Agilent 1290 Infinity II High Speed Pump

User Manual



Agilent Technologies

Notices

© Agilent Technologies, Inc. 2014, 2015

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

G7120-90000 Rev. D

Edition

07/2015

Printed in Germany

Agilent Technologies
Hewlett-Packard-Strasse 8
76337 Waldbronn

Warranty

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

Technology Licenses

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

Restricted Rights Legend

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

Safety Notices

CAUTION

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

WARNING

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

In This Guide...

This manual covers the Agilent 1290 Infinity II High Speed Pump (G7120A).

1 Introduction

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

2 Site Requirements and Specifications

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

3 Using the Pump

This chapter explains the operational parameters of the Agilent 1290 Infinity II High Speed Pump.

4 Optimizing Performance

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

5 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

6 Error Information

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

7 Maintenance

This chapter describes the maintenance of the High Speed Pump.

8 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

9 Identifying Cables

This chapter provides information on cables used with the modules.

10 Hardware Information

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

11 LAN Configuration

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

12 Appendix

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

Contents

1 Introduction 9

Product Description 10
Pump Principle 11
Leak and Waste Handling 13

2 Site Requirements and Specifications 17

Site Requirements 18
Physical Specifications 21
Performance Specifications 22

3 Using the Pump 25

Magnets 26
Turn on/off 27
Status Indicators 28
Best Practices 29
Normal Phase Applications 32

4 Optimizing Performance 35

Delay Volume and Extra-Column Volume 36
How to Configure the Optimum Delay Volume 37
How to Achieve Higher Resolution 39
Using Solvent Calibration Tables 42

5 Troubleshooting and Diagnostics 43

User Interfaces 44
Agilent Lab Advisor Software 45

6 Error Information 47

What Are Error Messages 49
General Error Messages 50
Pump Error Messages 57

7 Maintenance 75

Introduction to Maintenance 77
Warnings and Cautions 79
Overview of Maintenance 81
Cleaning the Module 82
Install Fittings and Capillaries 83
Remove and Install Doors 84
Replace the Shutoff Valve Panel 86
Replace the Pressure Sensor 87
Overview of Torques for Pump Head Procedures 89
Replace the Inlet Valve 90
Replace the Outlet Valve 92
Replace the Solvent Selection Valve (SSV) 94
Change Configuration or Replace the Jet Weaver 95
Replace the Seal Wash Pump 96
Release a Stuck Inlet Valve 97
Pump Head Procedures 98
Replace the Purge Valve Head 130
Replace Parts of the High Pressure Filter Assembly 132
Install the Valve Rail Kit 134
Replace the Module Firmware 135
Prepare the Pump Module for Transport 136

8 Parts and Materials for Maintenance 137

Overview of Maintenance Parts 138
Flow Connections 139
Pump Head Assemblies 140
Pump Head Assembly Parts 141
Primary Pump Head Parts 142
Secondary Pump Head Parts 144
Purge Valve 146
Cover Parts 147
Leak Parts 147
Accessory Kit 148
Tools 149
HPLC System Tool Kit 151

9 Identifying Cables 153

Cable Overview 154
Analog Cables 156
Remote Cables 158
CAN/LAN Cables 162
Agilent Module to PC 163
USB 164

10 Hardware Information 165

Firmware Description 166
Electrical Connections 169
Interfaces 171
Setting the 8-bit Configuration Switch 176
Early Maintenance Feedback 179
Instrument Layout 180

11 LAN Configuration 181

What You Have to Do First 182
TCP/IP parameter configuration 183
Configuration Switch 184
Initialization mode selection 185
Dynamic Host Configuration Protocol (DHCP) 189
Link configuration selection 192
Automatic configuration with Bootp 193
Manual Configuration 203
PC and User Interface Software Setup Setup 208

12 Appendix 211

General Safety Information 212
Waste Electrical and Electronic Equipment (WEEE) Directive (2002-96-EC) 218
Radio Interference 219
Sound Emission 220
Agilent Technologies on Internet 221

1 Introduction

Product Description 10
Pump Principle 11
Leak and Waste Handling 13
Waste Concept 15

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

Product Description

The Agilent 1290 Infinity II High Speed Pump can enhance your efficiency through high speed and chromatographic performance.

A low-delay-volume mixer allows you to run fast gradients for narrow-bore applications for high laboratory efficiency.

The new 1290 Infinity II LC power range has a high instrument efficiency, allowing you to run any HPLC and UHPLC method.

The full ISET range enables you to transfer existing methods from different instruments, including current Agilent systems as well as instruments from other manufacturers.

Active damping, automatic purge valve, new ultralow dispersion kits or low delay-volume capability, combine to achieve high instrument and analytical efficiency.

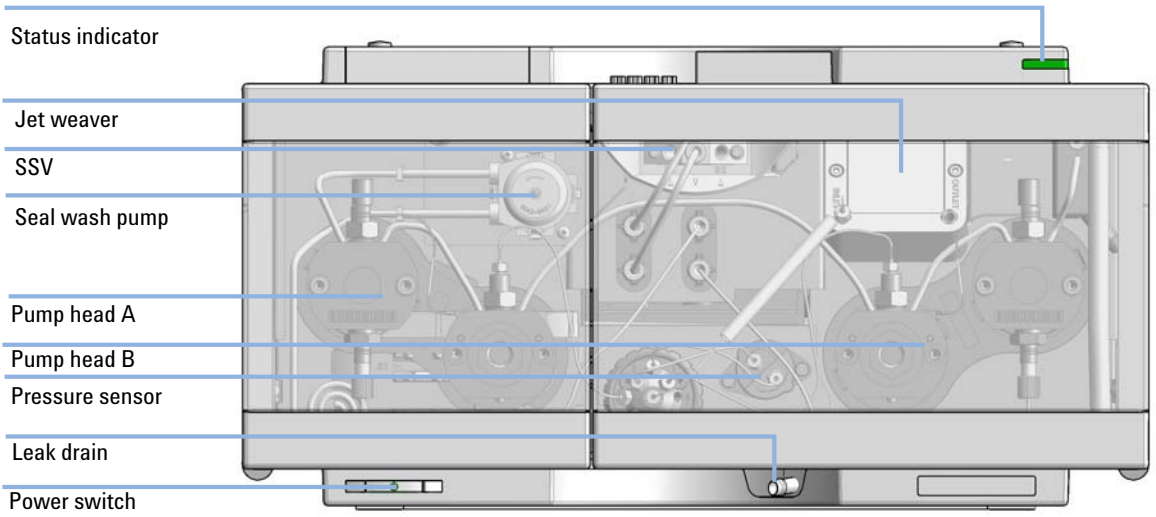


Figure 1 Overview of the High Speed Pump

Pump Principle

The 1290 Inifinity II Highspeed Pump features a dual pump head design for generation of binary gradients.

A solvent selection valve allows to choose from two solvents per pump head. However, this valve cannot the switched during a run.

Each pump head is equpipped with two independently actuated pistons in series.

Delivery cycle:

1 Piston two moves forward to deliver solvent into the flow path. The flow-rate is thereby determined by the speed of the piston.

   At the same time, piston one draws aspirates solvent from the solvent reservoir. The two piston chambers are isolated by a check valve (outlet ball valve).

2 Shortly before the end of the delivery stroke of piston two, piston one reverses its direction. The check valve (passive inlet valve) at the inlet to piston chamber one closes while the solvent in piston chamber one gets re-compresed to system operating pressure.

3 Piston two reverses while piston one delivery the set flow rate into the flow path and re-fills piston chamber two.

4 When piston two has reached that end of its intake stroke it reverses and the delivery cycle starts again with step 1)

Reproducible solvent properties are maintained by an integrated two-channel solvent degasser. It is located between solvent selection valve and the pump heads.

The pump automatically compensates for pressure- and flow instabilities caused by the complex relationship between solvent compressibility and system pressure.

The only user interaction is selecting the appropriate solvent or solvent mixture per channel from a drop-down list.

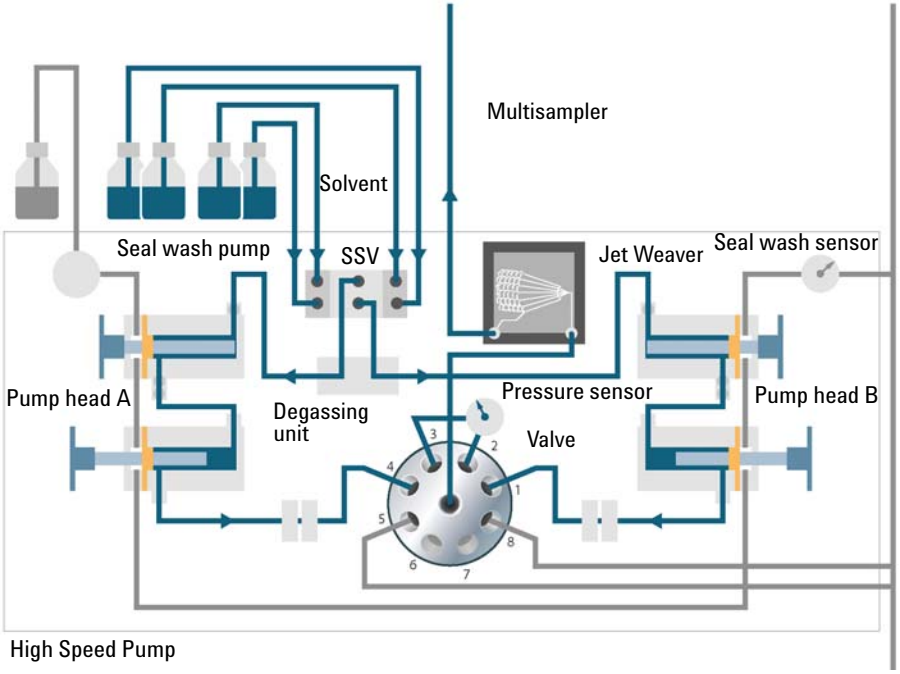


Figure 2 The hydraulic path

Leak and Waste Handling

The 1290 Infinity II Series has been designed for safe leak and waste handling. It is important that all security concepts are understood and instructions are carefully followed.

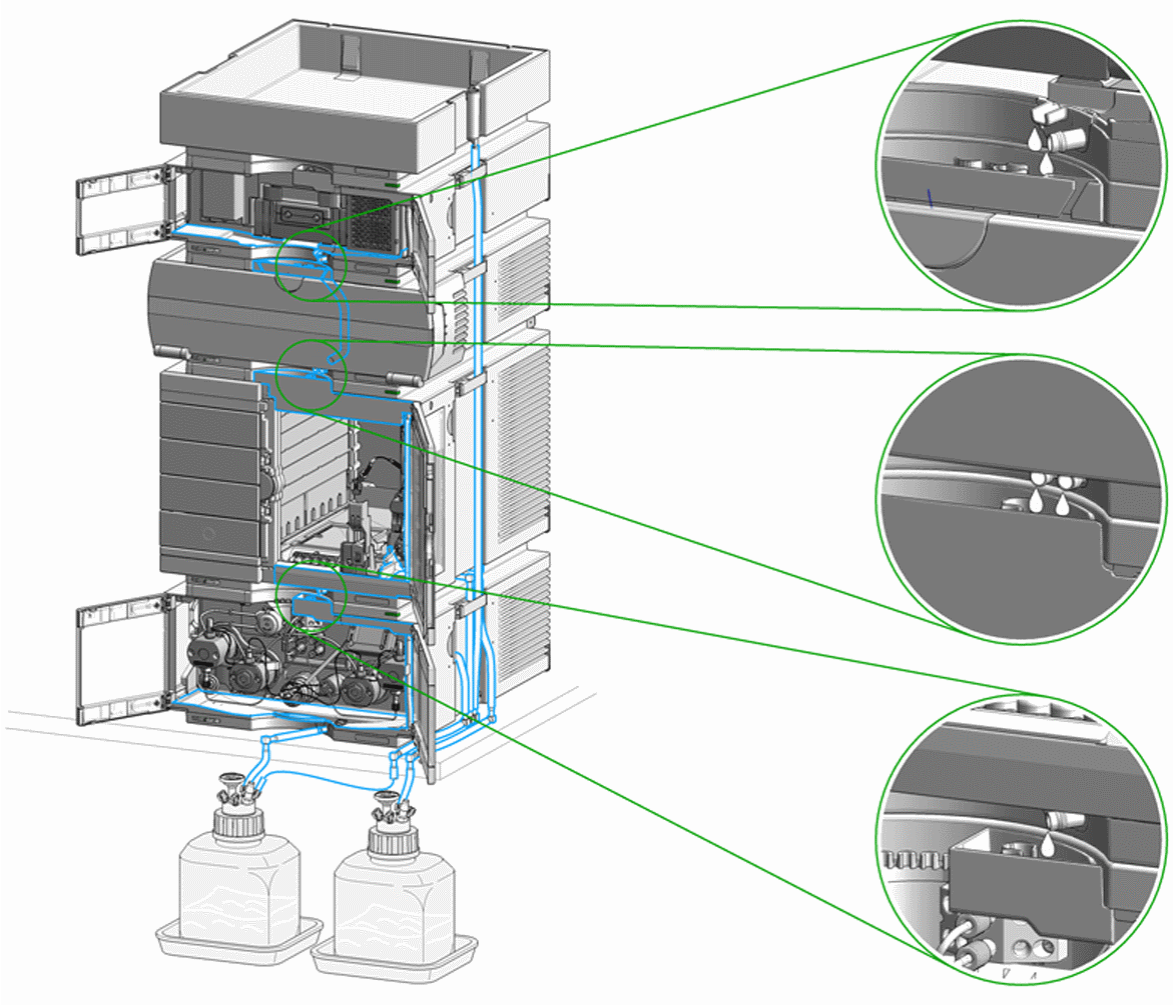


Figure 3 Leak and waste handling concept (overview - typical stack configuration as an example)

The solvent cabinet is designed to store a maximum volume of 8 L solvent. The maximum volume for an individual bottle stored in the solvent cabinet should not exceed 2 L. For details, see the usage guideline for the Agilent 1200 Infinity Series Solvent Cabinets (a printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available on the Internet).

All leak plane outlets are situated in a consistent position so that all Infinity and Infinity II modules can be stacked on top of each other. Waste tubes are guided through a channel on the right hand side of the instrument, keeping the front access clear from tubes.

The leak plane provides leak management by catching all internal liquid leaks, guiding them to the leak sensor for leak detection, and passing them on to the next module below, if the leak sensor fails. The leak sensor in the leak plane stops the running system as soon as the leak detection level is reached.

Solvent and condensate is guided through the waste channel into the waste container:

- from the detector's flow cell outlet
- from the Multisampler needle wash port
- from the Sample Cooler (condensate)
- from the Seal Wash Sensor
- from the pump's Purge Valve or Multipurpose Valve

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

NOTE Do not install the waste tubings into the central waste connectors.

Waste Concept

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





2
Site Requirements and Specifications

Site Requirements 18
Physical Specifications 21
Performance Specifications 22

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

Site Requirements

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

Power Consideration

The module power supply has wide ranging capabilities and accepts any line voltage in the range mentioned in Table 1 on page 21. Consequently, there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

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

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

➔ Make sure that it is always possible to access the power plug.

➔ Remove the power cable from the instrument before opening the cover.

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

WARNING

Incorrect line voltage at the module

Shock hazard or damage of your instrument can result if the devices are connected to line voltage higher than specified.

➔ Connect your module to the specified line voltage.

WARNING

Inaccessible power plug.

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

➔ Make sure the power connector of the instrument can be easily reached and unplugged.

➔ Provide sufficient space behind the power socket of the instrument to unplug the cable.

Power Cords

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

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

WARNING

Absence of ground connection

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

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

WARNING

Unintended use of supplied power cords

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

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

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

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

WARNING

Power cords

Solvents may damage electrical cables.

➔ Prevent electrical cables from getting in contact with solvents.

➔ Exchange electrical cables after contact with solvents.

Bench Space

The module dimensions and weight (see Table 1 on page 21) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

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

The module should be operated in a horizontal position.

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

Condensation

CAUTION Condensation within the module

Condensation can damage the system electronics.

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

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

Physical Specifications

Table 1 Physical Specifications

Type	Specification	Comments
Weight	21.0 kg (46.3 lbs)	
Dimensions (height × width × depth)	200 x 396 x 436 mm (7.9 x 15.6 x 17.2 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	210 VA / 180 W	
Ambient operating temperature	4 – 55 °C (39 – 131 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15092 ft)	For storing the module
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.

Performance Specifications

Table 2 Agilent 1290 Infinity II High Speed Pump (G7120A) Performance Specifications

Feature	Specification
Hydraulic system	Two dual pistons in series, pumps with proprietary servo-controlled variable stroke design and smooth motion control.
Pump resolution step size	300 pL step size
Settable flow range	0.001 – 5 mL/min, in 0.001 mL/min increments (executed in 300 pL/step increments).
Flow precision	≤0.07 % RSD or 0.005 min SD, whatever is greater
Flow accuracy	±1 % or 10 µL/min, whatever is greater
Pressure range	up to 130 MPa (1300 bar) at 0 – 2 mL/min ramping down to 80 MPa (800 bar) at 5 mL/min
Pressure pulsation	<1 % amplitude or <0.5 MPa (5 bar), whatever is greater
Compressibility compensation	Automatic
Recommended pH-range	1.0 – 12.5, solvents with pH <2.3 should not contain acid which attack stainless steel.
Gradient formation	High pressure binary mixing
Delay volume	As low as 45 µL (10 µL without mixer)
Composition precision	<0.15 % RSD or 0.01 min SD, whatever is greater
Composition accuracy	±0.35 % absolute
Number of solvent	2 out of maximum 26 solvents
Solvent selection valve	Internal 4-solvent selection valve included. External 2x 12 solvent valve as option, fully integrated in the pump control interface.

Table 2 Agilent 1290 Infinity II High Speed Pump (G7120A) Performance Specifications

Feature	Specification
Integrated degassing unit	Included Number of channels: 2 Internal volume per channel: 1.5 mL Materials in contact with solvent: TFE/PDD Copolymer, FEP, PEEK, PPS.
Automatic Purge Valve	Included
Active Seal wash	Included
Intelligent System Emulation Technology (ISET)	Included
Communications	Controller-area network (CAN), RS232C, APG remote: ready, start, stop and shutdown signals, LAN
Safety and maintenance	Extensive diagnostics, error detection and display through included Agilent LabAdvisor, leak detection, safe leak handling, leak output signal for shutdown of the pumping system. Low voltage in major maintenance areas.
GLP feature	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of seal wear and volume of pumped mobile phase with pre-defined and user settable limits and feedback messages. Electronic records of maintenance and errors.
Housing	All materials are recyclable.

3
Using the Pump

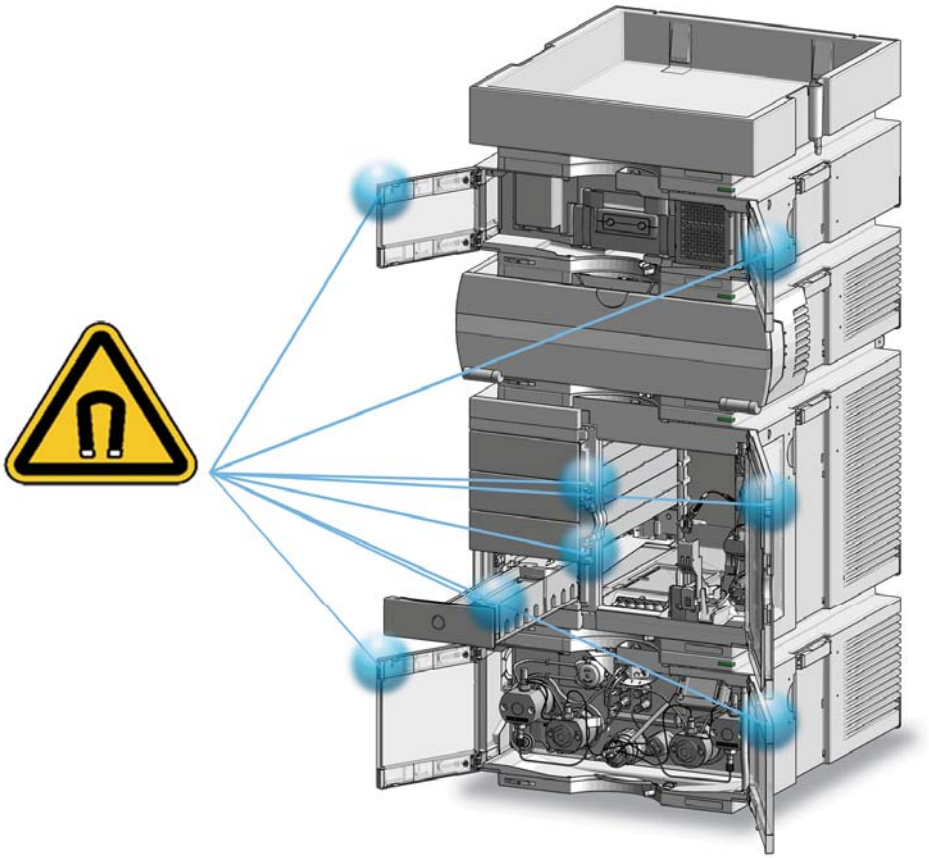
Magnets 26
Turn on/off 27
Status Indicators 28
Best Practices 29
- Daily / Weekly tasks 29
- Power up / Shut-down the pump 29
- Prepare the pump 30
- How to deal with solvents 31

Normal Phase Applications 32

This chapter explains the operational parameters of the Agilent 1290 Infinity II High Speed Pump.

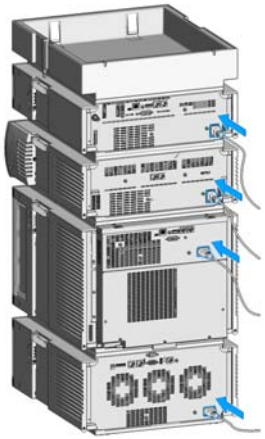
Magnets

1 This stack exemplarily shows the magnets' positions in the modules.

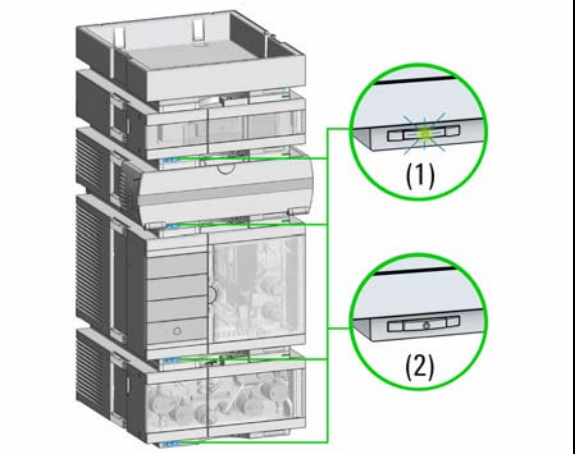


Turn on/off

1



2

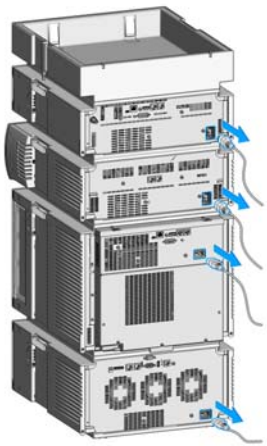


Power switch

(1) On

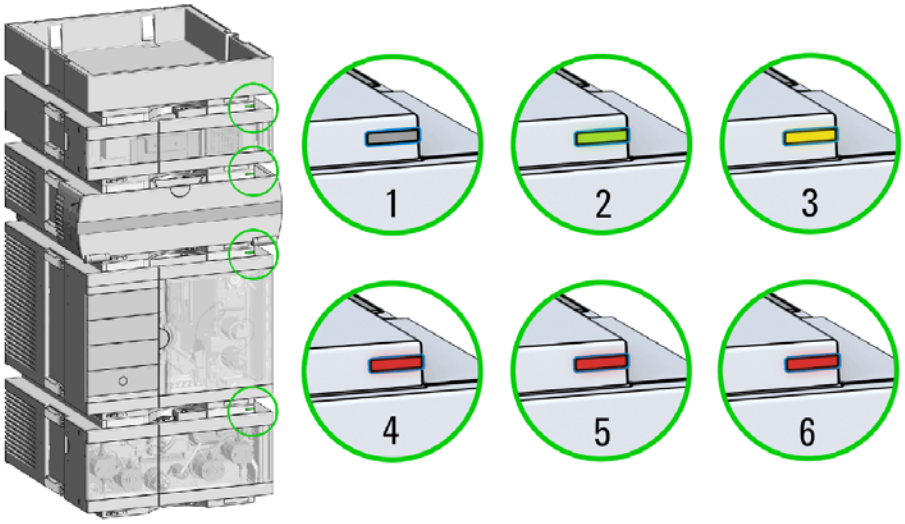
(2) Off

3



Status Indicators

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



Status indicators

1. Idle

2. Run mode

3. Not-ready. Waiting for a specific pre-run condition to be reached or completed.

4. Error mode - interrupts the analysis and requires attention (for example a leak or defective internal components).

5. Resident mode (blinking) - for example during update of main firmware.

6. Bootloader mode (fast blinking). Try to re-boot the module or try a cold-start. Then try a firmware update.

Best Practices

Daily / Weekly tasks

Daily tasks

- Replace mobile phase based on water/buffer.
- Replace organic mobile phase latest every 2nd day.
- Check seal wash solvent.
- Run conditioning with composition of your application.

Weekly tasks

- Change seal wash solvent (10 % / 90 % isopropanol/water) and bottle.
- Flush all channels with water to remove salt deposits.
- Visually inspect solvent filters. Clean or exchange if necessary.

Power up / Shut-down the pump

Power up the pump

- Use new or different mobile phase (as required).
- Purge pump heads with 2.5 – 3 mL/min for 5 min.
- Condition pump heads for 10 – 20 min.

Long-term shut-down of the pump

- Flush system with water to remove buffer.
- Use recommended solvents to store the system.
- Power off the pump or system.

Prepare the pump

Purge

Use the Purge function to:

- fill the pump,
- exchange a solvent,
- remove air bubbles in tubes and pump heads.

Condition

Use the Conditioning function:

- daily when starting the pump,
- to minimize pressure ripple by dissolving air bubbles in pump heads.

NOTE Condition your complete system with solvents and composition of your application (for example 50 %/50 % A/B at 0.5 mL/min.

Seal wash

The seal wash function runs continuously and is controlled by the seal wash sensor. This guarantees a maximum seal life time.

CAUTION Contaminated seal wash solvent

➔ Do not recycle seal wash solvent to avoid contamination.

➔ Weekly exchange seal wash solvent.

How to deal with solvents

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

Normal Phase Applications

Current valves used with 1260 and 1290 Infinity pumps do not work well with applications using non-polar solvents as for normal phase applications (e.g. hexane and heptane). With such applications, pressure drops could be observed. They are a result of particles electrostatically charging up in insulating solvents and sticking to the balls inside the valves, such that the valves do not close properly any more after some time of use (can be hours).

For normal phase applications, a second type of valves is available, which has a design based on the existing one for 1260 and 1290 Infinity valves. These valves use a new material for valve balls, which is a conductive ceramic and replaces non-conductive ruby balls. The balls do not charge up electrostatically and show good performance in normal phase.

The valves are marked with N for non-polar or normal phase.

Agilent recommends using these valves for (and only for) normal phase applications.

CAUTION

Corrosion of valves

Normal phase balls/valves corrode quickly in aqueous solutions and acids (at or below pH 7).

➔ Do not use normal phase valves in applications running with aqueous solutions.

The N-Valves have been tested successfully in using hexane at pressures below 100 bar; heptane can be used as a substitute for neurotoxic hexane.

Seals for Normal Phase Applications

For running normal phase on 1200 Infinity Series pumps, yellow PE seals are required, which exist as piston seals and wash seals. Seal wash is very uncommon for normal phase applications (no buffers needed), but wash seals are needed for seal wash pump heads.

1290 Infinity pumps use PE seals by default. In combination with ceramic pistons, PE seals are used for both reversed phase (1200 bar) and normal phase applications.

1260 Infinity pumps use sapphire pistons and black PTFE piston and wash seals by default (600 bar). Such PTFE seals create small wear particles in normal phase applications, which can clog valves and other parts in the flow path.

PE seals have a limited life time when used with normal phase solvents and sapphire pistons. Agilent recommends a maximum pressure of 200 bar for this combination, which shall also be applied for pressure tests.

NOTE

Tetrahydrofuran (THF) is not compatible with PE seals. Black PTFE seals should be used with THF, even in 1290 Infinity pumps. In this case, use a maximum pressure of about 400 bar.

Choice of Normal Phase Valves and Seals

Table 3 Recommended valves and seals for normal phase applications

	1260 Infinity	1290 Infinity
Inlet valves	1260 Infinity Inlet Valve Type N (G1312-60166)	1290 Infinity Inlet Valve Type N (G4220-60122) 1290 Infinity Quat Inlet Valve Type N (G4204-60122)
Outlet valves	1260 Infinity Outlet Valve Type N/SFC (G1312-60167)	1290 Infinity Outlet Valve Type N (G4220-60128)
Seals	PE seals (pack of 2) (0905-1420) Wash Seal PE (0905-1718)	

4
Optimizing Performance

Delay Volume and Extra-Column Volume 36
Delay Volume 36
How to Configure the Optimum Delay Volume 37
How to Achieve Higher Resolution 39
Using Solvent Calibration Tables 42

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

Delay Volume and Extra-Column Volume

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

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

Delay Volume

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

The delay volume in a system includes the volume in the pump from the point of mixing, connections between pump and autosampler, volume of the flow path through the autosampler and connections between autosampler and column.

How to Configure the Optimum Delay Volume

The physical delay volume of the pump depends primarily on the use of the Jet Weaver mixer. For UV detection the Jet Weaver should always be used but for mass spectrometric detection the user can decide to bypass the Jet Weaver in order to reduce the delay volume. This only makes sense for ultra-fast gradient operation (less than 0.5 min) or for use with very small volume columns. If the Jet Weaver is bypassed the connection tubing to the autosampler is routed directly from the purge valve.

NOTE Before disconnecting a Jet Weaver from the flow path, flush it with organic solvent. Avoid leaving water or buffers inside the Jet Weaver, which may cause the growth of microorganisms like algae or bacteria.

Sometimes it may be advisable to increase the delay volume in the pump. Specifically this can be the case when UV detection is employed and a strongly UV-absorbing compound has been added to the mobile phase. This can have the effect of emphasizing any pump noise and the most common example is the use of trifluoroacetic acid (TFA) in the analysis of proteins and peptides. The effect can be mitigated by increasing the mixer volume.

The following different Jet Weaver configurations are available:

- The Jet Weaver 35 µL/ 100 µL (G4220-60027) has two alternative volumes in the same unit.

  The switch from the lower volume, 35 µl, to the higher volume, 100 µl, is done by uninstalling it, turning it around from front to back and re-installing it, see "Change Configuration or Replace the Jet Weaver" on page 95. The mixing volume (and hence delay volume) is increased by 65 µl and the baseline performance with additives like TFA will be improved.The configuration of the Jet Weaver is logged automatically by an attached RFID tag.

- The 380 µL Jet Weaver high performance mixer is optionally available for demanding applications, which use solvents in different channels (for example A versus B), that differ strongly in their UV/Vis absorption, for example by using trifluoroacetic acid (TFA) as a modifier, which has a high absorbance.

Solvent packages created by the pump may persist until the solvent reaches the detector flow cell. Absorption fluctuations can then show up as baseline noise, also referred to as mixing noise. Applications like impurity quantitation or lowest level compound detection require minimizing this noise. The 380 µL Jet Weaver strongly improves mixing and therefore reduces baseline noise and improves sensitivity in detection. Patented Agilent microfluidic technology offers high mixing performance at a low internal volume of 380 µL.

How to Achieve Higher Resolution

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

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

Resolution between two peaks is described by the resolution equation:

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

where

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

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

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

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

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

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

where:

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

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

Using Solvent Calibration Tables

Importing Solvent Calibration Tables

RC.NET based Agilent graphical user interfaces (ChemStation, EZChrom Elite, OpenLab etc.) include data for most commonly used solvents in HPLC. This data contains solvent properties and is used for optimum pump control in order to ensure best flow and composition accuracy.

If your solvent is not included to the software, please check the Agilent web site
http://www.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?whid=69761
for additional libraries (registration required), which also provides updates and optimized data.

If your solvent is neither available in the user interface nor in the library, please use generic solvents. "Generic aqueous" gives good results for most solvent mixtures with at least 50 % water, which have similar properties as pure water. For other solvents with high organic percentage, "Generic organic" gives a good approximation.

Importing Solvent Calibration in ChemStation

1. Go to menu **Instrument > Instrument configuration**.
2. In the **Instrument Configuration** screen choose your module and click **Configure**.
3. Click **Configure Solvent Type Catalogs**.
4. In **Solvent Type Catalogs** click **Import**.
5. Navigate to the location of the solvent calibration table and click **Open**.
6. The new solvent will now appear in the **Solvent Type Catalogs**.



5
Troubleshooting and Diagnostics

User Interfaces 44
Agilent Lab Advisor Software 45

Overview about the troubleshooting and diagnostic features.

User Interfaces

- Depending on the user interface, the available tests and the screens/reports may vary.
- Preferred tool should be Agilent Lab Advisor Software, see "Agilent Lab Advisor Software" on page 45.
- The Agilent OpenLab ChemStation C.01.03 and above do not include any maintenance/test functions.
- Screenshots used within these procedures are based on the Agilent Lab Advisor Software.

Agilent Lab Advisor Software

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

The Agilent Lab Advisor software is available in two versions:

- Lab Advisor Basic
- Lab Advisor Advanced

Lab Advisor Basic is included with every Agilent 1200 Infinity Series and Infinity II Series pump.

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

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

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



6
Error Information

What Are Error Messages 49
General Error Messages 50
- Timeout 50
- Shutdown 50
- Remote Timeout 51
- Lost CAN Partner 52
- Leak Sensor Short 52
- Leak Sensor Open 53
- Compensation Sensor Open 53
- Compensation Sensor Short 54
- Fan Failed 54
- Leak 55
- Open Cover 55
- Cover Violation 56

Pump Error Messages 57
- Pressure of binary pump above upper limit 57
- Pressure below lower limit 58
- Target pressure not reached for binary pump degasser 58
- Degasser's pressure limit violation 59
- Solvent counter exceeded limit 59
- Waste counter limit exceeded 60
- Flow rate limit exceeded 60
- Binary pump shutdown during analysis 61
- Reading the pump encoder tag failed 61
- Writing the pump encoder tag failed 62
- Pump drive blocked or encoder failed 62
- Drive current too low 63
- Drive Encoder failed 63

Drive current too high 64
Drive timeout 64
Overcurrent of pump drive 65
Overcurrent of solvent selection valve (SSV) 65
Deliver underrun 65
Defect connection between main board and pump drive encoder 66
Pump drive encoder defect 66
Purge valve failed 67
Reading of purge valve tag failed 67
Pump drive encoder rollover 68
Drive position limit 68
Insufficient power of drive encoder LED 68
Drive encoder error 69
Writing the purge valve tag failed 69
Current of primary pump drive too high 70
Current of secondary pump drive too high 70
Unknown purge valve type 71
Pump drive encoder error 71
Pump drive error 71
Pump drive stroke blocked 72
Pump drive stop not found 72
Pressure sensor calibration wrong or missing 73
Seal wash pump was missing when tried to turn on 73

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

What Are Error Messages

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

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

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

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

General Error Messages

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

Timeout

Error ID: 0062

The timeout threshold was exceeded.

Probable cause	Suggested actions
1 The analysis was completed successfully, and the timeout function switched off the module as requested.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

Error ID: 0063

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

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

Probable cause	Suggested actions
1 Leak detected in another module with a CAN connection to the system.	Fix the leak in the external instrument before restarting the module.
2 Leak detected in an external instrument with a remote connection to the system.	Fix the leak in the external instrument before restarting the module.
3 Shut-down in an external instrument with a remote connection to the system.	Check external instruments for a shut-down condition.

Remote Timeout

Error ID: 0070

A not-ready condition is still present on the remote input. When an analysis is started, the system expects all not-ready conditions (for example, a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable cause	Suggested actions
1 Not-ready condition in one of the instruments connected to the remote line.	Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2 Defective remote cable.	Exchange the remote cable.
3 Defective components in the instrument showing the not-ready condition.	Check the instrument for defects (refer to the instrument's documentation).

Lost CAN Partner

Error ID: 0071

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

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

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

Leak Sensor Short

Error ID: 0082

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

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

Probable cause	Suggested actions
1 Defective leak sensor.	Please contact your Agilent service representative.
2 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.

Leak Sensor Open

Error ID: 0083

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

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

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

Compensation Sensor Open

Error ID: 0081

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

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

Probable cause	Suggested actions
1 Loose connection between the power switch board and the main board	Please contact your Agilent service representative.
2 Defective power switch assembly	Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 0080

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

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

Probable cause	Suggested actions
1 Defective power switch assembly	Please contact your Agilent service representative.
2 Loose connection between the power switch board and the main board	Please contact your Agilent service representative.

Fan Failed

Error ID: 0068

The cooling fan in the module has failed.

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

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

Probable cause	Suggested actions
1 Fan cable disconnected.	Please contact your Agilent service representative.
2 Defective fan.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Leak

Error ID: 0064

A leak was detected in the module.

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

Probable cause	Suggested actions
1 Loose fittings.	Ensure all fittings are tight.
2 Broken capillary.	Exchange defective capillaries.

Open Cover

Error ID: 0205

The top foam has been removed.

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

Cover Violation

Error ID: 7461

The top foam has been removed.

The sensor on the main board detects when the top foam is in place. If the foam is removed while the lamps are on (or if an attempt is made to switch on for example the lamps with the foam removed), the lamps are switched off, and the error message is generated.

Probable cause	Suggested actions
1 The top foam was removed during operation.	Please contact your Agilent service representative.
2 Foam not activating the sensor.	Please contact your Agilent service representative.

Pump Error Messages

These errors are pump specific.

Pressure of binary pump above upper limit

Error ID: 22014

The pressure has exceeded the upper pressure limit.

- Parameter: Measured pressure

Probable cause	Suggested actions
1 Blockage in flow path after the pressure sensor.	• Check for blockages in the LC system, e.g. purge valve, Jet Weaver, degraded column, column frits, needle, needle seat, capillaries etc. • Check for particles in the solvent.
2 Inappropriate settings (pressure limit, flow rate).	• Decrease flow rate. • Increase pressure limit.

Pressure below lower limit

Error ID: 22015

The pressure has dropped below the lower limit.

- Parameter: None

Probable cause	Suggested actions
1 Leak	Check for leaks.
2 Bottle empty	Check bottle filling.
3 Wrong solvent (viscosity)	Check solvent.
4 Inappropriate setting	Check flow rate and lower pressure limit.
5 Column degradation	Replace column.

Target pressure not reached for binary pump degasser

Error ID: 22031

The target pressure of the binary pump degasser has not been reached within the expected time.

- Parameter: Pressure in mbar

Probable cause	Suggested actions
1 Condensation in degasser chamber due to temperature fluctuation.	Equilibrate and restart module.
2 Degasser is defect.	Please contact your Agilent service representative.

Degasser's pressure limit violation

Error ID: 22032

Pressure too far above the limit.

Probable cause	Suggested actions
1 Leak in degasser chamber or degasser tubing.	Please contact your Agilent service representative.
2 Defect vacuum pump.	Please contact your Agilent service representative.
3 Degasser chamber empty or connected to air.	Block unused degasser channels.

Solvent counter exceeded limit

Error ID: 22055

The counter for the solvent volume has exceeded the limit, which has been set in the user interface.

Parameter:

- Without Solvent Selection Valve:

  0 for channel A, 1 for channel B
- With Solvent Selection Valve:

  2 for channel A1, 3 for channel B1, 4 for channel A2, 5 for channel B2

Probable cause	Suggested actions
1 No solvent present.	Refill solvent bottle.
2 Inappropriate setting.	Check solvent counter setting in user interface.

Waste counter limit exceeded

Error ID: 22056

The counter for the waste volume has exceeded the limit, which has been set in the user interface.

- Parameter: None

Probable cause	Suggested actions
1 The waste container is full.	Empty waste container.
2 Inappropriate setting for waste counter.	• Reset waste counter. • Adjust waste counter limit.

Flow rate limit exceeded

Error ID: 22064

The flow rate of the binary pump has exceeded the limit, while the pump runs in pressure controlled mode, e.g. during a pressure test.

- Parameter: None

Probable cause	Suggested actions
1 Leak	Check for leaks in the pump and flow path.
2 Bottle empty.	Fill solvent bottle.
3 Shutoff valve closed.	Open shutoff valve.
4 Drift of pressure sensor (unlikely for short tests taking some minutes).	Replace pressure sensor.

Binary pump shutdown during analysis

Error ID: 22065

The binary pump has been shut down by the control software or control module during an analysis.

- Parameter: 0 for off, 1 for standby.

Probable cause	Suggested actions
1 Pump has been shut down.	Restart pump.

Reading the pump encoder tag failed

Error ID: 22402

Reading the pump encoder tag has failed.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Defect connection between encoder and main board.	Please contact your Agilent service representative.
2 Missing or defect tag Defect connection between tag and encoder.	Please contact your Agilent service representative.

Writing the pump encoder tag failed

Error ID: 22405

Writing the pump encoder tag has failed.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Defect connection between encoder and main board.	Please contact your Agilent service representative.
2 Defect tag Defect connection between tag and encoder.	Please contact your Agilent service representative.

Pump drive blocked or encoder failed

Error ID: 22406

Pump drive blocked or encoder failed.

- Parameter: None

Probable cause	Suggested actions
1 Blockage of the pump drive Drive encoder failed.	Please contact your Agilent service representative.

Drive current too low

Error ID: 22407

The current consumption of the pump drive is too low.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Drive motor defect.	Please contact your Agilent service representative.
2 Wrong/missing connection of pump drive to main board.	Please contact your Agilent service representative.

Drive Encoder failed

Error ID: 22408

Drive encoder failed during pump drive calibration.

Probable cause	Suggested actions
1 Internal error.	Contact Agilent support.

Drive current too high

Error ID: 22409

The current consumption of the pump drive is too high.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Blockage of system before pressure sensor.	Check for blockage of e.g. outlet valve filter frit, purge valve, heat exchanger.
2 Drive motor defect.	Please contact your Agilent service representative.

Drive timeout

Error ID: 22410

Drive is blocked mechanically, fails during initialization.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Blockage of pump drive Drive motor defect.	Please contact your Agilent service representative.

Overcurrent of pump drive

Error ID: 22411

The current consumption of the pump drive is too high.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Blockage of system before pressure sensor.	Check for blockage of e.g. outlet valve filter frit, purge valve, heat exchanger.
2 Drive motor defect.	Please contact your Agilent service representative.

Overcurrent of solvent selection valve (SSV)

Error ID: 22412

Overcurrent of solvent selection valve (SSV).

- Parameter: None

Probable cause	Suggested actions
1 Valve defect.	Replace the solvent selection valve.

Deliver underrun

Error ID: 22413

Internal error.

- Parameter: None

Probable cause	Suggested actions
1 Internal error.	Please contact your Agilent service representative.

Defect connection between main board and pump drive encoder

Error ID: 22414

Defect connection between main board and pump drive encoder.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Defect connection between main board and pump drive encoder.	Please contact your Agilent service representative.
2 Defect encoder.	Please contact your Agilent service representative.

Pump drive encoder defect

Error ID: 22415

Defect pump drive encoder.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Defect encoder.	Please contact your Agilent service representative.

Purge valve failed

Error ID: 22417

Lost steps of the purge valve encoder.

- Parameter: None

Probable cause	Suggested actions
1 Purge valve drive mechanically blocked or defect.	• Check installation of purge valve head. • Please contact your Agilent service representative.

Reading of purge valve tag failed

Error ID: 22420

Reading the purge valve tag failed.

- Parameter: None

Probable cause	Suggested actions
1 Reading of purge valve tag failed.	Check cable connection.
2 Purge valve head tag defect or empty.	Replace purge valve head.
3 Purge valve tag reader is defect.	Please contact your Agilent service representative.

Pump drive encoder rollover

Error ID: 22424

Invalid pump drive encoder signals have been detected.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Pump drive encoder is defect.	Please contact your Agilent service representative.

Drive position limit

Error ID: 22425

Internal error.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Internal error.	Please contact your Agilent service representative.

Insufficient power of drive encoder LED

Error ID: 22426

Insufficient power of drive encoder LED.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Pump drive encoder is defect.	Please contact your Agilent service representative.

Drive encoder error

Error ID: 22427- 22430

An error has occurred for the pump drive encoder.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Pump drive encoder is defect.	Please contact your Agilent service representative.

Writing the purge valve tag failed

Error ID: 22431

Writing the purge valve tag failed.

- Parameter: None

Probable cause	Suggested actions
1 Purge valve head tag defect.	Replace purge valve head.
2 Purge valve tag reader is defect.	Please contact your Agilent service representative.

Current of primary pump drive too high

Error ID: 22433

The current of the primary pump drive is too high.

- Parameter: 1 or 4 referring to pump drive.

Probable cause	Suggested actions
1 Blockage of flow path between primary pump head and pressure sensor, e.g. of the heat exchanger.	• Check for blockages in flow path. • Please contact your Agilent service representative.
2 Primary pump drive is defect.	Please contact your Agilent service representative.

Current of secondary pump drive too high

Error ID: 22434

The current of the secondary pump drive is too high.

- Parameter: 2 or 3 referring to pump drive

Probable cause	Suggested actions
1 Blockage of flow path between secondary pump head and pressure sensor, e.g. of the heat exchanger.	• Check for blockages in the flow path. • Please contact your Agilent service representative.
2 Secondary pump drive is defect.	Please contact your Agilent service representative.

Unknown purge valve type

Error ID: 22435

The type information of the purge valve is invalid.

- Parameter: None

Probable cause	Suggested actions
1 Wrong valve head installed.	Check or replace purge valve head.
2 Valve head has invalid RFID tag content.	Check or replace purge valve head.

Pump drive encoder error

Error ID: 22437

The pump drive encoder has generated no signal.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Pump drive encoder is defect.	Please contact your Agilent service representative.

Pump drive error

Error ID: 22438, 22439

The pump drive failed during calibration.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Pump drive motor defect or mechanically blocked.	Please contact your Agilent service representative.

Pump drive stroke blocked

Error ID: 22441

During initialization the pump defines the operation position of the pump drives and therefore the pistons. First the pump drive moves backwards to find a mechanical stop within the ball screw. Afterwards, pistons move forwards for finding the maximum available stroke volume. These values are expected within a pre-defined range. "Maximum stroke too short" means that the outer drive position is too close. This can be caused by a drive initialization without pump head or if the pump head has not been installed properly (screws are loose).

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Wiper shifted	Please contact your Agilent service representative.
2 Pump head blocks piston movement	Replace, clean or repair pump head.
3 Pump drive motor is mechanically blocked.	Please contact your Agilent service representative.

Pump drive stop not found

Error ID: 22442

The maximum stroke is too long.

- Parameter: 1 – 4 referring to pump drive

Probable cause	Suggested actions
1 Wiper shifted	Please contact your Agilent service representative.
2 Pump drive spindle is defect.	Please contact your Agilent service representative.

Pressure sensor calibration wrong or missing

Error ID: 22443

Pressure sensor calibration wrong or missing.

- Parameter: None

Probable cause	Suggested actions
1 Pressure sensor calibration wrong or missing.	• Replace pressure sensor. • Please contact your Agilent service representative.

Seal wash pump was missing when tried to turn on

Error ID: 22499

The seal wash pump has not been detected (while being configured or detected before)

Probable cause	Suggested actions
1 Defect cable connection to seal wash pump.	Check cable connection.
2 Defect seal wash pump motor.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

7 Maintenance

Introduction to Maintenance 77
Warnings and Cautions 79
Overview of Maintenance 81
Cleaning the Module 82
Install Fittings and Capillaries 83
Remove and Install Doors 84
Replace the Shutoff Valve Panel 86
Replace the Pressure Sensor 87
Overview of Torques for Pump Head Procedures 89
Replace the Inlet Valve 90
Replace the Outlet Valve 92
Replace the Solvent Selection Valve (SSV) 94
Change Configuration or Replace the Jet Weaver 95
Replace the Seal Wash Pump 96
Release a Stuck Inlet Valve 97
Pump Head Procedures 98
- Remove the Pump Head Assembly 101
- Disassemble the Pump Head Assembly 103
- Disassemble the Primary Pump Head 105
- Disassemble the Secondary Pump Head 109
- Replacing the Heat Exchanger 113
- Replace Wash Seal and Gasket 116
- Assemble the Primary and Secondary Pump Head 118
- Reassemble the Pump Head Assembly 127
- Install the Pump Head Assembly 128

Replace the Purge Valve Head 130
Replace Parts of the High Pressure Filter Assembly 132
Install the Valve Rail Kit 134
Replace the Module Firmware 135
Prepare the Pump Module for Transport 136

This chapter describes the maintenance of the High Speed Pump.

Introduction to Maintenance

Figure 4 on page 77 shows the main user accessible assemblies of the Agilent 1290 Infinity II High Speed Pump. These parts can be accessed from the front (simple repairs) and don't require to remove the pump from the system stack.

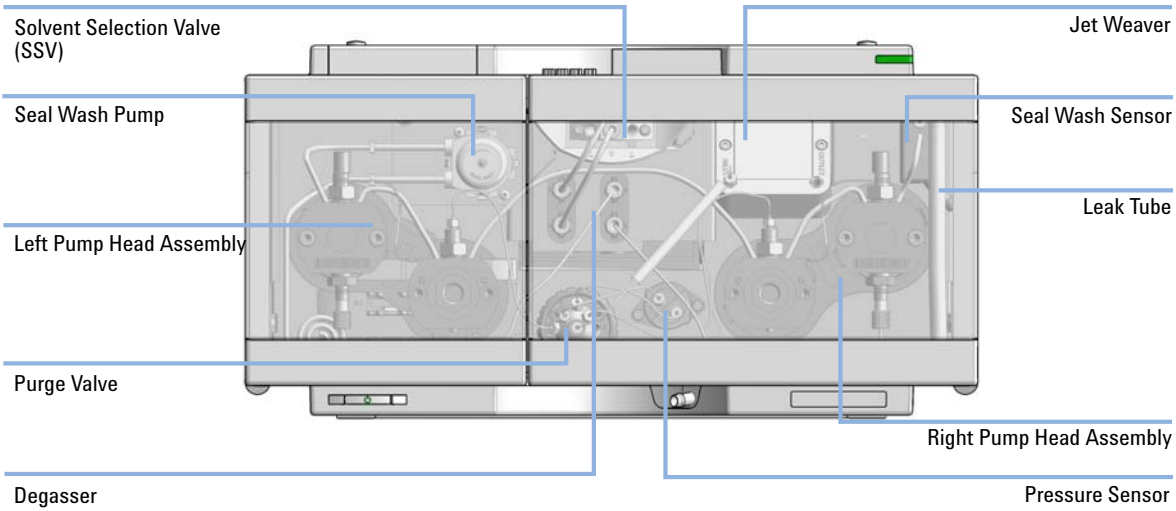


Figure 4 Maintenance parts

Figure 5 on page 78 shows the flow connections between these main assemblies.

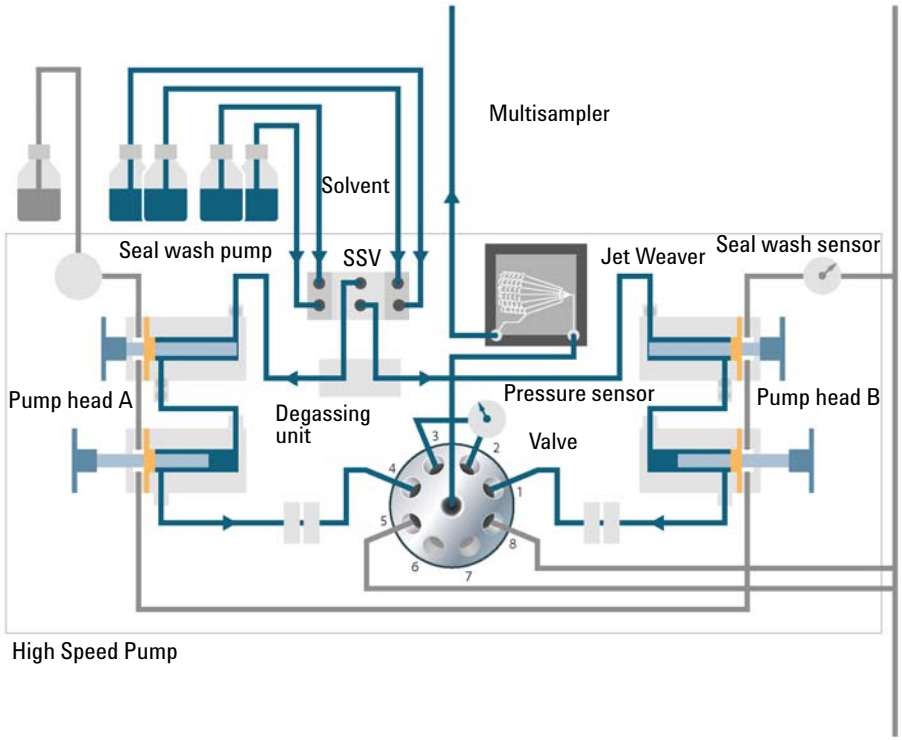


Figure 5 The hydraulic path

Recommended Interval for Preventive Maintenance

The recommended interval for preventive maintenance is:

- 100 L or 1 year (whichever comes first).

This recommendation is valid for LC instruments on which “typical” applications are running.

A “typical” application can be characterized as follows:

- pressure range 100 – 800 bar,
- flow rates 0.5 – 3.5 mL/min,
- typical solvents used in reversed phase LC.

Warnings and Cautions

WARNING

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

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

➔ Make sure that it is always possible to access the power plug.

➔ Remove the power cable from the instrument before opening the cover.

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

WARNING

Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

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

NOTE

The electronics of the module will not allow operation of the module when the top cover and the top foam are removed. A safety light switch on the main board will inhibit the operation of the fan immediately. Voltages for the other electronic components will be turned off after 30 seconds. The status lamp will light up red and an error will be logged into the logbook of the user interface. Always operate the module with the top covers in place.

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

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

➔ Do not operate the instrument in an explosive atmosphere.

CAUTION

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

ESD can damage electronic boards and components.

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

CAUTION

Safety standards for external equipment

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

Overview of Maintenance

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

Cleaning the Module

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

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

➔ Do not use an excessively damp cloth during cleaning.

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

Install Fittings and Capillaries

WARNING

Solvent can spray under high pressure.

➔ Observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing), when opening flow path.

CAUTION

Deformation of fittings and seals

Liquid drops under high pressure up to 1200 bar act like solid parts. Tightening connections under high pressure can deform or destroy fittings and seals.

➔ Never tighten flow connections under pressure.

NOTE

The lifetime of a fitting depends on how firmly it has been tightened; firm tightening reduces the lifetime.

If fitting has been overtightened, replace it.

1 Install fittings and capillaries.
2 Tighten fittings and capillaries.

Remove and Install Doors

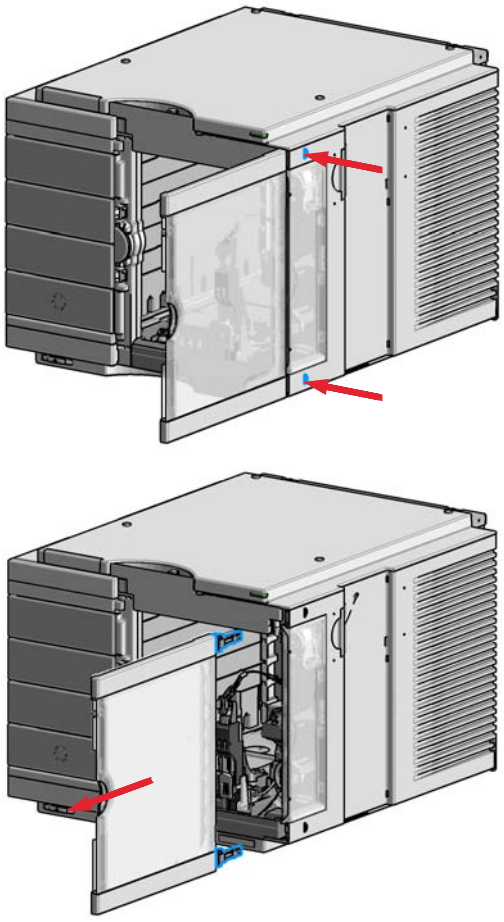
Parts required	p/n	Description
	5067-5767	Door assy 200 left IF II
	5067-5768	Door assy 200 right IF II

NOTE

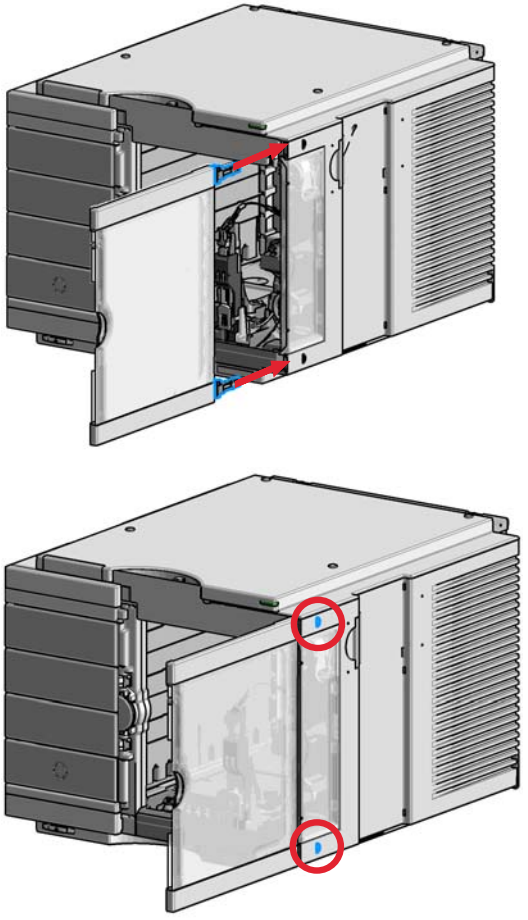
The figures shown in this procedure exemplarily show the Infinity II Multisampler module.

The principle of how to remove and/or install doors works in the same way for all Infinity II modules.

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



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



Replace the Shutoff Valve Panel

When If a shutoff valve is damaged or the panel needs to be removed for other repair procedures.

Parts required

#	p/n	Description
4	5067-4124	Shutoff valve
1	G7120-40004	Valve Holder Left
1	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit

Preparations In order to avoid leaks, remove tubings from the solvent bottles.

1. Unscrew tubing connections between shutoff valves, solvent bottles and the solvent selection valve.
2. If a single valve shall be replaced, it can be pulled to the front for removing it from its mounting.
3. Remove the shutoff valve panel by pulling it downwards.
4. After replacing the panel or after completion of other maintenance, re-install the panel and all flow connections.

Replace the Pressure Sensor

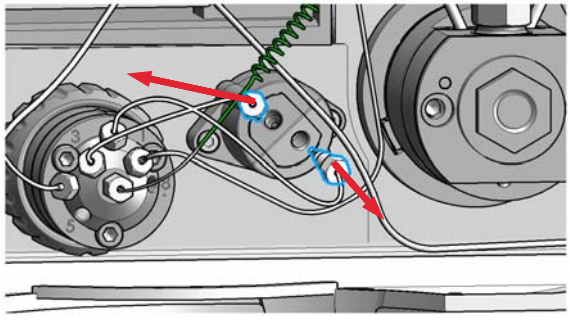
When	No or invalid pressure signal	
Tools required	**p/n**	**Description**
	8710-2412	Hex key 2.5 mm, 15 cm long, straight handle
	8710-0510	Wrench open 1/4 — 5/16 inch
		Screwdriver
Parts required	**p/n**	**Description**
	G7104-60001	Pressure sensor 1300 bar
Preparations	Turn off pump flow, switch off pump	

NOTE

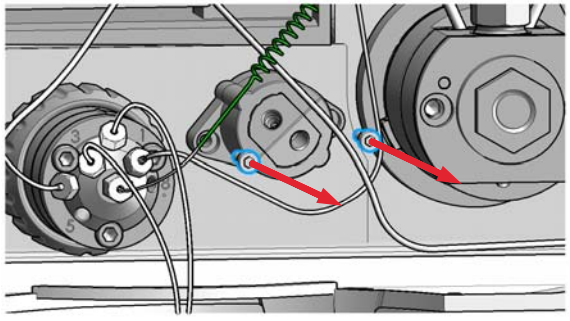
This procedure describes how to replace the pressure sensor.

In case the cable to the sensor shall be replaced as well, please contact your Agilent service representative.

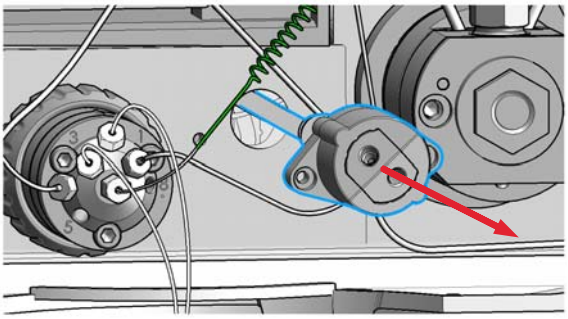
1 Remove capillary connections between the pressure sensor and purge valve.



2 Remove the screws that fix the pressure sensor to the chassis.



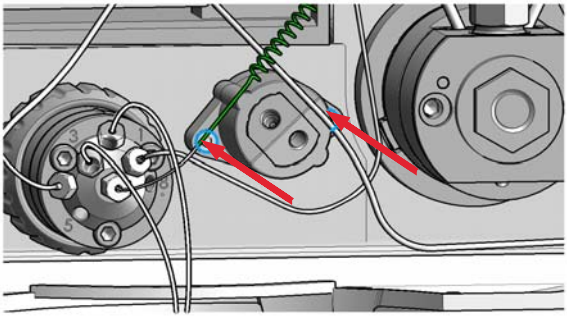
3 Carefully pull out the pressure sensor for about 2 cm. Then unscrew the cable from the pressure sensor.



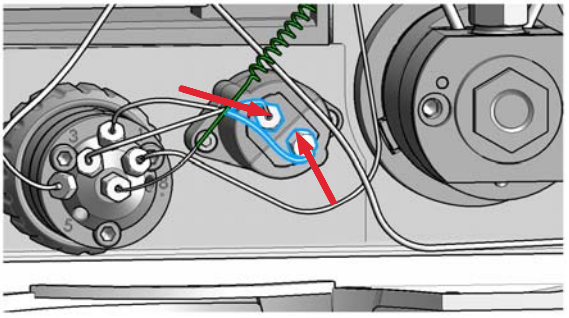
4 Connect the new pressure sensor to the pressure sensor connector.



5 Fix the pressure sensor to the instrument chassis.



6 Connect the capillaries from the valve to the pressure sensor: connect port 3 to the pressure sensor inlet and port 2 to the outlet.



Overview of Torques for Pump Head Procedures

Figure 6 on page 89 gives an overview of the torques that need to be set during maintenance of the pump heads.

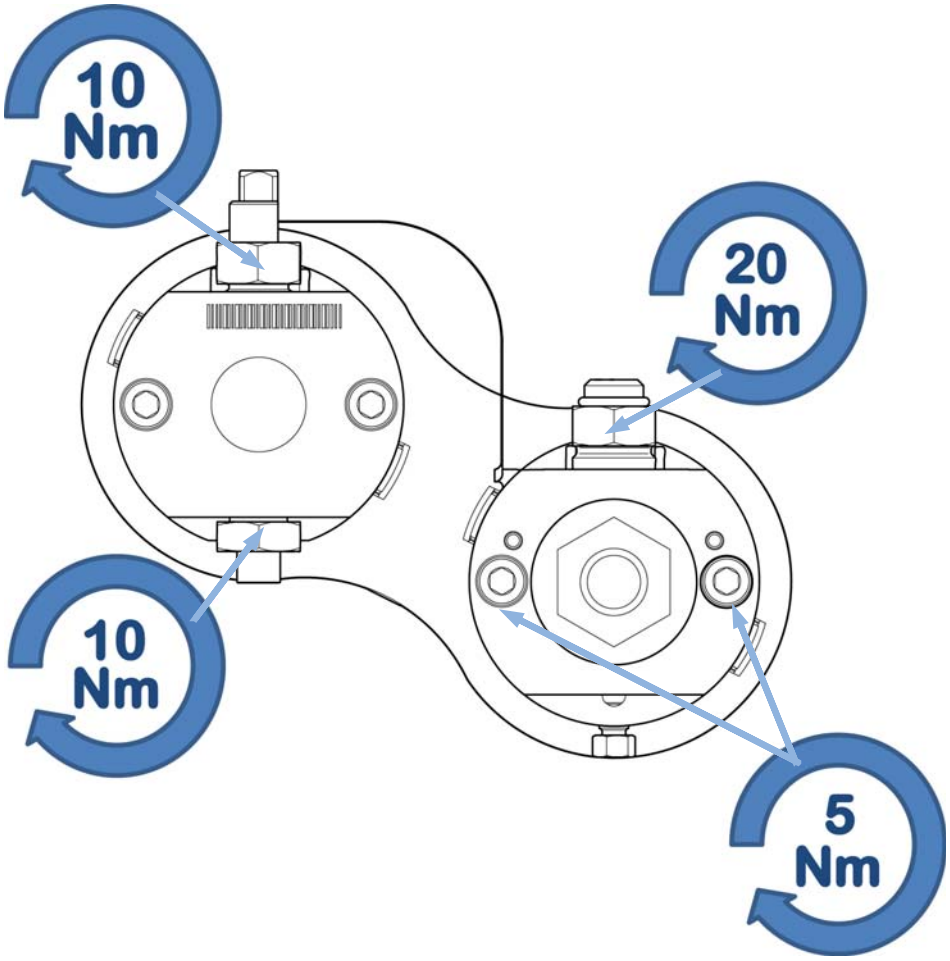


Figure 6 Overview of torques for pump head procedures

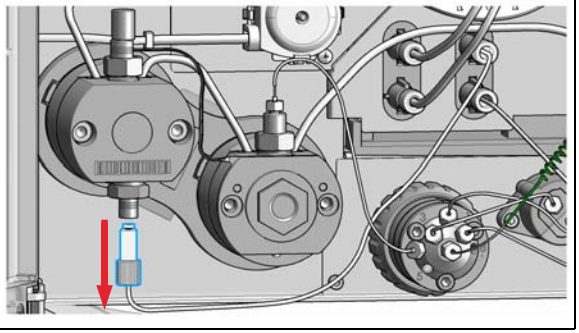
Replace the Inlet Valve

When	If Inlet valve is defective.	
Tools required	**p/n**	**Description**
		Wrench, 14 mm
	G4220-20012	Torque wrench 2 – 25 Nm
Parts required	**p/n**	**Description**
	G4220-60022	Inlet valve (primary pump head)

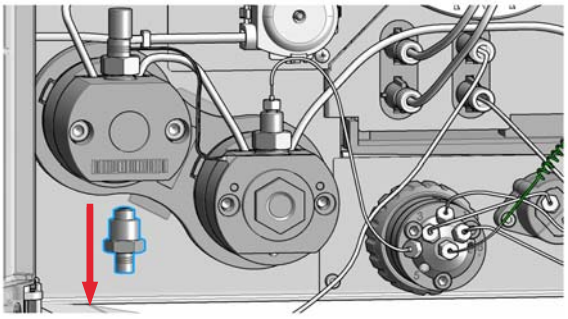
NOTE For best performance and life time and for avoiding leaks, use a torque wrench set to 10 Nm for fixing the inlet valve.

1 Close the shut off valves to avoid solvent leaks.

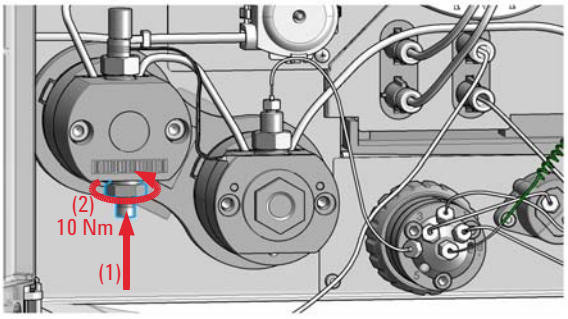
2 Unscrew the tubing at the inlet valve.



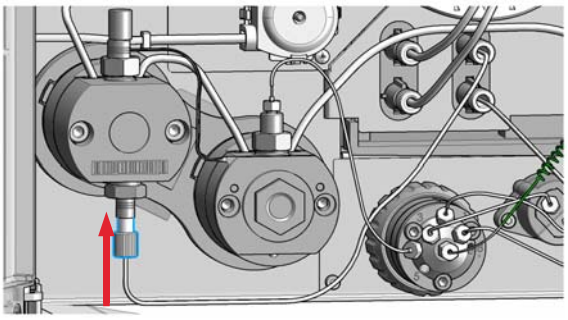
3 With a 14 mm wrench, unscrew the inlet valve and remove it.



4 Install inlet valve and tighten it at 10 Nm with a torque wrench (14 mm).



5 Attach the inlet tubing at the inlet valve.



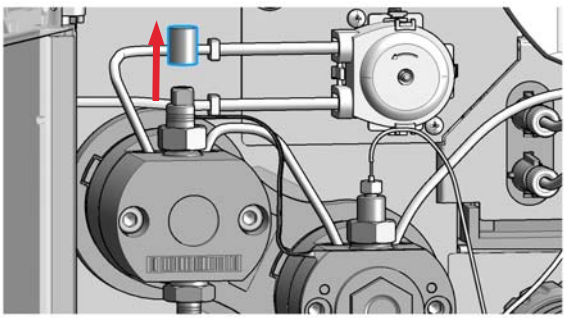
6 Open the shut off valves and purge the system to remove air.

Replace the Outlet Valve

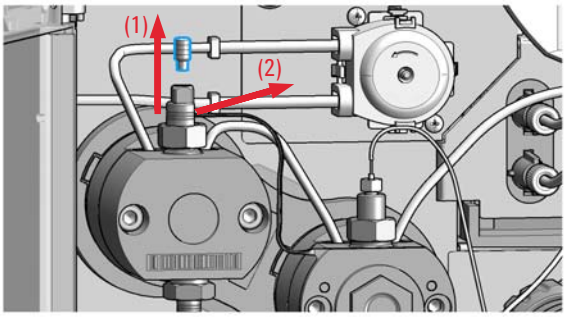
When	If Outlet valve is defective.	
Tools required	**p/n**	**Description**
	8710-0510	Wrench open 1/4 — 5/16 inch
	8710-2603	Spanner-double open ended 12X14 mm Chrome
	G4220-20012	Torque wrench 2 – 25 Nm
	G4220-20041	Bit Torx 10x25 mm
Parts required	**p/n**	**Description**
	G4220-60028	Outlet valve (primary pump head)
	G4220-20020	Internal gold seal for Outlet Valve

1 Close the shut off valves to avoid solvent leaks.

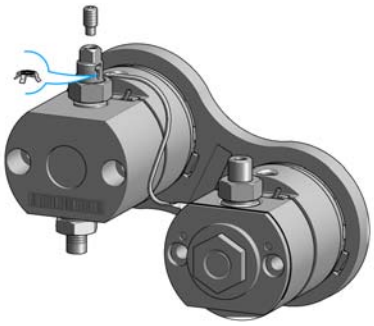
2 Remove the cap from the outlet valve.



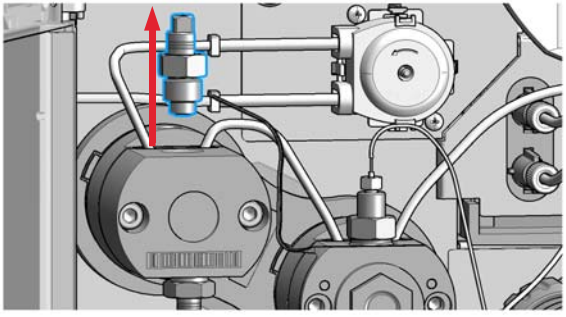
3 Open the 2.5 mm hex screw at the top of the primary pump head, which fixes the connection capillary of the heat exchanger and remove it (1). Then lift up the capillary and remove it from the primary pump head (2).



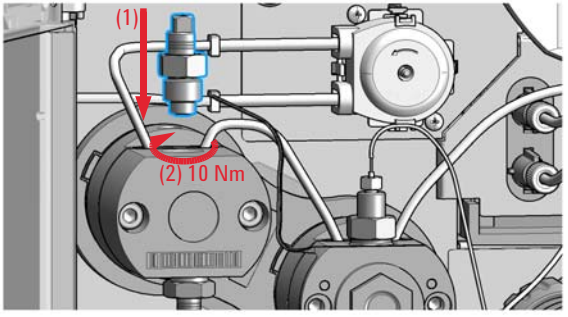
4 A gold seal between outlet valve and heat exchanger capillary is used for a tight connection. The seal can be replaced separately as needed.



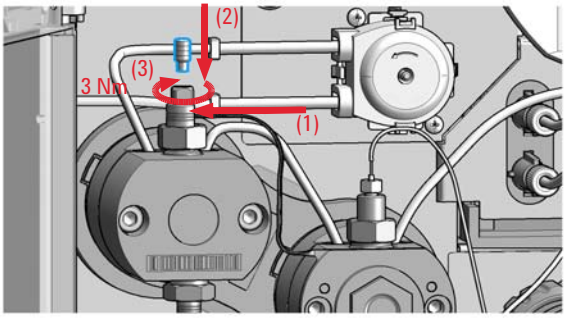
5 Unscrew the outlet valve with a 14 mm wrench.



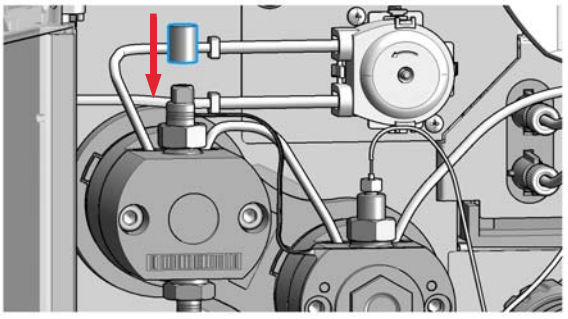
6 Insert the outlet valve into the pump head (1). Using a torque wrench, set 10 Nm and close the outlet valve (2).



7 Insert the heat exchanger capillary into the outlet of the outlet valve. Using a torque wrench with a 2.5 mm hex bit, set 3 Nm and close the hex screw at the top of the outlet.



8 Replace the cap of the Outlet Valve.



9 Open the shut off valves and purge the system to remove air.

Replace the Solvent Selection Valve (SSV)

When In case of problems with the solvent selection valve

Parts required

#	p/n	Description
1	G7120-60029	SSV Valve Assembly
2	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit

1 Close shut-off valve. Remove tubing connections between the SSV and the solvent shut-off valves and the SSV and the degassing unit inlets.

2 Push down the SSV panel for removing it.

3 Remove the connector by pushing up the small clip at the bottom of the connector.

4 Install a new SSV by inserting the connector and clipping the SSV panel to the module top panel. Then re-install all tubing connections, open shut-off valve and purge valve.

Change Configuration or Replace the Jet Weaver

When

For optimizing the pump configuration to mixing performance or low delay volumes/fast gradients, see chapter *Optimizing Performance*.

Tools required

p/n	Description
8710-0510	¼ inch wrench
	3 mm hex key

Parts required

#	p/n	Description
1	G4220-60027	Jet Weaver 35 µL/100 µL
1	G4220-60012	Jet Weaver 380 µL (OPTIONAL)
1	G4220-87000	Capillary ST 0.17 mm x 300 mm Valve to Jet Weaver

1 Remove capillary connections from the Jet Weaver.

2 Remove the hex screws that fix the Jet Weaver to the pump housing.

NOTE

The standard Jet Weaver (Jet Weaver 35 µL/ 100 µL (G4220-60027)) has a front and a rear side with different internal volumes (35 / 100 µL) that are optimized for a low delay volume or best mixing performance.

The optional Jet Weaver (Jet Weaver 380 µL (G4220-60012)) is recommended for applications which are challenging with respect to mixing noise (e.g. TFA applications) and has just one side.

3 Install new Jet Weaver or flip the Jet Weaver for backside.

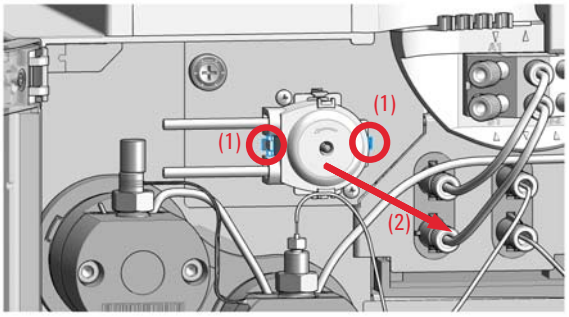
4 Reinstall the capillary connections.

The inlet at the left side of the Jet Weaver is connected to the central port of the pump valve by a capillary (length 300 mm, 0.17 mm i.d.). The outlet at the right side is connected to the autosampler.

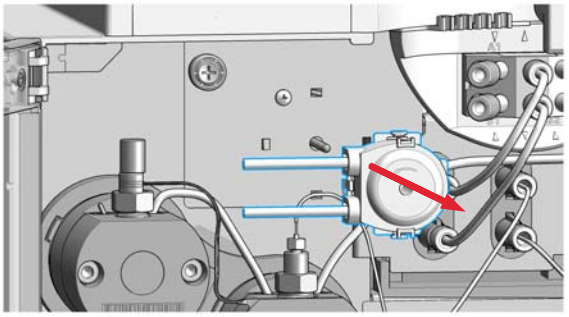
Replace the Seal Wash Pump

When	In case of wear of the seal wash pump	
Parts required	**p/n**	**Description**
	5065-4445	Peristaltic pump with Pharmed tubing
	5065-9978	Tubing, 1 mm i.d., 3 mm o.d., silicone, 5 m
Preparations	Remove the flow connections from and to the seal wash pump	

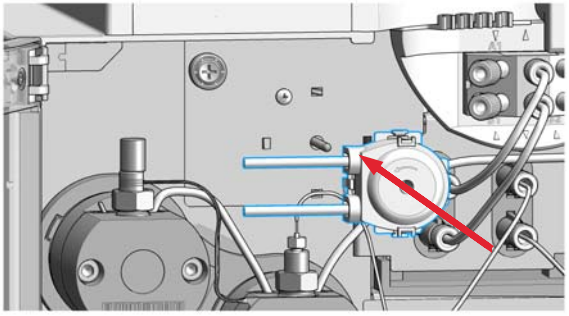
1 Press the clips.



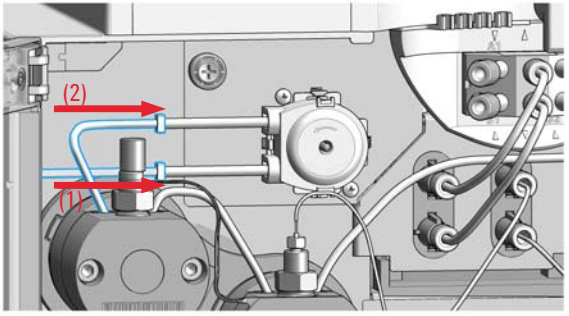
2 Pull the pump to the front.



3 Insert the pump clips to the holes in the pump housing.



4 Fix the seal wash tubings to the peristaltic pump inlet (1) and from the peristaltic pump outlet to the primary pump head inlet (2).



Release a Stuck Inlet Valve

When If inlet valve is stuck, or if pump is not generating pressure after being turned off for an extended period of time.

NOTE Before the system is turned off for an extended period of time, it should be flushed with at least 10 % isopropanol to prevent inlet valves from getting stuck.

1. Remove the capillary connection from the outlet of the secondary pump head.
2. Unscrew the tubing at the inlet valve.
3. Attach a Luer lock syringe with adapter to the tubing and fill it with solvent.
4. Reconnect tubing to inlet valve.
5. Unscrew tubing at degassing unit and attach the syringe to it.
6. Push solvent with syringe until it comes out at the top of the High Pressure Filter Assembly.
7. Detach the syringe and reconnect the tubing into the degassing unit.
8. Reinstall the capillary connection to the High Pressure Filter Assembly.
9. Purge the system to remove air.

Pump Head Procedures

CAUTION

Limitation of life time

The pump head assembly is an exchange part which cannot be reassembled with standard tools. Disassembling the pump head will strongly limit its life time.

➔ Do not disassemble the pump head assembly.

CAUTION

Damage of connections

Disassembling the flow connection between the two pump heads of the pump head assembly (solvent channel) can damage the connection and cause leaks.

➔ Do not disconnect the flow connection between the pump heads.

CAUTION

Damage of internal parts

➔ Do not apply a strong force to the screws of the pump head.

➔ Use a torque hex key for that purpose.

CAUTION

Damage of the pump piston

Removing pump heads in a position other than the maintenance position can damage the pump piston.

➔ Before switching off the pump, bring it to the maintenance position.

CAUTION

Damage of pump drives

The pump drive can be damaged if the pump initializes after switching it on without having the pump head installed properly.

➔ Use the Lab Advisor maintenance procedure for replacing pump heads.

➔ Install the pump head correctly before switching on the pump.

CAUTION

Damaged pump head

Disassembling or reassembling the pump head with tools other than the ones recommended can damage pump heads and significantly reduce their life time.

➔ Follow all instructions step by step.

➔ Use recommended tools like the pump head alignment tool and a torque wrench.

CAUTION

Damage of pump piston

The pump piston is made of ZrO_2-based ceramic, which is a very hard and resistant material, but it is sensitive to shearing forces from the side.

➔ Do not try to remove the pump piston from the rear.

➔ Do not use the piston for removing pump seals.

NOTE

Procedure is valid for primary and secondary pump head.

NOTE

You may assemble pump head parts only correctly. If parts are in wrong orientation, the screws do not fit in.

NOTE

Seals:

Always orientate the seals with the spring side towards the part.

Store seals in isopropanol and fit seals in wet.

HINT

Always ultrasonicate seals in solvent, to clean seals properly.

Obey the following order, to clean seals properly:

1. H_2O (tab)
2. H_2O (dest)
3. H_2O/Isopropanol 50%/50%
4. Isopropanol 100%

NOTE

If the pump head has been initialized without pump, this may have damaged the pump drive. In this case, please contact your local Agilent service organisation.

Remove the Pump Head Assembly

Tools required	p/n	Description
	8710-0510	Wrench open 1/4 — 5/16 inch
	5043-1361	Hex Key Set Driver
	5023-2499	Hex Key Set

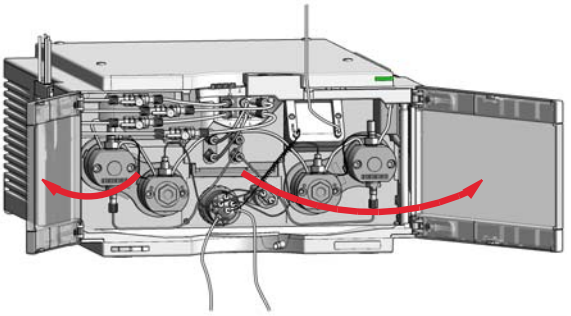
NOTE

This procedure describes the replacement of the left pump head assembly. Similarly, the right pump head assembly can be replaced.

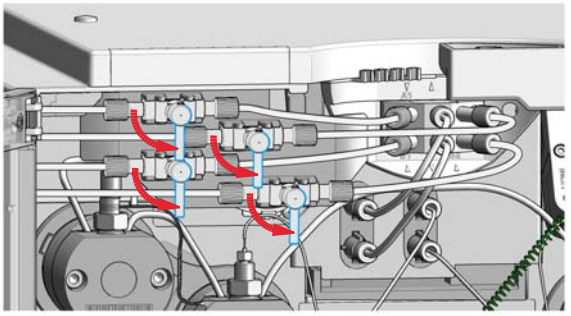
One pump head assembly consists of two pump heads, which are both removed at the same time.

1 In Lab Advisor go to **Tools > Remove/Install Pump Head** and follow instructions given on the screen.

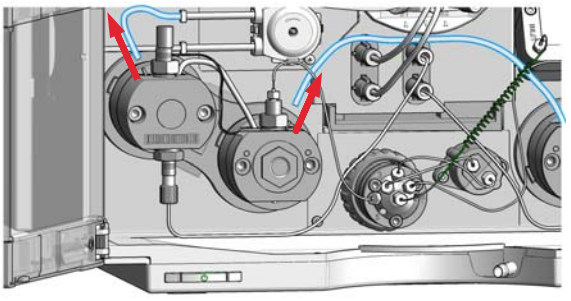
2 Open the doors.



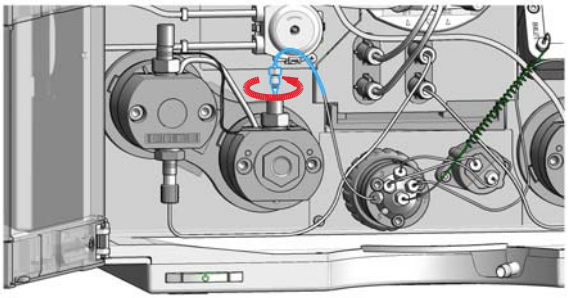
3 Close all shut-off valves.



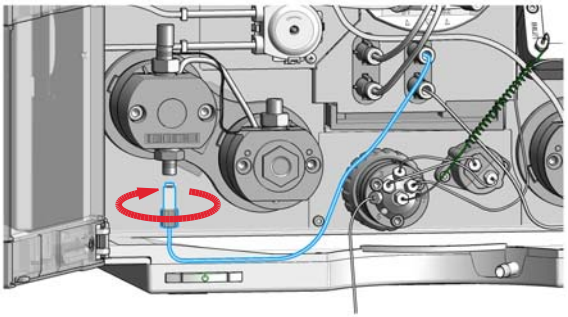
4 Remove the seal wash tubes.



5 Remove the capillary connection at the top of the secondary pump head to the pump valve.



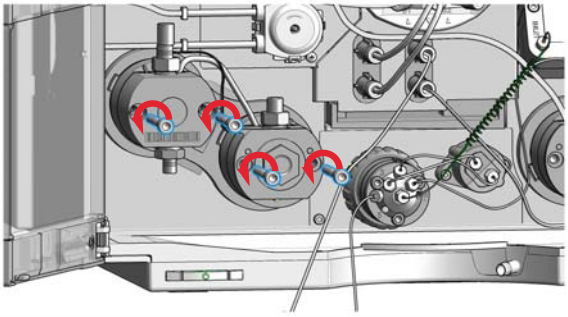
6 Remove the flow connection between the degassing unit and the primary pump head inlet.



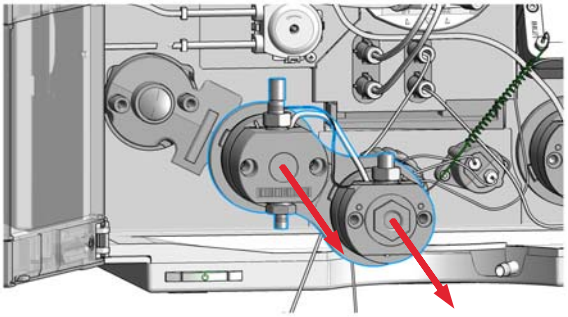
7 Open the four screws holding the pump heads.

NOTE

Open the screws step by step, not screw by screw.



8 Remove the complete pump head assembly by holding both heads and pulling it to the front.



9 Proceed to install (see "Install the Pump Head Assembly" on page 128) or disassemble the pump head (see "Disassemble the Pump Head Assembly" on page 103).

Disassemble the Pump Head Assembly

When If parts inside the pump head need to be replaced

Tools required

p/n	Description
5043-1361	Hex Key Set Driver
5023-2499	Hex Key Set
5023-2501	Screwdriver Torx-T10
8710-1924	Wrench open 14 mm

Preparations Remove the pump head

CAUTION

Damaged pump head

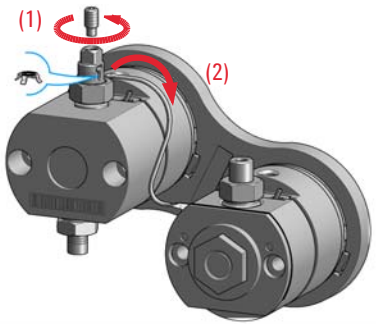
Disassembling or reassembling the pump head with tools other than the ones recommended can damage pump heads and significantly reduce their life time.

➔ Follow all instructions step by step.

➔ Use recommended tools like the pump head alignment tool and a torque wrench.

1 Place the pump head on a special holding tool.

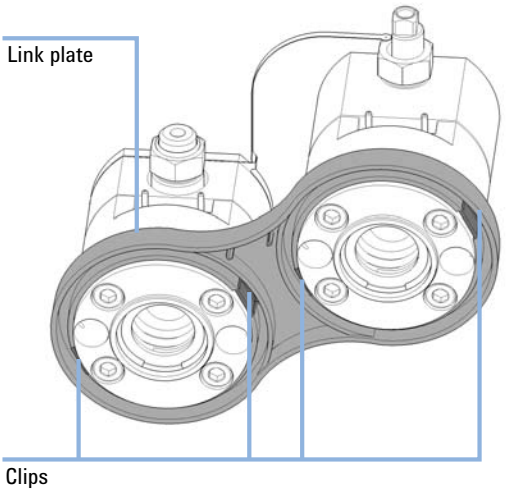
2 Open the screw at the top of the primary pump head, which fixes the connection capillary of the heat exchanger (1). Then lift up the capillary and remove it from the primary pump head (2).



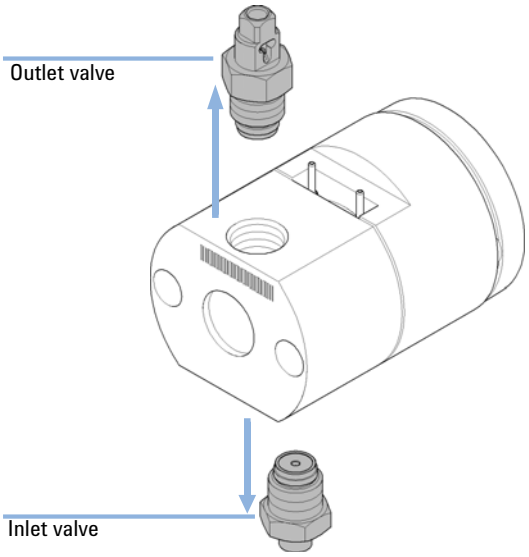
NOTE

A gold seal between outlet valve and heat exchanger capillary is used for a tight connection.

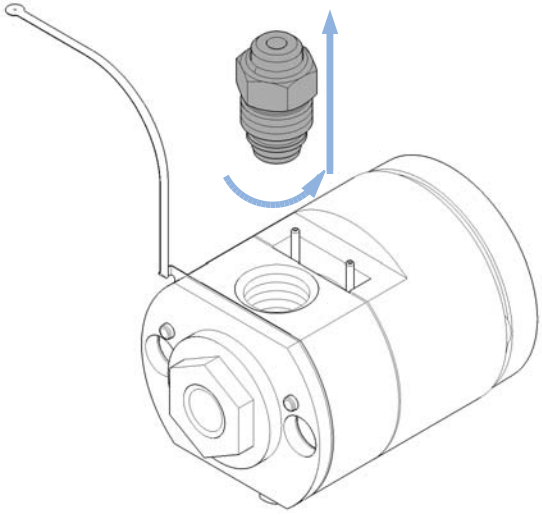
3 Remove both pump heads from the link plate by pushing the clips at the rear of the plate.



4 Remove the outlet valve at the top of the pump head and the inlet valve at the bottom of the pump head.



5 Remove the filter assembly at the top of the pump head.



Disassemble the Primary Pump Head

CAUTION

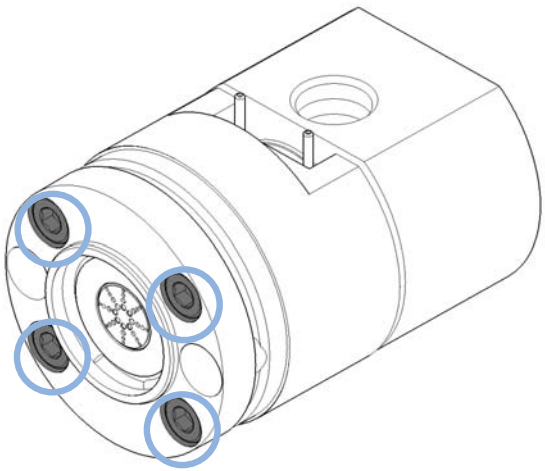
Damage of pump piston

The pump piston is made of ZrO_2-based ceramic, which is a very hard and resistant material, but it is sensitive to shearing forces from the side.

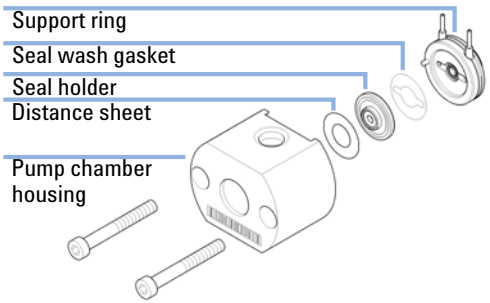
➔ Do not try to remove the pump piston from the rear.

➔ Do not use the piston for removing pump seals.

1 For disassembling the pump head, remove the 4 hex screws at the rear of the pump head.

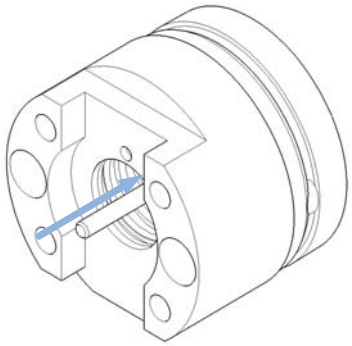


2 Remove the front part of the pump head including pump chamber housing with pump seal, distance sheet, support ring, seal holder including backup ring, and the gasket.



3 Remove the piston from the piston housing by pushing it to the rear, then pull it out from the rear.

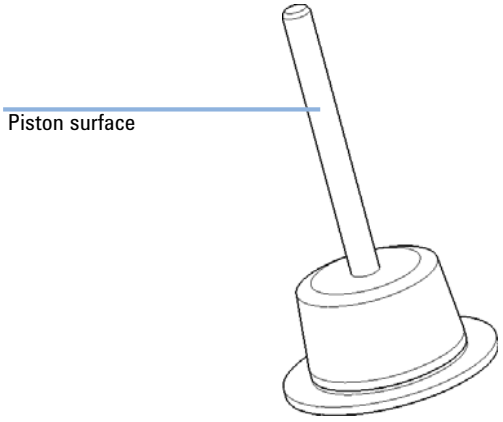
,



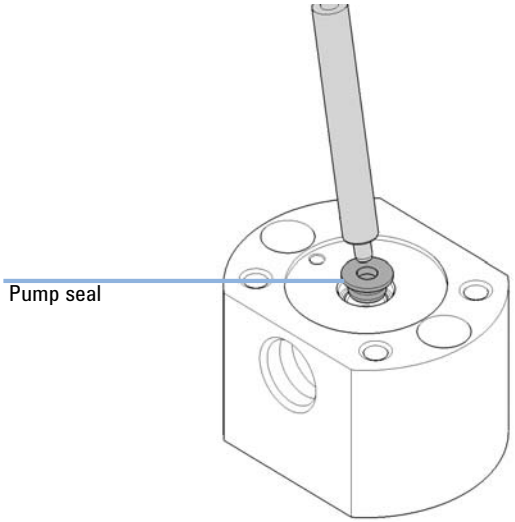
4 Check the pump pistons for scratches, grooves, and dents when changing the piston seals.

NOTE

Damaged pistons cause micro leaks and will decrease the lifetime of the seals.



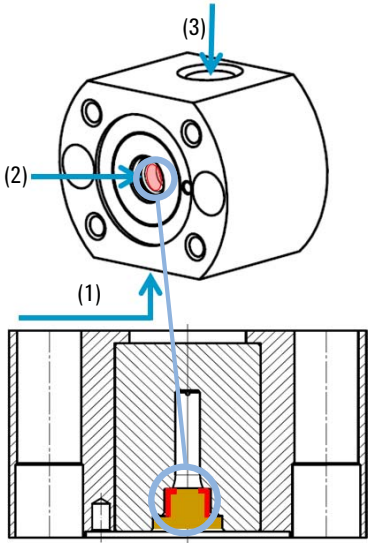
5 Use the steel side of the insert tool for removing the pump seal from the pump chamber housing.



NOTE

Do not use the pump piston for that purpose, as this can break it!

6 To flush out particles from the pump head, use pressurized air ((1), (2) and (3)).



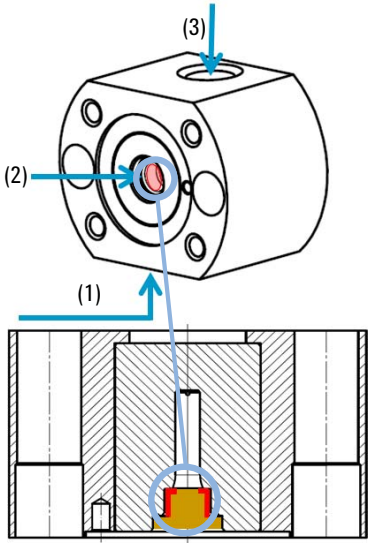
NOTE

Pump head parts in contact with the piston seal need to be cleaned properly in order to get a smooth surface and a tight connection.

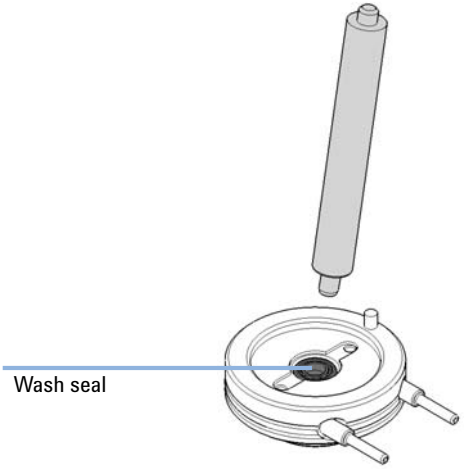
7 To remove wear, use isopropanol.

8 To clean the piston and the pump head surface, use the ultra fine abrasive mesh (p/n 8660-0852).

9 To dry the pump head and to remove residues, use pressurized air ((1), (2) and (3)).



10 If the wash seal shall be replaced by a new one, use the steel side of the insert tool for removing it.



Disassemble the Secondary Pump Head

CAUTION

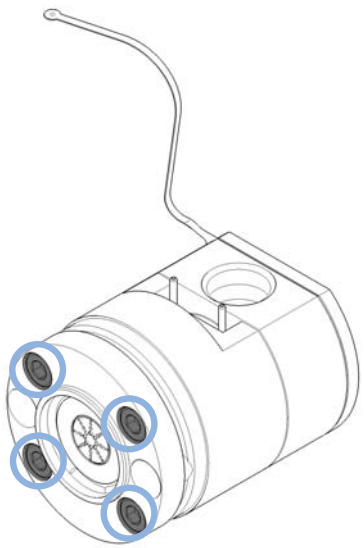
Damage of pump piston

The pump piston is made of ZrO_2-based ceramic, which is a very hard and resistant material, but it is sensitive to shearing forces from the side.

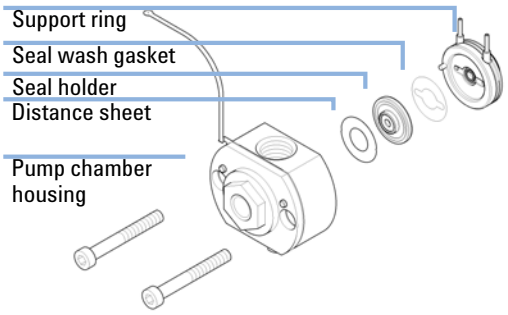
➔ Do not try to remove the pump piston from the rear.

➔ Do not use the piston for removing pump seals.

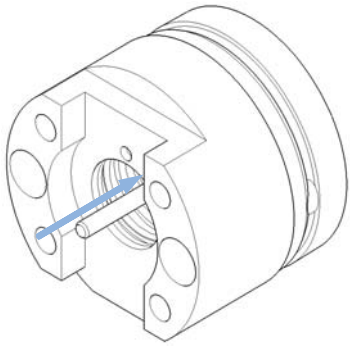
1 For disassembling the pump head, remove the 4 hex screws at the rear of the pump head.



2 Remove the front part of the pump head including pump chamber housing, distance sheet, pump seal and seal holder, and support ring with wash seal and gasket.



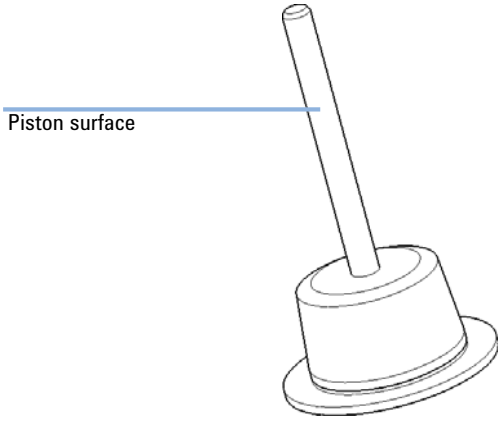
3 Remove the piston from the piston housing by pushing it to the rear, then pull it out from the rear.



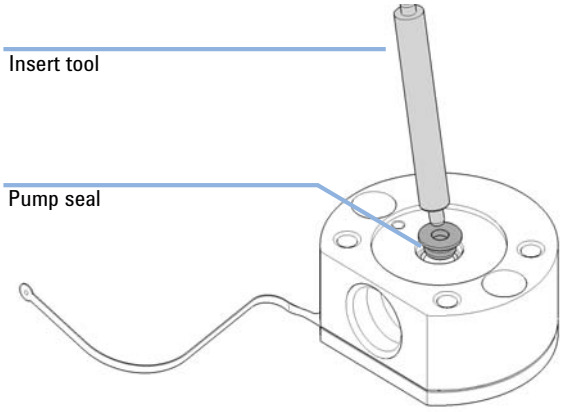
4 Check the pump pistons for scratches, grooves, and dents when changing the piston seals.

NOTE

Damaged pistons cause micro leaks and will decrease the lifetime of the seals.



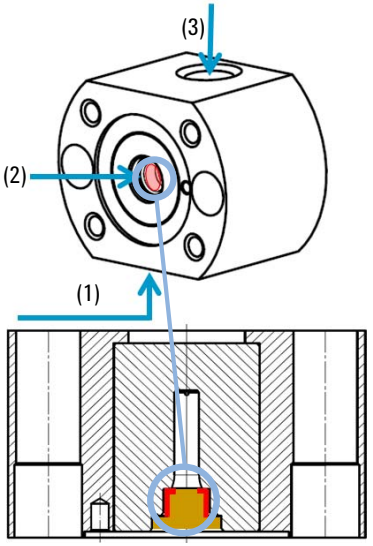
5 Use the steel side of the insert tool for removing the pump seal from the pump chamber housing.



NOTE

Do not use the pump piston for that purpose, as this can break it!

6 To flush out particles from the pump head, use pressurized air ((1), (2) and (3)).



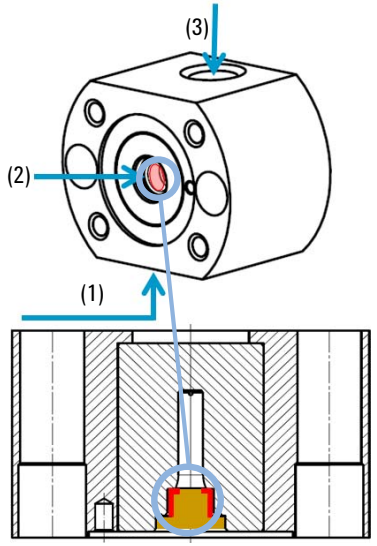
NOTE

Pump head parts in contact with the piston seal need to be cleaned properly in order to get a smooth surface and a tight connection.

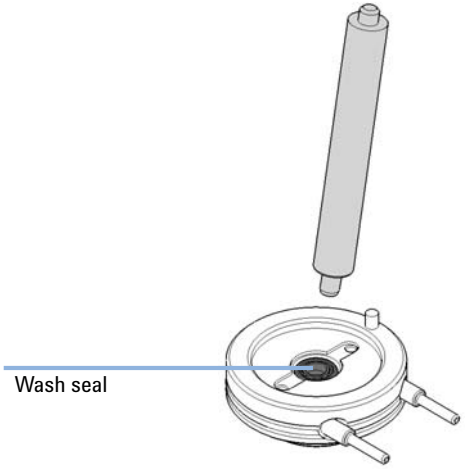
7 To remove wear, use isopropanol.

8 To clean the piston and the pump head surface, use the ultra fine abrasive mesh (p/n 8660-0852).

9 To dry the pump head and to remove residues, use pressurized air ((1), (2) and (3)).



10 If the wash seal shall be replaced by a new one, use the steel side of the insert tool for removing it.



Replacing the Heat Exchanger

Tools required	p/n	Description
		Wrench, 19 mm
	5023-2501	Screwdriver Torx-T10

Parts required	p/n	Description
	G4220-81013	Heat Exchanger (secondary pump head only)
	G4220-81012	Heat Exchanger (secondary pump head only)
	G4220-20028	Headless screw for 1290 Infinity pump heads
	G4220-20001	Spacer Fitting

Preparations

- Remove the pump head assembly from the pump
- Remove the secondary pump head from the link plate

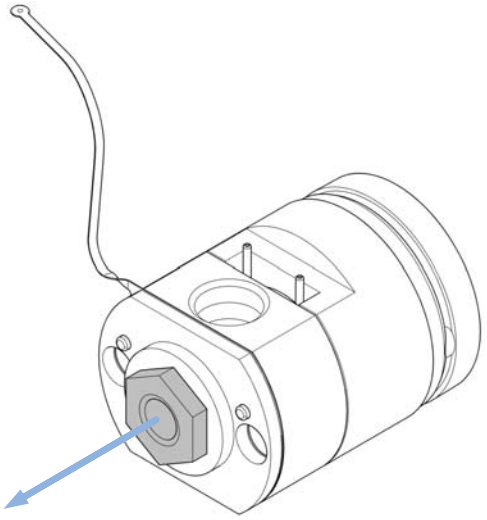
CAUTION

Loss of small spacer fitting

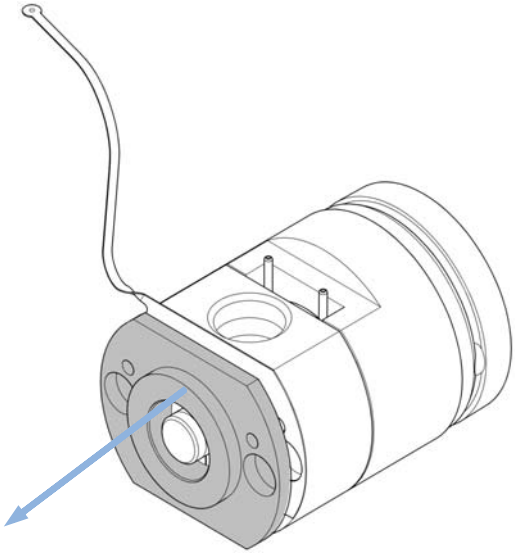
Inside the secondary pump head is a small spacer fitting, which can be dropped easily when removing the heat exchanger.

➔ The heat exchanger does not need to be removed for pump head maintenance.

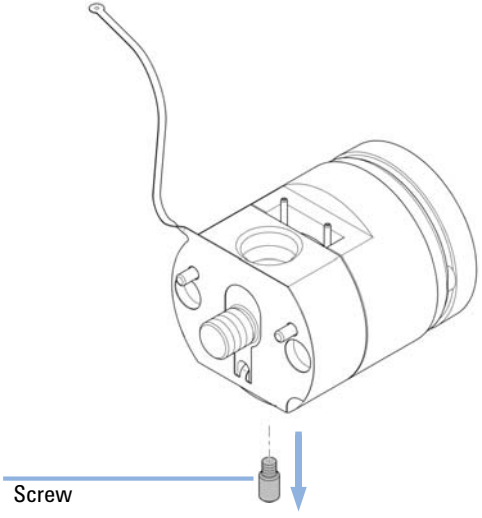
1 Remove the 19 mm screw at the front of the secondary pump head.



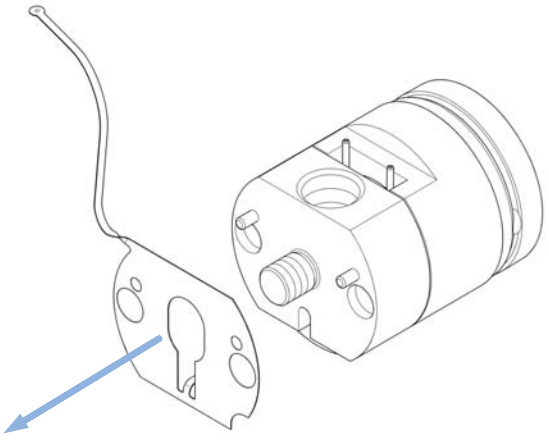
2 Remove the front plate.



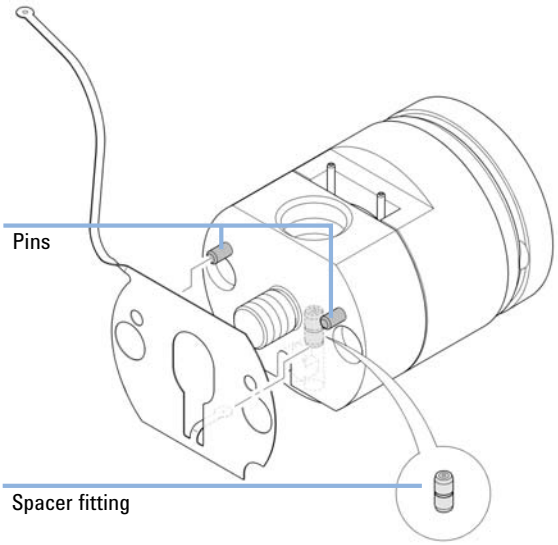
3 Remove the screw at the bottom of the pump head. Do not drop the golden spacer fitting.



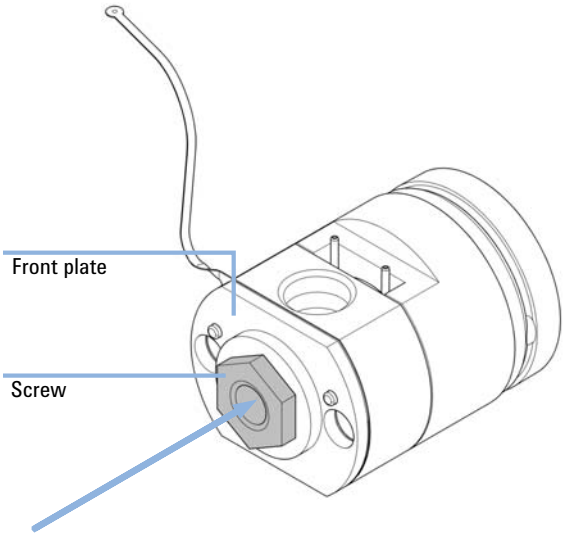
4 Lift out the heat exchanger.



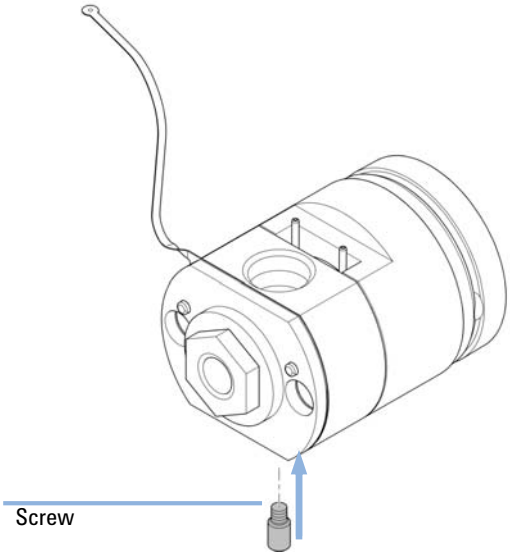
5 If removed, first insert the spacer fitting. Then insert the new heat exchanger to the opening in the pump head and lift it over the pins.



6 Use the 19 mm screw for fixing the front plate.



7 Insert and fix the screw.

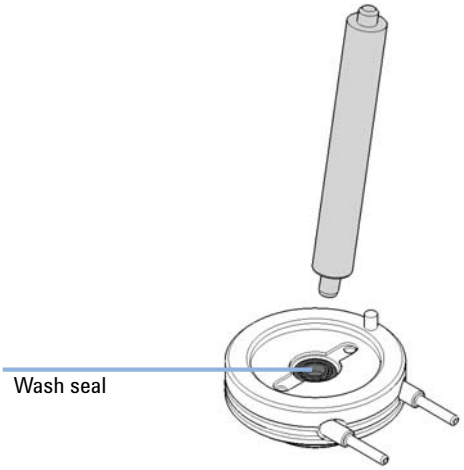


Replace Wash Seal and Gasket

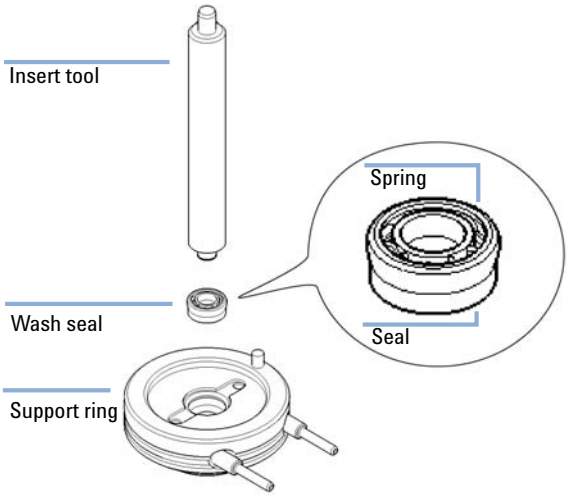
Tools required	p/n	Description
	01018-23702	Insert tool

Parts required	p/n	Description
	0905-1718	Wash Seal PE
	5062-2484	Gasket, seal wash (pack of 6)

1 If the wash seal shall be replaced by a new one, use the steel side of the insert tool for removing it.



2 Use the soft plastic side of the insert tool for inserting the wash seal into the support ring.



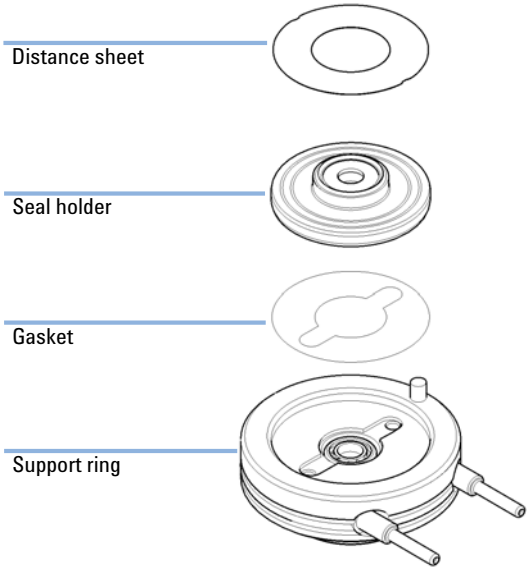
NOTE

Clean seals before reinstallation or use new ones.

NOTE

Store seals in isopropanol bath before installation.

3 Put the gasket into the support ring and insert the seal holder.



Assemble the Primary and Secondary Pump Head

This procedure describes how to assemble the secondary pump head using the pump head alignment tool. Assembling the primary pump head can be done accordingly. The secondary pump head has the heat exchanger capillary, which must fit into the openings of the alignment tool, whereas the primary pump head does not have a heat exchanger.

When Before installing the pump head.

Tools required

p/n	Description
	Pump head alignment tool
G4220-20012	Torque wrench 2 – 25 Nm
G4220-20013	4 mm hex bit
G4220-20041	Bit Torx 10x25 mm
G4220-20015	Adapter ¼ in square to hex
01018-23702	Insert tool

Parts required

p/n	Description
0905-1719	PE Seal

See chapter *"Parts"* for details.

CAUTION

Damage of the pump piston

The pump piston is very sensitive to shearing forces from the side.

➔ Use the alignment piston of the pump head alignment tool for the alignment procedure described below.

CAUTION

Wrong orientation of pins on support ring

Assembling the pump head without paying attention to the correct orientation of the pins on the support ring can lead to leaks or damage of the piston and pump head.

➔ Observe pins on the support ring, which help assembling the parts of the pump head in the correct orientation.

CAUTION

Damage of the pump head assembly

When installing the pump head assembly, the pump drives need to be in maintenance position, where they are retracted. Using the pump drive in default position will damage the pump head assembly.

➔ Bring the pump drive to the maintenance position.

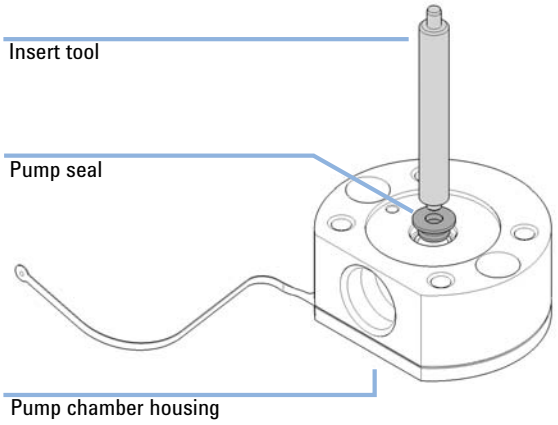
CAUTION

Damage to the pump head

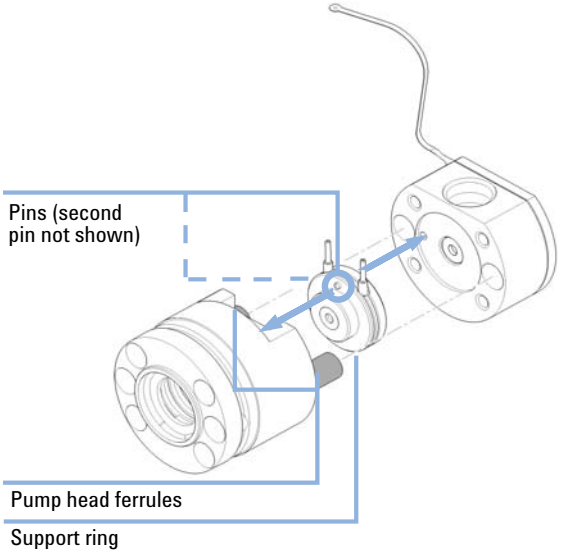
Using a wrong torque will damage the pump head.

➔ For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.

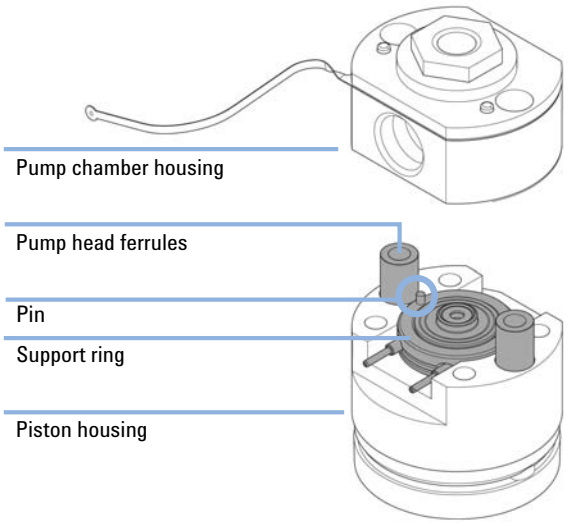
1 Use the soft plastic side of the insert tool for inserting the piston seal to the pump chamber housing. Wet the piston seal with isopropanol or another suitable solvent before insertion.



2 Insert the support ring and pump head ferrules into the piston housing. Observe the pins on the support ring, which help you assembling the pump head correctly.



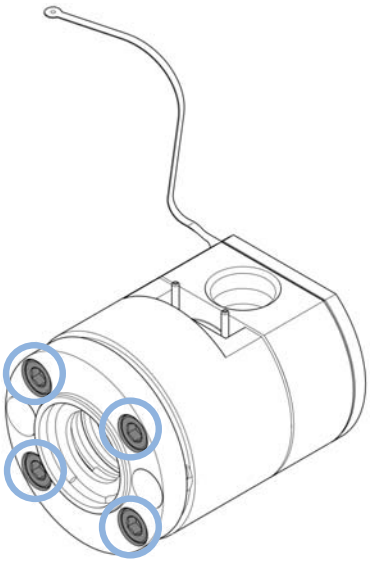
3 Assemble the pump head by putting the pump chamber housing on top of the support ring. Observe correct orientation of the pin.



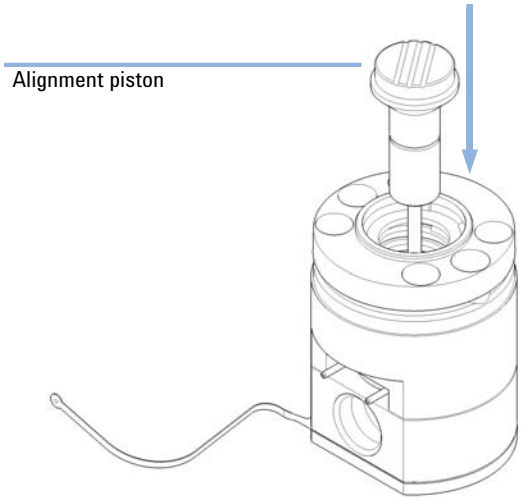
NOTE

Do NOT install the inlet and outlet valves and the outlet filter at this stage.

4 Loosely close the 4 screws at the rear of the pump head. The screws will be fixed tightly later.



5 Insert the alignment piston of the pump head alignment tool. Lubricate the alignment piston with isopropanol or another suitable solvent before insertion.



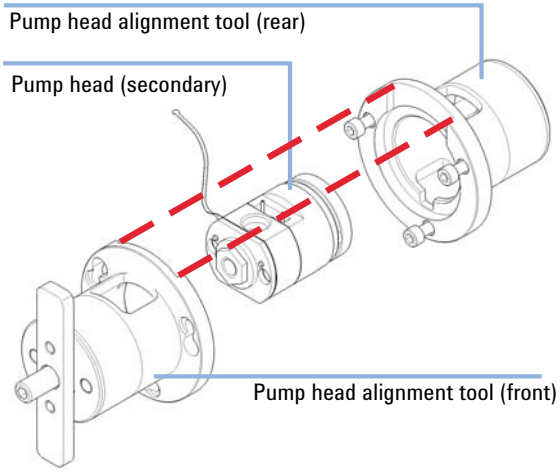
CAUTION

Damage to the pump head.

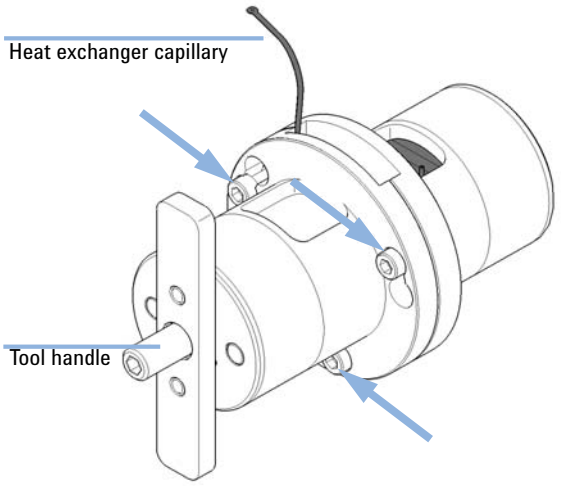
➔ **Using the alignment tool is mandatory.**

➔ **Not using will break the pump head.**

6 Insert the pump head to the pump head alignment tool, which is included to the 1290 Infinity Service Kit p/n 5067-4699. There are openings for the seal wash support ring and heat exchanger of the secondary pump head. Observe the correct orientation of all parts.



7 Close the tool by closing the three screws at the connection ring.

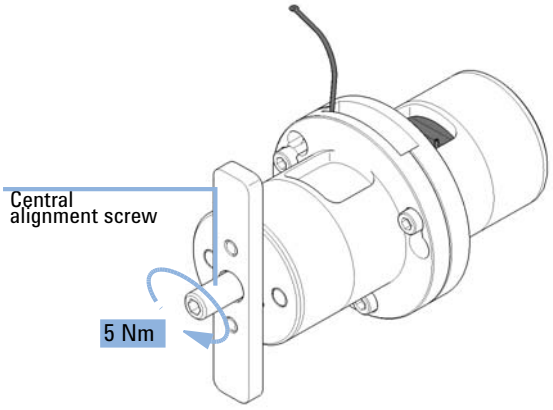


CAUTION

Damage to the pump head
Using a wrong torque will damage the pump head.

→ **For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.**

8 Using a torque key, which is included to the 1290 Infinity Service Kit p/n 5067-4699, set 5 Nm and fix the central alignment screw.

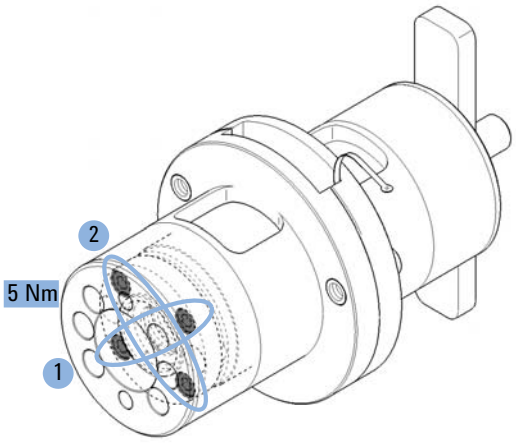


CAUTION

Damage to the pump head
Using a wrong torque will damage the pump head.

➔ **For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.**

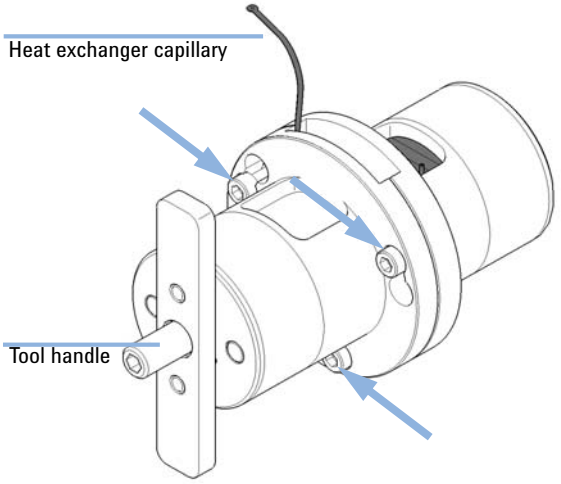
9 Using a torque key, which is included to the 1290 Infinity Service Kit p/n 5067-4699, set 5 Nm and fix the 4 screws at the rear of the alignment tool. Tighten screws crosswise.



NOTE

This procedure will align pump head parts to their correct positions and close the pump head tightly.

10 Open the 3 screws which have closed the pump head alignment tool and take out the aligned pump head. In case the pump head sticks inside the alignment tool, you can use the handle and insert it to the rear of the tool for pushing out the pump head.

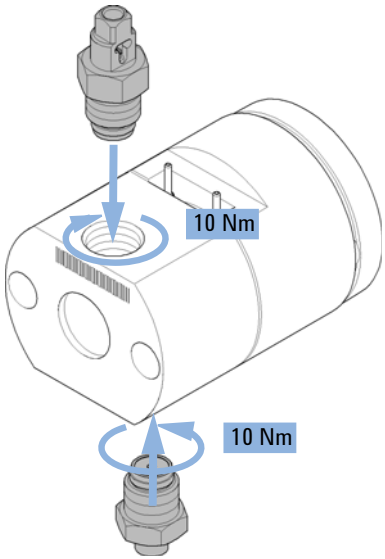


CAUTION

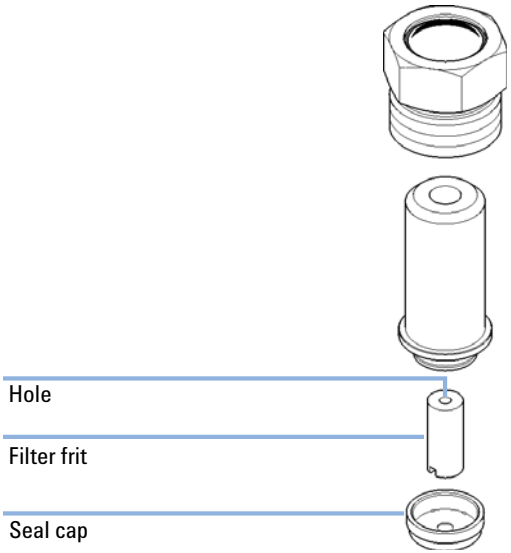
Damage to the pump head
Using a wrong torque will damage the pump head.

➔ **For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.**

11 For the primary pump head, install the inlet valve and outlet valve using the torque wrench, which is included to the 1290 Infinity Service Kit p/n 5067-4699. Set 10 Nm for the inlet valve and 10 Nm for the outlet valve.



12 Replace the filter frit and seal cap as desired. Please note the correct orientation of the filter frit.

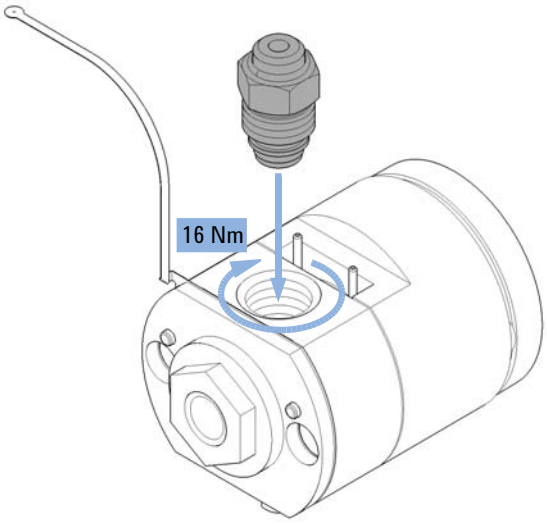


CAUTION

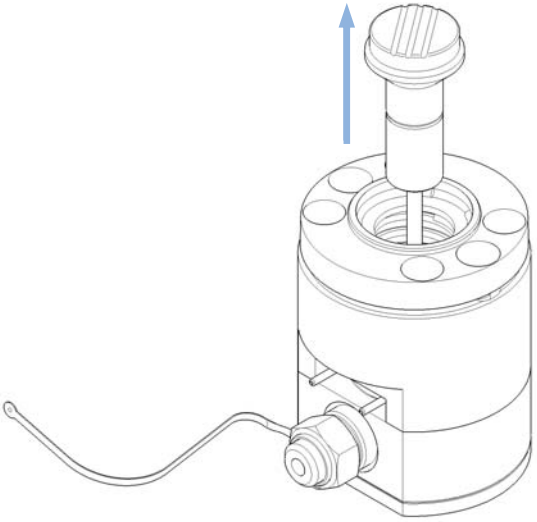
Damage to the pump head
Using a wrong torque will damage the pump head.

➔ **For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.**

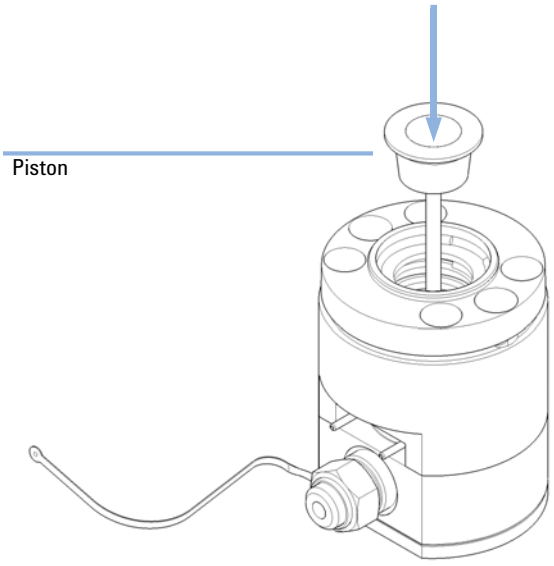
13 For the secondary pump head, assemble and install the high pressure filter assembly using the torque wrench (14 mm hex wrench), which is included to the 1290 Infinity Service Kit p/n 5067-4699, set to 16 Nm.



14 Remove the alignment piston.

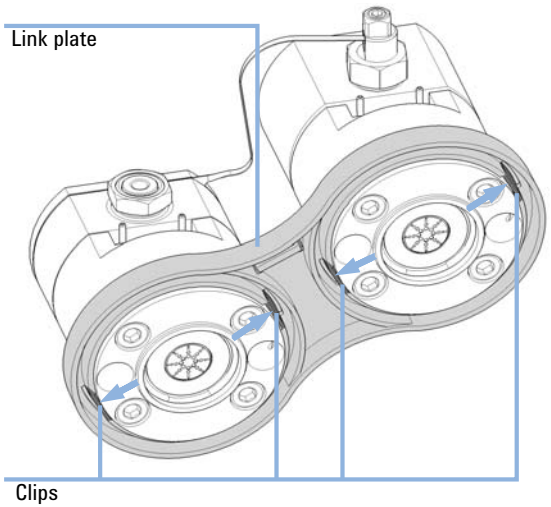


15 Lubricate the pump piston with isopropanol or another suitable solvent, and insert it.



Reassemble the Pump Head Assembly

1 Insert both pump heads to the link plate and make sure that the clips snap in that fix the pump heads.



NOTE

Observe the correct orientation of the primary and the secondary pump head. This is important for correct fixation of the heat exchanger and the capillaries, as described in the following steps.

NOTE

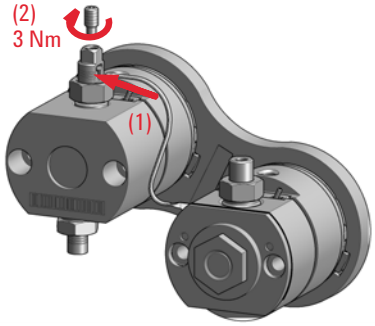
Mind the orientation of the ID tag.

CAUTION

Damage to the pump head
Using a wrong torque will damage the pump head.

➔ **For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.**

2 Insert the heat exchanger capillary into the outlet of the primary pump head (1). Using a torque key, which is included to the 1290 Infinity Service Kit p/n 5067-4699, set 3 Nm and close the screw at the top of the outlet (2).



Install the Pump Head Assembly

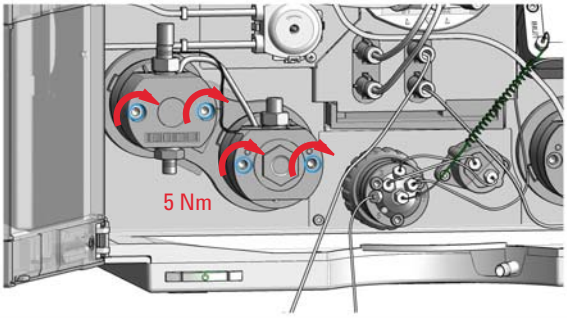
1 Bring the pump drive to the maintenance position using the Lab Advisor user interface: Go to **Tools > Remove/Install Pump Head** and follow instructions given on the screen. Both pump drives must be retracted.

CAUTION

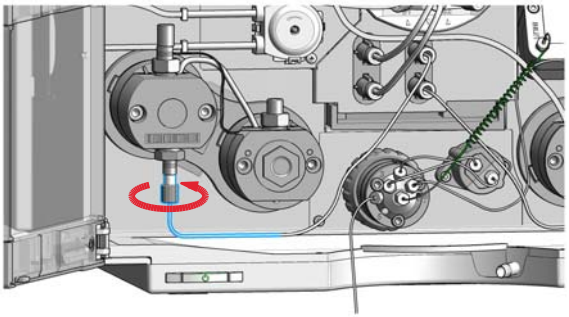
Damage to the pump head
Using a wrong torque will damage the pump head.

➔ **For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.**

2 Install the new pump head assembly by tightening the screws step by step. Apply 5 Nm using a torque hex key, which is included to the 1290 Infinity Service Kit p/n 5067-4699.



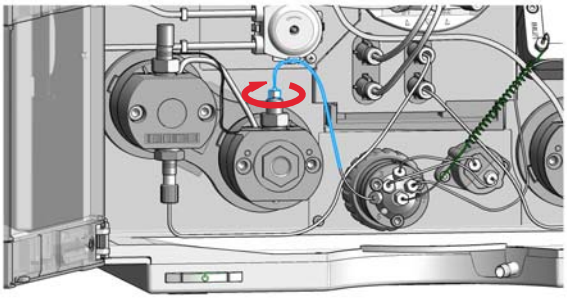
3 Connect the degassing unit outlet to the inlet of the primary pump head.



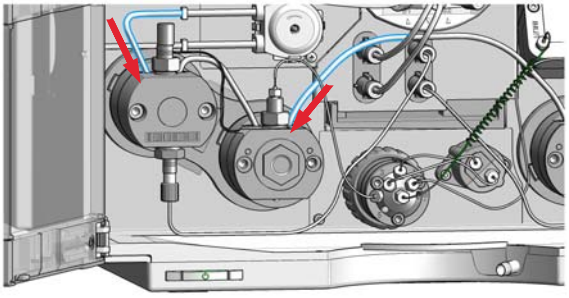
4 Connect the outlet of the secondary pump head to the inlet of the purge valve.

NOTE

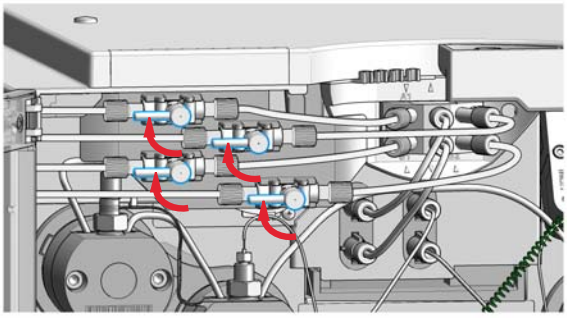
Channel A (left pump head assembly) is connected to port 4, channel B (right pump head assembly) to port 1 of the purge valve.



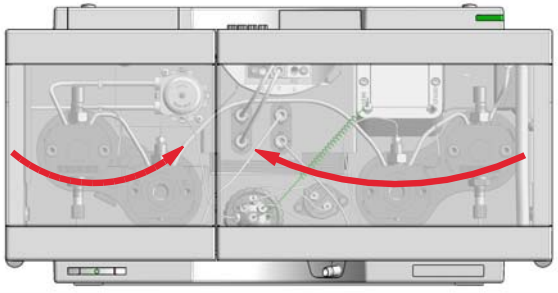
5 Replace the seal wash tubes.



6 Open the shut-off valves.



7 Close the doors.



8 Perform a Pump Leak Rate Test and a System Pressure Test.

Replace the Purge Valve Head

When In case of problems with the purge valve

Parts required

p/n	Description
tbd	Purge valve head
5067-4655	Capillary ST, 0.25 mm x 235 mm
G4220-87000	Capillary ST 0.17 mm x 300 mm
01090-87308	Capillary ST, 0.25 mm x 130 mm

Preparations Remove all capillary connections to the purge valve

CAUTION

Potential damage of valve head or malfunction of valve

When the pump is switched on, the valve tag is accessed (read/write) and used for correctly positioning the valve.

If the valve head is replaced while the pump is on, invalid information may be written to the valve head making it unusable, or positioning may be wrong resulting in wrong flow connections inside the valve potentially damaging parts.

➔ Switch off the pump before working on the purge valve.

CAUTION

Bias measurement results

The valve drive contains sensitive optical parts. Pollution of these parts can impair the accurate selection of valve ports and therefore bias measurement results.

➔ Protect the optical parts from dust and other pollutions.

1 Remove all capillary connections. Then unscrew the black union nut and remove the head of the purge valve by pulling it to the front.

2 Put the new valve head onto the valve drive such that the lobe fits to the groove. Screw the valve head onto the valve drive using the union nut.

3 Install all flow connections:

- Port 1 is connected to the outlet of the secondary pump head of channel B
- Port 2 is connected to the outlet of the pressure sensor
- Port 3 is connected to the inlet of the pressure sensor
- Port 4 is connected the outlet of the secondary pump head of channel A
- Ports 5 and 6 are connected to waste capillaries
- The central port is connected to the Jet Weaver inlet

Replace Parts of the High Pressure Filter Assembly

When

For removing blockages and leaks in the high pressure filter assembly. The filter frit in the outlet valve should be replaced regularly depending on the system usage. Other parts are covered by the Agilent Preventive Maintenance (PM) Service.

Tools required

p/n	Description
G4220-20012	Torque wrench 2 – 25 Nm
G4220-20015	Adapter ¼ in square to hex
	14 mm Hex bit

Parts required

#	p/n	Description
1	01018-22707	PTFE frits (pack of 5)
1	5067-4728	Seal cap

CAUTION

Leakage or damaged connection

Opening the outlet of the primary pump head may cause leaks or damage the connection between the pump heads.

➔ Do not open the outlet of the primary pump head.

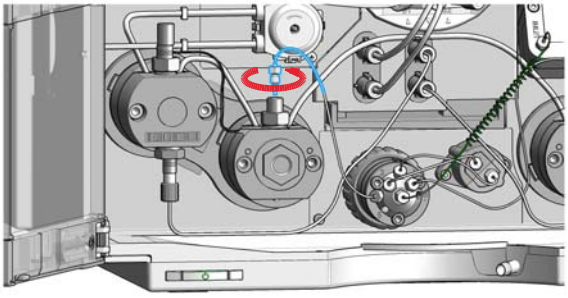
NOTE

This procedure describes replacements for channel A (left pump head assembly) and can be applied accordingly to channel B. In both cases, maintenance is done only at the secondary pump head outlet, which hosts the filter frit.

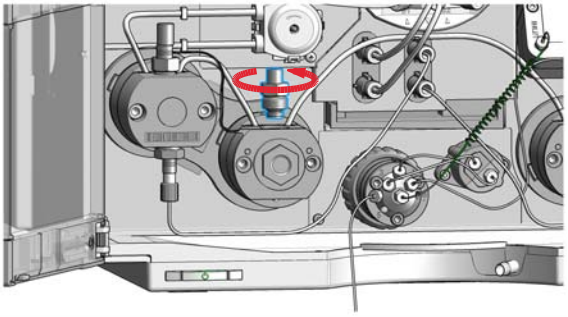
NOTE

When replacing a PTFE frit, consider replacing the seal cap as well in order to prevent leaks.

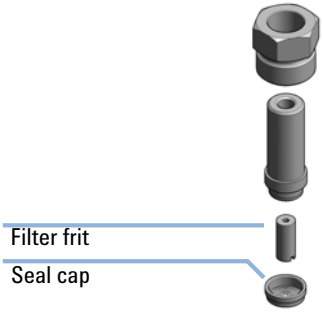
1 Remove the capillary connection from the outlet of the secondary pump head.



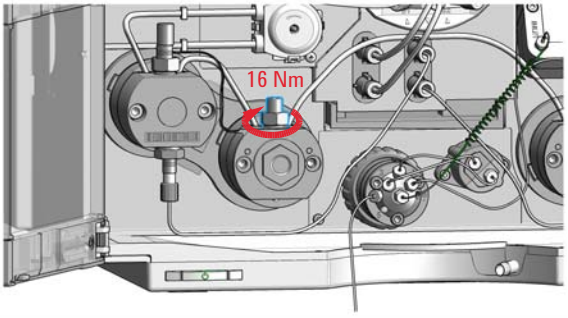
2 Use a 14 mm hex wrench for opening the filter assembly of the secondary pump head.



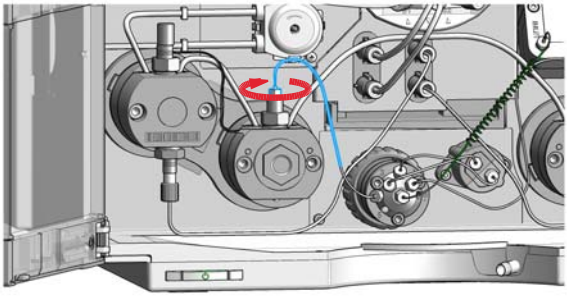
3 Replace the filter frit and seal cap as desired. Please note the correct orientation of the filter frit.



4 Re-install the filter assembly using the torque wrench (14 mm hex bit) set to 16 Nm.



5 Reconnect the capillary from the purge valve to the high pressure filter assembly.



Install the Valve Rail Kit

When	This rail is needed for the installation of external valves		
Tools required	**Description**		
	Pozidrive screwdriver #1		
Parts required	**#**	**p/n**	**Description**
	1	5067-4634	Valve Rail Kit

NOTE The rail can be installed on the left or right side of the pump. This procedure describes the installation on the left side and applies similarly to the right side.

1 The valve rail is fixed to the pump cover by 4 screws. The position of the lower screws is marked on the module cover. First tighten these screws, and then tighten the upper screws.

Replace the Module Firmware

When

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

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

Tools required

	Description
	Agilent Lab Advisor software
OR	Instant Pilot G4208A (only if supported by module)

Parts required

#	Description
1	Firmware, tools and documentation from Agilent web site

Preparations

Read update documentation provided with the Firmware Update Tool.

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

1 Download the required module firmware, the latest LAN/USB FW Update Tool and the documentation from the Agilent web.
http://www.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?whid=69761

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

Module Specific Information

There is no specific information for this module.

Prepare the Pump Module for Transport

When If the module shall be transported or shipped.

Parts required

p/n	Description
9301-0411	Syringe; Plastic
9301-1337	Syringe adapter
G7120-44000	Protective Foam

Preparations Flush both solvent channels with isopropanol.

CAUTION Mechanical damage

➔ For shipping the module, insert the Protective Foam to protected the module from mechanical damage.

➔ Be careful not to damage tubing or capillary connections while inserting the module in the Protective Foam.

1 Flush system with appropriate storage solution, for example 20 % isopropanol in water.

2 Remove solvent inlets from solvent reservoirs. Disconnect the solvent tubing from the inlet of primary pump heads for both solvent channels. Use a syringe for removing liquid from the solvent tubings between solvent reservoir, shutoff valve panel, solvent selection valve, degassing unit and pump inlets. Switch the solvent selection valve if applicable.

3 Remove tubing and capillary connections to other modules and the solvent cabinet. Remove tubing plugs.

4 Remove the shutoff valve panel by pulling it downwards.

5 You may keep internal tubing and capillary connections.

6 Remove cable connections to other modules. Remove the module from the stack.

7 Carefully insert the Protective Foam to the front part of the instrument. Do not damage any tubing or capillary connections.

8 Close the front cover.

9 For transport or shipment, put the module and accessory kit to the original shipment box.

8
Parts and Materials for Maintenance

Overview of Maintenance Parts 138
Flow Connections 139
Pump Head Assemblies 140
Pump Head Assembly Parts 141
Primary Pump Head Parts 142
Secondary Pump Head Parts 144
Purge Valve 146
Cover Parts 147
Leak Parts 147
Accessory Kit 148
Tools 149
HPLC System Tool Kit 151

This chapter provides information on parts for maintenance.

Overview of Maintenance Parts

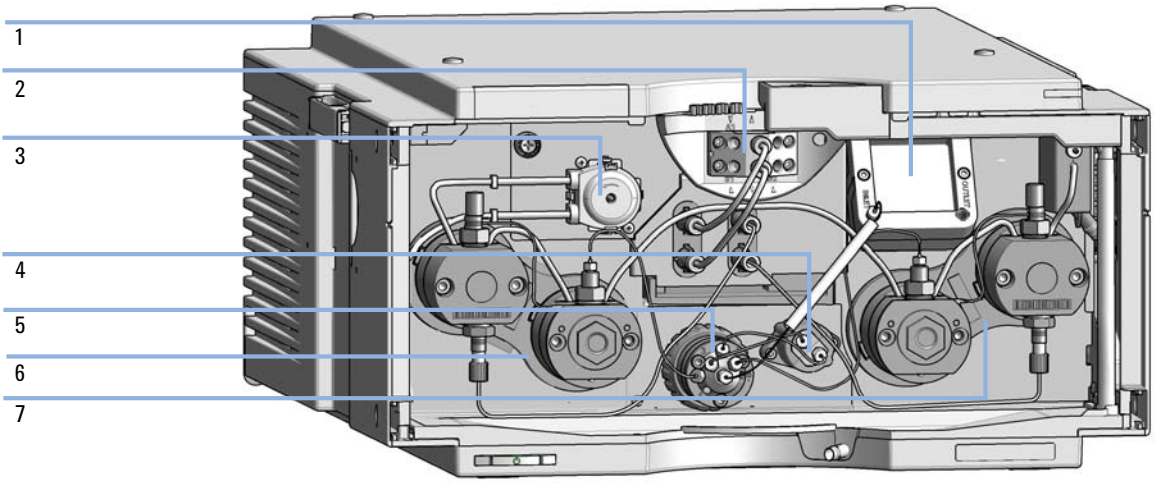


Figure 7 Overview of main assemblies

Item	p/n	Description
1	G4220-60027	Jet Weaver 35 µL/100 µL
1	G4220-60012	Jet Weaver 380 µL (OPTIONAL)
2	G7120-60029	SSV Valve Assembly
3	5065-4445	Peristaltic pump with Pharmed tubing
4	G7104-60001	Pressure sensor 1300 bar
5	tbd	Purge valve head
6	G4220-60900	Pump Head Channel A with Seal Wash
7	G4220-60910	Pump Head Channel B with Seal Wash

Flow Connections

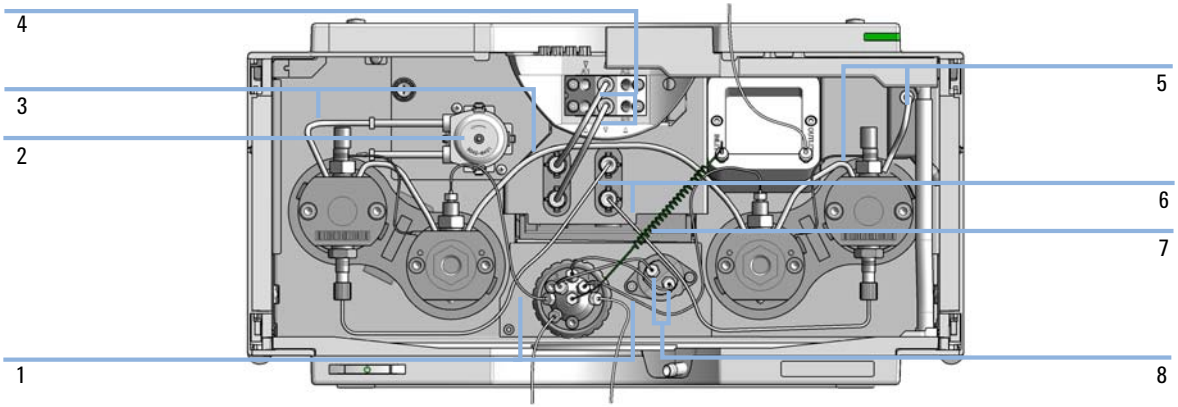


Figure 8 Flow connections of the High Speed Pump

Item	#	p/n	Description
1	2	5067-4655	Capillary ST, 0.25 mm x 235 mm purge valve to pump head assemblies channel A and B, 2x
2	1	5065-4445	Peristaltic pump with Pharmed tubing
3, 5	1	5065-9978	Tubing, 1 mm i.d., 3 mm o.d., silicone, 5 m
4	1	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit
6	1	5067-4661	Tubing kit 270 mm for connection of degassing unit to inlet valve (set of 2 tubes)
7	1	G4220-87000	Capillary ST 0.17 mm x 300 mm, Valve to Jet Weaver
8	2	01090-87308	Capillary ST, 0.25 mm x 130 mm, purge valve to pressure sensor, 2x
	1	G7120-40004	Valve Holder Left (not shown)
	1	5067-4124	Shutoff valve (not shown)
	1	G7120-60007	Bottle Head Assembly (not shown)
	1	G7120-68070	Ultra Clean Tubing Kit (includes bottle head assemblies and tubing connections within the pump)
	1	G4220-60070	Tubing Kit 140 mm - Ultra Clean Tubing (tubes from SSV to shutoff valve or degassing unit to MCGV)
	1	G7120-60017	Bottle Head Assembly Ultra Clean Tubing (bottle heads and tubing to shutoff panel / degasser)
	1	5067-5760	Solvent Cabinet Kit (not shown)

Pump Head Assemblies

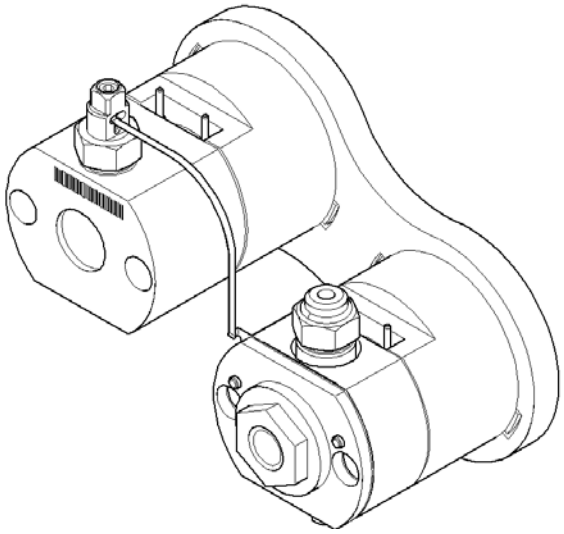


Figure 9 Pump head assembly (left) with seal wash option

Figure 9 on page 140 exemplarily shows the pump head with seal wash option for channel A of the pump. The following pump head assemblies are available:

p/n	Description
G4220-60900	Pump Head Channel A with Seal Wash
G4220-60910	Pump Head Channel B with Seal Wash

All pump head assemblies are complete including valves and filter assemblies.

Pump Head Assembly Parts

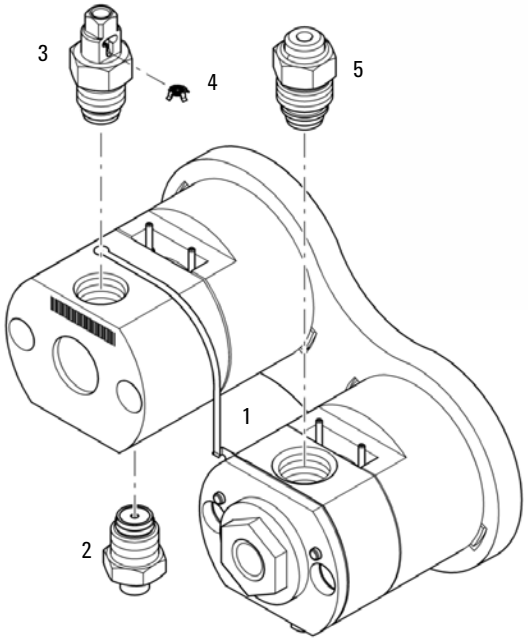


Figure 10 Pump head assembly parts

Item	p/n	Description
1	G4220-81013	Heat Exchanger (secondary pump head only) Channel A
1	G4220-81012	Heat Exchanger (secondary pump head only) Channel B
2	G4220-60022	Inlet valve (primary pump head)
3	G4220-60028	Outlet valve (primary pump head)
4	G4220-20020	Internal gold seal for Outlet Valve
5	G4280-60026	High Pressure Filter Assembly (secondary pump head)

Primary Pump Head Parts

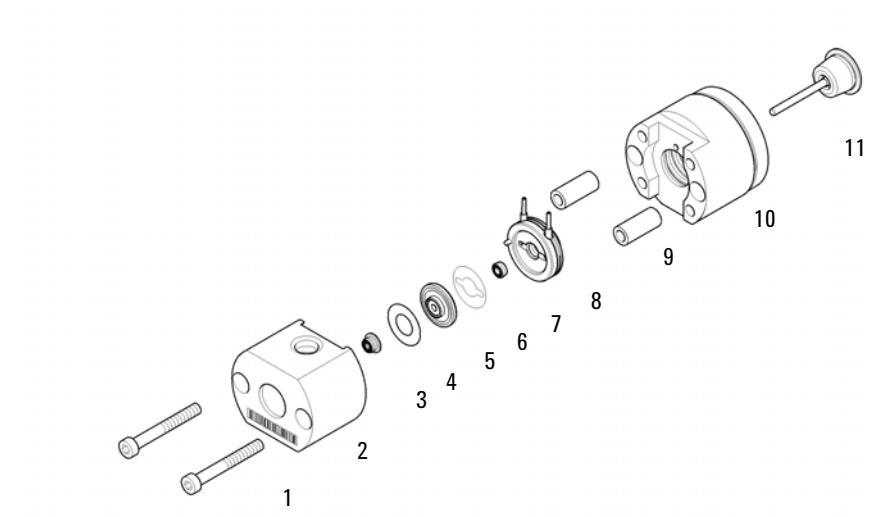


Figure 11 Primary pump head parts

Primary Head G4204-60060

Item	p/n	Description
1	0515-1218	Screw M5, 40 mm long
2	G4204-60033	PH Body prim
3	0905-1719	PE Seal
4	5023-2513	Distance sheet
5	G4220-60016	Seal holder including backup ring
6	01018-07102	Gasket (Seal wash)
7	0905-1718	Backup Seal PE (Seal Wash)
8	G4220-63010	Support Ring (Seal Wash)
9	G4220-23705	Bracket
10	G4220-60000	Preload Assy
11	5067-5938	Plunger

Secondary Pump Head Parts

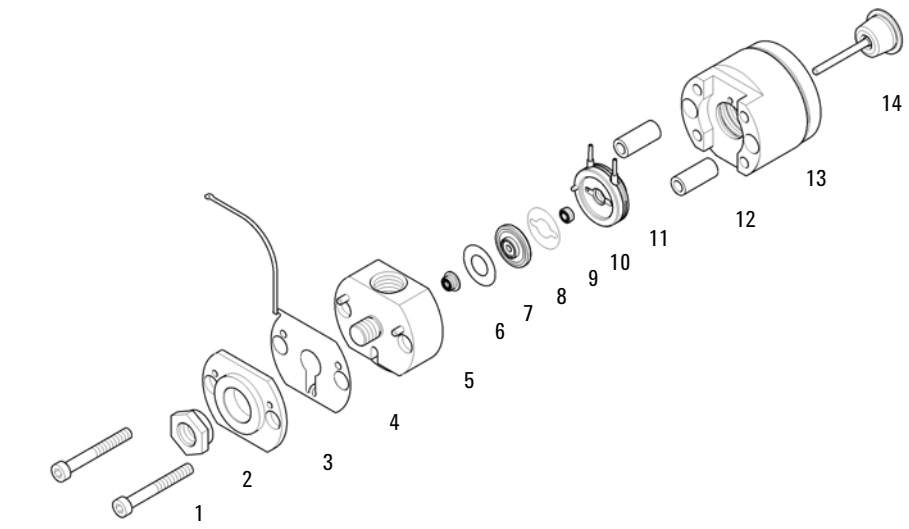


Figure 12 Secondary pump head parts

Secondary Head G4204-60061

Item	p/n	Description
1	0515-1218	Screw M5, 40 mm long
2	G4220-20003	Pump Head Screw
3	G4220-20000	LID
4	G4220-81013	Heat Exchanger
	G4220-81012	Heat Exchanger (secondary pump head only) (not shown)
5	G2404-25213	PH Body sec
	G4220-20028	Headless screw for 1290 Infinity pump heads (not shown)
	G4220-20001	Spacer Fitting (not shown)
6	0905-1719	PE Seal
7	5023-2513	Distance sheet
8	G4220-60016	Seal holder including backup ring
9	01018-07102	Gasket (Seal wash)
10	0905-1718	Backup Seal PE (Seal Wash)
11	G4220-63010	Support Ring (Seal Wash)
12	G4220-23705	Bracket
13	G4220-60000	Preload Assy
14	5067-5938	Plunger

Purge Valve

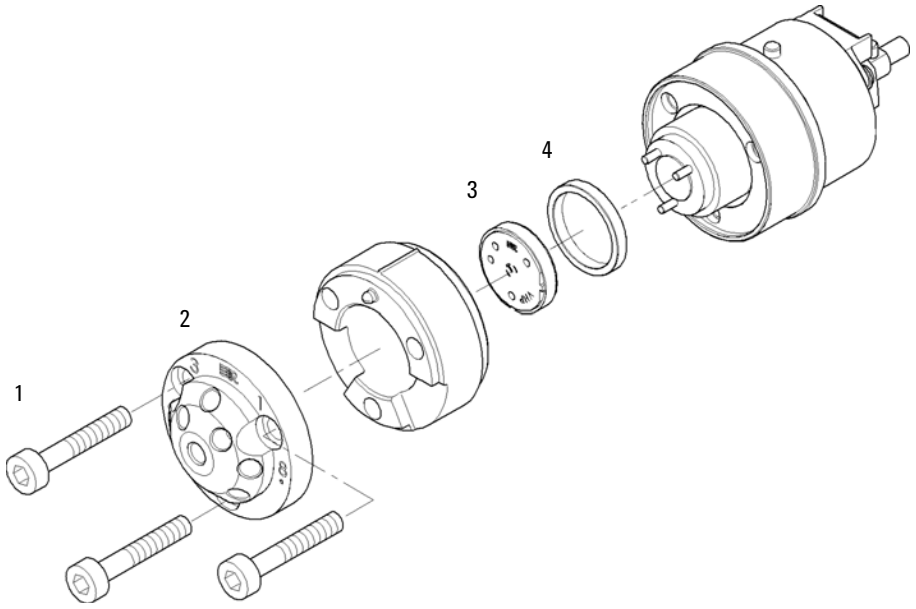


Figure 13 Purge valve parts

Item	p/n	Description
	tbd	Purge valve head
1	1535-4857	Stator screws
2	5068-0004	Purge Valve Stator
3	5068-0201	Purge Valve Rotor Seal, polyimide, 1300 bar
4	1535-4045	Bearing ring

Cover Parts

p/n	Description
5043-0286	Base Cover
5067-5908	Top Cover
G4224-60200	Side Cover Right 200
G4224-60201	Side Cover Left 200
5067-5767	Door assy 200 left IF II
5067-5768	Door assy 200 right IF II

Leak Parts

p/n	Description
5043-0856	Leak Adapter

Accessory Kit

Accessory kit (G7120-68705) contains the following parts:

p/n	Description
0100-1816	Fitting Waste Tube to Purge Valve
5065-9978	Tubing, 1 mm i.d., 3 mm o.d., silicone, 5 m
0890-2207	Tubing/Sleeving-Flex
5043-1013	Tubing Clip
5067-4124	Shutoff valve
5067-4670	SST cap. 0.17 mm ID 600 mm pre-swaged
5067-6129	Capillary ST 0.17 x 300 mm S/SX
5181-1519	CAN cable, Agilent module to module, 1 m
5500-1155	Tube Connector, 90 degree, ID 6.4
9301-1337	Syringe adapter
9301-6476	Syringe with luerlock 5 mL Polypropylene
G4220-60035	Tubing kit 140 mm, 2/pk
G7120-40004	Valve Holder Left
5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
5500-1156	T-Tube Connector ID6.4
5500-1169	Y Tube Connector ID6.4

Tools

Item	p/n	Description
	5067-4699	1290 Infinity pump service kit
1	5067-5688	Torque wrench 1 – 25 Nm with 14 mm wrench
2	G4220-20013	4 mm hex bit
3	G4220-20014	2.5 mm Hex Bit
4	G4220-20015	Adapter ¼ in square to hex
5	G4220-20041	Bit Torx 10x25 mm
	5067-5691	Wrench open, 19 mm
	5023-0285	Replacement kit for 1290 Infinity pump head alignment tool (piston/handle)

1290 Infinity pump service kit (5067-4699) includes pump head alignment tool and items 1 – 5.

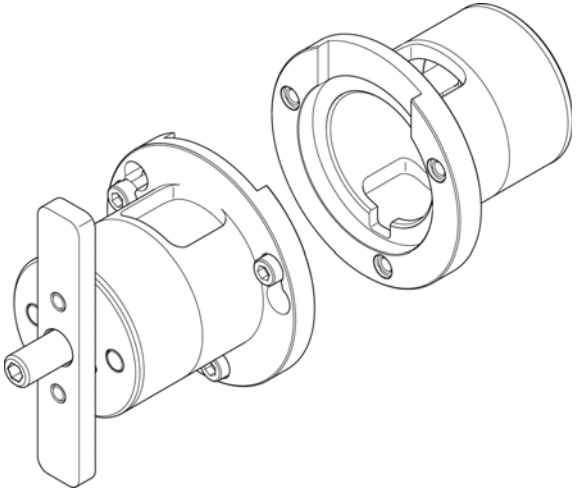


Figure 14 Pump head alignment tool

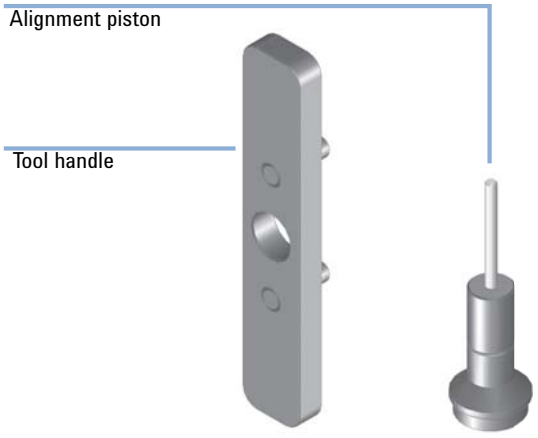


Figure 15 Replacement kit for 1290 Infinity pump head alignment tool (piston/handle)



Figure 16 HPLC System Tool Kit-Infinity-II

HPLC System Tool Kit

HPLC System Tool Kit-Infinity-II (G7120-68708) contains the following items:

p/n	Description
8720-0025	Wrench, 1/2 inch & 9/16 inch
8710-1924	Wrench open 14 mm
8710-2409	Wrench open end, 5/16 – 3/8 inch
8710-0510	Wrench open 1/4 — 5/16 inch
5023-2500	Wrench
8710-1534	Wrench, 4 mm both ends, open end
5043-1361	Hex Key Set Driver
5023-2499	Hex Key Set
8710-2394	Hex key 9/64 inch 15 cm long T-handle
8710-0899	Pozidriv screwdriver
5023-2501	Screwdriver Torx-T10
5023-2504	Hex driver SW-4 slitted
5023-2503	Hex driver SW-5 slitted
5023-2502	Hex driver 1/4 inch, slitted
9301-0411	Syringe; Plastic
9301-1337	Syringe adapter
0100-1710	Mounting Tool for Tubing Connections
0100-1681	Syringe adapter luer/barb
01018-23702	Insert tool
5067-6127	Blank Nut SL



9
Identifying Cables

Cable Overview 154
Analog Cables 156
Remote Cables 158
CAN/LAN Cables 162
Agilent Module to PC 163
USB 164

This chapter provides information on cables used with the modules.

Cable Overview

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

Analog cables

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

Remote cables

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

CAN cables

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

LAN cables

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

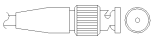
RS-232 cables (not for FUSION board)

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

USB cables

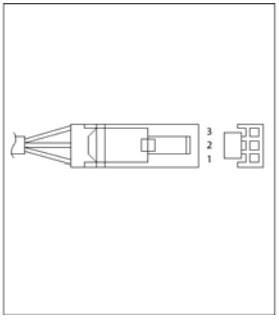
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

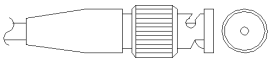


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

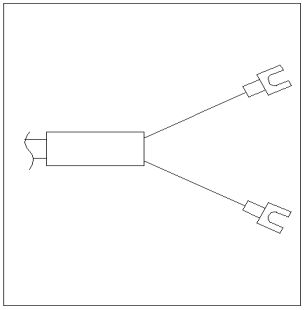
Agilent Module to 35900 A/D converters

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

Agilent Module to BNC Connector

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

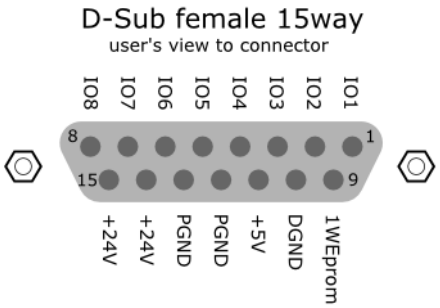
Agilent Module to General Purpose

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

Remote Cables

ERI (Enhanced Remote Interface)

5188-8029 ERI to general purpose

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

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

Table 4 5188-8044 ERI to ERI

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

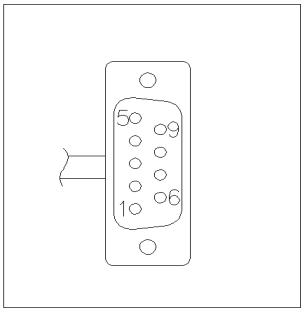
5188-8045 ERI to APG (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG))

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

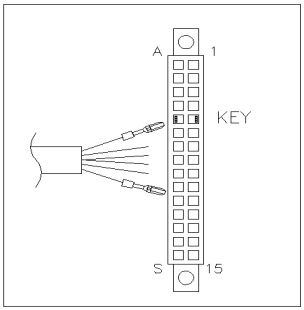


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

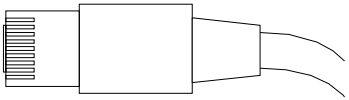
Agilent Module to Agilent 35900 A/D Converters

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

Agilent Module to General Purpose

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

CAN/LAN Cables



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

CAN Cables

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

LAN Cables

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

Agilent Module to PC

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

USB

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

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

10
Hardware Information

Firmware Description 166
Electrical Connections 169
Serial Number Information 170
Rear View of the Module 170
Interfaces 171
Overview Interfaces 172
Setting the 8-bit Configuration Switch 176
Special Settings 178
Early Maintenance Feedback 179
Instrument Layout 180

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

Firmware Description

The firmware of the instrument consists of two independent sections:

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

Resident System

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

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

Main System

Its properties are:

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

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

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

Firmware Updates

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

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

(*) Required tools, firmware and documentation are available from the Agilent web:
http://www.chem.agilent.com/_layouts/agilent/downloadFirmware.aspx?whid=69761

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

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

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

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

XXX is the build number of the firmware.

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

NOTE

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

Main and resident firmware must be from the same set.

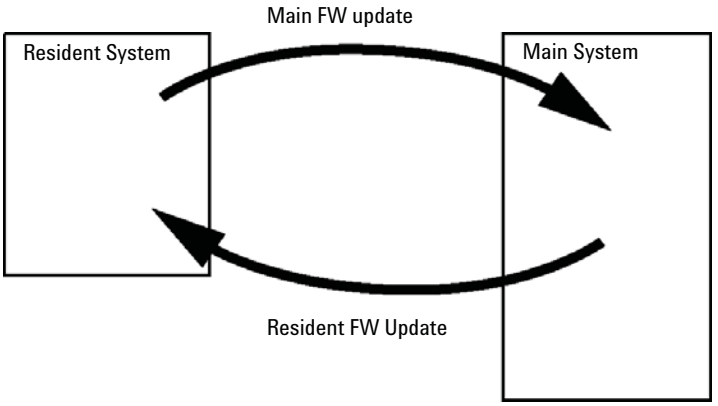


Figure 17 Firmware Update Mechanism

NOTE

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

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

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

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

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

Electrical Connections

- The CAN bus is a serial bus with high speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the RS-232C connector may be used to control the module from a computer through a RS-232C connection. This connector is activated and can be configured with the configuration switch.
- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

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

Serial Number Information

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

CCYWWSSSSS	Format
CC	country of manufacturing • DE = Germany • JP = Japan • CN = China
YWW	year and week of last major manufacturing change, e.g. 820 could be week 20 of 1998 or 2008
SSSSS	real serial number

Rear View of the Module

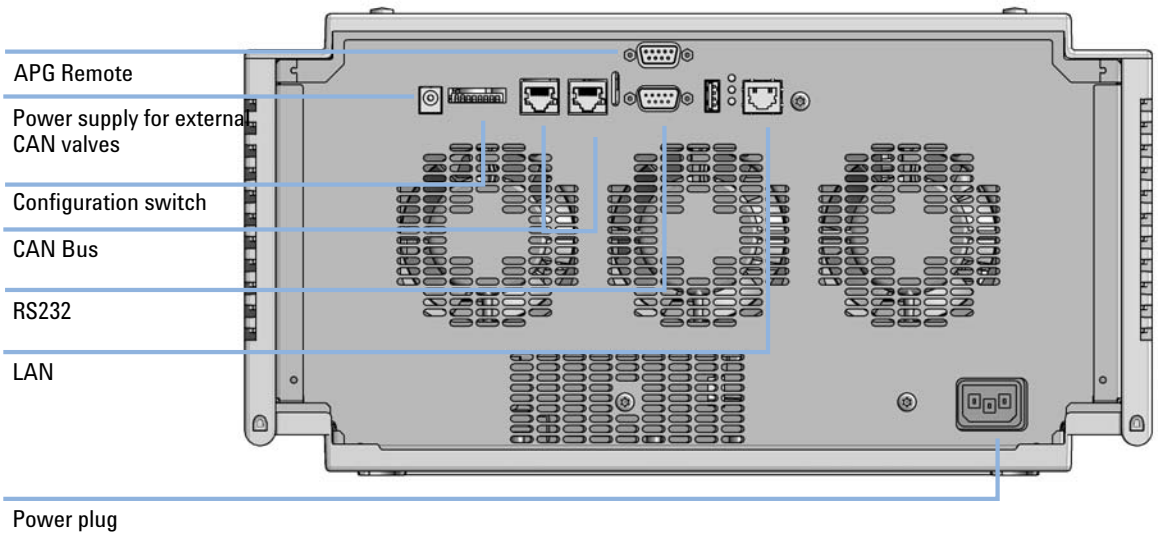


Figure 18 Rear view of the High Speed Pump

Interfaces

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

Table 5 Agilent 1200 Infinity II Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Pumps							
G7104A Flexible Pump	2	No	Yes	Yes	1	A	
G7120A High Speed Pump	2	No	Yes	Yes	1	A	
Samplers							
G7129A/B ALS	2	Yes	Yes	No	No	E	
G7167A/B Multisampler	2	Yes	Yes	No	No	E	
Detectors							
G7114A/B VWD	2	Yes	Yes	No	1	E	
G7117A/B DAD	2	Yes	Yes	No	1	E	
G7115A/B DAD	2	Yes	Yes	No	1	E	
Others							
G7116B MCT	2	No	No	No	No	No	Requires a HOST module via CAN

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

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

Overview Interfaces

CAN

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

LAN

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

NOTE

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

RS-232C (Serial)

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

NOTE

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

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

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

Table 6 RS-232C Connection Table

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

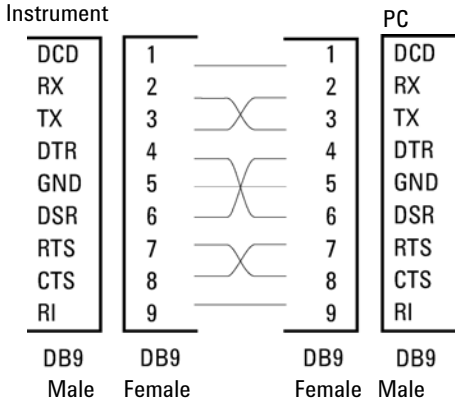


Figure 19 RS-232 Cable

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module's main board.

APG Remote

The APG Remote connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features as common shut down, prepare, and so on.

Remote control allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired- or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to **SHUT DOWN** the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the **POWER ON** state of all connected modules. Control of analysis is maintained by signal readiness **READY** for next analysis, followed by **START** of run and optional **STOP** of run triggered on the respective lines. In addition **PREPARE** and **START REQUEST** may be issued. The signal levels are defined as:

- standard TTL levels (0 V is logic true, + 5.0 V is false),
- fan-out is 10,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

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

Table 7 Remote Signal Distribution

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

Special Interfaces

The module includes a DC-Out (24 VDC) power line that is intended to be used with certain modules that operate as CAN slaves, for example external valves. The line has a limited output of 0.5 A (1.7 A as of August 2011) and is self resetting.

Setting the 8-bit Configuration Switch

The 8-bit configuration switch is located at the rear of the module. Switch settings provide configuration parameters for LAN, serial communication protocol and instrument specific initialization procedures.

All modules with on-board LAN:

- Default is ALL switches DOWN (best settings).
  - Bootp mode for LAN and
  - 19200 baud, 8 data bit / 1 stop bit with no parity for RS-232
- For specific LAN modes switches 3-8 must be set as required.
- For boot/test modes switches 1+2 must be UP plus required mode.

NOTE For normal operation use the default (best) settings.

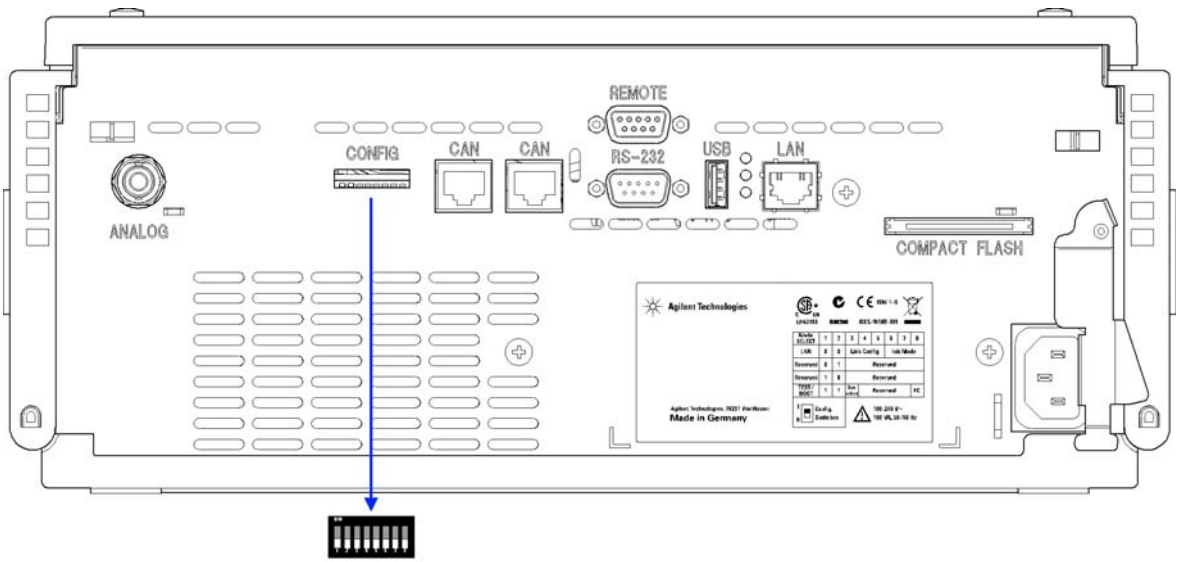


Figure 20 Location of Configuration Switch (example shows a G4212A DAD)

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF. For details on the LAN settings/configuration refer to chapter LAN Configuration.

Table 8 8-bit Configuration Switch (with on-board LAN)

	Mode		Function					
	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
LAN	*0*	*0*	Link Configuration			Init Mode Selection		
Auto-negotiation			*0*	x	x	x	x	x
10 MBit, half-duplex			1	*0*	*0*	x	x	x
10 MBit, full-duplex			1	*0*	1	x	x	x
100 MBit, half-duplex			1	1	*0*	x	x	x
100 MBit, full-duplex			1	1	1	x	x	x
Bootp			x	x	x	*0*	*0*	*0*
Bootp & Store			x	x	x	*0*	*0*	1
Using Stored			x	x	x	*0*	1	*0*
DHCP			x	x	x	1	*0*	*0*
Using Default			x	x	x	*0*	1	1
TEST	1	1	System					NVRAM
Boot Resident System			1					x
Revert to Default Data (Coldstart)			x	x	x			1

Legend:

0 (switch down), 1 (switch up), x (any position)

NOTE When selecting the mode TEST, the LAN settings are: Auto-Negotiation & Using Stored.

NOTE For explanation of "Boot Resident System" and "Revert to Default Data (Coldstart)" refer to "Special Settings" on page 178.

Special Settings

The special settings are required for specific actions (normally in a service case).

NOTE The tables include both settings for modules – with on-board LAN and without on-board LAN. They are identified as LAN and no LAN.

Boot-Resident

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

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

Table 9 Boot Resident Settings (On-board LAN)

Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
TEST/BOOT	1	1	1	0	0	0	0	0

Forced Cold Start

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

CAUTION Loss of data

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

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

If you use the following switch settings and power the instrument up again, a forced cold start has been completed.

Table 10 Forced Cold Start Settings (On-board LAN)

Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
TEST/BOOT	1	1	0	0	0	0	0	1

Early Maintenance Feedback

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

EMF Counters

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

Using the EMF Counters

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

Setting the EMF Limits

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

Instrument Layout

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

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



11
LAN Configuration

What You Have to Do First 182
TCP/IP parameter configuration 183
Configuration Switch 184
Initialization mode selection 185
Dynamic Host Configuration Protocol (DHCP) 189
- General Information (DHCP) 189
- Setup (DHCP) 190

Link configuration selection 192
Automatic configuration with Bootp 193
- About Agilent BootP Service 193
- How BootP Service Works 194
- Situation: Cannot Establish LAN Communication 194
- Installation of BootP Service 195
- Two Methods to Determine the MAC Address 197
- Assigning IP Addresses Using the Agilent BootP Service 198
- Changing the IP Address of an Instrument Using the Agilent BootP Service 201

Manual Configuration 203
- With Telnet 204

PC and User Interface Software Setup Setup 208
- PC Setup for Local Configuration 208
- User Interface Software Setup 209

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

What You Have to Do First

The module has an on-board LAN communication interface.

1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear of the module (see Figure 22 on page 182).



Figure 21 MAC-Label

2 Connect the instrument's LAN interface (see Figure 22 on page 182) to

- the PC network card using a crossover network cable (point-to-point) or
- a hub or switch using a standard LAN cable.

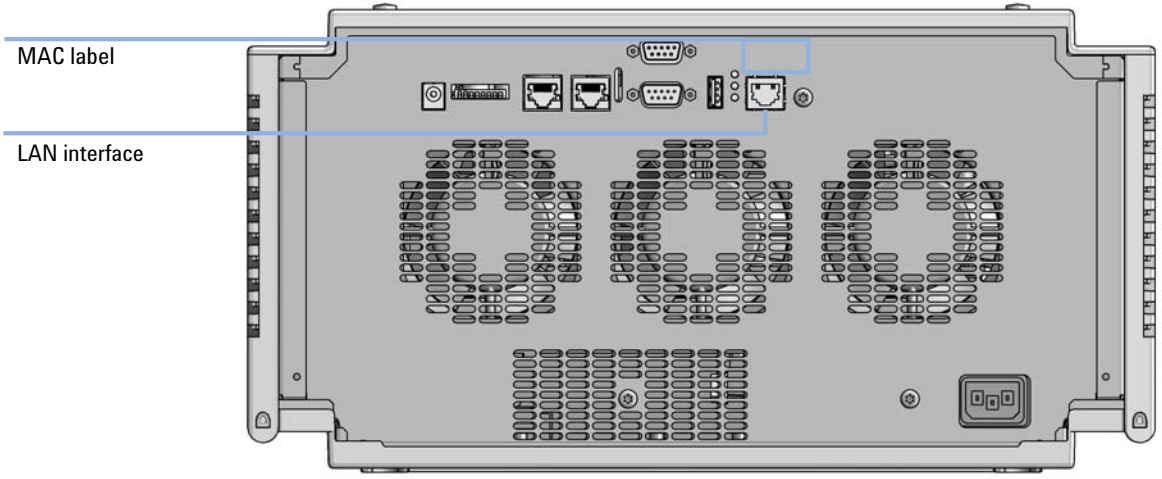


Figure 22 Location of LAN interface and MAC label

TCP/IP parameter configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet Mask
- Default Gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based BOOTP Server (using the so-called Bootstrap Protocol)
- by automatically requesting the parameters from a network-based DHCP Server (using the so-called Dynamic Host Configuration Protocol). This mode requires a LAN-onboard Module or a G1369C LAN Interface card, see "Setup (DHCP)" on page 190
- by manually setting the parameters using Telnet
- by manually setting the parameters using the Instant Pilot (G4208A)

The LAN interface differentiates between several initialization modes. The initialization mode (short form 'init mode') defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived from a Bootp cycle, non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see Table 12 on page 185.

Configuration Switch

The configuration switch can be accessed at the rear of the module.

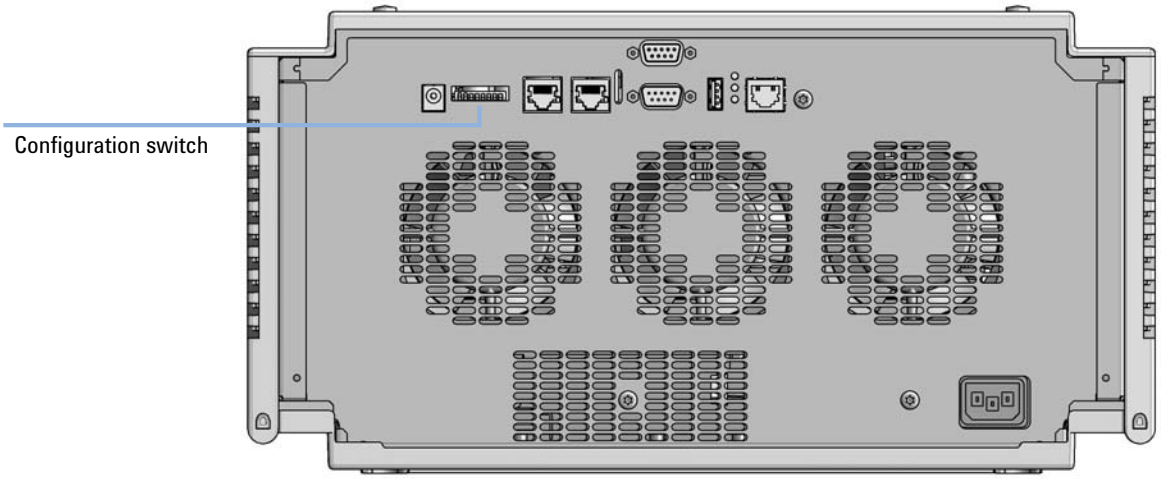


Figure 23 Location of Configuration Switch

The module is shipped with all switches set to OFF, as shown above.

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF.

Table 11 Factory Default Settings

Initialization ('Init') Mode	Bootp, all switches down. For details see "Initialization mode selection" on page 185
Link Configuration	speed and duplex mode determined by auto-negotiation, for details see "Link configuration selection" on page 192

Initialization mode selection

The following initialization (init) modes are selectable:

Table 12 Initialization Mode Switches

	SW 6	SW 7	SW 8	Init Mode
	OFF	OFF	OFF	Bootp
	OFF	OFF	ON	Bootp & Store
	OFF	ON	OFF	Using Stored
	OFF	ON	ON	Using Default
	ON	OFF	OFF	DHCP [1]

[1] Requires firmware B.06.40 or above. Modules without LAN on board, see G1369C LAN Interface Card

Bootp

When the initialization mode **Bootp** is selected, the module tries to download the parameters from a **Bootp** Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the module. Therefore, the parameters are lost with the next power cycle of the module.

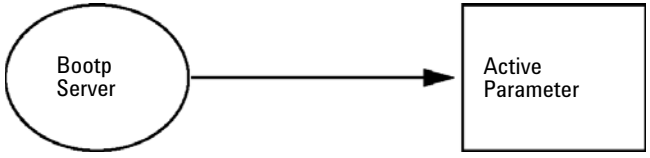


Figure 24 **Bootp** (Principle)

Bootp & Store

When **Bootp & Store** is selected, the parameters obtained from a **Bootp** Server become the active parameters immediately. In addition, they are stored to the non-volatile memory of the module. Thus, after a power cycle they are still available. This enables a kind of bootp once configuration of the module.

Example: The user may not want to have a **Bootp** Server be active in his network all the time. But on the other side, he may not have any other configuration method than **Bootp**. In this case he starts the **Bootp** Server temporarily, powers on the module using the initialization mode **Bootp & Store**, waits for the **Bootp** cycle to be completed, closes the **Bootp** Server and powers off the module. Then he selects the initialization mode Using Stored and powers on the module again. From now on, he is able to establish the TCP/IP connection to the module with the parameters obtained in that single **Bootp** cycle.

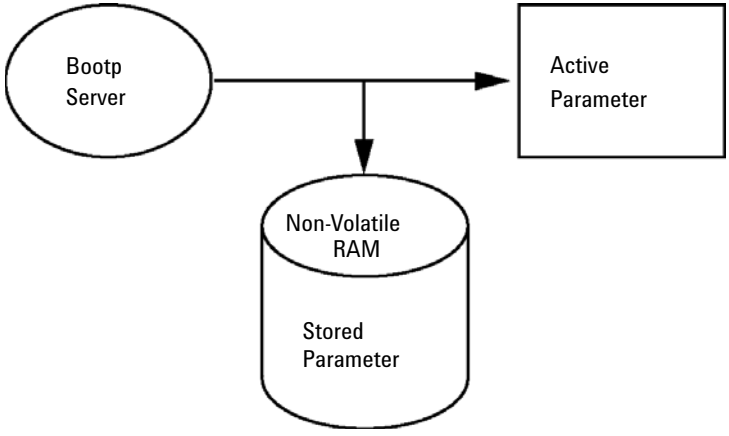


Figure 25 Bootp & Store (Principle)

NOTE Use the initialization mode **Bootp & Store** carefully, because writing to the non-volatile memory takes time. Therefore, when the module shall obtain its parameters from a **Bootp** Server every time it is powered on, the recommended initialization mode is **Bootp**!

Using Stored

When initialization mode **Using Stored** is selected, the parameters are taken from the non-volatile memory of the module. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

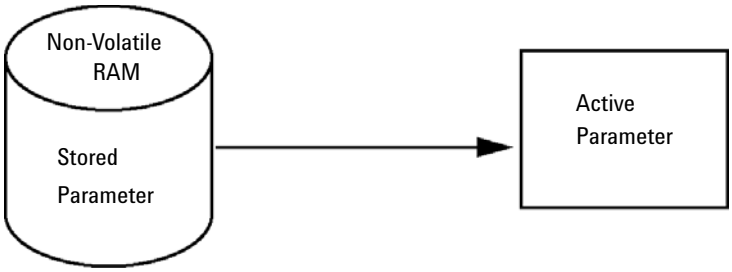


Figure 26 Using Stored (Principle)

Using Default

When **Using Default** is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see Table 13 on page 187.

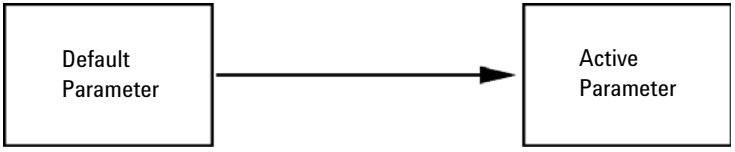


Figure 27 Using Default (Principle)

NOTE Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately.

Table 13 Using Default Parameters

IP address:	192.168.254.11
Subnet Mask:	255.255.255.0
Default Gateway	not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the module must reside in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the module. He may then close the session, select the initialization mode Using Stored, power-on again and establish the TCP/IP connection using the new parameters.

When the module is wired to the PC directly (e.g. using a cross-over cable or a local hub), separated from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE

In the **Using Default** mode, the parameters stored in the memory of the module are not cleared automatically. If not changed by the user, they are still available, when switching back to the mode Using Stored.

Dynamic Host Configuration Protocol (DHCP)

General Information (DHCP)

The Dynamic Host Configuration Protocol (DHCP) is an auto configuration protocol used on IP networks. The DHCP functionality is available on all Agilent HPLC modules with on-board LAN Interface or LAN Interface Card, and "B"-firmware (B.06.40 or above).

When the initialization mode "DHCP" is selected, the card tries to download the parameters from a DHCP Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the card.

Besides requesting the network parameters, the card also submits its hostname to the DHCP Server. The hostname equals the MAC address of the card, e.g. *0030d3177321*. It is the DHCP server's responsibility to forward the hostname/address information to the Domain Name Server. The card does not offer any services for hostname resolution (e.g. NetBIOS).

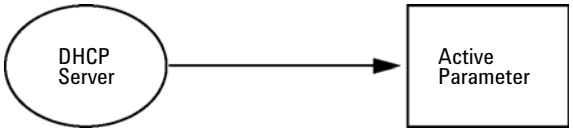


Figure 28 DHCP (Principle)

NOTE

1. It may take some time until the DHCP server has updated the DNS server with the hostname information.
2. It may be necessary to fully qualify the hostname with the DNS suffix, e.g. *0030d3177321.country.company.com*.
3. The DHCP server may reject the hostname proposed by the card and assign a name following local naming conventions.

Setup (DHCP)

Software required The modules in the stack must have at least firmware from set A.06.34 and the above mentioned modules B.06.40 or above (must from the same firmware set).

1 Note the MAC address of the LAN interface (provided with G1369C LAN Interface Card or Main Board). This MAC address is on a label on the card or at the rear of the main board, e.g. *0030d3177321*.

On the Instant Pilot the MAC address can be found under **Details** in the LAN section.

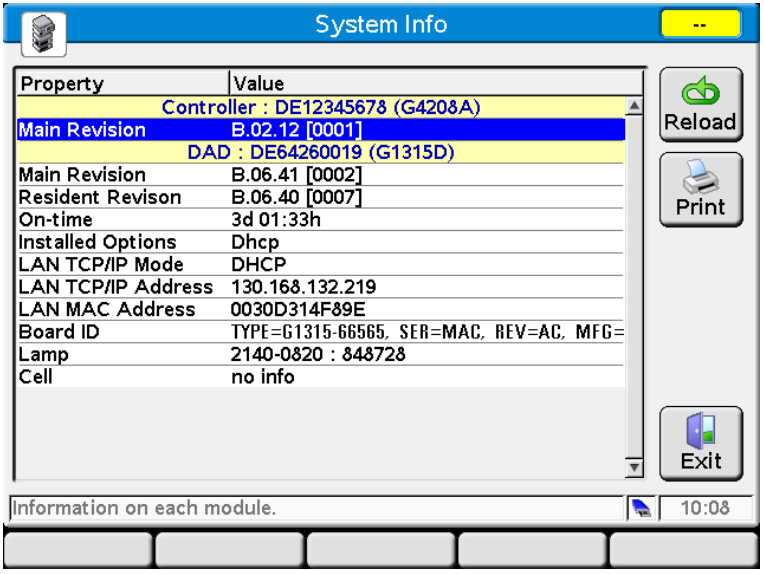


Figure 29 LAN Setting on Instant Pilot

2 Set the Configuration Switch to DHCP either on the G1369C LAN Interface Card or the main board of above mentioned modules.

Table 14 G1369C LAN Interface Card (configuration switch on the card)

SW 4	SW 5	SW 6	SW 7	SW 8	Initialization Mode
ON	OFF	OFF	OFF	OFF	DHCP

Table 15 LC Modules inclusive 1120/1220 (configuration switch at rear of the instrument)

SW 6	SW 7	SW 8	Initialization Mode
ON	OFF	OFF	DHCP

3 Turn on the module that hosts the LAN interface.

4 Configure your Control Software (e.g. Agilent ChemStation, Lab Advisor, Firmware Update Tool) and use MAC address as host name, e.g. *0030d3177321*.

The LC system should become visible in the control software (see Note in section "General Information (DHCP)" on page 189).

Link configuration selection

The LAN interface supports 10 or 100 Mbps operation in full- or half-duplex modes. In most cases, full-duplex is supported when the connecting network device - such as a network switch or hub - supports IEEE 802.3u auto-negotiation specifications.

When connecting to network devices that do not support auto-negotiation, the LAN interface will configure itself for 10- or 100-Mbps half-duplex operation.

For example, when connected to a non-negotiating 10-Mbps hub, the LAN interface will be automatically set to operate at 10-Mbps half-duplex.

If the module is not able to connect to the network through auto-negotiation, you can manually set the link operating mode using link configuration switches on the module.

Table 16 Link Configuration Switches



SW 3	SW 4	SW 5	Link Configuration
OFF	-	-	speed and duplex mode determined by auto-negotiation
ON	OFF	OFF	manually set to 10 Mbps, half-duplex
ON	OFF	ON	manually set to 10 Mbps, full-duplex
ON	ON	OFF	manually set to 100 Mbps, half-duplex
ON	ON	ON	manually set to 100 Mbps, full-duplex

Automatic configuration with Bootp

NOTE All examples shown in this chapter will not work in your environment. You need your own IP-, Subnet-Mask- and Gateway addresses.

NOTE Assure that the detector configuration switch is set properly. The setting should be either **BootP** or **BootP & Store**, see Table 12 on page 185.

NOTE Assure that the detector connected to the network is powered off.

NOTE If the Agilent BootP Service program is not already installed on your PC, then install it from your Agilent ChemStation DVD, located in folder **BootP**.

About Agilent BootP Service

The Agilent BootP Service is used to assign the LAN Interface with an IP address.

The Agilent BootP Service is provided on the ChemStation DVD. The Agilent BootP Service is installed on a server or PC on the LAN to provide central administration of IP addresses for Agilent instruments on a LAN. The BootP service must be running TCP/IP network protocol and cannot run a DHCP server.

How BootP Service Works

When an instrument is powered on, an LAN Interface in the instrument broadcasts a request for an IP address or host name and provides its hardware MAC address as an identifier. The Agilent BootP Service answers this request and passes a previously defined IP address and host name associated with the hardware MAC address to the requesting instrument.

The instrument receives its IP address and host name and maintains the IP address as long as it is powered on. Powering down the instrument causes it to lose its IP address, so the Agilent BootP Service must be running every time the instrument powers up. If the Agilent BootP Service runs in the background, the instrument will receive its IP address on power-up.

The Agilent LAN Interface can be set to store the IP address and will not lose the IP address if power cycled.

Situation: Cannot Establish LAN Communication

If a LAN communication with BootP service cannot be established, check the following on the PC:

- Is the BootP service started? During installation of BootP, the service is not started automatically.
- Does the Firewall block the BootP service? Add the BootP service as an exception.
- Is the LAN Interface using the BootP-mode instead of "Using Stored" or "Using Default" modes?

Installation of BootP Service

Before installing and configuring the Agilent BootP Service, be sure to have the IP addresses of the computer and instruments on hand.

1 Log on as Administrator or other user with Administrator privileges.

2 Close all Windows programs.

3 Insert the Agilent ChemStation software DVD into the drive. If the setup program starts automatically, click **Cancel** to stop it.

4 Open Windows Explorer.

5 Go to the BootP directory on the Agilent ChemStation DVD and double-click **BootPPackage.msi**.

6 If necessary, click the **Agilent BootP Service...** icon in the task bar.

7 The **Welcome** screen of the **Agilent BootP Service Setup Wizard** appears. Click **Next**.

8 The **End-User License Agreement** screen appears. Read the terms, indicate acceptance, then click **Next**.

9 The **Destination Folder** selection screen appears. Install BootP to the default folder or click **Browse** to choose another location. Click **Next**.

The default location for installation is:

C:\Program Files\Agilent\BootPService\

10 Click **Install** to begin installation.

11 Files load; when finished, the **BootP Settings** screen appears.

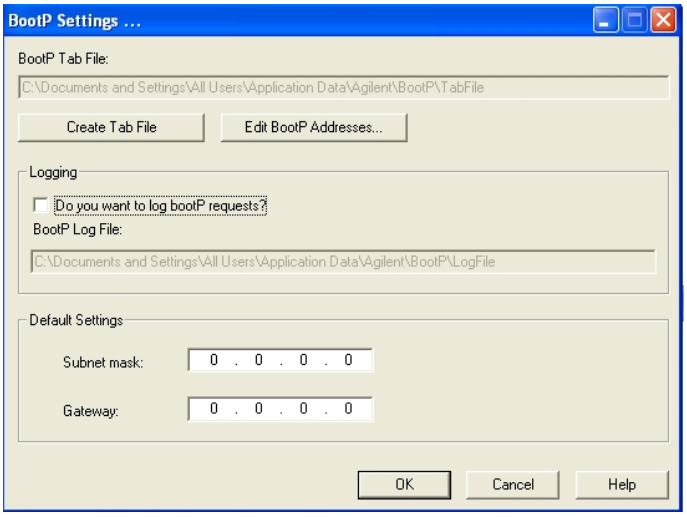


Figure 30 BootP Settings screen

12 In the **Default Settings** part of the screen, if known, you can enter the subnet mask and gateway.

Defaults can be used:

- The default subnet mask is 255.255.255.0
- The default gateway is 192.168.254.11

13 On the **BootP Settings** screen, click **OK**. The **Agilent BootP Service Setup** screen indicates completion.

14 Click **Finish** to exit the **Agilent BootP Service Setup** screen.

15 Remove the DVD from the drive.

This completes installation.

16 Start BootP Service in the Windows® services: On the Windows® desktop click right on **Computer** icon, select **Manage > Services and Applications > Services**. Select the **Agilent BootP Service** and click **Start**.

Two Methods to Determine the MAC Address

Enabling logging to discover the MAC address using BootP

If you want to see the MAC address, select the **Do you want to log BootP requests?** check box.

1 Open BootP Settings from **Start > All Programs > Agilent BootP Service > EditBootPSettings**.

2 In **BootP Settings...** check **Do you want to log BootP requests?** to enable logging.

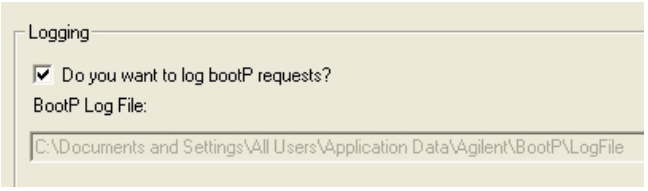


Figure 31 Enable BootP logging

The log file is located in

C:\Documents and Settings\All Users\Application Data\Agilent\BootP\LogFile

It contains a MAC address entry for each device that requests configuration information from BootP.

3 Click **OK** to save the values or **Cancel** to discard them. The editing ends.

4 After each modification of the BootP settings (i.e. **EditBootPSettings**) a stop or start of the BootP service is required for the BootP service to accept changes. See "Stopping the Agilent BootP Service" on page 201 or "Restarting the Agilent BootP Service" on page 202.

5 Uncheck the **Do you want to log BootP requests?** box after configuring instruments; otherwise, the log file will quickly fill up disk space.

Determining the MAC address directly from the LAN Interface card label

1 Turn off the instrument.

2 Read the MAC address from the label and record it.

The MAC address is printed on a label on the rear of the module.

3 Read the MAC address from the label and record it.

The MAC address is printed on a label on the rear of the module.

See Figure 21 on page 182 and Figure 22 on page 182.

4 Turn on the instrument.

Assigning IP Addresses Using the Agilent BootP Service

The Agilent BootP Service assigns the Hardware MAC address of the instrument to an IP address.

Determining the MAC address of the instrument using BootP Service

1 Power cycle the Instrument.

2 After the instrument completes self-test, open the log file of the BootP Service using Notepad.

- The default location for the logfile is C:\Documents and Settings\All Users\Application Data\Agilent\BootP\LogFile.
- The logfile will not be updated if it is open.

The contents will be similar to the following:

```
02/25/10 15:30:49 PM

Status: BootP Request received at outermost layer

Status: BootP Request received from hardware address: 0010835675AC

Error: Hardware address not found in BootPTAB: 0010835675AC

Status: BootP Request finished processing at outermost layer
```

3 Record the hardware (MAC) address (for example, 0010835675AC).

4 The Error means the MAC address has not been assigned an IP address and the Tab File does not have this entry. The MAC address is saved to the Tab File when an IP address is assigned.

5 Close the log file before turning on another instrument.

6 Uncheck the **Do you want to log BootP requests?** box after configuring instruments to avoid having the logfile use up excessive disk space.

Adding each instrument to the network using BootP

1 Follow **Start > All Programs > Agilent BootP Service** and select **Edit BootP Settings**. The BootP Settings screen appears.

2 Uncheck the **Do you want to log BootP requests?** once all instruments have been added.

The **Do you want to log BootP requests?** box must be unchecked when you have finished configuring instruments; otherwise, the log file will quickly fill up disk space.

3 Click **Edit BootP Addresses...** The **Edit BootP Addresses** screen appears.

4 Click **Add...** The **Add BootP Entry** screen appears.

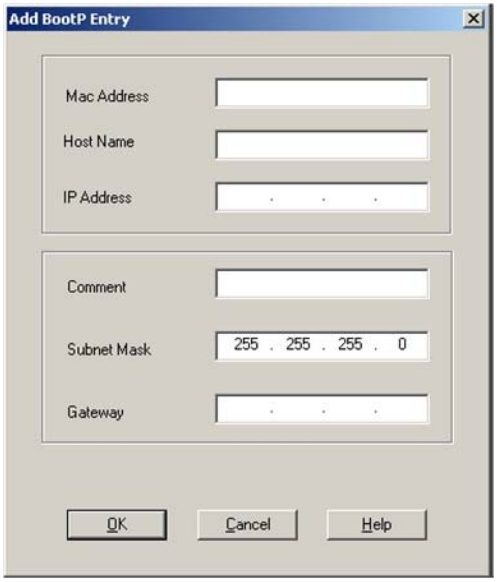


Figure 32 Enable BootP logging

5 Make these entries for the instrument:

- MAC address
- Host name, Enter a Hostname of your choice.

  The Host Name must begin with "alpha" characters (i.e. LC1260)
- IP address
- Comment (optional)
- Subnet mask
- Gateway address (optional)

The configuration information entered is saved in the Tab File.

6 Click **OK**.

7 Leave **Edit BootP Addresses** by pressing **Close**.

8 Exit **BootP Settings** by pressing **OK**.

9 After each modification of the BootP settings (i.e. EditBootPSettings) a stop or start of the BootP service is required for the BootP service to accept changes. See "Stopping the Agilent BootP Service" on page 201 or "Restarting the Agilent BootP Service" on page 202.

10 Power cycle the Instrument.

OR

If you changed the IP address, power cycle the instrument for the changes to take effect.

11 Use the PING utility to verify connectivity by opening a command window and typing:

Ping 192.168.254.11 for example.

The Tab File is located at

C:\Documents and Settings\All Users\Application Data\Agilent\BootP\TabFile

Changing the IP Address of an Instrument Using the Agilent BootP Service

Agilent BootP Service starts automatically when your PC reboots. To change Agilent BootP Service settings, you must stop the service, make the changes, and then restart the service.

Stopping the Agilent BootP Service

1 From the Windows control panel, select **Administrative Tools > Services**. The **Services** screen appears.

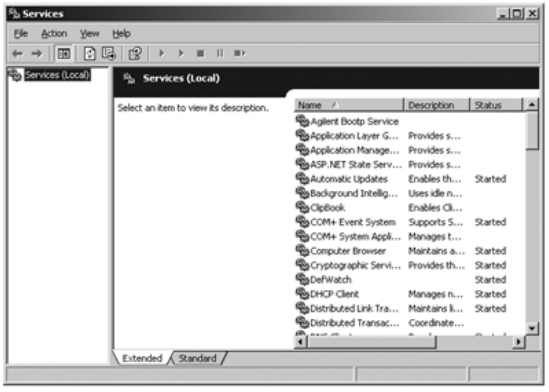


Figure 33 Windows Services screen

2 Right-click **Agilent BootP Service**.

3 Select **Stop**.

4 Close the **Services and Administrative Tools** screen.

Editing the IP address and other parameters in EditBootPSettings

1 Select **Start > All Programs > Agilent BootP Service** and select **Edit BootP Settings**. The **BootP Settings** screen appears.

2 When the **BootP Settings** screen is first opened, it shows the default settings from installation.

3 Press **Edit BootP Addresses...** to edit the Tab File.

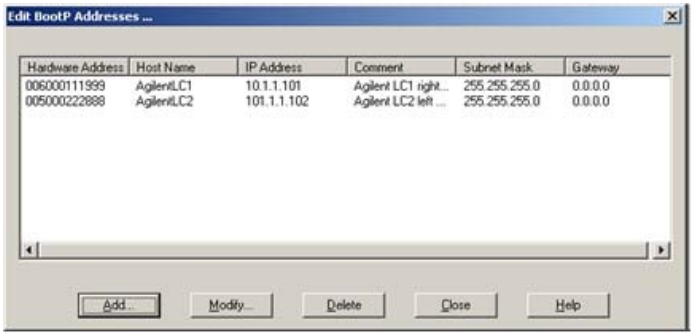


Figure 34 Edit BootP Adresses screen

4 In the **Edit BootP Addresses...** screen press **Add...** to create a new entry or select an existing line from the table and press **Modify...** or **Delete** to change the IP address, comment, subnet mask, for example, in the Tab File.

If you change the IP address, it will be necessary to power cycle the instrument for the changes to take effect.

5 Leave **Edit BootP Addresses...** by pressing **Close**.

6 Exit BootP Settings by pressing OK.

Restarting the Agilent BootP Service

1 In the Windows control panel, select **Administrative Tools > Services**. The **Services** screen appears, see Figure 33 on page 201.

2 Right-click **Agilent BootP Service** and select **Start**.

3 Close the **Services and Administrative Tools** screens.

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the module. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, given that the initialization mode selection switches are allowing it.

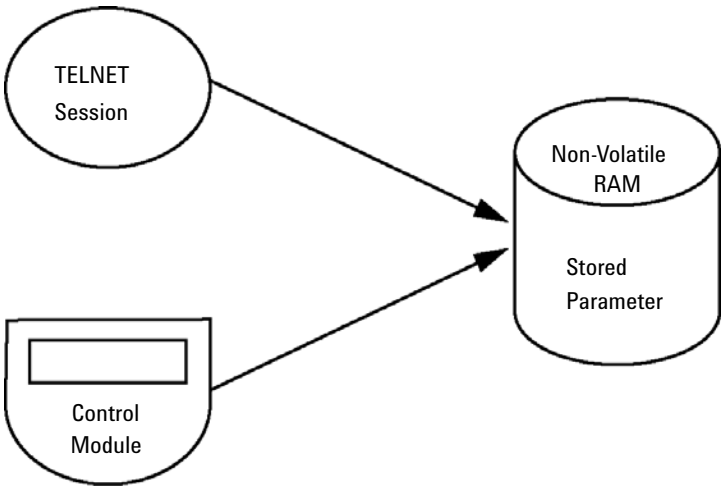


Figure 35 Manual Configuration (Principle)

With Telnet

Whenever a TCP/IP connection to the module is possible (TCP/IP parameters set by any method), the parameters may be altered by opening a Telnet session.

1 Open the system (DOS) prompt window by clicking on Windows **START** button and select **"Run..."**. Type "cmd" and press OK.

2 Type the following at the system (DOS) prompt:

- `c:\>telnet <IP address>` or
- `c:\>telnet <host name>`

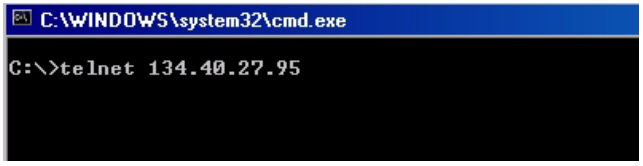


Figure 36 Telnet - Starting a session

where <IP address> may be the assigned address from a Bootp cycle, a configuration session with the Handheld Controller, or the default IP address (see "Configuration Switch" on page 184).

When the connection was established successfully, the module responds with the following:

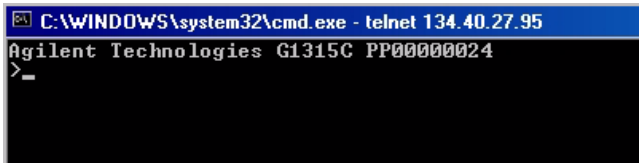


Figure 37 A connection to the module is made

3 Type
`?` and press enter to see the available commands.

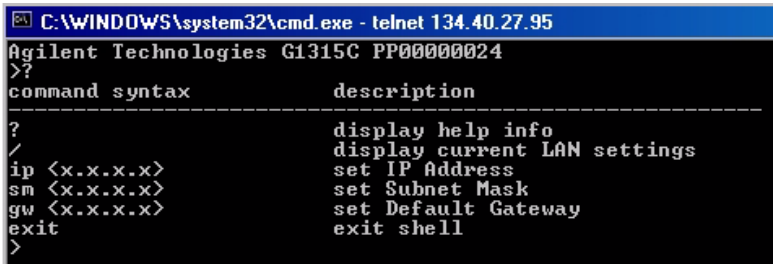


Figure 38 Telnet Commands

Table 17 Telnet Commands

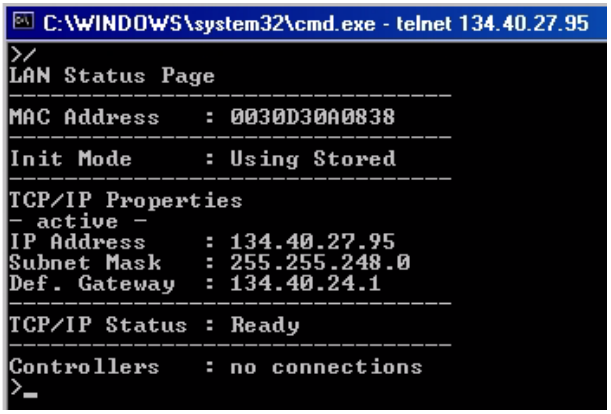
Value	Description
?	displays syntax and descriptions of commands
/	displays current LAN settings
ip <x.x.x.x>	sets new ip address
sm <x.x.x.x>	sets new subnet mask
gw <x.x.x.x>	sets new default gateway
exit	exits shell and saves all changes

4 To change a parameter follows the style:

- parameter value, for example:
  `ip 134.40.27.230`

Then press [Enter], where parameter refers to the configuration parameter you are defining, and value refers to the definitions you are assigning to that parameter. Each parameter entry is followed by a carriage return.

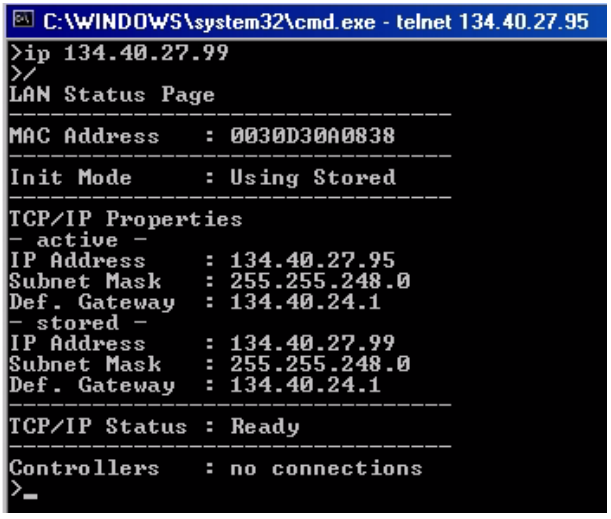
5 Use the “/” and press Enter to list the current settings.



information about the LAN interface
MAC address, initialization mode
Initialization mode is Using Stored
active TCP/IP settings
TCP/IP status - here ready
connected to PC with controller software (e.g. Agilent ChemStation), here not connected

Figure 39 Telnet - Current settings in "Using Stored" mode

6 Change the IP address (in this example 134.40.27.99) and type “/” to list current settings.



change of IP setting to
Initialization mode is Using Stored
active TCP/IP settings
stored TCP/IP settings in non-volatile memory

connected to PC with controller software (e.g. Agilent ChemStation), here not connected

Figure 40 Telnet - Change IP settings

7 When you have finished typing the configuration parameters, type **exit** and press **Enter** to exit with storing parameters.

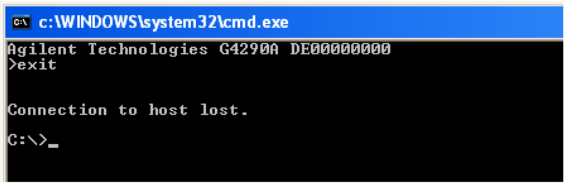


Figure 41 Closing the Telnet Session

NOTE If the Initialization Mode Switch is changed now to “Using Stored” mode, the instrument will take the stored settings when the module is re-booted. In the example above it would be 134.40.27.99.

PC and User Interface Software Setup Setup

PC Setup for Local Configuration

This procedure describes the change of the TCP/IP settings on your PC to match the module's default parameters in a local configuration (see also "Initialization mode selection" on page 185).

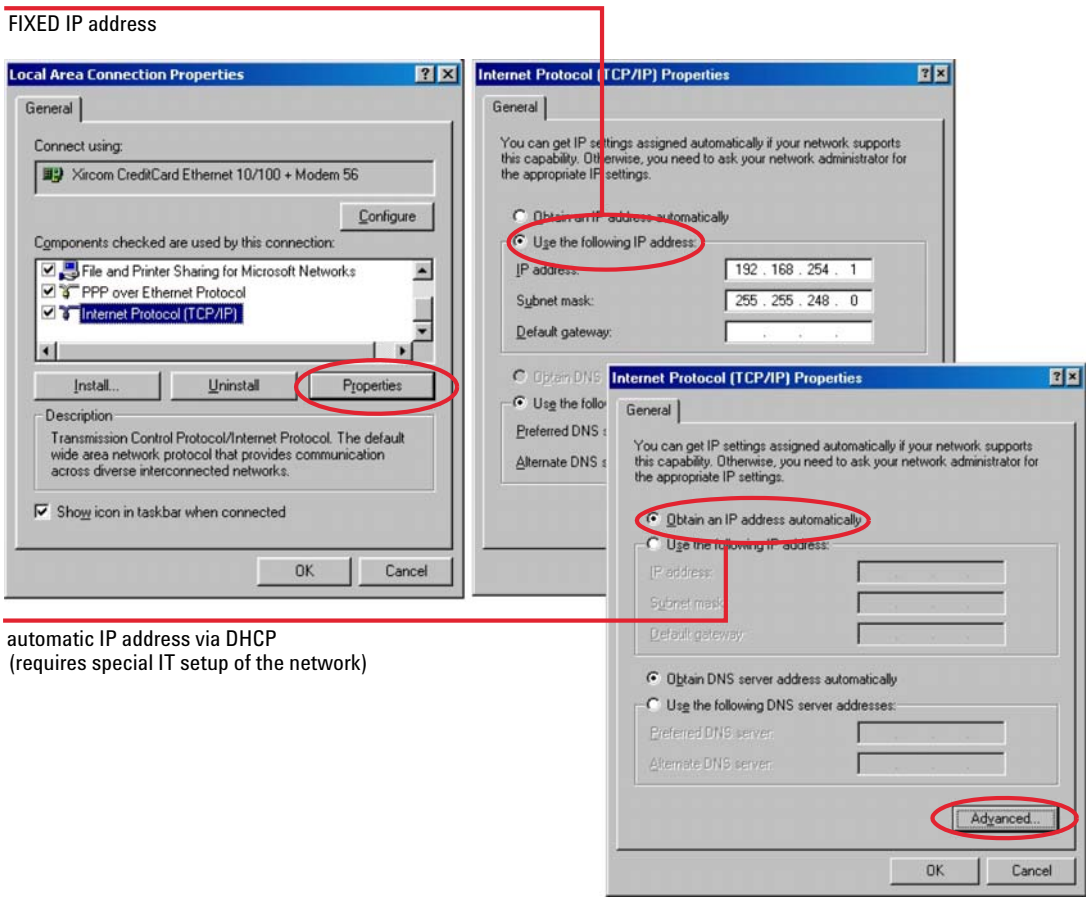


Figure 42 Changing the TCP/IP settings of the PC

User Interface Software Setup

Install you user interface software according the provided *User Interface Software Setup Guide*.



12
Appendix

General Safety Information 212
- General Safety Information 212
- Safety Standards 212
- General 212
- Before Applying Power 213
- Ground the Instrument 213
- Do Not Operate in an Explosive Atmosphere 214
- Do Not Remove the Instrument Cover 214
- Do Not Modify the Instrument 214
- In Case of Damage 214
- Solvents 215
- Safety Symbols 216

Waste Electrical and Electronic Equipment (WEEE) Directive (2002-96-EC) 218

Radio Interference 219

Sound Emission 220

Agilent Technologies on Internet 221

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

General Safety Information

General Safety Information

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

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

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

Safety Standards

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

General

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

Before Applying Power

WARNING

Wrong voltage range, frequency or cabling

Personal injury or damage to the instrument

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

NOTE

Note the instrument's external markings described under "Safety Symbols" on page 216.

Ground the Instrument

WARNING

Missing electrical ground

Electrical shock

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

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

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

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

➔ Do Not Remove the Instrument Cover

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

Do Not Modify the Instrument

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

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

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

Solvents

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

Safety Symbols

Table 18 Symbols

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

Table 18 Symbols

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

WARNING

A WARNING

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

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

CAUTION

A CAUTION

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

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

Waste Electrical and Electronic Equipment (WEEE) Directive (2002-96-EC)

Abstract

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

NOTE

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

Product Category:

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



NOTE

Do not dispose of in domestic household waste

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

Radio Interference

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

Test and Measurement

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

Sound Emission

Manufacturer's Declaration

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

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

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

Agilent Technologies on Internet

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

http://www.agilent.com

Index

8

8-bit configuration switch
- on-board LAN 176

A

Agilent Lab Advisor software 45
Agilent Lab Advisor 45
Agilent
- on internet 221
- User Interface Software Setup 208

ambient non-operating temperature 21
ambient operating temperature 21
analog signal 174
apg remote 174
assemble
- primary pump head 118
- secondary pump head 118

automatic configuration with Bootp 193

B

bench space 20
binary pump shutdown during analysis 61
BootP service
- installation 195
- restart 202
- settings 202
- stop 201

Bootp
- & Store 186
- automatic configuration 193
- initialization modes 185
- using default 187
- using stored 187

C

cable
- CAN 162
- LAN 162
- overview 154
- RS-232 163

cables
- analog 156
- remote 158

CAN
- cable 162

capillaries 83
cleaning 82
compensation sensor open 53
compensation sensor short 54
condensation 20
configuration switches 184
current of primary pump drive too high 70
current of secondary pump drive too high 70

D

defect connection between main board and pump drive encoder 66
degasser's pressure limit violation 59
delay volume
- description 36

deliver underrun 65
DHCP
- general information 189
- setup 190

dimensions 21
disassemble
- primary pump head 105
- pump head assembly 103
- secondary pump head 109

doors
- install 84
- remove 84

drive current too high 64
drive current too low 63
drive encoder error 69
drive Encoder failed 63
drive position limit 68
drive timeout 64

E

electrical connections
- descriptions of 169

electronic waste 218
electrostatic discharge (ESD) 80
EMF
- early maintenance feedback 179

error messages
- binary pump shutdown during analysis 61
- compensation sensor open 53
- compensation sensor short 54
- cover violation 56
- current of primary pump drive too high 70
- current of secondary pump drive too high 70
- defect connection between main board and pump drive encoder 66
- degasser's pressure limit violation 59
- deliver underrun 65

drive current too high 64
drive current too low 63
drive encoder error 69
drive Encoder failed 63
drive position limit 68
drive timeout 64
fan failed 54
flow rate limit exceeded 60
ignition without cover 55, 55
insufficient power of drive encoder LED 68
leak sensor open 53
leak sensor short 52
leak 55
lost CAN partner 52
overcurrent of pump drive 65
overcurrent of solvent selection valve (SSV) 65
pressure below lower limit 58
pressure exceeded upper pressure limit 57
pressure sensor calibration wrong or missing 73
pump drive blocked or encoder failed 62
pump drive encoder defect 66
pump drive encoder error 71
pump drive encoder rollover 68
pump drive error 71
pump drive stop not found 72
pump drive stroke blocked 72
pump error 57
purge valve failed 67
reading of purge valve tag failed 67
reading the pump encoder tag failed 61
remote timeout 51
seal wash pump was missing when tried to turn on 73
shutdown 50
solvent counter exceeded limit 59
target pressure not reached for binary pump degasser 58
timeout 50
unknown purge valve type 71
waste counter limit exceeded 60
writing the pump encoder tag failed 62
writing the purge valve tag failed 69
extra-column volume 36

F

fan failed 54
firmware
description 166
main system 166
resident system 166
update tool 167
updates 167, 135
upgrade/downgrade 135
fittings 83
flow connections 139
flow rate limit exceeded 60
frequency range 21

G

gasket
replace 116
general error messages 50

H

heat exchanger
replace 113
high pressure filter assembly
replace 132
humidity 21

I

initialization mode selection 185
inlet valve
release 97
replace 90
stuck 97
installation
bench space 20
power considerations 18
site requirements 17
install
doors 84
valve rail kit 134
instrument layout 180
insufficient power of drive encoder LED 68
interfaces 44
Infinity II 171
internet 221

J

jet weaver
change configuration 95
replace 95

L

LAN
automatic configuration with Bootp 193
Bootp & Store 186
Bootp 185
cable 162
configuration switche 184
configuration 181
first steps 182
initialization mode selection 185
link configuration selection 192
manual configuration with telnet 204
manual configuration 203
PC and User Interface Software Setup 208
TCP/IP parameter configuration 183

using default 187
using stored 187
leak sensor open 53
leak sensor short 52
leak 55
line frequency 21
line voltage 21
link configuration selection 192
lost CAN partner 52

M

MAC address
determine 198
MAC
address 182
maintenance
feedback 179
introduction 77
replacing firmware 135
manual configuration
of LAN 203
message
cover violation 56
ignition without cover 55, 55
remote timeout 51
module firmware
replace 135

N

non-operating altitude 21
non-operating temperature 21
normal phase 32
seals 33

O

operating Altitude 21
operating temperature 21
optimization
achieving higher resolution 39
outlet valve
replace 92
overcurrent of pump drive 65
overcurrent of solvent selection valve (SSV) 65
overview
cable 154

P

parts
primary pump head 142
secondary pump head 144
PC and User Interface Software Setup 208
performance specifications 22
performance
Optimization 35
physical specifications 21
power considerations 18
power consumption 21
power cords 19
pressure below lower limit 58
pressure exceeded upper pressure limit 57
pressure sensor calibration wrong or missing 73
pressure sensor
replace 87
primary pump head
assemble 118
disassemble 105
parts 142
product description 10
pump drive blocked or encoder failed 62
pump drive encoder defect 66
pump drive encoder error 71
pump drive encoder rollover 68
pump drive error 71
pump drive stop not found 72
pump drive stroke blocked 72
pump error messages 57
pump head assembly
disassemble 103
reassemble 127
remove 101
pump head
torques 89
purge valve failed 67
purge valve head
replace 130

R

radio interference 219
reading of purge valve tag failed 67
reading the pump encoder tag failed 61
remote
cables 158
remove
doors 84
pump head assembly 101
repairs
replacing firmware 135
replace
gasket 116
high pressure filter assembly 132
inlet valve 90
jet weaver 95
outlet valve 92
pressure sensor 87
purge valve head 130
seal wash pump 96
solvent selection valve 94
wash seal 116
resolution
Optimization 39
RS-232C
cable 163

S

safety class I 212
safety
  general information 212
  standards 21
  symbols 216
seal wash pump was missing when tried to turn on 73
secondary pump head
  assemble 118
  disassemble 109
  parts 144
serial number
  information 170
shutdown 50
shutoff valve panel
  replacing 86
shutoff valves
  replacing 86
site requirements 17
  power cords 19
solvent counter exceeded limit 59
solvent selection valve
  replace 94
special interfaces 175
special settings
  boot-resident 178
  forced cold start 178
specification
  physical 21
specifications 17
SSV
  replace 94

T

target pressure not reached for binary pump degasser 58
TCP/IP parameter configuration 183
telnet
  configuration 204
temperature sensor 55
timeout 50
torques
  pump head 89
transport
  prepare 136
troubleshooting
  error messages 49

U

unknown purge valve type 71

V

valve rail kit
  install 134
voltage range 21

W

wash seal
  replace 116
waste counter limit exceeded 60
waste
  electrical and electronic equipment 218
WEEE directive 218
weight 21
writing the pump encoder tag failed 62
writing the purge valve tag failed 69

www.agilent.com

In This Book

This manual contains technical reference information about the Agilent 1290 Infinity II High Speed Pump G7120A.

- introduction and specifications,
- using and optimizing,
- troubleshooting and diagnose,
- maintenance,
- parts identification,
- hardware information,
- safety and related information.

© Agilent Technologies 2014, 2015

Printed in Germany
07/2015

G7120-90000
Rev. D

Agilent Technologies