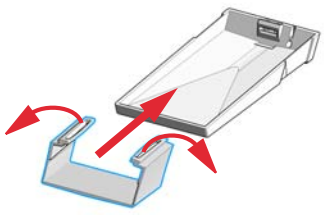
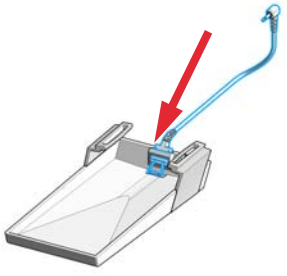
The Preparative Valve-Based Fraction Collector can be installed in different ways. It can be attached to either side of your Instrument with the use of the Valve Rail (InfinityLab LC Series, 1260, 1290 Series Pumps and Detectors, for older modules order new cover kits), or it can be mounted to a G1383A column organizer by using the optional column stand mount.

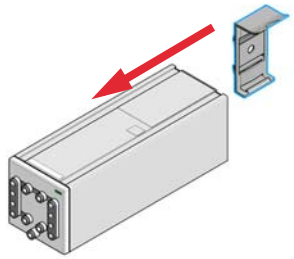
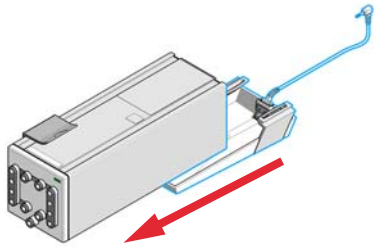
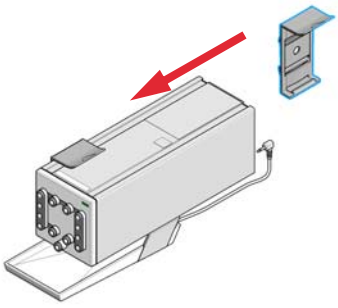
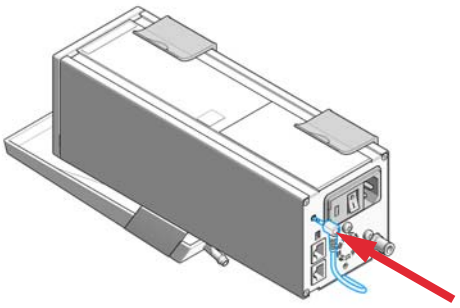
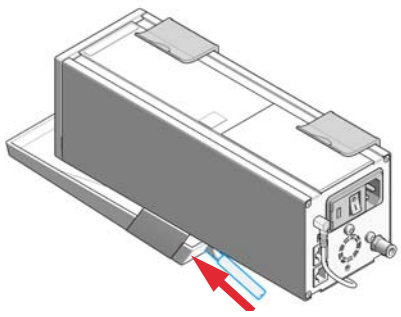
## Assembling and Installing the Leak Tray and Leak Sensor

**NOTE**

Only connect or disconnect the leak sensor while the valve drive is powered off.

The Preparative Valve-Based Fraction Collector must be 'powered off' for at least 10 s to recognize any hardware changes correctly.

| | |
|---|---|
| **1** Attach the leak tray clamp to the leak tray.  | **2** Push the leak sensor into its holder on the leak tray.  |

| | |
|---|---|
| **3** Slide the first clamp on to one side of the Preparative Valve-Based Fraction Collector housing.<br>  | **4** Slide the leak tray onto the bottom of the Preparative Valve-Based Fraction Collector.<br>  |
| **5** Slide the second clamp on to the same side as the first one.<br>  | **6** Connect the leak sensor cable to the Preparative Valve-Based Fraction Collector.<br>  |
| **7** Attach the waste tubing to the leak plane and guide it to a proper waste container.<br>  | **8** Route the leak tubing to a suitable waste container. |

# Mount the Preparative Valve-Based Fraction Collector to an Instrument by Using a Valve Rail

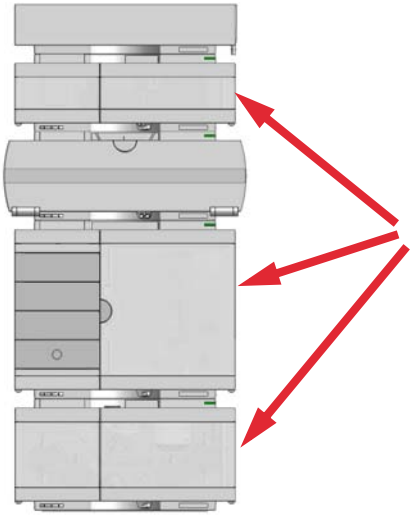


**Figure 3** **Possible mounting points to an Agilent InfinityLab LC Series module**

**Parts required**

| p/n | Description |
|---|---|
| 5067-5685 | Clamp Guide Kit-IF-II |

**Preparations**

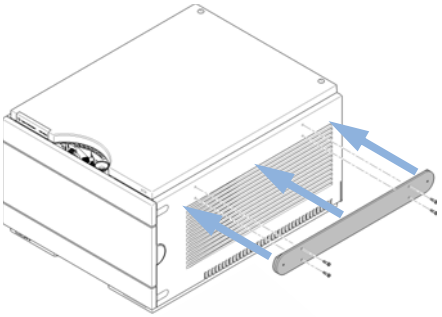
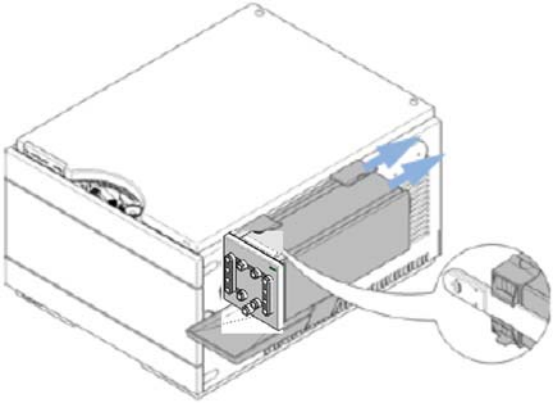
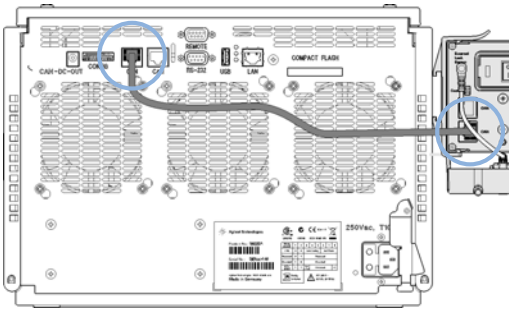
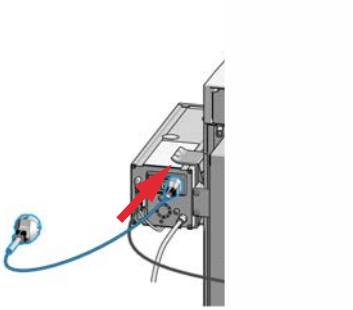
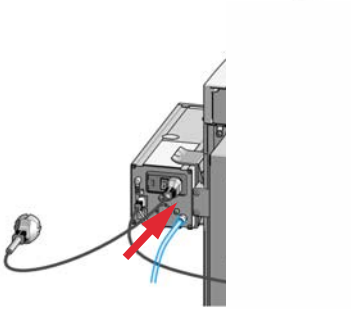
For correct leak and waste installation, see "Assembling and Installing the Leak Tray and Leak Sensor" on page 23.

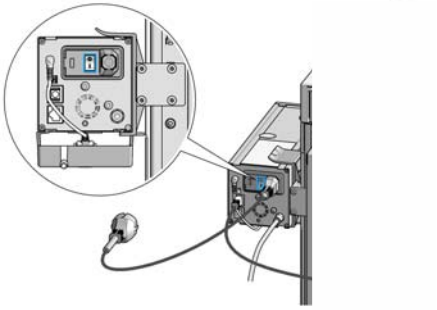
**CAUTION**

**"Defective on arrival" problems**

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

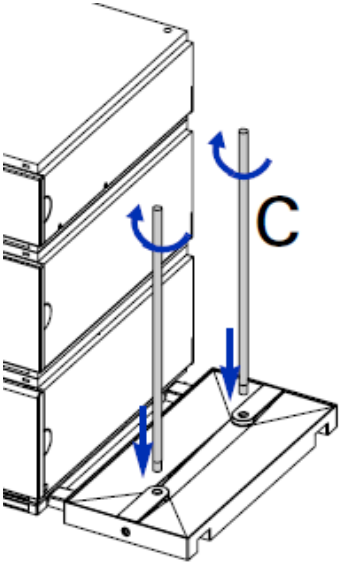
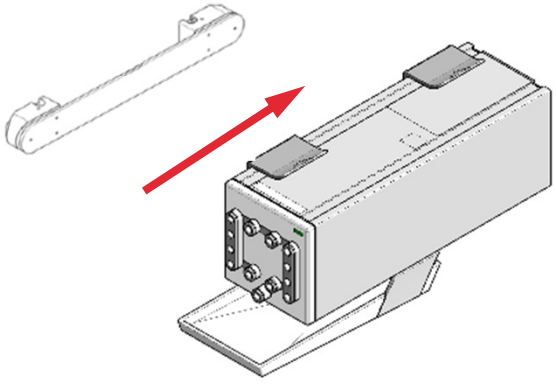
- ✓ **Notify your Agilent sales and service office about the damage.**
- ✓ **An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.**

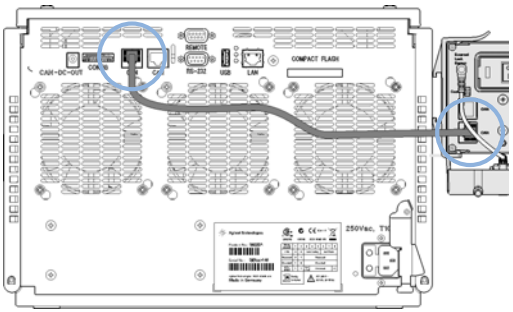
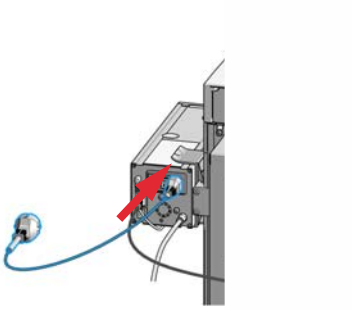
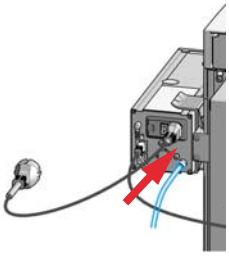
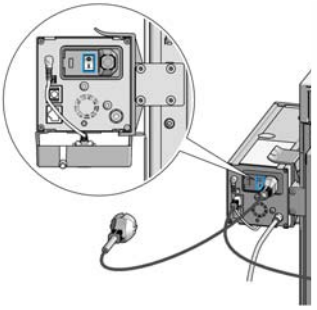
| | |
|---|---|
| **1** Ensure the power switch at the rear of the module is OFF and the power connector is unplugged. | **2** Identify the marks for the screws on the side panel of the cabinet assy and screw the valve rail to the side panel of the cabinet.<br>  |
| **3** Slide the Preparative Valve-Based Fraction Collector onto the rail.<br>  | **4** Connect the CAN interface connection.<br>  |
| **5** Connect the power cable to the power connector at the rear of the module.<br>  | **6** Connect compressed air or nitrogen line.<br>  |

| | |
|---|---|
| **7** Power on the module by switching the Power button at the rear of the module.<br>  | |

# Mount the Preparative Valve-Based Fraction Collector to a G1383A Column Organizer

**NOTE** For more information about the column organizer read the G1383-90011 Column Organizer Quick Reference Guide.

| | |
|---|---|
| **1** Ensure the power switch at the rear of the module is OFF and the power connector is unplugged. | **2** Assemble the column stand with a system.<br>  |
| **3** Slide the Preparative Valve-Based Fraction Collector onto the column stand mount.<br>  | **4** Slide the column stand mount onto the column stand. |

| | |
|---|---|
| **5** Connect the CAN interface connection.<br>  | **6** Connect the power cable to the power connector at the rear of the module.<br>  |
| **7** Connect compressed air or nitrogen line.<br>  | **8** Power on the module by switching the Power button at the rear of the module.<br>  |

# Flow connections with the Preparative Valve-Based Fraction Collector

**CAUTION**

**Pollution of sensitive parts**

**Inaccurate selection of valve ports and bias of collection results.**

✓ **Keep the fraction lines installed to all ports, this protects the valves internals.**

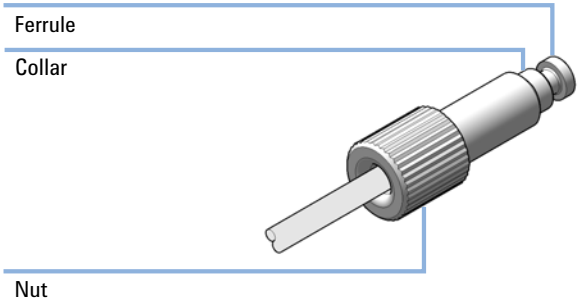
**CAUTION**

**Using a low pressure valve on the high pressure side**

**Valve damage**

✓ **When installing the Preparative Valve-Based Fraction Collector, make sure that the flow inlet is connected to the detector outlet, using correct tubing and fittings.**

1 Place the nut and then the ferrule on the tubing.




2 For each of the tubes for the valves, place the loosely assembled fittings into the valve ports and make sure the tubing is bottomed out inside the port.

**NOTE**

Ensure the appropriate fittings are used and insert the tubing fully into the correct components before tightening the fittings.

3 Tighten the nut finger-tight.

4 Guide the tubing that is connected to ports 1-11, to 11 different collection bottles that are of sufficient size to handle the planned fraction sizes.

5 Guide the tubing that is connected to port W, to a waste bottle that is of sufficient size to handle the planned flow rates.

6 Connect the line coming from the detector, to port IN on the Preparative Valve-Based Fraction Collector.

# 4 Using the Preparative Valve-Based Fraction Collector



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 Preparative Valve-Based Fraction Collector is ready to be operated, the fraction delay time needs to be determined. Figure 4 on page 33 shows a schematic drawing of the flow path between the detector and the Preparative Valve-Based Fraction Collector with the delay volume $V_{D1}$. For peak-based fraction collection the system delay times $t_{D1}$ can be calculated by dividing the delay volume by the flow rate v.

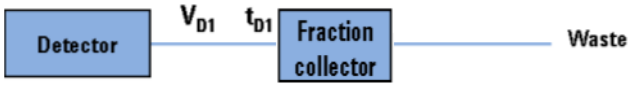



**Figure 4 Delay volumes and delay times**

Delay volume $V_{D1}$, which is specified in the Preparative Valve-Based Fraction Collector Configuration window, is determined using the Delay Volume Calibration feature of the LAB Advisor software.

When a peak is detected during a purification run (see Figure 5 on page 33) the Preparative Valve-Based Fraction Collector is triggered using the following delay time calculations:

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

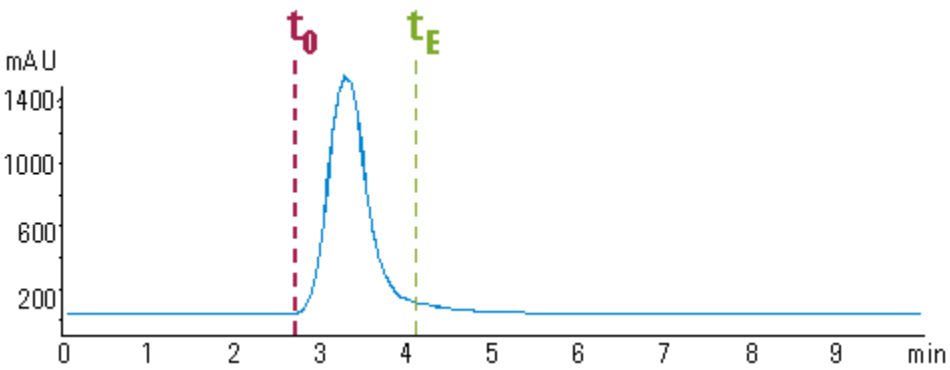



**Figure 5 Chromatogram from a UV-detector with peak starting at $t_0$ and ending at $t_E$**

### Performing a Delay Calibration with an UV Detector

1. Place a vial containing the Delay Sensor Calibrant (5190-8223) 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 Preparative Valve-Based 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 Preparative Valve-Based Fraction Collector is triggered.

**NOTE**

After a line is filled, either by purging or by fraction collection, the air channel is opened automatically. If compressed air or nitrogen is connected each line is air-flushed for a user-specified duration, which is set from the online user interface. (recommend minimum of 3 seconds). If no compressed air or nitrogen is connected, the air-valve is still opened (recommend minimum of 5 seconds) to allow the solvent lines to be emptied by gravity. If you use slightly longer lines into your fraction vessels, you will need to increase your air-flush time.

# Solvent Information

Observe the following recommendations on the use of solvents.

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

## Solvent compatibility for stainless steel in standard LC systems

Stainless steel is inert to 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, the 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 such as nitric acid, sulfuric acid, and organic solvents, especially at higher temperatures (if your chromatography method allows, replace by phosphoric acid or phosphate buffer which are less corrosive to stainless steel).
- Halogenated solvents or mixtures that 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.

## 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 with many organic solvents used in chromatographic systems like methanol, acetonitrile and isopropanol. It has limited stability with aliphatic, aromatic and halogenated hydrocarbons, THF, phenol and derivatives, concentrated acids and bases. For normal phase applications, the maximum pressure should be limited to 200 bar.

### Tantalum (Ta)

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

### Stainless Steel (ST)

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

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

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

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, diisopropylether). Such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1 % solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

### Titanium (Ti)

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

### Diamond-Like Carbon (DLC)

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

### Fused silica and Quartz ($SiO_2$)

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

### Gold

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

### Zirconium Oxide ($ZrO_2$)

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

### Platinum/Iridium

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

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

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

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

not to let dry out the chamber. For optimizing the life of the pressure sensor, do not leave HFIP in the chamber when the unit is off.

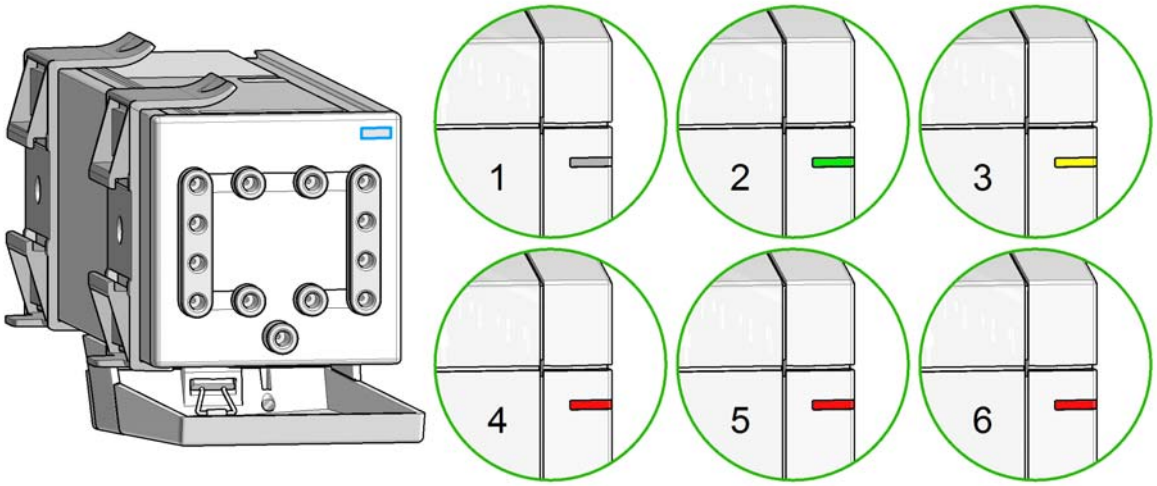
The tubing of the leak sensor is made of PVDF (polyvinylidene fluoride), which is incompatible with the solvent DMF (dimethyl formamide).

### Sapphire, Ruby and $Al_2O_3$-based ceramics

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

# 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.

# 5 Preparing the Preparative Valve-Based Fraction Collector



This chapter explains the operational parameters of the module.

# Leak and Waste Concept

The leak concept of the Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector is designed to deal with leaks of solvents specified up to a maximum flow rate of 200 mL/min.

In addition to this manual it is important to follow the instructions for the installation of the *Leak and Waste Handling* procedure in the *System Installation Guide*, to ensure a reliable leak transfer to the waste bottle.

Leaks outside the valve cannot be controlled completely by the valve leak concept. The Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector has a leak tray and a leak sensor to support the leak handling around the valves. However the operator is responsible for the overall leak concept.

# Best Practices

## Weekly Tasks

- Flush all channels with water to remove salt deposits, using an intermediate solvent when needed.
- Wipe the outside clean with a moist rag.

## How to deal with solvents

- Use clean bottles only.
- Exchange water-based solvents daily.
- Select solvent volume to be used up within 1 – 2 days.
- Use only HPLC-grade solvents and water filtered through 0.2 µm filters.
- Label bottles correctly with bottle content, and filling date / expiry date.
- Use solvent inlet filters.
- Reduce risk of algae growth: use brown bottles for aqueous solvents, avoid direct sunlight.

# Setting up the Preparative Valve-Based 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 Valve> Configuration** from the Instrument menu or right-click on the Preparative Valve-Based Fraction Collector icon in the graphical user interface.

## Instrument Configuration

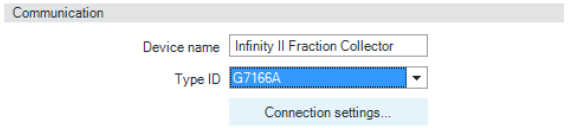
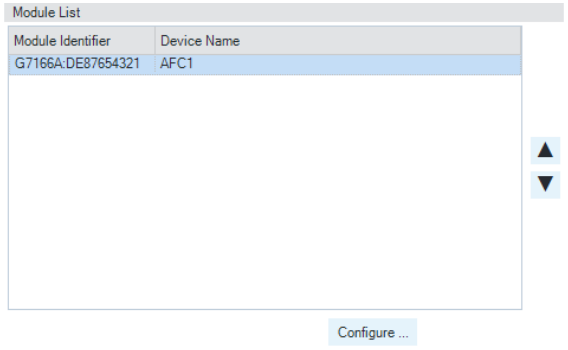
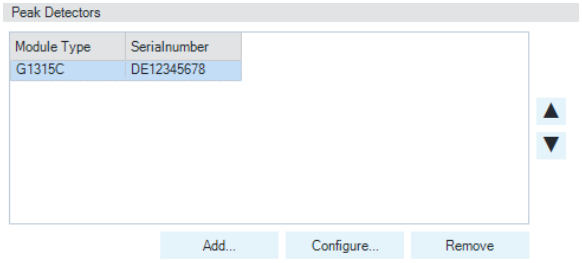
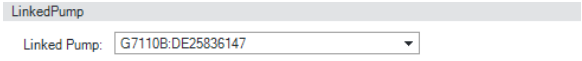
Use the **Instrument Configuration** dialog box to examine and, if necessary, modify your instrument configuration. The **Configurable Modules** panel contains a list of all modules available for configuration. The **Selected Modules** panel contains the list of configured modules.

**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 Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector configuration parameters are in four sections:

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

**Table 4 Instrument configuration parameters**

| Parameter | Description |
|---|---|
|  | **Communication**: The parameters in this dialog box are detected automatically during autoconfiguration.<br>• **Device name**,<br>• **Type ID**,<br>• Button: **Connection settings** |
|  | **Module List**<br>• **Module identifier (Type ID: Serial number)**,<br>• **Device name**,<br>• Button: **Configure** (**Device name, Serial number, Firmware revision**) |
|  | **Peak Detectors**<br>• **Module type**:<br>product number of the peak detector detected during autoconfiguration<br>• **Serial number**:<br>serial number of the peak detector detected during autoconfiguration<br>• **Digital trigger: MSD Installed**,<br>• Buttons: **Add**, **Configure** (**Peak detector**), **Remove**<br>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**<br>• If your system is configured with only one Agilent pump, the pump is detected automatically during autoconfiguration and identified as the linked pump.<br>• 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. |

# Additional Instrument Configuration Settings

**Table 5 Additional Instrument Configuration Settings**

| | |
|---|---|
| **Reset Fraction Collector** | Re-initializes the fraction collector. |
| **Modify – Detector Delay Volumes...** | Opens a window with a table that lists all potential analog peak detection sources configured in your instrument. To modify the delay volume, enter the new delay volume (in µL) in the Delay Volume (µL) field of the appropriate peak detector. The changes in delay volumes are registered when you leave the dialog box with "OK". |
| **Modify – Linked Pump...** | Select the pump that delivers the main flow. Choices include all pumps that can be used as linked pump. Choose None if the pump that delivers the main flow does not support linking. |
| **Modify – Modify Flush with Air Duration...** | Enter the duration of the flush with air in the Flush Time field. |
| **Start Flush with Air** | Toggles the air flushing on. |
| **Stop Flush with Air** | Toggles the air flushing off. |
| **Start Purge...** | Opens a window that allows you to start a purge for a certain time, for selected channels. |
| **Stop Purge** | Stops a currently running purge. |
| **Reset Fraction Volumes** | Informs the Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector that the collection bottles and waste bottle are all empty. |

**NOTE**

After a line is filled, either by purging or by fraction collection, the air channel is opened automatically. If compressed air or nitrogen is connected each line is air-flushed for a user-specified duration, which is set from the online user interface. (recommend minimum of 3 seconds). If no compressed air or nitrogen is connected, the air-valve is still opened (recommend minimum of 5 seconds) to allow the solvent lines to be emptied by gravity. If you use slightly longer lines into your fraction vessels, you will need to increase your air-flush time.

# Preparative Valve-Based Fraction Collector User Interface (Dashboard Panel)

**Table 6 Preparative Valve-Based Fraction Collector User Interface**

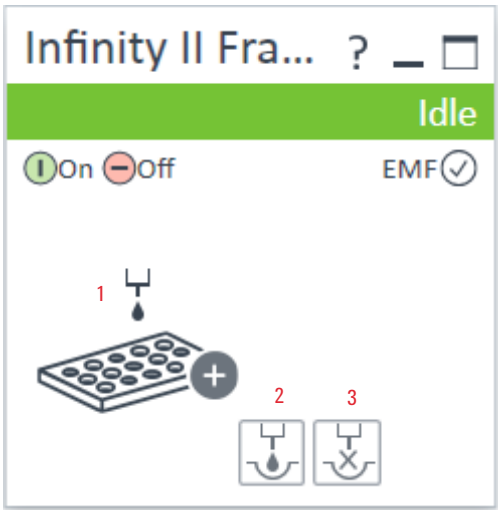
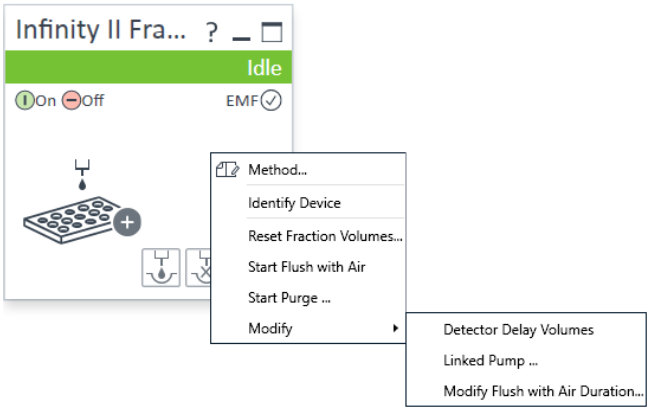
| Parameter | Description |
|---|---|
|  | *Module graphic*<br>The items in the Preparative Valve-Based Fraction Collector graphic have the following meaning and function:<br>• 1: Denotes collection to a fraction location. The current collection location is shown to the right of the graphic. The tooltip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

**Table 6 Preparative Valve-Based Fraction Collector User Interface**

| Parameter | Description |
|---|---|
|  | *Context Menu*<br><br>The context menu of the dashboard panel contains the following commands:<br>• **Method**:<br><br>Displays the Preparative Valve-Based Fraction Collector's Method Setup dialog box.<br>• **Identify Device**:<br><br>Causes the LED on the front of the module to blink for a few seconds.<br>• **Reset Fraction Volumes**:<br><br>Informs the Preparative Valve-Based Fraction Collector that the collection bottles and waste bottle are all empty.<br>• **Start Flush with Air**:<br><br>Toggles the air flushing, on or off.<br>• **Start Purge**:<br><br>Opens a window that allows you to start a purge for a certain time, for selected channels.<br>• **Modify** > **Detector Delay Volumes**:<br><br>The table lists all potential analog peak detection sources configured in your instrument. To modify the delay volume, enter the new delay volume (in µL) in the **Delay Volume (µL)** field of the appropriate peak detector. The changes in delay volumes are registered when you leave the dialog box with **OK**.<br>• **Modify** > **Linked Pump**:<br><br>Click the down-arrow and select the pump that delivers the main flow from the drop-down list. The list includes all pumps that can be used as linked pump. Choose **None** if the pump that delivers the main flow does not support linking.<br>• **Modify** > **Modify Flush with Air Duration**:<br><br>Enter the duration of the flush with air in the **Flush Time** field. |

# Method Parameter Settings

The Preparative Valve-Based Fraction Collector method setup parameters are in eight sections:

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

**Table 7 Method Parameter Settings**

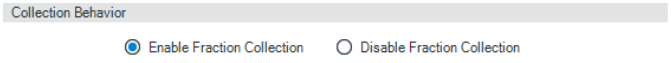
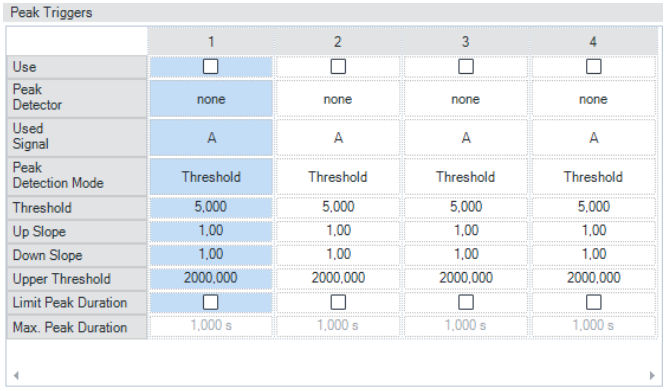
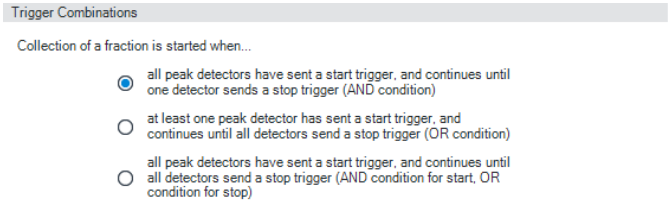
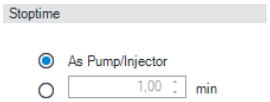
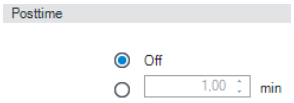
| Parameter | Description |
|---|---|
|  | **Collection Behavior**<br>Use this setting to either enable or disable the fraction collection parameters of the instrument. |
|  | **Peak Triggers**<br>Use the Peak Triggers table to specify the detection settings of the peak detectors available in your system.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

**Table 7 Method Parameter Settings**

| Parameter | Description |
|---|---|
|  | **Trigger Combinations**<br>Use the **Trigger Combinations** to specify how multiple peak triggers are combined to start or stop Fraction Collection.<br>You can choose that:<br>• 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)<br>• 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)<br>• 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**<br>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.<br>Limits: 0.01 – 99999.00 min or **As Pump/Injector** |
|  | **Posttime**<br>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.<br>Limits: 0.01 – 99999.00 min or **Off** (0.0 min) |
| **Advanced** | See "Advanced Settings" on page 53 |
| **Timetable** | See "Timetable Settings" on page 55 |
| **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

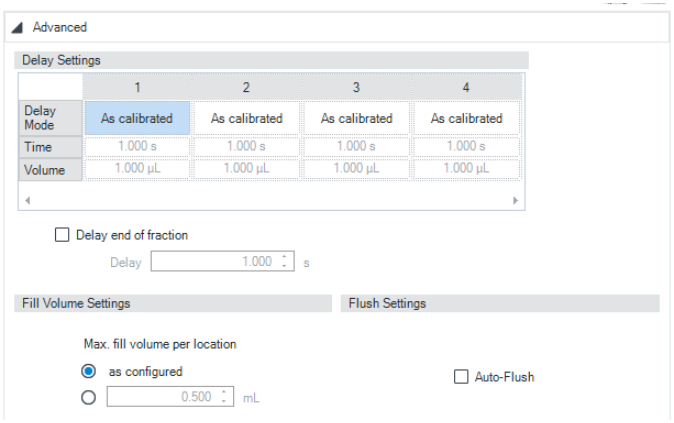
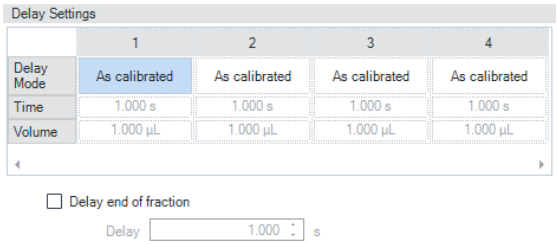
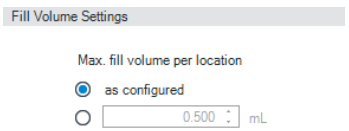
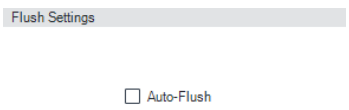



**Figure 6 Advanced settings**

The Preparative Valve-Based Fraction Collector method setup advanced parameters are in four sections, depending on the configuration:

- **Delay Settings**
- **Fill Volume Settings**
- **Flush Settings**
- **3rd Party Pump Flow**

**Table 8 Advanced Parameters Description**

| Parameter | Description |
|---|---|
|  | **Delay Settings**<br>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:<br>• **Off** (No delay is applied to fraction collection and collection starts as soon as the trigger conditions are met)<br>• **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)<br>• **Use Time** (Enables the **Time** field to allow you to set a delay time)<br>• **Use Volume** (Enables the **Volume** field to allow you to set a delay volume)<br>**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**<br>Use the **Fill Volume Settings** to specify the **Maximum fill volume** used in your method. |
|  | **Flush Settings**<br>Mark the **Auto-Flush** check box to automatically flush all of the instrument's ports with pressurized air between fractions. |
| **3rd Party Pump Flow** | If your Fraction Collector is not connected to a Linked Pump, specify a Pump Flow for the Fraction Collection method.<br>This option is not visible if the system contains an Agilent pump. |

# Timetable Settings

NOTE

A timetable entry is crucial to enable any fraction collection.

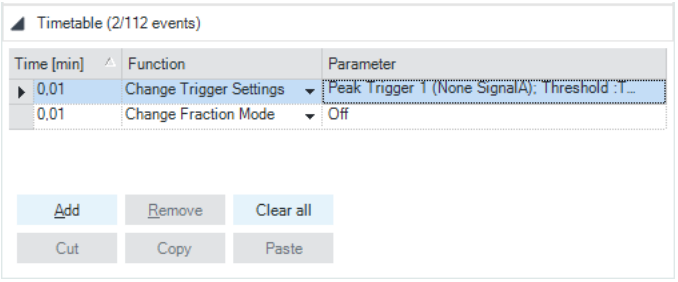



**Figure 7 Timetable settings**

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 9 Timetable Functions**

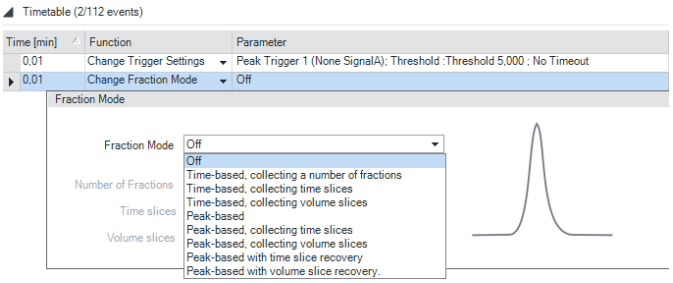
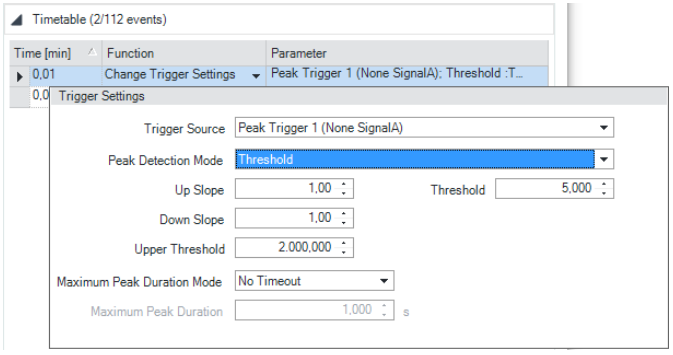
| Function | Parameters |
|---|---|
|  | **Fraction Mode**<br>• **Off** (Turns off the current fraction collection, where you use Off to turn off fraction collection at the end of the run if you have not specified a **Stoptime**)<br>• **Time-based, collecting a number of fractions** (Fractions are collected 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)<br>• **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)<br>• **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)<br>• **Peak-based** (Fractions are collected based on the peak detection settings)<br>• **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)<br>• **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)<br>• **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)<br>• **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 9 Timetable Functions**

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

# 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 (Figure 8 on page 58) in the Peak Detectors section.

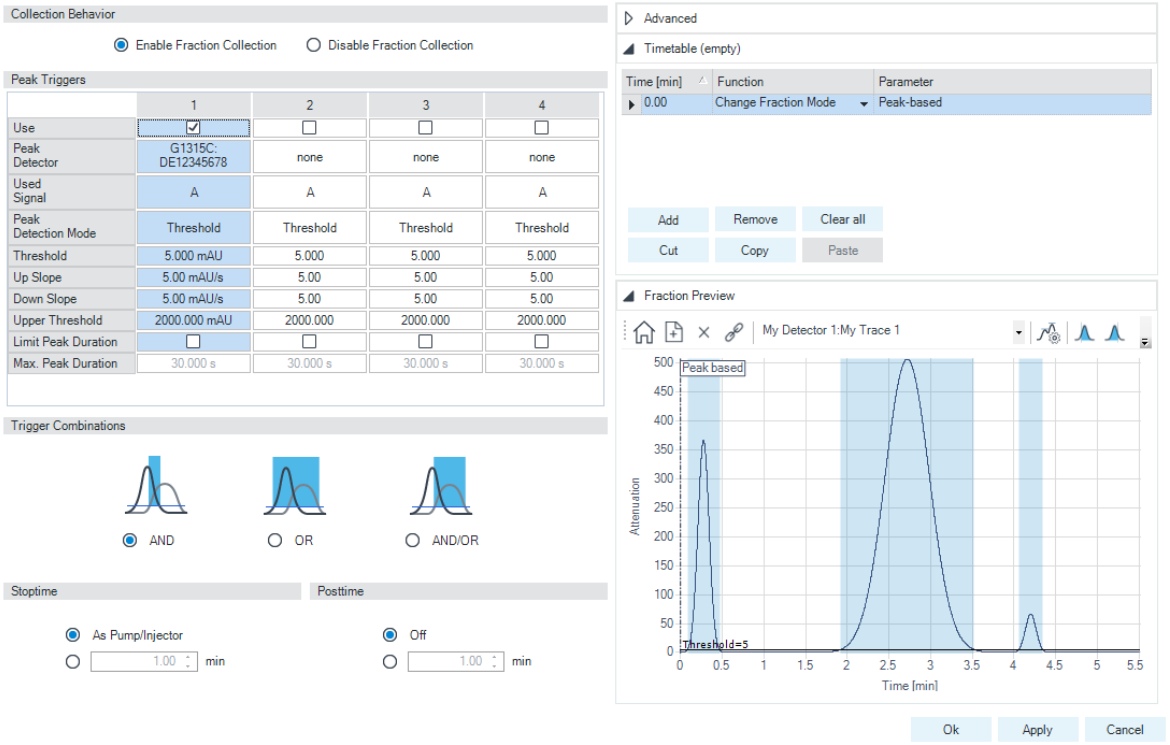



**Figure 8 Fraction Preview dialog box**

The **Fraction Preview** screen allows to test the fraction collection parameters against an example chromatogram. It can also be used to optimize the fraction collection parameters interactively. With the help of this tool values for up and down slope as well as for upper and lower threshold can easily be graphically specified. To load a chromatogram e.g. 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 clicking 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.

# Pooling

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

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

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

# 6 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 62.
- The Agilent OpenLab ChemStation C.01.03 and above do not include any maintenance/test functions.
- Screenshots used within these procedures are based on the Agilent Lab Advisor Software.

# Agilent Lab Advisor Software

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

The Agilent Lab Advisor software is available in two versions:

- Lab Advisor Basic
- Lab Advisor Advanced

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

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

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

# Hardware Symptoms

## Synchronization Lost

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. |
| 2 | Defective CAN cable. | Switch off the system. Restart the system, and determine which module or modules are not recognized by the system. |
| 3 | Defective valve. | Exchange the defective Preparative Valve-Based Fraction Collector. |
| 4 | Defective MTP main board in other module. | Exchange the potentially defective main boards. |

## Leak

A leak was detected in the fraction collector.

| Probable cause | | Suggested actions |
|---|---|---|
| 1 | Loose fittings | Ensure all fittings are tight. |
| 2 | Broken capillary or tubing | Exchange defective capillaries or tubing. |
| 3 | Leak sensor not connected to the Preparative Valve-Based Fraction Collector | Ensure the leak sensor is connected correctly. |
| 4 | Defective leak sensor | Exchange the leak sensor. |
| 5 | Defective valve | Exchange the Preparative Valve-Based Fraction Collector. |

NOTE

Make sure the leak sensor and leak plane are completely dry before restarting the Preparative Valve-Based Fraction Collector.

## Calibration delay volume test shows two peaks

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 Air bubbles are in the flow path | Check flow path for leaks and air bubbles. |
| 3 Wrong method has been used for the delay calibration | Check method and delay calibration procedure. |

## Valve switch failed

The Preparative Valve-Based Fraction Collector failed to switch to next position.

| Probable cause | Suggested actions |
|---|---|
| 1 Power cord for the Preparative Valve-Based Fraction Collector is not connected | Check power cord connection. |
| 2 Preparative Valve-Based Fraction Collector is blocked. Possible if eluents with highly concentrated electrolytes are used | Purge Preparative Valve-Based Fraction Collector to dissolve crystals. |
| 3 Preparative Valve-Based Fraction Collector is defective | • Synchronize the Preparative Valve-Based Fraction Collector.<br>• Exchange the Preparative Valve-Based Fraction Collector. |

# Limitations and how to avoid problems

**Table 10 Limitations**

| Limitation | How to avoid problems |
|---|---|
| Replacing fraction containers | When replacing filled tubes or bottles, make sure to re-set the bottle volumes, otherwise the Preparative Valve-Based Fraction Collector will not recognize that the fraction containers were emptied. If a fraction vessel is theoretically overfilled, an error message occurs and the pump is shut OFF |
| Pooling | When pooling fractions, overfill protection no longer exists. It is the user's responsibility to make sure that all fraction vessels are large enough to completely collect all pooled fractions. |

# 7 Error Information



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

# What Are Error Messages

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

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

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

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

# General Error Messages

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.<br>• 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. | Exchange the leak sensor. |
| 2 Leak sensor incorrectly routed, being pinched by a metal component. | • Make sure the leak sensor is installed correctly.<br>• Correct the routing of the cable.<br>• If cable defective, exchange the leak sensor. |

## 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. | Ensure the leak sensor is connected correctly. |
| 2 Defective leak sensor. | Exchange the leak sensor. |
| 3 Leak sensor incorrectly routed, being pinched by a metal component. | Exchange the leak sensor. |

## 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. | Exchange the main board. |

## 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. | Exchange the main board. |

# 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. |

# Module Specific Error Messages

## Initialization of Valve Failed

**Error ID: 24000**

During the initialization process the motor of the valve drive moves to some special positions depending on the installed valve head. A failure in this process means either that the movement couldn't be performed properly or it was not noticed correctly by the sensor.

| Probable cause | Suggested actions |
|---|---|
| 1 Mechanical problems. Friction too high or blockages on the valve drive's motor or on the valve head. | • Check valve head for correct installation<br>• Try to identify the source of trouble by installing a different valve head if possible.<br>• Contact your Agilent Service representative. |
| 2 Defect Sensor on the Valve Drive Motor | • Check valve head for correct installation<br>• Try to identify the source of trouble by installing a different valve head if possible.<br>• Contact your Agilent Service representative. |

## Pressure Cluster Partner Missing

The connection from the valve drive to a defined pressure cluster partner is lost.

| Probable cause | Suggested actions |
|---|---|
| 1 Communication issues | Check the CAN cable connections of the modules. |
| 2 Configuration mismatch | Check and correct if necessary the valve configuration and presence of defined pressure cluster partner. |

# Position Cluster Partner Missing

| Probable cause | Suggested actions |
|---|---|
| 1 Communication issues | Check the CAN cable connections of the modules. |
| 2 Configuration mismatch | Check and correct if necessary the valve configuration and presence of defined position cluster partner. |

# 8 Maintenance



This chapter gives you an overview and instructions about the possible maintenance and repair procedures that can be performed by the user.

# Introduction to Maintenance

The module is designed for little to no maintenance. The most frequent maintenances such as cleaning the valve 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.

# Cautions and Warnings

**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.**

# Overview of Maintenance

The following pages describe maintenance procedures (simple repairs) that can be done without opening the main cover.

**Table 11 Maintenance Procedures**

| Procedure | Typical Frequency |
|---|---|
| "Cleaning the Module" on page 80 | If required |
| "Replacing the Fuses of the Preparative Valve-Based Fraction Collector" on page 81 | When a fuse is defect |
| "Replacing the Module Firmware" on page 83 | If required |

# 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. Port can be cleaned by pumping a suitable solvent through each of the ports, and blowing the ports dry with nitrogen or air.

**WARNING**

**Liquid dripping into the electronic compartment of your module**

**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.**
- ✓ **Use an intermediate solvent to clean out all ports on the valve head.**

# Replacing the Fuses of the Preparative Valve-Based Fraction Collector

**When**

If the valve drive shows no reaction.

**Tools required**

| Description |
|---|
| Screwdriver |

**Parts required**

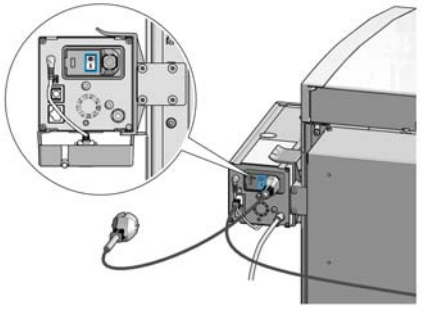
| # | p/n | Description |
|---|---|---|
| 2 | 2110-1486 | Fuse 2 AT250 V |

**WARNING**

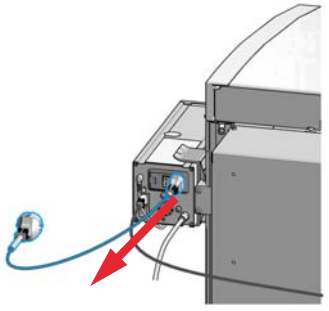
**Electrical shock**

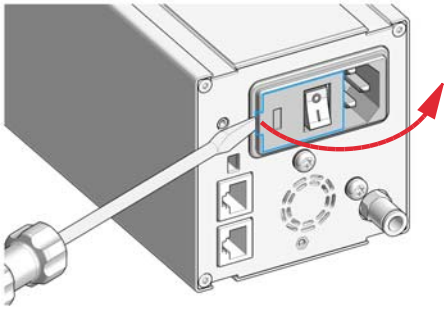
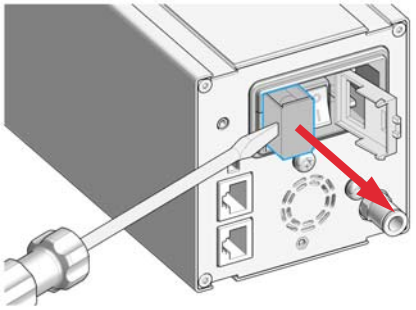
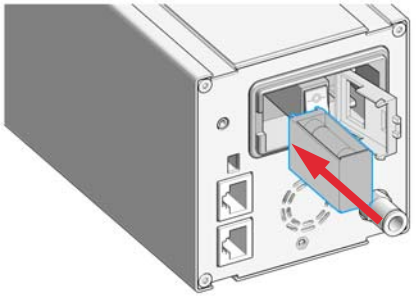
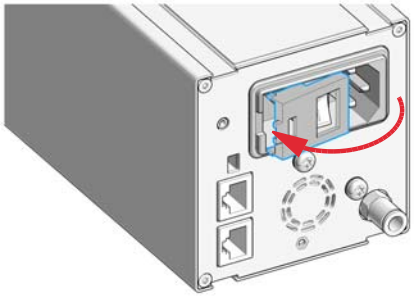
- ✓ **Disconnect the valve drive from line power before changing a fuse or trying to open the hatch of the power input socket.**
- ✓ **Never re-connect the line power before having the power input socket closed.**

**1** Switch off the instrument. The line switch is located at the rear of the valve drive.



**2** Disconnect the power cable from the power input socket.



| | |
|---|---|
| **3** To access the fuse drawer, gently lift the outer plastic housing of the power inlet socket using a flat screw-driver.<br>  | **4** Pull out the fuse drawer as shown.<br>  |
| **5** Replace the defect fuse(s). | **6** Slide in the fuse drawer and push till it fits tightly.<br>  |
| **7** Finally, close the fuse drawer housing, reconnect the instrument to the power line and switch it on.<br>  | |

# Replacing the Module Firmware

**Table 12 Module Specific Information**

| | |
|---|---|
| Initial firmware (main and resident) | C.07.01 |
| Compatible with 1200 series modules | All other modules must have firmware revision A.07.01 or B.07.01 or above (main and resident). Otherwise the communication will not work. |
| Conversion to / emulation | N/A |

# 9 Parts and Materials



This chapter provides information on parts and materials.

# Valve Drive Parts

| Item | p/n | Description |
|---|---|---|
| 1 | 5043-0275 | Clamp guide<br>For attaching the valve to a rail assembly |
| 2 | 5067-4792 | Leak sensor assembly<br>External leak sensor |
| 3 | 5043-0271 | Holder leak plane |
| 4 | 5043-0270 | Leak plane |
| 5 | 2110-1486 | Fuse 2 AT250 V |
| 6 | 5067-4634 | Valve rail assembly for G7159B<br>See "Installing the Preparative Valve-Based Fraction Collector" on page 23 |
| 7 | 5067-1510 | Rail assy for column organizer<br>See "Installing the Preparative Valve-Based Fraction Collector" on page 23 |

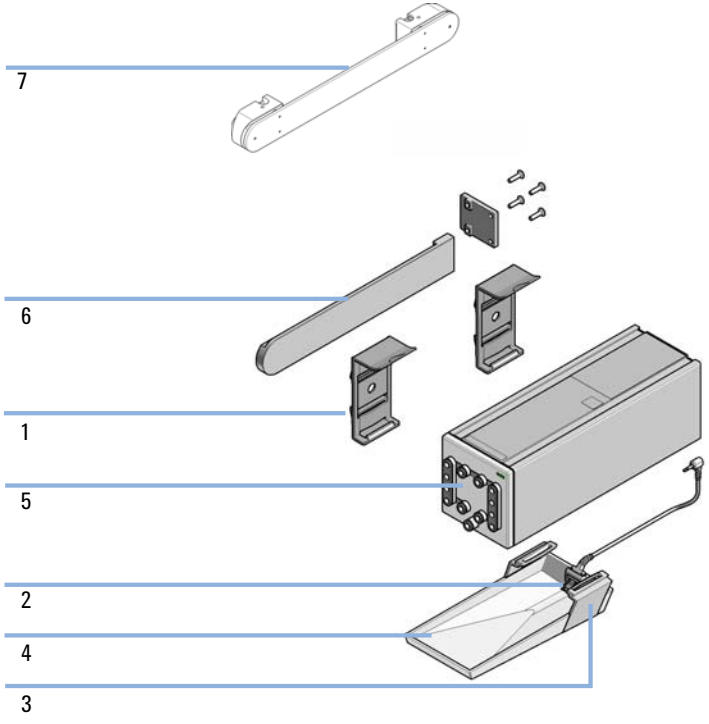



**Figure 9 Valve Drive Parts**

# Accessory Kit

## Accessory Kit (G9352-68100)

| Item | # | p/n | Description |
|---|---|---|---|
| 1 | 1 | 5043-0271 | Holder leak plane |
| 2 | 1 | 5043-0270 | Leak plane |
| 3 | 1 | 5067-4792 | Leak sensor assembly |
| 4 | 2 | 5043-0275 | Clamp guide |
| 5 | 1 | 5023-2879 | 18 m Tubing ESD PTFE (OD2.5/ID1.6) |
| 6 | 12 | 5023-2871 | Fitting 1/4-28 for Tube-OD 2.5 m ESD-PEEK |
| 7 | 1 | 5023-2878 | 2m Tubing ESD PTFE (OD2/ID1.2) |
| 8 | 1 | 5023-2872 | Fitting 1/4-28 for Tube-OD2mm ESD-PEEK |
| 9 | 2 | 3710043100 | Tubing poly-urethane 4mm x 6mm |
| 10 | 1 | 1610140200 | Elbow, 6mm tube push fit x male 1/8 BSP |
| 11 | 1 | 8710-1930 | Plastic and PEEK tubing cutter |
| 12 | 1 | 5181-1519 | CAN cable, Agilent module to module, 1 m |
| 13 | 1 | 9222-0519 | Bag Plastic |

# 10 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<br>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<br>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) |

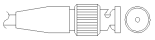
### RS-232 cables (not for FUSION board)

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

### USB cables

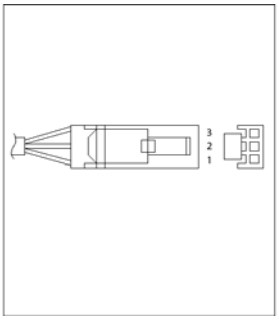
| p/n | Description |
|---|---|
| 5188-8050 | USB A M-USB Mini B 3 m (PC-Module) |
| 5188-8049 | USB A F-USB Mini B M OTG (Module to Flash Drive) |

# Analog Cables

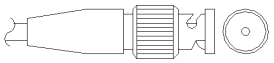


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

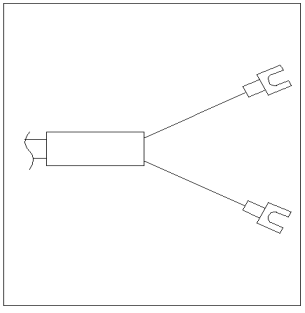
## Agilent Module to 35900 A/D converters

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

## Agilent Module to BNC Connector

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

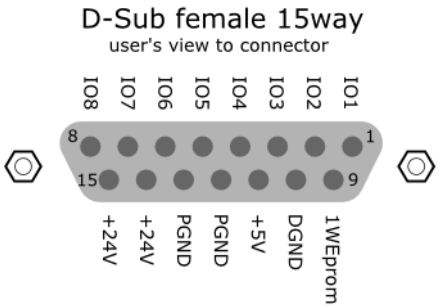
## Agilent Module to General Purpose

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

# Remote Cables

## ERI (Enhanced Remote Interface)

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

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

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

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

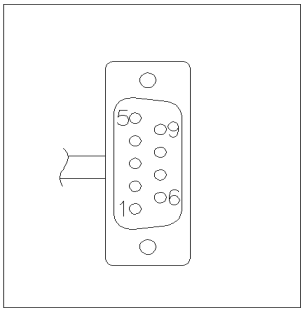
- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

**Table 13 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 | | |

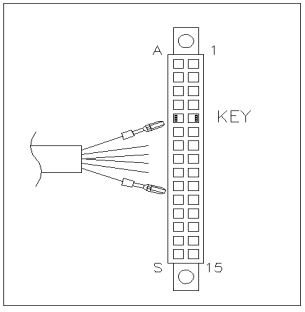

One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

## Agilent Module to Agilent 35900 A/D Converters

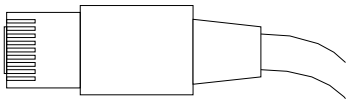
| p/n 5061-3378 | Pin 35900 A/D | Pin Agilent module | Signal Name | Active (TTL) |
|---|---|---|---|---|
|  | 1 - White | 1 - White | Digital ground | |
| | 2 - Brown | 2 - Brown | Prepare run | Low |
| | 3 - Gray | 3 - Gray | Start | Low |
| | 4 - Blue | 4 - Blue | Shut down | Low |
| | 5 - Pink | 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<br>Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It is also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9. |
| 5181-1561 | RS-232 cable, 8 m |

# USB

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

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

# 11 Hardware Information



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

# Electrical Connections

- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.
- The ERI/REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shutdown, prepare, and so on.
- With the appropriate software, the LAN connector may be used to control the module from a computer through a LAN connection. This connector is activated and can be configured with the configuration switch.
- With the appropriate software, the USB connector may be used to control the module from a computer through a USB connection.
- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses because automatic electronic fuses are implemented in the power supply.

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

# Serial Number Information (ALL)

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

| | |
|---|---|
| CCXZZ00000 | Format |
| CC | Country of manufacturing<br>• DE = Germany<br>• JP = Japan<br>• 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 |

# Front and Rear View of the Module

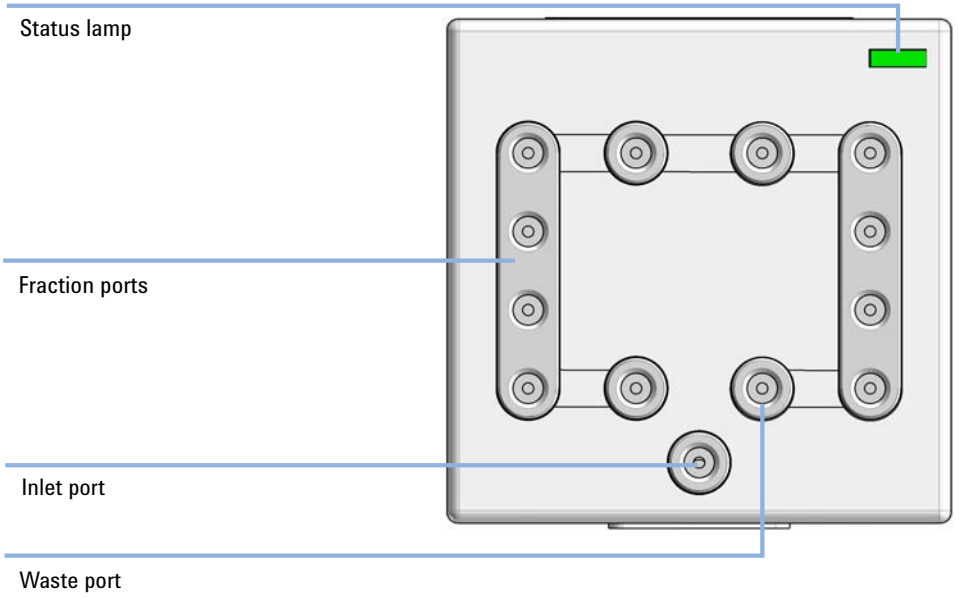



**Figure 10** Front view of the module

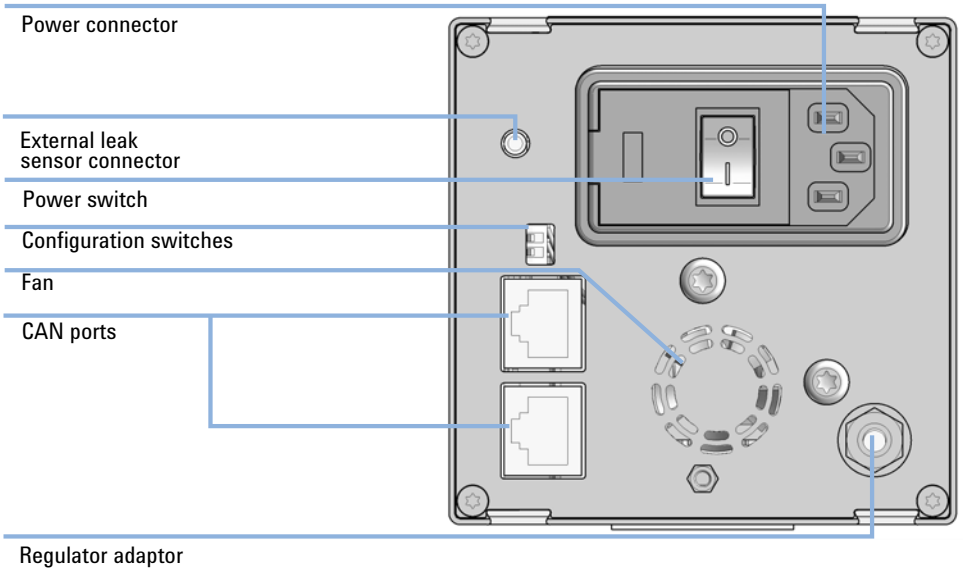



**Figure 11** Rear view of the module

# Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

**Table 14 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 | |
| **Fraction Collectors** | | | | | | | |
| G7158B | 2 | Yes | Yes | No | No | E | |
| G7159B | 2 | Yes | Yes | No | No | E | |

**Table 14 Agilent InfinityLab LC Series Interfaces**

| Module | CAN | USB | LAN (on-board) | RS-232 | Analog | APG (A) / ERI (E) | Special |
|---|---|---|---|---|---|---|---|
| G7166A | 2 | No | No | No | No | No | Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card |
| G1364E/F, G5664B | 2 | Yes | Yes | No | No | E | THERMOSTAT for G1330B |
| **Others** | | | | | | | |
| G7116A/B | 2 | No | No | No | No | No | Requires a HOST module via CAN |
| G7122A | No | No | No | Yes | No | A | |
| G7170B | 2 | No | No | No | No | No | Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card |

**NOTE** The detector (DAD/MWD/FLD/VWD/RID) is the preferred access point for control via LAN. The inter-module communication is done via CAN.

- CAN connectors as interface to other modules
- LAN connector as interface to the control software
- RS-232C as interface to a computer
- USB (Universal Series Bus) as interface to a computer
- REMOTE connector as interface to other Agilent products
- Analog output connector(s) for signal output

# Overview Interfaces

## CAN

The CAN is inter-module communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

## LAN

The modules have either an interface slot for a LAN card (e.g. Agilent G1369B/C LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a PC with the appropriate control software. Some modules have neither on-board LAN nor an interface slot for a LAN card (e.g. G1170A Valve Drive or G4227A Flexible Cube). These are hosted modules and require a Host module with firmware B.06.40 or later or with additional G1369C LAN Card.

**NOTE**

If an Agilent detector (DAD/MWD/FLD/VWD/RID) is in the system, the LAN should be connected to the DAD/MWD/FLD/VWD/RID (due to higher data load). If no Agilent detector is part of the system, the LAN interface should be installed in the pump or autosampler.

## USB

The USB interface replaces the RS-232 Serial interface in new FUSION generation modules. For details on USB refer to "USB (Universal Serial Bus)" on page 108.

## 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 15 ERI signal distribution**

| Pin | Signal | Description |
|---|---|---|
| 1 | START REQUEST | (L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler. |
| 2 | STOP | (L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities. |
| 3 | READY | (H) System is ready for next analysis. Receiver is any sequence controller. |
| 4 | POWER ON | (H) All modules connected to system are switched on. Receiver is any module relying on operation of others. |
| 5 | | Not used |
| 6 | SHUT DOWN | (L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk. |
| 7 | START | (L) Request to start run / timetable. Receiver is any module performing run-time controlled activities. |
| 8 | PREPARE | (L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities. |

### Special Interfaces

There is no special interface for this module.

## ERI (Enhanced Remote Interface)

ERI replaces the AGP Remote Interface that is used in the HP 1090/1040/1050/1100 HPLC systems and Agilent 1100/1200/1200 Infinity HPLC modules. All new InfinityLab LC Series products using the FUSION core electronics use ERI. This interface is already used in the Agilent Universal Interface Box 2 (UIB2)

### ERI Description

The ERI interface contains eight individual programmable input/output pins. In addition, it provides 24 V power and 5 V power and a serial data line to detect and recognize further add-ons that could be connected to this interface. This way the interface can support various additional devices like sensors, triggers (in and out) and small controllers, etc.

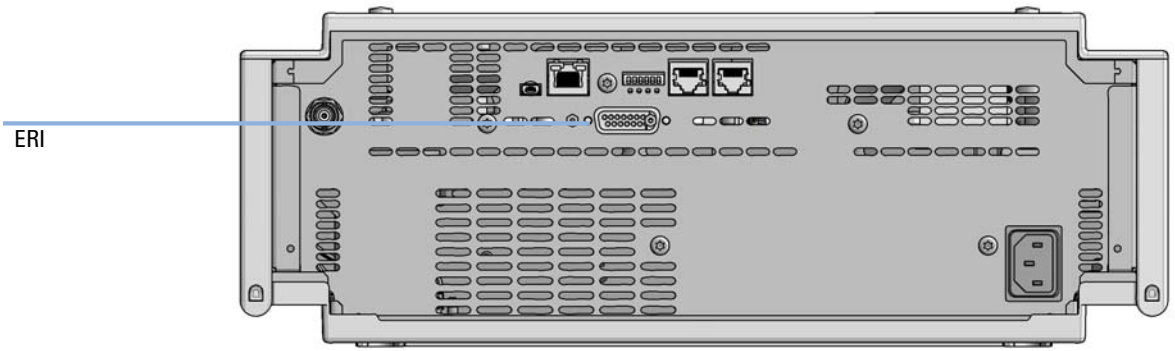
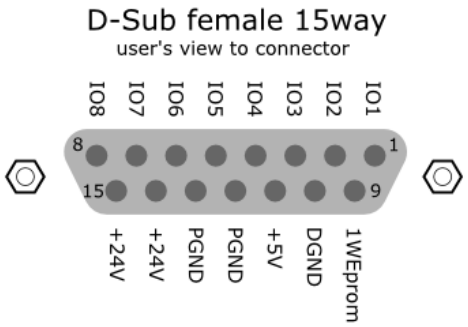



**Figure 12 Location of the ERI interface (example shows a G7114A/B VWD)**




| 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

# Configuration Switch Settings of the Preparative Valve-Based Fraction Collector

## Configuration Switch Settings

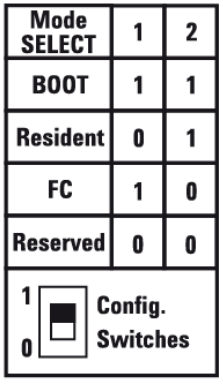



Figure 13 Config Switch

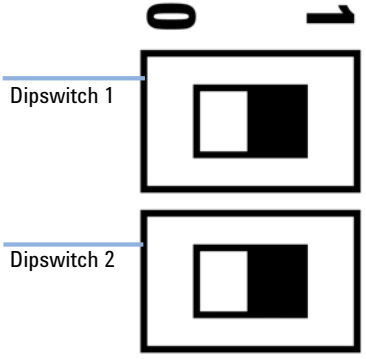



Figure 14 Dipswitch 1 and 2

Table 16 Configuration Switch Settings

| Dipswitch 1 | Dipswitch 2 | Function |
|---|---|---|
| ON (1) | ON (1) | Default/Standard Operation Mode |
| ON (1) | OFF (0) | Forced Cold Start |
| OFF (0) | ON (1) | Resident Mode |
| OFF (0) | OFF (0) | Not Supported |

## Special Settings

### Boot-Resident

Firmware update procedures may require this mode in case of firmware loading errors (main firmware part). If you use the following switch settings and power the instrument up again, the instrument firmware stays in the 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.

**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.**

# 12 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 117.

## 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.

# Compressed Gas Information

**WARNING**

**Compressed gas**

**Personnel injury and/or damage to equipment and property.**

- ✓ **Strictly follow the rules and/or regulations imposed by the local authorities responsible for such use in the workplace.**

Operation of an Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector (G7166A) involves the use of compressed gases. Careless, improper or unskilled use of this instrument can cause injury to personnel, and/or damage to equipment and property.

All compressed gases (other than air) can create a hazard if they leak into the atmosphere. Any leak (except that of air) can result in an oxygen-deficient atmosphere, which can cause asphyxiation. The storage area must be adequately ventilated and must comply with the rules and regulations imposed by the local authorities responsible for such use in the workplace.

Gas cylinders must be stored and handled strictly in accordance with local safety codes and regulations. Cylinders must be used and stored only in a vertical position and secured to an immovable structure or a properly constructed cylinder stand. Move cylinders only by securing them to a properly constructed trolley. If gases are to be plumbed from a remote storage area to the instrument site, ensure that the local outlets are fitted with stop valves, pressure gauges and suitable regulators that are easily accessible to the instrument operator.

Use only approved regulator and hose connectors (refer to the gas supplier's instructions). Keep gas cylinders cool and properly labeled. (All cylinders are fitted with a pressure relief device that will rupture and empty the cylinder if the internal pressure is raised above the safe limit by excessive temperatures.) Ensure that you have the correct cylinder before connecting it to the Preparative Valve-Based Fraction Collector.

# Safety Symbols

**Table 17 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.<br>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:<br>**http://regulations.corporate.agilent.com/DoC/search.htm** |
|  | Manufacturing date. |
|  | Power symbol indicates On/Off.<br>The apparatus is not completely disconnected from the mains supply when the power switch is in the Off position |
|  | Pacemaker<br>Magnets could affect the functioning of pacemakers and implanted heart defibrillators.<br>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 17 Symbols**

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

**WARNING**

**A WARNING**

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

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

**CAUTION**

**A CAUTION**

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

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

# Waste Electrical and Electronic Equipment (WEEE) Directive

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

NOTE

Do not dispose of in domestic household waste

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

# Radio Interference

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

## Test and Measurement

If test and measurement equipment is operated with unscreened cables, or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

# Sound Emission

## Manufacturer's Declaration

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

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

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

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## In This Book

This manual contains technical reference information about the Agilent 1260 Infinity II Preparative Valve-Based Fraction Collector. The manual describes the following:

- introduction,
- requirements and specifications,
- installation,
- using the module,
- troubleshooting and diagnostics,
- errors,
- maintenance and repair,
- parts and materials,
- hardware information,
- safety and related information.

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