Notices

© Agilent Technologies, Inc. 2016-2018

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Agilent Technologies, Inc. as governed by United States and international copyright laws.

Manual Part Number
G7159-90000 Rev. E

Edition
03/2018

Printed in Germany
Agilent Technologies
Hewlett-Packard-Strasse 8
76337 Waldbronn

Warranty
The material contained in this document is provided “as is,” and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology Licenses
The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Restricted Rights Legend
If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as “Commercial computer software” as defined in DFAR 252.227-7014 (June 1995), or as a “commercial item” as defined in FAR 2.101(a) or as “Restricted computer software” as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies’ standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Safety Notices

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

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

This manual contains technical reference information about the Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector (G7159B).

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

2 Site Requirements and Specifications
This chapter provides information on environmental requirements, physical and performance specifications.

3 Using the Fraction Collector
This chapter explains the essential operational parameters of the module.

4 Preparing the Fraction Collector
This chapter explains the operational parameters of the module.

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

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

7 Maintenance
This chapter describes the maintenance of the module.

8 Parts for Maintenance and Repair
This chapter provides information on parts for maintenance and repair.
In This Guide

9 Identifying Cables
This chapter provides information on cables used with the module.

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

11 Appendix
This chapter provides additional information on safety, legal, and web.
## Contents

### 5 Troubleshooting and Diagnostics 81
- User Interfaces 82
- Agilent Lab Advisor Software 83

### 6 Error Information 85
- What Are Error Messages 86
- General Error Messages 87

### 7 Maintenance 95
- Introduction to Maintenance 96
- Warnings and Cautions 97
- Cleaning the Module 99
- Overview of Maintenance 100
- Install and Remove the Top Fume Hood 101
- Clean the Leak Pan 103
- Prepare the Module for Transportation 104
- Replace the Module Firmware 106

### 8 Parts for Maintenance and Repair 107
- Supported Containers 108
- List of Recommended Fraction Tubes 109
- Fraction Collector Accessory Kit 110
- Tubing Kits 111
- Top Fume Hood Kit 113

### 9 Identifying Cables 115
- Cable Overview 116
- Analog Cables 118
- Remote Cables 120
- CAN/LAN Cables 124
- RS-232 Cables 125
- USB 126
10 Hardware Information 127
   Firmware Description 128
   Electrical Connections 131
   Interfaces 134
   Setting the 6-bit Configuration Switch 142
   Early Maintenance Feedback 146
   Instrument Layout 147

11 Appendix 149
   General Safety Information 150
   Waste Electrical and Electronic Equipment Directive 156
   Radio Interference 157
   Sound Emission 158
   Agilent Technologies on Internet 159
1 Introduction

Product Description 10
Features 11
Overview of the Module 12
Fraction Collector Principle 13
Leak and Waste Concept 14
Waste Concept 15

This chapter gives an introduction to the module and an instrument overview.
The Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector is the ideal solution that automatically manages high-capacity fraction collection of purified peaks for semi-preparative and preparative scale purification. Collect milligrams to multi-gram quantities of sample intuitive with ease. The Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector features handling a wide variety of collection vessels with ease and capacity of up to 5.9 L by using 150 x 25 mm (L x OD). The containers use identification tags to automatically detect the vessel dimensions. With a novel robotic technology, Y-, Z-, theta-axis probe functionality minimizes sample carryover between the fractions during movements between the vessels. The Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector is optimized for flow rates up to 200 mL/min, and can be easily integrated with any Agilent solvent delivery module, autosampler, or detector.

Figure 1  Overview of the open-bed fraction collector
Features

- **Maximize your flexibility** – Choose how much you want to collect, whether you prefer a large number of fractions which enables collection of up to 432 fraction in 150 x 12 mm (L x OD) vessels, or you prefer large volumes, or any combination of formats. Fraction Containers are available in eight formats, and you mix them to accommodate the different vessel ODs.

- **High capacity** – Using one type of drawer and offering six different type of containers, the Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector can collect a maximum of 5.9 L.

- **Scalable collection volumes** – The Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector enhances flexibility by providing two differently optimized tubing kits. Optimized for collections up to 50 mL/min and the other high flow kit for up to 200 mL/min.

- **Accurate collection modes** – real time peak or mass detection algorithms allow to achieve accurate, reproducible fraction detection every time.

- **Lowest delay volumes** - Optimized tubing and unique delay sensor for accurate collection minimize peak dispersion.

- **Low carryover** - The Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector is designed for low carryover due to extremely fast Y-, Z-, and Theta-axis movement, thus minimizing sample loss during movements from vessel-to-vessel.
Overview of the Module

The Fraction Collector transport mechanism uses a cartesian robot. The Y drive together with the Theta drive optimize the positioning for the fraction containers. The robot moves above a position and the diverter valve switches to collect in the according collection position.

All axes of the transport mechanism are driven by very fast BLCD motors. Optical encoders ensure the correct operation of the movement.

The entire flow path including the diverter valve and delay sensor are always flushed by the mobile phase for minimum internal carry-over.

To reduce carry-over further, you have the possibility to rinse the diverter valve on a rinse port. The bottle containing the mobile phase for the wash procedure will be located in the solvent bottle cabinet. The rinse waste produced during this operation is channeled safely away through a waste drain.
**Fraction Collector Principle**

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

The standard fractioning sequence occurs in the following order:

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

**Fractioning Sequence**

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

Leak and Waste Concept

Leak and Waste Concept

1 Rinse Port

2 Drain Outlet
Waste Concept

1. Agilent recommends using the 6 L waste can with 1 Stay Safe cap GL45 with 4 ports (5043-1221) for optimal and safe waste disposal. If you decide to use your own waste solution, make sure that the tubes don't immerse in the liquid.
1 Introduction
Leak and Waste Concept
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 21. 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**

**Absence of ground connection**

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

➔ Never operate your instrumentation from a power outlet that has no ground connection.

**WARNING**

**Unintended use of supplied power cords**

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

➔ Never use a power cord other than the one that Agilent shipped with this instrument.

➔ Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.

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

**WARNING**

**Power cords**

Solvents may damage electrical cables.

➔ Prevent electrical cables from getting in contact with solvents.

➔ Exchange electrical cables after contact with solvents.
Bench Space

The module dimensions and weight (see Table 1 on page 21) 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>30.6 kg</td>
<td></td>
</tr>
<tr>
<td>Dimensions (height × width × depth)</td>
<td>781 mm x 393 mm x 622 mm</td>
<td></td>
</tr>
<tr>
<td>Line voltage</td>
<td>100 – 240 V~, ± 10 %</td>
<td>Wide-ranging capability</td>
</tr>
<tr>
<td>Line frequency</td>
<td>50 or 60 Hz, ± 5 %</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>350 VA, 350 W</td>
<td></td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>4-40°C (39.2 -104°F)</td>
<td></td>
</tr>
<tr>
<td>Ambient non-operating temperature</td>
<td>-40 – 70 °C (-40 – 158 °F)</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>≤80 % r.h. up to 31 °C, decreasing to 50 % r.h. at 40 °C</td>
<td>Non-condensing</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>Up to 3000 m (9842 ft)</td>
<td></td>
</tr>
<tr>
<td>Non-operating altitude</td>
<td>Up to 4600 m (15092 ft)</td>
<td>For storing the module</td>
</tr>
<tr>
<td>Safety standards: IEC, EN, CSA, UL</td>
<td>Installation category II, Pollution degree 2</td>
<td>For indoor use only.</td>
</tr>
<tr>
<td>ISM Classification</td>
<td>ISM Group 1 Class B</td>
<td>According to CISPR 11</td>
</tr>
</tbody>
</table>
Performance Specifications

Table 2  Performance Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay volume</td>
<td>Calculated by Lab Advisor. Dead volume in Valve tip appr. 30 µL</td>
<td></td>
</tr>
<tr>
<td>Time to move from vessel to vessel</td>
<td>0.3 s</td>
<td></td>
</tr>
<tr>
<td>Minimum system flow</td>
<td>1 mL/min</td>
<td></td>
</tr>
<tr>
<td>Maximum system flow</td>
<td>200 mL/min</td>
<td></td>
</tr>
<tr>
<td>Maximum collection volume</td>
<td>78 mL</td>
<td>With 30x150 mm (OD x L) tube</td>
</tr>
<tr>
<td>Maximum capacity</td>
<td>432 fractions</td>
<td>using 12 mm OD tubes</td>
</tr>
<tr>
<td></td>
<td>5.9 L</td>
<td>using 25 x 150 mm (OD x L) tubes</td>
</tr>
<tr>
<td>Trigger modes</td>
<td>Off</td>
<td>Fraction triggering is disabled. No fractions will be collected.</td>
</tr>
<tr>
<td></td>
<td>Peak-based</td>
<td>When a peak is discovered by a peak trigger, fractions are collected.</td>
</tr>
<tr>
<td></td>
<td>Peak-based, collecting time slices</td>
<td>When a peak is discovered by a peak trigger, fractions are collected</td>
</tr>
<tr>
<td></td>
<td>Peak-based, collecting volume slices</td>
<td>When a peak is discovered by a peak trigger, fractions are collected</td>
</tr>
<tr>
<td></td>
<td>Peak-based with time slice recovery</td>
<td>The complete output of the fraction collector is recovered into separate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>slices of a specified duration. When a peak is discovered by a peak</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trigger, fractions are collected in dedicated vessels. Depending on the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>max. fill volume, Recovery and Fractions will use one or more vessel(s).</td>
</tr>
</tbody>
</table>

Note: All specifications are subject to change without notice. Please refer to the latest version of the user manual for the most current information.
### Site Requirements and Specifications

#### Performance Specifications

**Peak-based with volume slice recovery**

The complete output of the fraction collector is recovered into separate slices of a specified volume. When a peak is discovered by a peak trigger, fractions are collected in dedicated vessels. Depending on the max. fill volume, Recovery and Fractions will use one or more vessel(s).

**Time-based, collecting a number of fractions**

Starting at a given time, the output of the fraction collector is separated into a specified number of fractions. Collecting a specified number of fractions works only when a stop time is set in the fraction collector or the trigger mode is followed by another instruction in the timetable of the fraction collector. Depending on the max. fill volume, each fraction will use one or more vessel(s).

**Time-based, collecting time slices**

Starting at a given time, the output of the fraction collector is collected into separate slices of a specified duration. Depending on the max. fill volume, each slice will use one or more vessel(s).

**Time-based, collecting volume slices**

Starting at a given time, the output of the fraction collector is collected into separate slices of a specified volume. Depending on the max. fill volume, each slice will use one or more vessel(s).

**Trigger sources**

- G7115A, 1260 Infinity II DAD
- G7165A, 1260 Infinity II MWD
- G7114A, 1260 Infinity II VWD
- G6120BA, LC/MS Single Quad VL
- G6130BA, LC/MS Single Quad SL
- G7121A, 1260 Infinity II FLD
- G4260B, 1260 Infinity II ELSD
- G7162A, 1260 Infinity II RID

**Diverter valve**

3/2 valve

**Maximum pressure**

6 bar (switching)

**Drawers**

Drawer ambient

### Table 2  Performance Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak-based with volume slice</td>
<td>The complete output of the fraction collector is</td>
<td>The complete output of the fraction collector is recovered into separate slices of a specified volume. When a peak is discovered by a peak trigger, fractions are collected in dedicated vessels. Depending on the max. fill volume, Recovery and Fractions will use one or more vessel(s).</td>
</tr>
<tr>
<td>recovery</td>
<td>recovered into separate slices of a specified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>volume. When a peak is discovered by a peak trigger, fractions are collected in dedicated vessels. Depending on the max. fill volume, Recovery and Fractions will use one or more vessel(s).</td>
<td></td>
</tr>
<tr>
<td>Time-based, collecting a</td>
<td>Starting at a given time, the output of the fraction</td>
<td>Starting at a given time, the output of the fraction collector is separated into a specified number of fractions. Collecting a specified number of fractions works only when a stop time is set in the fraction collector or the trigger mode is followed by another instruction in the timetable of the fraction collector. Depending on the max. fill volume, each fraction will use one or more vessel(s).</td>
</tr>
<tr>
<td>number of fractions</td>
<td>collector is separated into a specified number of fractions. Collecting a specified number of fractions works only when a stop time is set in the fraction collector or the trigger mode is followed by another instruction in the timetable of the fraction collector. Depending on the max. fill volume, each fraction will use one or more vessel(s).</td>
<td></td>
</tr>
<tr>
<td>Time-based, collecting time</td>
<td>Starting at a given time, the output of the fraction</td>
<td>Starting at a given time, the output of the fraction collector is collected into separate slices of a specified duration. Depending on the max. fill volume, each slice will use one or more vessel(s).</td>
</tr>
<tr>
<td>slices</td>
<td>collector is collected into separate slices of a specified duration. Depending on the max. fill volume, each slice will use one or more vessel(s).</td>
<td></td>
</tr>
<tr>
<td>Time-based, collecting volume</td>
<td>Starting at a given time, the output of the fraction</td>
<td>Starting at a given time, the output of the fraction collector is collected into separate slices of a specified volume. Depending on the max. fill volume, each slice will use one or more vessel(s).</td>
</tr>
<tr>
<td>slices</td>
<td>collector is collected into separate slices of a specified volume. Depending on the max. fill volume, each slice will use one or more vessel(s).</td>
<td></td>
</tr>
<tr>
<td>Trigger sources</td>
<td>G7115A, 1260 Infinity II DAD</td>
<td>G7115A, 1260 Infinity II DAD</td>
</tr>
<tr>
<td></td>
<td>G7165A, 1260 Infinity II MWD</td>
<td>G7165A, 1260 Infinity II MWD</td>
</tr>
<tr>
<td></td>
<td>G7114A, 1260 Infinity II VWD</td>
<td>G7114A, 1260 Infinity II VWD</td>
</tr>
<tr>
<td></td>
<td>G6120BA, LC/MS Single Quad VL</td>
<td>G6120BA, LC/MS Single Quad VL</td>
</tr>
<tr>
<td></td>
<td>G6130BA, LC/MS Single Quad SL</td>
<td>G6130BA, LC/MS Single Quad SL</td>
</tr>
<tr>
<td></td>
<td>G7121A, 1260 Infinity II FLD</td>
<td>G7121A, 1260 Infinity II FLD</td>
</tr>
<tr>
<td></td>
<td>G4260B, 1260 Infinity II ELSD</td>
<td>G4260B, 1260 Infinity II ELSD</td>
</tr>
<tr>
<td></td>
<td>G7162A, 1260 Infinity II RID</td>
<td>G7162A, 1260 Infinity II RID</td>
</tr>
<tr>
<td>Diverter valve</td>
<td>3/2 valve</td>
<td>3/2 valve</td>
</tr>
<tr>
<td>Maximum pressure</td>
<td>6 bar (switching)</td>
<td>6 bar (switching)</td>
</tr>
<tr>
<td>Drawers</td>
<td>Drawer ambient</td>
<td>Drawer ambient</td>
</tr>
</tbody>
</table>
## Site Requirements and Specifications

### Performance Specifications

#### Table 2 Performance Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction Containers</td>
<td><strong>Tube Containers, ambient:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 30 x 150 mm tubes, ambient, 10 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 30 x 100 mm tubes, ambient, 10 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 25 x 150 mm tubes, ambient, 18 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 25 x 100 mm tubes, ambient, 18 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 16 x 150 mm tubes, ambient, 36 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 16 x 100 mm tubes, ambient, 36 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 12 x 150 mm tubes, ambient, 72 tubes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube Container for 12 x 100 mm tubes, ambient, 72 tubes</td>
<td></td>
</tr>
<tr>
<td>Minimum tube height</td>
<td>50 mm</td>
<td></td>
</tr>
<tr>
<td>Maximum tube height</td>
<td>160 mm</td>
<td></td>
</tr>
</tbody>
</table>
3

Using the Fraction Collector

Configuration and Operation of the Open Bed Fraction Collector 26
  Delay Volumes and Delay Calibration 26
  Perform a Delay Calibration Run in OpenLAB CDS Chemstation Edition 28
  Help: 29
  Delay Evaluation 32
  Setting up a Fraction Collector Method 35
Solvent Information 41
Turn on/off 43
Status Indicators 44
Drawer Status Indicator 45
Exchange Drawers 46
Exchange Containers 48
Replace Inlet/Waste Tubings 49

This chapter explains the essential operational parameters of the module.
Delay Volumes and Delay Calibration

Once software is installed and the Preparative Open Bed Fraction Collector is ready to be operated, the fraction delay time needs to be determined. Figure Figure 2 on page 26 shows a schematic drawing of the flow path between the detector and the fraction collector with the two delay volumes $V_{D1}$ and $V_{D2}$. For peak-based fraction collection the system delay times $t_{D1}$ and $t_{D2}$ can be calculated by dividing the delay volumes by the flow rate.

![Figure 2](image)

**Figure 2** Delay volumes and delay times

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

When a peak is detected during a purification run (Figure 3 on page 27) the diverter valve is triggered using the following delay time calculations:

- Start of fraction collection: $t = t_0 + t_{D1}$
- End of fraction collection: $t = t_E + t_{D1} + t_{D2}$
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 Open Bed 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 Open Bed Fraction Collector is triggered.
Using the Fraction Collector
Configuration and Operation of the Open Bed Fraction Collector

Perform a Delay Calibration Run in OpenLAB CDS Chemstation Edition

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

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

The figure shows the scheme of the delay time calculation between UV detector and fraction collector.
Using the Fraction Collector
Configuration and Operation of the Open Bed Fraction Collector

Help:

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

Cancel  Closes the Delay Calibration Wizard without consequence.

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

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

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

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

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

Cancel  Closes the Delay Calibration Wizard without consequence.
This button is active only when a fraction collector has been selected.
Prepare Instrument for Calibration (Delay Calibration Wizard)

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

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

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

**NOTE**

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

<table>
<thead>
<tr>
<th>Back</th>
<th>Displays the Set Up Calibration page of the Delay Calibration Wizard (“Set Up Calibration (Delay Calibration Wizard)” on page 29). This button is active only until you have started the preparation of the instrument.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancel</td>
<td>Before preparation Closes the Delay Calibration Wizard without consequence. After preparation Displays the dialog box.</td>
</tr>
<tr>
<td>Next</td>
<td>Displays the Perform Calibration Run page of the Delay Calibration Wizard (“Perform Calibration Run(Delay Calibration Wizard)” on page 31). This button is active only when the preparation of the instrument is complete.</td>
</tr>
</tbody>
</table>
Perform Calibration Run (Delay Calibration Wizard)

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

- **System On**: Click to turn the system on.
- **System Off**: Click to turn the system off.
- **Edit Sample Info**: Displays the dialog box, which allows you to edit the sample information for the calibration run.
- **Load Method**: Displays the Method Browser for master methods, which allows you to select a different master method to load and use for the calibration run.
- **Automatically activate Delay Sensor Signal**: Mark this check box to automatically switch on the collection of the signal from the fraction collector’s flow delay sensor. This signal is necessary to calculate the delay time/volume.

**NOTE**

When you mark this check box, the method is modified.

- **Start Calibration Run**: Starts the delay calibration run. The message line describes the progress of the run. You can perform multiple calibration runs; this button is active after each calibration run has completed.
- **Delay Evaluation**: Opens the Delay Evaluation window to allow you to determine the delay volume(s) (“Delay Evaluation” on page 32). This button is active only when at least one delay calibration run has been performed.

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

- **Back**: Displays the Prepare Instrument for Calibration page of the Delay Calibration Wizard (“Prepare Instrument for Calibration (Delay Calibration Wizard)” on page 30). This button is active only until a calibration run has been started.
- **Cancel**: Displays the dialog box.
- **Next**: Displays the Finalize Calibration page of the Delay Calibration Wizard. This button is inactive until the calibration run is complete.
3 Using the Fraction Collector
Configuration and Operation of the Open Bed Fraction Collector

Delay Evaluation

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

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

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

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

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

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

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

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

**Create Calibration Summary**
- Displays the delay calibration parameters and results in the Delay Calibration Summary window.
Signals

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

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

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

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

Displays the Edit Integration Settings dialog box.

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

**Unzoom All** Sets all signal plots to their original zoom states.
Setting up a Fraction Collector Method

Fraction Trigger Mode

Use Timetable: Enables the Timetable.

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

Max. Peak Duration: Defines a maximum collection time in case that the signal does not reach the condition to cut the fraction as exhibited in Figure 4 on page 35. This could be caused by tailing peaks or if the baseline is drifting during gradient runs. The default value is set to 0.5 minutes. If broad peaks are expected, this value should be increased without exceeding the run time.

![Figure 4](image)

Figure 4  Maximum Fraction Duration
Fraction Trigger Mode

**Use Timetable:** Enables the **Timetable**.

**Peak-based:** If **Peak-based** is selected, the collection of a fraction is triggered by the signal of the detector, e.g. the Agilent 1260 Infinity Diode Array Detector or Variable Wavelength Detector. The detailed trigger conditions are specified in the **Peak Detectors** table. In the peak-based trigger mode all entries in the timetable are ignored.

**Max. Peak Duration:** Defines a maximum collection time in case that the signal does not reach the condition to cut the fraction as exhibited in **Figure 5** on page 36. This could be caused by tailing peaks or if the baseline is drifting during gradient runs. The default value is set to 0.5 minutes. If broad peaks are expected, this value should be increased without exceeding the run time.

![Figure 5](image-url)  
**Figure 5**  Maximum Fraction Duration
Peak Detectors

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

The peak detector table contains seven columns:

Working Mode

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

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

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

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

To specify the trigger values Up Slope, Down Slope, Threshold and Upper Threshold we recommend to use the Fraction Preview tool as described in “Fraction Preview” on page 39.

Upper Threshold

At high absorbance values the light intensity on the detector is extremely low and consequently detector noise will be superimposed on the detector signal. In this case the detector noise might trigger fraction collection. To avoid false fraction collection triggering, we recommend setting an Upper Threshold well below the limit where this false triggering effect might occur. As soon as the detector signal exceeds the Upper Threshold, settings for Up Slope or Down Slope will be ignored until the signal drops again below the Upper Threshold.
When using more than one peak detector fraction collection can be triggered either when **all selected peak detectors** detect a peak or when **at least one selected peak detector** detects a peak basing on the settings in the peak detectors table above.

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

**Timetable**

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

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

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

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

- The **# of Fractions** can be edited to collect a fixed number of equal fractions in a give time interval. This time interval is defined by the time value in the current and following timetable line.

- **Timeslices [min]** can be edited to collect fractions with a defined collection time. With this option the collection time of the last fraction can be shorter. This depends on the overall runtime.

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

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

**Time**

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

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

**Fraction Preview**

To determine the appropriate fraction collection parameters the Agilent ChemStation provides a valuable tool that becomes accessible by pushing the button labelled Fraction Preview Tool (see Figure 6 on page 39) in the Peak Detectors section.

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

Observe the following recommendations on the use of solvents.

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

Solvent compatibility for stainless steel in standard LC systems

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

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride, and so on) and aqueous solutions of halogenes
- High concentrations of inorganic acids like nitric acid, sulfuric acid and organic solvents especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:
  \[ 2 \text{CHCl}_3 + \text{O}_2 \rightarrow 2 \text{COCl}_2 + 2 \text{HCl} \]
  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
3 Using the Fraction Collector

Solvent Information

- 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.
## Using the Fraction Collector

### Turn on/off

1. Plug in the power cable.

2. **Power switch**
   - 1: On
   - 2: Off

3. Unplug the power cable.
Status Indicators

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

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

The drawer status indicator indicates one of three possible conditions:
1: off: drawer not detected
2: on: drawer detected and not in use = drawer can be pulled out
3: blinking: drawer detected and in use = drawer blocked
## Exchange Drawers

### Parts required

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G9321-60085</td>
<td>Drawer ambient</td>
</tr>
</tbody>
</table>

**WARNING**

**Toxic, flammable and hazardous solvents, samples and reagents**

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

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

➔ The volume of substances should be reduced to the minimum required for the analysis.

➔ Do not operate the instrument in an explosive atmosphere.

**WARNING**

**Protruding drawers**

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

➔ Always remove or close a drawer completely.
Using the Fraction Collector

Exchange Drawers

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

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

Preparations
Remove the drawer from the module.

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

NOTE
Mind the correct orientation of the container on the drawer.
Check if the container is fixed properly ("Click").
Replace Inlet/Waste Tubings

**Parts required**

<table>
<thead>
<tr>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G9321-60951</td>
<td>1290 Inf II PrepFC Tubing Kit 200 for flow rates up to 200 mL/min</td>
</tr>
<tr>
<td>OR</td>
<td>1 G9321-60952</td>
<td>1290 Inf II PrepFC Tubing Kit 50 for flow rates up to 50 mL/min</td>
</tr>
</tbody>
</table>

**Preparations**

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

1. **Swing up the fume hood against the mechanical stop.**

2. **Remove the fume hood by pulling it toward you.**

3. **Remove the Inlet/Waste Tubings from the capillary holder.**

4. **Remove tubing clip and dongle from the fraction collector.**
Replace Inlet/Waste Tubings

5 Open the tube holder.

6 Remove the tubings from the tube holder.

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

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

9 Unscrew the tubings from the valve assembly.

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

NOTE
Do not remove the delay sensor holder from the tubing.
11 Install the delay sensor holder.

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

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

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

14 Install the tubings to the tube holder.

15 Close the tube holder.

16 Push the clip into the housing and connect the dongle.
### Using the Fraction Collector

**Replace Inlet/Waste Tubings**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>17</strong></td>
<td>Install the Inlet/Waste Tubings to the capillary holder. Position them approximately in the middle of the capillary holder.</td>
</tr>
<tr>
<td><strong>18</strong></td>
<td>Push the top fume hood into the recession.</td>
</tr>
<tr>
<td><strong>19</strong></td>
<td>Close the top fume hood.</td>
</tr>
</tbody>
</table>
4

Preparing the Fraction Collector

Best Practices 54
   Regular Inspections 54
   Power up / Shut down 54
   Prepare the Fraction Collector 54
   Using the Fraction Collector 54
Solvent Information 55
   Material Information 56
Capillary Color Coding Guide 61
Installing Capillaries 62
Setting up the Fraction Collector with the Instrument Control Interface 65
   Overview 65
   Instrument Configuration 65
   Fraction Collector User Interface (Dashboard Panel) 69
Method Parameter Settings 71
   Advanced Settings 74
   Timetable Settings 76
Pooling 79

This chapter explains the operational parameters of the module.
Best Practices

Regular Inspections

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

Power up / Shut down

Power up

- Check that the robotics is not obstructed.

Shut down

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

Prepare the Fraction Collector

- Flush the LC system.
- Make sure to have a stable detector baseline.
- Make sure that fraction tubes are empty or that there is at least enough space for the next fraction.

Using the Fraction Collector

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

Observe the following recommendations on the use of solvents.

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

**Recommended Wash Solvents**

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

**NOTE**

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

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

Disclaimer

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

PEEK

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

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

There is still a number of known incompatibilities with chemicals such as chloroform, methylene chloride, THF, DMSO, strong acids (nitric acid > 10 %, sulphuric acid > 10 %, sulfonic acids, trichloroacetic acid), halogenes or aequous halogen 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 and for normal phase applications in 1260 Infinity pumps.

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

**Tantalum (Ta)**

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

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

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride, and so on) and aqueous solutions of halogens.
- High concentrations of inorganic acids like nitric acid, sulfuric acid and organic solvents especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:
  \[2 \text{CHCl}_3 + \text{O}_2 \rightarrow 2 \text{COCl}_2 + 2 \text{HCl}\]

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

Titanium (Ti)

Titanium is highly resistant to oxidizing acids (for example, nitric, perchloric and hypochlorous acid) over a wide range of concentrations and temperatures. This is due to a thin oxide layer on the surface, which is stabilized by oxidizing compounds. Non-oxidizing acids (for example, hydrochloric, sulfuric and phosphoric acid) can cause slight corrosion, which increases with acid concentration and temperature. For example, the corrosion rate with 3% HCl (about pH 0.1) at room temperature is about 13 μm/year. At room temperature, titanium is resistant to concentrations of about 5% sulfuric acid (about pH 0.3). Addition of nitric acid to hydrochloric or sulfuric acids
significantly reduces corrosion rates. Titanium is sensitive to acidic metal chlorides like FeCl₃ or CuCl₂. 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 (SiO₂)**

Fused silica is used in 1290 Infinity Flow Cells and capillaries. 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 (ZrO₂)**

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)

Fluorinated polymers like PTFE (polytetrafluoroethylene), 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 G1322A, 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.

Sapphire, Ruby and Al₂O₃-based ceramics

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Material</th>
<th>Description</th>
<th>Fitting Left/Fitting Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capillary</td>
<td>Connection capillaries</td>
<td>ST</td>
<td>Stainless steel</td>
<td>W Swagelok + 0.8 mm Port id</td>
</tr>
<tr>
<td>Loop</td>
<td>Loop capillaries</td>
<td>Ti</td>
<td>Titanium</td>
<td>S Swagelok + 1.6 mm Port id</td>
</tr>
<tr>
<td>Seat</td>
<td>Autosampler needle seats</td>
<td>PK</td>
<td>PEEK</td>
<td>M Metric M4 + 0.8 mm Port id</td>
</tr>
<tr>
<td>Tube</td>
<td>Tubing</td>
<td>FS/PK</td>
<td>PEEK-coated fused silica*</td>
<td>E Metric M3 + 1.6 mm Port id</td>
</tr>
<tr>
<td>Heat exchanger</td>
<td>Heat exchanger</td>
<td>PK/ST</td>
<td>Stainless steel-coated PEEK**</td>
<td>U Swagelok union</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PTFE</td>
<td>PTFE</td>
<td>L Long</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FS</td>
<td>Fused silica</td>
<td>X Extra long</td>
</tr>
</tbody>
</table>

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

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

**Figure 7** Syntax for capillary description

---

At-a-glance color-coding keys

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

<table>
<thead>
<tr>
<th>Internal Diameter in mm</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.015</td>
<td>Orange</td>
</tr>
<tr>
<td>0.025</td>
<td>Yellow</td>
</tr>
<tr>
<td>0.05</td>
<td>Beige</td>
</tr>
<tr>
<td>0.075</td>
<td>Black</td>
</tr>
<tr>
<td>0.1</td>
<td>Purple</td>
</tr>
<tr>
<td>0.12</td>
<td>Red</td>
</tr>
<tr>
<td>0.17</td>
<td>Green</td>
</tr>
<tr>
<td>0.20/0.25</td>
<td>Blue</td>
</tr>
<tr>
<td>0.3</td>
<td>Grey</td>
</tr>
<tr>
<td>0.50</td>
<td>Bone White</td>
</tr>
</tbody>
</table>

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

For correct installation of capillary connections of the sampler it's important to choose the correct fittings, see “Capillary Color Coding Guide” on page 61.

<table>
<thead>
<tr>
<th>Parts required</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5067-4650</td>
<td>Capillary ST 0.12 mm x 150 mm SL/SX</td>
</tr>
<tr>
<td></td>
<td>5067-4651</td>
<td>Capillary ST 0.12 mm x 280 mm SL/SX</td>
</tr>
<tr>
<td></td>
<td>5067-4720</td>
<td>Capillary ST 0.17 mm x 150 mm SL/SX</td>
</tr>
<tr>
<td></td>
<td>5067-4722</td>
<td>Capillary ST 0.17 mm x 280 mm SL/SX</td>
</tr>
<tr>
<td></td>
<td>5065-4454</td>
<td>Fitting screw long 10/pk</td>
</tr>
</tbody>
</table>

Quantity depends on configuration of the module (number of connections to the multisampler).

The capillaries mentioned above are examples only.

1. Select a nut that is long enough for the fitting you'll be using.
2. Slide the nut over the end of the tubing.
3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.

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

**NOTE**
Don’t overtighten. Overtightening will shorten the lifetime of the fitting.
5 Once you believe you have the fitting complete, loosen the nut, and inspect the ferrule for the correct position on the tubing.

**Example of a perfect fitting**

<table>
<thead>
<tr>
<th>Ferrule cannot seat properly</th>
<th>Mixing chamber will not seal properly</th>
</tr>
</thead>
<tbody>
<tr>
<td>If dimension X is too long, leaks will occur</td>
<td>If dimension X is too short, a dead volume or mixing chamber will occur</td>
</tr>
</tbody>
</table>

**Figure 8** Examples of incorrect fittings

**NOTE** The first time that the swagelock fitting is used on a column or an injection valve, the position of the ferrule is permanently set. If changing from a column or an injection valve to another, the fitting may leak or decrease the quality of the separation by contributing to band broadening.
Setting up the Fraction Collector with the Instrument Control Interface

Overview

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

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

Instrument Configuration

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

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

![Configuration Screen](image)

Figure 9 Instrument Configuration
Preparing the Fraction Collector

Setting up the Fraction Collector with the Instrument Control Interface

The Fraction Collector configuration parameters are in four sections:

- Communication
- Module List
- Peak Detectors
- Linked Pump

Table 3  Instrument configuration parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong></td>
<td><strong>Communication</strong>: The parameters in this dialog box are detected automatically during autoconfiguration.</td>
</tr>
<tr>
<td></td>
<td>• Device name,</td>
</tr>
<tr>
<td></td>
<td>• Type ID,</td>
</tr>
<tr>
<td></td>
<td>• Button: <strong>Connection settings</strong></td>
</tr>
<tr>
<td><strong>Module List</strong></td>
<td><strong>Module List</strong>:</td>
</tr>
<tr>
<td></td>
<td>• Module identifier (Type ID: Serial number),</td>
</tr>
<tr>
<td></td>
<td>• Device name,</td>
</tr>
<tr>
<td></td>
<td>• Button: <strong>Configure</strong> (Device name, Serial number, Firmware revision)</td>
</tr>
</tbody>
</table>
4 Preparing the Fraction Collector
Setting up the Fraction Collector with the Instrument Control Interface

Table 3 Instrument configuration parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Detectors:</td>
<td></td>
</tr>
<tr>
<td>· Module type:</td>
<td>product number of the peak detector detected during autoconfiguration</td>
</tr>
<tr>
<td>· Serial number:</td>
<td>serial number of the peak detector detected during autoconfiguration</td>
</tr>
<tr>
<td>· Digital trigger: MSD Installed</td>
<td></td>
</tr>
<tr>
<td>· Buttons: Add, Configure (Peak detector), Remove</td>
<td>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.</td>
</tr>
<tr>
<td>Linked Pump:</td>
<td></td>
</tr>
<tr>
<td>· If your system is configured with only one Agilent pump, the pump is detected automatically during autoconfiguration and identified as the linked pump.</td>
<td></td>
</tr>
<tr>
<td>· 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.</td>
<td></td>
</tr>
</tbody>
</table>
Fraction Collector User Interface (Dashboard Panel)

Table 4  Fraction Valve User Interface

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module graphic</strong></td>
<td>The items in the Fraction Collector graphic have the following meaning and function:</td>
</tr>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>Starts manual fraction collection. This button is active only during a run where fraction collection is enabled.</td>
</tr>
<tr>
<td>3</td>
<td>Stops manual fraction collection. This button is active only during a run where fraction collection is enabled.</td>
</tr>
</tbody>
</table>

**Instrument Actuals**

The following fraction collector actuals are displayed:

- **Current location:**
  The fraction location currently in use.

- **Fraction mode:**
  The current fraction mode.

- **Purge Status:**
  The status of the purge procedure.

- **Flush Status:**
  The status of the Flush procedure.
Preparing the Fraction Collector
Setting up the Fraction Collector with the Instrument Control Interface

Table 4  Fraction Valve User Interface

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method...</td>
<td>Displays the Fraction Collector’s Method Setup dialog box.</td>
</tr>
<tr>
<td>Identify Device</td>
<td>Causes the LED on the front of the module to blink for a few seconds.</td>
</tr>
<tr>
<td>Home Arm</td>
<td>Moves the robot arm to its home position.</td>
</tr>
<tr>
<td>Reset Fraction Collector</td>
<td>Sends a reset signal to fraction collector. During the reset, the fraction collector is in a Not Ready state.</td>
</tr>
<tr>
<td>Reset Fraction Volumes</td>
<td>Informs the fraction collector that the collection bottles and waste bottle are all empty.</td>
</tr>
<tr>
<td>Rinse Needle</td>
<td>Displays the Rinse dialog box, which allows you to specify the rinse parameters.</td>
</tr>
<tr>
<td>Modify &gt; Drawer Configuration</td>
<td>Displays the Modify Drawer Configuration dialog box, which allows you to view and (if necessary) modify the drawer configuration of your device.</td>
</tr>
<tr>
<td>Modify &gt; Detector Delay Volumes</td>
<td>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.</td>
</tr>
<tr>
<td>Modify &gt; Linked Pump</td>
<td>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 <strong>None</strong> if the pump that delivers the main flow does not support linking.</td>
</tr>
</tbody>
</table>

*Context Menu*

The context menu of the dashboard panel contains the following commands:

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

**Figure 10** Method settings
Preparing the Fraction Collector

Method Parameter Settings

The Fraction Collector method setup parameters are in eight sections:

- Collection Behavior
- Peak Triggers
- Trigger Combinations
- Stop time
- Posttime
- Advanced
- Timetable
- Fraction Preview

Table 5  Method Parameter Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collection Behavior</strong></td>
<td>Use this setting to either enable or disable the fraction collection parameters of the instrument.</td>
</tr>
<tr>
<td><strong>Peak Triggers</strong></td>
<td>Use the Peak Triggers table to specify the detection settings of the peak detectors available in your system.</td>
</tr>
<tr>
<td><strong>Peak Detection Mode</strong></td>
<td>The following detection modes are available:</td>
</tr>
<tr>
<td>Off</td>
<td>Indicates that the peak detector is not used.</td>
</tr>
<tr>
<td>Slope</td>
<td>Detects peaks based on slope values only.</td>
</tr>
<tr>
<td>Threshold</td>
<td>Detects peaks based on threshold values only.</td>
</tr>
<tr>
<td>Limit Peak Duration</td>
<td>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.</td>
</tr>
<tr>
<td>Max Peak Duration</td>
<td></td>
</tr>
</tbody>
</table>

Limits: |

- **Up slope**: 0.01 – 10000 units/s, **Down slope**: 0.01 – 10000 units/s
- **Threshold**: -10000 – 10000 units, **Upper threshold**: 0.01 – 10000 units
- **Threshold and Slope**: Detects peaks based on both threshold and slope values

- **Max Peak Duration** | You can Limit Peak Duration to stop the fraction collection in cases where the baseline drifts and the signal does not drop below the specified threshold value. |

Limits: 1 – 10000 s
### Trigger Combinations

Use the **Trigger Combinations** to specify how multiple peak triggers are combined to start or stop Fraction Collection.

You can choose that:

- Collection of a fraction is started when all peak detectors have sent a start trigger, and continues until one detector sends a stop trigger (AND condition)
- Collection of a fraction is started when at least one peak detector has sent a start trigger, and continues until all detectors send a stop trigger (OR condition)
- Collection of a fraction is started when all peak detectors have sent a start trigger, and continues until all detectors send a stop trigger (AND condition for start, OR condition for stop)

### Stoptime

Enables you to set a time at which the fraction collector stops an analysis. If the fraction collector is used with other Agilent Modular LC modules, the fraction collector stoptime stops the fraction collector only and does not stop any other modules.

Limits: 0.01 – 99999.00 min or **As Pump/Injector**

### Posttime

You can set the **Posttime** so that your fraction collector remains in the post-run state during the **Posttime** to delay the start of the next analysis. When the **Posttime** has elapsed, the fraction collector is ready for the next analysis.

Limits: 0.01 – 99999.00 min or **Off** (0.0 min)

### Advanced

See “Advanced Settings” on page 74

### Timetable

See “Timetable Settings” on page 76

### 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Trigger Combinations** | Use the Trigger Combinations to specify how multiple peak triggers are combined to start or stop Fraction Collection. You can choose that:  
- Collection of a fraction is started when all peak detectors have sent a start trigger, and continues until one detector sends a stop trigger (AND condition)  
- Collection of a fraction is started when at least one peak detector has sent a start trigger, and continues until all detectors send a stop trigger (OR condition)  
- Collection of a fraction is started when all peak detectors have sent a start trigger, and continues until all detectors send a stop trigger (AND condition for start, OR condition for stop) |
| **Stoptime** | Enables you to set a time at which the fraction collector stops an analysis. If the fraction collector is used with other Agilent Modular LC modules, the fraction collector stoptime stops the fraction collector only and does not stop any other modules. Limits: 0.01 – 99999.00 min or As Pump/Injector |
| **Posttime** | You can set the Posttime so that your fraction collector remains in the post-run state during the Posttime to delay the start of the next analysis. When the Posttime has elapsed, the fraction collector is ready for the next analysis. Limits: 0.01 – 99999.00 min or Off (0.0 min) |
| **Advanced** | See “Advanced Settings” on page 74 |
| **Timetable** | See “Timetable Settings” on page 76 |
| **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

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

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

Figure 11  Advanced settings
### Table 6  Advanced Parameters Description

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delay Settings</strong></td>
<td></td>
</tr>
<tr>
<td>Delay Mode</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td></td>
</tr>
<tr>
<td><strong>Fill Volume Settings</strong></td>
<td></td>
</tr>
<tr>
<td>Max. fill volume per location</td>
<td>as configured</td>
</tr>
<tr>
<td></td>
<td>0.500 mL</td>
</tr>
<tr>
<td><strong>3rd Party Pump Flow</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### Delay Settings

Use the **Delay Settings** table to specify the delay that is applied to a peak trigger signal. You can specify this setting for each peak detector separately. You can choose from:

- **Off** (No delay is applied to fraction collection and collection starts as soon as the trigger conditions are met)
- **As calibrated** (Delays fraction collection by a pre-defined delay volume, where for each peak trigger, the delay volume can be displayed (and edited) using the **Modify Detector Delay Volumes** dialog box, accessed from the context menu of the instrument’s dashboard panel)
- **Use Time** (Enables the **Time** field to allow you to set a delay time)
- **Use Volume** (Enables the **Volume** field to allow you to set a delay volume)

**Delay end of fraction**: An additional delay can be set if you want to delay the end of fraction collection by an additional amount of time. Specify the additional time used to delay the end of fraction collection in seconds.

#### Fill Volume Settings

Use the **Fill Volume Settings** to specify the **Maximum fill volume** used in your method.

#### 3rd Party Pump Flow

If your Fraction Collector is not connected to a Linked Pump, specify a Pump Flow for the Fraction Collection method.

**NOTE**

This section is only visible if there is no Agilent pump recognized.
4 Preparing the Fraction Collector
Method Parameter Settings

Timetable Settings

A timetable entry is crucial to enable any fraction collection.

Figure 12 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 7  Timetable Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fraction Mode</strong></td>
<td></td>
</tr>
<tr>
<td>- <strong>Off</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Time-based, collecting a number of fractions</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Time-based, collecting time slices</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Time-based, collecting volume slices</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Peak-based</strong> (Fractions are collected based on the peak detection settings)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Peak-based, collecting time slices</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Peak-based, collecting volume slices</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Peak-based with time-slice recovery</strong> (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)</td>
<td></td>
</tr>
<tr>
<td>- <strong>Peak-based with volume-slice recovery</strong> (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)</td>
<td></td>
</tr>
</tbody>
</table>
4 Preparing the Fraction Collector

Method Parameter Settings

Table 7 Timetable Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger Settings</td>
<td></td>
</tr>
<tr>
<td>• Trigger Source</td>
<td>(Click the down-arrow and select the trigger source from the drop-down list)</td>
</tr>
<tr>
<td>• Peak Detection Mode</td>
<td>(Click the down-arrow and select the peak detection mode from the drop-down list). You can select from:</td>
</tr>
<tr>
<td></td>
<td>• Slope (Detects peaks based on slope values only)</td>
</tr>
<tr>
<td></td>
<td>Limits:</td>
</tr>
<tr>
<td></td>
<td>• Up Slope: 0.01 – 10000 units/s,</td>
</tr>
<tr>
<td></td>
<td>• Down Slope: 0.01 – 10000 units/s</td>
</tr>
<tr>
<td></td>
<td>• Threshold (Detects peaks based on threshold values only)</td>
</tr>
<tr>
<td></td>
<td>Limits:</td>
</tr>
<tr>
<td></td>
<td>• Threshold: -10000 – 10000 units,</td>
</tr>
<tr>
<td></td>
<td>• Upper Threshold: 0.01 – 10000 units</td>
</tr>
<tr>
<td></td>
<td>• Threshold and Slope (Detects peaks based on both threshold and slope values)</td>
</tr>
<tr>
<td></td>
<td>• Maximum Peak Duration Mode (Click the down-arrow and select the mode from the drop-down list). You can select from:</td>
</tr>
<tr>
<td></td>
<td>• No Timeout (The peak duration has no limit)</td>
</tr>
<tr>
<td></td>
<td>• Use Max Peak Duration (The peak has a maximum duration, set in the Maximum Peak Duration field)</td>
</tr>
</tbody>
</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.
4 Preparing the Fraction Collector
Pooling
5 Troubleshooting and Diagnostics

User Interfaces 82
Agilent Lab Advisor Software 83

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 83.
- 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.
5 Troubleshooting and Diagnostics
Agilent Lab Advisor Software
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.

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Suggested actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  The analysis was completed successfully, and the timeout function switched off the module as requested.</td>
<td>Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.</td>
</tr>
<tr>
<td>2  A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.</td>
<td>Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.</td>
</tr>
</tbody>
</table>
Error Information
General Error Messages

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.

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

1. Not-ready condition in one of the instruments connected to the remote line.

2. Defective remote cable.

3. Defective components in the instrument showing the not-ready condition.

Suggested actions

1. Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.

2. Exchange the remote cable.

3. 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.

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Suggested actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  CAN cable disconnected.</td>
<td>• Ensure all the CAN cables are connected correctly.</td>
</tr>
<tr>
<td></td>
<td>• Ensure all CAN cables are installed correctly.</td>
</tr>
<tr>
<td>2  Defective CAN cable.</td>
<td>Exchange the CAN cable.</td>
</tr>
<tr>
<td>3  Defective main board in another module.</td>
<td>Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.</td>
</tr>
</tbody>
</table>
## 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.

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Suggested actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Defective leak sensor.</td>
<td>Exchange the leak sensor.</td>
</tr>
<tr>
<td>2 Leak sensor incorrectly routed, being pinched by a metal component.</td>
<td>• Make sure the leak sensor is installed correctly.</td>
</tr>
<tr>
<td></td>
<td>• Correct the routing of the cable.</td>
</tr>
<tr>
<td></td>
<td>• If cable defective, exchange the leak sensor.</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Suggested actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Leak sensor not connected to the main board.</td>
<td>Ensure the leak sensor is connected correctly.</td>
</tr>
<tr>
<td>2 Defective leak sensor.</td>
<td>Exchange the leak sensor.</td>
</tr>
<tr>
<td>3 Leak sensor incorrectly routed, being pinched by a metal component.</td>
<td>Exchange the leak sensor.</td>
</tr>
</tbody>
</table>
Error Information

General Error Messages

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.
Fan Failed

Error ID: 0068

The cooling fan in the module has failed.

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

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

Probable cause Suggested actions
1 Fan cable disconnected. Ensure the fan is connected correctly.
2 Defective fan. Exchange fan.
3 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.
6 Error Information
General Error Messages
This chapter describes the maintenance of the module.
Introduction to Maintenance

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

**NOTE**

There are no serviceable parts inside.
Do not open the module.
Warnings and Cautions

**WARNING**

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

Risk of stroke and other personal injury. Repair work at the module can lead to personal injuries, e.g. shock hazard, when the module cover is opened and the instrument is connected to power.

➔ Never perform any adjustment, maintenance or repair of the module with the top cover removed and with the power cord plugged in.

➔ The security lever at the power input socket prevents that the module cover is taken off when line power is still connected. Never plug the power line back in when cover is removed.

**WARNING**

Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

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

**WARNING**

➔ Regularly inspect the inlet / waste tubing assembly and the valve to needle tubing and exchange them if they are worn out or show visible signs of damage.
Warnings and Cautions

**WARNING**

Toxic, flammable and hazardous solvents, samples and reagents

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

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

➔ The volume of substances should be reduced to the minimum required for the analysis.

➔ Do not operate the instrument in an explosive atmosphere.

**CAUTION**

Electronic boards and components are sensitive to electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ Be sure to hold the board by the edges, and do not touch the electrical components. Always use ESD protection (for example, an ESD wrist strap) when handling electronic boards and components.

**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.
Cleaning the Module

To keep the module case clean, use a soft cloth slightly dampened with water, or a solution of water and mild detergent.

**WARNING**

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

➔ Do not use an excessively damp cloth during cleaning.

➔ Drain all solvent lines before opening any connections in the flow path.
Overview of Maintenance

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

Table 8  Overview of maintenance procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Typical Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacing the Inlet / Waste tubings</td>
<td>When worn out, when showing visual signs of damage, typically once per year.</td>
<td>See “Replace Inlet/Waste Tubings” on page 49</td>
</tr>
</tbody>
</table>
Install and Remove the Top Fume Hood

See chapter Parts for details.

<table>
<thead>
<tr>
<th>Parts required</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G9321-68200</td>
<td>Top Fume Hood Kit</td>
<td></td>
</tr>
</tbody>
</table>

1. Install the exhaust sheet by fixing the four screws to the fraction collector.
2. Push the top fume hood into the recession.
3. Close the top fume hood.
4. Swing up the fume hood against the mechanical stop.
7 Maintenance
Install and Remove the Top Fume Hood

5. Remove the fume hood by pulling it toward you.

6. Remove the screws fixing the exhaust sheet to the fraction collector, then remove the exhaust sheet.
Clean the Leak Pan

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

1. Pull the release knobs on both sides at the front of the guide support assembly.
2. Open the guide support assembly (1.) and fix it at the back with the spring-loaded pin (2.).
3. Clean the leak pan.

Next Steps:
4. Release the spring-loaded pin and lower the guide support into its original position.
5. If the release knobs do not snap in, slightly turn them.

NOTE
Don’t touch or clean the RFID antennas on the back side (lower side) of the guide support assembly.
Prepare the Module for Transportation

When

- For transportation within the laboratory
- For shipping the module

Parts required

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Foam</td>
</tr>
<tr>
<td>Shipping Block</td>
</tr>
<tr>
<td>Screw M3</td>
</tr>
</tbody>
</table>

Preparations

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

1. Insert the transportation foam to the rear panel.
2. Push the transportation foam down to the rinse port.
3. Using "Single Steps" from the Service and Diagnostics section in Lab Advisor, move the robotics to the park position.

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

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

6. Fix the shipping bolt with the M3 screw.

7. For shipping the module to another location, position the module in the transportation box and fix it correctly.
Replace the Module Firmware

When

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

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

Tools required

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agilent Lab Advisor software</td>
</tr>
<tr>
<td>OR Instant Pilot G4208A</td>
</tr>
<tr>
<td>(only if supported by module)</td>
</tr>
</tbody>
</table>

Parts required

<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Firmware, tools and documentation from Agilent web site</td>
</tr>
</tbody>
</table>

Preparations

Read update documentation provided with the Firmware Update Tool.

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

1. Download the required module firmware, the latest FW Update Tool and the documentation from the Agilent web.

2. For loading the firmware into the module follow the instructions in the documentation.

Module Specific Information

There is no specific information for this module.
8 Parts for Maintenance and Repair

Supported Containers  108
List of Recommended Fraction Tubes  109
Fraction Collector Accessory Kit  110
Tubing Kits  111
Top Fume Hood Kit  113

This chapter provides information on parts for maintenance and repair.
**Supported Containers**

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G9321-60015</td>
<td>Tube Container for 30 mm x 150 mm tubes, ambient, 10 tubes</td>
</tr>
<tr>
<td>G9321-60058</td>
<td>Tube Container for 30 mm x 100 mm tubes, ambient, 10 tubes</td>
</tr>
<tr>
<td>G9321-60025</td>
<td>Tube Container for 25 mm x 150 mm tubes, ambient, 18 tubes</td>
</tr>
<tr>
<td>G9321-60035</td>
<td>Tube Container for 25 mm x 100 mm tubes, ambient, 18 tubes</td>
</tr>
<tr>
<td>G9321-60129</td>
<td>Tube Container for 16 mm x 150 mm tubes, ambient, 36 tubes</td>
</tr>
<tr>
<td>G9321-60055</td>
<td>Tube Container for 16 mm x 100 mm tubes, ambient, 36 tubes</td>
</tr>
<tr>
<td>G9321-60131</td>
<td>Tube Container for 12 mm x 150 mm tubes, ambient, 72 tubes</td>
</tr>
<tr>
<td>G9321-60045</td>
<td>Tube Container for 12 mm x 100 mm tubes, ambient, 72 tubes</td>
</tr>
</tbody>
</table>
List of Recommended Fraction Tubes

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5190-9090</td>
<td>Fraction Tubes 150 mm x 30 mm, 78 mL (pack of 100) fits with p/n G9321-60015</td>
</tr>
<tr>
<td>5042-6458</td>
<td>Fraction Tubes 100 mm x 30 mm, 50 mL (pack of 100) fits with p/n G9321-60058</td>
</tr>
<tr>
<td>5190-9091</td>
<td>Fraction Tubes 150 mm x 25 mm, 55 mL (pack of 100) fits with p/n G9321-60025</td>
</tr>
<tr>
<td>5042-6459</td>
<td>Fraction Tubes 100 mm x 25 mm, 35 mL (pack of 100) fits with p/n G9321-60035</td>
</tr>
<tr>
<td>5190-9092</td>
<td>Fraction Tubes 150 mm x 16 mm, 21 mL (pack of 250) fits with p/n G9321-60129</td>
</tr>
<tr>
<td>5022-6532</td>
<td>Fraction Tubes 100 mm x 16 mm, 14 mL (pack of 250) fits with p/n G9321-60055</td>
</tr>
<tr>
<td>5190-9093</td>
<td>Fraction Tubes 150 mm x 12 mm, 11 mL (pack of 250) fits with p/n G9321-60131</td>
</tr>
<tr>
<td>5022-6531</td>
<td>Fraction Tubes 100 mm x 12 mm, 7 mL (pack of 250) fits with p/n G9321-60045</td>
</tr>
</tbody>
</table>
8 Parts for Maintenance and Repair
Fraction Collector Accessory Kit

Fraction Collector Accessory Kit

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G9321-68002</td>
<td>Fraction Collector Accessory Kit</td>
</tr>
</tbody>
</table>
Tubing Kits

Tubing Kit G9321-60951

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

<table>
<thead>
<tr>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G9321-40081</td>
<td>Delay Sensor Clip</td>
</tr>
<tr>
<td>1</td>
<td>G9321-40000</td>
<td>Tube Holder</td>
</tr>
<tr>
<td>1</td>
<td>1819-1008</td>
<td>IC 1K-Bit EEPROM Serial-1-wire 2-SFN</td>
</tr>
<tr>
<td>1</td>
<td>5023-2878</td>
<td>2 m Tubing ESD PTFE (OD2/ID1.2)</td>
</tr>
<tr>
<td>1</td>
<td>5023-2636</td>
<td>2 m Tubing ESD PTFE (OD2.5/OD1.6)</td>
</tr>
<tr>
<td>2</td>
<td>5023-2871</td>
<td>Fitting 1/4-28 for Tube-OD 2.5 mm ESD-PEEK</td>
</tr>
<tr>
<td>2</td>
<td>5023-2872</td>
<td>Fitting 1/4-28 for Tube-OD 2.0 mm ESD-PEEK</td>
</tr>
<tr>
<td>1</td>
<td>5043-1471</td>
<td>Fitting Handle</td>
</tr>
<tr>
<td>5</td>
<td>G9321-20052</td>
<td>Tubing Segment</td>
</tr>
<tr>
<td>1</td>
<td>G9321-87712</td>
<td>Label Tubing IN ID1.2</td>
</tr>
<tr>
<td>1</td>
<td>G9321-87716</td>
<td>Label Tubing Out To Waste</td>
</tr>
</tbody>
</table>
Tubing Kit G9321-60952

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

<table>
<thead>
<tr>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G9321-40081</td>
<td>Delay Sensor Clip</td>
</tr>
<tr>
<td>1</td>
<td>G9321-40000</td>
<td>Tube Holder</td>
</tr>
<tr>
<td>1</td>
<td>1819-1008</td>
<td>IC 1K-Bit EEPROM Serial-1-wire 2-SFN</td>
</tr>
<tr>
<td>1</td>
<td>5023-2637</td>
<td>2 m Tubing ESD PTFE (OD1.6/ID0.8)</td>
</tr>
<tr>
<td>1</td>
<td>5023-2636</td>
<td>2 m Tubing ESD PTFE (OD2.5/OD1.6)</td>
</tr>
<tr>
<td>2</td>
<td>5023-2871</td>
<td>Fitting 1/4-28 for Tube-OD 2.5 mm ESD-PEEK</td>
</tr>
<tr>
<td>2</td>
<td>5023-2874</td>
<td>Fitting 1/4-28 for Tube-OD 1.6 mm ESD-PEEK</td>
</tr>
<tr>
<td>1</td>
<td>5043-1471</td>
<td>Fitting Handle</td>
</tr>
<tr>
<td>5</td>
<td>G9321-20052</td>
<td>Tubing Segment</td>
</tr>
<tr>
<td>1</td>
<td>G9321-87708</td>
<td>Label Tubing IN ID0.8</td>
</tr>
<tr>
<td>1</td>
<td>G9321-87716</td>
<td>Label Tubing Out To Waste</td>
</tr>
</tbody>
</table>
## Top Fume Hood Kit

<table>
<thead>
<tr>
<th>Item</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G9321-60830</td>
<td>Top Fume Hood</td>
</tr>
<tr>
<td>2</td>
<td>0515-1753</td>
<td>SCREW-MACH-M3X0.5-8MM-LG-PAN-HD</td>
</tr>
<tr>
<td>3</td>
<td>G9321-00100</td>
<td>Exhaust Sheet</td>
</tr>
<tr>
<td>4</td>
<td>G1364-03201</td>
<td>Exhaust Tube Adapter</td>
</tr>
<tr>
<td>5</td>
<td>5067-5406</td>
<td>Screw Tx20, M4 x 8 mm</td>
</tr>
</tbody>
</table>

---

**Figure 13**  Top Fume Hood Kit
8 Parts for Maintenance and Repair
Top Fume Hood Kit
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

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>35900-60750</td>
<td>Agilent 35900A A/D converter</td>
</tr>
<tr>
<td>01046-60105</td>
<td>Analog cable (BNC to general purpose, spade lugs)</td>
</tr>
</tbody>
</table>

## Remote cables

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

## CAN cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5181-1516</td>
<td>CAN cable, Agilent module to module, 0.5 m</td>
</tr>
<tr>
<td>5181-1519</td>
<td>CAN cable, Agilent module to module, 1 m</td>
</tr>
</tbody>
</table>
### LAN cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5023-0203</td>
<td>Cross-over network cable, shielded, 3 m (for point to point connection)</td>
</tr>
<tr>
<td>5023-0202</td>
<td>Twisted pair network cable, shielded, 7 m (for point to point connection)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232-61601</td>
<td>RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It’s also called &quot;Null Modem Cable&quot; 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.</td>
</tr>
<tr>
<td>5181-1561</td>
<td>RS-232 cable, 8 m</td>
</tr>
</tbody>
</table>

### USB cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5188-8050</td>
<td>USB A M-USB Mini B 3 m (PC-Module)</td>
</tr>
<tr>
<td>5188-8049</td>
<td>USB A F-USB Mini B M OTG (Module to Flash Drive)</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>p/n 35900-60750</th>
<th>35900 Pin Agilent module</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Not connected</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Shield</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Center</td>
</tr>
</tbody>
</table>
### Agilent Module to BNC Connector

<table>
<thead>
<tr>
<th>p/n</th>
<th>Pin BNC</th>
<th>Pin Agilent Module</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>8120-1840</td>
<td>Shield</td>
<td>Shield</td>
<td>Analog -</td>
</tr>
<tr>
<td></td>
<td>Center</td>
<td>Center</td>
<td>Analog +</td>
</tr>
</tbody>
</table>

### Agilent Module to General Purpose

<table>
<thead>
<tr>
<th>p/n</th>
<th>Pin</th>
<th>Pin Agilent Module</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01046-60105</td>
<td>1</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Black</td>
<td>Analog -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Red</td>
<td>Analog +</td>
</tr>
</tbody>
</table>
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)

<table>
<thead>
<tr>
<th>p/n 5188-8029</th>
<th>pin</th>
<th>Color code</th>
<th>Enhanced Remote</th>
<th>Classic Remote</th>
<th>Active (TTL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>white</td>
<td>IO1</td>
<td>START REQUEST</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>brown</td>
<td>IO2</td>
<td>STOP</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>green</td>
<td>IO3</td>
<td>READY</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>yellow</td>
<td>IO4</td>
<td>POWER ON</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>grey</td>
<td>IO5</td>
<td>NOT USED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>pink</td>
<td>IO6</td>
<td>SHUT DOWN</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>blue</td>
<td>IO7</td>
<td>START</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>red</td>
<td>IO8</td>
<td>PREPARE</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>black</td>
<td>1wire DATA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>violet</td>
<td>DGND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>grey-pink</td>
<td>+5V ERI out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>red-blue</td>
<td>PGND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>white-green</td>
<td>PGND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>brown-green</td>
<td>+24V ERI out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>white-yellow</td>
<td>+24V ERI out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>yellow-brown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- 5188-8045 ERI to APG (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG))

<table>
<thead>
<tr>
<th>p/n 5188-8045</th>
<th>Pin (ERI)</th>
<th>Signal</th>
<th>Pin (APG)</th>
<th>Active (TTL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>GND</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Start Request</td>
<td>9</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Stop</td>
<td>8</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ready</td>
<td>7</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Power on</td>
<td>6</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Future</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Shut Down</td>
<td>4</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Start</td>
<td>3</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Prepare</td>
<td>2</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Ground</td>
<td>Cable Shielding</td>
<td>NC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Identifying Cables
Remote Cables

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

Table 9  5188-8057 ERI to APG and RJ45

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

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

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

### Agilent Module to General Purpose

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

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

CAN Cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5181-1516</td>
<td>CAN cable, Agilent module to module, 0.5 m</td>
</tr>
<tr>
<td>5181-1519</td>
<td>CAN cable, Agilent module to module, 1 m</td>
</tr>
</tbody>
</table>

LAN Cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5023-0203</td>
<td>Cross-over network cable, shielded, 3 m (for point to point connection)</td>
</tr>
<tr>
<td>5023-0202</td>
<td>Twisted pair network cable, shielded, 7 m (for point to point connection)</td>
</tr>
</tbody>
</table>
# RS-232 Cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232-61601</td>
<td>RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It’s also called &quot;Null Modem Cable&quot; 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.</td>
</tr>
<tr>
<td>5181-1561</td>
<td>RS-232 cable, 8 m</td>
</tr>
</tbody>
</table>
To connect a USB Flash Drive use a USB OTG cable with Mini-B plug and A socket.

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5188-8050</td>
<td>USB A M-USB Mini B 3 m (PC-Module)</td>
</tr>
<tr>
<td>5188-8049</td>
<td>USB A F-USB Mini B M OTG (Module to Flash Drive)</td>
</tr>
</tbody>
</table>
10 Hardware Information

Firmware Description 128
Electrical Connections 131
  Serial Number Information (ALL) 132
  Rear View of the Module 133
Interfaces 134
  Overview Interfaces 136
  ERI (Enhanced Remote Interface) 139
  USB (Universal Serial Bus) 141
Setting the 6-bit Configuration Switch 142
  Special Settings 144
Early Maintenance Feedback 146
Instrument Layout 147

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

The firmware of the instrument consists of two independent sections:

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

**Resident System**

This resident section of the firmware is identical for all Agilent 1100/1200/1220/1260/1290 series modules. Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS-232C)
- memory management
- ability to update the firmware of the 'main system'

**Main System**

Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS-232C)
- memory management
- ability to update the firmware of the 'resident system'

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG remote,
- error handling,
- diagnostic functions,
- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.
Firmware Updates

Firmware updates can be done using the following tools (latest version should be used):

- Agilent Lab Advisor software with files on the hard disk (*)
- Firmware Update Tool with local files on the hard disk (*)
- Instant Pilot (G4208A) with files on a USB Flash Disk

(*) Required tools, firmware and documentation are available from the Agilent web: http://www.agilent.com/en-us/firmwareDownload?whid=69761

The file naming conventions are:

`PPPP_RVVV_XXX.dlb`, where

- `PPPP` is the product number, for example, 1315B for the G1315B DAD,
- `R` is the firmware revision, for example, A for G1315B or B for the G1315C DAD,
- `VVV` is the revision number, for example 650 is revision 6.50,
- `XXX` is the build number of the firmware.

For instructions on firmware updates refer to section Replacing Firmware in chapter "Maintenance" or use the documentation provided with the Firmware Update Tools.

**NOTE**

Update of main system can be done in the resident system only. Update of the resident system can be done in the main system only.

Main and resident firmware must be from the same set.
**Firmware Description**

Some modules are limited in downgrading due to their main board version or their initial firmware revision. For example, a G1315C DAD SL cannot be downgraded below firmware revision B.01.02 or to A.xx.xx.

Some modules can be re-branded (e.g. G1314C to G1314B) to allow operation in specific control software environments. In this case the feature set of the target type are use and the feature set of the original are lost. After re-branding (e.g. from G1314B to G1314C), the original feature set is available again.

All these specific informations are described in the documentation provided with the firmware update tools.

The firmware update tools, firmware and documentation are available from the Agilent web.

Electrical Connections

- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.

- The ERI/REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shutdown, prepare, and so on.

- With the appropriate software, the LAN connector may be used to control the module from a computer through a LAN connection. This connector is activated and can be configured with the configuration switch.

- With the appropriate software, the USB connector may be used to control the module from a computer through a USB connection.

- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses because automatic electronic fuses are implemented in the power supply.

**NOTE**

Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.
Serial Number Information (ALL)

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

CCXZZ00000 Format

CC Country of manufacturing
• DE = Germany
• JP = Japan
• CN = China

X Alphabetic character A-Z (used by manufacturing)

ZZ Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)

00000 Serial number
Rear View of the Module

Figure 15  Rear view of the fraction collector
## Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

<table>
<thead>
<tr>
<th>Table 10</th>
<th>Agilent InfinityLab LC Series Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module</strong></td>
<td><strong>CAN</strong></td>
</tr>
<tr>
<td><strong>Pumps</strong></td>
<td></td>
</tr>
<tr>
<td>G7104A/C Flexible Pump</td>
<td>2</td>
</tr>
<tr>
<td>G7110B Isocratic Pump</td>
<td>2</td>
</tr>
<tr>
<td>G7111A/B Quaternary Pump</td>
<td>2</td>
</tr>
<tr>
<td>G7112B Binary Pump</td>
<td>2</td>
</tr>
<tr>
<td>G7120A High Speed Pump</td>
<td>2</td>
</tr>
<tr>
<td>G7161A Preparative Binary Pump</td>
<td>2</td>
</tr>
<tr>
<td><strong>Samplers</strong></td>
<td></td>
</tr>
<tr>
<td>G7129A/B/C Vialsampler</td>
<td>2</td>
</tr>
<tr>
<td>G7167B/C Multisampler</td>
<td>2</td>
</tr>
<tr>
<td>G7157A Preparative AutoSampler</td>
<td>2</td>
</tr>
<tr>
<td><strong>Detectors</strong></td>
<td></td>
</tr>
<tr>
<td>G7114A/B VWD</td>
<td>2</td>
</tr>
<tr>
<td>G7115A DAD</td>
<td>2</td>
</tr>
<tr>
<td>G7117A/B/C DAD</td>
<td>2</td>
</tr>
<tr>
<td>G7121A/B FLD</td>
<td>2</td>
</tr>
<tr>
<td>G7162A/B RID</td>
<td>2</td>
</tr>
<tr>
<td>G7165A MWD</td>
<td>2</td>
</tr>
<tr>
<td><strong>Fraction Collectors</strong></td>
<td></td>
</tr>
<tr>
<td>G7159B FC</td>
<td>2</td>
</tr>
<tr>
<td>G7166A VFC</td>
<td>2</td>
</tr>
<tr>
<td>G1364E/F FC</td>
<td>2</td>
</tr>
</tbody>
</table>
**Hardware Information**

**Interfaces**

<table>
<thead>
<tr>
<th>Module</th>
<th>CAN</th>
<th>USB</th>
<th>LAN (on-board)</th>
<th>RS-232</th>
<th>Analog</th>
<th>APG (A) / ERI (E)</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G7116A/B MCT</td>
<td>2</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Requires a HOST module via CAN</td>
</tr>
<tr>
<td>G7122A Degasser</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>G7170B MS Flow Modulator</td>
<td>2</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card</td>
</tr>
</tbody>
</table>

**NOTE**

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

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

**CAN**

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

**LAN**

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

**NOTE**

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

**USB**

The USB interface replaces the RS-232 Serial interface in new FUSION generation modules. For details on USB refer to “USB (Universal Serial Bus)” on page 141.

**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).
**Interfaces**

**Special Interfaces**

There is no special interface for this module.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>START REQUEST</td>
<td>(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.</td>
</tr>
<tr>
<td>2</td>
<td>STOP</td>
<td>(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.</td>
</tr>
<tr>
<td>3</td>
<td>READY</td>
<td>(H) System is ready for next analysis. Receiver is any sequence controller.</td>
</tr>
<tr>
<td>4</td>
<td>POWER ON</td>
<td>(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>6</td>
<td>SHUT DOWN</td>
<td>(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.</td>
</tr>
<tr>
<td>7</td>
<td>START</td>
<td>(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.</td>
</tr>
<tr>
<td>8</td>
<td>PREPARE</td>
<td>(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.</td>
</tr>
</tbody>
</table>
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 1200 Infinity II 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 16  Location of the ERI interface (example shows a G7114A/B VWD)
## Hardware Information

### Interfaces

#### 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).

![D-Sub female 15way user's view to connector](image)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Enhanced Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IO 1 (START REQUEST)</td>
</tr>
<tr>
<td>2</td>
<td>IO 2 (STOP)</td>
</tr>
<tr>
<td>3</td>
<td>IO 3 (READY)</td>
</tr>
<tr>
<td>4</td>
<td>IO 4 (POWER ON)</td>
</tr>
<tr>
<td>5</td>
<td>IO 5 (NOT USED)</td>
</tr>
<tr>
<td>6</td>
<td>IO 6 (SHUT DOWN)</td>
</tr>
<tr>
<td>7</td>
<td>IO 7 (START)</td>
</tr>
<tr>
<td>8</td>
<td>IO 8 (PREPARE)</td>
</tr>
<tr>
<td>9</td>
<td>1 wire DATA</td>
</tr>
<tr>
<td>10</td>
<td>DGND</td>
</tr>
<tr>
<td>11</td>
<td>+5 V ERI out</td>
</tr>
<tr>
<td>12</td>
<td>PGND</td>
</tr>
<tr>
<td>13</td>
<td>PGND</td>
</tr>
<tr>
<td>14</td>
<td>+24 V ERI out</td>
</tr>
<tr>
<td>15</td>
<td>+24 V ERI out</td>
</tr>
</tbody>
</table>
**5V Distribution (Future Use)**

- Available directly after turn on/off the hosting module (assures that certain base functionality of the device can be detected by firmware).
- For digital circuits or similar.
- Provided 500 mA maximum.
- Short-circuit proof with automatic switch off (by firmware).

**24V Distribution (Future Use)**

- Available by firmware command (defined turn on/off).
- For devices that need higher power
  - Class 0: 0.5 A maximum (12 W)
  - Class 1: 1.0 A maximum (24 W)
  - Class 2: 2.0 A maximum (48 W)
- Class depends on hosting module’s internal power overhead.
- If a connected device requires more power the firmware detects this (overcurrent detection) and provides the information to the user interface.
- Fuse used for safety protection (on board).
- Short circuit will be detected through hardware.

**USB (Universal Serial Bus)**

USB (Universal Serial Bus) - replaces RS232, supports:
- a PC with control software (for example Agilent Lab Advisor)
- USB Flash Disk
Setting the 6-bit Configuration Switch

The 6-bit configuration switch is located at the rear of the module with FUSION electronics. Switch settings provide configuration parameters for LAN and instrument specific initialization procedures.

All modules with FUSION electronics:

- Default is ALL switches DOWN (best settings).
  - Default IP address for LAN 192.168.254.11
- For specific LAN modes switches 4-5 must be set as required.
- For boot resident/cold start modes switches 1+2 or 6 must be UP.

![Configuration switch](image-url)
## Table 12  6-bit Configuration Switch

<table>
<thead>
<tr>
<th>Mode</th>
<th>Switch 1</th>
<th>Switch 2</th>
<th>Switch 3</th>
<th>Switch 4</th>
<th>Switch 5</th>
<th>Switch 6</th>
<th>Function/Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COM</strong>(^1)</td>
<td>0</td>
<td>n.a.(^2)</td>
<td>n.a.</td>
<td><strong>LAN Init Mode</strong></td>
<td>n.a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use Default IP Address(^3)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Use Stored IP Address</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Use DHCP to request IP Address(^4)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>1</td>
<td><strong>System</strong></td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td><strong>ColdStart</strong></td>
<td></td>
</tr>
<tr>
<td>Boot Main System / Keep Data</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Boot Resident System / Keep Data</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Boot Main System / Revert to Default Data</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Boot Resident System / Revert to Default Data</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

1. When selecting mode **COM**, settings are stored to non-volatile memory. When selecting mode **TEST**, **COM** settings are taken from non-volatile memory.

2. **not assigned** - Always keep these switches on position ’0’ (off)

3. Default IP Address is 192.168.254.11

4. Host Name will be the MAC address.
Special Settings

Boot-Resident/Main

Firmware update procedures may require this mode in case of firmware loading errors (main/resident firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident/main mode. In resident mode, it is not operable as a module. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Forced Cold Start

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

- Boot Main System / Revert to Default Data
  The instrument will boot to main mode and changes to the module’s default parameter. May be also required to load resident firmware into the module.

- Boot Resident System / Revert to Default Data
  The instrument will boot to resident mode and changes to the module’s default parameter. May be also required to load main firmware into the module.

CAUTION

Loss of data

Forced cold start erases all methods and data stored in the non-volatile memory. Exceptions are calibration settings, diagnosis and repair log books which will not be erased.

Save your methods and data before executing a forced cold start.

If you use the following switch settings and power the instrument up again, it will start as described above.
### Setting the 6-bit Configuration Switch

#### Table 13  Boot Resident / Forced Coldstart

<table>
<thead>
<tr>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
<th>SW4</th>
<th>SW5</th>
<th>SW6</th>
<th>Init Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Boot Main System / Keep Data</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Boot Resident System / Keep Data</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Boot Main System / Revert to Default Data</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Boot Resident System / Revert to Default Data</td>
</tr>
</tbody>
</table>

Note: The setting '0' (down) is essential.
Early Maintenance Feedback

Maintenance requires the exchange of components which are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the module and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

EMF counters increment with use and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Some counters can be reset to zero after the required maintenance procedure.

Using the EMF Counters

The user-settable EMF limits for the EMF Counters enable the early maintenance feedback to be adapted to specific user requirements. The useful maintenance cycle is dependent on the requirements for use. Therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially the default EMF limits should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by the EMF counters. Enter these values (or values slightly less than the displayed values) as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.
Instrument Layout

The industrial design of the module incorporates several innovative features. It uses Agilent’s E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers of foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.
10 Hardware Information
Instrument Layout
11 Appendix

General Safety Information 150
General Safety Information 150
Safety Standards 150
General 150
Before Applying Power 151
Ground the Instrument 151
Do Not Operate in an Explosive Atmosphere 152
Do Not Remove the Instrument Cover 152
Do Not Modify the Instrument 152
In Case of Damage 152
Solvents 153
Safety Symbols 154
Waste Electrical and Electronic Equipment Directive 156
Radio Interference 157
Sound Emission 158
Agilent Technologies on Internet 159

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 154.

---

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.
Appendix

General Safety Information

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.

➔ Reduce the volume of substances to the minimum required for the analysis.

➔ Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.

➔ Ground the waste container.

➔ Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.

➔ To achieve maximal safety, regularly check the tubing for correct installation.

---

**NOTE**

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

**Table 14  Symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>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.</td>
</tr>
<tr>
<td>⚡</td>
<td>Indicates dangerous voltages.</td>
</tr>
<tr>
<td>⬇️</td>
<td>Indicates a protected ground terminal.</td>
</tr>
<tr>
<td>🔥</td>
<td>The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.</td>
</tr>
<tr>
<td>☀️</td>
<td>Cooling unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.</td>
</tr>
<tr>
<td>☐</td>
<td>Confirms that a manufactured product complies with all applicable European Community directives. The European Declaration of Conformity is available at: <a href="http://regulations.corporate.agilent.com/DoC/search.htm">http://regulations.corporate.agilent.com/DoC/search.htm</a></td>
</tr>
<tr>
<td>📜</td>
<td>Manufacturing date.</td>
</tr>
<tr>
<td>⚥</td>
<td>Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the power switch is in the Off position.</td>
</tr>
<tr>
<td>💥</td>
<td>Pacemaker Magnets could affect the functioning of pacemakers and implanted heart defibrillators. A pacemaker could switch into test mode and cause illness. A heart defibrillator may stop working. If you wear these devices keep at least 55 mm distance to magnets. Warn others who wear these devices from getting too close to magnets.</td>
</tr>
</tbody>
</table>
Magnetic field
Magnets produce a far-reaching, strong magnetic field. They could damage TVs and laptops, computer hard drives, credit and ATM cards, data storage media, mechanical watches, hearing aids and speakers. Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.

Indicates a pinching or crushing hazard

Indicates a piercing or cutting hazard.

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

➔ Do not proceed beyond a caution until you have fully understood and met the indicated conditions.
Waste Electrical and Electronic Equipment Directive

Abstract


NOTE

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

Product Category:

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

NOTE

Do not dispose of in domestic household waste

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

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

Test and Measurement

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

Manufacturer’s Declaration

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

This product has a sound pressure emission (at the operator position) < 70 dB.
• Sound Pressure Lp < 70 dB (A)
• At Operator Position
• Normal Operation
• According to ISO 7779:1988/EN 27779/1991 (Type Test)
Agilent Technologies on Internet

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

http://www.agilent.com
Index

A
Agilent Lab Advisor software 83
Agilent Lab Advisor 83
Agilent on internet 159
ambient non-operating temperature 21
ambient operating temperature 21
analog signal 136

B
bench space 20

cable
CAN 124
LAN 124
overview 116
RS-232 125
cables
analog 118
remote 120
CAN cable 124
capillary connections installing 62

cleaning 99
coding
color 61
guide 61
color coding 61
guide 61
compensation sensor open 92
compensation sensor short 92

condensation 20

D
delay evaluation 32
dimensions 21


electrical connections
descriptions of 131
electronic waste 156
electrostatic discharge (ESD) 98
EMF
early maintenance feedback 146
error messages
compensation sensor open 92
compensation sensor short 92
fan failed 93
leak sensor open 91
leak sensor short 91
leak 93
lost CAN partner 90
remote timeout 89
shutdown 88
timeout 87
evaluation 32

F
fan failed 93
firmware
description 128
main system 128
resident system 128
update tool 129
updates 129, 106

G
general error messages 87
guide
coding 61
color 61

H
humidity 21

I
installation
bench space 20
installing
capillary connections 62
instrument layout 147
interfaces 82
Infinity II 134
internet 159

L
LAN
cable 124
leak sensor open 91
leak sensor short 91
leak 93
line frequency 21
line voltage 21
lost CAN partner 90

upgrade/downgrade 106
frequency range 21
M
maintenance
  definition of 96
  feedback 146
  replacing firmware 106
message
  remote timeout 89
module firmware
  replace 106

N
non-operating altitude 21
non-operating temperature 21

O
operating Altitude 21
operating temperature 21
overview
  cable 116

P
physical specifications 21
  power consideration 18
  power consumption 21
  power cords 19

R
radio interference 157
remote (ERI) 137
remote
cables 120
reparis
  replacing firmware 106
RS-232C
  cable 125

S
safety
  general information 150
  standards 21
  symbols 154
serial number
  information 132
shutdown 88
site requirements
  power cords 19
sound emission 158
special interfaces 138
special settings
  boot main 144
  boot-resident 144
specification
  physical 21

T
temperature sensor 93
timeout 87
troubleshooting
  error messages 86

U
USB 136

V
voltage range 21

W
waste
  electrical and electronic equipment 156
WEEE directive 156
weight 21
In This Book

This manual contains technical reference information about the Agilent 1290 Infinity II Preparative Open-Bed Fraction Collector (G7159B). The manual describes the following:

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