



Agilent 1290 Infinity Multisampler

User Manual



Agilent Technologies

Notices

© Agilent Technologies, Inc. 2014

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

G7167-90000

Edition

08/2014

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 covers the Agilent 1290 Infinity Multisampler (G7167B).

1 Introduction

This chapter gives an introduction to the Multisampler.

2 Site Requirements and Specifications

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

3 Using the Module

This chapter explains the essential operational parameters of the module.

4 Preparing the module

This chapter explains the operational parameters of the module.

5 Optimizing Performance

This chapter gives hints on how to optimize the performance or use additional devices.

6 Troubleshooting and Diagnostics

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

7 Error Information

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

8 Test Functions

This chapter describes the built in test functions.

9 Maintenance

This chapter describes the maintenance of the Multisampler

10 Parts for Maintenance and Upgrade or Options

This chapter provides information on parts material required for the module.

11 Identifying Cables

This chapter provides information on cables used with the modules.

12 Hardware Information

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

13 LAN Configuration

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

14 Appendix

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

Contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 9 |
| | Features | 10 |
| | Overview of the Module | 12 |
| | Multisampler Principle | 14 |
| | System Overview | 19 |
| 2 | Site Requirements and Specifications | 23 |
| | Site Requirements | 24 |
| | Physical Specifications | 28 |
| | Performance Specifications | 29 |
| | Physical Specifications of the Sample Cooler | 32 |
| 3 | Using the Module | 35 |
| | Magnets | 36 |
| | Turn on/off | 40 |
| | Status indicators | 41 |
| | Insert vial trays/wellplates | 43 |
| | Remove vial trays/wellplates | 45 |
| | Installing the Sample Cooler | 46 |
| | Transporting the Multisampler with a Sample Cooler Installed | 53 |
| 4 | Preparing the module | 55 |
| | Leak and Waste Handling | 56 |
| | Preparing the Multisampler | 58 |
| | Solvent Information | 60 |
| | Setting up the Autosampler with Agilent Open Lab ChemStation | 65 |

| | | |
|----------|--|------------|
| 5 | Optimizing Performance | 73 |
| | Delay Volume and Extra-Column Volume | 74 |
| | How to Configure the Optimum Delay Volume | 75 |
| | How to Achieve Higher Injection Volumes | 79 |
| | How to Achieve High Throughput | 82 |
| | How to Achieve Higher Resolution | 83 |
| | How to Achieve Higher Sensitivity | 86 |
| | How to Achieve Lowest Carry Over | 87 |
| 6 | Troubleshooting and Diagnostics | 91 |
| | Overview of the Module's Indicators and Test Functions | 92 |
| | Status Indicators | 93 |
| | User Interfaces | 95 |
| | Agilent Lab Advisor Software | 96 |
| 7 | Error Information | 97 |
| | What Are Error Messages | 98 |
| | General Error Messages | 99 |
| 8 | Test Functions | 107 |
| | Tests and Calibrations in Agilent Lab Advisor | 108 |
| 9 | Maintenance | 109 |
| | Introduction to Maintenance | 110 |
| | Warnings and Cautions | 112 |
| | Overview of Maintenance | 114 |
| | Clean the Module | 115 |
| | Removal and Installation of the Front Door | 116 |
| | Remove the Needle Assembly | 119 |
| | Install the Needle Assembly | 122 |
| | Exchange the Needle Seat | 125 |
| | Replace the Rotor Seal | 127 |
| | Remove the Metering Seal | 131 |
| | Install the Metering Seal | 135 |
| | Replace the Peristaltic Pump Cartridge | 139 |
| | Replace the Flushhead Seal | 142 |

| | |
|--|------------|
| Replace the Injection Valve | 144 |
| Removing the Sample Loop-Flex | 145 |
| Installing the Sample Loop-Flex | 147 |
| Replace the Dummy Drawer | 149 |
| Exchange the Power Supply Fuses (Sample Cooler) | 159 |
| Remove the Sample Cooler | 161 |
| Install the Sample Cooler | 162 |
| Replace the Module Firmware | 165 |
| 10 Parts for Maintenance and Upgrade or Options | 167 |
| Overview of Maintenance Parts | 168 |
| Sampler Main Assemblies | 169 |
| Hotel Drawer | 171 |
| Analytical Head Assembly 40 μ L | 172 |
| Analytical Head Assembly 100 μ L | 173 |
| Analytical Head Assembly 900 μ L | 174 |
| Flush Head Assembly 500 μ L | 176 |
| Injection Valve Assembly | 178 |
| Injection Valve with Actuator | 179 |
| Needle Port Assembly | 180 |
| Door Assy IF | 181 |
| Accessory Kit | 182 |
| Tubing Kit Sampler Standard | 183 |
| Sample Cooler | 184 |
| 11 Identifying Cables | 185 |
| Cable Overview | 186 |
| Analog Cables | 188 |
| Remote Cables | 190 |
| CAN/LAN Cables | 194 |
| Agilent Module to PC | 195 |
| USB | 196 |

| | |
|---|------------|
| 12 Hardware Information | 197 |
| Firmware Description | 198 |
| Electrical Connections | 201 |
| Interfaces | 204 |
| Setting the 6-bit Configuration Switch | 212 |
| Instrument Layout | 214 |
| Early Maintenance Feedback | 215 |
| 13 LAN Configuration | 217 |
| Setting up the module in a LAN environment | 218 |
| Connecting the module via LAN | 219 |
| 14 Appendix | 221 |
| General Safety Information | 222 |
| Waste Electrical and Electronic Equipment Directive | 228 |
| Refrigerant | 229 |
| Radio Interference | 231 |
| Sound Emission | 232 |
| Solvent Information | 233 |
| Agilent Technologies on Internet | 234 |



1 Introduction

| | |
|-------------------------|----|
| Features | 10 |
| Overview of the Module | 12 |
| Multisampler Principle | 14 |
| System Overview | 19 |
| Leak and Waste Handling | 19 |

This chapter gives an introduction to the Multisampler.

Features

The Agilent 1290 Infinity Multisampler sets a new benchmark in flexibility. This autosampler can handle both vials and microtiter plates (whether shallow or deep) with ease and efficiency. In fact, this compact module has the capacity to house up to 6,144 samples - all within the footprint of an Agilent 1200 Infinity LC - plus the robotics to smoothly inject each into the chromatograph in turn. With Agilent's unique dual-needle design, cycle time can be as low as just 5 seconds. And with our multi-wash capability, you can reduce carryover to less than 10 parts per million. In short, this innovative Multisampler is designed to provide maximum flexibility and scalability.

- **HIGH CAPACITY**

Using shallow well-plate drawers, the Multisampler takes a maximum load of 16 microtiter plates and up to 6,144 samples.

- **FAST INJECTION CYCLES**

The dual-needle design lets you alternate samples through one injection path and then the other, virtually eliminating conventional wait times—whether for large volume or flushing procedures.

- **SEAMLESS AUTOMATION**

Internal robotics move microtiter plates and other sample containers from the sample hotel to the central workspace for sample processing steps and injections.

- **ULTRALOW CARRYOVER**

The Multisampler is designed for low carryover, but you can take clean to a whole new level with our multi-wash capability. This integrated feature flushes the injection needle inside and outside with three solvents, uses seat back flush procedures.

- SCALABLE INJECTION VOLUMES

Our unique dual-needle setup also enhances flexibility by providing two differently optimized injectors in a single instrument. You can, for example, optimize one path for large volume injections and the other for low delay volumes.

- UNMATCHED FLEXIBILITY

Use vials, microtiter plates, or any combination of formats. Sample drawers are available in three heights, and you can mix shallow drawers with deeper ones to accommodate different sample sizes.

For specifications, see [“Performance Specifications”](#) on page 29.

This 1290 Infinity Autosampler has been introduced together with the Agilent 1290 Infinity Liquid Chromatograph.

Overview of the Module

The Multisampler transport mechanism uses a Cartesian robot. The X-Y drive together with the Z drive optimize the grabbing and positioning for the sample trays and the needle handling inside of the Multisampler. The sample coupler moves the sample container from the sample hotel which stores all the samples and place it on the central workspace. Then the needle coupler of the Z drive take over and grab the needle assembly from the needle station and perform the analytical procedures inside of the Multisampler. Due the uncoupled needle design the robot can do other liquid handling jobs during the analysis.

The multisampler employ an active vial/plate pusher mechanism to hold down the vial or the plate while the needle is drawn back from the sample vessel (a must in the case a septum is used). This active vial/plate pusher employs a sensor to detect the presence of a plate and to ensure accurate movement regardless of plate used. All axes of the transport mechanism are driven by very fast BLCD motors. Optical encoders ensure the correct operation of the movement.

The standard metering device provides injection volumes from 0.1 – 20 μL . A 0.1 – 40 μL injection volume metering device is installed in the G7167B, with a 20 μL , low restriction loop capillary restricting the injection volume. The entire flowpath including the metering device is always flushed by the mobile phase after injection for minimum internal carry-over.

To reduce the carry over you have two different possibilities. First the external needle wash. In the Standard configuration the needle flush station is equipped with a peristaltic pump to wash the outside of the needle. This reduces the already low carry-over for very sensitive analysis. The bottle containing the mobile phase for the wash procedure will be located in the solvent bottle cabinet. Produced waste during this operation is channeled safely away through a waste drain. In the Multi-Wash configuration the external needle wash will be done by a micro piezo pump combined with a solvent selection valve: Where you can select between three different solvents. If this is not sufficient to reduce the carry over there is an additional and perfect way to achieve the lowest carry over in the Multi-Wash configuration by using the intergrated flush

pump. This high pressure pump can also select between three different solvents and it is capable of reducing the carry over to a minimum by using the seat backflushing. The flush pump outlet capillary is connected to the port 4 of the Multisampler, which normally holds the waste line. If the Multisampler is in bypass mode the flush pump connects to the needle seat and can flush backwards through the needle seat into the waste line attached to the needle seat outlet port.

The six- port (only 5 ports are used) injection valve unit is driven by a high- speed hybrid stepper motor. During the sampling sequence, the valve unit bypasses the Multisampler, and connects flow from the pump to the column directly. During injection and analysis, the valve unit directs the flow through the Multisampler which ensures that all of the sample is injected onto the column, and that the metering unit and needle are always free from sample residue before the next sampling sequence begins.

The Cooling Control of the vial/plate temperature in the Multisampler is achieved using an additional Agilent Sample Cooler module. The sample cooler is a micro compressor based refrigerator. A fan draws air from the central workstation above the sample container of the Multisampler. It is then blown through the fins of the cooling module. There it is cooled according the temperature setting. The cooled air enters the Sampler Hotel through a recess underneath the special designed base plate. The air is then distributed evenly through the Sample Hotel ensuring effective temperature control, regardless of how many sample container are in the drawer. In cooling mode condensation is generated on the cooled side of the Sample Cooler. This condensed water is safely guided into a waste bottle for condensed water.

Multisampler Principle

The movements of the Multisampler components during the sampling sequence are monitored continuously by the Multisampler processor. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sampling sequence is not completed successfully, an error message is generated. Solvent is bypassed from the Multisampler by the injection valve during the sampling sequence. After the required sample container was automatically loaded from the sample hotel and placed on the central workspace. The Needle assembly moves via robot to the desired sample position and is lowered into the sample liquid in the sample to allow the metering device to draw up the desired volume by moving its plunger back a certain distance. The needle assembly is then raised again and moved to the needle park station onto the seat to close the sample loop. Sample is applied to the column when the injection valve returns to the mainpass position at the end of the sampling sequence.

The standard sampling sequence occurs in the following order:

- 1 The robot load the required sample container on the central workspace
- 2 The injection valve switches to the bypass position.
- 3 The plunger of the metering device moves to the initialization position.
- 4 The robot couple into the needle assembly from the needle parkstation.
- 5 The robot unlock the needle assembly and moves up.
- 6 The coupled needle assembly/robot moves to the desired sample vial (or well plate) position on the central workstation.
- 7 The needle lowers into the sample vial (or well plate).
- 8 The metering device draws the preset sample volume.
- 9 The needle lifts out of the sample vial (or well plate).
- 10 The coupled needle assembly/robot is then moved to the park station onto the seat to close the sample loop.

- 11 The needle assembly is locked into the park station and moves down.
- 12 The injection cycle is completed when the injection valve switches to the mainpass position.
- 13 The robot move the sample container back into the sample hotel if the sampling sequence is done If needle wash is required it will be done between step 7 and 8.

NOTE

For the needle seat backflush the Multisampler must be in bypass mode.

Injection Sequence

Before the start of the injection sequence, and during an analysis, the injection valve is in the mainpass position. In this position, the mobile phase flows through the Multisampler metering device, sample loop, and needle, ensuring all parts in contact with sample are flushed during the run, thus minimizing carry-over.

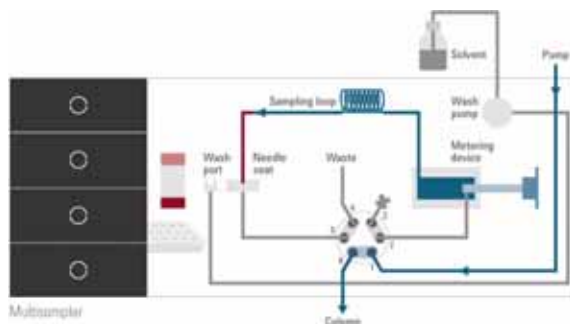


Figure 1 Valve in mainpass, flow through

When the sample sequence begins, the valve unit switches to the bypass position. Solvent from the pump enters the valve unit at port 1, and flows directly to the column through port 6.

The standard injection starts with draw sample from vial/wellplate from the central workstation. In order to do this the needle assembly moves via robot to the desired sample position and is lowered into the sample liquid in the sample to allow the metering device to draw up the desired volume by moving its plunger back a certain distance. The needle assembly is then raised again and moved to the needle park station onto the seat to close

1 Introduction

Multisampler Principle

the sample loop. In case of an injector program several steps are interspersed at this point.

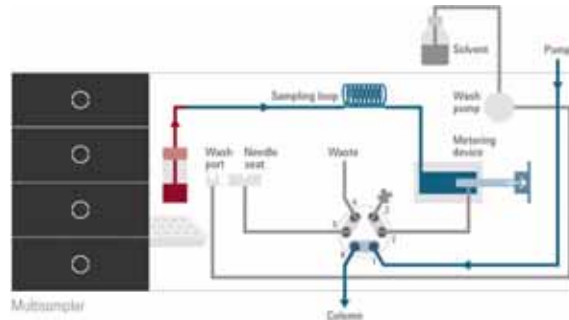


Figure 2 Valve in bypass, drawing sample

Flush the Needle

Before injection and to reduce the carry-over for very sensitive analysis, the outside of the needle can be washed in a flush port located behind the injector port. As soon as the needle is on the flush port a wash pump delivers some solvent during a defined time to clean the outside of the needle. At the end of this process the needle assembly returns to the needle port.

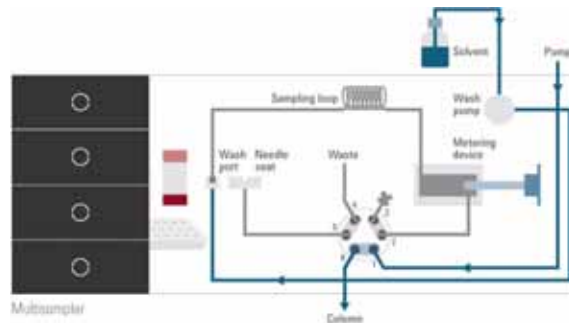


Figure 3 Valve in bypass, washing needle

Inject- and-Run

The final step is the inject- and run-step. The six-port valve is switched to the mainpass position, and directs the flow back through the sample loop, which now contains a certain amount of sample. The solvent flow transports the sample onto the column, and separation begins. This is the beginning of a run within an analysis. In this stage, all major performance- influencing hardware is flushed internally by the solvent flow. For standard applications no additional flushing procedure is required.

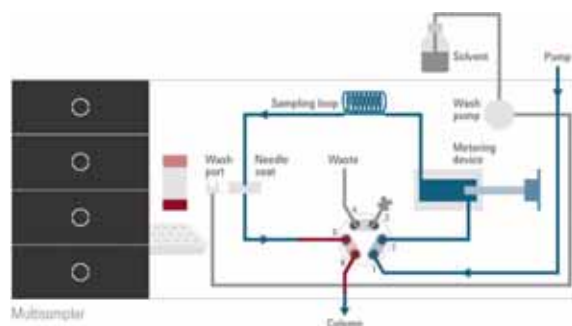


Figure 4 Valve in mainpass, sample injected

1 Introduction

Multisampler Principle

Needle seat back flush

After the injection to reduce the carry-over for very sensitive analysis, the needle seat can be flushed by an integrated flush pump with up to 3 different solvents which may have different properties and solvent strengths. As soon as injection valve is in bypass mode the flush pump delivers some solvent during a defined time to clean the needle seat. The back flushing solvent will be guided into the waste line attached on the needle wash port. At the end of this process the injection valve switch back into the mainpass position ready for the next injection. The last rinsing step should always include the mobile phase as solvent to get the initial conditions again.

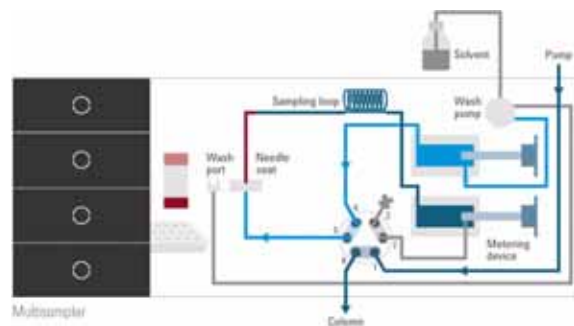


Figure 5 Valve in bypass, needle backflush (Multiwash)

System Overview

Leak and Waste Handling

The 1200 Infinity Series has been designed for safe leak and waste handling. It is important that all security concepts are understood and instructions are carefully followed.

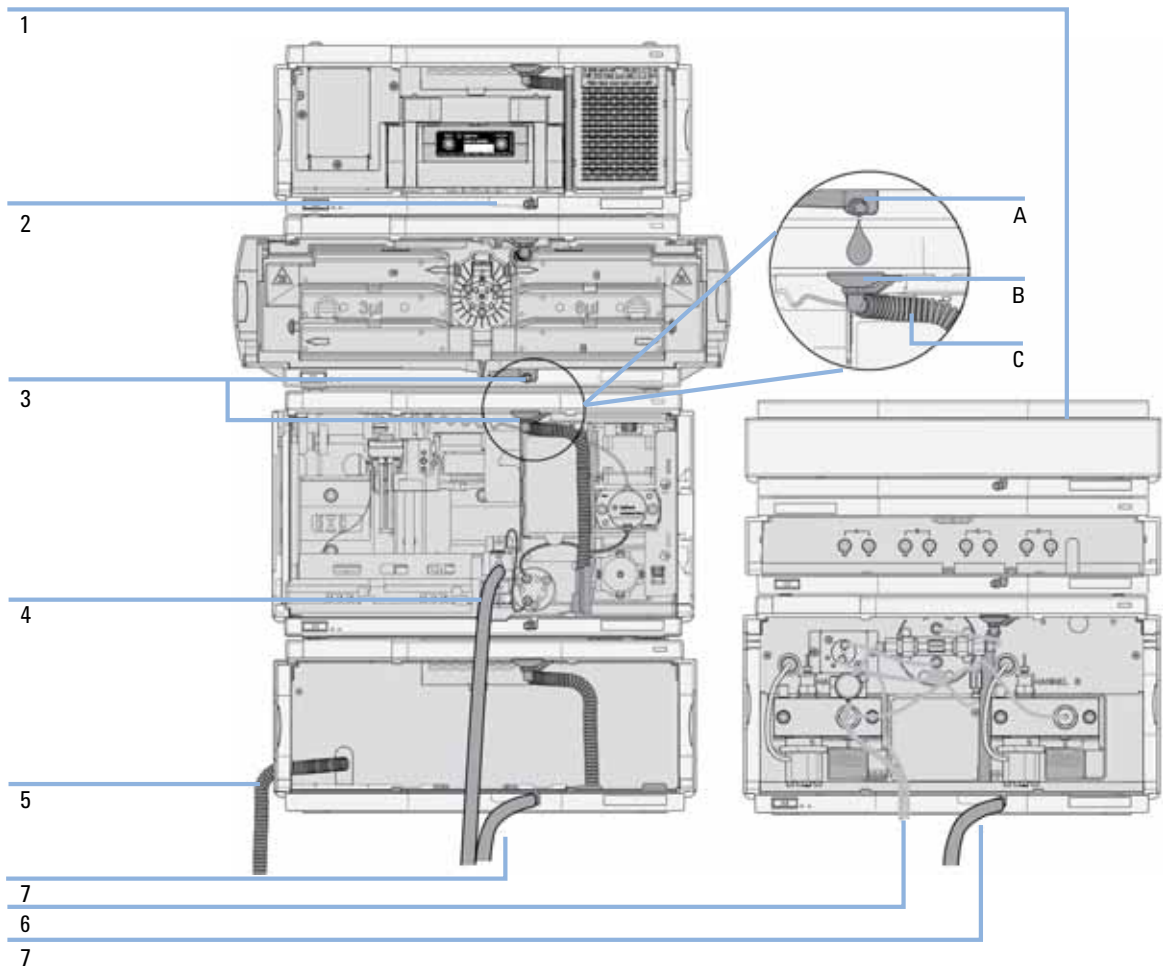


Figure 6 Leak and waste handling concept (overview - typical stack configuration as an example)

The solvent cabinet (1) is designed to store a maximum volume of 6 L solvent. The maximum volume for an individual bottle stored in the solvent cabinet should not exceed 2.5 L. For details, see the usage guideline for the Agilent 1200 Infinity Series Solvent Cabinets (a printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available on the Internet).

The leak pan (2) (individually designed in each module) guides solvents to the front of the module. The concept covers also leakages on internal parts (e.g. the detector's flow cell). The leak sensor in the leak pan stops the running system as soon as the leak detection level is reached.

The leak pan's outlet port (3, A) guides excessive overflow from one module to the next, as the solvent flows into the next module's leak funnel (3, B) and the connected corrugated waste tube (3, C). The corrugated waste tube guides the solvent to the next lower positioned module's leak tray and sensor.

The waste tube of the sampler's needle wash port (4) guides solvents to waste.

The condense drain outlet of the autosampler cooler (5) guides condensate to waste.

The waste tube of the purge valve (6) guides solvents to waste.

The waste tube connected to the leak pan outlet on each of the bottom instruments (7) guides the solvent to a suitable waste container.



Figure 7 Warning label (illustration for correct waste tubing)

Leak and Waste Handling in a Mixed Configuration

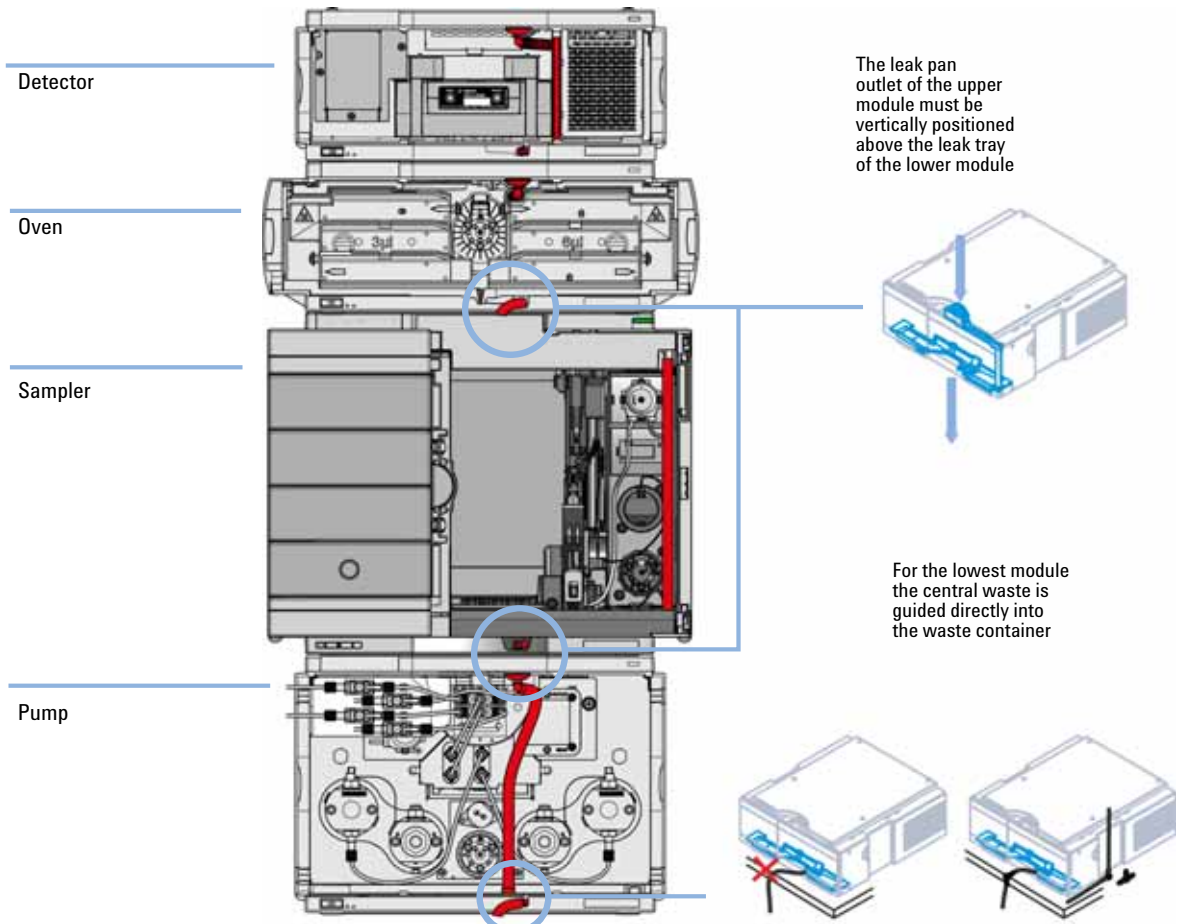


Figure 8 Leak and waste handling with multisampler in a mixed configuration as an example

1 Introduction

System Overview

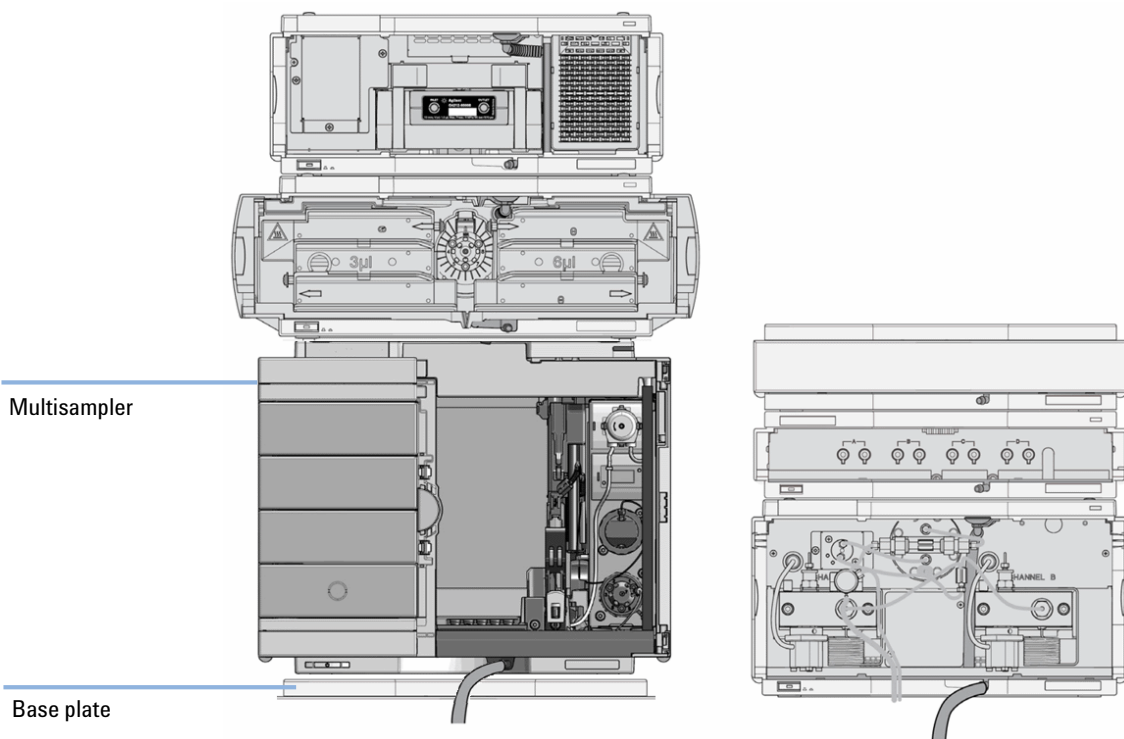


Figure 9 Leak and waste handling with multisampler in a mixed configuration as an example (two stack configuration)

Do not place the multisampler directly on the bench. Install Base plate (G1328-44121) underneath.



2 Site Requirements and Specifications

Site Requirements 24

Physical Specifications 28

Performance Specifications 29

Physical Specifications of the Sample Cooler 32

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 28. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Hazard of electrical shock or damage of your instrumentation can result, if the devices are connected to a line voltage higher than specified.

→ Connect your instrument to the specified line voltage only.

WARNING

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

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

→ Always unplug the power cable before opening the cover.

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

CAUTION

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

Different power cords are offered as options with 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.

WARNING

Absence of ground connection or use of unspecified power cord

The absence of ground connection or the use of unspecified power cord can lead to electric shock or short circuit.

- Never operate your instrumentation from a power outlet that has no ground connection.
 - Never use a power cord other than the Agilent Technologies power cord designed for your region.
-

WARNING

Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

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

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 the power cords that Agilent Technologies supplies with this instrument for any other equipment.
-

Bench Space

The module dimensions and weight (see [Table 1](#) on page 28) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench shall carry a complete HPLC system, make sure that the bench is designed to bear the weight of all modules.

The module should be operated in a horizontal position.

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.
-

Warranty Provisions and Reference

Warranty provisions

Agilent standard warranty does not cover:

- Improper use or operation outside the product specification
- Defects due to adjustments or maintenance by customer or unauthorized parties
- Visible abuse, negligence or shipping damage
- Unsupported configurations
- Improper site preparations
- Use of non Agilent parts

Reference

- The removal of nameplates leads to loss of Warranty claim.
- Any unauthorized destruction of seals will invalidate the Warranty claim.

Physical Specifications

Table 1 Physical Specifications

| Type | Specification | Comments |
|-------------------------------------|--|-------------------------|
| Weight | 22 kg w/o sample cooler | |
| Dimensions (height × width × depth) | 320 mm x 396 mm x 468 mm | |
| Line voltage | 100 – 240 V~, ± 10 % | Wide-ranging capability |
| Line frequency | 50 or 60 Hz, ± 5 % | |
| Power consumption | 180 VA/180 W/614 BTU/h | |
| Ambient operating temperature | 4-40°C (39.2 -131°F) | |
| Ambient non-operating temperature | -40 – 70 °C (-40 – 158 °F) | |
| Humidity | < 95 % r.h. at 40 °C (104 °F) | Non-condensing |
| Operating altitude | Up to 3000 m (9842 ft) | |
| Non-operating altitude | Up to 4600 m (15091 ft) | For storing the module |
| Safety standards: IEC, CSA, UL | Installation category II, Pollution degree 2 | For indoor use only. |

Performance Specifications

Table 2 Performance Specifications

| Type | Specification | Comment |
|------------------------|--|---|
| Injection range | 0.1 – 20 µL in 0.1 µL increments (default) 0.1 – 40 µL in 0.1 µL increments if 40 µL loop is installed 0.1 – 120 µL in 0.1 µL increments with 1290 Infinity large volume injection kit (hardware modification required) pressure range up to 1200 bar 0.1 – 100 µL in 0.1 µL increments with 100 µL upgrade kit hardware (modification required) up to 1200 bar | |
| Precision | Typically <0.15 % RSD or SD<10 nL | Measured caffeine |
| Pressure range | Up to 1200 bar > 500 µL Multidraw with 100 µL Analytical Head Up to 400 bar > 900 µL Analytical Head | with Upgrade Kit (hardware modification required) |
| Sample viscosity range | 0.2 – 5 cp | |
| Sample capacity | 1H Drawer Up to 8 drawers and 16 positions Shallow well plates (MTP) 2H Drawer Up to 4 drawers and 8 positions MTP, deep well plates, vials, Eppendorf 3H Drawer Up to 2 drawers and 4 positions MTP, deep well plates, vials up to 6 mL, Eppendorf | Max. 6144/1536 samples (384MTP/96) 3072 samples, 432 vials (2 mL) 1536 samples, 60 vials (6 mL), 384 vials (1 mL), 216 vials (2 mL) |
| Injection cycle time | <10 s using following standard conditions: Default draw speed: 100 µL/min Default eject speed: 400 µL/min Injection volume: 1 µL | |

2 Site Requirements and Specifications

Performance Specifications

Table 2 Performance Specifications

| Type | Specification | Comment |
|-----------------------------|---|--|
| Carry Over | <0.003 % (30 ppm) Multisampler Standard <0.0009 % (9 ppm) Multisampler Multiwash | Using the following conditions: <ul style="list-style-type: none"> • Column: Agilent ZORBAX SB-C18, 2.1x 50 mm1.8 mm (827700-902) • Mobile Phase: <ul style="list-style-type: none"> • A: 0.1 % TFA in water • B: 0.1 % TFA in Acetonitrile • Isocratic : % B=35 % • Flow rate: 0.5 mL/min • Temperature: 25 °C • Wavelength: 257 nm • Sample: 1200 ng/μL Chlorhexidine for UV, 2400 ng/μL Chlorhexidine for MS (dissolved with mobile phase A), 1 μL injected and measured both on Agilent 6410 QQQ and G4212A DAD • Wash solution: H2O with 0.1 % TFA (5 s) |
| Control and data evaluation | Agilent Open Lab CDS Mass hunter QQQ Mass hunter QTOF Lab Advisor ICF for 3rd party SW control LC and CE Drivers | A.01.03 or above (A.02.02 supports Sample Entry UI (Slydini)) B.07.01 or above B.06.01 or above B.02.05 or above A.02.01 or above A.02.10 or above |
| Local Control | Agilent Instant Pilot (G4208A) | B.02.16 or above (currently not supported/official release 2015) |
| Communications | Controller-area network (CAN),Local Area Network (LAN) ERI: ready, start, stop and shut-down signals | |
| Safety and maintenance | Extensive support for troubleshooting and maintenance is provided by the Instant Pilot, Agilent Lab Advisor, and the Chromatography Data System. Safety-related features are leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas. | |

Table 2 Performance Specifications

| Type | Specification | Comment |
|-----------------|---|---------|
| GLP features | Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors. | |
| Housing | All materials recyclable. | |
| Metering device | Metering device in high pressure flow path | |

Physical Specifications of the Sample Cooler

Cooling unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.

Table 3 Physical Specification of the Sample Cooler

| Type | Specification | Comments |
|-------------------------------------|--|-------------------------------------|
| Weight | < 6 kg | |
| Dimensions (height × width × depth) | 205 mm X 340 mm X 370 mm | |
| Refrigerant gas | HFKW-134a (0.042 kg) | Ozone depletion potential (ODP) = 0 |
| Line voltage | 24 VDC (nominal) | |
| Current | 10 A max. | |
| Ambient operating temperature | 4 – 40 ° C (39.2 – 131 ° F) | |
| Ambient non-operating temperature | -40 – 70 ° C (-20 – 158 ° F) | |
| Humidity | < 95 % r.h. at 40 ° C (104 ° F) | Non-condensing |
| Operating altitude | Up to 3000 m (9842 ft) | |
| Non-operating altitude | Up to 4600 m (15091 ft) | |
| Safety standards: IEC, CSA, UL | Installation category II, Pollution degree 2 | For indoor use only. |

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

- The breakdown of the sample cooler unit must be carried out by specialist refrigeration company.
- All media must be disposed of in accordance with national and local regulations.
- Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance.

Table 4 Performance Specifications Agilent 1290 Sample Cooler

| Type | Specifications |
|---|---|
| Temperature range | Settable from 4 – 40 °C in 1 ° increments |
| Temperature accuracy (<25°C, <50% r.H.) | 2 °C to 6 °C at a setpoint of 4 °C |
| Temperature accuracy at ambient temperatures and humidity <60 % | 2 °C to 8 °C at a setpoint of 4 °C |
| Temperature Stability | +/- 1°C |

2 Site Requirements and Specifications

Physical Specifications of the Sample Cooler



3 Using the Module

| | |
|--|----|
| Magnets | 36 |
| Turn on/off | 40 |
| Status indicators | 41 |
| Power Supply Indicator | 41 |
| Module Status Indicator | 41 |
| Drawer Status Indicator | 42 |
| Insert vial trays/wellplates | 43 |
| Remove vial trays/wellplates | 45 |
| Installing the Sample Cooler | 46 |
| Damaged Packaging | 46 |
| Install the Sample Cooler | 47 |
| Transporting the Multisampler with a Sample Cooler Installed | 53 |

This chapter explains the essential operational parameters of the module.



Magnets

WARNING

Heart pacemakers

Magnets may derogate the function of heart pacemakers and implanted defibrillators. Heart pacemakers may switch to the test modus which may cause malaise. Defibrillators may malfunction.

- Bearers of heart pacemakers or implanted defibrillators must stay off at least 55 mm from the magnets.
-

CAUTION

Magnetic fields

Magnets produce a far-reaching, strong magnetic field.

You can damage for example televisions, laptops, computer harddisks, credit cards, magnetic cards may be damaged as well.

- Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.
-

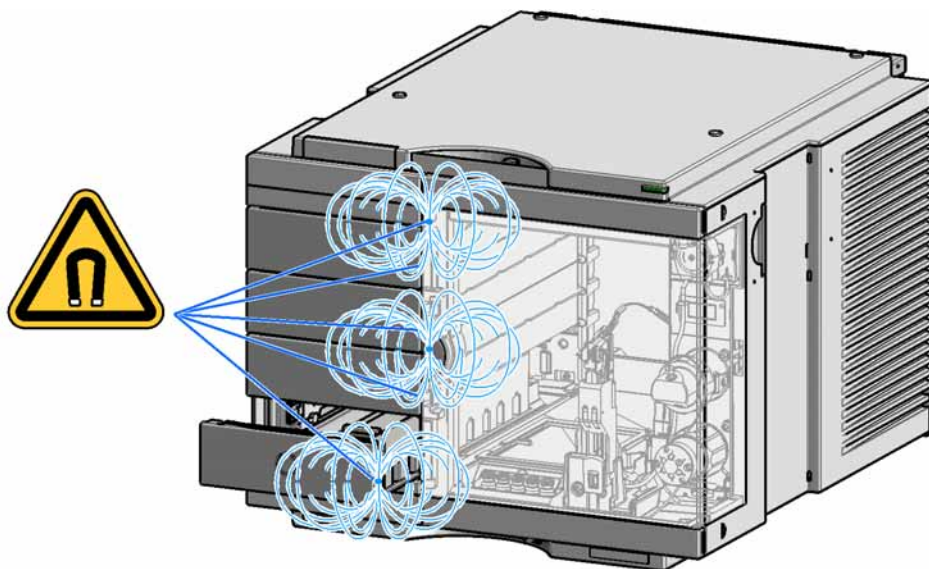


Figure 10 Position of magnets at the multisampler (door closed)

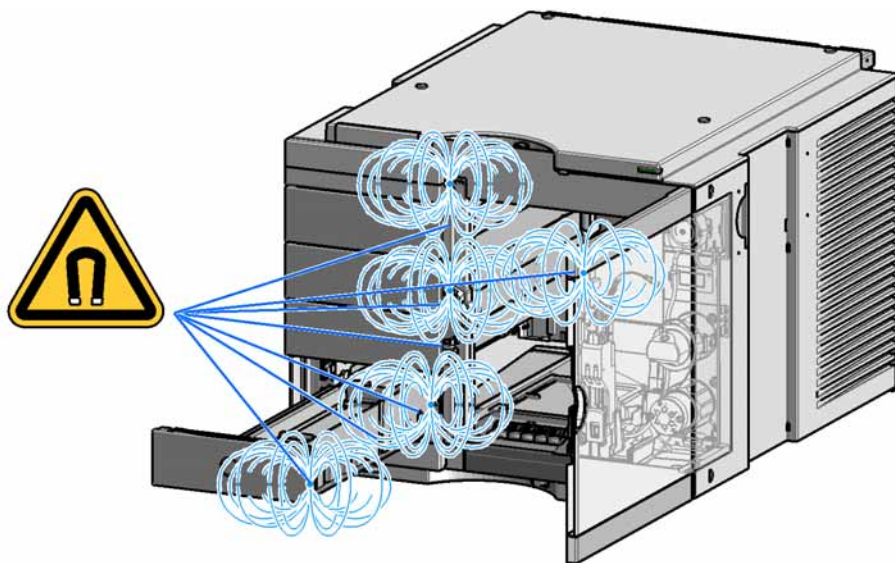


Figure 11 Position of magnets at the multisampler (open doors and drawers)

3 Using the Module Magnets

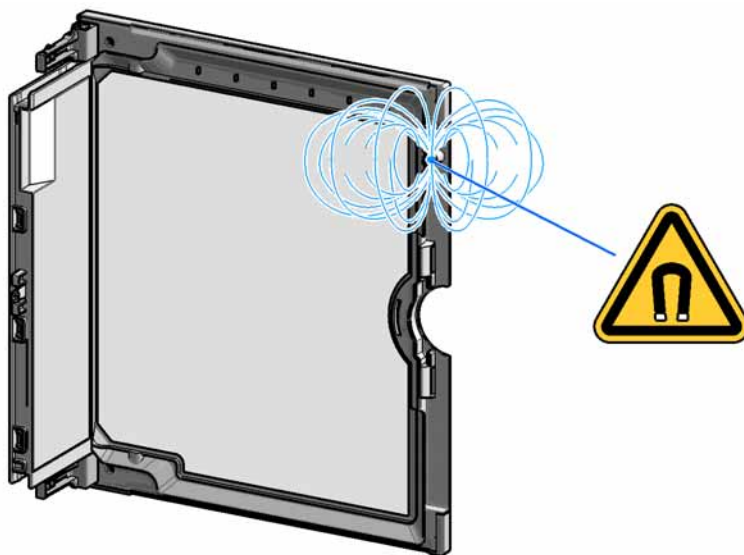


Figure 12 Position of the magnet at the door

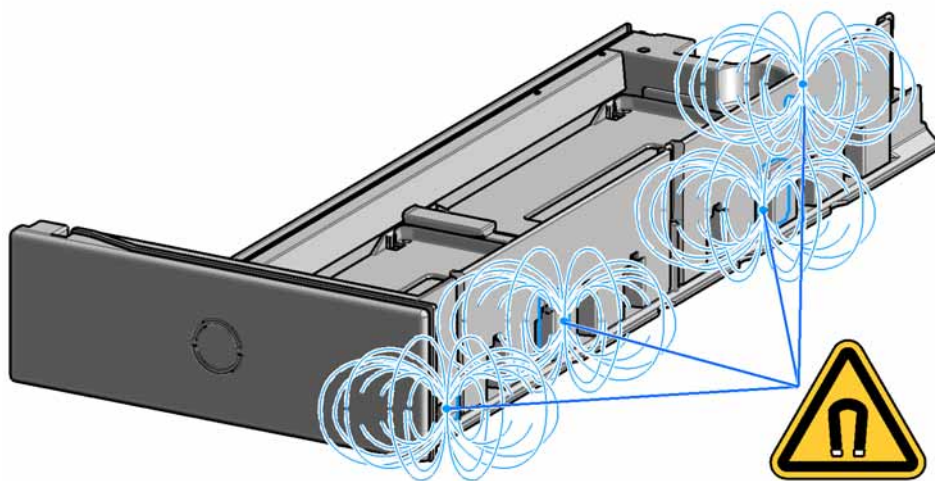


Figure 13 Position of the magnets at the drawer

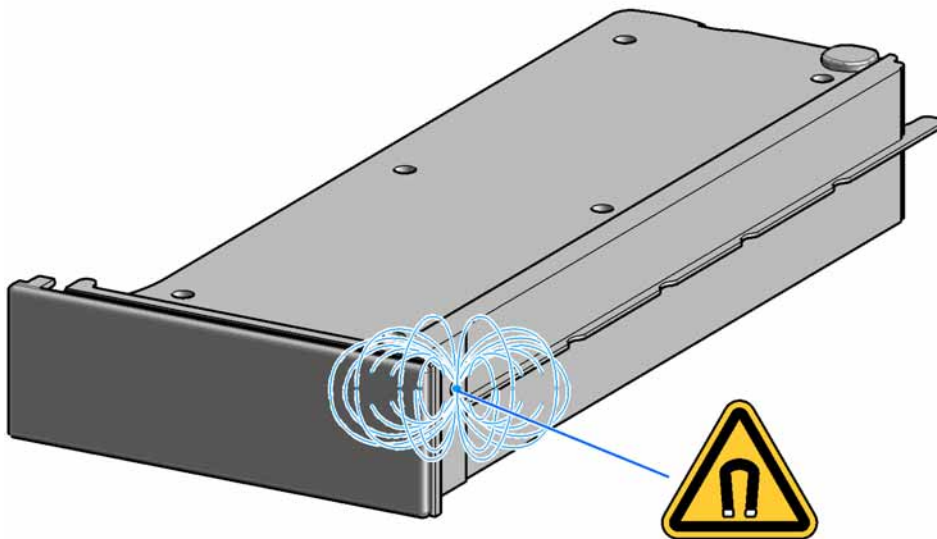
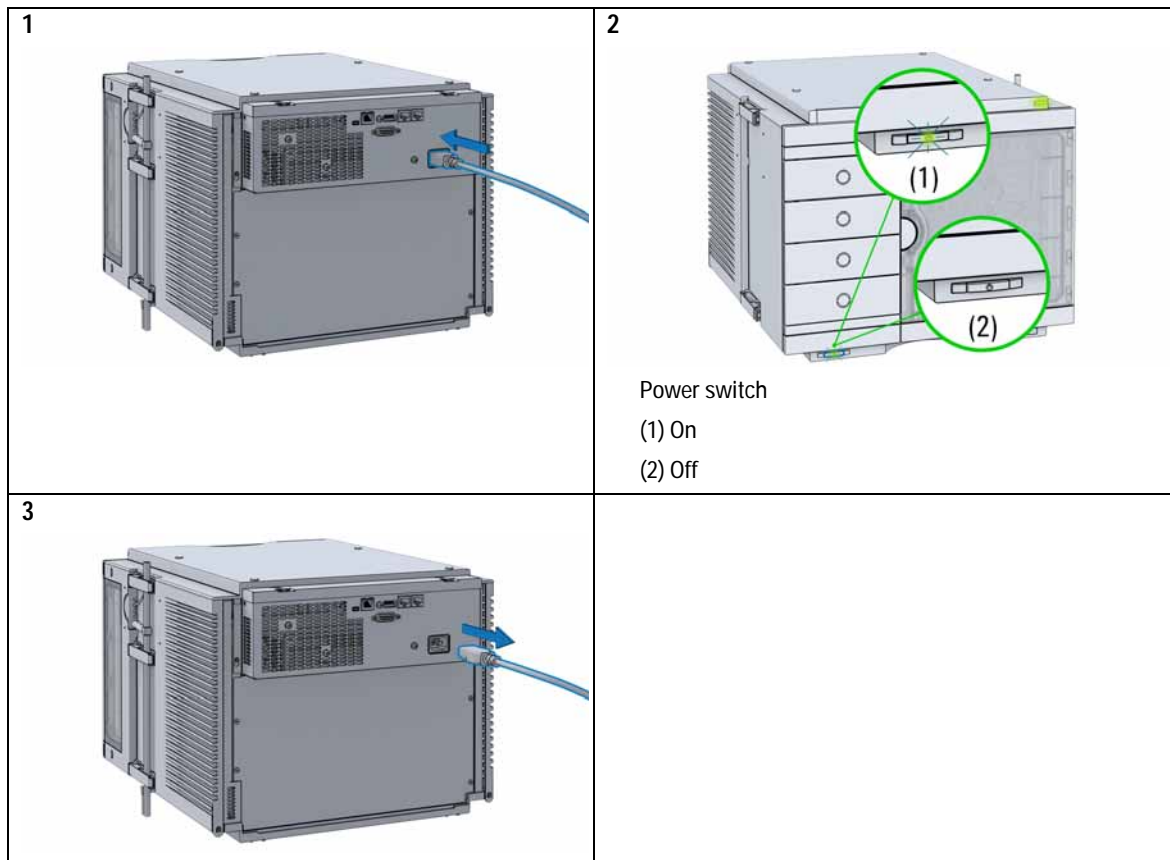


Figure 14 Position of the magnet at the dummy drawer

3 Using the Module

Turn on/off

Turn on/off



Status indicators

Three status indicators are located on the front of the module. The lower left indicates the power supply status, the upper right indicates the module status and those on the drawers indicate the drawer status.

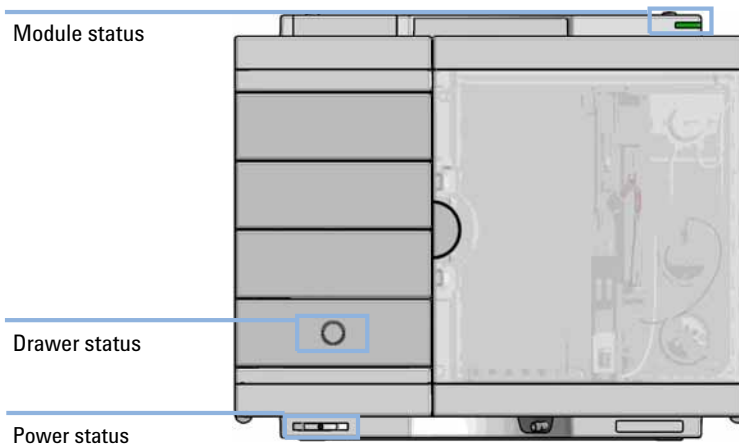


Figure 15 Module status indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is *ON*.

Module Status Indicator

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

- When the status indicator is *OFF* (and power switch light is on), the module is in a *prerun* condition, and is ready to begin an analysis.

- A *green* status indicator, indicates the module is performing an analysis (*run mode*).
- A *yellow* indicator indicates a *not-ready* condition. The module is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a set point), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the module has detected an internal problem which affects correct operation of the module. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.

If the error occurs during analysis, it is propagated within the LC system, i.e. a red LED may indicate a problem of a different module. Use the status display of your user interface for finding the root cause/module of the error.

- A *red blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).
- A *fast red blinking* indicator indicates that the module is in a low-level error mode. In such a case try to re-boot the module or try a cold-start (see [Table 15](#) on page 213). Then try a firmware update (see [“Replace the Module Firmware”](#) on page 165). If this does not help, a main board replacement is required.

Drawer Status Indicator

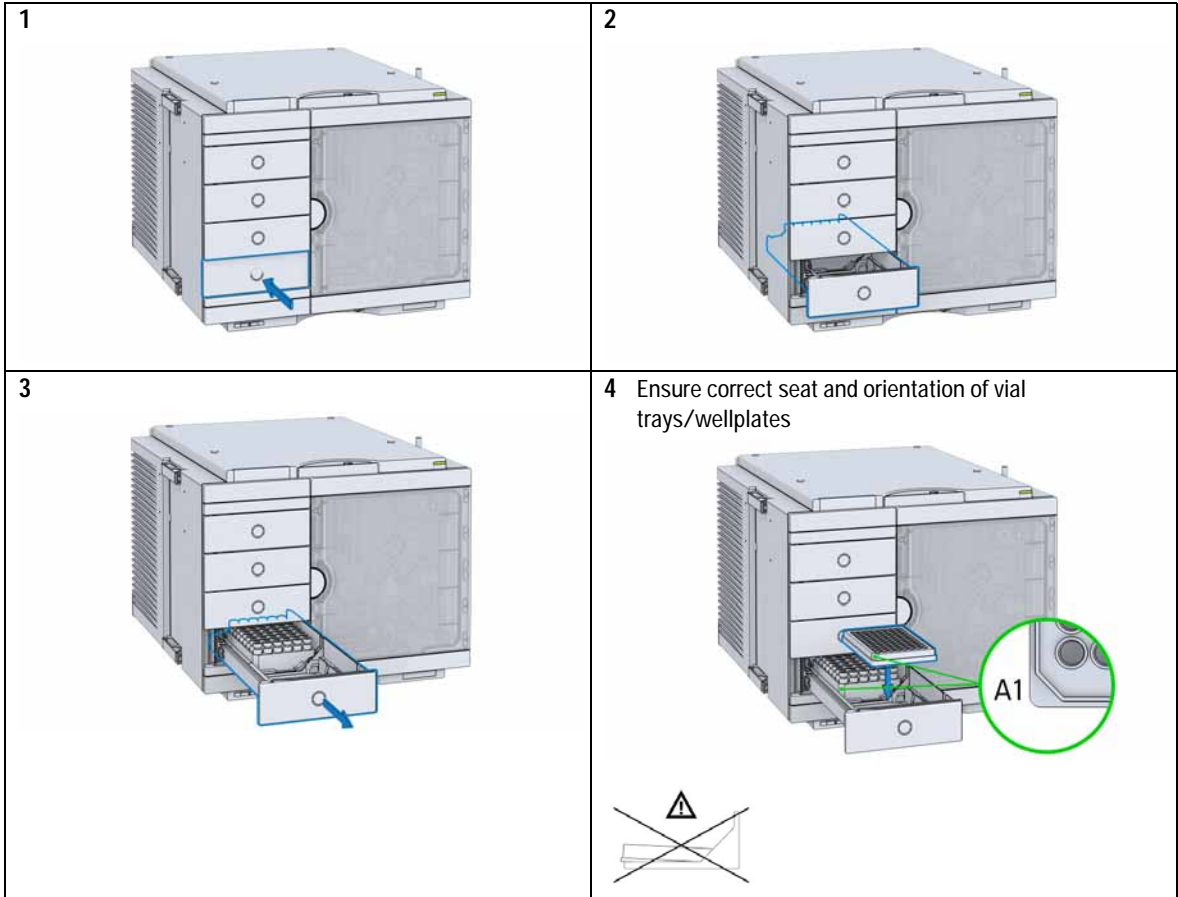
The module status indicator indicates one of three possible module conditions:

- When the status indicator is *OFF* no sample containers are loaded.
- When the upper, lower or both semi circle status indicator are *ON*, indicates the rear or front position of the drawer or both positions are loaded with a sample containers.
- When semi circle indicators are *blinking* the robot interacts with a drawer.

NOTE

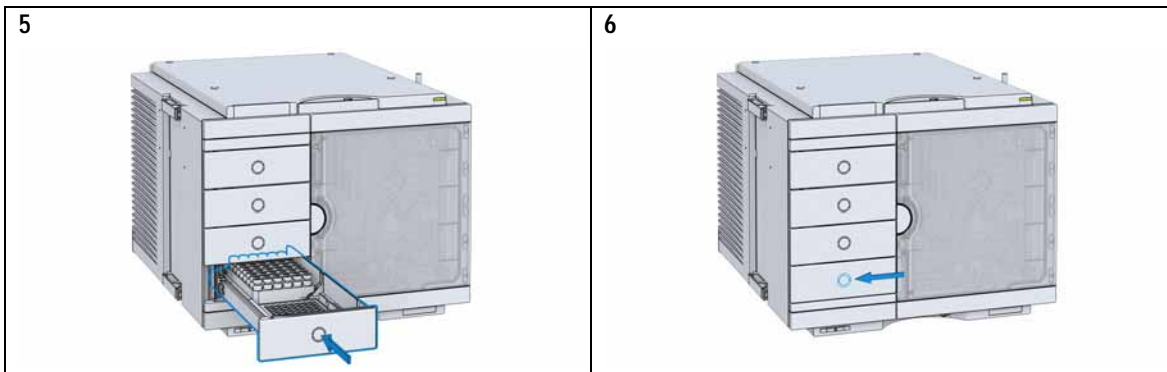
Do not try to open the drawer at this point.

Insert vial trays/wellplates

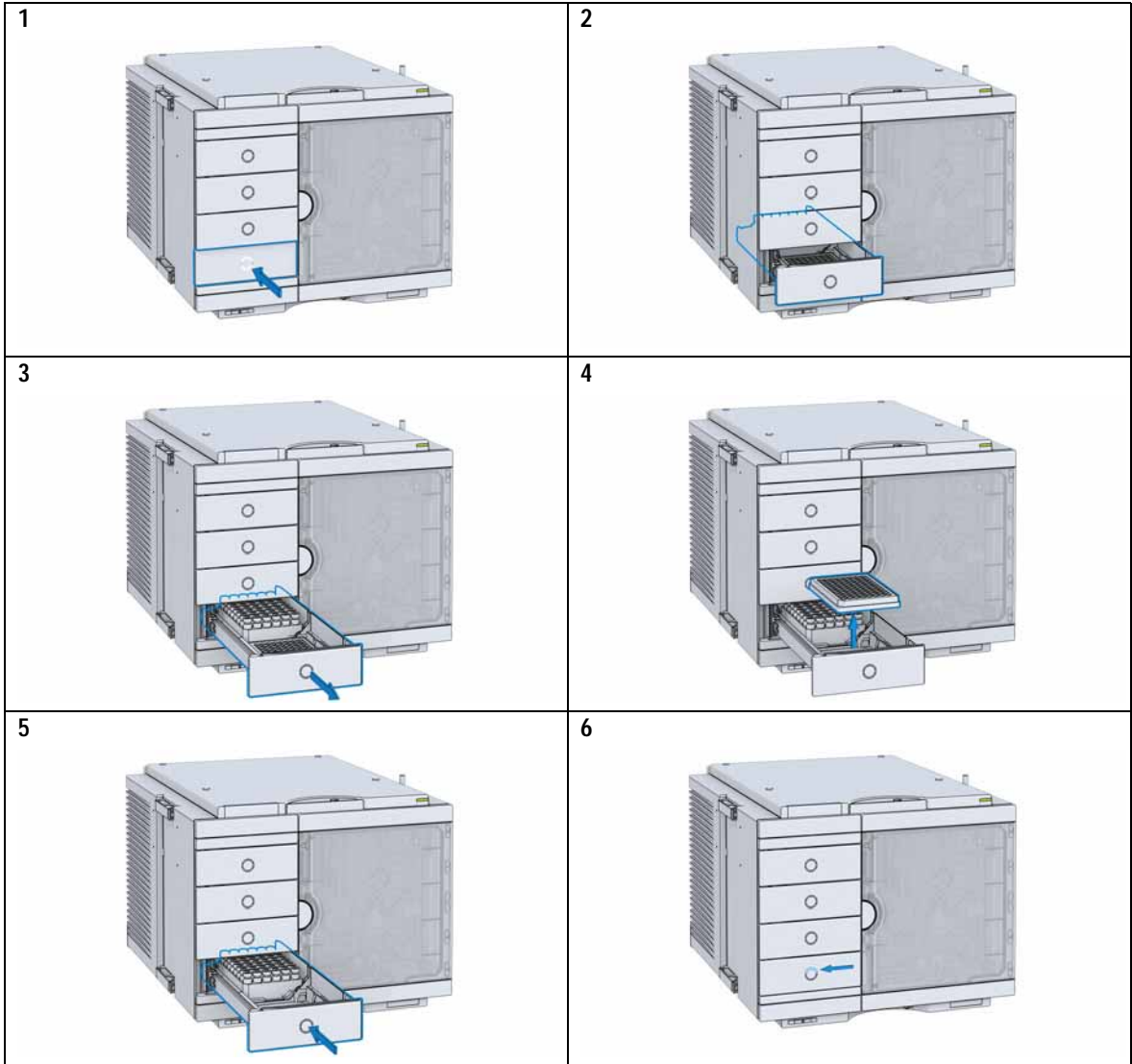


3 Using the Module

Insert vial trays/wellplates



Remove vial trays/wellplates



Installing the Sample Cooler

Damaged Packaging

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

CAUTION

"Defective on arrival" problems

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

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

Install the Sample Cooler

| Parts required | p/n | Description |
|----------------|-------------|---------------|
| | | Multisampler |
| | G7167-60005 | Sample cooler |
| | | Power cord |

Hardware required Other cables see below and “[Cable Overview](#)” on page 186

Software required OpenLabCDS and/or Instant Pilot G4208A with the appropriate revisions, see [Table 2](#) on page 29

NOTE

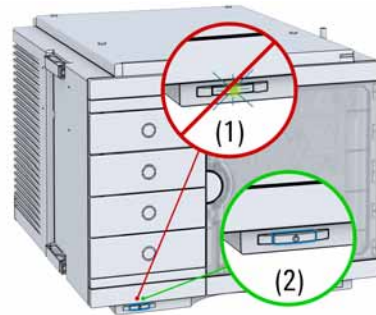
If the sample cooler is disconnected from the power supply, you should wait for at least five minutes before plugging it back.

NOTE

Even under average humidity conditions, a significant amount of condensed water gathers every day. A suitable container must be provided and emptied regularly in order to avoid overflow.

1 Place the Autosampler on the bench.

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



3 Using the Module

Installing the Sample Cooler

3 Ensure that the power cable is removed from the instrument.



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



5 Remove the sample cooler mainframe cover.



6 Slide in the sample cooler the halfway.



WARNING

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

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

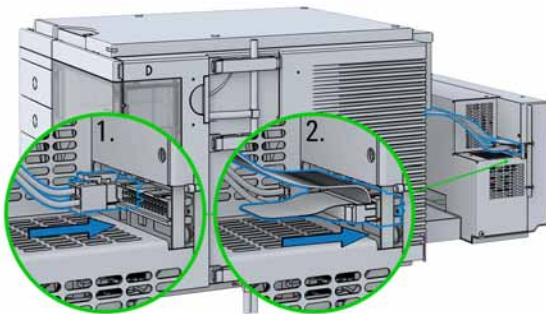
- Make sure that it is always possible to access the power plug.
- Do not use the sample cooler if it is not operating correctly or has been damaged. Disconnect it from the power supply and call your local service center.
- Remove the power cable from the module before opening the cover.
- Do not connect the power cable to the module while the covers are removed.
- If the sample cooler is disconnected from the power supply, you should wait for at least five minutes before plugging it back.

CAUTION

Damaged electronics

- To avoid damages of the electronics of the module make sure the power cords are unplugged before disconnecting or reconnecting the multisampler to the sample cooler cables.

7 Connect power cable and signal/data cable.

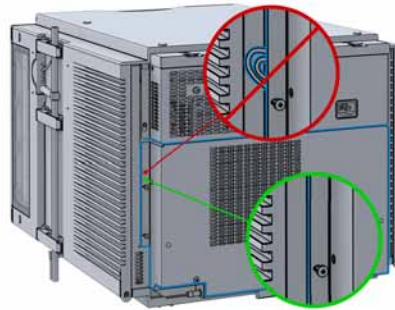


CAUTION

Damage to the cables

- Do not bend or pinch the cables.
- Fit in the sample cooler perfectly.

8 Slide in the whole unit.



3 Using the Module

Installing the Sample Cooler

- 9 Tighten the 4 screws which holds the sample cooler unit in place.



WARNING

Heavy weight

The module is heavy (>22 kg (>46 lbs)).

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

- 10 Lift the multisampler with the sample cooler installed into the LC stack.

CAUTION

Routing of the condensation tubing
Proper routing of the condensation tubing is critical for correct condensate drainage.

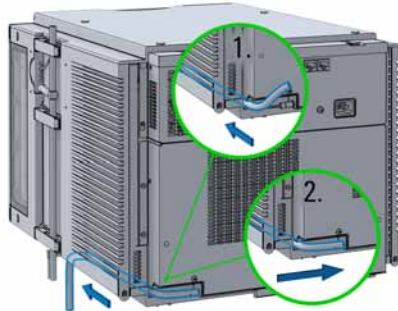
- Do not place the multisampler directly on the bench. Install Base plate (G1328-44121) underneath.

CAUTION

Damage through condensation
If the condensation tube is located in liquid the condensed water cannot flow out of the tube and the outlet is blocked. Any further condensation will then remain in the instrument. This may damage the instruments electronics.

- Make sure the condensation tube is always above the liquid level in the vessel.
- Make sure the waste container is not sealed.
- Ensure the drain tube has no loops and leads directly into the waste bottle.

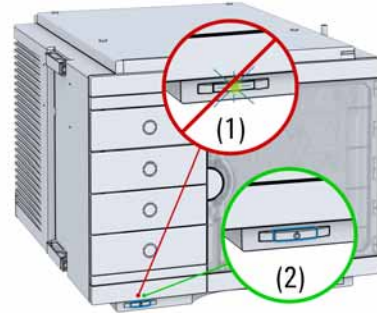
11 Install the condensate tubing on the drain outlet of the sample cooler and guide the condensation tubing out to the central waste.



NOTE

Do not kink the drain tubing and avoid siphoning effects of the drainage.

12 Ensure the power switch on the front of the module is OFF (switch stands out).



3 Using the Module

Installing the Sample Cooler

- 13 Connect the CAN interface cables to other modules in the system (see section *Recommended Stack Configurations* in the technical note *Use of Multisampler in Mixed Configurations* or the service manual).
- 14 If required, connect additional interface and control cables to the autosampler (see section *Recommended Stack Configurations* in the technical note *Use of Multisampler in Mixed Configurations* or the service manual). Refer to the documentation of the Agilent 1200 Infinity Series Instant Pilot or ChemStation for LC for more information.

NOTE

In an Agilent 1290 Infinity or 1260 Infinity system, the individual modules are connected by a CAN cable. The Agilent 1200 Infinity Series Instant Pilot can be connected to the CAN bus at any of the modules in the system. If an Agilent detector is part of the system, the LAN connection must be at the detector. For more information about connecting the instant pilot or control software refer to the respective user manual.

For connecting the Agilent 1290 Infinity equipment to non-Agilent 1290 Infinity equipment, see "[Cable Overview](#)" on page 186).

CAUTION

Damage to the sample cooler

- Wait at least 30 min before switching on the multisampler.
 - This allows the refrigerant and system lubrication to reach equilibrium.
- 15 Connect the power cable to the power connector at the rear of the module.



Transporting the Multisampler with a Sample Cooler Installed

NOTE

There are magnets in the front area of the multisampler, see “Magnets” on page 36.

NOTE

When moving the multisampler around the laboratory, make sure that any condensed water inside the thermostat is removed.

- Tilt the module to the back, so that the water inside the thermostat can safely flow into the leak funnel.
 - Otherwise no special precautions are needed for the modules.
-

WARNING**Heavy weight**

The module is heavy (>22 kg (>46 lbs)).

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

CAUTION**Mechanical damage of the module**

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

- Always park the transport assembly before shipment.
-

3 Using the Module

Transporting the Multisampler with a Sample Cooler Installed

If the multisampler with a sample cooler needs to be shipped to another location via carrier, ensure:

- The two modules are shipped in separate boxes.
- The Sample handler of the multisampler is parked, see **Park Robot** in Agilent Lab Advisor online help for more information.
- The sample containers (vial trays) are removed from the sample hotel.
- The condensed water inside of the sample cooler is removed.



4 Preparing the module

| | |
|--|----|
| Leak and Waste Handling | 56 |
| Preparing the Multisampler | 58 |
| Solvent Information | 60 |
| Setting up the Autosampler with Agilent Open Lab ChemStation | 65 |
| Control Settings | 68 |
| Method Parameter Settings | 69 |
| Module Configuration | 71 |

This chapter explains the operational parameters of the module.



Leak and Waste Handling

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

- When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.
- The volume of substances should be reduced to the minimum required for the analysis.
- Do not operate the instrument in an explosive atmosphere.
- Never exceed the maximal permissible volume of solvents (6 L) in the solvent cabinet.
- Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for the Agilent 1200 Infinity Series Solvent Cabinets.
- Arrange the bottles as specified in the usage guideline for the solvent cabinet.
- A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available on the Internet.
- Ground the waste container.
- The residual free volume in the appropriate waste container must be large enough to collect the waste liquid.
- Check the filling level of the waste container regularly.
- To achieve maximal safety, check the correct installation regularly.
- Do not use solvents with an auto-ignition temperature below 200 °C (392 °F).

NOTE

Recommendations for Solvent Cabinet

For details, see the usage guideline for the Agilent 1200 Infinity Series Solvent Cabinets.

For details on correct installation, see section *Installation Information on Leak and Waste Handling* in the service manual.

Preparing the Multisampler

For best performance of the multisampler

- When using the multisampler in a system with a vacuum degassing unit, shortly degas your samples before using them in the multisampler.
- Filter samples before use in a 1200 Infinity Series system. Use High pressure filter kit (5067-4638) for inline filtering.
- When using buffer solutions, flush the system with water before switching it off.
- Check the multisampler plungers for scratches, grooves and dents when changing the piston seal. Damaged plungers cause micro leaks and will decrease the lifetime of the seal.
- Solvent Information - Observe recommendations on the use of solvents, see “[Solvent Information](#)” on page 60.
- Priming and Purging the System - When the solvents have been exchanged or the system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel. Therefore priming and purging of the system is required before starting an application.

Table 5 Choice of Priming Solvents for Different Purposes

| Activity | Solvent | Comments |
|--|---------------------|---|
| After an installation | Isopropanol | Best solvent to flush air out of the system |
| When switching between reverse phase and normal phase (both times) | Isopropanol | Best solvent to flush air out of the system |
| After an installation | Ethanol or methanol | Alternative to isopropanol (second choice) if no isopropanol is available |
| To clean the system when using buffers | Bidistilled water | Best solvent to re-dissolve buffer crystals |
| After a solvent change | Bidistilled water | Best solvent to re-dissolve buffer crystals |

Solvent Information

Observe the following recommendations on the use of solvents.

- Follow recommendations for avoiding the growth of algae, see pump manuals.
- Small particles can permanently block capillaries and valves. Therefore, always filter solvents through 0.4 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

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 conditions, please consult the material information section or contact Agilent.

Disclaimer

Subsequent data were collected from external resources and are 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 a pH range between 1 – 12, and inert to many common solvents.

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

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.

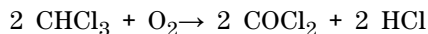
Tantalum (Ta)

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:



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.

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

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

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.

Setting up the Autosampler with Agilent Open Lab ChemStation

The setup of the Multisampler is shown with the Agilent OpenLab ChemStation C.01.05. Depending on the controller (e.g. Agilent Instant Pilot, OpenLab EZChrom, Masshunter) the screens look different.

NOTE

This section describes the autosampler settings only. For information on the Agilent OpenLab ChemStation or other 1290 Infinity modules refer to the corresponding documentation.



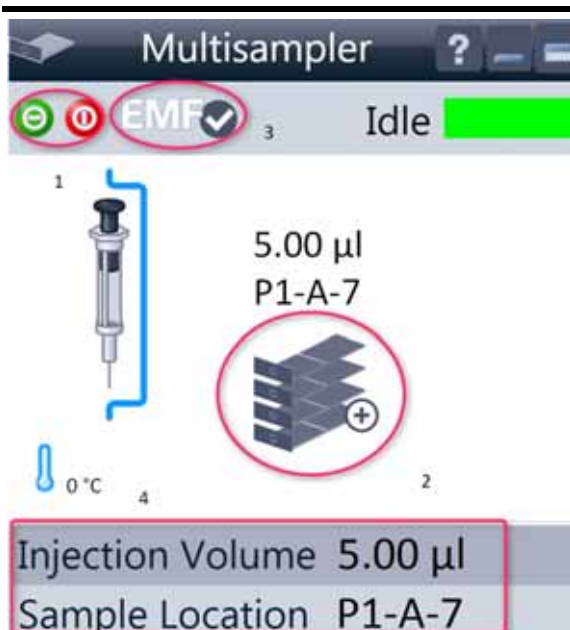
Figure 16 ChemStation Method and Run Control

After successful load of the OpenLab ChemStation, you should see the module as an active item in the graphical user interface (GUI).

4 Preparing the module

Setting up the Autosampler with Agilent Open Lab ChemStation

Table 6 The Autosampler User Interface

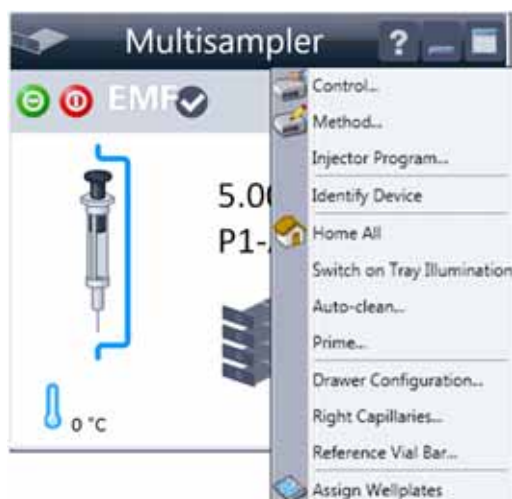


Within the Multisampler user interface, there are active areas. If you move the mouse cursor across the icons (tray, EMF button), the cursor will change and you may click on the icon to

- 1 Turn on/off the autosampler
- 2 Configure the sample hotel
- 3 Get the status of the EMF (Early Maintenance Feature)
- 4 Cooling Temperature

Current instrument information on:

- Injection volume
- Sample location



A right-click into the Active Area will open a menu to

- Show the **Control** User Interface (special module settings)
- Show the **Method** User interface (same as via menu **Instrument > Set up Instrument Method > Setup G7167B**)
- **Injector Program**

When you activate a pretreatment/injector program, it replaces the standard injection cycle.



- **Identify Device**
- **Home All**
- **Switch on Tray Illumination**
- **Auto Clean**
- **Prime**
- **Drawer Configuration**

Changing the load capacity of the Sample Hotel

- **Right Capillaries**
- **Reference Vial Bar**
- **Assign Wellplates**

Wellplate Configuration (same as click on the Tray icon)

Table 6 The Autosampler User Interface

| | |
|---|--|
|  <p>The screenshot shows the Multisampler software interface. At the top, there is a status bar with a green power icon, a red stop icon, the text 'EMF' with a checkmark, and the word 'Idle' in a green box. Below this is a syringe icon and the text '0.00 µL'. At the bottom, there is a sample tray icon with a plus sign. Below the tray, there are two fields: 'Injection Volume 0.00 µL' and 'Sample Location'.</p> | <p>Module Status shows Run / Ready / Error state and “Not Ready text” or “Error text”</p> <ul style="list-style-type: none"> • Error (Red) • Not ready (yellow) • Ready (green) • Pre run, Post run (purple) • Run (blue) • Idle (green) • Offline (dark gray) • Standby (light gray) |
|  <p>This screenshot is identical to the one above, but the 'EMF' text and its checkmark in the status bar are circled in red.</p> | <p>EMF Status shows Run / Ready / Error state and “Not Ready text” or “Error text”</p> <ul style="list-style-type: none"> • Offline (gray) • OK • No Maintenance required (green) • EMF warning. Maintenance might be required (yellow) • EMF warning. Maintenance required (red) |

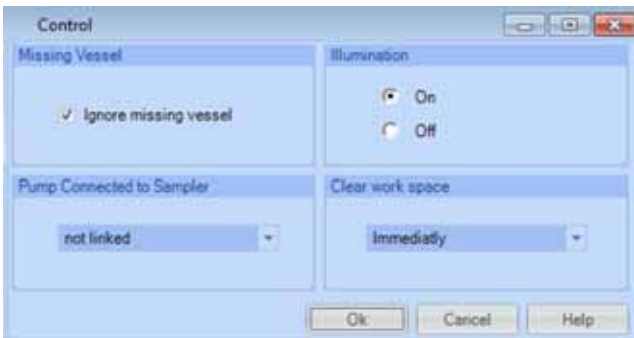
4 Preparing the module

Setting up the Autosampler with Agilent Open Lab ChemStation

Control Settings

These settings are available via right click on the Active Area of the ALS GUI.

Table 7 Control settings

| | |
|---|---|
|  | <p>Missing Vessel: The handling of missing vessels can be configured.</p> <p>Illumination: Switch on/off the internal illumination</p> <p>Linked Pump: To configure which pump delivers flow to the Autosampler</p> <p>Prime Flush Pump: Priming the Needle wash flush pump</p> <p>Work space: Clear the workspace > Immediately, At the End of the Analysis and Never</p> |
|---|---|

Method Parameter Settings

These settings are available via **Menu > Instrument > Set up Instrument Method Multisampler** or via right click on the Active area.

NOTE

The signal window in the lower part is not shown when opening the parameter settings via right mouse on the Multisampler user interface.



Figure 17 Method parameter settings

NOTE

For additional help and support. Highlight the desired cell and press the **F1** key. A help screen will open with additional information and documentation about the topic.

4 Preparing the module

Setting up the Autosampler with Agilent Open Lab ChemStation



Injection Mode/ Needle Wash

The settable **Injection volume** is depending on what kind of configuration is installed. Default configuration 0.1 – 20 µL.

It is possible to select between using the **Standard Wash** or **Standard Wash off**. Using needle wash is one option to obtain minimum carry-over.



The Injection cleaning section allows you to select between the **Standard Wash** option and the **Multi-wash** option. With the **Standard Wash** (default configuration) you can choose between two modes the Flush port or Wash Vial. If the **Multi-Wash** option is installed (additional hardware is required) you can use **Needle Wash** and **Seat Back Flush** together to obtain the lowest carry-over.



Stoptime/Posttime

A Multisampler **Stoptime** can be set. For equilibration of the Multisampler a **Posttime** can be set.

Module Configuration

The settings are available via menu **Instrument > Instrument Configuration > Multisampler Configuration**.

Multisampler Configuration Instrument 1

Communication:

Device name: Multisampler
 Type ID: G7167B
 Serial number: DEA0000001
 Firmware revision: B.06.60
 Connection settings...

Options:

Left needle installed Alternating needle usage not available

Left needle:
 Metering: G4267-60042: 40 µL Analytical Head
 Loop: G4267-60301: Sample Loop-Flex 20 µL left
 Seat: G4267-87012: Seat assembly 0.12 mm 1290 In6
 Max. Injection Volume: 20 µL
 (Multi-draw disabled)

Right needle:
 Metering: G4267-60042: 40 µL Analytical Head
 Loop: G4267-60300: Sample Loop-Flex 20 µL right
 Seat: G4267-87012: Seat assembly 0.12 mm 1290 In6
 Max. Injection Volume: 20 µL
 (Multi-draw disabled)

Cooler installed Multi-wash installed

Reference vial array:
 G4267-40071: 5 Vial bar

Define Sample Containers...

- **Device name:** based on the module.
- **Type ID:** based on the module (product number). Some modules may allow changing the type based on hardware/firmware. This results in a change of features and functions.
- **Serial number:** based on the module.
- **Firmware revision:** based on the module.
- **Options:** lists installed options.

4 Preparing the module

Setting up the Autosampler with Agilent Open Lab ChemStation



5 Optimizing Performance

Delay Volume and Extra-Column Volume 74

 Delay Volume 74

How to Configure the Optimum Delay Volume 75

How to Achieve Higher Injection Volumes 79

How to Achieve High Throughput 82

How to Achieve Higher Resolution 83

How to Achieve Higher Sensitivity 86

How to Achieve Lowest Carry Over 87

This chapter gives hints on how to optimize the performance or use additional devices.



Delay Volume and Extra-Column Volume

The *delay volume* is defined as the system volume between the point of mixing in the pump and the top of the column.

The *extra-column volume* is defined as the volume between the injection point and the detection point, excluding the volume in the column.

Delay Volume

In gradient separations, this volume causes a delay between the mixture changing in the pump and that change reaching the column. The delay depends on the flow rate and the delay volume of the system. In effect, this means that in every HPLC system there is an additional isocratic segment in the gradient profile at the start of every run. Usually the gradient profile is reported in terms of the mixture settings at the pump and the delay volume is not quoted even though this will have an effect on the chromatography. This effect becomes more significant at low flow rates and small column volumes and can have a large impact on the transferability of gradient methods. It is important, therefore, for fast gradient separations to have small delay volumes, especially with narrow bore columns (e.g., 2.1 mm i.d.) as often used with mass spectrometric detection.

How to Configure the Optimum Delay Volume

For very fast gradients over 0.5 min the delay volume of the system can be easily reduced without changing the physical configuration of the system. The change is achieved by changing the behavior of the multisampler. The 180 μL delay volume of the autosampler is due to the flow path from the injection valve through the metering device, needle, needle seat and connecting capillaries back to the injection valve (see [Table 8](#) on page 76). To make an injection the valve switches from mainpass to bypass so that the metering device can draw the sample into the needle capillary. The injection is made when the valve switches back to mainpass and the sample is flushed onto the column. The valve remains in this position during analysis so that the autosampler is continually flushed and hence the gradient has to flow through this delay volume to reach the column. This can be eliminated by switching the injection valve from mainpass to bypass after the injection has been made and the injected sample has been flushed onto the column. In practice this can be done a few seconds after injection and is activated by selecting the **Automatic Delay Volume Reduction (ADVR)** function in the autosampler setup menu. The Flush-out Factor (typically 5 times injection volume) ensures that enough time is allowed to flush the sample out of the injector before switching to bypass. For instance a 1 μL injection under standard conditions effectively reduces the system delay volume by approximately 160 μL .

5 Optimizing Performance

How to Configure the Optimum Delay Volume

Table 8 Schematic of injection steps in 1290 Infinity Multisampler

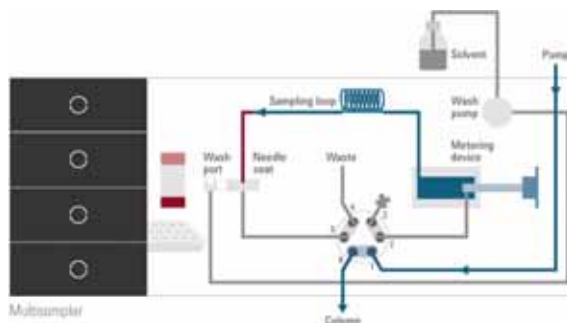


Figure 18 Valve in mainpass, flow through

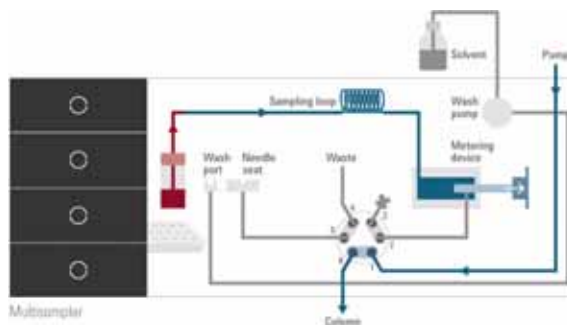


Figure 19 Valve in bypass, drawing sample

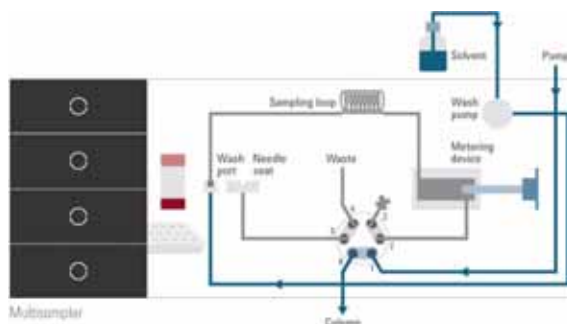
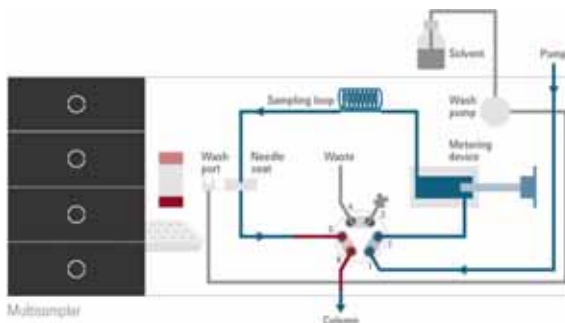
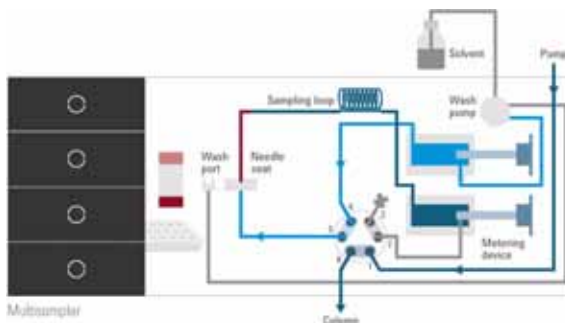


Figure 20 Valve in bypass, washing needle

Table 8 Schematic of injection steps in 1290 Infinity Multisampler**Figure 21** Valve in mainpass, sample injected**Figure 22** Valve in bypass, needle backflush (Multiwash)

When using ADVR it should be noted that the gradient has already started at the pump at the instant of injection. The question should be asked whether the gradient has already reached the autosampler, in which case a small step in the gradient will result. This happens when the delay volume is less than the flush-out volume and is not necessarily a problem but may be a factor to be considered in a method transfer. With a flush-out factor of 5 and an injection volume of 10 μl , the autosampler will allow 50 μl to pass through before switching to bypass which, with a delay volume of 50 μl , means the gradient just reached the injection valve. Smaller injection volumes will have no effect but for larger injection volumes this will introduce a small step in the gradient. The flow rate in use will also have an impact on the decision to use ADVR or not. At 0.2 ml/min the delay time saved is 21 seconds while at 1.0 ml/min it is 4 seconds.

5 Optimizing Performance

How to Configure the Optimum Delay Volume

The ADVR function is unlikely to be suitable for applications involving compounds which are known to cause carry-over problems. The best solution to reduce the delay volume is to install the 40 μL Analytical Head and the 20 μL Loop. To get the best results it is also recommended to order the Low dispersion heat exchanger and the micro flow cell for UV. This will reduce the the delay volume by 120 μL .

How to Achieve Higher Injection Volumes

The standard configuration of the Agilent 1290 Infinity Multisampler can inject a maximum volume of 20 μL with the standard loop capillary. To increase the injection volume the Multidraw upgrade kit (G4216-68711) can be installed. With this kit you can add a maximum of 80 μL to the injection volume of your injector. The total volume for the standard 1290 Infinity Multisampler is then 100 μL or 120 μL depending on the loop size with 40 μL analytical head installed.

For higher injection volume you can choose between further options. This requires additional hardware modifications. One way to increase the injection volume is to change the analytical head volume. There are a 100 μL and 900 μL analytical heads available. Additionally you can install the Multidraw kit (G1313-68711). With the kit you can add a maximum of 400 μL or 1400 μL to the injection volume of your injector. The total volume is then 500 μL or 1500 μL for the 1290 Infinity Multisampler with a 100 μL analytical head setup. Note the delay volume of your Multisampler is extended when using the extended seat capillaries from the multi-draw kit. When calculating the delay volume of the Multisampler you have to double the volume of the extended capillaries. The system delay volume due to the Multisampler will increase accordingly.

Whenever a method is scaled down from a larger column to a smaller column it is important that the method translation makes an allowance for reducing the injection volume in proportion to the volume of the column to maintain the performance of the method. This is to keep the volume of the injection at the same percentage volume with respect to the column. This is particularly important if the injection solvent is stronger (more eluotropic) than the starting mobile phase and any increase will affect the separation particularly for early running peaks (low retention factor). In some cases it is the cause of peak distortion and the general rule is to keep the injection solvent the same or weaker than the starting gradient composition. This has a bearing on whether, or by how much, the injection volume can be increased and the user should check for signs of increased dispersion (wider or more skewed peaks and reduced peak resolution) in trying to increase the injection size. If an injection is made in a weak solvent then the volume can probably be increased further because the effect will be to concentrate the analyte on the head of the column at the

5 Optimizing Performance

How to Achieve Higher Injection Volumes

start of the gradient. Conversely if the injection is in a stronger solvent than the starting mobile phase then increased injection volume will spread the band of analyte down the column ahead of the gradient resulting in peak dispersion and loss of resolution.

Perhaps the main consideration in determining injection volume is the diameter of the column as this will have a big impact on peak dispersion. Peak heights can be higher on a narrow column than with a larger injection on a wider column because there is less peak dispersion. With 2.1 mm i.d. columns typical injection volumes might range up to 5 to 10 μL but it is very dependent on the chemistry of the analyte and mobile phase as discussed above. In a gradient separation injection volumes of about 5 % of the column volume might be achieved whilst maintaining good resolution and peak dispersion. One way to achieve larger injections is to use a trapping column selected by a switching valve to capture and concentrate the injection before switching it, i.e. injecting it, onto an analytical column, see [Figure 23](#) on page 81. The valve can be conveniently located in the Thermostatted Column Compartment.

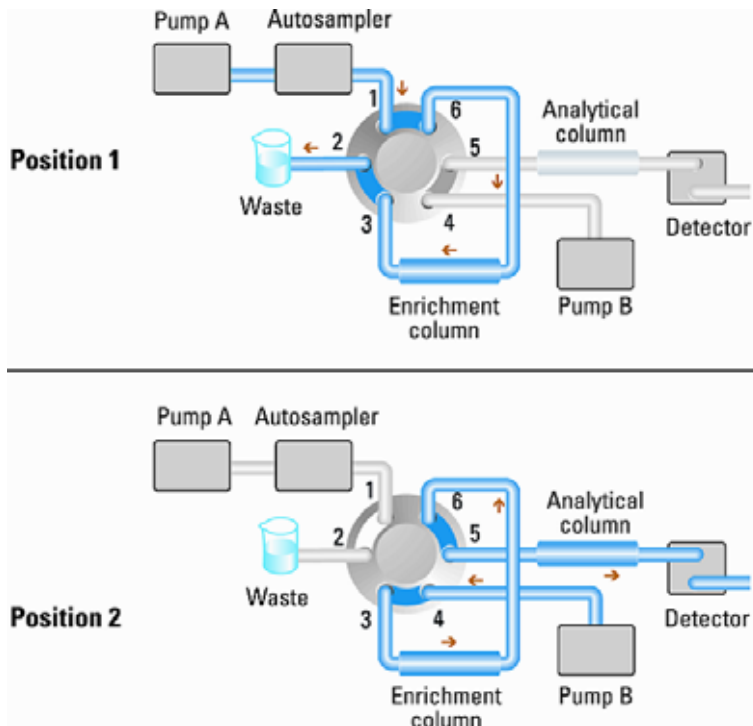


Figure 23 Sample enrichment

How to Achieve High Throughput

The injection can be optimized for speed remembering that drawing the sample too fast can reduce the reproducibility. Marginal gains are to be made here as the sample volumes used tend towards the smaller end of the range in any case. A significant portion of the injection time is the time taken with the needle movements to and from the vial and into the flush port. These manipulations can be performed while the previous separation is running. This is known as *overlapped injection* and it can be easily turned on from the Multisampler setup screen in the control software. The Multisampler can be told to switch the flow through the Multisampler to bypass after the injection has been made and then after, for example, 3 minutes into a 4 minutes run to start the process of aspirating the next sample and preparing for injection. This can typically save 0.5 to 1 minute per injection.

How to Achieve Higher Resolution

Increased resolution in a separation will improve the qualitative and quantitative data analysis, allow more peaks to be separated or offer further scope for speeding up the separation. This section explains how resolution can be increased by examining the following points:

- Optimize selectivity
- Smaller particle-size packing
- Longer Columns
- Shallower gradients, faster flow

Resolution between two peaks is described by the resolution equation:

$$R_s = \frac{1}{4} \sqrt{N} \frac{(\alpha - 1)}{\alpha} \frac{(k_2 + 1)}{k_2}$$

where

- R_s =resolution,
- N =plate count (measure of column efficiency),
- α =selectivity (between two peaks),
- k_2 =retention factor of second peak (formerly called capacity factor).

The term that has the most significant effect on resolution is the selectivity, α , and practically varying this term involves changing the type of stationary phase (C18, C8, phenyl, nitrile etc.), the mobile phase and temperature to maximize the selectivity differences between the solutes to be separated. This is a substantial piece of work which is best done with an automated method development system which allows a wide range of conditions on different columns and mobile phases to be assessed in an ordered scouting protocol. This section considers how to get higher resolution with any chosen stationary and mobile phases. If an automated method development system was used in the decision on phases it is likely that short columns were used for fast analysis in each step of the scouting.

5 Optimizing Performance

How to Achieve Higher Resolution

The resolution equation shows that the next most significant term is the plate count or efficiency, N , and this can be optimized in a number of ways. N is inversely proportional to the particle size and directly proportional to the length of a column and so smaller particle size and a longer column will give a higher plate number. The pressure rises with the inverse square of the particle size and proportionally with the length of the column. This is the reason that the 1290 Infinity LC system was designed to go to 1200 bar so that it can run sub-two-micron particles and column length can be increased to 100 mm or 150 mm. There are even examples of 100 mm and 150 mm columns linked to give 250 mm length. Resolution increases with the square root of N so doubling the length of the column will increase resolution by a factor of 1.4. What is achievable depends on the viscosity of the mobile phase as this relates directly to the pressure. Methanol mixtures will generate more back pressure than acetonitrile mixtures. Acetonitrile is often preferred because peak shapes are better and narrower in addition to the lower viscosity but methanol generally yields better selectivity (certainly for small molecules less than about 500 Da). The viscosity can be reduced by increasing the temperature but it should be remembered that this can change the selectivity of the separation. Experiment will show if this leads to increase or decrease in selectivity. As flow and pressure are increased it should be remembered that frictional heating inside the column will increase and that can lead to slightly increased dispersion and possibly a small selectivity change both of which could be seen as a reduction in resolution. The latter case might be offset by reducing the temperature of the thermostat by a few degrees and again experiment will reveal the answer.

The van Deemter curve shows that the optimum flow rate through an STM column is higher than for larger particles and is fairly flat as the flow rate increases. Typical, close to optimum, flow rates for STM columns are: 2 ml/min for 4.6 mm i.d.; and 0.4 ml/min for 2.1 mm i.d. columns.

In isocratic separations, increasing the retention factor, k , results in better resolution because the solute is retained longer. In gradient separations the retention is described by k^* in the following equation:

$$k^* = \frac{t_G}{\Delta\%B} \cdot \frac{F}{V_m} \cdot \frac{100}{S}$$

where:

- k^* = mean k value,
- t_G = time length of gradient (or segment of gradient) (min),
- F = flow (ml/min),
- V_m = column delay volume,
- $\Delta\%B$ = change in fraction of solvent B during the gradient,
- S = constant (ca. 4-5 for small molecules).

This shows that k and hence resolution can be increased by having a shallower gradient (2 to 5 %/min change is a guideline), higher flow rate and a smaller volume column. This equation also shows how to speed up an existing gradient – if the flow is doubled but the gradient time is halved, k^* remains constant and the separation looks the same but happens in half the time. Recently published research has shown how a shorter STM column (at temperatures above 40 °C) can generate higher peak capacity than a longer STM column by virtue of running it faster. (Refer to *Petersson et al., J.Sep.Sci, 31, 2346-2357, 2008, Maximizing peak capacity and separation speed in liquid chromatography*).

How to Achieve Higher Sensitivity

The sensitivity of a separation method is linked to the choice of stationary and mobile phases as good separation with narrow peaks and a stable baseline with minimal noise are desirable. The choice of instrument configuration will have an effect and a major impact is the setup of the detector. This section considers how sensitivity is affected by:

- Pump mixer volume
- Narrower columns
- Detector flow cell
- Detector parameters

In addition, the discussion on detector parameters also mentions the related topics of selectivity and linearity.

Columns

Sensitivity is specified as a signal-to-noise ratio (S/N) and hence the need to maximize peak height and minimize baseline noise. Any reduction in peak dispersion will help to maintain peak height and so extra-column volume should be minimized by use of short, narrow internal diameter, connection capillaries and correctly installed fittings. Using smaller inner diameter columns should result in higher peak height and is therefore ideal for applications with limited sample amounts. If the same sample amount can be injected on a smaller i.d. column, then the dilution due to column diameter will be less and the sensitivity will increase. For example, decreasing the column i.d. from 4.6 mm to 2.1 mm results in a theoretical gain in peak height of 4.7 times due to the decreased dilution in the column. For a mass spectrometer detector, the lower flow rates of narrow columns can result in higher ionization efficiencies and therefore higher sensitivity.

How to Achieve Lowest Carry Over

Carryover is measured when residual peaks from a previous active-containing injection appear in a subsequent blank solvent injection. There will be carry over between active injections which may lead to erroneous results. The level of carryover is reported as the area of the peak in the blank solution expressed as a percentage of the area in the previous active injection. The Agilent 1290 Infinity Multisampler is optimized for lowest carryover by careful design of the flow path and use of materials in which sample adsorption is minimized. A carryover figure of 0.001 % should be achievable even when a triple quadrupole mass spectrometer is the detector. Operating settings of the Multisampler allow the user to set appropriate parameters to minimize carryover in any application involving compounds liable to stick in the system. The following functions of the Multisampler can be used to minimize carryover:

- Internal needle wash
- External needle wash
- Needle seat backflush
- Injection valve cleaning

The flow path, including the inside of the needle, is continuously flushed in normal operation, providing good elimination of carryover for most situations. Automated delay volume reduction (ADVR) will reduce the delay volume but will also reduce the flushing of the Standard Multisampler and should not be used with analytes where carryover might be a problem.

The outside of the needle can be washed using a wash vial in a specific location or the needle can be washed using the flush port. If a wash vial in a tray location specified by the user is chosen then this vial should have no septum and should contain a solvent suitable for washing the sample from the needle. The septum is not used to avoid wiping contamination off the needle on the downstream only to re-apply it on the upstroke. The needle can be dipped into the vial multiple times. This will be effective in removing a small degree of carryover but for more effective washing of the outside of the needle use the flushport.

5 Optimizing Performance

How to Achieve Lowest Carry Over

The flush port is located above and behind the needle seat and in the standard hardware configuration a peristaltic pump delivers the wash solvent. It has a volume of 0.68 mL and the peristaltic pump delivers 5 mL/min, which means the flush port volume is completely refilled with fresh solvent in 7 s.

If the flush port is selected, the user can set how long the outside of the needle is to be washed with fresh solvent. This may be as low as two or three seconds in routine situations where carryover is less of a problem and 10 – 20 s for more complete washing.

It is recommended that washing the outside of the needle in the flush port should be standard procedure to avoid contaminating the needle seat. If the needle seat becomes contaminated it will have to be back-flushed. In the standard setup it must be done by manually changing the flow connections to clean it.

In this standard configuration the task can be done automated by using the Flexible Cube module. If you have installed the multiwash option of the Agilent 1290 Multisampler for priming of the flushport a micro piezo pump with 3 different wash solvent connections is installed. The integrated high pressure flush pump which will do the seat back flush.

The flush port and its solvent delivery pump and tubing should be regularly flushed to ensure the lowest carryover. For example, before using the system each day, prime the flush pump for three minutes with appropriate solvent.

When other measures have failed to eliminate carryover it might be that analyte is sticking inside the injector valve. With auto clean feature in the CDS system the injector valve can be set to make additional switching movements to clean out the flow path in the valve if problems occur here with carryover. If the problem compounds need a high percentage of organic phase for elution, it is recommended to switch the injection valve at the high percentage of organic phase after the last peak has eluted. It is also recommended to switch the injection valve again after the initial conditions for the mobile phase have stabilized. This ensures that the bypass groove in the rotor seal of the valve contains the gradient start conditions, which is especially important for flow rates below 0.5 mL/min. For samples where the outside of the needle cannot be cleaned sufficiently with water or alcohol from the flush pump use wash vials with an appropriate solvent. With an injector program several wash vials can be used for cleaning.

The optimum carry-over performance of the Multisampler is achieved after a run-in period of new instruments or after the exchange of consumable parts (like needle, needle seat and valve parts). During injections in this period, surfaces of these parts adjust to each other. After this period, we recommend back-flushing the needle seat in order to get the sealing areas between needle and needle seat clean. Regular Preventive Maintenance service is recommended as the carry-over performance of the Autosampler depends on the integrity of these consumable parts.

5 Optimizing Performance

How to Achieve Lowest Carry Over



6 Troubleshooting and Diagnostics

Overview of the Module's Indicators and Test Functions 92

Status Indicators 93

Power Supply Indicator 93

Module Status Indicator 93

Drawer Status Indicator 94

User Interfaces 95

Agilent Lab Advisor Software 96

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



Overview of the Module's Indicators and Test Functions

Status Indicators

The module is provided with two status indicators which indicate the operational state of the module. The status indicators provide a quick visual check of the operation of the module.

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the module generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided (see chapter Error Information).

Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components (see Tests and Calibrations).

Status Indicators

Three status indicators are located on the front of the module. The lower left indicates the power supply status, the upper right indicates the module status and those on the drawers indicate the drawer status.

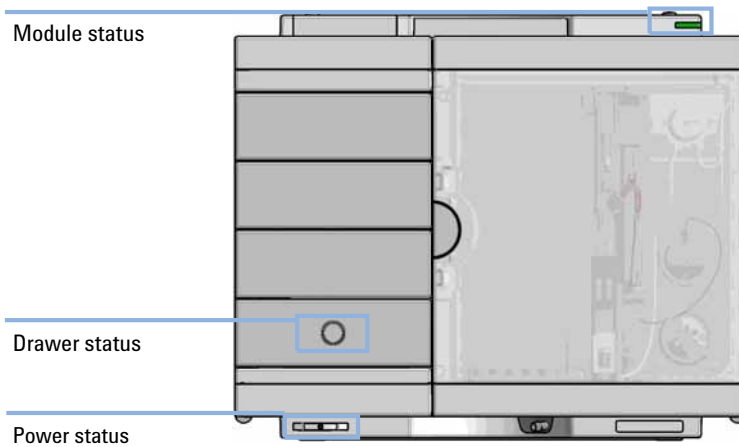


Figure 24 Module status indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is *ON*.

Module Status Indicator

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

- When the status indicator is *OFF* (and power switch light is on), the module is in a *prerun* condition, and is ready to begin an analysis.

- A *green* status indicator, indicates the module is performing an analysis (*run mode*).
- A *yellow* indicator indicates a *not-ready* condition. The module is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a set point), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the module has detected an internal problem which affects correct operation of the module. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.

If the error occurs during analysis, it is propagated within the LC system, i.e. a red LED may indicate a problem of a different module. Use the status display of your user interface for finding the root cause/module of the error.

- A *red blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).
- A *fast red blinking* indicator indicates that the module is in a low-level error mode. In such a case try to re-boot the module or try a cold-start (see [Table 15](#) on page 213). Then try a firmware update (see [“Replace the Module Firmware”](#) on page 165). If this does not help, a main board replacement is required.

Drawer Status Indicator

The module status indicator indicates one of three possible module conditions:

- When the status indicator is *OFF* no sample containers are loaded.
- When the upper, lower or both semi circle status indicator are *ON*, indicates the rear or front position of the drawer or both positions are loaded with a sample containers.
- When semi circle indicators are *blinking* the robot interacts with a drawer.

NOTE

Do not try to open the drawer at this point.

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 96.
- 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 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 Infinity II Series pump.

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

The optional Agilent Maintenance Wizard Add-on provides an easy-to-use, step-by-step multimedia guide for performing preventive maintenance on Agilent 1200 Infinity and Infinity II Series instruments.

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.



7 Error Information

| | |
|---------------------------|-----|
| What Are Error Messages | 98 |
| General Error Messages | 99 |
| Timeout | 99 |
| Shutdown | 100 |
| Remote Timeout | 101 |
| Lost CAN Partner | 102 |
| Leak Sensor Short | 102 |
| Leak Sensor Open | 103 |
| Compensation Sensor Open | 103 |
| Compensation Sensor Short | 104 |
| Fan Failed | 104 |
| Leak | 105 |
| Open Cover | 105 |

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 remote cable (see documentation for the APG interface).

General Error Messages

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

Timeout

Error ID: 0062

The timeout threshold was exceeded.

Probable cause

- 1 The analysis was completed successfully, and the timeout function switched off the module as requested.
- 2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.

Suggested actions

- Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
- Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

Error ID: 0063

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

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

Probable cause

- 1 Leak detected in another module with a CAN connection to the system.
- 2 Leak detected in an external instrument with a remote connection to the system.
- 3 Shut-down in an external instrument with a remote connection to the system.

Suggested actions

- Fix the leak in the external instrument before restarting the module.
- Fix the leak in the external instrument before restarting the module.
- Check external instruments for a shut-down condition.

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

- Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
- Exchange the remote cable.
- Check the instrument for defects (refer to the instrument's documentation).

Lost CAN Partner

Error ID: 0071

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

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

Probable cause

- 1 CAN cable disconnected.
- 2 Defective CAN cable.
- 3 Defective main board in another module.

Suggested actions

- Ensure all the CAN cables are connected correctly.
 - Ensure all CAN cables are installed correctly.
- Exchange the CAN cable.
- Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak Sensor Short

Error ID: 0082

The leak sensor in the module has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable cause

- 1 Defective leak sensor.
- 2 Leak sensor incorrectly routed, being pinched by a metal component.

Suggested actions

- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

Leak Sensor Open

Error ID: 0083

The leak sensor in the module has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

| Probable cause | Suggested actions |
|---|---|
| 1 Leak sensor not connected to the main board. | Please contact your Agilent service representative. |
| 2 Defective leak sensor. | Please contact your Agilent service representative. |
| 3 Leak sensor incorrectly routed, being pinched by a metal component. | Please contact your Agilent service representative. |

Compensation Sensor Open

Error ID: 0081

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

The resistance across the temperature compensation sensor (NTC) on the main board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

| Probable cause | Suggested actions |
|-------------------------|---|
| 1 Defective main board. | Please contact your Agilent service representative. |

Compensation Sensor Short

Error ID: 0080

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

The resistance across the temperature compensation sensor (NTC) on the main board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable cause

- 1 Defective main board.

Suggested actions

Please contact your Agilent service representative.

Fan Failed

Error ID: 0068

The cooling fan in the module has failed.

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

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

Probable cause

- 1 Fan cable disconnected.
- 2 Defective fan.
- 3 Defective main board.

Suggested actions

Please contact your Agilent service representative.

Please contact your Agilent service representative.

Please contact your Agilent service representative.

Leak

Error ID: 0064

A leak was detected in the module.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak-sensor circuit on the main board.

Probable cause

- 1 Loose fittings.
- 2 Broken capillary.

Suggested actions

- Ensure all fittings are tight.
- Exchange defective capillaries.

Open Cover

Error ID: 0205

The top foam has been removed.

Probable cause

- 1 Foam not activating the sensor.
- 2 Defective sensor or main board.

Suggested actions

- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

7 Error Information

General Error Messages



8 Test Functions

Tests and Calibrations in Agilent Lab Advisor 108

This chapter describes the built in test functions.



Tests and Calibrations in Agilent Lab Advisor

Use the tests and diagnostic features provided in the Agilent Lab Advisor software to check if your module is working correctly.

For further details, refer to the Agilent Lab Advisor software help files.



9 Maintenance

| | |
|--|-----|
| Introduction to Maintenance | 110 |
| Warnings and Cautions | 112 |
| Overview of Maintenance | 114 |
| Clean the Module | 115 |
| Removal and Installation of the Front Door | 116 |
| Remove the Needle Assembly | 119 |
| Install the Needle Assembly | 122 |
| Exchange the Needle Seat | 125 |
| Replace the Rotor Seal | 127 |
| Remove the Metering Seal | 131 |
| Install the Metering Seal | 135 |
| Replace the Peristaltic Pump Cartridge | 139 |
| Replace the Flushhead Seal | 142 |
| Replace the Injection Valve | 144 |
| Removing the Sample Loop-Flex | 145 |
| Installing the Sample Loop-Flex | 147 |
| Replace the Dummy Drawer | 149 |
| Optional Configurations | 149 |
| Installing and Replacing of Drawers (Upgrade Drawer Kit) | 151 |
| Configuration of the Hotel Drawers | 155 |
| Exchange the Power Supply Fuses (Sample Cooler) | 159 |
| Remove the Sample Cooler | 161 |
| Install the Sample Cooler | 162 |
| Replace the Module Firmware | 165 |

This chapter describes the maintenance of the Multisampler



Introduction to Maintenance

Figure 25 on page 110 shows the main user accessible assemblies of the multisampler. These parts can be accessed from the front (simple repairs) and don't require to remove the multisampler from the system stack.

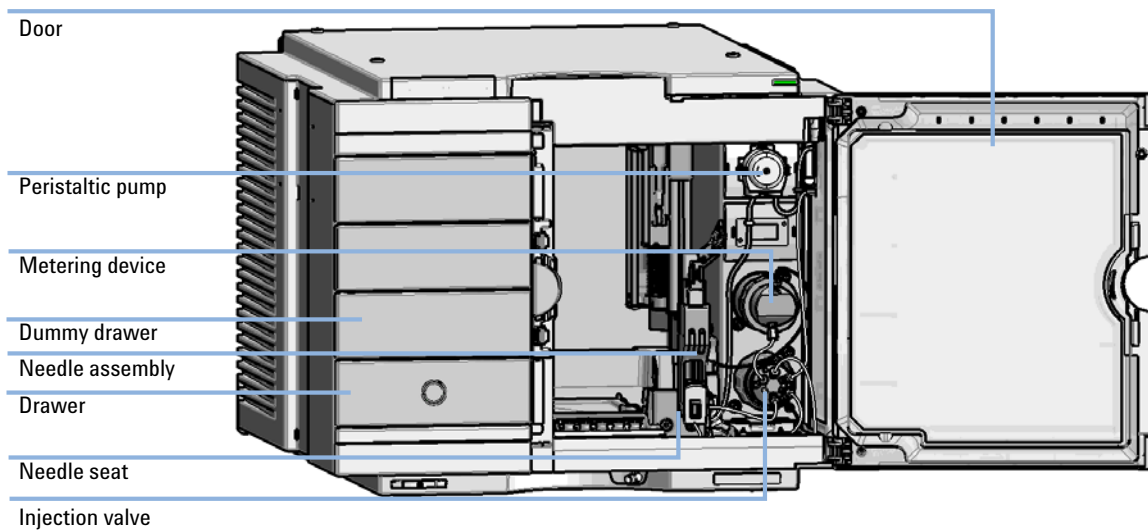


Figure 25 Main user accessible assemblies (standard)

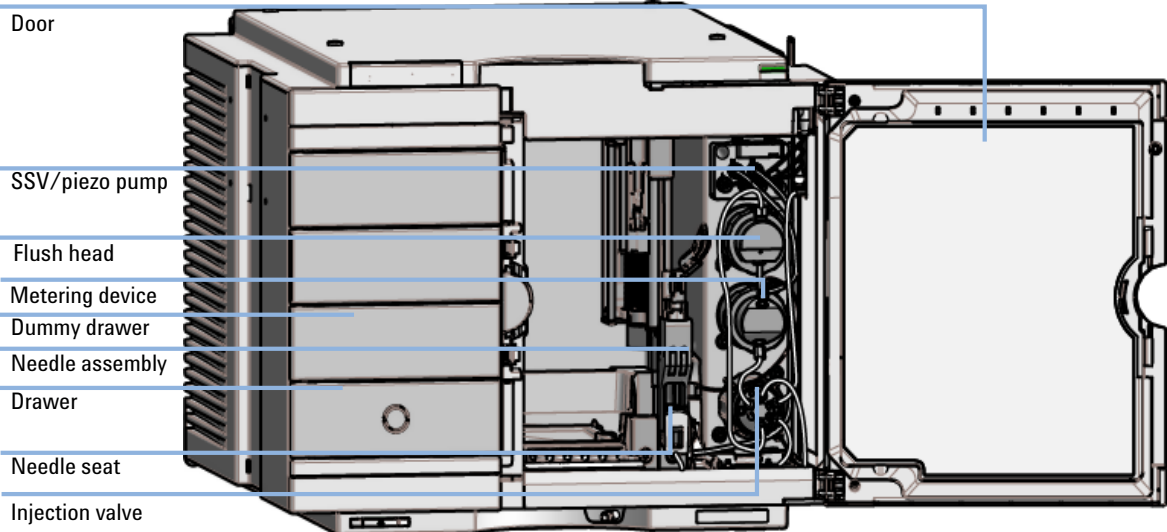


Figure 26 Main user accessible assemblies (multiwash)

Warnings and Cautions

WARNING

Personal injury or damage to the product

Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

- Use your Agilent products only in the manner described in the Agilent product user guides.
-

WARNING

Electrical shock

Repair work at the module can lead to personal injuries, e.g. shock hazard, when the cover is opened.

- Do not remove the cover of the module.
 - Only certified persons are authorized to carry out repairs inside the module.
-

WARNING

Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

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

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

CAUTION

Safety standards for external equipment

- If you connect external equipment to the instrument, make sure that you only use accessory units tested and approved according to the safety standards appropriate for the type of external equipment.
-

Overview of Maintenance

It is necessary to perform periodic inspection of this instrument to ensure its safe use. It is possible to have these periodic inspections performed by Agilent service representatives on a contractual basis. For information regarding the maintenance inspection contract, contact your Agilent representative.

The following pages describe the maintenance (simple repairs) of the module that can be carried out without opening the main cover.

Table 9 Overview of maintenance

| Procedure | Typical interval (minimum) | Notes |
|-----------------------------------|----------------------------|-------|
| Change needle/needle seat | 60000 needle into seat | |
| Change peristaltic pump cartridge | 3000 h on time | |
| Change rotor seal | 30000 injections | |

Clean 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.
-

Removal and Installation of the Front Door

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

Tools required **Description**
Flat screwdriver

Parts required

| p/n | Description |
|-----------|------------------------|
| 5067-5415 | Door Assy IF-320-Right |

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

NOTE

For detailed information on position of the magnets, refer to [“Magnets”](#) on page 36

CAUTION

Magnetic fields

Magnets produce a far-reaching, strong magnetic field.

You can damage for example televisions, laptops, computer harddisks, credit cards, magnetic cards may be damaged as well.

→ Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.

WARNING

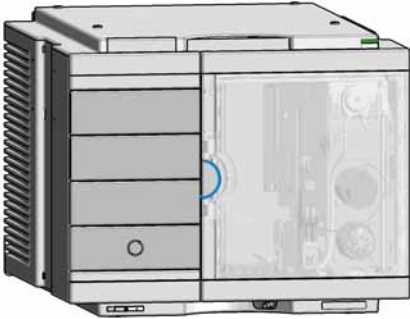
Heart pacemakers

Magnets may derogate the function of heart pacemakers and implanted defibrillators. Heart pacemakers may switch to the test modus which may cause malaise. Defibrillators may malfunction.

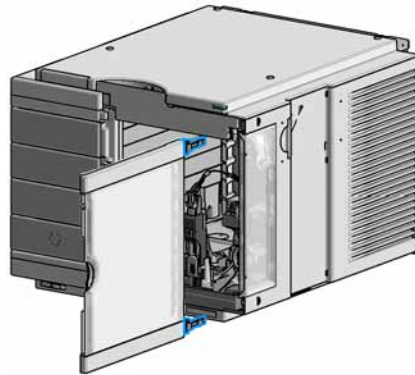
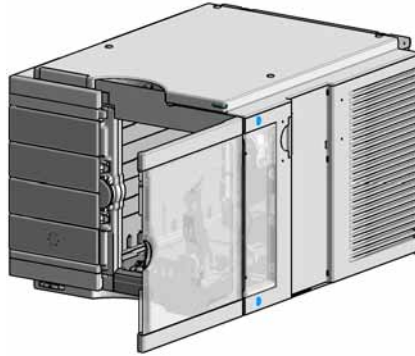
→ Bearers of heart pacemakers or implanted defibrillators must stay off at least 55 mm from the magnets.

Removal and Installation of the Front Door

1 Open the front door.



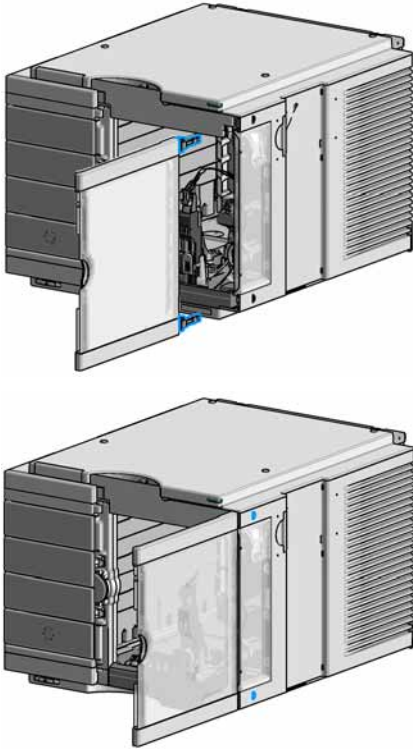
2 Press the release buttons and pull the front door out.



9 Maintenance

Removal and Installation of the Front Door

- 3 For the Installation of the front door. Insert the hinges into their guides and move the door in until the release buttons click into their final position.



Remove the Needle Assembly

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

| Tools required | p/n | Description |
|-----------------------|------------|-----------------------------|
| | 8710-0510 | Wrench open 1/4 — 5/16 inch |

| Parts required | p/n | Description |
|-----------------------|-------------|--------------------|
| | G4267-87201 | Needle Assembly |

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

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

- Do not open the safety lock of the needle assembly
- Be careful working at the z-robot.
- Wear safety goggles, when removing the needle assembly.

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.

NOTE

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

9 Maintenance

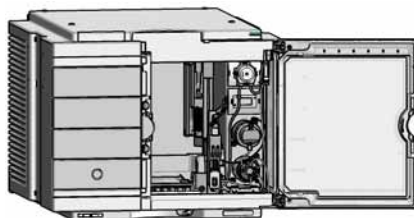
Remove the Needle Assembly

- 1 In the Instant Pilot start the maintenance mode and select **Change needle/seat** function.

OR

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

- 2 Open the front door.



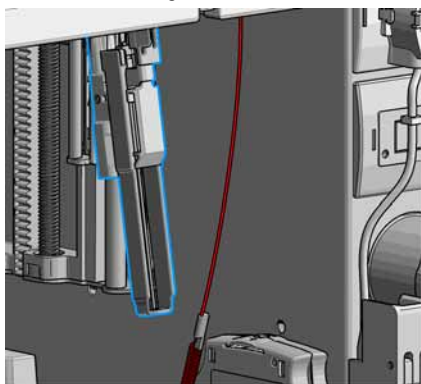
WARNING

Sharp needle

Uncovered needles may cause injuries

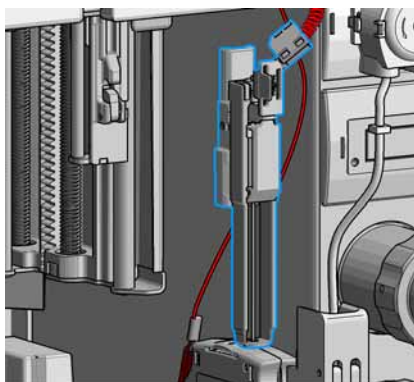
→ Do not unlock the safety lock of needle assembly.

- 3 Remove the needle assembly by slightly pulling the needle cartridge.



- 4

Z-Robot (Z-arm coupler) without the needle assembly.



CAUTION

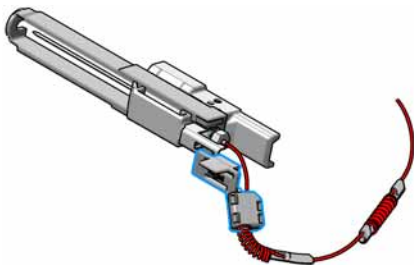
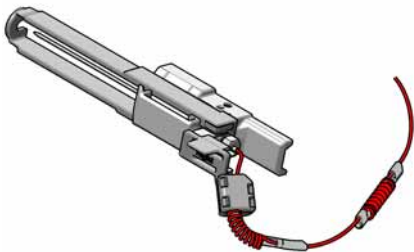
Damage of the loop

The loop shape may be damaged if the loop is stretched or bent too far.

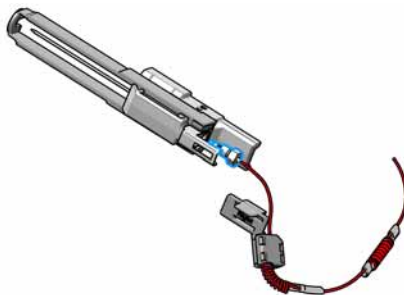
→ Avoid to change the loop shape.

→ Do not pull or bend the loop too far.

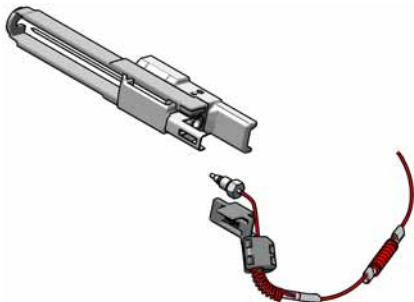
5 The needle assembly is still connected to the loop capillary.



6 Use a 1/4 inch wrench to loosen the fitting of the loop capillary.



7 Remove the needle assembly.



Install the Needle Assembly

| | | |
|-----------------------|--|-----------------------------|
| When | When the limit in the needle into seat counter in the EMF is exceeded or when needle shows indications of damage, blockage or leaks. | |
| Tools required | p/n | Description |
| | 8710-0510 | Wrench open 1/4 — 5/16 inch |
| Parts required | p/n | Description |
| | G4267-87201 | Needle Assembly |
| Preparations | In order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves. | |

WARNING

Risk of injury by uncovered needle

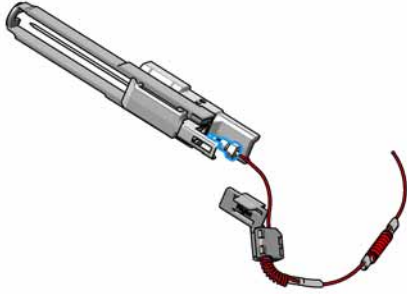
An uncovered needle is a risk of harm to the operator.

- Do not open the safety lock of the needle assembly
- Be careful working at the z-robot.
- Wear safety goggles, when removing the needle assembly.

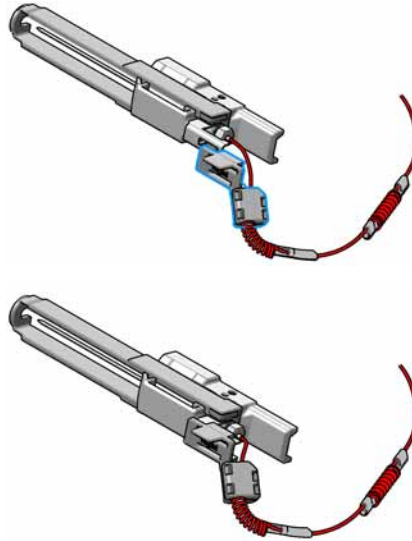
NOTE

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

1 Install the loop capillary on top of the needle cartridge and tighten the fitting hand tight.



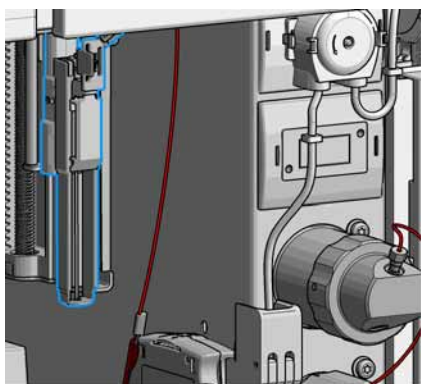
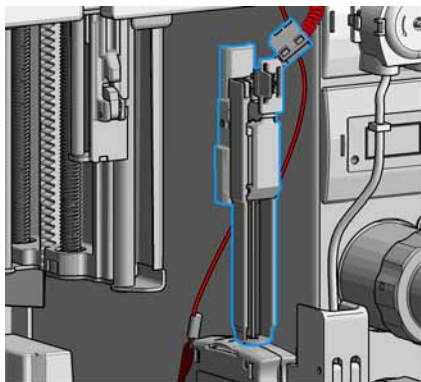
2 Install loop plastic adapter which shows the orientation. Then use a 1/4 inch wrench to tighten the fitting of the loop capillary.



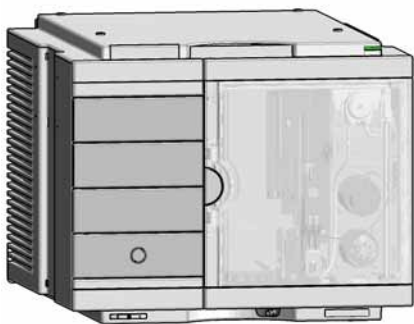
9 Maintenance

Install the Needle Assembly

- 3 Pinch and reinsert the needle assembly and the connected loop capillary into the z-arm coupler.



- 5 Close the front door.



- 4 In the Instant Pilot close **Change needle /seat**.

OR

In the Agilent Lab Advisor software **Change needle/loop** > **End**, click **End** and wait until the needle assembly is in the needle park station.

- 6 Perform a pressure test.

Exchange the Needle Seat

When When seat is visibly damaged, blocked or leaks.

| | | |
|-----------------------|------------|--|
| Tools required | p/n | Description |
| | 8710-0510 | Wrench open 1/4 — 5/16 inch Flat head screwdriver |

| | | |
|-----------------------|-------------|---|
| Parts required | p/n | Description |
| | G4267-87012 | High Pressure Needle Seat, 0.12 mm (PEEK) |

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

WARNING

Risk of injury by uncovered needle

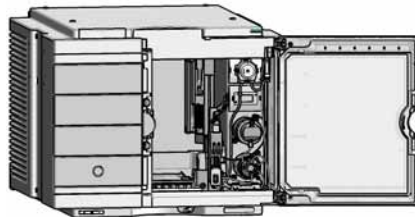
An uncovered needle is a risk of harm to the operator.

- Do not open the safety lock of the needle assembly
- Be careful working at the z-robot.
- Wear safety goggles, when removing the needle assembly.

- 1 In the Instant Pilot start the maintenance mode and select **Change needle/seat** function.

OR
In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen **Maintenance Positions > Change Needle**, click start and wait until the needle assembly is in maintenance position.

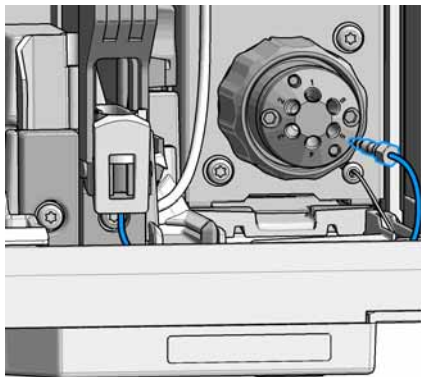
- 2 Open the front door.



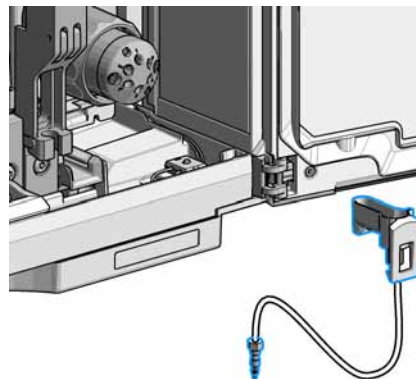
9 Maintenance

Exchange the Needle Seat

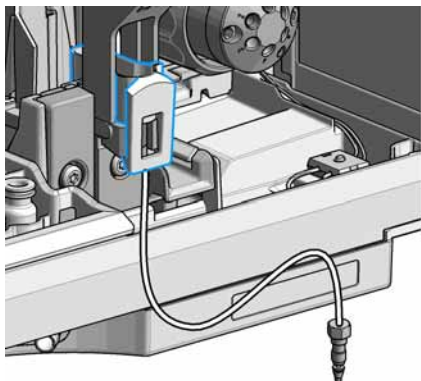
3 Disconnect the seat capillary from the Injection valve.



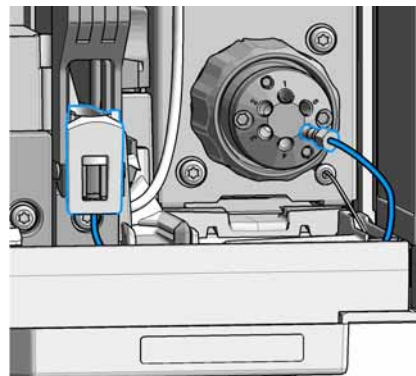
4 Unclick the needle seat assembly carefully by lifting the leak tube from the holder.



5 Insert the new Needle seat. Press it firmly in position.



6 Reconnect the seat capillary to the injection valve.

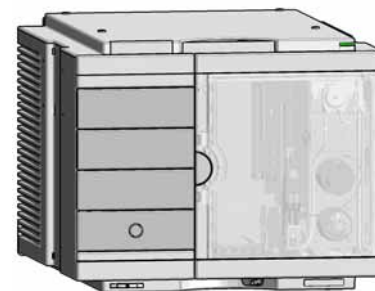


7 In the Instant Pilot close **Change needle /seat**.

OR

In the Agilent Lab Advisor software **Change needle** click **End** and wait until the needle assembly is in the needle park position.

8 Close the front door.



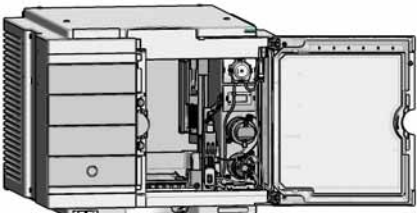
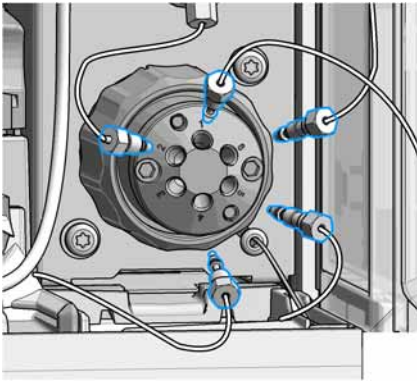
9 Perform a pressure test.

Replace the Rotor Seal

| | | |
|-----------------------|--|--|
| When | When poor injection volume reproducibility or when injection valve is leaking. | |
| Tools required | p/n | Description |
| | 8710-0510 | Wrench open 1/4 — 5/16 inch |
| | 8710-2394 | Hex key 9/64 inch 15 cm long T-handle |
| | | Cleaning tissue and appropriate solvent like isopropanol or methanol |
| Parts required | p/n | Description |
| | 5068-0198 | Rotor Seal for VICI Injection Valve (PAEK) |

CAUTION

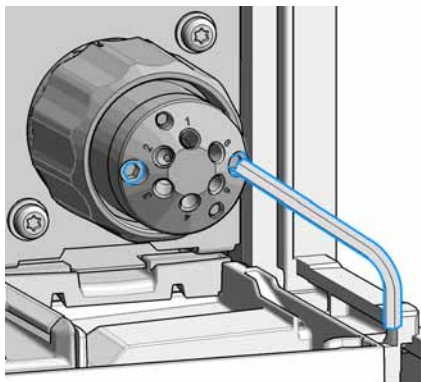
Reduced life time of the injection valve
Component cleanliness is crucial for the life time of the injection valve.
→ Replace the rotor seal in a clean environment.

| | |
|---|--|
| <p>1 Open the front door.</p>  | <p>2 Remove all capillaries from the injection valve with a 1/4 inch wrench.</p> <p>NOTE Remember the correct plumbing.</p>  |
|---|--|

9 Maintenance

Replace the Rotor Seal

- 3 Use a 9/64 inch hex driver to unscrew the two socket screws which hold the stator head in place.

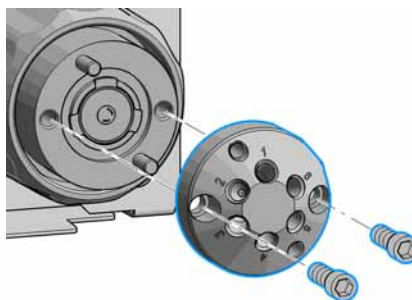


CAUTION

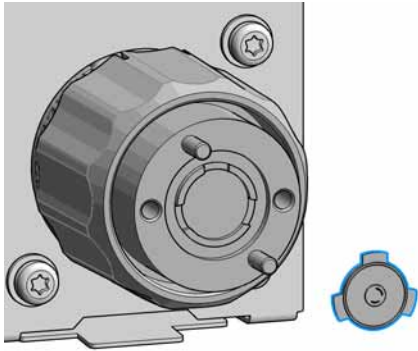
Damage to the stator head
The polished sealing surface of the stator head contains six ports that access handling can easily damage.

- Avoid touching the polished surface of the stator head.
- Never place the polished surface on a hard surface.

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



5 Remove the rotor seal.



NOTE

Remove the rotor seal with a small tool, gently pry the rotor seal away from the drive.

Examine the rotor sealing surface for scratches and nicks.

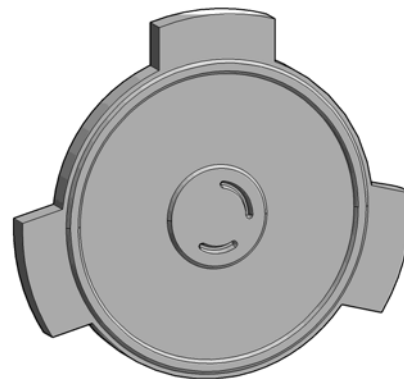
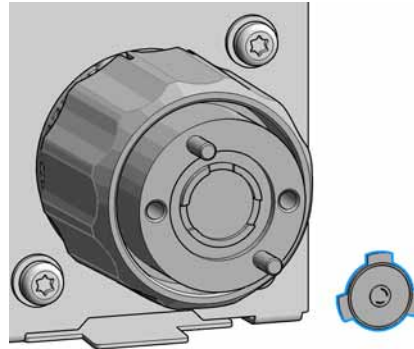
- If scratches are visible the rotor seal must be replaced.
- If no scratches are visible clean all the parts with an appropriate solvent, taking care that no surfaces get scratched.

CAUTION

Damage to the rotor seal and cross-port leaks

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

6 Install new rotor seal.



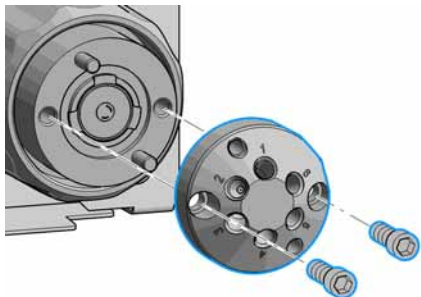
NOTE

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

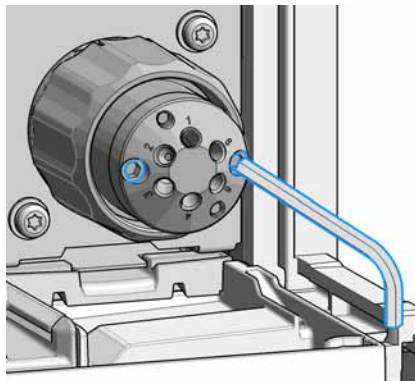
9 Maintenance

Replace the Rotor Seal

- 7** Reinstall the stator head. The index pins on the drive and the stator head must engage in the corresponding holes. Insert the two socket head screws.



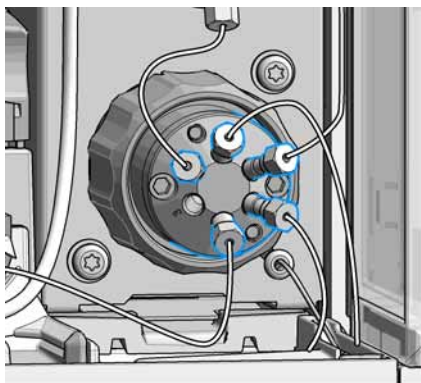
- 8** Using a 9/64 in. L-Hex wrench, tighten each screw gently until you feel resistance (approximately fingertight). Tighten each screw by 1/8 turn, and then tighten each screw again, until the stator is secured to the driver.



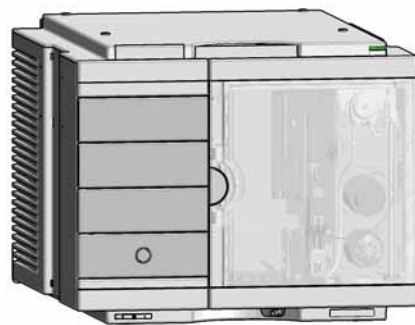
NOTE

Do not over-tighten the screws. The screws hold the assembly together and do not affect the sealing force. The sealing force is automatically set as the screws close the stator head against the valve body.

- 9** Reconnect all capillaries to the proper injection valve ports with a 1/4 inch wrench



- 10** Close the front door.



- 11** Perform a pressure test.

Remove the Metering Seal

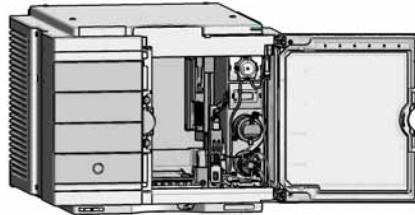
When When poor injection volume reproducibility or when metering device / analytical head is leaking.

| Tools required | p/n | | Description |
|----------------|-------------|-----------|--------------|
| | | 8710-0510 | |
| | 8710-2392 | | 4 mm Hex key |
| | 01018-23702 | | Insert tool |

| Parts required | # | p/n | Description |
|----------------|---|-----------|--|
| | | 1 | 0905-1717 |
| | 1 | 0905-1719 | Metering seal 100 µL for 100 µL analytical head |
| | 1 | 5067-5920 | Piston ceramic If previous piston is scratched |

- 1** In the Instant Pilot start the maintenance mode and select **Change metering device** function.
- OR
- In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen (**Tools**) > **Maintenance Positions** > **Change Needle**, click start and wait until the metering device is in maintenance position.

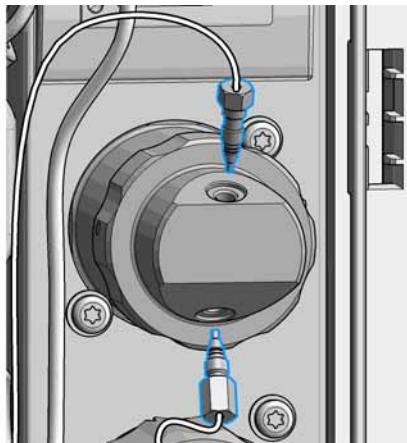
- 2** Open the front door.



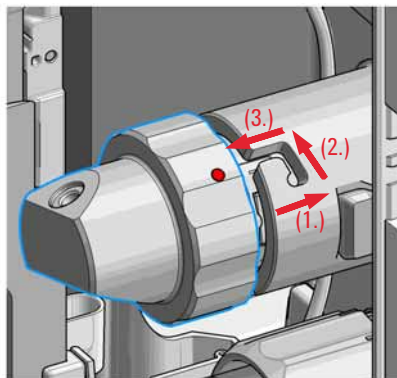
9 Maintenance

Remove the Metering Seal

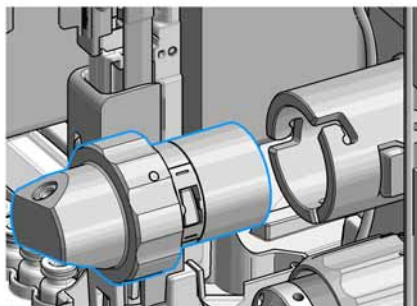
3 Disconnect all capillaries from the metering device.



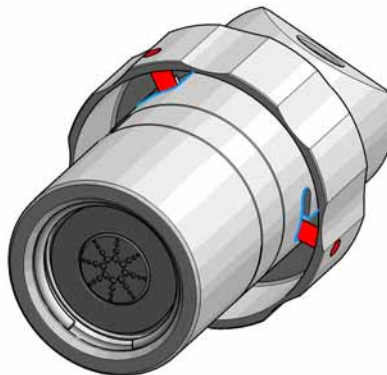
4 To release the bayonet lock, push (1.) and rotate (2.) the analytical head a quarter left. Then you can pull and detach the analytical head assembly from the actuator (3.).



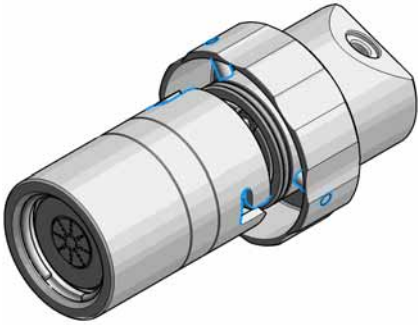
5 Remove the metering device.



6 Take the metering device. Push against the rear side of the metering device and rotate a quarter left to release the bayonet lock.



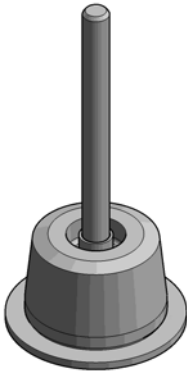
7 Now you can separate the analytical head and head body.



8 Remove the piston out of the head body.



9 Inspect the piston for cleanliness and scratches.



- If dirty:
Clean the piston with an appropriate solvent.
- If scratched:
Replace the piston by a new one.

10 Take the analytical head and remove the three screws on the rear side, which holds the support ring in place. Check the support ring for any damages.



9 Maintenance

Remove the Metering Seal

- 11** Carefully remove the metering seal using the steel side of the insert tool. Clean the chamber with an appropriate solvent and ensure that all particulate matter is removed.





Install the Metering Seal

When After removing the metering seal.

| Tools required | p/n | Description |
|----------------|-------------|--|
| | 8710-0510 | Wrench open 1/4 — 5/16 inch |
| | 8710-2392 | 4 mm Hex key |
| | 01018-23702 | Insert tool |
| | | Cleaning tissue and appropriate solvent like isopropanol or methanol |

| Parts required | # | p/n | Description |
|----------------|---|-----------|---|
| | 1 | 0905-1717 | Metering seal for 40 µL analytical head |
| | 1 | 0905-1719 | Metering seal 100 µL for 100 µL analytical head |
| | 1 | 5067-5920 | Piston ceramic If previous piston is scratched |

Preparations Removing the metering seal, see [“Remove the Metering Seal”](#) on page 131

| | |
|---|--|
| <p>1 Install the new metering seal using the plastic side of the insert tool. Press it firmly into position. Avoid any offset angle as it might deform the seal.</p>  | <p>2 Reassemble the support ring.</p>  |
|---|--|

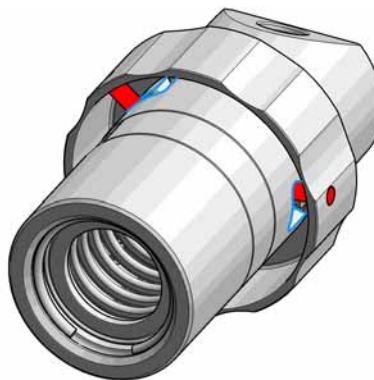
9 Maintenance

Install the Metering Seal

- 3 Make sure to comply to the following order of actions:
- a Tighten the three screws fingerthight, then
 - b Tighten the screws a little at a time to keep the support ring surface *parallel* (important!) to the surface of the analytical head.



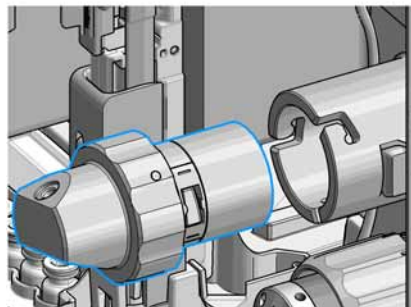
- 4 Use the twist and lock bayonet mechanisms to reassemble the analytical head assembly. Push the two parts together to couple the head body with the analytical head. Once the pin reaches the bottom of the slot, one or both parts are rotated so that the pin slides along the horizontal arm of the L until it reaches the *serif*. The spring then pushes the male connector up into the *serif* to keep the pin locked into place.



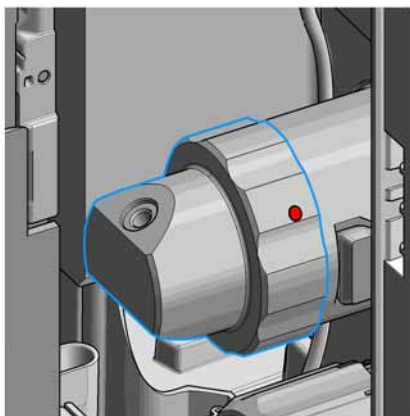
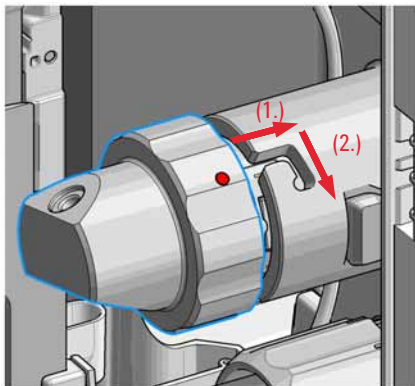
- 5 Press the piston carefully into the housing of the head body and the seal.



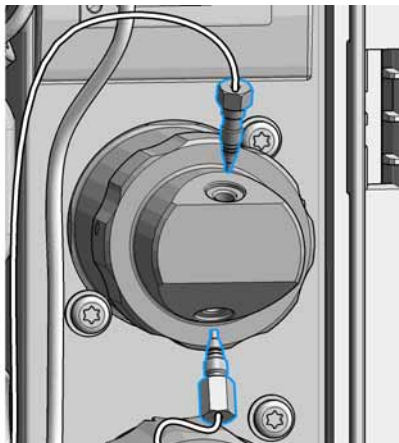
- 6 Reinstall the complete analytical head with the actuator housing



7 Fix the analytical head by pushing (1.) and rotating (2.) via twist and lock bayonet mechanism.



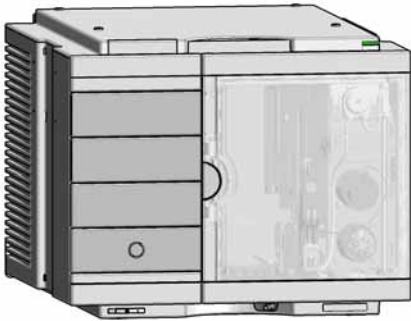
8 Reconnect the capillaries.



9 Maintenance

Install the Metering Seal

9 Close the front door.



In the Instant Pilot exit the maintenance mode and select **Change metering device** function.

OR

In Agilent Lab Advisor software system screen exit **Service & Diagnostics (Tools) > Maintenance Positions > Change Metering Device** click **End** and wait until the metering device is in **Home** position.

10 Perform a pressure test.

Replace the Peristaltic Pump Cartridge

When Tubing blocked or broken

Tools required Description

| Parts required | # | p/n | Description |
|----------------|---|-----------|--------------------------------------|
| | 1 | 5042-6401 | Peristaltic Pump Pharmed |
| OR | 1 | 5065-4445 | Peristaltic pump with Pharmed tubing |

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

WARNING

When opening capillary or tube fittings solvents may leak out.

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

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

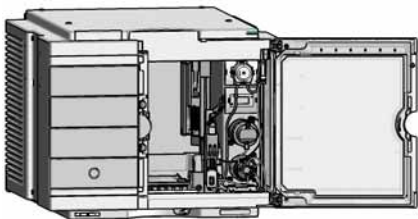
NOTE

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

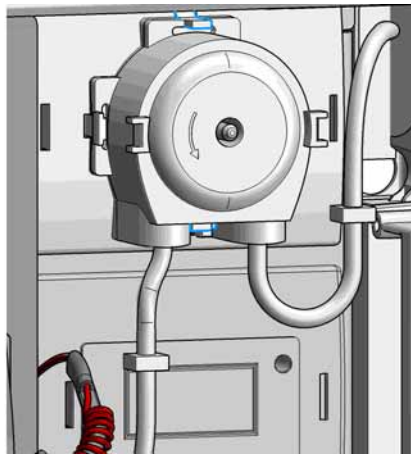
9 Maintenance

Replace the Peristaltic Pump Cartridge

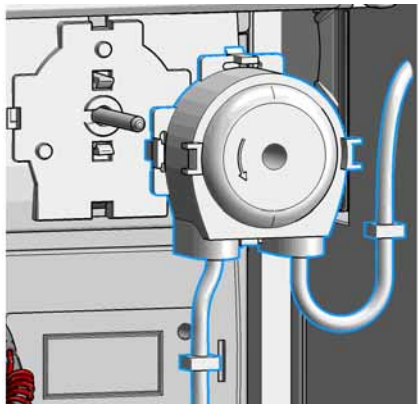
1 Open the front door.



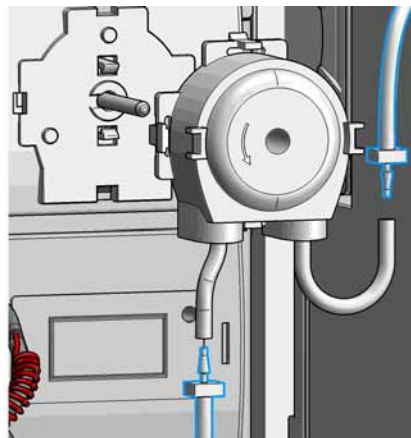
2 Press the two clips on the front of the peristaltic pump cartridge.



3 Pull the cartridge forward off the motor shaft.

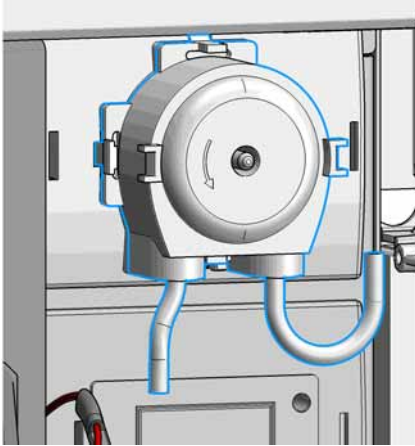


4 Disconnect the tubing coupler leading to the wash port and the tubing coupler coming from the solvent bottle.

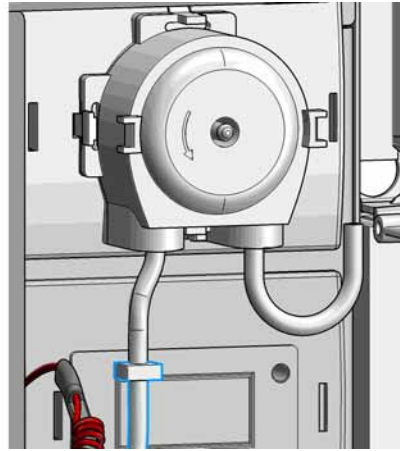


Replace the Peristaltic Pump Cartridge

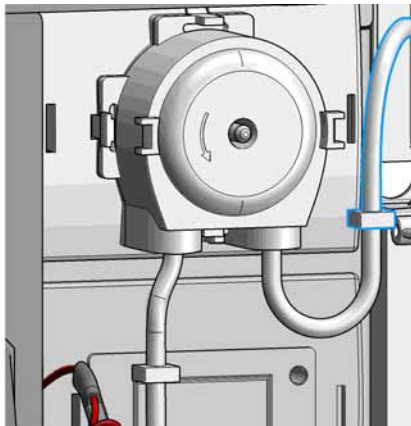
- 5 Push the new cartridge onto the motor shaft until the clips click into place.



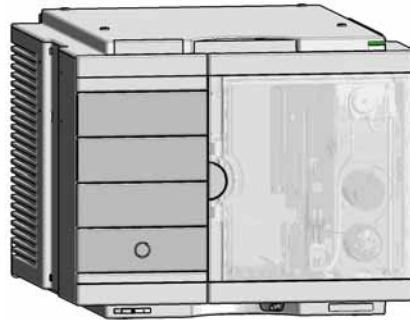
- 6 Connect the wash port tubing to the upper tubing of the new cartridge (use sand paper to get a good grip on the tubing).



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



- 8 Close the front door.



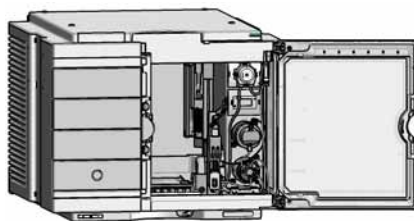
Replace the Flushhead Seal

1 In the Instant Pilot start the maintenance mode and select **Change metering device** function.

OR

In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen (**Tools**) > **Maintenance Positions** > **Change Needle**, click start and wait until the metering device is in maintenance position.

2 Open the front door.



- 3 Remove all capillaries from the flush head
- 4 Press and turn the Flush Head a quarter left (bayonet fitting) and detach the metering device from the actuator.
- 5 Pull the flush head away from the hydraulic box
- 6 Press against the rear side of flush head and turn a quarter left (bayonet fitting) and separate the flush head, head body and the piston.

NOTE

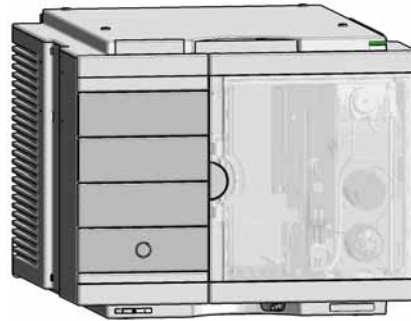
Be careful not to break the piston.

- 7 Take the flush head and remove the three screws on the rear side, which hold the support ring in place.
- 8 Check the support ring for any damages. If the support is scratched or damaged, replace the support ring by a new one.
- 9 After removing of the support ring. Carefully remove the metering seal by using the steel side of the insert tool.
- 10 Clean the chamber with the appropriated solvent and ensure all particulate matter is removed.
- 11 Install the new flush head seal using the plastic side of the insert tool. Press it firmly into position. Avoid any offset angle as it might deform the seal.
- 12 Reassemble the support ring.

Make sure to comply to the following order of actions:

 - 1 Tighten the three screws fingertight, then
 - c Tighten the screws a little at a time to keep the support ring surface *parallel* (important!) to the surface of the flush head.
- 13 Reassemble the head body with the flush head by pressing and turning the head body against the head body.
- 14 Press the piston into the seal.
- 15 Reinstall the flush head to the actuator housing.
- 16 Fix the flush head.
- 17 Connect the capillaries.

- 18 Close the front door.



Replace the Injection Valve

When Add new injection valve or replace defective injection valve.

Tools required

| Description |
|-------------|
| Wrench 9/64 |

Parts required

| p/n | Description |
|-----------|----------------------------------|
| 5067-4232 | 2pos/6port Injection Valve (VIC) |

Preparations Switch off the power of the Multisampler

- 1 Disconnect the capillaries.
- 2 Open the spanner.
- 3 Remove the pod.
- 4 Install the new valve.

NOTE

Check the orientation of the rear side.

-
- 5 Push the injection valve into the actuator.

NOTE

The index pin must fit in the slot.

-
- 6 Close the spanner.
 - 7 Reconnect the capillaries

Removing the Sample Loop-Flex

| | | |
|-----------------------|---|---|
| When | If the sample loop flex is defective or damaged. | |
| Tools required | p/n | Description |
| | 8710-0510 | Wrench open 1/4 — 5/16 inch |
| Parts required | p/n | Description |
| | G4267-60300 | Sample Loop Flex 20 µL, right (red coded) |
| | G4267-60400 | Sample Loop Flex 40 µL, right (green coded) |
| | G4267-60500 | Sample Loop Flex 100 µL, right (blue coded) |
| Preparations | Finish any pending acquisition job and return any plate on the workspace back to the hotel. | |

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

- Do not open the safety lock of the needle assembly
- Be careful working at the z-robot.
- Wear safety goggles, when removing the needle assembly.

1 In the Instant Pilot start the maintenance mode and select **Change needle/seat** function.

OR

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

2 Open the front door.

3 Disconnect the sample loop flex capillary from the analytical head.

9 Maintenance

Removing the Sample Loop-Flex

CAUTION

Damage of the loop

The loop shape may be damaged if the loop is stretched or bent too far.

- Avoid to change the loop shape.
 - Do not pull or bend the loop too far.
-

4 Remove the needle assembly by slightly pulling the needle cartridge.

WARNING

Sharp needle

Uncovered needles may cause injuries

- Do not unlock the safety lock of needle assembly.
-

5 The needle assembly is still connected to the loop capillary. Use a 1/4 inch wrench to loosen the fitting of the loop capillary.

6 Remove the cartridge out of it proper position. By gently tilting and pulling it out of the work space of the multisampler.

Installing the Sample Loop-Flex

| | | |
|-----------------------|---|---|
| When | If the sample loop flex is defective or damaged. | |
| Tools required | p/n | Description |
| | 8710-0510 | Wrench open 1/4 — 5/16 inch |
| Parts required | p/n | Description |
| | G4267-60300 | Sample Loop Flex 20 µL, right (red coded) |
| | G4267-60400 | Sample Loop Flex 40 µL, right (green coded) |
| | G4267-60500 | Sample Loop Flex 100 µL, right (blue coded) |
| Preparations | Finish any pending acquisition job and return any plate on the workspace back to the hotel. | |

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

- Do not open the safety lock of the needle assembly
- Be careful working at the z-robot.
- Wear safety goggles, when removing the needle assembly.

-
- 1 Take the new sample loop flex and install the shorter capillary of the sample loop to the analytical head.
 - 2 Click the sample loop cartridge in the designated location and keep the right orientation.
 - 3 Install the sample loop capillary on top of the needle cartridge and tighten the fitting hand tight.
 - 4 Install loop plastic adapter which shows the orientation. Then Use a 1/4 inch wrench to tighten the fitting of the sample loop capillary.

9 Maintenance

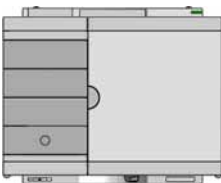



Installing the Sample Loop-Flex

- 5 Pinch and reinsert the needle assembly and the connected sample loop capillary into the z-arm coupler.
- 6 In the Instant Pilot close **Change needle /seat**.
OR
In Agilent Lab Advisor software **Change needle/loop**. Click **End** and wait until the needle is in the needle park station.
- 7 Close the front door.

Replace the Dummy Drawer

Optional Configurations

Table 10 Overview on optional configurations (examples for uniform types)

| | 1H | 2H | 3H | Dummy-Drawer |
|---|-------------------|-------------------|-------------------|-------------------|
|  <p>Delivery Status</p> | - | G7167-60020 1x | - | G4267-60024 3x |
|  <p>Up to 8 single height drawers 16 positions Shallow wellplates and MTP Max Sample capacity 1536 / 6144 samples (96 Shallow Wellplates / 384 MTP)</p> | G7167-60021 8x | - | - | - |
|  <p>Up to 4 Dual Height drawers 8 positions Vials (2 mL), deep well plates, MTP, Eppendorf Max Sample capacity 432 / 3072 samples (2 mL Vials/ 384 MTP)</p> | - | G7167-60020 4x | - | - |
|  <p>Up to 2 Drawers Triple Height 4 positions (2H or 2*1H option left over) Vials (6 ml), deep well plates, MTP, Eppendorf Max Sample capacity 60 / 216/ 1536 samples (6 mL Vials/ 2 mL Vials/ 384 MTP)</p> | - | G7167-60020 1x | G7167-60022 2x | - |

9 Maintenance

Replace the Dummy Drawer

NOTE

Mixed configurations are possible (for example 1x3H- with 1x2H- and 3x1H-drawer).

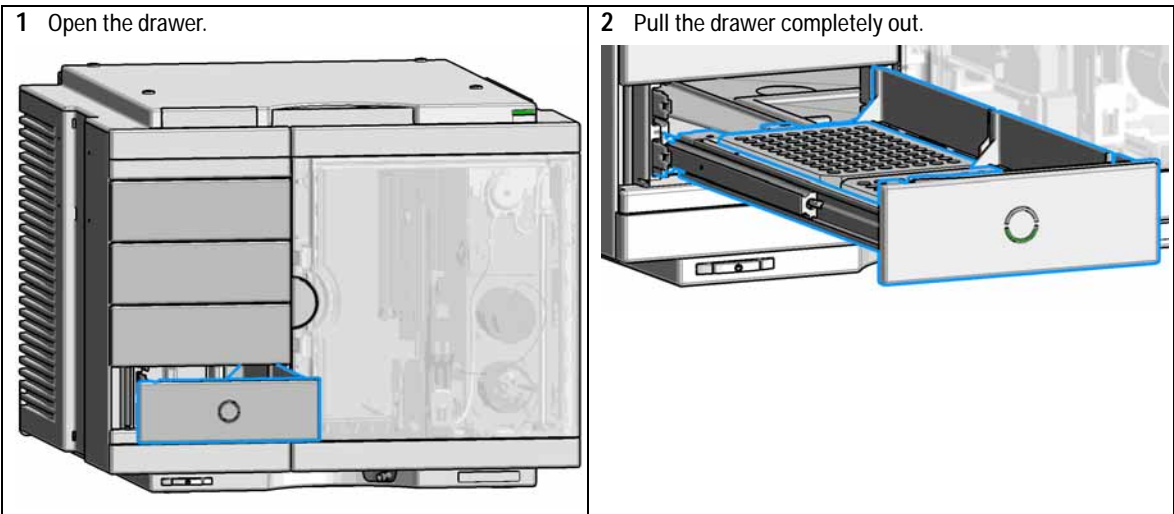
All positions in the Sample Hotel must be filled either with dummies or drawers. The drawers must be installed from bottom to top.

Installing and Replacing of Drawers (Upgrade Drawer Kit)

| | | |
|-----------------------|--------------------|--------------------|
| Tools required | Description | |
| | Screwdriver | |
| Parts required | p/n | Description |
| | G7167-60020 | Drawer 2H |
| | G7167-60021 | Drawer 1H |
| | G7167-60022 | Drawer 3H |

NOTE

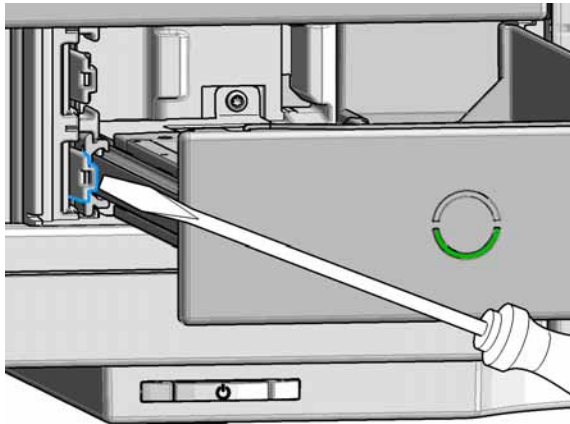
Before you start the new drawer installation you have to remove the lower drawer (2H drawer = default configuration) from the Sample Hotel.



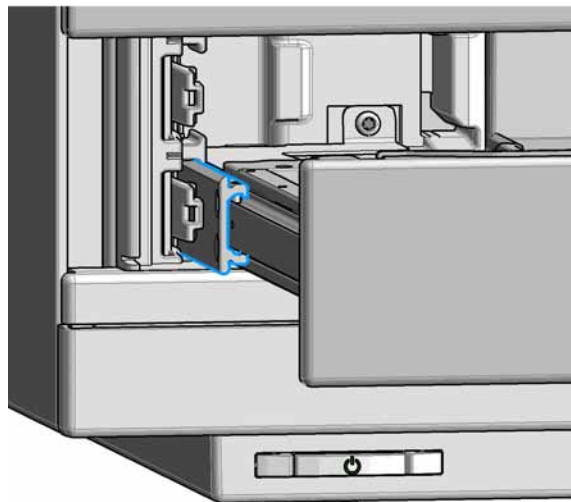
9 Maintenance

Replace the Dummy Drawer

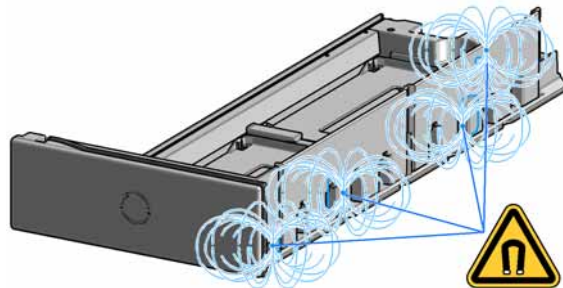
- 3 Unlatch the drawer: Use a screwdriver to press the clamping lever lightly to the left.



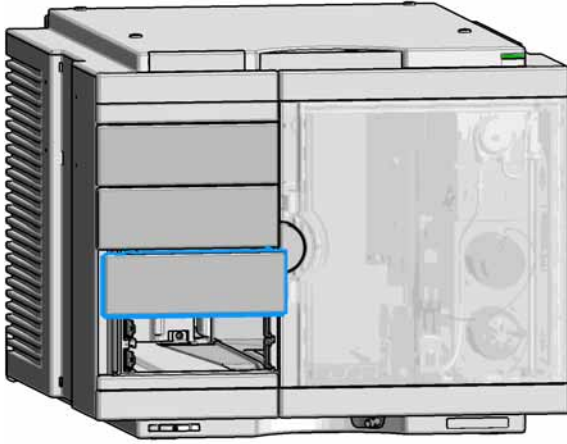
- 4 Remove the drawer from the rail guide.



The drawer is now out of the hotel.



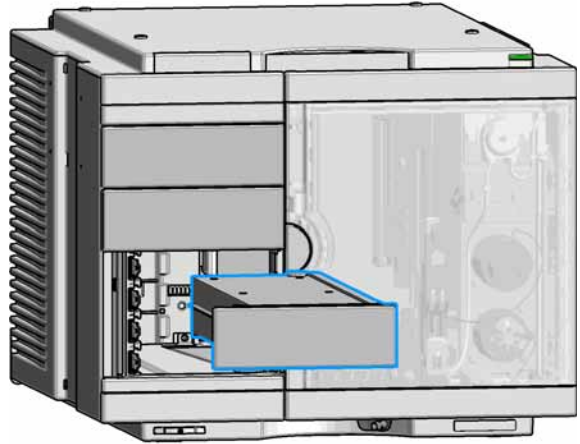
- 5 Grab in the recession below the dummy drawer front panel (1.) and lift the left side (2.).



- 6 Remove the dummy drawer.

NOTE

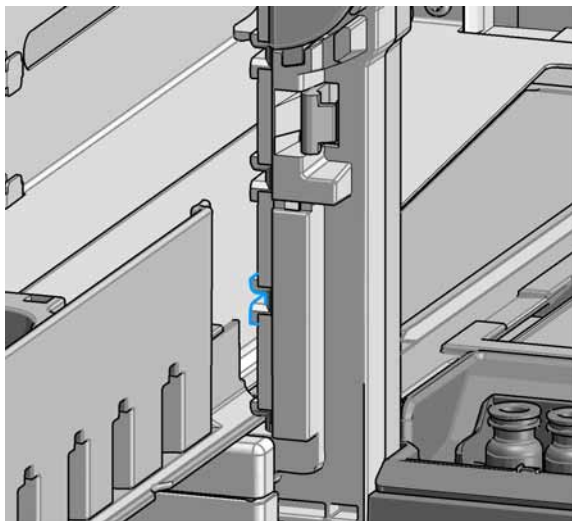
At this stage remove all other dummies that will be replaced by hotel drawers.



9 Maintenance

Replace the Dummy Drawer

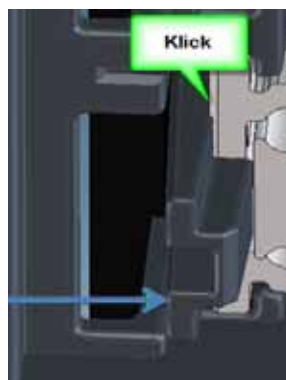
- 7 Place the new drawer horizontally into the middle bracket.



- 8 Push until the complete drawer locks in place.

NOTE

Take care that the clamping lever locks.



NOTE

Always fill sample hotel completely (no empty drawer slots). Otherwise the drawers can't be configured in the software.

- 9 Configure the hotel drawers in the controller software (see the Online Help of the software for details).

Configuration of the Hotel Drawers

The configuration of your drawers is necessary to detect the new drawer configuration for your CDS system. When a wrong configuration is detected there will be a mismatch in your CDS system and you are not able to use the new drawers. The new drawer configuration is active and stored after you have done the Drawer Configuration.

9 Maintenance

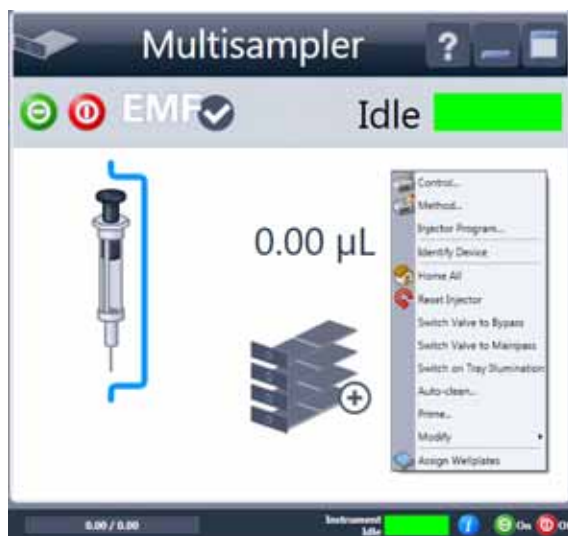
Replace the Dummy Drawer

Configure the Hotel Drawers in the Control Software

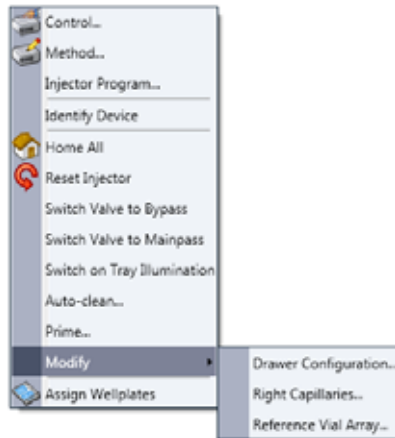
Software required OpenLAB (A.01.03 or above)
LC driver (A.02.10 or above)

- Preparations**
- Stop the acquisition run.
 - Remove the sample containers (trays and well plates) from workspace.
 - Complete the drawer installation.
 - Remove the sample containers (trays and well plates) from the drawers.
 - Verify that all sample trays (palettes) are installed in their drawers.
 - All open drawers and dummies have to be closed and installed properly.

- 1 Start OpenLAB CDS ChemStation Edition.
- 2 Right-click on the **Multisampler** GUI.



3 Select **Modify > Drawer Configuration** in the GUI screen.



4 Follow the Setup or Change configuration screen.

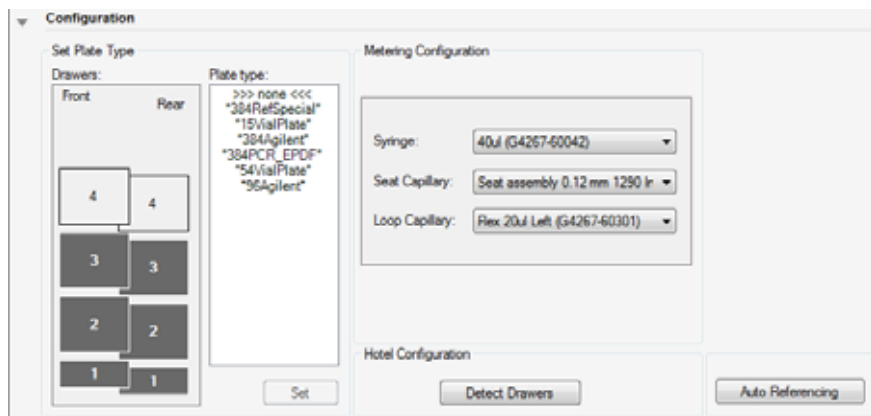
5 System is ready after the robot has done **Auto Referencing**.

Configure the Hotel Drawers in Lab Advisor

Software required Lab Advisor (B.02.05 or above)

- Preparations**
- Stop the acquisition run.
 - Remove the sample containers (trays and well plates) from workspace.
 - Complete the drawer installation.
 - Remove the sample containers (trays and well plates) from the drawers.
 - Verify that all sample trays (palettes) are installed in their drawers.
 - All open drawers and dummies have to be closed and installed properly.

- 1 Start the Lab Advisor Software.
- 2 Connect the instrument and select **Instrument Control** in the system screen.
- 3 Switch In the **Configuration** menu of the Multisampler. Select **Detect Drawers** in the **Hotel Configuration**.



- 4 Follow the Detect Hotel Configuration screen to detect the physical available drawers.
- 5 System is ready after the robot has done **Auto Referencing**.

Exchange the Power Supply Fuses (Sample Cooler)

The fuse holders are located on the mainboard of the multisampler.

When If wrong fuses are installed.

Tools required **Description**
Flat head screwdriver

Parts required

| p/n | Description |
|-----------|------------------------------------|
| 2110-0015 | Fuses T2.5 A/250V (CSA, UL listed) |

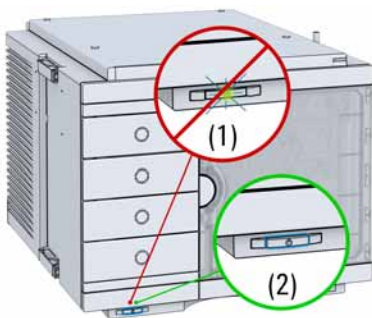
CAUTION

Damaged electronics

Disconnecting or reconnecting the autosampler/ fraction collector to thermostat cable when the power cords are connected to either of the two modules will damage the electronics of the modules. In such a case, mainboards of both instruments must be exchanged, otherwise they can damage the other instrument.

→ Make sure the power cords are unplugged before disconnecting or reconnecting the autosampler/ fraction collector to thermostat cable.

- 1** Switch OFF the power switch at the front of the cooled multisampler.



- 2** Remove the power cable from the multisampler module.



9 Maintenance

Exchange the Power Supply Fuses (Sample Cooler)

3 Open the mainboard cover plate.



4 Pull the fuse out of the fuse holder.

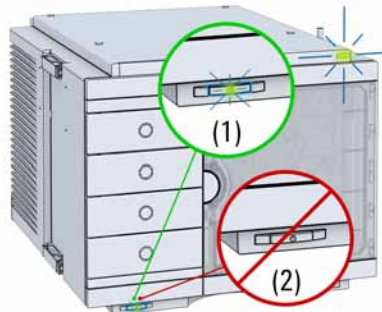
5 Insert the new fuse into the fuse holder.

6 Close the mainboard cover plate.

7 Reinsert the power cables.



8 Switch ON the power switch.



Remove the Sample Cooler

WARNING

Heavy weight

The module is heavy (>22 kg (>46 lbs)).

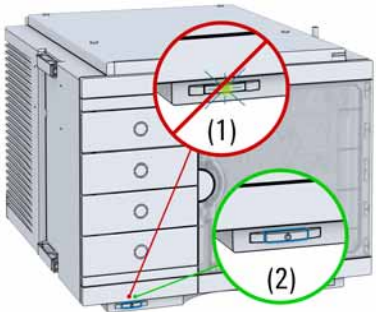
- Carry the module at least with 2 people.
- Avoid back strain or injury by following all precautions for lifting heavy objects.
- Ensure that the load is as close to your body as possible.
- Ensure that you can cope with the weight of your load.

CAUTION

Routing of the condensation tubing

Proper routing of the condensation tubing is critical for correct condensate drainage.

- Do not place the multisampler directly on the bench. Install Base plate (G1328-44121) underneath.

| | |
|---|---|
| <p>1</p>  <p>Power switch (1) On (2) Off</p> | <p>Next Steps:</p> <ol style="list-style-type: none">2 Remove the power cable from the module.3 Open the four screws on cooler cover.4 Slide the sample cooler the half way out.5 Remove power and the signal cable.6 Slide the cooler completely out.7 Place the sample cooler on the bench. |
|---|---|

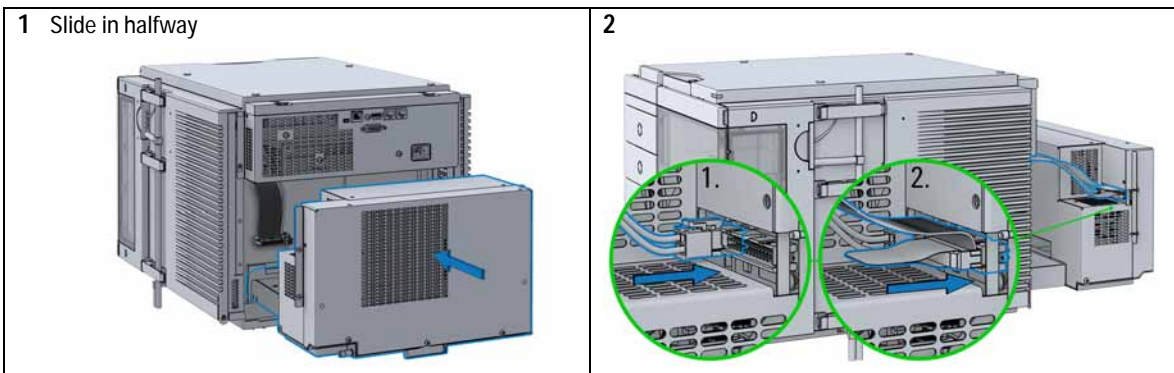
Install the Sample Cooler

When If the cooler is damaged or defective.

Tools required **Description**
Screwdriver, Pozidriv #1 PT3

Parts required

| p/n | Description |
|-------------|---------------|
| G4267-60005 | Sample Cooler |

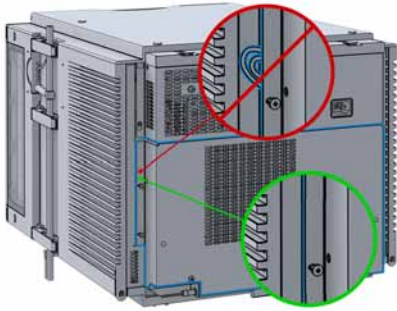


CAUTION

Damage to the cables

- Do not bend or pinch the cables.
- Fit in the cooler perfectly.

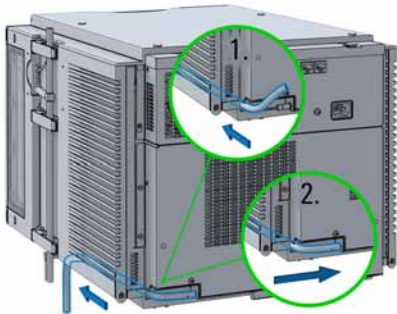
3



4



5 Install the condensate tubing correctly.



CAUTION

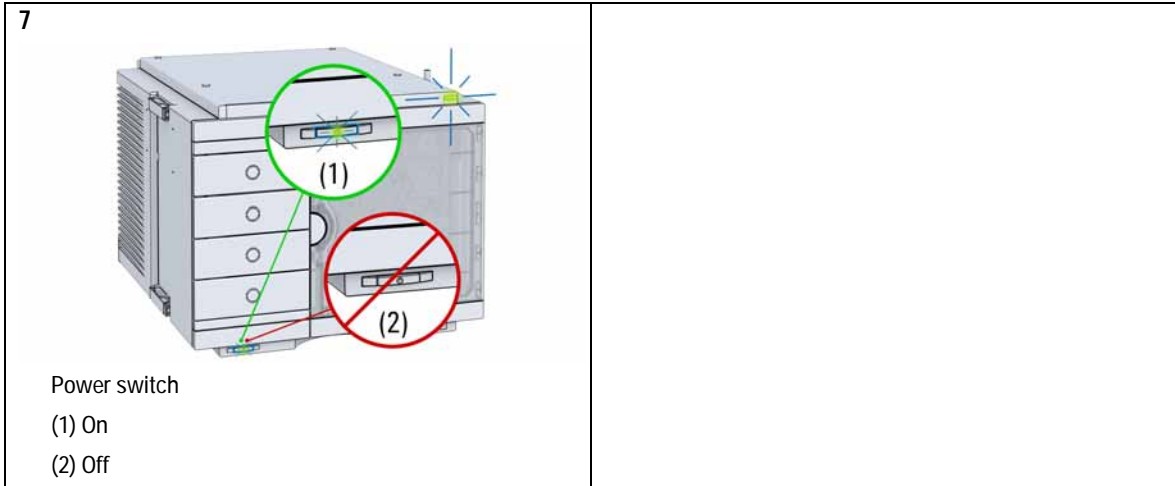
Damage to the cooler

- Wait at least 30 min before switching on the multisampler.

6



9 Maintenance
Install the Sample Cooler



Replace the Module Firmware

| | |
|-------------|--|
| When | <p>The installation of newer firmware might be necessary</p> <ul style="list-style-type: none"> • if a newer version solves problems of older versions or • to keep all systems on the same (validated) revision. <p>The installation of older firmware might be necessary</p> <ul style="list-style-type: none"> • to keep all systems on the same (validated) revision or • if a new module with newer firmware is added to a system or • if third party control software requires a special version. |
|-------------|--|

| | |
|-----------------------|---|
| Tools required | Description |
| | LAN/USB Firmware Update Tool |
| OR | Agilent Lab Advisor software |
| OR | Instant Pilot G4208A (only if supported by module) |

| | | |
|-----------------------|----------|---|
| Parts required | # | Description |
| | 1 | Firmware, tools and documentation from Agilent web site |

Preparations Read update documentation provided with the Firmware Update Tool.

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

- 1 Download the required module firmware, the latest LAN/USB FW Update Tool and the documentation from the Agilent web.
http://www.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?wid=69761
- 2 For loading the firmware into the module follow the instructions in the documentation.

Module Specific Information

There is no specific information for this module.

9 Maintenance

Replace the Module Firmware



10 Parts for Maintenance and Upgrade or Options

| | |
|--------------------------------------|-----|
| Overview of Maintenance Parts | 168 |
| Sampler Main Assemblies | 169 |
| Hotel Drawer | 171 |
| Analytical Head Assembly 40 μ L | 172 |
| Analytical Head Assembly 100 μ L | 173 |
| Analytical Head Assembly 900 μ L | 174 |
| Flush Head Assembly 500 μ L | 176 |
| Injection Valve Assembly | 178 |
| Injection Valve with Actuator | 179 |
| Needle Port Assembly | 180 |
| Door Assy IF | 181 |
| Accessory Kit | 182 |
| Tubing Kit Sampler Standard | 183 |
| Sample Cooler | 184 |

This chapter provides information on parts material required for the module.



Overview of Maintenance Parts

| p/n | Description |
|-------------|---|
| 0905-1717 | Metering seal 40 µL |
| 0905-1719 | Metering seal 100 µL |
| 5067-5918 | Metering seal 500 µL |
| 5068-0007 | Injection valve rotor seal |
| G4267-87201 | Needle Assembly |
| G4267-87012 | High Pressure Needle Seat, 0.12 mm (PEEK) |
| G4267-60300 | Sample Loop Flex 20 µL, right (red coded) |
| G4267-60400 | Sample Loop Flex 40 µL, right (green coded) |
| G4267-60500 | Sample Loop Flex 100 µL, right (blue coded) |
| 5065-4445 | Peristaltic pump with Pharmed tubing |

Sampler Main Assemblies

| p/n | Description |
|-------------|--|
| G4267-60002 | Hotel Assembly |
| G7167-60020 | Drawer 2H |
| G7167-60021 | Drawer 1H |
| G7167-60022 | Drawer 3H |
| G4267-60001 | Sample Handler Assembly |
| 5067-4232 | 2pos/6port Injection Valve (VICI) |
| G4267-87201 | Needle Assembly |
| G4267-60044 | Needle Port Assembly Station |
| G4267-60045 | Flush head, 500 μ L |
| G4267-87012 | High Pressure Needle Seat, 0.12 mm (PEEK) |
| G4267-60300 | Sample Loop Flex 20 μ L, right (red coded) |
| G4267-60400 | Sample Loop Flex 40 μ L, right (green coded) |
| G4267-60500 | Sample Loop Flex 100 μ L, right (blue coded) |
| G4267-60050 | Baseplate Assembly |

10 Parts for Maintenance and Upgrade or Options

Sampler Main Assemblies

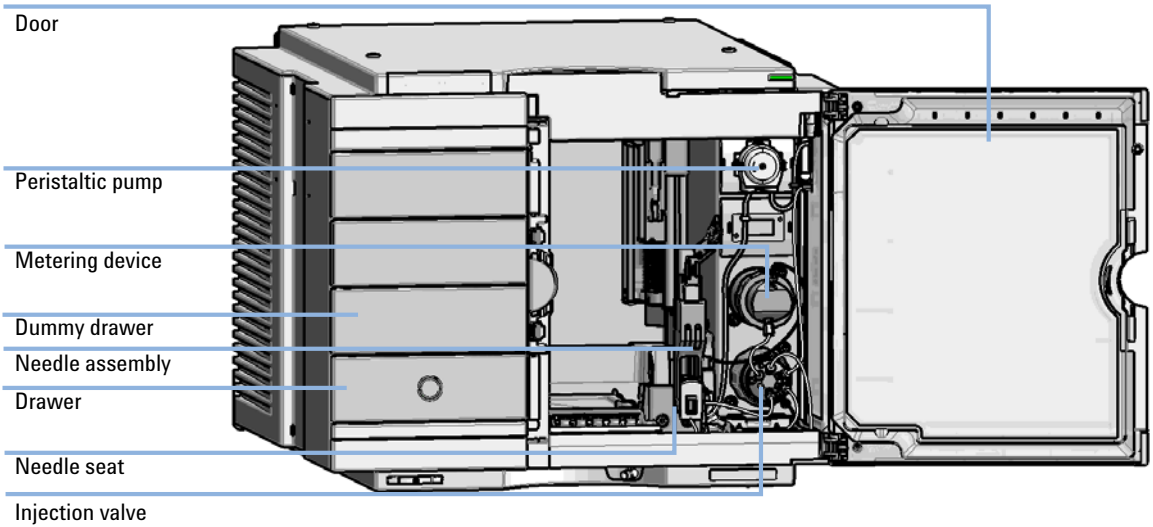


Figure 27 Main user accessible assemblies (standard)

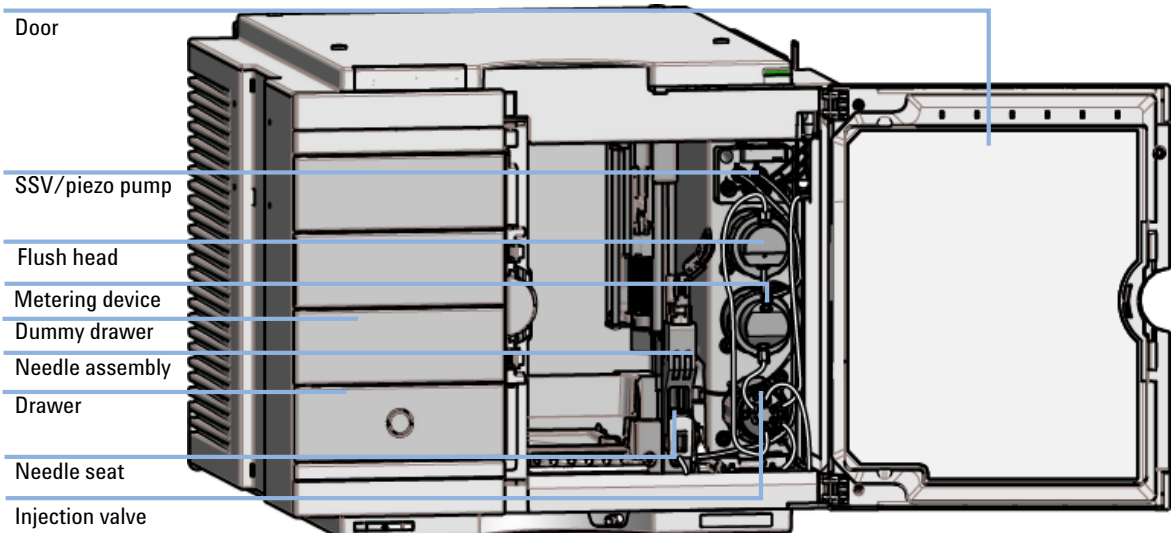


Figure 28 Main user accessible assemblies (multiwash)

Hotel Drawer

| Item | p/n | Description |
|------|-------------|---|
| 1 | G7167-60021 | Drawer 1H (2 p/k (including 2*G4267-60206 Sample Container)) |
| 2 | G7167-60020 | Drawer 2H (including 2*G4267-60205 Sample Container) |
| 3 | G7167-60022 | Drawer 3H (2 p/k (including 2*G4267-60205 Sample Container)) |
| | G4267-60024 | Dummy Drawer (not shown) |

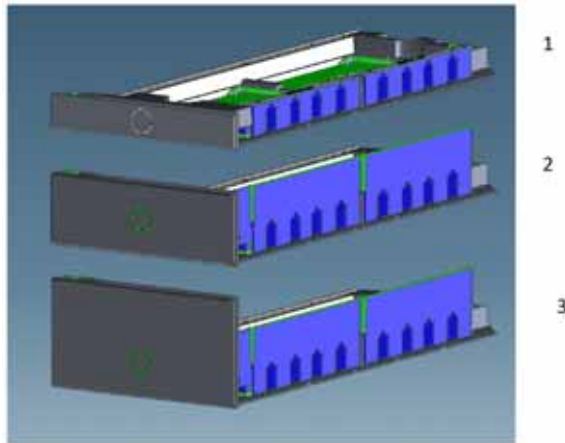


Figure 29 Hotel drawer

10 Parts for Maintenance and Upgrade or Options

Analytical Head Assembly 40 μ L

Analytical Head Assembly 40 μ L

| Item | p/n | Description |
|------|-------------|-----------------------------------|
| | G4267-60042 | Analytical Head, 40 μ L |
| 1 | G4267-60423 | Head Assembly, 40 μ L |
| 2 | G4267-60432 | Spring Adapter Assembly |
| 3 | G4267-60422 | Seal Support Assembly, 40 μ L |
| 4 | 0905-1717 | Metering seal 40 μ L |
| 5 | 5067-5920 | Piston ceramic |
| 6 | 0515-4384 | Screw |

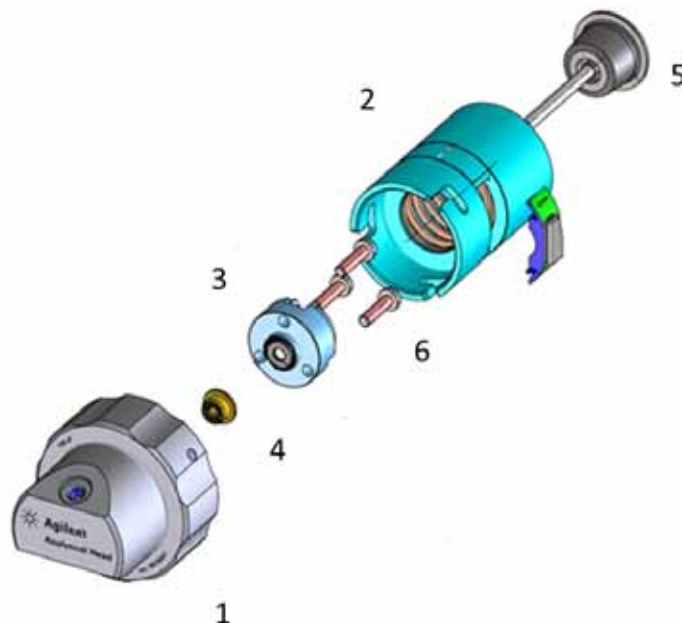


Figure 30 Analytical head assembly, 40 μ L

Analytical Head Assembly 100 μ L

| Item | p/n | Description |
|------|-------------|-------------------------------------|
| | G4267-60043 | Analytical Head, 100 μ L |
| 1 | G4267-60433 | Head Assembly, 100 μ L |
| 2 | G4267-60432 | Spring Adapter Assembly |
| 3 | G4267-60434 | Seal Support Assembly, 100 μ L |
| 4 | 0905-1719 | Metering seal 100 μ L |
| 5 | 5067-5678 | Piston 1290 Infinity Pumps, ceramic |
| 6 | 0515-1052 | Screw 2.5 mm hex |

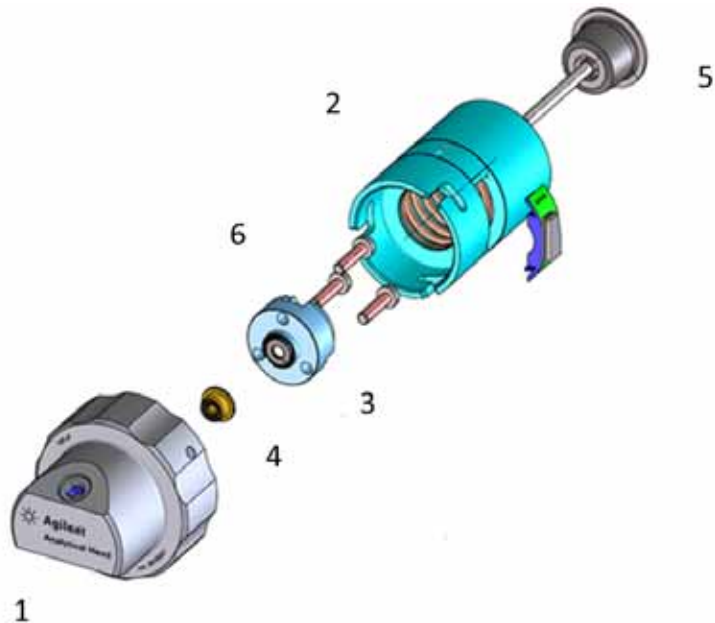


Figure 31 Analytical head assembly, 100 μ L

10 Parts for Maintenance and Upgrade or Options

Analytical Head Assembly 900 µL

Analytical Head Assembly 900 µL

| Item | p/n | Description |
|------|-------------|----------------------------------|
| | G4267-60046 | Analytical head, 900 µL, 400 bar |
| 1 | G4267-60461 | Head Assembly, 900 µL |
| 2 | 0905-1294 | Metering seal, 900 µL |
| 3 | G4267-60463 | Seal Support Assembly, 900 µL |
| 4 | 0515-4864 | Screw for heat exchangers |
| 5 | G4267-60432 | Spring Adapter Assembly |
| 6 | G4267-60462 | Piston Assembly, 900 µL |

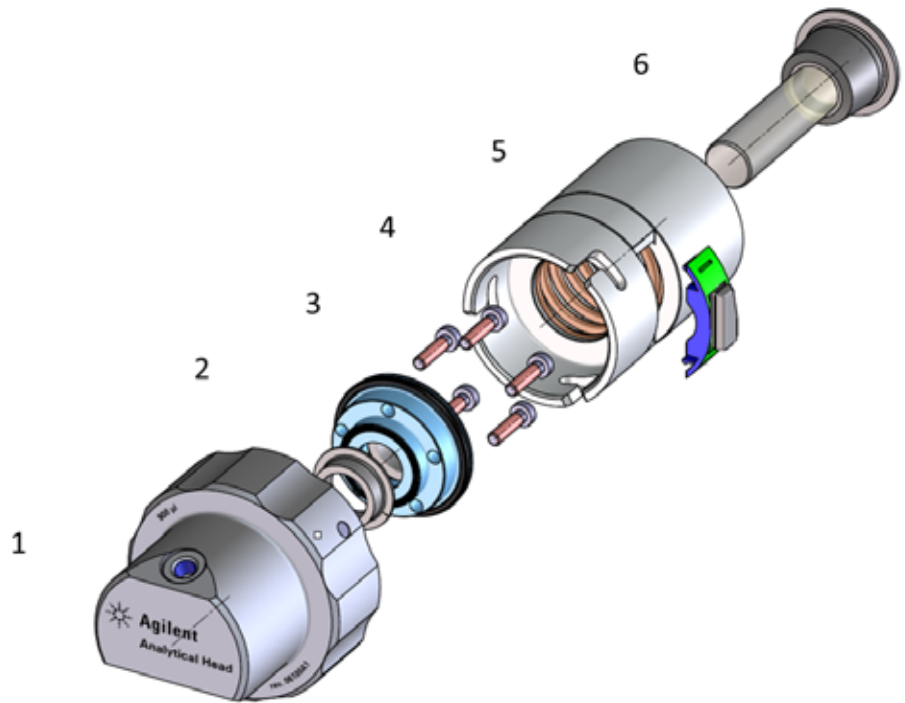


Figure 32 Analytical head assembly, 900 μ L

10 Parts for Maintenance and Upgrade or Options

Flush Head Assembly 500 μ L

Flush Head Assembly 500 μ L

| Item | p/n | Description |
|------|-------------|---|
| | G4267-60049 | Flush head, 500 μ L |
| 1 | G4267-60491 | Flush Head Assembly, 500 μ L |
| 2 | G4267-60482 | Cylinder Assembly, 500 μ L |
| 3 | 5023-2473 | Sealing Plate 500 μ L |
| 4 | G4267-60432 | Spring Adapter Assembly |
| 5 | 1410-1881 | Bearing-Sleeve 8 mm-ID 10 mm-OD 10 mm-LG PI |
| 6 | 5067-5918 | Seal 500 μ L |
| 7 | 5067-5919 | Piston Assembly 500 μ L |
| 8 | G4267-60451 | Pump Valve IN |
| 9 | G4267-60452 | Pump Valve Out |

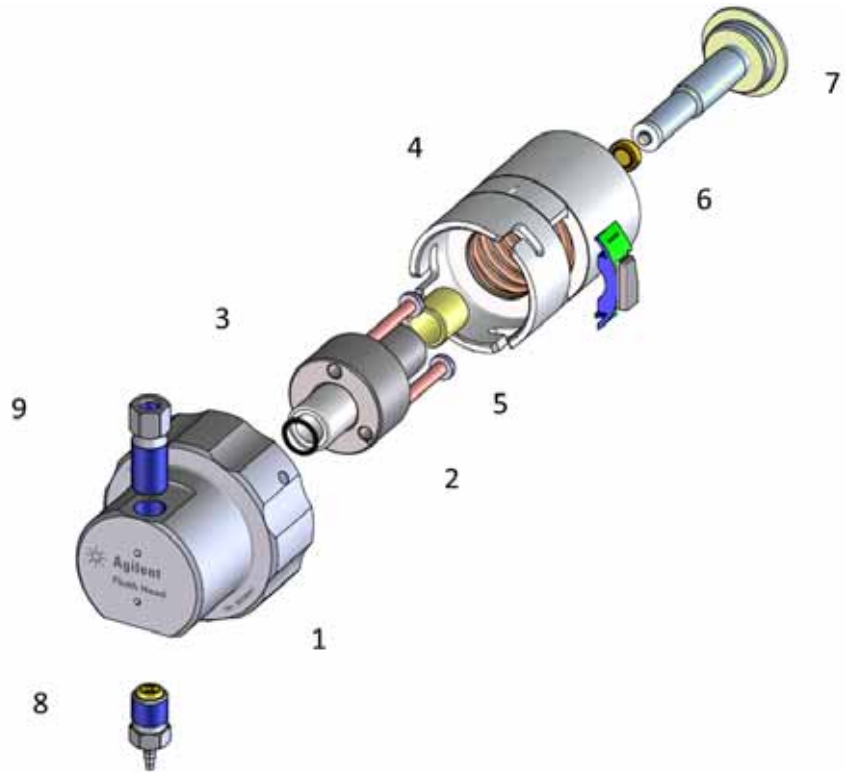


Figure 33 Flush head assembly, 500 μ L

Injection Valve Assembly

| Item | p/n | Description |
|------|-----------|--|
| | 5067-4232 | 2pos/6port Injection Valve (VICI) |
| 1 | 5068-0197 | Stator head |
| 2 | 5068-0198 | Rotor Seal for VICI Injection Valve (PAEK) |
| 3 | 5068-0019 | Stator screws |
| | 5500-1159 | Capillary ST 0.17x100 SX/S-2.3 Metering Device to Injection Valve |
| | 5067-4650 | Capillary ST 0.12 mm x 150 mm SL/SX Pump to sampler |
| | 5500-1157 | Capillary, ST, 0.12 mmx500 mm Sampler to column compartment |

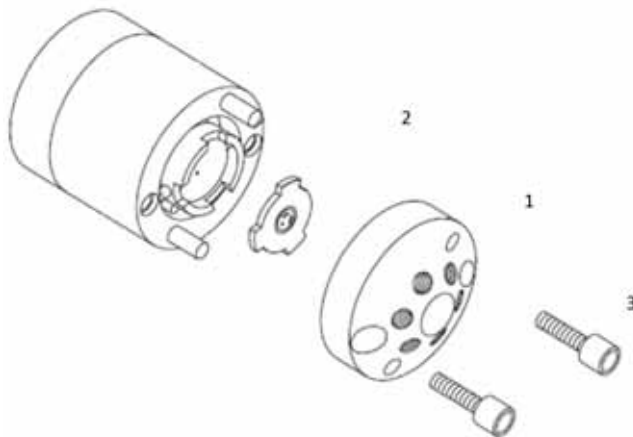


Figure 34 Injection valve assembly (VICI)

Injection Valve with Actuator

| Item | p/n | Description |
|------|-----------|-----------------------------------|
| 1 | 5067-4162 | Direct-Actuator-50 Assembly |
| 2 | 5043-0291 | Lock Nut |
| 3 | 5067-4232 | 2pos/6port Injection Valve (VICI) |
| 4 | 5188-8030 | Tag Reader |

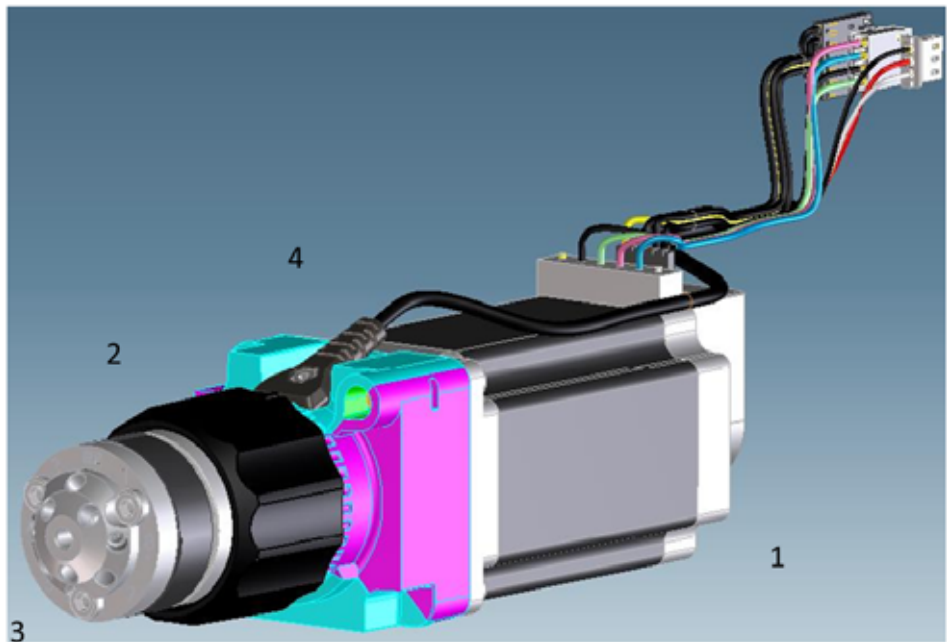


Figure 35 Injection valve with actuator

Needle Port Assembly

| Item | p/n | Description |
|------|-------------|------------------------------|
| 1 | G4267-60044 | Needle Port Assembly Station |
| 2 | G4267-40045 | Needle port Adapter |

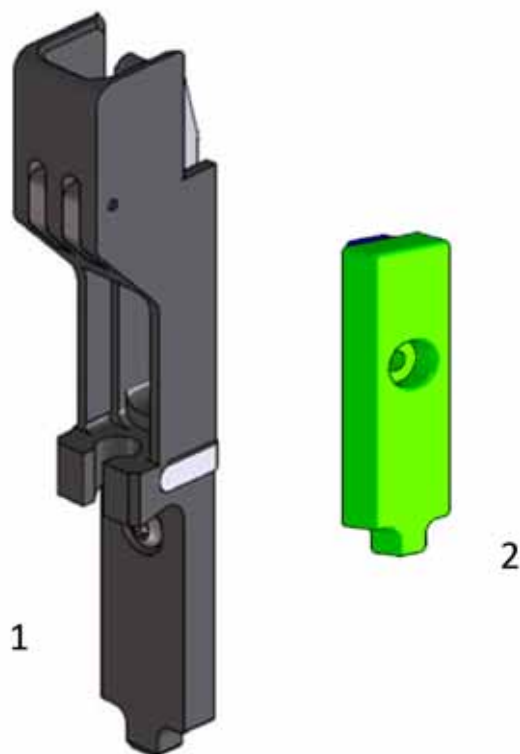


Figure 36 Needle port assembly

Door Assy IF

| Item | p/n | Description |
|------|----------------|------------------------|
| | 5067-5415 | Door Assy IF-320-Right |
| 1 | 5067-5412 (2x) | Hinge Universal-180 |
| 2 | G4267-68713 | Pressure Spring |
| 3 | 5021-1879 | Permanent Magnet |

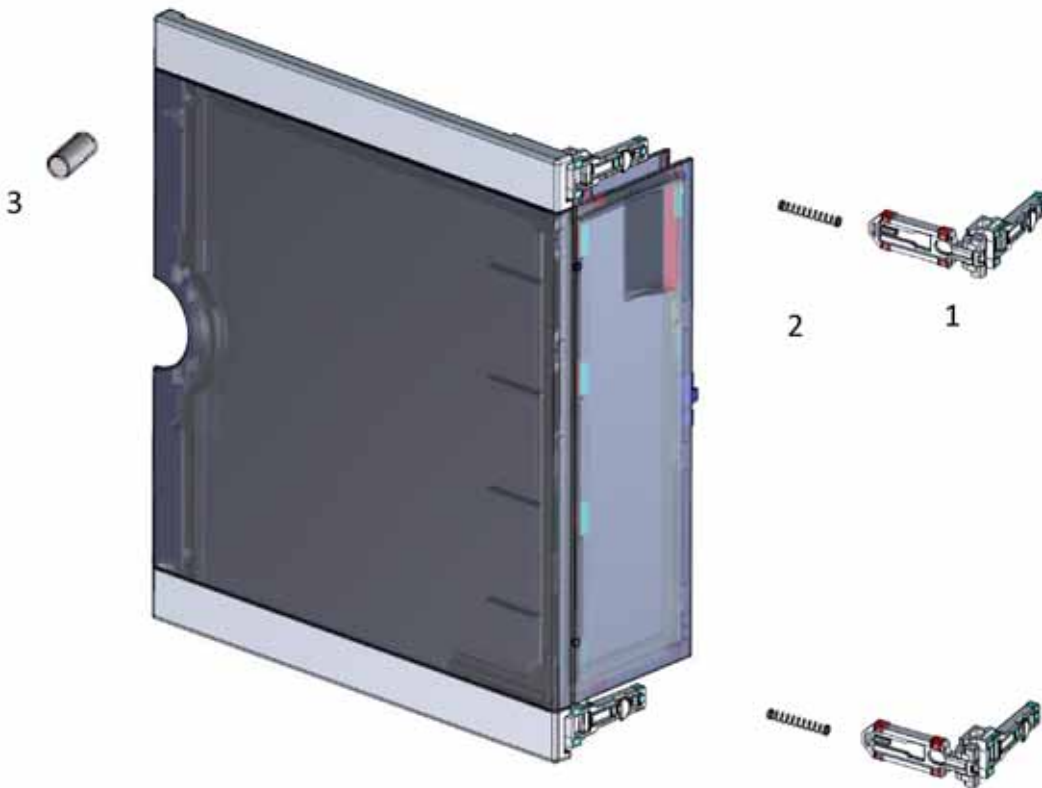


Figure 37 Door Assy IF

Accessory Kit

| Item | p/n | Description |
|------|-------------|---|
| | G4267-68705 | Accessory Kit |
| 1 | 5063-6527 | Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste) |
| 2 | 5181-1519 | CAN cable, Agilent module to module, 1 m |
| 3 | 5500-1157 | Capillary, ST, 0.12 mmx500 mm |
| 4 | G4220-60007 | Bottle Head Assembly |
| 5 | 5043-1013 | Tubing Clip |

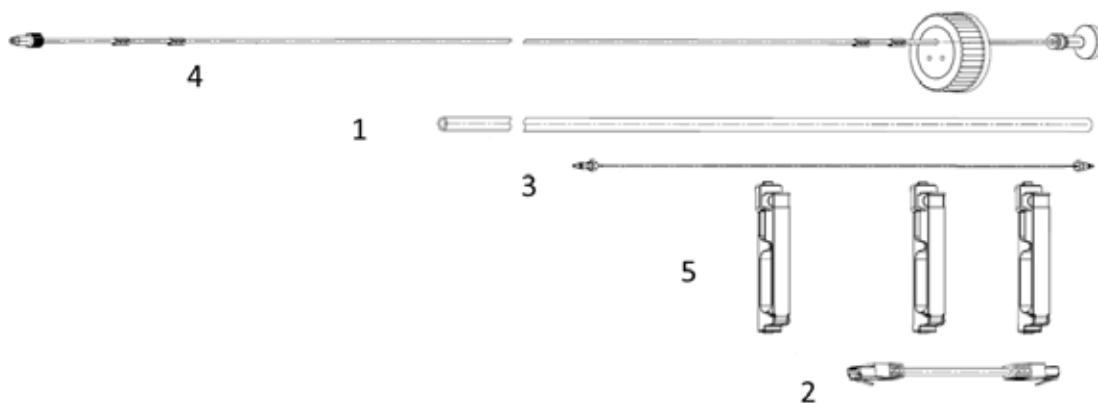


Figure 38 Accessory kit (standard)

Tubing Kit Sampler Standard

| Item | p/n | Description |
|------|-------------|---------------------------------------|
| | G4267-60061 | Tubing-Kit-Sampler-Standard contains: |
| 1 | 5500-1155 | Tube Connector, 90 degree, ID 6.4 |
| 2 | 5042-6422 | Tubing connector, 1 mm o.d. |
| 3 | 0100-1846 | UNION-TEFZEL |
| 4 | 0100-1708 | Nut 1/8 PPS |
| 5 | 0890-1760 | Tubing Flexible 1 ea / 1 meter |
| 6 | 0100-1700 | FERRULE-AY-18IN |
| 7 | 5042-9974 | Tubing Flex (1.5 m) |

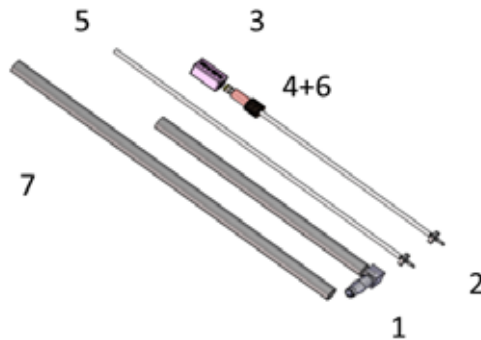


Figure 39 Tubing kit sampler standard

10 Parts for Maintenance and Upgrade or Options

Sample Cooler

Sample Cooler

| Item | p/n | Description |
|------|-------------|---|
| 1 | G4267-60005 | Sample Cooler |
| | G4267-81015 | Cable Power Sample Cooler not shown |
| | G4267-81014 | Cable-Ribbon Sample Cooler not shown |
| | 2110-1519 | Fuse 3.50 A125 V not shown |

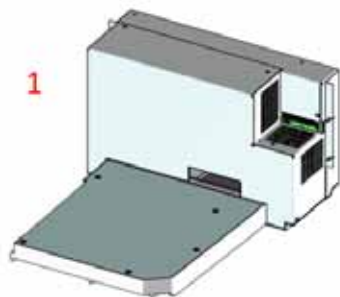


Figure 40 Sample cooler



11 Identifying Cables

| | |
|----------------------|-----|
| Cable Overview | 186 |
| Analog Cables | 188 |
| Remote Cables | 190 |
| CAN/LAN Cables | 194 |
| Agilent Module to PC | 195 |
| USB | 196 |

This chapter provides information on cables used with the modules.

Cable Overview

NOTE

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

Analog cables

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

Remote cables

| p/n | Description |
|-------------|--|
| 5188-8029 | ERI to general purpose |
| 5188-8044 | Remote Cable ERI – ERI |
| 5188-8045 | Remote Cable APG – ERI |
| 5061-3378 | Remote Cable to 35900 A/D converter |
| 01046-60201 | Agilent module to general purpose |

CAN cables

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

LAN cables

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

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


| p/n | Description |
|-------------|---|
| G1530-60600 | RS-232 cable, 2 m |
| RS232-61601 | RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9. |
| 5181-1561 | RS-232 cable, 8 m |

Analog Cables

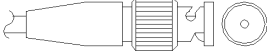


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

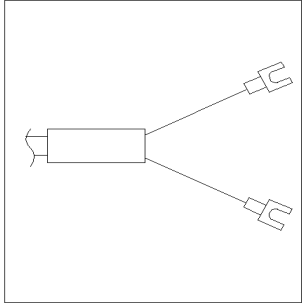
Agilent Module to 35900 A/D converters

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

Agilent Module to BNC Connector

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

Agilent Module to General Purpose

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

Remote Cables


ERI (Enhanced Remote Interface)

5188-8029 ERI to general purpose


| p/n 5188-8029 | pin | Enhanced Remote | Classic Remote |
|--|-----|-----------------|----------------|
| <p>D-Sub female 15way user's view to connector</p> | 1 | I01 | START REQUEST |
| | 2 | I02 | STOP |
| | 3 | I03 | READY |
| | 4 | I04 | POWER ON |
| | 5 | I05 | NOT USED |
| | 6 | I06 | SHUT DOWN |
| | 7 | I07 | START |
| | 8 | I08 | PREPARE |
| | 9 | 1wire DATA | |
| | 10 | DGND | |
| | 11 | +5V ERI out | |
| | 12 | PGND | |
| | 13 | PGND | |
| | 14 | +24V ERI out | |
| | 15 | +24V ERI out | |

5188-8044 ERI to ERI (Connector D_Subminiature 15 pin)

Table 11 5188-8044 ERI to ERI

| p/n 5188-8044 | Pin (ERI) | Signal | Pin (ERI) |
|---|-----------------|---------------|-----------|
|  | 10 | GND | 10 |
| | 1 | Start Request | 1 |
| | 2 | Stop | 2 |
| | 3 | Ready | 3 |
| | 5 | Power on | 5 |
| | 4 | Future | 4 |
| | 6 | Shut Down | 6 |
| | 7 | Start | 7 |
| | 8 | Prepare | 8 |
| Ground Connection | Cable Shielding | NC | |

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

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

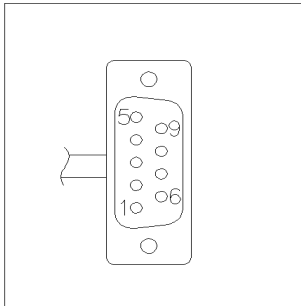
11 Identifying Cables

Remote Cables

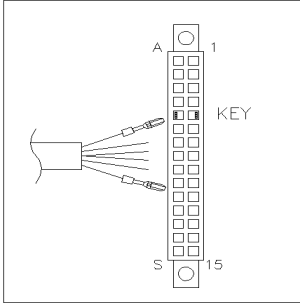


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

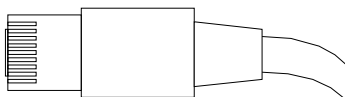
Agilent Module to Agilent 35900 A/D Converters

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

Agilent Module to General Purpose

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

CAN/LAN Cables



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

CAN Cables

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

LAN Cables

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

Agilent Module to PC

| p/n | Description |
|-------------|---|
| G1530-60600 | RS-232 cable, 2 m |
| RS232-61601 | RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9. |
| 5181-1561 | RS-232 cable, 8 m |

11 Identifying Cables

USB

USB

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



12 Hardware Information

| | |
|---|-----|
| Firmware Description | 198 |
| Electrical Connections | 201 |
| Rear view of the module | 202 |
| Information on Instrument Serial Number | 203 |
| Interfaces | 204 |
| Overview Interfaces | 205 |
| ERI (Enhanced Remote Interface) | 209 |
| Setting the 6-bit Configuration Switch | 212 |
| Instrument Layout | 214 |
| Early Maintenance Feedback | 215 |

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 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 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.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?whid=69761

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

PPPP is the product number, for example, 1315B for the G1315B DAD,

R the firmware revision, for example, A for G1315B or B for the G1315C DAD,

VVV is the revision number, for example 650 is revision 6.50,

XXX is the build number of the firmware.

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

NOTE

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

Main and resident firmware must be from the same set.

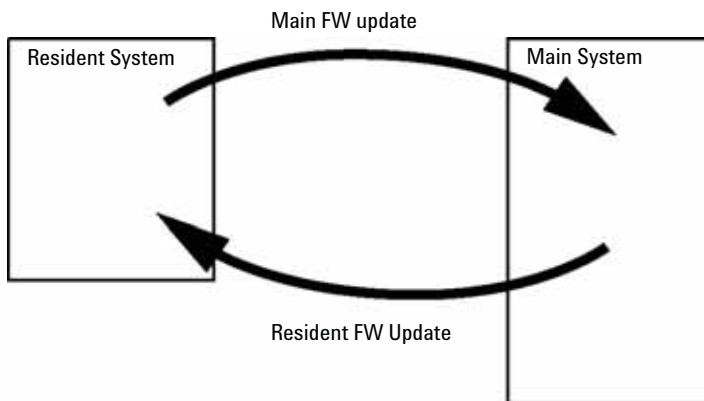


Figure 41 Firmware Update Mechanism

NOTE

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

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

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

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

- http://www.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?whid=69761

Electrical Connections

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

NOTE

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

Rear view of the module

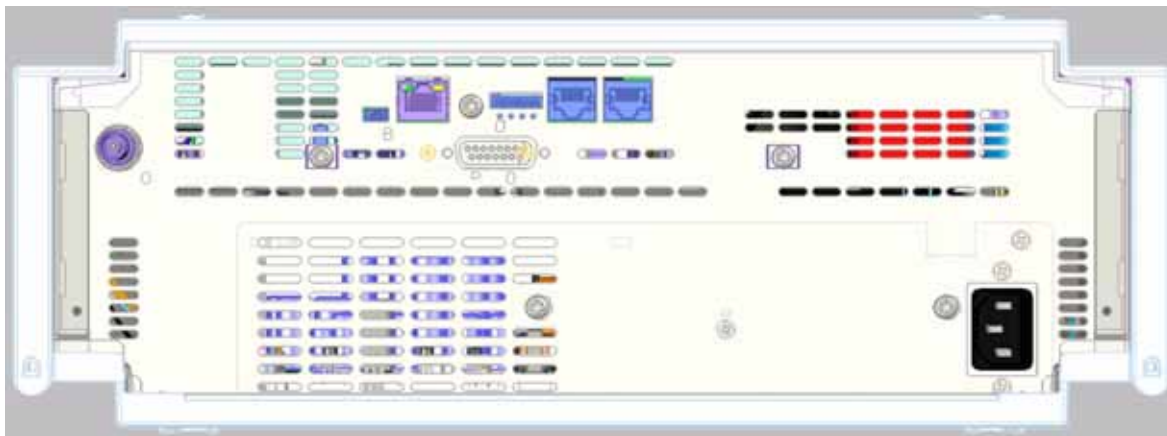


Figure 42 Rear view of detector (example shows a G7114A/B VWD) – electrical connections and label

Information on Instrument Serial Number

Serial Number Information 1200 Series and 1290 Infinity

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

| | |
|------------|---|
| CCYWWSSSSS | Format |
| CC | country of manufacturing <ul style="list-style-type: none"> • DE = Germany • JP = Japan • CN = China |
| YWW | year and week of last major manufacturing change, e.g. 820 could be week 20 of 1998 or 2008 |
| SSSSS | real serial number |

Serial Number Information 1260 Infinity

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

| | |
|------------|--|
| CCXZZ00000 | Format |
| CC | Country of manufacturing <ul style="list-style-type: none"> • DE = Germany • JP = Japan • CN = China |
| X | Alphabetic character A-Z (used by manufacturing) |
| ZZ | Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module) |
| 00000 | Serial number |

Interfaces

The Agilent 1200 Infinity Series II modules provide the following interfaces:

Table 12 Agilent 1200 Infinity II Series Interfaces

| Module | CAN | USB | LAN (on-board) | RS-232 | Analog | APG (A) / ERI (E) | Special |
|------------------------|-----|-----|-------------------|--------|--------|-------------------------|--------------------------------|
| Pumps | | | | | | | |
| G7104A Flexible Pump | 2 | No | Yes | Yes | 1 | A | |
| G7120A High Speed Pump | 2 | No | Yes | Yes | 1 | A | |
| Samplers | | | | | | | |
| G7129A/B ALS | 2 | Yes | | No | No | E | |
| G7167A/B Multisampler | 2 | Yes | | No | No | E | |
| Detectors | | | | | | | |
| G7114A/B VWD | 2 | Yes | Yes | No | 1 | E | |
| G7117A/B DAD | 2 | Yes | Yes | No | 1 | E | |
| G7115A/B DAD | 2 | Yes | Yes | No | 1 | E | |
| Others | | | | | | | |
| G7116A MCT | 2 | No | No | No | No | No | Requires a HOST module via CAN |

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.

RS-232C (Serial)

The RS-232C connector is used to control the module from a computer through RS-232C connection, using the appropriate software. This connector can be configured with the configuration switch module at the rear of the module. Refer to *Communication Settings for RS-232C*.

12 Hardware Information

Interfaces

NOTE

There is no configuration possible on main boards with on-board LAN. These are pre-configured for

- 19200 baud,
- 8 data bit with no parity and
- one start bit and one stop bit are always used (not selectable).

The RS-232C is designed as DCE (data communication equipment) with a 9-pin male SUB-D type connector. The pins are defined as:

Table 13 RS-232C Connection Table

| Pin | Direction | Function |
|-----|-----------|----------|
| 1 | In | DCD |
| 2 | In | RxD |
| 3 | Out | TxD |
| 4 | Out | DTR |
| 5 | | Ground |
| 6 | In | DSR |
| 7 | Out | RTS |
| 8 | In | CTS |
| 9 | In | RI |

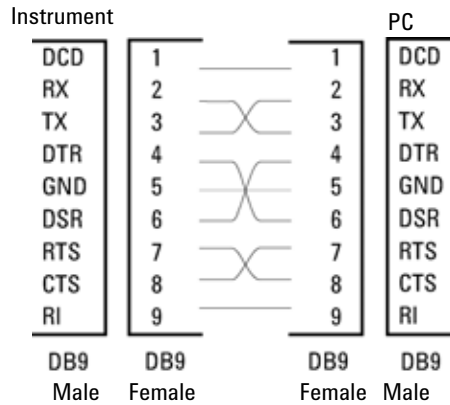


Figure 43 RS-232 Cable

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.

APG Remote

The APG Remote 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.

Remote control 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),

12 Hardware Information

Interfaces

- fan-out is 10,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

NOTE

All common TTL circuits operate with a 5 V power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5.0 V (with respect to the ground terminal).

Table 14 Remote Signal Distribution

| Pin | Signal | Description |
|-----|---------------|--|
| 1 | DGND | Digital ground |
| 2 | PREPARE | (L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities. |
| 3 | START | (L) Request to start run / timetable. Receiver is any module performing run-time controlled activities. |
| 4 | SHUT DOWN | (L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk. |
| 5 | | Not used |
| 6 | POWER ON | (H) All modules connected to system are switched on. Receiver is any module relying on operation of others. |
| 7 | READY | (H) System is ready for next analysis. Receiver is any sequence controller. |
| 8 | STOP | (L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities. |
| 9 | START REQUEST | (L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler. |

Special Interfaces

There is no special interface for this module.

ERI (Enhanced Remote Interface)

ERI replaces the AGP Remote Interface that is used in the HP 1090/1040/1050/1100 HPLC systems and Agilent 1100/1200/1200 Infinity HPLC modules. All new 1200 Infinity 2 products (Infinity Series II) 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.

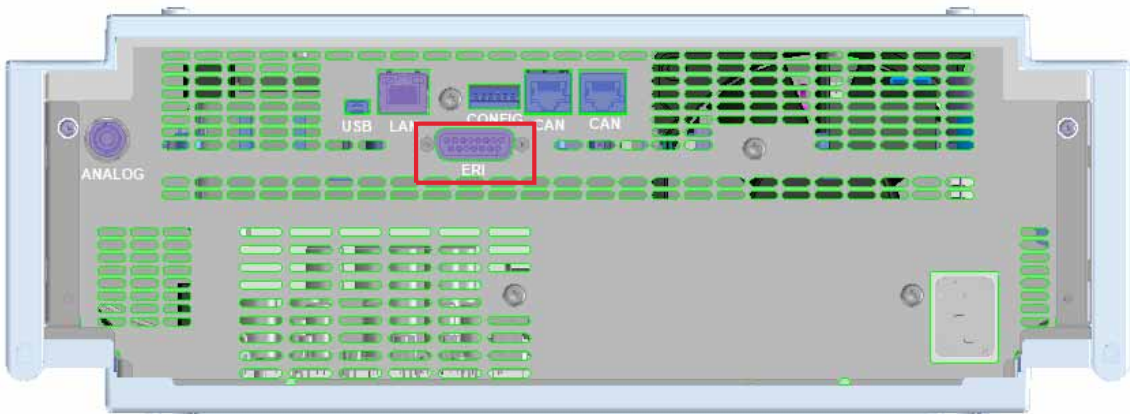


Figure 44 Location of the ERI interface (example shows a G7114A/B VWD)

12 Hardware Information

Interfaces

| | Pin | Enhanced Remote |
|--|-----|-----------------|
| <p>D-Sub female 15way user's view to connector</p> <p>IO 1 IO 2 IO 3 IO 4 IO 5 IO 6 IO 7 IO 8</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</p> <p>1WEprom DGND +5V PGND PGND +24V +24V</p> | 1 | IO 1 |
| | 2 | IO 2 |
| | 3 | IO 3 |
| | 4 | IO 4 |
| | 5 | IO 5 |
| | 6 | IO 6 |
| | 7 | IO 7 |
| | 8 | IO 8 |
| | 9 | 1 wire DATA |
| | 10 | DGND |
| | 11 | +5 V ERI out |
| | 12 | PGND |
| | 13 | PGND |
| | 14 | +24 V ERI out |
| | 15 | +24 V ERI out |

IO (Input/Output) Lines

- Eight generic bi-directional channels (input or output).
- Same as the APG Remote.
- Devices like valves, relays, ADCs, DACs, controllers can be supported/controlled.

1-Wire Data (Future Use)

This serial line can be used to read out an EPROM or write into an EPROM of a connected ERI-device. The firmware can detect the connected type of device automatically and update information in the device (if required).

5V Distribution (Future Use)

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

24V Distribution (Future Use)

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

Setting the 6-bit Configuration Switch

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

All modules with FUSION electronics:

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

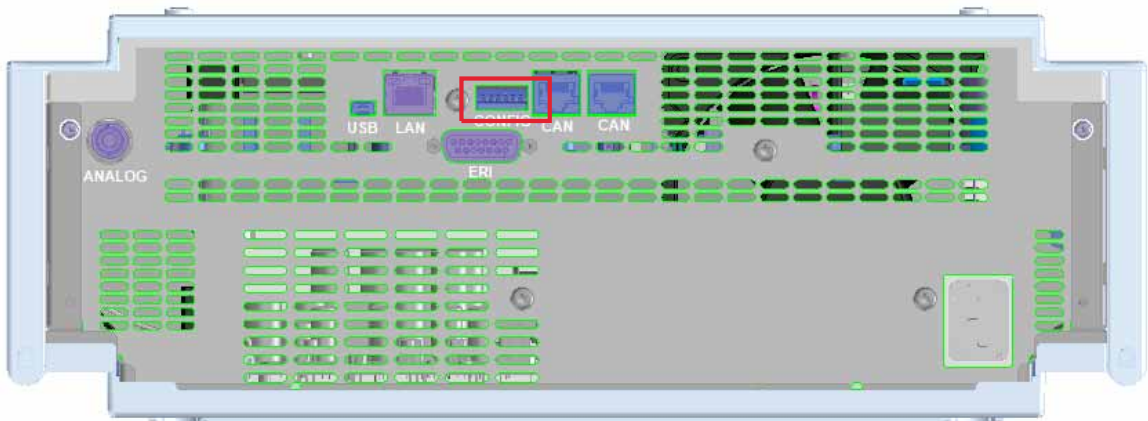


Figure 45 Location of Configuration Switch (example shows a G7114A/B VWD)

Table 15 6-bit Configuration Switch

| | Mode | Function/Setting | | | | |
|---|----------|-------------------|----------|---------------|----------|-----------|
| | Switch 1 | Switch 2 | Switch 3 | Switch 4 | Switch 5 | Switch 6 |
| COM ¹ | 0 | n.a. ² | n.a. | LAN Init Mode | | n.a. |
| Use Default IP Address ³ | | 0 | 0 | 0 | 0 | 0 |
| Use Stored IP Address | | 0 | 0 | 0 | 1 | 0 |
| Use DHCP to request IP Address ⁴ | | 0 | 0 | 1 | 0 | 0 |
| Test | 1 | System | n.a. | n.a. | n.a. | ColdStart |
| Boot Resident System | | 1 | 0 | 0 | 0 | x |
| Revert to Default Data | | x | 0 | 0 | 0 | 1 |

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

² not assigned - Always keep these switches on position '0' (off)

³ Default IP Address is 192.168.254.11

⁴ Host Name will be the MAC address.

Instrument Layout

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

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

Early Maintenance Feedback

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.

12 Hardware Information

Early Maintenance Feedback



13 LAN Configuration

Setting up the module in a LAN environment [218](#)

Connecting the module via LAN [219](#)

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



13 LAN Configuration

Setting up the module in a LAN environment

Setting up the module in a LAN environment

It is not recommended to connect a system via an autosampler. The detector is producing the most data in the stack, followed by the pump, and it is therefore highly recommended to use either of these modules for the LAN connection.

Connecting the module via LAN

If the module is being operated as a standalone module or if a connection via LAN is required regardless of above mentioned recommendation, a G1369B/C LAN card has to be used. For installation and configuration, see the G1369B/C documentation.

13 LAN Configuration

Connecting the module via LAN



14 Appendix

| | |
|---|-----|
| General Safety Information | 222 |
| General Safety Information | 222 |
| Safety Standards | 222 |
| General | 222 |
| Before Applying Power | 223 |
| Ground the Instrument | 223 |
| Do Not Operate in an Explosive Atmosphere | 224 |
| Do Not Remove the Instrument Cover | 224 |
| Do Not Modify the Instrument | 224 |
| In Case of Damage | 224 |
| Solvents | 225 |
| Symbols | 226 |
| Waste Electrical and Electronic Equipment Directive | 228 |
| Refrigerant | 229 |
| Radio Interference | 231 |
| Sound Emission | 232 |
| Solvent Information | 233 |
| Agilent Technologies on Internet | 234 |

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



General Safety Information

General Safety Information

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

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

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

Safety Standards

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

General

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

Before Applying Power

WARNING

Wrong voltage range, frequency or cabling

Personal injury or damage to the instrument

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

NOTE

Note the instrument's external markings described under “Symbols” on page 226.

Ground the Instrument

WARNING

Missing electrical ground

Electrical shock

- If your product is provided with a grounding type power plug, the instrument chassis and cover must be connected to an electrical ground to minimize shock hazard.
 - The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.
-

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

→ Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

→ Do Not Remove the Instrument Cover

→ Only Agilent authorized personnel are allowed to remove instrument covers. Always disconnect the power cables and any external circuits before removing the instrument cover.

Do Not Modify the Instrument

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

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

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

Solvents

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

- When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.
 - The volume of substances should be reduced to the minimum required for the analysis.
 - Do not operate the instrument in an explosive atmosphere.
 - Never exceed the maximal permissible volume of solvents (6 L) in the solvent cabinet.
 - Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for the Agilent 1200 Infinity Series Solvent Cabinets.
 - Arrange the bottles as specified in the usage guideline for the solvent cabinet.
 - A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available on the Internet.
 - Ground the waste container.
 - The residual free volume in the appropriate waste container must be large enough to collect the waste liquid.
 - Check the filling level of the waste container regularly.
 - To achieve maximal safety, check the correct installation regularly.
-

Symbols

Table 16 Symbols














| | |
|---|--|
|  | The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage. |
|  | Indicates dangerous voltages. |
|  | Indicates a protected ground terminal. |
|  | Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product. |
|  | The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up. |
|  | Cooling unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label. |
|  | Confirms that a manufactured product complies with all applicable European Community directives. The European Declaration of Conformity is available at: http://regulations.corporate.agilent.com/DoC/search.htm |
|  | Manufacturing date. |
|  | Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the power switch is in the Off position |
|  | Pacemaker Magnets could affect the functioning of pacemakers and implanted heart defibrillators. A pacemaker could switch into test mode and cause illness. A heart defibrillator may stop working. If you wear these devices keep at least 55 mm distance to magnets. Warn others who wear these devices from getting too close to magnets. |

Table 16 Symbols

| | |
|---|---|
|  | <p>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.</p> |
|  | <p>Indicates a pinching or crushing hazard</p> |
|  | <p>Indicates a piercing or cutting hazard.</p> |

WARNING

A WARNING

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

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

CAUTION

A CAUTION

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

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

Waste Electrical and Electronic Equipment Directive

Abstract

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

NOTE

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

Product Category:

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



NOTE

Do not dispose off in domestic household waste

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

Refrigerant

Table 17 Physical properties of refrigerant HFKW-134a

| | |
|----------------------|----------|
| Molecular weight | 102 |
| Critical temperature | 101.1 °C |
| Critical pressure | 40.6 bar |
| Boiling point | -26.5 °C |

WARNING

Refrigerant



Refrigerant HFKW-134a is known as a safe refrigerant, however accidents can occur if it is handled incorrectly. For this reason, the following instructions must be observed:

- Avoid contact with liquid refrigerant HFKW-134a. At atmospheric pressure HFKW-134a evaporates at approximately -26 °C and causes frost bite.
 - After skin contact, rinse the affected area with water.
 - After eye contact, rinse the eye(s) with plenty of water for at least 15 minutes and consult a doctor.
 - HFKW-134a must not be allowed to escape in enclosed areas. Although HFKW-134a is not toxic, there is a danger of suffocation as gaseous refrigerant is heavier than air.
 - Please observe the following first aid instructions. After inhalation, move the affected person to fresh air, keep him warm and allow him to rest. If necessary, he should be supplied with oxygen. If he has stopped breathing or is breathing erratically, he should be given artificial respiration. In the case of cardiac arrest, carry out heart massage. Send for a doctor immediately.
 - Moreover, it must be noted that HFKW-134a must always be extracted from the system and collected. It must never be discharged into the atmosphere on environmental grounds (greenhouse effect).
-

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

- The breakdown of the sample cooler unit must be carried out by specialist refrigeration company.
 - All media must be disposed of in accordance with national and local regulations.
 - Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance.
-

Radio Interference

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

Test and Measurement

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

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.

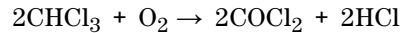
This product has a sound pressure emission (at the operator position) < 70 dB.

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

Solvent Information

Observe the following recommendations on the use of solvents.

- Brown glass ware can avoid growth of algae.
- Avoid the use of the following steel-corrosive solvents:
 - Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on),
 - High concentrations of inorganic acids like sulfuric acid and nitric acid, especially at higher temperatures (if your chromatography method allows, replace by phosphoric acid or phosphate buffer which are less corrosive against stainless steel),
 - Halogenated solvents or mixtures which form radicals and/or acids, for example:



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-isopropyl ether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides,
- Solvents containing strong complexing agents (e.g. EDTA),
- Mixtures of carbon tetrachloride with 2-propanol or THF.

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

- accessory kit
 - standard 182
- Agilent Lab Advisor software 96
- Agilent Lab Advisor 96
- Agilent
 - on internet 234
- algae 233
- ambient non-operating temperature 28
- ambient operating temperature 28
- analog signal 207
- analytical head assembly
 - 100 173
 - 40 172
- apg remote 207
- assemblies
 - main 169
- assembly
 - door 181
 - needle port 180

B

- bench space 26

C

- cable
 - CAN 194
 - LAN 194
 - overview 186
 - RS-232 195
- cables
 - analog 188
 - remote 190
- CAN

- cable 194
- cleaning 115
- compensation sensor open 103
- compensation sensor short 104
- condensation 26
- configuration
 - module 71
 - options 149
- control settings 68

D

- defect on arrival 46
- delay volume
 - description 74
- dimensions 28
- door
 - assembly 181
- doors
 - installation 116
 - removal 116
- drawer upgrade
 - installation 151
- drawer
 - status indicator 42, 94

E

- electrical connections
 - descriptions of 201
- electronic waste 228
- EMF
 - early maintenance feedback 215
- error messages
 - compensation sensor open 103
 - compensation sensor short 104

- fan failed 104
- ignition without cover 105, 105
- leak sensor open 103
- leak sensor short 102
- leak 105
- lost CAN partner 102
- remote timeout 101
- shutdown 100
- timeout 99
- extra-column volume 74

F

- fan failed 104
- features 10
- firmware
 - description 198
 - main system 198
 - resident system 198
 - update tool 199
 - updates 198, 165
 - upgrade/downgrade 165
- flush head 176
- frequency range 28

G

- general error messages 99

H

- hotel drawer
 - configure in control software 156
 - configure in Lab Advisor 158
- hotel
 - drawer 171
- humidity 28

Index

I

- indicator
 - drawer status 42, 94
- indicators
 - status 93, 41
- injection valve
 - actuator 179
- installation
 - bench space 26
 - sample cooler 47
 - upgrade drawer 151
- installing
 - sample loop-flex 147
- instrument layout 214
- interfaces 95
 - Infinity II 204
- internet 234

L

- LAN
 - cable 194
 - configuration 217
 - environment 218
 - setup 218
- leak sensor open 103
- leak sensor short 102
- leak 105
- line frequency 28
- line voltage 28
- lost CAN partner 102

M

- maintenance
 - feedback 215
 - overview 168, 114
 - replacing firmware 165
- message
 - ignition without cover 105, 105
 - remote timeout 101

- metering seal
 - install 135
 - remove 131
- method parameter settings 69
- module firmware
 - replace 165
- module
 - configuration 71
 - overview 12
- multisampler
 - transport 53

N

- needle assembly
 - installation 122
 - remove 119
- needle port
 - assembly 180
- needle seat
 - exchange 125
- non-operating altitude 28
- non-operating temperature 28

O

- operating Altitude 28
- operating temperature 28
- optimization
 - achieving higher resolution 83
 - achieving higher sensitivity 86
 - column use 86
- overview
 - cable 186
 - module 12

P

- packaging
 - damaged 46
- physical specifications 28
- power consideration 24

- power consumption 28
- power cords 25
- power supply indicator 41, 93
- principle 14

R

- radio interference 231
- remote
 - cables 190
- removing
 - sample loop-flex 145
- repairs
 - replacing firmware 165
- resolution
 - Optimization 83
- rotor seal
 - replace 127
- RS-232C
 - cable 195

S

- safety class I 222
- safety
 - general information 222
 - standards 28
 - symbols 226
- sample cooler 184
 - installation 47
 - install 162
 - power supply fuses 159
 - remove 161
- sample loop-flex
 - install 147
 - removal 145
- sampler
 - main assemblies 169
 - tubing kit 183
- sensitivity
 - optimization 86

- serial number
 - information 203, 203
- setup
 - LAN 218
- shutdown 100
- site requirements
 - power cords 25
- solvents 233
- sound emission 232
- special interfaces 208
- specification
 - physical 28
- status
 - indicators 93, 41

T

- temperature sensor 105
- test functions 92
- timeout 99
- transport 53
- troubleshooting
 - error messages 92, 98
 - status indicators 92
- tubing kit
 - sampler 183

V

- voltage range 28

W

- waste
 - electrical and electronic equipment 228
- WEEE directive 228
- weight 28

In This Book

This manual contains technical reference information about the Agilent 1290 Infinity Multisampler G7167B.

The manual describes the following:

- Introduction,
- Site requirements and specifications,
- Using the module,
- Preparing the module,
- Optimizing performance,
- Troubleshooting and diagnostics,
- Error information,
- Test functions,
- Maintenance,
- Parts,
- Hardware information,
- LAN configuration,
- Safety and related information.

© Agilent Technologies 2014

Printed in Germany
08/2014

G7167-90000
G7167-90000

G7167-90000