Agilent 218 Purification Solution

System User Guide
Notices

© Agilent Technologies, Inc. 2012

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
G9300-90300

Edition
02/2012

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

This product may be used as a component of an in vitro diagnostic system if the system is registered with the appropriate authorities and complies with the relevant regulations. Otherwise, it is intended only for general laboratory use.

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.
This manual provides setup information on following modules:

- Agilent 218 Solvent Delivery Module (G9300A/G9301A)
- Agilent 325 UV/VIS Dual WL Detector (G9309A)
- Agilent 410 Autosampler (G9331A/G9332A)
- Agilent 440 Fraction Collector (G9340A)

1 Introduction
This chapter introduces to the Agilent 218 Purification Solution system and its components.

2 Site Requirements and Specifications
This chapter provides information on site requirements and specifications of your system.

3 Installation
This chapter gives information about the installation of your Agilent 218 Solvent Delivery Module, Agilent 325 UV/VIS Dual WL Detector, Agilent 410 Autosampler, and Agilent 440 Fraction Collector.

4 Using, Troubleshooting, Maintenance and Parts
This chapter provides information on how to access further details on the system components.

5 Cables
This chapter provides information on cables used with the instrument.

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

1 Introduction 7
   Introduction to the System 8
   Introduction to the Solvent Delivery Module 9
   Introduction to the Detector 11
   Introduction to the Autosampler 12
   Introduction to the Fraction Collector 15

2 Site Requirements and Specifications 17
   Site Requirements 18
   Specifications 21

3 Installation 23
   Delivery 26
   Damaged Packaging 27
   Check Delivery 28
   Unpacking and Inspection 30
   Optimizing the Stack Configuration 33
   Installing the Solvent Delivery Module 37
   Installing the Detector 69
   Installing the Autosampler 81
   Installing the Fraction Collector 92
   Setup Hardware 104
   Setup the System with OpenLAB CDS ChemStation Edition - Control Panel 110

4 Using, Troubleshooting, Maintenance and Parts 125
   Using, Troubleshooting, Maintenance and Parts 126
5 Cables 127
  Cable Overview 128
  Cable Connections 129
  Analog Output 130
  Relay Output 131
  Desktop PC Communications 134
  Synchronization Signals 135

6 Appendix 139
  General Safety Information 140
  Solvent Miscibility 146
  Solvent Compressibility 147
  The Waste Electrical and Electronic Equipment Directive 148
  Batteries Information 149
  Radio Interference 150
  CE Compliance 151
  Electromagnetic Compatibility 152
  Agilent Technologies on Internet 154
This chapter introduces to the Agilent 218 Purification Solution system and its components.
Introduction to the System

A complete Agilent 218 Purification Solution system includes:

- Agilent 218 Solvent Delivery Module(s),
- Tubing,
- Mast kit,
- Agilent 325 UV/VIS Dual WL Detector,
- Agilent 410 Autosampler, and
- Agilent 440 Fraction Collector
Introduction to the Solvent Delivery Module

The Agilent 218 Solvent Delivery Module uses proven single-piston rapid-refill technology for economy, reliability, and virtually pulse-free operation. A range of interchangeable pump heads allows operation at flow rates from 10 µL/min to 200 mL/min. Biocompatible pump heads are available for those analysts requiring a completely inert flow path.

A single-channel analog-to-digital converter built in to each Agilent 218 Solvent Delivery Module can convert a detector signal to digital form and transmit the data to a computer system. Five programmable analog inputs and three programmable relay outputs are available to further automate the HPLC system. The Agilent 218 Solvent Delivery Module is easy to use and very flexible in operation. It can be used in several different modes of operation: as a standalone isocratic pump, as either a master pump or a slave pump in a high pressure gradient system, as a sample inject pump in a preparative system, or in a fully automated HPLC system controlled by an external computer. In each case, the Agilent 218 Solvent Delivery Module provides outstanding accuracy over its entire range of pressures, flow rates, and solvents.

The Agilent 218 Solvent Delivery Module operates very quietly because of minimal motor noise and resonance vibrations.

A complete Agilent 218 Solvent Delivery Module includes a drive module, a pump head, and a pressure module.

One of the Agilent 218 Solvent Delivery Modules in the HPLC system needs to have a pressure module installed in its compartment in the pump side panel. The pressure module dampens pulsations and supplies the current system pressure value to the drive module. Software in the drive module ensures that the system pressure is within pre-set maximum and minimum limits. Flow rates are automatically corrected for solvent-compression effects based on the system pressure value read from the pressure module and a compressibility factor entered by the user for each solvent.

The Agilent 218 Solvent Delivery Module operates with a variety of Agilent 218 Solvent Delivery Module heads to maintain specified performance over designated flow and pressure ranges. The easily replaceable pump heads are
self-contained units including a spring-loaded piston and check-valve cartridges. Pump heads are not included with individual drive modules.

A complete HPLC system can be controlled either by an Agilent 218 Solvent Delivery Module or PC-based software. When the computer controls pumps, all pumps are slaves and programming is done on the computer.

On the pump rear panel there is a single RS-422 male connector. This connector is used for bidirectional signals to and from the controller, whether the controller is an external computer or another Agilent 218 Solvent Delivery Module. Internal software in the Agilent 218 Solvent Delivery Module determines whether the pump is a master controller or a slave pump.

The possible system configurations (depending on the type of pumps and controller being used) are the following:

- Isocratic system
- Gradient system with one Agilent 218 Solvent Delivery Module as the controller

When several pumps are connected together, the master Agilent 218 Solvent Delivery Module can control the other pumps in the liquid delivery system. A master Agilent 218 Solvent Delivery Module can control up to three other slave units: either three additional pumps in a quaternary system, or two additional elution pumps and one injection pump. The master Agilent 218 Solvent Delivery Module can control other modules in the system using outputs, and receive information through input contacts.

- Gradient system with HPLC control software as a controller

In this configuration all pumps are slaves and the computer is the system controller. The HPLC control software controls the pumps via the serial interface cable and other devices through contact closures on the Control/Interface module (CIM) built into the Agilent 218 Solvent Delivery Module.
Introduction to the Detector

The Agilent 325 UV/VIS Dual WL Detector is integrated into a Liquid Chromatography System. The detector is controlled remotely by OpenLAB through Ethernet communications. In this situation, all functions of the detector are controlled through the Workstation software.

The detector measures the sample absorbance at the user-selected wavelength. The absorbance is displayed. Wavelength absorbance parameters are time programmable.

Features of the Agilent 325 UV/VIS Dual WL Detector:

- Stackable module
- Interchangeable flowcells
- Simple lamp replacement
- Comfortable control (OpenLAB)
- Wide detection range (peaks up to 40 AU/cm with appropriate flowcell)
Introduction to the Autosampler

Autosampler (G9331A)

Introduction to the Autosampler

The Agilent 410 Autosampler has been designed to meet the needs of the modern analytical laboratory. The autosampler has the following features:

- Reliable
- Cost-effective
- Easy to use
- Column temperature control and sample cooling guaranting consistent results
- High resolution syringe control guaranting superior precision for injection and reagent addition
- Fast replacement of the injection valve

Loop injection with Pressure Assisted Sample Aspiration is a proven concept that combines high precision with simplicity and reliability.

Three injection modes can be selected:

- Full loop
- Partial loop filling
- μL Pick-up

Therefore maximum precision, maximum flexibility and zero sample loss can be achieved.

Side-Port Needle

The strong side-port needle combines the optimum point style for septa piercing with a minimum risk of blockage by septum particles.
Column Oven

A column oven is an integral part of the Agilent 410 Autosampler because constant column temperature is important for long term stability of a chromatographic separation and may be required for GLP compliance.

Reagent Addition

Internal Standard addition, sample dilution or derivatization can be programmed in a very simple manner. A single-stage derivatization of a sample in a separate (destination) vial requires no more than 4 program lines. Multi-reagent addition is also possible, two large volume reagent vials are available on the sample tray.

Service Autosampler

Low instrument down time is accomplished by a high Mean Time Between Failure and quick instrument service. Special attention has been paid to these aspects of the concept, as is illustrated by the injection valve. The Agilent 410 Autosampler will alert you when the lifetime of the seal is exceeded or if the switching torque becomes too high. This allows preventive maintenance before injection performance degrades. And if necessary, the entire injection valve can be replaced in seconds with the unique Quick-fit valve mounting mechanism.
Introduction to the Autosampler

**Autosampler (G9332A)**

By just choosing PREP in your system settings, you can use the Agilent 410 Autosampler to inject all of your sample into a Preparative LC system or in other areas where large injection volumes are required.

The combination of large sample vials (10 mL), a large sample volume needle and a 2.5 mL syringe enable you to inject large volumes very reproducible with high speeds and only 45 µL of sample loss. The installed large bore valve (0.75 mm) with 10 mL sample loop enables you to inject from microliters to milliliters with the same AutoSampler. Flow rates up to 200 mL per minute are possible when in the Prep mode.

<table>
<thead>
<tr>
<th>Tubing</th>
<th>Material</th>
<th>Dimensions</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSV sample needle and tubing</td>
<td>Stainless Steel</td>
<td>70 mm x 0.81 mm o.d. x 0.51 mm i.d.</td>
<td>45 µL</td>
</tr>
<tr>
<td></td>
<td>Tefzel®</td>
<td>155 mm x 1/16” o.d. x 0.50 mm i.d.</td>
<td>45 µL</td>
</tr>
<tr>
<td>Buffer tubing from high-pressure valve to syringe valve</td>
<td>PTFE</td>
<td>2550 mm x 1/16” o.d. x 1 mm i.d.</td>
<td>2000 µL</td>
</tr>
</tbody>
</table>

If the Prep option is factory installed the installation instructions can be skipped.

If the Prep option is bought as a kit, carry out the installation instructions, see “Installing the Agilent 410 Autosampler Prep Option” on page 91 for more information.
Introduction to the Fraction Collector

The Agilent 440 Fraction Collector is a random access, single probe fraction collector and can accommodate a variety of racks. It is designed to automate the sample collection process. This fraction collector is designed to meet the diverse requirements of high-throughput laboratories.

Three racks are included with the fraction collector and are made of polypropylene to resist most chemical spills. Up to three racks of many configurations can be placed on the fraction collector. Additional sample racks can be set up in sequence and manually changed during an analysis as each rack’s analysis is completed.

The rack closest to the rear of the fraction collector (next to the pillar) is considered rack number one.
1 Introduction
Introduction to the Fraction Collector
2 Site Requirements and Specifications

Site Requirements 18
Specifications 21

This chapter provides information on site requirements and specifications of your system.
Site Requirements

Power Considerations

The instrument power supply has wide ranging capability. It accepts any line voltage in the range described in Physical Specifications.

**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.

---

**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.
2 Site Requirements and Specifications

Site Requirements

Condensation

CAUTION Condensation within the module
Condensation will 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.

Area selected

WARNING Explosion, damage and accuracy of the module

➔ Select an area free from drafts, corrosive atmospheres, and vibration.

➔ Select a dust-free, low-humidity environment.

➔ Use air-conditioning for control of the environment.

Bench Space

Make sure that the bench is designed to bear the weight of all modules.

For details on the space needed around the individual modules, refer to the according manuals:

• Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000)
• Agilent 325 UV/VIS Dual Wavelength Detector - User Manual (p/n G9309-90000)
• Agilent 410 Autosampler - User Manual (p/n G9331-90000)
• Agilent 440 Fraction Collector – User Manual (p/n G9340-90000)
Specifications

For details on specifications of the individual modules, please refer to the according manuals:

- Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000)
- Agilent 325 UV/VIS Dual Wavelength Detector - User Manual (p/n G9309-90000)
- Agilent 410 Autosampler - User Manual (p/n G9331-90000)
- Agilent 440 Fraction Collector – User Manual (p/n G9340-90000)
2 Site Requirements and Specifications
Specifications
3 Installation

Delivery 26
Damaged Packaging 27
Check Delivery 28
  Delivery Checklists 28
Unpacking and Inspection 30
Optimizing the Stack Configuration 33
  Isocratic System 34
  Binary System 35
  Auto-Preparative System 36
Installing the Solvent Delivery Module 37
  Electrical Setup 37
  Pump Head Installation 39
  Pressure Module Installation 41
  Internal Mixer Installation 44
  Mast Kit and Components Installation 46
  Installing the Mast 47
  Installing the Manual Injection Valve and Bracket 48
  Installing the Prime/Purge Valve and Bracket_system 50
  Installing the 3-way Pump Head Prime Valve 51
  Installing the Column Hanger 53
  Plumbing Connections 53
  Pump Head Low Pressure Tubing and Inlet Filter Assembly 54
  Installing the Piston-washing Tubing 55
  Pump Head High Pressure Tubing 56
  Narrowbore and Analytical Stainless Steel Mixers Plumbing Fittings 61
  Analytical PEEK and Narrowbore/Analytical Titanium Mixers Plumbing Fittings 62
3 Installation Specifications

Preparative PEEK/Titanium Mixers Plumbing Fittings 63
Connecting Communication Cabling Using Serial Interface 63
Setting the Pump ID and Pump Head Size When Using HPLC Control Software 67
Setting the Pump ID and Pump Head Size When Using an Agilent 218 Pump as a Master Controller 68

Installing the Detector 69
Location of the Detector Module 69
Power Connection and Rear Panel Services 70
Avoiding Harmful Interferences to Radio or Television Reception 72
Removing the Front Panel 73
Hydraulic Connections - Flowcells 74
Installing a Flowcell 75
Detector Outlet Back Pressure Restrictor 78
Installing the Door 79
Installing and Removing the Door 80

Installing the Autosampler 81
Location of the Autosampler Module 81
Overview of the Module 82
Installing the Sample Tray 85
Connecting the Waste Tubings 85
Starting the Autosampler 87
Rinsing the System with Wash Solvent 88
Connecting the HPLC to the Autosampler 89
Filling and Sealing the Vials 89
Loading the Sample Tray 90
Installing the Agilent 410 Autosampler Prep Option 91

Installing the Fraction Collector 92
Overview of the Module 92
Installation Overview 93
Assembling the Fraction Collector 93
Installing the Spill Tray 94
Installing the Rack Location Mat 95
Installing the Probe and Tubing 95
Assembling the Sample Racks 98
This chapter gives information about the installation of your Agilent 218 Solvent Delivery Module, Agilent 325 UV/VIS Dual WL Detector, Agilent 410 Autosampler, and Agilent 440 Fraction Collector.
Delivery

For detailed information on parts delivered with the modules, refer to the corresponding module manuals:

- Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000)
- Agilent 325 UV/VIS Dual Wavelength Detector - User Manual (p/n G9309-90000)
- Agilent 410 Autosampler - User Manual (p/n G9331-90000)
- Agilent 440 Fraction Collector – User Manual (p/n G9340-90000)

### Components of a Complete System

A complete system comprises following modules (as ordered):

<table>
<thead>
<tr>
<th>Hardware Modules</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G9300A</td>
<td>Agilent 218 Isocratic Solvent Delivery Module</td>
</tr>
<tr>
<td></td>
<td>G9301A</td>
<td>Agilent 218 Add-On Solvent Delivery Module (OPTIONAL)</td>
</tr>
<tr>
<td></td>
<td>G9309A</td>
<td>Agilent 325 UV/VIS Dual WL Detector</td>
</tr>
<tr>
<td></td>
<td>G9331A</td>
<td>Agilent 410 Autosampler</td>
</tr>
<tr>
<td></td>
<td>G9332A</td>
<td>Agilent 410 Preparative Autosampler (OPTIONAL)</td>
</tr>
<tr>
<td></td>
<td>G9340A</td>
<td>Agilent 440 Fraction Collector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G9287-60001</td>
<td>Prep LC driver CD</td>
</tr>
<tr>
<td></td>
<td>M8500AA</td>
<td>LC driver</td>
</tr>
<tr>
<td></td>
<td>M8301AA</td>
<td>LC Core Software</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OpenLAB CDS A.01.03 or higher</td>
</tr>
</tbody>
</table>
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.
Check Delivery

Delivery Checklists

**Delivery Checklist Pump**

The pump is packed in a single carton.

The pressure module ordered with the pump is shipped separately and needs to be installed.

Any pump head ordered with the pump is packed separately.

The following list shows all items delivered in a standard delivery. Your personal list depends on your order, therefore countercheck delivery with your order.

- Agilent 218 Solvent Delivery Module
- Power cord
- Pump head kit
- Plumbing kit (G9300A)
- Pressure transducer module (G9300A)
- Mast kit (G9301A)
- Internal mixer (G9301A)

**Delivery Checklist Detector**

The following list shows all items delivered in a standard delivery. Your personal list depends on your order, therefore countercheck delivery with your order.

- Agilent 325 UV/VIS Dual Wavelength detector
- Assy PWB Sync. Interface 325/335
- Cross-over Ethernet cable
- Power cord

**NOTE**

Flow cells are required for the detector, but are ordered separately. See "Hydraulic Connections - Flowcells" on page 74 for suitable flowcells.
Delivery Checklist Autosampler

The autosampler is packed in a single carton.

The following list shows all items delivered in a standard delivery. Your personal list depends on your order, therefore countercheck delivery with your order.

- Agilent 410 Autosampler (G9331A/G9332A)
- Power cord
- Agilent 410 Reservoir Rack
- Standard Tray Assy (G9332A)
- Agilent and PrepStar Mast kit
- Prime purge valve bracket
- Prime purge valve stainless steel

Delivery Checklist Fraction Collector

The following list shows all items delivered in a standard delivery. Your personal list depends on your order, therefore countercheck delivery with your order.

- Agilent 440-LC Fraction Collector
- Assy USB RS232 serial adaptor
- Rack
- 440-LC Hard Wired Interface kit
- Power cord
Unpacking and Inspection

1. Check carefully to make sure you received all the items listed on the packing list.
2. Carefully unpack all the containers and inspect the contents for damage as soon as possible.
3. Save the packing containers; they will be useful if you have to file a claim for damage, or in the case of future transit.

Unpacking the Solvent Delivery System

**WARNING**

Danger to hands and feet
The instrument is heavy.

➔ Always use a fork lift or other suitable lifting device when moving the instrument.

**CAUTION**

Overheating of the pump
Objects interfering with airflow to the pump

➔ Maintain at least 15 cm (6 inches) clear space next to the fan.
Unpacking the Detector

Ensure there is enough room on the bench for the detector.

**WARNING**

**Heavy weight**

The Agilent 325 UV/VIS Dual Wavelength Detector weighs in excess of 15 kg (33 lb).

➔ Carry the instrument 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.

1. Carefully unpack the unit from the shipping carton and place it on the bench.

2. Make sure to check carefully for all miscellaneous components that might be contained in the inner compartments.

**NOTE**

The detector is a sensitive instrument and should always be handled with the degree of care appropriate for laboratory instrumentation.

**HINT**

Keep the shipping carton, as it provides excellent protection if you have to transport or store the detector in the future.
Unpacking the Autosampler

**CAUTION** Risk of damaging the autosampler.

➔ Do not lift the Agilent 410 Autosampler by the front cover.

1 Lift the Agilent 410 Autosampler as shown in Figure 1 on page 32 with both hands under the instrument or with one hand under the front and the other hand grasping the rear top of the Agilent 410 Autosampler.

![Figure 1: Agilent 410 Autosampler lifting instructions](image-url)
Optimizing the Stack Configuration

This section contains information on how to stack your modules, depending on the preparative method.

For optimal performance in other configurations than in the given examples respect the following rules:

- The orientation is also suggested if you are only installing the Agilent 218 Pump.
- If an autosampler is present, it should be placed on top of the detector.
- Position the master pump as highest pump in the stack.

**NOTE**

The pump with the pressure module is the master pump. In gradient systems, the remaining pumps are slave pumps.

This position allows easy access to keypad and display to control the HPLC-system via pump instead of software.
Isocratic System

Figure 2  Isocratic System

Table 2  Isocratic system - component heights on the mast measured from the bench to the bottom of the bracket

<table>
<thead>
<tr>
<th>Part</th>
<th>Height in mm (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection valve</td>
<td>285 (11.2)</td>
</tr>
<tr>
<td>Prime/purge valve</td>
<td>185 (7.3)</td>
</tr>
<tr>
<td>Low pressure solvent valve</td>
<td>100 (3.9)</td>
</tr>
</tbody>
</table>
Binary System

![Diagram of Binary System]

**Figure 3**  Binary System

**Table 3**  Binary system - component heights on the mast measured from the bench to the bottom of the bracket

<table>
<thead>
<tr>
<th>Part</th>
<th>Height in mm (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection valve</td>
<td>485 (19.1)</td>
</tr>
<tr>
<td>Prime/purge valve</td>
<td>385 (15.2)</td>
</tr>
<tr>
<td>Low pressure solvent valve</td>
<td>300 (11.8)</td>
</tr>
<tr>
<td>Low pressure solvent valve</td>
<td>100 (3.9)</td>
</tr>
</tbody>
</table>
3 Installation
Optimizing the Stack Configuration

Auto-Preparative System

![Auto-Preparative System Diagram]

Figure 4 Gradient Auto-Preparative System

NOTE The injection pump is used for automatic injection.
Installing the Solvent Delivery Module

Electrical Setup

**CAUTION**
Damage to the module.

➔ Use only correct fuses, recommended for your voltage usage.

➔ A label stating the operating power rating of your instrument (as wired in the factory) is affixed to the rear panel adjacent to the power receptacle and voltage selection assembly (J1).

➔ The pumps are shipped with fuses installed; ready for operation on 220/230 V. You will need to reconfigure the voltage for 115 V usage.

➔ Check that the voltage configuration is set correctly for your local power requirements.

➔ If it is necessary to change the voltage configuration, see the Agilent 218 Pump Voltage Conversion Instruction (p/n 8510249500).

1. Setup electrical connections.
2. Check that the ON/OFF power switch is off (in the O position).
3. Connect the power cord to the back panel of the module and plug it into a grounded power socket.

**NOTE**
A good ground connection is necessary to ensure safety for users and proper communications.

4. Turn on the power switch.
3 Installation
Installing the Solvent Delivery Module

**NOTE**

If the pump does not start check following items:

1. Proper connection of the power cord
2. Power at the wall receptacle
3. Functionality of the main power fuse (F1)

For fuse installation, see maintenance procedure in Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000).

The fuse rating and operating voltage is printed on the rear panel next to the power receptacle.
Pump Head Installation

The pumps are shipped without the pump head installed. You will have to install the pump head before beginning to run. You can also change pump heads at any time.

Figure 5  Pump head installation

Tools required  Description
Hex wrench, 1/4 in (200 mL/min head only)

1 Remove the shipping plug from the liquid head aperture on the front of the pump.
2 Insert the pump head into the front aperture of the pump.

NOTE
The notch at the bottom of the pump head body must fit the matching pin on the pump, below the aperture. This notch ensures that the inlet and outlet ports are located in the correct position.

3 Holding the pump head in place, slide the clamp (found in the pump head kit) down over the head so the clamp flanges engage the slots on both sides of the pump head.
3 Installation
Installing the Solvent Delivery Module

NOTE Depending on the position of the pump cam, you may have to push the pump head in to get the clamp on. Make sure that the clamp flanges are in their slots on both sides and finger-tighten the thumbscrew until the clamp holds the pump head securely.

In the case of the 200 mL/min head use the supplied hex wrench to tighten hex screw on the clamp. Tighten very securely. Repeat this procedure for each pump head in your system.

NOTE There are three sizes of pump head clamps. The smaller one fits all pump heads that do not have piston wash. The larger one fits all heads that have piston wash. The largest clamp is used only with the 200 mL/min head.

4 Enter the pump head size into the pump software and into the pump firmware (from the key pad).

NOTE For details see “Setting the Pump ID and Pump Head Size When Using HPLC Control Software” on page 67 or “Setting the Pump ID and Pump Head Size When Using an Agilent 218 Pump as a Master Controller” on page 68.
Pressure Module Installation

Each Agilent 218 Pump can have a pressure module installed in the panel on the right side of the pump. The pressure module dampens pump pulsations and supplies the current pressure value to the Agilent 218 software. The pump needs this information to implement compressibility compensation and flow rate accuracy corrections and to ensure that system pressure is within the limits entered during setup.

Four pressure module ratings are available:

- 60.0 MPa (600 bar, 8700 psi),
- 41.4 MPa (414 bar, 6000 psi),
- 27.6 MPa (276 bar, 4000 psi),
- 13.8 MPa (138 bar, 2000 psi),
- 8.3 MPa (83 bar, 1200 psi).

These have different flow rate max/min (see Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000))

The pressure module is identified on the front of its panel. The connector from the pressure module should be plugged into the master pump. Only one pump in the HPLC system needs to have a pressure module installed.

<table>
<thead>
<tr>
<th>Tools required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phillips head screwdriver</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: You do not need to remove the top cover to install the pressure module or mixer. The covers are removed in some photographs for clarity.

NOTE: If you are using an HPLC system with a Agilent 218 as controller, the pump with the pressure module should be the master controller (device ID = MC).

NOTE: For the Agilent Modular HPLC Systems, the pressure module must go into the topmost pump.
3 Installation
Installing the Solvent Delivery Module

NOTE
If you are using a computer as controller, the pump with the pressure module needs to be identified in the controller configuration window.

1 Decide which pump is to have the pressure module installed, (i.e., which pump is the master pump) then remove the panel on the rear of the right side using a Phillips head screwdriver.

NOTE
Keep the panel in a safe place.
2 Place the pressure module in position and attach the connector to the plug on the inside of the pressure module compartment. The connection is done using a 9-pin ‘D’ shell connector. The 4-pin side of the connector is positioned towards the rear of the pump module. The module and its connector are a one-way fit.

Next Steps:

3 Tighten the screws on the mounting panel to hold the module in place.

**NOTE**

This is critical as the pressure module can slip out if the pump is picked up without the screws being tightened.
Internal Mixer Installation

If two or more pumps are being used together to proportion individual solvents into one mixture, a mixer is required.

Mixers are available in several different materials and three different sizes:

- A 0.6 mL,
- 1.2 mL, and
- 10 mL mixer.

The internal mixer is identical in function and capability to the external mixer except that it obtains power from the pump drive module and it mounts into the pressure module bay at the right rear of the pump. The mixer is identified by a label on the inside of the mixer mounting panel. This identifies the mixer size, material and part number.

The mixer connects to the Agilent 218 Pump using a 2-pin Molex connector for power. There is no ON/OFF switch for the mixer. Whenever the Agilent 218 Pump is powered on, the mixer is running. This continuous running does not hurt the mixer. When no liquid is present, the mixing bars may not be moving. This is normal. When liquid is present, the mixing bars flip back and forth rapidly to mix the solvents.

1. Ensure the pump power is turned off.
2. Remove the cover panel from the right rear of the Agilent 218 Pump. Save the screws.
3  Attach the 2-pin Molex connector to the white Molex connector in the mixer compartment. The flat sides of the connector should be toward the rear of the pump.

4  Fit the mixer panel onto the module and use the screws to fasten it to the pump.
Mast Kit and Components Installation

1  “Installing the Mast” on page 47
2  “Installing the Manual Injection Valve and Bracket” on page 48
3  “Installing the Prime/Purge Valve and Bracket_system” on page 50
4  “Installing the 3-way Pump Head Prime Valve” on page 51
5  “Installing the Column Hanger” on page 53
Installing the Mast

<table>
<thead>
<tr>
<th>Parts required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mast kit (2x mast clamp</td>
<td>Mast kit (2x mast clamp bracket assembly, 2x 10-32 socket screws, stainless steel mast)</td>
</tr>
</tbody>
</table>

1. Remove the mast, brackets and two screws from the Mast Kit Assembly.
2. Attach a mast clamp to the fittings at the front corner of the pump.

OR

Attach a mast clamp to the fittings one each on the lower front corner of the pump and top front corner of the detector (if fitted).

3. Secure the stainless-steel mast within the clamps so the lower end of the mast is level with the bench.
3 Installation
Installing the Solvent Delivery Module

Installing the Manual Injection Valve and Bracket

<table>
<thead>
<tr>
<th>Tools required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex key, 2 mm, provided with the injection valve</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parts required</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection valve</td>
<td>R000048605</td>
<td>Injection valve bracket</td>
</tr>
</tbody>
</table>

1. Unpack the injection valve with attached black cable.
2. Remove the red dust cover and gently pull out the needle port from the valve.
3. Remove the selection handle from the valve by loosening the two grub screws securing it to the injection valve body using the provided 2 mm hex key.
4. Remove the two screws and injection valve bracket from the accessories bag that came with the injection valve.
5. Attach the bracket to the injection valve with the two screws.
### Installation

#### Installing the Solvent Delivery Module

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Replace the selection handle and tighten the two grub screws securing the handle using the 2 mm hex key. The grub screws should be flush with the flat side of the metal post.</td>
</tr>
<tr>
<td>7</td>
<td>Replace the needle port in the valve.</td>
</tr>
<tr>
<td>8</td>
<td>Attach the injection valve to the mast. For correct height see &quot;Isocratic System&quot; on page 34(isocratic system) or &quot;Binary System&quot; on page 35(binary system).</td>
</tr>
</tbody>
</table>

**Next Steps:**

- Replace the needle port in the valve.
- Attach the injection valve to the mast. For correct height see "Isocratic System" on page 34(isocratic system) or "Binary System" on page 35(binary system).
3 Installation
Installing the Solvent Delivery Module

Installing the Prime/Purge Valve and Bracket_system

<table>
<thead>
<tr>
<th>Parts required</th>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prime/purge valve - consult the documentation that came with the valve for the part number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CP16267</td>
<td>Hex key, 2 mm</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>R000048606</td>
<td>Prime/purge valve bracket for stainless steel purge valve</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>R000048616</td>
<td>Prime/purge valve bracket for PEEK™ purge valve</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
While stainless steel images are shown here, the procedure is the same for PEEK or Titanium prime/purge valves.

1. Unpack the stainless steel purge valve and purge valve bracket.
2. Remove the knob and nut from the purge valve. The knob is held in place with a grub screw which is loosened using a 2 mm hex key.
3. Secure the valve to the valve bracket using the nut.
4. Replace the knob on the valve and tighten the grub screw using the provided 2 mm hex key.
5. Attach the purge valve to the mast. For correct height see “Isocratic System” on page 34 or “Binary System” on page 35.
Installing the 3-way Pump Head Prime Valve

<table>
<thead>
<tr>
<th>Tools required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex key, 2 mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parts required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump head prime valve</td>
<td></td>
</tr>
<tr>
<td>Pump head prime valve bracket</td>
<td></td>
</tr>
</tbody>
</table>

1. Unpack the 3-way valve and bracket.

2. Using the provided 2 mm hex key, loosen the grub screw and slide off the selection knob.

3. Unscrew the nut and then remove the two washers from the 3-way valve.

4. Attach the bracket so that the three holes on the 3-way valve face away from the thumbscrew on the bracket.
3  Installation
Installing the Solvent Delivery Module

**CAUTION**

Damage to the fittings

➔ Finger-tighten the nut and use the provided hex key to tighten the selection knob.

5  Place the flat washer and then ridged washer on the 3-way valve. Screw on the nut to secure the two washers.

6  Slide the selection knob onto the 3-way valve. The engraved lines on the top of the selection knob should point to the holes in the black body of the 3-way valve. The grub screw should be flush with the flat side of the metal post on the 3-way valve.

Next Steps:

7  Secure the selection knob to the 3-way valve using only the provided 2 mm hex key. Do not over-tighten.

8  Attach the 3-way valve to the mast. See Table 2 on page 34 for the correct height.

**NOTE**

If you have a binary system, repeat this procedure for the second 3-way pump head prime valve. For correct height see Table 3 on page 35.
Installing the Column Hanger

<table>
<thead>
<tr>
<th>Parts required</th>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>R000048610</td>
<td>Analytical column hanger for ¼ in. OD</td>
</tr>
<tr>
<td>OR</td>
<td>1</td>
<td>R000048602</td>
<td>Preparative column hanger for 1 in. OD</td>
</tr>
<tr>
<td>OR</td>
<td>1</td>
<td>R000048601</td>
<td>Preparative column hanger for ½ in. OD</td>
</tr>
</tbody>
</table>

1. Attach the column hanger on to the mast so that the column inlet is close to the injection valve. Avoid blocking the other components.

2. Secure the column hanger by tightening the black thumbscrew on the bracket.

Plumbing Connections

**CAUTION**

Damage to the pump heads

- Each individual pump head has a different set of tubing that comes with the pump head for connection to the solvent reservoir and to the rest of the system. They also have individual nuts, bushings and ferrules that are used to connect the pump to the rest of the system. Use those parts to make the connections.

- If you want to run the pump without liquid flow, remove the liquid head, or use demo mode.
Pump Head Low Pressure Tubing and Inlet Filter Assembly

The four types of inlet filter assemblies are shown below.

### 10 mL/min Heads

![Diagram of 10 mL/min Heads](image)

**Figure 7**  Inlet filter assembly installation

**Installation of inlet tubing for 10 to 100 mL/min heads**

1. Remove the solvent inlet assembly from the accessories package and immerse the inlet filter into clean, HPLC-grade water.
2. Assemble the inlet filter onto the end of the inlet tubing.
3 Connect the inlet fitting to the inlet port on the pump head check valve (the lower port). Tighten the inlet tubing finger tight.

**NOTE**
If leakage occurs in use, tighten very slightly with an open-end wrench until the leak stops. Do not over-tighten. The fitting may be damaged.

**Installation of inlet tubing for 200 mL/min heads**

1 Remove the solvent inlet assembly from the accessory package and immerse diagonally cut end of tubing into solvent container. The solvent containers should be located on the floor with the pump on the bench.

2 Connect the inlet fitting to the inlet port on the pump head check valve (the lower port). Tighten the inlet tubing finger tight.

**NOTE**
If leakage occurs in use, tighten very slightly with an open-end wrench until the leak stops. Do not over-tighten. The fitting may be damaged.

**Installing the Piston-washing Tubing**

**NOTE**
Skip this step if you do not have piston washing on your pump heads. The wash tubing is provided as a single piece.

**NOTE**
When pumps are stacked, the tubing from the upper pump rinse outlet can be connected to the rinse inlet of the lower pump, so that pump heads can be rinsed in series. The tubing clamp need only be attached to the outlet rinse tubing on the bottom pump.

1 Cut into two pieces of appropriate length for the wash inlet and outlet.

2 Thread male Luer fittings into the inlet (top) and outlet rinse ports and connect the silicone tubing to the Luer fittings.

3 Attach the tubing clamp to the outlet tubing.
3 Installation
Installing the Solvent Delivery Module

Pump Head High Pressure Tubing

1. Thread one of the ¼-28 male nuts and ferrules onto the outlet tubing. For orientation see (A).
2. With the nut and ferrule in place, insert the tubing into the outlet check valve as far as it will go.
3. Holding the tubing in place, tighten the nut ¼ turn beyond finger-tight with an open-end wrench to swage the ferrule to the tubing.
4. Repeat this process at the other end of the outlet tubing for the next device in line (mixer, pressure monitor, etc.).

NOTE If the connection leaks when the system is pressurized, tighten the nut slightly until the leak stops.
Installation of high pressure tubing for high pressure tubing for PEEK heads

1. Thread one of the polyacetal nuts and ETFE (ethylene-tetrafluoroethylene, Tefzel) 2-piece ferrules onto the outlet tubing. For orientation see (B).

2. With the nut and ferrule in place, insert the tubing into the outlet check valve as far as it will go.

3. Holding the tubing in place, tighten the nut ¼ turn beyond finger-tight with an open-end wrench to swage the ferrule to the tubing.

4. Repeat this process at the other end of the outlet tubing for the next device in line (mixer, pressure monitor, or drain valve).

**NOTE**
If the connection leaks when the system is pressurized, tighten the nut slightly until the leak stops.

Connections for the outlet check valve

**200 mL/min Head**

The 200 mL/min head uses 0.318 cm (1/8 in) tubing and fittings on its outlet. The pressure module used with the 200 mL/min head also uses 0.318 cm (1/8 in) tubing and fittings.

**100 mL/min Head**

The pressure module comes with two 0.318 cm (1/8 in) to 0.159 cm (1/16 in) adapters for use with the 100 mL/min head. The outlet of the 100 mL/min head is 0.159 cm (1/16 in) tubing and fittings.

**NOTE**
Refer to Figure 9 on page 60 for the appropriate outlet connections for your pump. The appropriate compression fitting is in the accessories package. Typically they are ¼-28 male nuts and ferrules.
3 Installation
Installing the Solvent Delivery Module

Table 4 Connections for the outlet check valve

<table>
<thead>
<tr>
<th>Outlet valve</th>
<th>Ferrule/Tubing (SST/SST)</th>
<th>Ferrule/Tubing (Titanium/Titanium)</th>
<th>Ferrule/Tubing (PEEK/PEEK)</th>
</tr>
</thead>
</table>

Analytical (SST)

- Compression fitting
- SST tubing
- SST ferrule

- Compression fitting

Analytical (Titanium)

- Compression fitting
- PEEK tubing
- Ferrule collar
- PEEK ferrule

over 172 bar
up to 172 bar

over 172 bar

1
### Table 4  Connections for the outlet check valve

<table>
<thead>
<tr>
<th>Outlet valve</th>
<th>Ferrule/Tubing (SST/SST)</th>
<th>Ferrule/Tubing (Titanium/Titanium)</th>
<th>Ferrule/Tubing (PEEK/PEEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semi-Prep (SST)</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Semi-Prep (Titanium)</strong></td>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
</tbody>
</table>

1. Unit conversion: 172 bar = 2500 psi = 17.2 MPa
2. Unit conversion: 1/8 in = 0.318 mm
3 Installation
Installing the Solvent Delivery Module

Figure 9  Detail of PEEK ferrule and ferrule collar
Narrowbore and Analytical Stainless Steel Mixers Plumbing Fittings

![Figure 10](image) Compression fittings for 0.6 mL (narrowbore) and 1.2 mL (analytical) stainless steel mixers

**Tools required**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrench, 1/4 in</td>
</tr>
</tbody>
</table>

1. For both the extra-long fitting on the outlet and the two standard fittings for the inlet, slide the fitting and ferrule over the 0.159 cm (1/16 in) OD tubing and push the end of the tubing into the port as far as possible.

2. Holding the tubing in place, finger-tighten the fitting, then tighten 1/4 turn more with a wrench. When tightening the outlet fitting, hold the top of the piston steady with another wrench.
3 Installation
Installing the Solvent Delivery Module

Analytical PEEK and Narrowbore/Analytical Titanium Mixers
Plumbing Fittings

Figure 11 Compression fittings for 1.2 mL (analytical) PEEK, and 0.6 mL (narrowbore) and 1.2 mL (analytical) titanium mixers

Do not use tools to tighten.

1 Slide the 0.159 cm (1/16 in) OD outlet tubing through the one-piece fitting and ferrule and push the end of the tubing into the port as far as possible.
2 Holding the tubing in place, finger-tighten the fitting.
3 For both inlet ports, place a fitting and ferrule on the tubing and tighten in the same manner as the outlet fitting.
Preparative PEEK/Titanium Mixers Plumbing Fittings

![Fitting Ferrule collar Ferrule](image)

**Figure 12** Compression fittings for 10 mL (preparative) PEEK and titanium mixers

<table>
<thead>
<tr>
<th>Tools required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrench, 5/16 in</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

All ports are identical.

1. Slide the fitting and ferrule/ferrule collar over the 0.318 mm (1/8 in) OD tubing as shown and push the end of the tubing into the port as far as possible.

2. Holding the tubing in place, finger-tighten the fitting. When tightening the outlet port fitting, hold the piston steady with another wrench (5/16 in).

**NOTE**

When the system plumbing is complete, check for any leaks. If a leak is found, stop the pumps and tighten the affected fitting just enough to stop the leak.

Connecting Communication Cabling Using Serial Interface

On the rear panel there is a single RS-422 male connector for serial communications.

Communications between slave pumps and controller (a computer or master pump) are established through the serial interface channel. This bi-directional communication protocol uses the EIA RS-422/RS-485 interface specification for data transmission.

Internal software in the pump determines whether the pump is a master controller or a slave pump. One software-controlled connector located on the back panel sends and receives signals from the controller (master pump or external computer). This connector is used on all pumps, both when the pump

---

Purification Solution System User Guide 63
is used as a controller or as a slave: the software informs the controller of the status of each pump. The various configurations are discussed below.

NOTE
Connection with a computer is covered in the interface manual of the specific software system used.

Using OpenLAB as the System Controller
1. Cable your system, see “Cable Connections” on page 129.
2. Go to “Setting the Pump ID and Pump Head Size When Using HPLC Control Software” on page 67 or “Setting the Pump ID and Pump Head Size When Using an Agilent 218 Pump as a Master Controller” on page 68 to set the pump ID and pump head size.

Using a Agilent 218 Pump as a System Controller
1. Enter the ID number of each Agilent 218 Pump using its own keypad.

NOTE
Each pump in the system is connected with the serial interface cable. To distinguish one module from another, each module has a unique ID number. This number must be entered in each Agilent 218 Pump using its own keypad.

NOTE
The ID number of the master pump is set by the user to MC. Slave pump ID numbers can be set as desired. Each system can have only one master pump. Slave pump IDs can also be set from a master pump from the BUS IDs menu.
External Contacts Connectors

The Agilent 218 Pump has a number of analog and digital connections on the rear panel.

These can be used to digitize data from an analog detector, start and stop other devices through contact closures and to receive contact closures to start and stop the pump.

Connections are made to this strip by two connectors included in Standard accessory kit (p/n 393550991). These two connectors are then attached to another device.
3 Installation
Installing the Solvent Delivery Module

Table 5  J3 terminal strip

<table>
<thead>
<tr>
<th>Name</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTGR HI</td>
<td>Positive wire from detector</td>
</tr>
<tr>
<td>INTGR LO</td>
<td>Negative wire from detector</td>
</tr>
<tr>
<td>INTGR GND</td>
<td>Ground wire from detector $^1$</td>
</tr>
<tr>
<td>CHASSIS GND</td>
<td>Ground wire to chassis</td>
</tr>
<tr>
<td>ANALOG OUT</td>
<td>0 – 10 V output signal. Specifies which option to output as an analog signal to a recording device. Programmable options are: $%A$, $%B$, $%C$, $%D$ (solvent composition %), pressure (system pressure), nm (wavelength specified in the I/O window), flow (system flow rate), or off. Full scale voltage is 10 V.</td>
</tr>
<tr>
<td>ANALOG OUT GND</td>
<td>Ground wire for Analog Out $^1$.</td>
</tr>
</tbody>
</table>

$^1$ Do not connect to Chassis Gnd

Table 6  J2 terminal strip

<table>
<thead>
<tr>
<th>Name</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX +5V</td>
<td>5 V positive signal</td>
</tr>
<tr>
<td>AUX GND</td>
<td>Ground for auxiliary voltage $^1$.</td>
</tr>
<tr>
<td>STOP</td>
<td>Contact closure input to stop the pump from an external device.</td>
</tr>
<tr>
<td>D GND</td>
<td>Digital ground for Stop signal $^1$.</td>
</tr>
<tr>
<td>HOLD</td>
<td>Contact closure input from an external device to Hold a running method at the current time and flow/composition conditions.</td>
</tr>
<tr>
<td>D GND</td>
<td>Digital ground for Hold signal $^1$.</td>
</tr>
<tr>
<td>TRANSFER</td>
<td>Contact closure input to Transfer to another method from an external device. Transfer can be immediate, deferred until the end of the current method pass, or automatic at the end of run if no contact closure is received.</td>
</tr>
<tr>
<td>D GND</td>
<td>Digital ground for Transfer signal $^1$.</td>
</tr>
</tbody>
</table>
Setting the Pump ID and Pump Head Size When Using HPLC Control Software

This is done on the pumps whether you are using an HPLC control software or using one of the pumps as a master controller.

**To set the pump ID when all pumps are slaves:**
1. Turn the pump on.
2. Press **SETUP** and then press **ID**.
3. Set the ID for the Agilent 218 Pump either by entering a number between 0 and 63, or pressing the **UP ARROW** or **DOWN ARROW** key to scroll through a preset list of choices. Available choices are: 0 – 63, **MC** (master controller) or **– –** (no ID).

**To set the pump head size when all pumps are slaves:**
1. Turn the pump on.
2. Press **SETUP** and then press **HdSz**.
3. Use the **UP ARROW** or **DOWN ARROW** key to select between a preset list of choices. Choices are: 5, 10, 25, 50, 100, and 200 mL/min, 10P, 25P, 50P, 100P. The **P** designation stands for PEEK. The compressibility compensation for PEEK heads is different than for stainless steel or titanium heads.
3 Installation
Installing the Solvent Delivery Module

Setting the Pump ID and Pump Head Size When Using an Agilent 218 Pump as a Master Controller

Setting the pump ID and pump head size

1  Turn the pump on.
2  Press SETUP.
3  Press PUMP.
4  Select between A, B, C, and D. Selecting a pump opens a window to set Pump ID, Head size, compressibility factors, and refill speed.

NOTE For more information about setting the pump ID and pump head size, see Setup in Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000)
Installing the Detector

Location of the Detector Module

Place the detector conveniently near your HPLC system. The modular design of the detector enables you to locate it anywhere within the limitations imposed by the length of the power cord, fluid lines and signal cables. In order to keep liquid dead volume as low as possible and to minimize peak broadening in the lines, the distance between the column outlet and the flowcell inlet should be kept to a minimum.

For best performance, the detector should be located on a clean, sturdy, vibration free bench in an area free of:

- Heat sources (such as direct sunlight or a heater vent)
- Drafts (such as an open doorway, window, or air conditioner vent)
- Smoke or UV-absorbing vapor
- Corrosive or dusty atmosphere
- Potential liquid spills

Provide approximately 4 inches of space behind the unit so that the cooling fan intake is not impeded, and to allow easy access to the rear panel services (see “Power Connection and Rear Panel Services” on page 70).
Power Connection and Rear Panel Services

**WARNING**

Electrical shock

Risk of stroke and other personal injury.

➔ Turn off the power to the detector before making power and signal cable connections.

The detector can communicate with other modules and devices in the entire HPLC system. All power and signal connections are made on the rear panel of the detector (see Figure 14 on page 70). The connectors on the rear panel support communication configurations to a wide range of Agilent modules and non-Agilent devices.

**Figure 14**  Agilent 325 Detector rear panel services

The following table summarizes the function of each connection:
For more information about the connections see chapter Cables.

**AC Power**

The Agilent 325 UV/VIS Dual Wavelength Detector may be connected to any voltage in the range 100 – 240 VAC ±10 %, 50 /60 Hz ±1 Hz, single phase, without modification or the need to change fuses.

Before connecting power to the detector, ensure that the power switch on the front of the instrument is OFF (the rocker switch $O$ is pressed). The power switch is a rocker switch that connects from the front of the detector directly to the power receptacle on the rear panel. Plug one end of the power cord into the power receptacle on the rear panel and the other end into your AC power source.
3 Installation
Installing the Detector

**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.

All devices in the liquid chromatography system should be connected to the same power source, using a properly grounded (3rd wire to earth) multiple outlet power strip.

**NOTE**

Do not turn on the AC power yet. All required external devices and hydraulics must first be connected.

---

**Avoiding Harmful interferences to Radio or Television Reception**

Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

1. Relocate the radio or antenna.
2. Move the device away from the radio or television.
3. Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
4. Make sure that all peripheral devices are also certified.
5. Make sure that appropriate cables are used to connect the device to peripheral equipment.
6 Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.

7 Changes or modifications not expressly approved by Agilent Technologies could void the user’s authority to operate the equipment.

Removing the Front Panel

1 If installed, remove the door from the Agilent 325 Detector (see “Installing and Removing the Door” on page 80 for more information).

2 Remove the panel on the front right side of the detector by unscrewing the captive screw in the top left corner of the panel.

![Removing the front panel](image-url)

**Figure 15** Removing the front panel
Hydraulic Connections - Flowcells

Hydraulic connections are located at the front of the Agilent 325 Detector.

The only line installed by the user where dead volume and low holdup are critical is the line from the column exit to the flowcell inlet port. This line should be as short as possible.

The Agilent 325 Detector can be fitted with any one of four flowcells (ordered separately). Each one has an inlet and outlet connection and quartz optics cell window. Your chosen flowcell type is packed internally in the detector. The four flowcell types are outlined in Table 8 on page 74.

Table 8  Compatible flowcells

<table>
<thead>
<tr>
<th>Flowcell type</th>
<th>Flowcell p/n</th>
<th>Pathlength1</th>
<th>Column ID</th>
<th>Flow rate</th>
<th>Maximum pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical</td>
<td>210181800</td>
<td>9 mm x 0 mm</td>
<td>2 – 8 mm</td>
<td>0.0001 – 10 mL/min</td>
<td>69 bar (1000 psi)</td>
</tr>
<tr>
<td>Preparative2</td>
<td>210181900</td>
<td>9 mm x 1 mm</td>
<td>4 – 76 mm</td>
<td>1 – 500 mL/min</td>
<td>69 bar (1000 psi)</td>
</tr>
<tr>
<td>Scale Up2</td>
<td>210224200</td>
<td>4 mm x 0.25 mm</td>
<td>4 – 76 mm</td>
<td>10 – 200 mL/min</td>
<td>69 bar (1000 psi)</td>
</tr>
<tr>
<td>Super Prep2</td>
<td>210182000</td>
<td>4 mm x 0.15 mm</td>
<td>8 – 152 mm</td>
<td>30 – 1200 mL/min</td>
<td>69 bar (1000 psi)</td>
</tr>
<tr>
<td>Micro-analytical</td>
<td>210182100</td>
<td>4 mm x 0 mm</td>
<td>1 – 4 mm</td>
<td>0 – 20 mL/min</td>
<td>69 bar (1000 psi)</td>
</tr>
</tbody>
</table>

1 A pathlength of a mm x b mm means that the sample light path has a pathlength of a mm, and the reference light path has a pathlength of b mm. A reference light path of zero means there is no fluid in the cell - air acts as the reference.

2 Extended range cell

It is important for the extended range cells to run at least at the minimum flow rate.
Installing a Flowcell

The Agilent 325 UV/VIS Dual Wavelength Detector is not shipped with a flowcell installed. You will need to install the flowcell that you purchased with the detector. Each flowcell comes with a set of recommended nuts and ferrules that may be fitted to tubing.

1/16" tubing is used on all flowcells. However for the 4 mm x 0.15 mm super prep. flowcell it is recommended to use 1/8" tubing at higher flow rates. In this case you can add the Adaptor 1/8" - 1/16" (p/n 1610126800). This will require the 1/8" tubing and the 1/8" flowcell fittings.

Tubing connections are PEEK™ type, except for the Super Prep flowcell which uses Tefzel® tubing 0.125 mm x 0.062 mm.

<table>
<thead>
<tr>
<th>Parts required</th>
<th>#</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>210181800</td>
<td>Flowcell 9 mm x 0 mm, inert (analytical)</td>
</tr>
<tr>
<td>OR</td>
<td>1</td>
<td>210181900</td>
<td>Flowcell 9 mm x 1 mm, inert (prep.)</td>
</tr>
<tr>
<td>OR</td>
<td>1</td>
<td>210224200</td>
<td>Flowcell 4 mm x 0.25 mm, inert (scale up)</td>
</tr>
<tr>
<td>OR</td>
<td>1</td>
<td>210182100</td>
<td>Flowcell 4 mm x 0 mm, inert (super prep.)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9910128300</td>
<td>Flow cell replacement fittings</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>210182000</td>
<td>Flowcell 4 mm x 0.15 mm, inert (super prep.)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1610126900</td>
<td>Fitting 1/8&quot; tube nut flat bottom</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1610126400</td>
<td>Fitting 1/8&quot; tube ferrule, Pack of 10</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1610126800</td>
<td>Adaptor 1/8&quot; - 1/16&quot;</td>
</tr>
</tbody>
</table>
## 3 Installation
### Installing the Detector

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Fit the nuts and ferrules on the PEEK™ tubes.</td>
</tr>
<tr>
<td><img src="image1.png" alt="Image of ferrule and nut" /></td>
<td><img src="image2.png" alt="Image of PEEK tube" /></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Screw the two tubes into the inlet and outlet connection of the flowcell. Each flowcell has an inlet and outlet connection.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Diagram of flowcell connections" /></td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Remove the front panel (see “Removing the Front Panel” on page 73 for more information).</td>
</tr>
<tr>
<td><img src="image4.png" alt="Diagram of front panel removal" /></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

The position of the inlet and outlet connections varies for different flowcells.
4 Carefully position the flowcell so that the two thumbscrews are positioned in the threaded holes in the flowcell compartment.

   a Push at the center of the flowcell to ensure it is positioned squarely in its housing and that it is not tilted in any way.

   NOTE
   It is critical to the performance of the detector that the flowcell is inserted correctly. The internal optical components of the flowcell are an integral part of the detector’s optical system. If the flowcell is not fitted correctly, it will have an adverse effect on detector performance.

Next Steps:

5 Secure the flowcell by tightening the thumbscrews with your fingers. Alternate tightening the thumbscrews until they are snug.

6 Replace the front panel.

   NOTE
   For optimum performance, the detector should be operated with the front panel in place. This is because the foam on the inside of the panel stops breezes, which may cause instability and noise, from reaching the flowcell.

   NOTE
   The flowcell should be removed with the connecting tubing fitted. These must be removed outside the detector compartment.

7 Perform a lamp calibration (see chapter maintenance in Agilent 325 UV/VIS Dual Wavelength Detector - User Manual (p/n G9309-90000)).
Detector Outlet Back Pressure Restrictor

The Back pressure restrictor (p/n 110743300) should be added to all flow cells, unless a fraction collector is installed after the detector. The back pressure restrictor assembly that was supplied with your detector should be threaded into the outlet line from the flowcell. The back pressure restrictor applies approximately 2.76 bar (40 psi) back pressure on the flowcell. This prevents outgassing and bubbles from forming or being trapped in the flowcell, which can cause an unstable baseline.

Note the arrow stamped on the restrictor body. This arrow must point away from the flowcell outlet port, and toward the waste receiver. The threaded plastic fittings should be finger tightened only enough to prevent leaks.

About 122 cm (48") of 1.6 mm (1/16") tubing is supplied at both the inlet and outlet of the restrictor. The inlet tubing is provided with a 1.6 mm (1/16") plastic tubing fitting for connecting to the flowcell outlet port. Either the outlet tubing can be directed to the waste container, or the tubing removed, and the restrictor itself dropped to the bottom of the waste bottle.

The restrictor pressure setting is not adjustable. If the restrictor fails or becomes plugged, replace the existing cartridge with a new 2.76 bar (40 psi) replacement.
Installing the Door

The module door may be attached to the front of the Agilent 325 Detector to cover the tubing connections to the flowcell.

**NOTE**
If the Agilent 325 Detector is the top module in the stack, the door cap should be installed before installing the door on the module.

### Installing the Door Cap

**If the Agilent 325 Detector is not at the top of the stack, do not install the cap and proceed to the instructions describing door installation.**

1. Stand the door upside down on a flat surface (i.e., with the two ribs towards the bottom).

![Figure 16 Installing the door cap](image)

2. Take the cap and remove the protective paper exposing the adhesive that will attach the cap to the door.

3. Insert the cap into the door and press the adhesive onto the inside of the door lip. Be sure to keep the door edges and cap edges flush.
3 Installation
Installing the Detector

Installing the Door
1 Insert the top hinge pin into the top hinge.
2 Gently press down on the top of the door and slide the lower hinge pin into the lower hinge. The door should now pivot on the pins and close. The magnetic door latch should stick to the instrument.

Figure 17 Installing the Agilent 325 Detector door

Installing and Removing the Door
1 Gently push down on the door and slide the lower hinge pin out of the lower hinge.
2 Lift and slide out the top of the door.
Installing the Autosampler

Location of the Autosampler Module

The best place to install your Agilent 410 Autosampler is at the top of the module stack. This stack would normally be; solvent delivery module on the bench, detector on top of the SDM, and finally the AutoSampler. From the right-hand side you have the shortest connection to the injection valve of the Agilent 410 Autosampler to the column.
3 Installation
Installing the Autosampler

Overview of the Module

Figure 18  Autosampler overview
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vial wash drain</td>
</tr>
<tr>
<td>2</td>
<td>Condensed water and leakage drain</td>
</tr>
<tr>
<td>3</td>
<td>Tray fixation knob</td>
</tr>
<tr>
<td>4</td>
<td>Sample tray</td>
</tr>
<tr>
<td>5</td>
<td>Syringe dispenser</td>
</tr>
<tr>
<td>6</td>
<td>Keyboard</td>
</tr>
<tr>
<td>7</td>
<td>Buffer tubing</td>
</tr>
<tr>
<td>8</td>
<td>Needle arm</td>
</tr>
<tr>
<td>9</td>
<td>Injection valve</td>
</tr>
<tr>
<td>10</td>
<td>Oven compartment</td>
</tr>
<tr>
<td>11</td>
<td>Tubing guide</td>
</tr>
<tr>
<td>12</td>
<td>Wash position</td>
</tr>
<tr>
<td>13</td>
<td>Position for transport solvent and reagent vials</td>
</tr>
</tbody>
</table>

The rear view of the autosampler is shown in Figure 19 on page 84.
3 Installation
Installing the Autosampler

Figure 19  Rear View of the autosampler
Installing the Sample Tray

1. Place the sample tray in the autosampler and rotate it until the tray drops into the slot, only one position is possible.

2. Turn the tray fixation knob clock-wise to fixate the tray (see “Overview of the Module” on page 82 for an overview).

Connecting the Waste Tubings

The following Waste Tubings must be connected to the autosampler:

- General waste tubing
- Syring waste tubing
- Water and leakage drain

Connecting the General Waste Tubing

1. Connect the drain tubing to the right-hand drain hose connector of the autosampler and put it in a bottle which is placed on the floor.

   All the liquid dispensed while the autosampler is in the wash position is removed through this drain.
3 Installation
Installing the Autosampler

**Connecting the Syringe Waste Tubing**

1. Place the syringe waste tubing into a small bottle next to the autosampler. If no injection volumes are programmed that are larger than the buffer tubing can contain, the syringe waste will only be wash solvent.

**Connecting the Water and Leakage Drain**

All solvents that result from a leak in the system and condensed water are drained through the left hand hose connector.

**CAUTION**
Risk of damaging the autosampler
Drain and waste tubing are twisted thereby obstructing the flow path.

➔ Be sure that the drain and waste tubing are not twisted.

1. Connect the hose connector to a waste container on the floor.
Starting the Autosampler

<table>
<thead>
<tr>
<th>Tools required</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled water</td>
<td>Distilled water</td>
<td></td>
</tr>
<tr>
<td>Isopropanol</td>
<td>Isopropanol</td>
<td></td>
</tr>
<tr>
<td>Helium</td>
<td>Helium</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>Ultrasonic bath</td>
<td></td>
</tr>
</tbody>
</table>

Preparations

- Allow the Agilent 410 Autosampler to reach ambient temperature for at least one hour.
- Connect the waste tubings (see “Connecting the Waste Tubings” on page 85 for more information).

**WARNING**

Electrical shock

Risk of stroke and other personal injury due to reduced safety protection or unwanted fusing.

⇒ Ensure that the code on the fuse cap matches the information next to the fuse holders.

**WARNING**

Risk of fire and damaging the module

⇒ For 115 VAC ±15 %, use two 5 A T-fuses (slow-blow).
⇒ For 230 VAC ±15 %, use two 2.5 A T-fuses (slow-blow).
⇒ All fuses must be UL listed and CSA certified, or IEC 127 type.

**NOTE**

Keep the keyboard front cover closed during operation.

1. Remove the safety screw on the right-hand side of the front cover.
2. Check fuses and voltage settings on the rear of the instrument.
3. Connect the power cable.
4. Turn the power switch to ON.
   The Ready screen appears displaying the firmware revision number.
3 Installation
Installing the Autosampler

Rinsing the System with Wash Solvent

<table>
<thead>
<tr>
<th>Tools required</th>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled water</td>
<td></td>
<td>Distilled water</td>
</tr>
<tr>
<td>Isopropanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helium</td>
<td></td>
<td>Helium</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td>Ultrasonic bath</td>
</tr>
</tbody>
</table>

**CAUTION**

Damage to the system

- Crystals from salts or buffer solutions may block or damage the system.

➔ Never use salts or buffer solutions as wash solvents.
➔ Only use water/organic solvents.

1. Place a clean bottle for the wash solvent at the left-hand side of the autosampler.
2. Use a mixture of distilled water and isopropanol (80 / 20 v/v %) or the mobile phase as wash solvent.
3. Degas the wash solvent with Helium or an ultrasonic bath.
4. Put the wash solvent tubing in the filled wash solvent bottle.
5. Press **MAINTENANCE** to go the autosampler maintenance functions.
6. Fill the tubing using the autosampler soft-function keys **SYR END** and **SYR HOME**.
7. With **SYR END** a syringe volume of wash solvent is aspirated from the wash solvent bottle and the wash solvent tubing is filled. With **SYR HOME** the syringe contents will be dispensed to the syringe waste.
8. Repeat this action until the wash solvent tubing and the syringe are completely filled and no air bubbles appear in the syringe.
9. Press **Escape** to leave the maintenance screen.
10. After the wash solvent tubing and the syringe are filled, press **WASH** to perform a standard wash routine. Repeat the wash routine 2 or 3 times. All tubing connected to the syringe valve will be rinsed with wash solvent.

**NOTE**

The autosampler will give the best results if all air is removed from the syringe.
Connecting the HPLC to the Autosampler

To ensure reproducible injections the following connections to your HPLC system should be made:

1. Connect the HPLC pump to port 1 of the injection valve.
2. Connect the HPLC column to port 6 of the injection valve.
3. Check for leakage and let the system equilibrate for at least 5 min.

**NOTE**
The instrument is flushed with Isopropanol. Make sure that the mobile phase of your HPLC system is miscible with Isopropanol. If your mobile phase is not miscible with Isopropanol, then start with an intermediate solvent that is a transition to the mobile phase. To avoid possible contamination of the column, it is good practice to not have the column installed during this operation.

**NOTE**
It is essential that the contents of the sample loop are injected as a back flush onto the column, therefore do not exchange column and pump connections at the injection valve.

Filling and Sealing the Vials

1. Fill the standard vials, as well as the conical vials by means of a narrow–end pipette to allow air to escape when filling the vial.

**NOTE**
Do not fill vials completely to the top. In that case sample will be forced into the air needle, risking cross-contamination of samples and fouling of the needle pair.

2. Check that the seal is airtight due to maintain a pressure on the vial for air bubble prevention and to prevent evaporation of volatile samples.
3. Check seal after crimping, if the cap can be turned easily, the seal is not airtight (re-adjust hand crimper).

**NOTE**
When using uncapped vials, the performance of the AutoSampler may not meet the specifications (precision). Do not re-use a sample vial without replacing its cap or septum.
3 Installation
Installing the Autosampler

**Loading the Sample Tray**

1. Place the vial in the tray and link them to methods in the Series. For details, see Agilent 410 Autosampler - User Manual (p/n G9331-90000), Chapter *Using*, section *Programming the Run Sequence or Series*.

2. If the autosampler is not running, manually rotate the tray to gain access to all vial positions.
Installing the Agilent 410 Autosampler Prep Option

1 Replace the standard injection valve with the special Agilent 410 Prep valve.

2 Replace standard sample needle, air needle and buffer tubing with the ones supplied in Prep Upgrade Option, Includes Needle, Syringe, Injection Valve and Large Volume Sample Tray (p/n 393590791).

3 Re-connect all tubing to the injection valve.

4 Replace standard Syringe with the 2500 µL syringe.

5 Install the 24 vials (LSV) tray.

6 Choose Prep Mode in system.
Installing the Fraction Collector

Overview of the Module

Figure 20  Fraction collector components

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Theta axis</td>
</tr>
<tr>
<td>2</td>
<td>Z axis slide</td>
</tr>
<tr>
<td>3</td>
<td>Top knurled mount nut on the probe assembly</td>
</tr>
<tr>
<td>4</td>
<td>Probe mounting block</td>
</tr>
<tr>
<td>5</td>
<td>Lower knurled mount nut on the probe assembly</td>
</tr>
</tbody>
</table>
Installation Overview

Basic installation involves:
- Assembling the fraction collector
- Connecting the fraction collector to the HPLC system
- Installing Agilent OpenLAB CDS ChemStation PrepLC Drivers
- Determining the delay volume and probe depth

All external DIP switches should always be in the OFF position.

Assembling the Fraction Collector

Carefully follow the instructions provided below to assemble your instrument.
Assembling the Agilent 440 Fraction Collector includes installing the:

1. Spill tray
2. Rack location mat
3. Probe and tubing
4. Sample racks

Position the fraction collector on the side of the HPLC system closest to the detector output to help decrease the delay volume.
3 Installation
Installing the Fraction Collector

Installing the Spill Tray

Figure 21   Spill tray alignment pin and mat for the rack location raised locating tabs

Preparations
Position the fraction collector closest to the detector output. This decreases the delay volume.

NOTE
The spill tray will catch most solvent spills. Always clean up spills immediately.

1 Locate the alignment pins protruding above the base support tube.
2 Lower the tray so that the two alignment pins closest to the fraction collector pillar fit into the slots in the spill tray.
3 Lower the spill tray until the front edge rests on the front of the base support tube.
4 Check that the spill tray is firmly pushed down on all alignment pins.

NOTE
The spill tray must be firmly in position so that it does not move.
Installing the Rack Location Mat

The rack location mat is installed on top of the spill tray.

## Preparations

- Spill tray installed

### NOTE

There are cut-outs around the rack location mat. The cut-outs slot over the raised locating tabs that are molded into the spill tray to ensure proper alignment (see Figure 22 on page 99).

1. Position the rack location mat over the spill tray and press the mat onto the locating tabs.
2. Check that the rack location mat fits firmly in place by trying to move it side to side. There should not be any movement. If the rack location mat is loose, refit it.

Installing the Probe and Tubing

The sample probe comes preassembled with 0.050 cm (0.020 in) ID tubing. There are three additional coils of tubing included in the probe kit.

- The longer piece of tubing with a nut and ferrule is used for the drain tube on the divert valve.
- The shorter tubing with a nut and ferrule is used to connect fraction collector divert valve to the sample output from the HPLC system.
- The third piece of tubing is 0.025 cm (0.010 in) ID tubing and can be used for low delay volumes for applications with flow rates of 2 mL/min or less.

For details on installing the tubing, refer to Agilent 440 Fraction Collector – User Manual (p/n G9340-90000).

1. Turn off the fraction collector.
2. Slide the Z-axis slide to the top of the probe carriage.
3. Manually rotate the probe arm so that it can be easily accessed.
3 Installation
Installing the Fraction Collector

4 Disassemble the probe kit by unscrewing the nut holding the metal probe from the bottom of the lower knurled mount nut and then the lower knurled mount nut from the top knurled mount nut.

5 Insert the probe into the probe mounting block (see Figure 20 on page 92).
6 Push the tubing down into the probe so that at least 0.5 cm tubing protrudes from the end of the probe.
7 Secure the lower knurled mount nut to the top knurled mount nut.
8 Secure the nut holding the metal probe into the bottom of the lower knurled mount nut.
9 Clip the tubing into the tube restraint which is the small hook at the top of the Z-axis slider. Allow for a small length in the tubing to prevent kinking the tubing.
10 Run the tubing along the back side of the probe arm housing.
11 Attach the split ring (also called the retaining ring) as shown below. The retaining ring is split to attach it through the loop on the underside of the probe arm housing.

12 Feed the tubing through the retaining loop attached to the underside of the housing.

13 Screw the tubing fitting into the bottom (port 3) of the valve.

It is important to ensure that the length of the tubing from the probe to the valve allows the probe arm to move freely in all axes. If it is too tight, it will restrict movement and may cause movement failure. If it is too loose, the probe arm may become tangled in the tubing as it moves. Tubing length between the valve and the detector depends on fraction collector placement. When choosing the length of tubing ensure it is long enough to allow free movement of the arm but not too long to delay sample delivery into the tubes. If the tubing is too long between the detector output and the fraction collector probe end, your samples may not correspond correctly to the fraction collector markers on your chromatogram. The delay volume calculation will compensate for this effect.

14 Move the probe arm to the front-right side of the fraction collector and rotate the probe arm fully to the right to check that the tubing is completely free to move.

15 Manually position the probe arm in the middle along the X axis.

16 Rotate the probe arm through its full extent to check that the tubing is free to allow full movement in all directions.
3 Installation
Installing the Fraction Collector

**NOTE**
If the length is not correct, remove and then replace the tubing, install the fittings and tubing onto the fraction collector. Repeat step 14 on page 97 - step 16 on page 97 to test the tubing length.

17 Adjust the length of the sample line from the HPLC system. In port 2 (see Figure on page 97) screw in the fitting with Tefzel tubing. Connect the other end of this tubing to the HPLC system's detector outlet or to the back pressure restrictor if one is present.

**NOTE**
This tubing should be as short as possible.

18 In port 1 (see Figure on page 97) screw in the fitting with Teflon tubing. Put the other end of the tubing into your waste container.

### Assembling the Sample Racks

**CAUTION**
**Loss of sample**
If a tube sits at an angle in the rack, the probe may hit the side of the tube as it enters or leaves the tube. This can affect the alignment of the probe and/or damage the tube.

⇒ Ensure that the tubes sit vertically within the sample rack.

1 Follow the manufacturer’s instructions to assemble the sample racks.
2 If needed: Insert the overlay by placing the overlay over the top of the rack.
Installing the Sample Racks

1. **Standard racks:**
   - Fit the pegs on the rack into the holes on the rack location mat. The rack closest to the pillar of the fraction collector is considered rack number one.

   OR

2. **Autosampler rack (Type 128 or Type 200):**
   - Slide the extended portion on the bottom of the rack into the long slit on the rack location mat.

![Figure 22 Rack location mat]

<table>
<thead>
<tr>
<th></th>
<th>Cut-outs on the rack location mat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Holes for regular tube racks</td>
</tr>
<tr>
<td>3</td>
<td>Holes for the autosampler rack</td>
</tr>
</tbody>
</table>
3  Installation
Installing the Fraction Collector

Rack Orientation

1  Place the rack in the correct orientation to get your samples in the desired order.

The following image shows an example of where the first sample is delivered to and the orientation of the regular racks provided with the fraction collector.

![Image of fraction collector rack orientations]

Figure 23  Tube positions on the fraction collector
Connecting the Power to the Fraction Collector

The connection panel of the Agilent 440 Fraction Collector (G9340A) is located on the pillar (also called a control column). The panel contains an I/O port, indicators, DIP switches, the power socket and switch, and a RS 232 port for communication between the Agilent 440 Fraction Collector (G9340A) and the system (or computer) that is running instrument control software.

![Connection panel diagram]

Three power cables are supplied with the module. Select the correct one for your location.

**WARNING**

**Electrical shock**

Electrical power for the module must be provided through a three wire outlet with ground connection. The outlet must be rated for at least 75 VA.

⇒ Ensure that power receptacles are earth-grounded at the grounding pin.
3 Installation

Installing the Fraction Collector

1 Ensure that the power switch is turned off (0).

2 Plug one end of the power cable into the module (both the switch and the power socket are located on the connection panel on the pillar) and the other into the mains power outlet.

3 Turn on the module.

The module will go through initialization tests and set the probe position. If the initialization process is not successful, refer to chapter Troubleshooting and Diagnostics in Agilent 440 Fraction Collector – User Manual (p/n G9340-90000).

If the fraction collector does not start up, check each fuse as described in chapter maintenance in Agilent 440 Fraction Collector – User Manual (p/n G9340-90000).

During the initialization sequence:

1 The probe rises to the full extreme of the Z axis.

2 The probe travels to the full extremes of the X axis and rotates to the full extremes of the Theta axis.

3 Then the probe is positioned at the front-left of the fraction collector.

**Instrument Communication Port**

The instrument communication port, see Figure 24 on page 101, is used to connect the Agilent 440 Fraction Collector (G9340A) to the computer or MIB controlling the instrument.

**Auxiliary Communication Port**

The auxiliary communications port provided on the Agilent 440 Fraction Collector (G9340A) is not used with current Agilent software or hardware.

**NOTE**

Ensure that the probe arm’s movement is not interfered with during operation/initialization.

**NOTE**

In some countries, it may be necessary to fit a suitable three pin power plug to the cord. A three pin earthed power outlet must be used.

Ensure the module is always connected to the mains supply protective earth.
Connecting the Fraction Collector to the HPLC System

For details on setting up the fraction collector to the HPLC System, see “Setup the System with OpenLAB CDS ChemStation Edition - Control Panel” on page 110.

Determining the Volume Delay

1  For information refer to the help of the control software.

Determining the Correct Probe Depth

1  For information refer to the help of the control software.
3 Installation
Setup Hardware

Setup Hardware

Setup the Hardware

This is done on the modules regardless of whether you are using HPLC control software or using one of the pumps as a master controller including following modules:

- Different pumps,
- 325 UV/VIS Dual WL Detector,
- 440 Fraction Collector, and
- 410 Autosampler.
Setup the Pump

The correct setup of the pump depends on the pump head installed. Choices are: 5, 10, 25, 50, 100 and 200 mL/min, 10P, 25P, 50P, 100P.

The P designation stands for PEEK. The compressibility compensation for PEEK heads is different than for stainless steel or titanium heads.

**Setup Pump ID for Pump 1**

1. Turn the module on.
2. Press on the Pump keyboard:
   - **Setup** and then
   - **Enter**
3. With the left arrow key select:
   - **ID of the Pump**: 1
   - **HDSZ (Pump head): xx** (depends on what pump head is installed - for choices see Note above)
   - **Refill: 125 (piston)**
   - **CIM: 5**
4. Press **Enter**.
5. Reboot the module.
3 Installation
Setup Hardware

Setup Pump ID for Pump 2 (if Exist)

1. Turn on the Pump 2.
2. Press on the Pump keyboard:
   - Setup and then
   - Enter

3. With the left arrow key select:
   - ID of the Pump: 2 (available choices are: 0 – 63, MC (master controller)
     or – – (no ID).

   **NOTE**
   For OpenLAB, an ID between 1 – 63 must be used.

   - HDSZ (Pump head): xx (depends on what pump head is installed - for
     choices see Note above)
   - Refill: 125 (piston)
   - CIM: ----

4. Press Enter.
5. Reboot the module.
Setup the Autosampler

**Preparation for general and tray settings:**
1. Press **Serial** on the autosampler keyboard.

**To set up the general system settings:**
1. Turn the module on.
2. Press **SYSTEM**.
3. Press **GENERAL**
4. Confirm or change each of the settings that appear on the display:
   - Volume of installed loop (0 – 5000 µL)
   - Volume of tubing "needle→valve" 0 – 999 µL
   - Syringe volume (250 /1000 )
   - Syringe speed (**LOW**/**NORMAL**/**HIGH**)
   - Skip missing vials (**YES**/**NO**)
   - Air segment (**YES**/**NO**)
   - Headspace pressure (**YES**/**NO**)

**To set up the tray settings:**
1. Turn the module on.
2. Press **SYSTEM**.
3. Press **Tray**
4. Confirm each of the tray settings that appear on the display:
   - Tray type (84 +3 /9 /24 )
   - Vial type (STANDARD/2.5 mL)
5. Reboot the module.

Setup the Detector

The detector is set up at the factory with a BOOTP (or DHCP) IP address. If need be, this can be changed by a trained service engineer who will own a copy of the diagnostics software.
Setup the Fraction Collector

The Fraction Collector is ready to be set up in OpenLab and does not need to have the hardware set up.
Install Agilent OpenLAB CDS ChemStation PrepLC Drivers

**Parts required**

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8301AA</td>
<td>LC Core SW</td>
</tr>
<tr>
<td>M8500AA</td>
<td>M8500AA LC driver</td>
</tr>
<tr>
<td>G9287-60001</td>
<td>PrepLC Drivers</td>
</tr>
</tbody>
</table>

**Hardware required**

Computer with *OpenLAB CDS ChemStation Edition* installed. For details refer to the *OpenLAB WorkStation Installation Guide*.

1. Copy `AgilentDriversPrepLCChemstationSet_up.msi` from CD G9287-60001 to your computer.

2. Doubleclick on `AgilentDriversPrepLCChemstationSet_up.msi` and follow the steps in the setup wizard.
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

Preparations

- Latest driver package installed
- Modules are wired as described in “Cable Connections” on page 129
- All modules are setup as described in “Setup the Hardware” on page 104
- All modules are switched on

OpenLAB configuration

1. Open the Agilent OpenLAB Control Panel and select Create > Create Instrument

2. Define the Name (Example PrepLC)
3 Select: **Agilent LC System** from **Instrument type** drop down menu.

4 Select **Configure Instrument**
3 Installation
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

5 Select No to avoid the auto-configuration (It doesn't work with this version).

6 The left panel of the Configurable Modules contains the Agilent Prep LC.

7 Select the module you have available in your system.

8 Click → to add the modules to the Selected Modules.

The configuration dialog for the selected module opens.
**Pump Configuration**

1. Doubleclick in **Configurable Modules** on Pump.
   
   **Pump Configuration** dialog opens.

2. Select the COM Port as COM 1 and the desired Pressure unit bar (available kPa, PSI, bar, MPa).

3. Verify the connection by clicking on **Activate communication**.
   
   Information **Communication established with COM1** is visible on the screen.

4. Click **OK**.
   
   Configuration dialog closes.
3 Installation
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

Autosampler configuration

1 Doubleclick in Configurable Modules on Autosampler. 
   Autosampler Configuration dialog opens.

2 Select the COM Port as COM 1.

3 Select the Tray84 standard vials as an example.

4 Double check your actual configured Tray.

5 Check the other variables present in the Autosampler Configuration screen.

6 Verify the connection by clicking on Activate communication.
   Information Communication established with COM1 is visible on the screen.

7 Click OK.
   Configuration dialog closes.
Detector Configuration

1. Doubleclick in Configurable Modules on Detector.
   Detector Configuration dialog opens.

2. Select the Browse function to start discovery your Detector
   The IP address will be populated by the searching results.
   Example:
   IP address 192.168.0.97

3. Verify the connection by clicking on Activate communication.
   Information Communication established with COM1 is visible on the screen.

4. Click OK.
   Configuration dialog closes.
**Installation**

Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

**Fraction Collector Configuration**

1. Doubleclick in **Configurable Modules** on Fraction Detector. **Fraction Collector Configuration** dialog opens.

2. Select the **COM Port** as **COM 2**

![Fraction Collector Configuration dialog open]

3. Fill in the **Flow settings** and the **Rack and tube settings**.

4. Verify the connection by clicking on **Activate communication**.

5. Verify the connection by clicking on **Activate communication**.
   
   Information **Communication established with COM2** is visible on the screen.
Terminating configuration

1  Before closing the **Configure Instrument** windows deselect the **3D spectral evaluation** check box.

2  Click **OK**.

You're back in Agilent OpenLab Control Panel.
3 Installation
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

Setup Method

1. Select **Launch** to start the OpenLab CDS Chemstation Edition.
2 Set **Pumps** parameters.

3 Click **OK** to confirm method.
3 Installation
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

4 Set **Autosampler** parameters.

5 Click **OK** to confirm method.
6 Set **Autosampler Injector Program**.

7 Click **OK** to confirm method.
3 Installation
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel

8 Set **PS-325** parameters.

[Diagram showing setup parameters]

**NOTE**
The Run time must be defined to the detector parameters.

9 Click **OK** to confirm method.
10 Set **Fraction collector**.

![Fraction collector setup](image)

11 Click **OK** to confirm method.

Setup is completed.
3 Installation
Setup the System with OpenLAB CDS ChemStation Edition - Control Panel
This chapter provides information on how to access further details on the system components.
Using, Troubleshooting, Maintenance and Parts

For details on using, troubleshooting, maintenance and necessary parts for the individual modules, please refer to the according manuals:

- Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000)
- Agilent 325 UV/VIS Dual Wavelength Detector - User Manual (p/n G9309-90000)
- Agilent 410 Autosampler - User Manual (p/n G9331-90000)
- Agilent 440 Fraction Collector – User Manual (p/n G9340-90000)
This chapter provides information on cables used with the instrument.

### 5 Cables

- Cable Overview 128
- Cable Connections 129
- Analog Output 130
- Relay Output 131
- Desktop PC Communications 134
- Synchronization Signals 135
## Cable Overview

### Necessary cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>392612901</td>
<td>Ethernet cable (for use in a network)</td>
</tr>
<tr>
<td>5023-0203</td>
<td>Ethernet cable (cross-over, for standalone use)</td>
</tr>
<tr>
<td>392607969</td>
<td>Inject marker cable</td>
</tr>
<tr>
<td>392607975</td>
<td>Next injection cable</td>
</tr>
<tr>
<td>393546291</td>
<td>Serial communication ribbon</td>
</tr>
<tr>
<td>393597601</td>
<td>Converter RS232 to RS422</td>
</tr>
<tr>
<td>7910046300</td>
<td>Serial cable</td>
</tr>
</tbody>
</table>

### Optional cables

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>110743800</td>
<td>Relay interface cable (for relay interface board, one relay contact per cable)</td>
</tr>
<tr>
<td>110744200</td>
<td>Analog signal cable</td>
</tr>
</tbody>
</table>
Cable Connections

Figure 25  Cable connections for workstation control of Agilent 218 Pumps, Agilent 325 Detector, Agilent 410 Autosampler and Agilent 440 Fraction Collector
Analog Output

For analog output signals, install the optional Analog signal cable (p/n 110744200) into the J14 receptacle. Pin designations are shown below.

![Diagram of J14 with pin designations](image)

**Figure 26** Pin designation for J14

The open ends of the analog output cable have labels with the signal names (Channel A +, Channel A -, and Channel B +, Channel B -).
Relay Output

For time programming external events, a contact closure Relay output is available. To configure the Relay output, install the optional Assy PWB relay interface 325 (p/n 210187590) into the J4 receptacle. Pin designations are shown below.

![Figure 27: Pin designation for J4](image)

There are four general purpose output relays and one dedicated Peak relay. Each output uses a DIP relay that is capable of handling 500 mA of contact current. At reset or power up, the output relay contacts are set to the default parameters (open). After loading a method they will be set as defined in the method’s `time=0` parameters.
The Peak relay is software programmable for duration, delay and active sense. At power up, the relay contact will be set to the inactive state (as defined by the value of the active sense parameter stored in the detector). Upon being triggered, relay activation will occur for the time interval equal to the Peak Sense duration parameter as stored in the method.

The Peak relay can be activated from any of the following sources (only one source can be active at any one time):

- Time Slice event – Once time slice has been turned on, it will provide a periodic activation of the Peak Sense relay at an interval defined in Time Slice period within the method. Time Slice can be turned on and off by time.
- Pulse event – A single timed programmed activation of the Peak Sense relay as defined in the method.
- Peak sense has been turned on.

To connect open-ended wires to the relay signals available at J4, use the optional Assy PWB relay interface 325 (p/n 210187590) (see Figure 28 on page 132). Simply plug this PWB into the rear panel connector.

![Relay output board](image)

**Figure 28** Relay output board
The Relay interface cable (for relay interface board, one relay contact per cable) (p/n 110743800) is used to attach to the 3 pin connectors at the relay output board.

With the 3 pin connectors, the contact closure is between pins 1 and 2 of the plugs. Pin 3 is connected to ground. The relay interface cable has three open-ended wires. The relay contact is connected between the clear and the black wire. The green wire is connected to ground.
Communication between the detector and a desktop PC occurs by an Ethernet connection. Communication by an Ethernet connection is required to control the detector remotely by OpenLAB. When the Workstation provides HPLC system control, the synchronization cables from P9 and J10 are not used.

To create an Ethernet connection, insert an RJ45 cable included in the ship kit into the J1 receptacle and into the PC. The Ethernet cable that comes with the detector is a cross-over cable, which is appropriate for connecting the detector directly to a PC. Connecting the detector to a network or a hub will usually require a patch cable. A Ethernet cable (for use in a network) (p/n 392612901) can be purchased from Agilent or either locally.

Most PCs come pre-configured with an Ethernet connection, which is usually built into the motherboard, or with an Ethernet network card installed. However, if you have a PC that has no network interface, you will need to install and configure a Network Interface Card (PCI bus). The PC must have a spare PCI slot for the installation of this device. You are also responsible for setting up and maintaining any LAN configuration where a detector may be used. All network issues are to be dealt with by the user.
Synchronization Signals

The synchronization signals at P9 and J10 are used to synchronize the operation of a group of instruments that are not interfaced to OpenLAB. The synchronization signals come in four pairs and define how the detector will operate in a HPLC system. These signals are important for controlling timing and synchronization of the detector with the other devices in the system. Synchronization signals are closely tied to the detector states and transitions. P9 and J10 pin designations are shown in Figure 29 on page 135.

![Figure 29 Pin designations for J10 and P9](image)

P9 provides connections when the Agilent 325 UV/VIS Dual Wavelength Detector acts as a “slave” and receives control from another module. J10 provides connections when the detector acts as a “master” and sends control to another device.

An input is activated or said to be present when its two signal wires are connected together. This can be done with a relay contact closure. If the inputs are driven from another instrument with optical isolators or other polarized devices, then attention must be paid to the polarity of the signal wire.
connections. The positive (+) output signal must be connected to the positive (+) input signal and the negative (-) output to the negative (-) input.

The color coding and physical design of the cable connectors ensure that correct signals and polarity are matched.

The outputs are optical isolators and simulate a relay contact closure when they are activated (see Figure 30 on page 136). The minimum requirement for an input signal to be detected is 200 ms.

**Figure 30** Input/output schematics
An optional Assy PWB sync. interface 325 (p/n 210186590) is available to interface between the Agilent 325 UV/VIS Dual Wavelength Detector synchronization signals and other devices. This board is inserted into the P9 and J10 connectors and connects to a terminal strip on the adapter board. This terminal strip accepts bare wire leads from cables connecting other devices. These cables may originate from the other device, or a dedicated cable can be used, if available for the particular application.

### Table 9 Signal Description J10 and P9

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Out</td>
<td>A non-polarized constantly active output (a short). This output can be used to activate Enable In on the next instrument.</td>
</tr>
<tr>
<td>Ready In</td>
<td>When Enable Ready In is set (software switch), this polarized input signal must be present before the Agilent 325 Detector can go to the Ready state. Specifically, when the Agilent 325 Detector is in the NOT Ready Lamp On state, on receiving a Ready In signal, a monitor period will occur after which the Agilent 325 Detector goes to the Ready state. It must stay active until the Agilent 325 Detector starts. Ready In will be ignored in all other states.</td>
</tr>
<tr>
<td>Ready Out</td>
<td>This polarized output signal indicates that the Agilent 325 Detector is in the Ready state and is ready to start a time program.</td>
</tr>
<tr>
<td>Start In</td>
<td>This polarized edge triggered input signal will start the active method if the Agilent 325 Detector is in the Ready state.</td>
</tr>
<tr>
<td>Start Out</td>
<td>This polarized output signal will be activated for 600 ms when the Agilent 325 Detector starts a time program.</td>
</tr>
<tr>
<td>Fault In</td>
<td>This polarized edge triggered input signal informs the Agilent 325 Detector that a fault condition exists in another instrument in the system. The Agilent 325 Detector halts the time program and sends a Fault Out signal. The lamp can be programmed to either remain on or turn off upon receiving a fault signal.</td>
</tr>
</tbody>
</table>
| Fault Out   | This polarized output signal will activate for 600 ms when either of the following conditions occurs:
  - The Agilent 325 Detector discovers an internal fault condition that warrants aborting the run.
  - The Agilent 325 Detector receives a Fault In signal and it has no internal fault condition itself. |
| Auto-zero   | This edge-triggered contact closure causes an auto-zero adjustment. |
| Lamp off    | This edge-triggered contact closure switches the lamp off. It is possible to turn the lamp back on manually if the contact is still closed. |
Figure 31  The I/O adapter board
6 Appendix

General Safety Information 140
Solvent Miscibility 146
Solvent Compressibility 147
The Waste Electrical and Electronic Equipment Directive 148
Batteries Information 149
Radio Interference 150
CE Compliance 151
Electromagnetic Compatibility 152
Agilent Technologies on Internet 154

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

The following is a list of symbols that appear with warnings in this manual or on the liquid chromatograph. The hazard they describe is also shown.

A triangular symbol indicates a warning. The meanings of the symbols that may appear alongside warnings in the documentation or on the instrument itself are as follows:

Table 10  Warning symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲</td>
<td>Broken glass</td>
</tr>
<tr>
<td>▲</td>
<td>Chemical hazard</td>
</tr>
<tr>
<td>▲</td>
<td>Electrical shock</td>
</tr>
<tr>
<td>▲</td>
<td>Explosion hazard</td>
</tr>
<tr>
<td>▲</td>
<td>Eye hazard</td>
</tr>
<tr>
<td>▲</td>
<td>Fire hazard</td>
</tr>
<tr>
<td>▲</td>
<td>Heavy weight (danger to feet)</td>
</tr>
<tr>
<td>▲</td>
<td>Heavy weight (danger to hands)</td>
</tr>
<tr>
<td>▲</td>
<td>Hot surface</td>
</tr>
<tr>
<td>▲</td>
<td>Moving parts</td>
</tr>
<tr>
<td>▲</td>
<td>Respiratory hazard</td>
</tr>
<tr>
<td>▲</td>
<td>Attention(^1)</td>
</tr>
</tbody>
</table>

\(^1\) The symbol may be used on warning labels attached to the instrument. When you see this symbol, refer to the relevant operation or service manual for the correct procedure referred to by that warning label.
### General Safety Information

#### Table 11  Information symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol 1" /></td>
<td>Mains power on</td>
</tr>
<tr>
<td><img src="image2" alt="Symbol 0" /></td>
<td>Mains power off</td>
</tr>
<tr>
<td><img src="image3" alt="Symbol 3" /></td>
<td>Fuse</td>
</tr>
<tr>
<td><img src="image4" alt="Symbol 4" /></td>
<td>Single phase alternating current</td>
</tr>
<tr>
<td><img src="image5" alt="Symbol 5" /></td>
<td>Direct current</td>
</tr>
<tr>
<td><img src="image6" alt="Symbol 6" /></td>
<td>When attached to the rear of the instrument, indicates that the product complies with the requirements of one or more EU directives.</td>
</tr>
</tbody>
</table>
Solvent Hazards

WARNING

Explosion, fire, asphyxiation

This instrument is not explosion-proof.

Certain solvents may cause weakening and leaks of tubings or fittings with possible bursting.

Even small leaks in solvent supply systems can be dangerous.

➔ Only use solvents compatible with the HPLC system tubings and fittings.

➔ Employ static measuring and static discharge devices to safeguard against the buildup of static electricity.

➔ In unattended operation, do not use organic solvents having an ignition point below 70 °C.

➔ Do not bring a heat or flame source near the instrument.

➔ The area in which solvents are stored and the area surrounding the instrument must be adequately ventilated to prevent accumulations of gas.

➔ Always check the condition of the instrument (leakage of solvent or waste solution, leakage of solvent inside the instrument). If an abnormality is found, stop operation immediately.

➔ When using flammable chemicals, be careful about possible ignition due to static electricity. To prevent the build-up of static electricity, use a conductive container for waste.

➔ Use only approved regulator and hose connectors (refer to the supplier’s instructions).

➔ Keep solvents cool and properly labeled. Ensure that you have the correct solvent before connecting it to the instrument.
WARNING Inflammation or injury due to toxic, corrosive or stimulative solvent

➔ Do not contact toxic, corrosive or stimulative solvent.

➔ For details of the properties of each solvent and how to handle it, refer to the relevant Material Safety Data Sheets (MSDS).

➔ Be sure to handle each solvent properly.

➔ Wear proper personal protective clothes (e.g., safety goggles) so that a solvent will not come into direct contact with the skin.

➔ Ventilate the laboratory room adequately to prevent accidental inhalation of harmful solvent vapor.

WARNING Cuts

➔ When working with glass or quartz parts take care to prevent breakage.

Other Precautions

Airflow to the cooling fans of the liquid chromatograph must be unobstructed. Do not block the ventilation grills on the liquid chromatograph and accessories.

Consult the manuals supplied with your PC, monitor and for their specific ventilation requirements.
High Pressure Hazards

**WARNING**

High velocity stream of volatile and/or toxic liquids.

If a line ruptures, a relief device opens, or a valve opens accidentally under pressure, potentially hazardous high liquid pressures can be generated by the pump.

➔ Wear personal protective equipment when you inject samples or perform routine maintenance.

➔ Never open a solvent line or valve under pressure. Stop the pump first and let the pressure drop to zero.

➔ Always keep the doors and covers closed during operation.

➔ Read and adhere to all Notes, Cautions, and Warnings in the manual.

Ultraviolet Radiation

**WARNING**

Irritation to the skin, eyes and upper respiratory system

➔ Ensure that protective lamp covers of variable and fixed wavelength detectors are in place during operation.

➔ Do not look directly into detector fluid cells or at the UV light source. When inspecting the light source or fluid cell, always use protective eye covering such as borosilicate glass or polystyrene.

➔ Ventilate the area surrounding the detector such that the concentration of ozone does not exceed the maximum permissible level. All venting must be to outside air, never within the building.

Ozon generation

Ozone can be generated by radiation from the source lamps. The maximum permissible exposure level is 0.1 ppm (0.2 mg/m³).
Solvent Miscibility

Solvents should mix with each other in all proportions. This is important during elution and during solvent changeover. Refer to Figure 32 on page 146 for miscibility of some common HPLC solvents.

Figure 32  Solvent miscibility of some common solvents
Solvent Compressibility

The values in Table 12 on page 147 should be used for the Agilent 218 Purification Solution compressibility factors when you are setting up the pumping system parameters.

For details on how to set up the pump system parameters, refer to Agilent 218 Solvent Delivery Module - User Manual (p/n G9300-90000).

### Table 12 Compressibility factors

<table>
<thead>
<tr>
<th>Solvent</th>
<th>x</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>46</td>
<td>3231</td>
</tr>
<tr>
<td>Acetone</td>
<td>128.9</td>
<td>956</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>97.4</td>
<td>1212</td>
</tr>
<tr>
<td>Benzene</td>
<td>96.7</td>
<td>1046</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>106.7</td>
<td>998</td>
</tr>
<tr>
<td>Chloroform</td>
<td>97.4</td>
<td>1227</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>114</td>
<td>800</td>
</tr>
<tr>
<td>Dichloroethane</td>
<td>111.9</td>
<td>1020</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>188</td>
<td>700</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>80</td>
<td>1500</td>
</tr>
<tr>
<td>Dioxane</td>
<td>60</td>
<td>1500</td>
</tr>
<tr>
<td>Ethanol</td>
<td>115</td>
<td>1100</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>100</td>
<td>1800</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>97.4</td>
<td>1212</td>
</tr>
<tr>
<td>Methanol</td>
<td>125</td>
<td>1200</td>
</tr>
<tr>
<td>n Heptane</td>
<td>144</td>
<td>760</td>
</tr>
<tr>
<td>n Hexane</td>
<td>167.2</td>
<td>644</td>
</tr>
<tr>
<td>o Dichlorobenzene</td>
<td>95</td>
<td>1400</td>
</tr>
<tr>
<td>Propanol</td>
<td>98</td>
<td>1200</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>95</td>
<td>1500</td>
</tr>
<tr>
<td>Toluene</td>
<td>93</td>
<td>1200</td>
</tr>
<tr>
<td>2-Methylformamide</td>
<td>80</td>
<td>1500</td>
</tr>
</tbody>
</table>
The Waste Electrical and Electronic Equipment Directive

Abstract


NOTE

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

Product Category:

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

NOTE

Do not dispose off in domestic household waste

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

**WARNING** Lithium batteries may not be disposed-off into the domestic waste. Transportation of discharged Lithium batteries through carriers regulated by IATA/ICAO, ADR, RID, IMDG is not allowed.

Danger of explosion if battery is incorrectly replaced.

➔ Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

➔ Replace only with the same or equivalent type recommended by the equipment manufacturer.

**NOTE** Bij dit apparaat zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.
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.
CE Compliance

Your Agilent 700 Series ICP-OES instrument has been designed to comply with the requirements of the Electromagnetic Compatibility (EMC) Directive and the Low Voltage (electrical safety) Directive (commonly referred to as the LVD) of the European Union. Agilent has confirmed that each product complies with the relevant Directives by testing a prototype against the prescribed EN (European Norm) standards.

Proof that a product complies with these directives is indicated by:

• the CE Marking appearing on the rear of the product, and

• the documentation package that accompanies the product containing a copy of the Declaration of Conformity. The Declaration of Conformity is the legal declaration by Agilent that the product complies with the directives listed above, and shows the EN standards to which the product was tested to demonstrate compliance.
Electromagnetic Compatibility

**EN55011/CISPR11**

Group 1 ISM equipment: group 1 contains all ISM equipment in which there is intentionally generated and/or used conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself.

Class A equipment is equipment suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

This device complies with the requirements of CISPR11, Group 1, Class A as radiation professional equipment. Therefore, there may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

- Relocate the radio or antenna.
- Move the device away from the radio or television.
- Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
- Make sure that all peripheral devices are also certified.
- Make sure that appropriate cables are used to connect the device to peripheral equipment.
- Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.
- Changes or modifications not expressly approved by Agilent Technologies could void the user’s authority to operate the equipment.
ICES/NMB-001

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme à la norme NMB-001 du Canada.
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

Select Products/Chemical Analysis

It will provide also the latest firmware of the modules for download.
Index

3-way pump head prime valve
installation 51

A
AC power 71
Agilent
on internet 154
analog output 130
assembling
fraction collector 93
autosampler
connecting 89
lifting 32
location 81
service 13

B
battery
safety information 149

C
cables
other 70
power 70
checklist
delivery 28
pump 28
column oven 13
communication cabling
connecting 63
compliance
CE 151
components 92
condensation 20
connections
workstation control 129
connector
external contacts 65
connectors
external 65

defect on arrival 27
delivery checklist
autosampler 29
detector 28
delivery
checklist 29
fraction collector 29
detector outlet back pressure restrictor 78
driver
installation 109
electronic waste 148

E
features 11
flowcell types 74
flowcell
install 75
general waste tubing
connecting 85

H
hardware
setup 104
high pressure tubing
pump head 56
high pressure hazard 145

I
inlet filter assembly 54
inspection 30
installation
internal mixer 44
mast kit 46
overview 93
pressure module 41
probe 95
pump head tubing 95
installing
door 79
internal mixer
installation 44
internet 154
introduction
detector 11

L
lithium batteries 149
location
detector module 69
low pressure tubing 54
Index

M
maintenance
module 126
manual injection valve and bracket
installation 48
mast kit
installation 46
mat
rack location 95
method
setup 118

O
outlet check valve
connections 57
overview
installation 93
module 82

P
packaging
damaged 27
parts 126
piston-washing
installation 55
plumbing fittings
narrowbore titanium 62
preparative PEEK 63
plumbing fittings
analytical stainless steel 61
analytical titanium mixers 62
narrowbore 61
preparative titanium 63
plumbing
safety 53
power cords 19
power
connection 101
prepping
ChemStation control 110
electrical 37
hardware 104
OpenLab 110
pump ID 105
side-port needle 12
site requirements
power cords 19
specifications 21
spill tray
installation 94
stack
auto-preparative 36
binary 35
isocratic 34
optimizing 33
synchronization signals 135
syringe waste tubing
connecting 86
system
rinsing 88

T
terminal strip
J2 66
J3 66
troubleshooting 126

U
unpacking 30
using 126

V
vials
filling and sealing 89

W
waste
Index

- electrical and electronic equipment 148
- water and leakage drain connecting 86
- WEEE directive 148
In This Book

This manual provides setup information on following modules:

- Agilent 218 Solvent Delivery Module (G9300A/G9301A)
- Agilent 325 UV/VIS Dual WL Detector (G9309A)
- Agilent 410 Autosampler (G9331A/G9332A)
- Agilent 440 Fraction Collector (G9340A)

The manual describes the following:

- Optimizing stack configuration
- Setup hardware
- Setup software
- Setup methods