Agilent

Agilent InfinityLab LC Series
Multicolumn Thermostats

User Manual

Notices

Document Information

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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 Book

This manual covers the following modules:

- Agilent 1290 Infinity II Multicolumn Thermostat (G7116B)
- Agilent 1260 Infinity II Multicolumn Thermostat (G7116A)

1 Introduction to the Multicolumn Thermostat

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

2 Site Requirements and Specifications

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

3 Using the Module

This chapter gives instructions on how to use the module.

4 Preparing the Module

This chapter provides information on how to set up the module for an analysis and explains the basic settings.

5 Optimization

This chapter provides information on how to optimize the Multicolumn Thermostat.

6 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

7 Error Information

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

8 Test Functions and Calibrations

This chapter describes the module's built-in test functions.

9 Maintenance

This chapter describes the maintenance of the MCT.

10 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

11 Identifying Cables

This chapter provides information on cables used with the Agilent Infinity and Infinity II Series modules.

12 Hardware Information

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

13 Appendix

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

Contents

1 Introduction to the Multicolumn Thermostat

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

Product Description (G7116B)

The Agilent 1290 Infinity II Multicolumn Thermostat (MCT) facilitates precise column thermostatting over a broad temperature range with cooling down to 20 °C below ambient temperature and heating up to 110 °C.

This capability provides high flexibility for optimized speed and enhanced selectivity of LC separations. Exchangeable ultra-high-pressure valves enable a wide range of applications such as column selection from eight columns in a single MCT, sample preparation for analyte enrichment or matrix removal, alternating column regeneration – and many more.

The MCT matches perfectly with all InfinityLab LC Series systems and can also be combined with previous 1260 and 1290 Infinity Series modules.

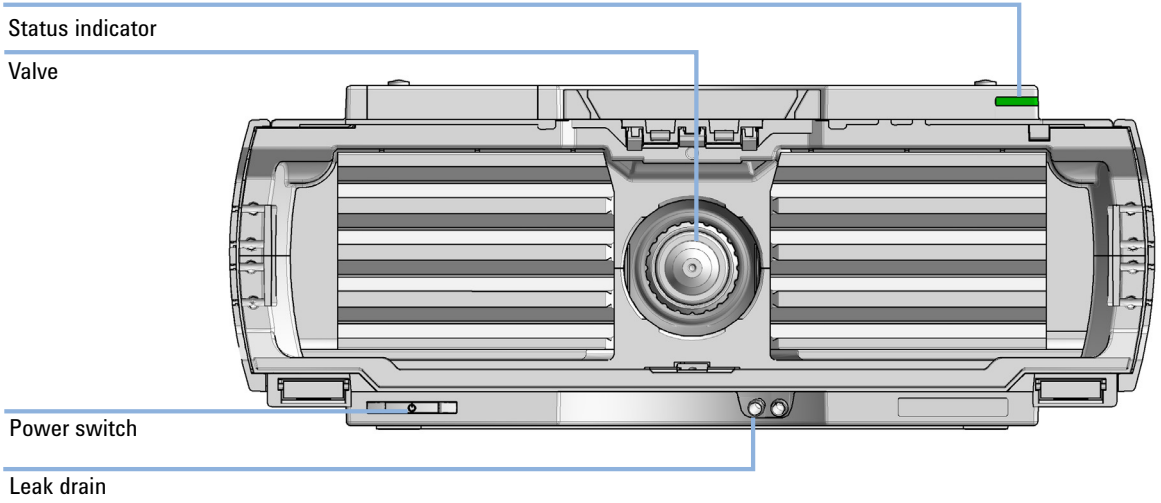


Figure 1 Overview of the Multicolumn Thermostat

Product Description (G7116A)

The Agilent 1260 Infinity II Multicolumn Thermostat (MCT) facilitates precise column thermostatting over a broad temperature range with cooling down to 10 °C below ambient temperature and heating up to 85 °C.

This capability provides robust and reliable separations for maximum application flexibility. Exchangeable high-pressure valves enable a wide range of applications such as column selection of up to four columns, sample preparation for analyte enrichment or matrix removal, or alternating column regeneration.

The MCT matches perfectly with all InfinityLab LC Series systems and can also be combined with 1290 Infinity II Series modules as well as with previous 1260 Infinity and 1290 Infinity Series modules.

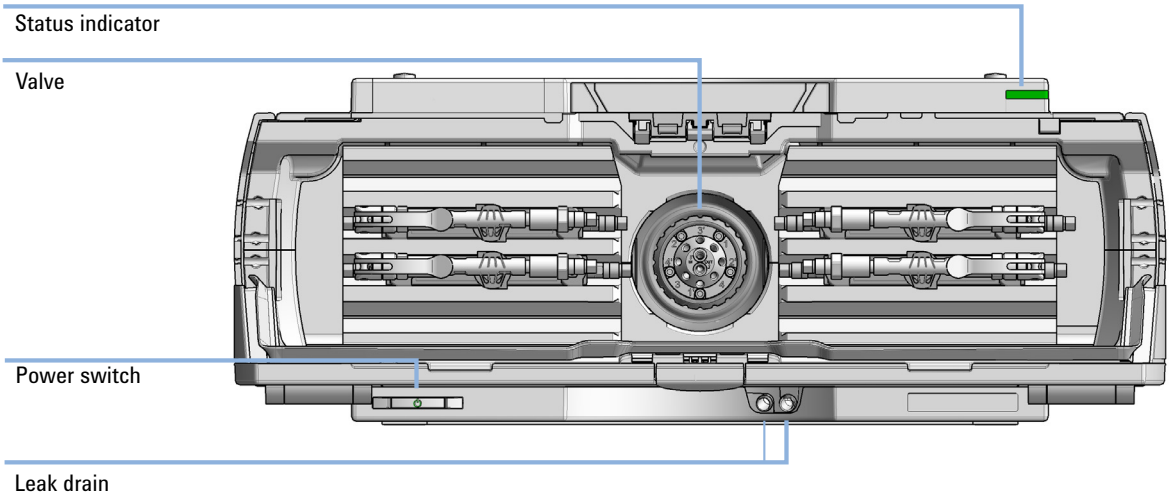


Figure 2 Overview of the Multicolumn Thermostat

Features (G7116B)

- Superior usability with flexible flap positions: open door to 90° (desk function), or to 180°, or even removal of the front door for maximum accessibility.
- Efficient, fast, and most convenient column exchange through InfinityLab Quick Connect Fittings.
- Advanced column capacity for up to 8 columns in a single MCT.
- Next generation InfinityLab Quick Connect Heat Exchangers for precolumn solvent thermostatting, which contribute volumes of only 3, 1.6 or 1 µL for optimized low dispersion.
- Maximum application flexibility through Peltier cooling and heating with two independent temperature zones from 20 °C below ambient temperature up to 110 °C.
- Optional valve drive to host user-exchangeable InfinityLab Quick Change Valves of different formats.
- High temperature precision for reproducible retention times and peak areas.
- Optional column identification module to track history of up to eight columns for documentation of column type, major column parameters, and number of injections as standard for GLP.

Features (G7116A)

- Superior usability with flexible flap positions: open door to 90° (desk function), or to 180°, or even removal of the front door for maximum accessibility.
- Efficient, fast, and most convenient column exchange through InfinityLab Quick Connect Fittings.
- Reproducible precolumn solvent thermostatting with next generation InfinityLab Quick Connect Heat Exchanger easily installed for each column. A bio-inert heat exchanger is available for biological and extreme pH applications.
- Maximum application flexibility through Peltier cooling and heating with two independent temperature zones from 10 °C below ambient temperature up to 85 °C.
- Optional, traceable column identification to track history of up to four columns for documentation of column type, major column parameters, and number of injections as standard for GLP.
- Optional valve drive to host user-exchangeable InfinityLab Quick Change Valve Heads of different formats, which are also available in bio-inert materials.

Operating Principle

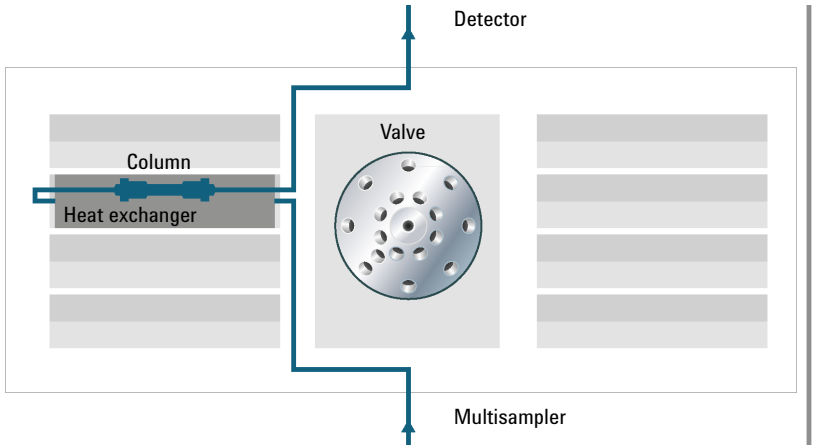


Figure 3 Hydraulic path

The Concept of Heating and Cooling

The design of the Multicolumn Thermostat (MCT) uses Quick Connect Heat Exchangers that are mounted on to the heating and cooling devices with Peltier elements. The solvent entering the Quick Connect Heat Exchangers is heated up or cooled down to a settable temperature before entering the column.
A triangular shape of the Quick Connect Heat Exchangers prevents incorrect placement and ensures optimum heat exchange of the solvent. Optimal insulation of the heater room offers best temperature stability for the column. This ensures that the column and the solvent flowing through it are almost at the same temperature. The solvent cools down or heats up on its transfer from the Quick Connect Heat Exchangers to the column inlet. This depends on several factors: flow rate, setpoint temperature, and ambient temperature. Any type of heated column compartment brings one important consequence for column temperature equilibration. Before an equilibrium is reached, the whole mass of column, column packing, and solvent volume inside the column has to be brought to the selected temperature. This depends on several factors: flow rate, setpoint temperature, ambient temperature, and column dimensions. The column equilibrates faster at higher flow rates (due to thermostatted mobile phase). In a flowthrough temperature regulation system, there are necessarily slightly different temperatures at different positions. The actual temperature displayed on the user interface is always the temperature measured at the heating and cooling device.

The equilibration of the column may take a while. Stability of the pressure signal is a good indication for temperature equilibrium of the column.

Column Switching Valve

InfinityLab Quick Change Valves for column switching are an orderable add-on option for the InfinityLab Multicolumn Thermostat.

Multicolumn Selection (G7116B with G4239C)

Advantages

- Increase productivity
- Higher instrument up-time

The valve facilitating quick changes allows the selection between up to eight different stationary phases for a variety of applications, or the usage of identical stationary phases in columns with different dimensions for either faster run-times (short columns) or higher resolution (long columns) or for loading studies with different internal diameters.

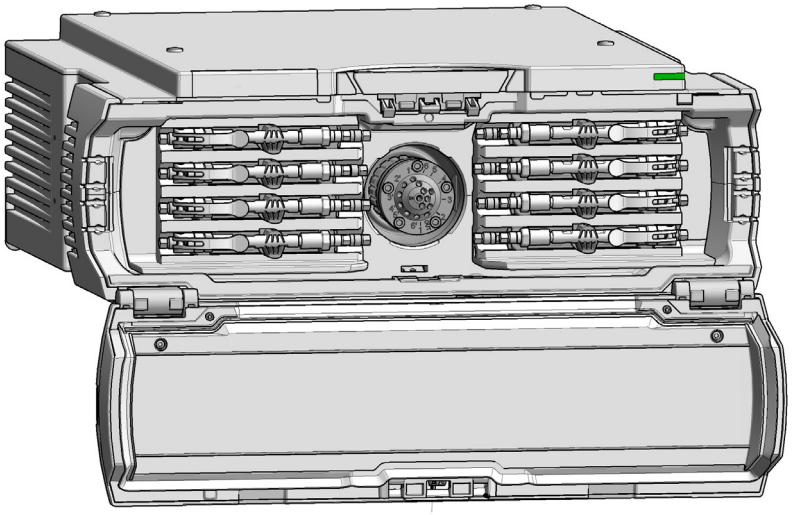


Figure 4 **The G7116B 1290 Infintiy II Multicolumn Thermostat equipped with an InfinityLab Quick Change 8-column selector valve head**

Multicolumn Selection (G7116A with G4237A)

Advantages

- Increase productivity
- Higher instrument up-time

The valve facilitating quick changes allows the selection between up to four different stationary phases for a variety of applications, or the usage of identical stationary phases in columns with different dimensions for either faster run-times (short columns) or higher resolution (long columns) or for loading studies with different internal diameters.

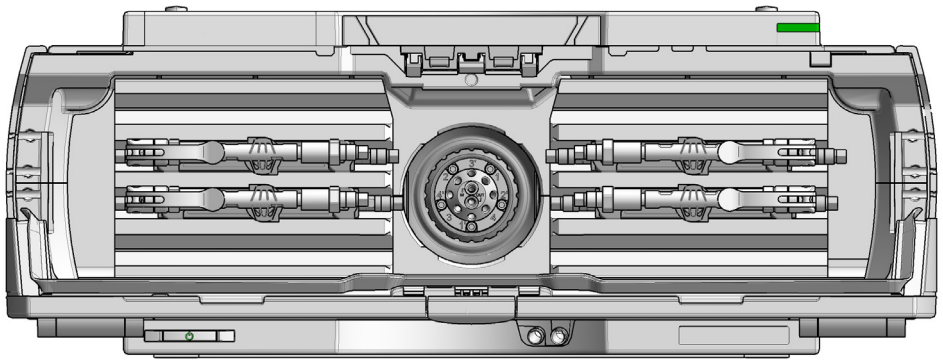


Figure 5 **The G7116A 1260 Infinity II Multicolumn Thermostat equipped with an InfinityLab Quick Change 4-column selector valve head**

Method Development

Advantages:

- Faster method development
- Automated method development possible

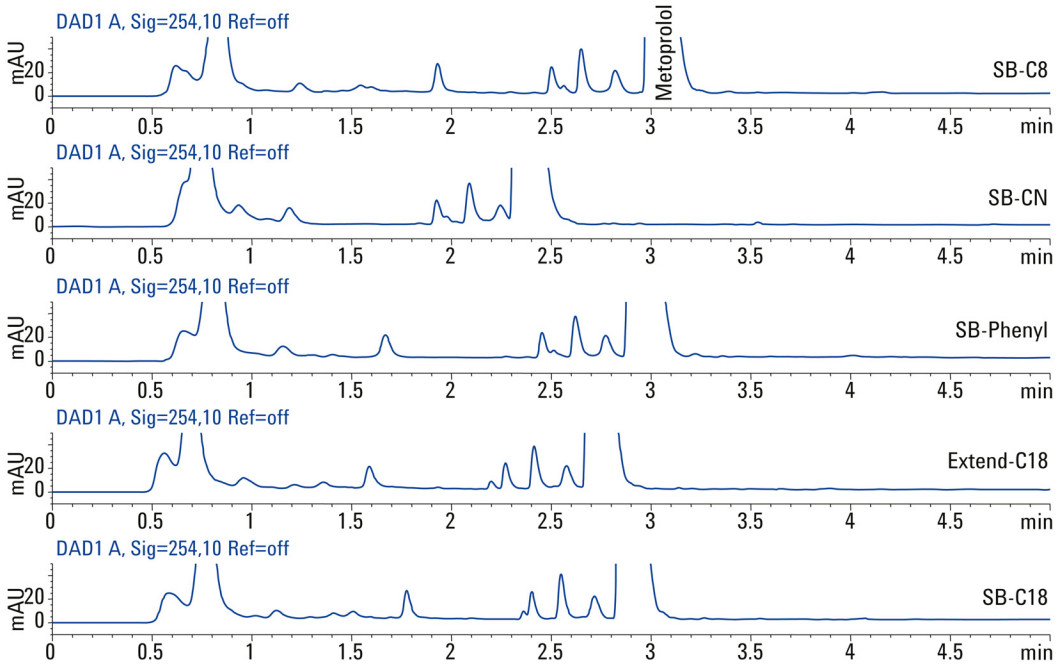


Figure 6 **Different chromatographic results obtained for the same sample on five different stationary phases**

Typical Applications

NOTE

The interconnection of ports at particular valve position strongly depends on the combination of valve and module. The software user interface always displays the correct situation. A method modification or re-plumbing of the connections is typically required if transferring methods from G1316A/B/C to G7116A/B, G1170A or G4227A.

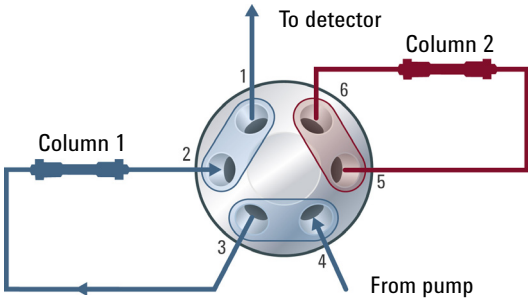
Refer to the table below for further information on which ports are connected to which position.

Modules	Valve	Position 1	Position 2
G1316A/B/C	2-position/6-port	1-2	1-6
G7116A/B, G1170A, G4227A	2-position/6-port	1-6	1-2
G1316A/B/C	2-position/10-port	1-2	1-10
G7116A/B, G1170A, G4227A	2-position/10-port	1-10	1-2

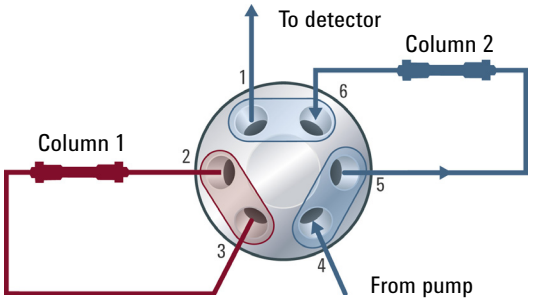
Dual column selection (2-position/6-port or 2-position/10-port valves)

Advantages:

- Increase productivity
- Higher instrument up-time



Position 1-2

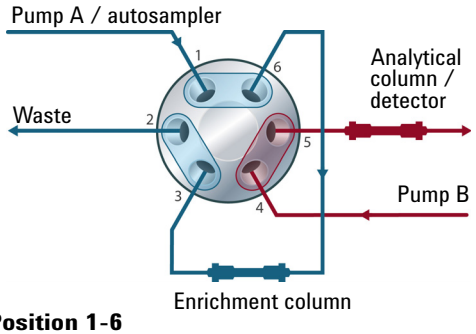


Position 1-6

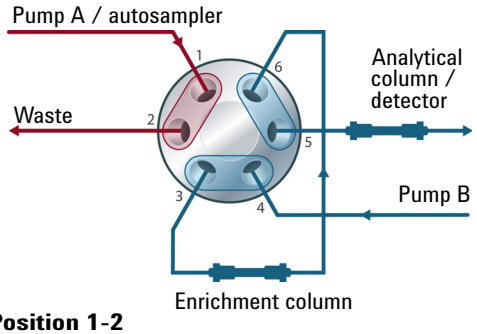
The valve can select either column 1 or column 2, allowing quick changes between two different stationary phases for separation selectivity, or immediate availability of a second and identical stationary phase in case the first column loses efficiency, when dealing with complex matrices for instance.

Sample enrichment and sample cleanup (2-position/6-port or 2-position/10-port valves)

Sample Enrichment

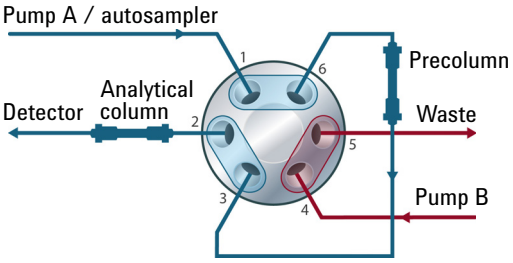


Position 1-6

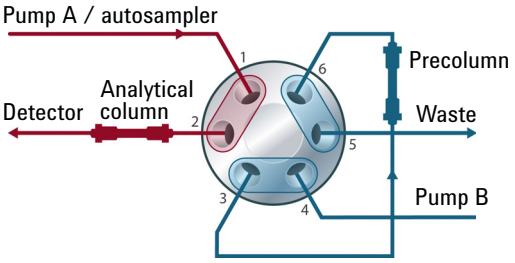


Position 1-2

Sample Cleanup



Position 1-6



Position 1-2

Advantages:

- Easy automation of sample preparation
- Higher reproducibility
- Increased productivity and sensitivity

Sample cleanup is essential for samples with complex matrices, such as biological fluids, food extracts and waste water. Before injection into a LC or LC/MS system, the sample matrix must be separated from the analytes of interest. Otherwise, contaminants can disrupt separation and detection or even damage the analytical column.

Enrichment methods

Enrichment methods are the techniques of choice to obtain highest sensitivity and to remove the sample matrix in such applications as proteomics, drug metabolism, and environmental trace analysis. The analytes are retained and concentrated onto the precolumn, while the sample matrix is passed to waste. After the valve switch, a second pump backflushes the analytes out of the precolumn onto the separation column. This allows injection of large volumes onto the precolumn, significantly expanding sensitivity in the range of ten to several thousands.

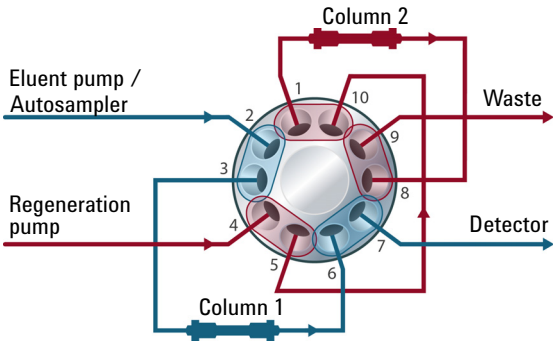
Sample cleanup

Cleanup methods handle analytes and matrices in the opposite way to enrichment methods. Matrix components are retained on the precolumn while the analytes pass through to the separation column. After the valve switches, an extra pump backflushes the matrix components out of the precolumn to waste, while the analytes are separated on the main column. Backflushing prepares the precolumn for the next injection.

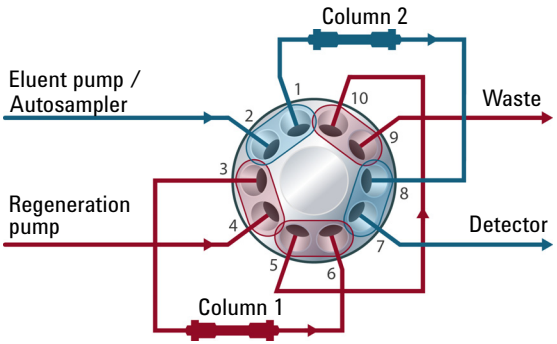
Alternating Column Regeneration (2-position/10-port valves only)

Advantages:

- High sample throughput
- Increased productivity
- High efficiency



Position 1-10



Position 1-2

Gradient elution is frequently used for fast separation of complex samples in LC. Since the gradient elution requires the column to regenerate before subsequent runs, an automated column regeneration system saves valuable analysis time. Agilent's InfinityLab Quick Change 2-position/10-port valve enables the simultaneous analysis of one sample on one LC column while an extra regeneration pump flushes and equilibrates a second, identical column. At the end of the run, the valve switches to the second position and the next sample is separated on the previously flushed and equilibrated column. Meanwhile, the regeneration pump flushes and equilibrates the first column. Up to 50 % of analysis time is often required to equilibrate columns. Using alternating column regeneration saves time and provides higher sample throughput.

Leak and Waste Handling

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

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 Infinity II 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 or Sample Thermostat (condensate)
- from the pump's Seal Wash Sensor (if applicable)
- from the pump's Purge Valve or Multipurpose Valve

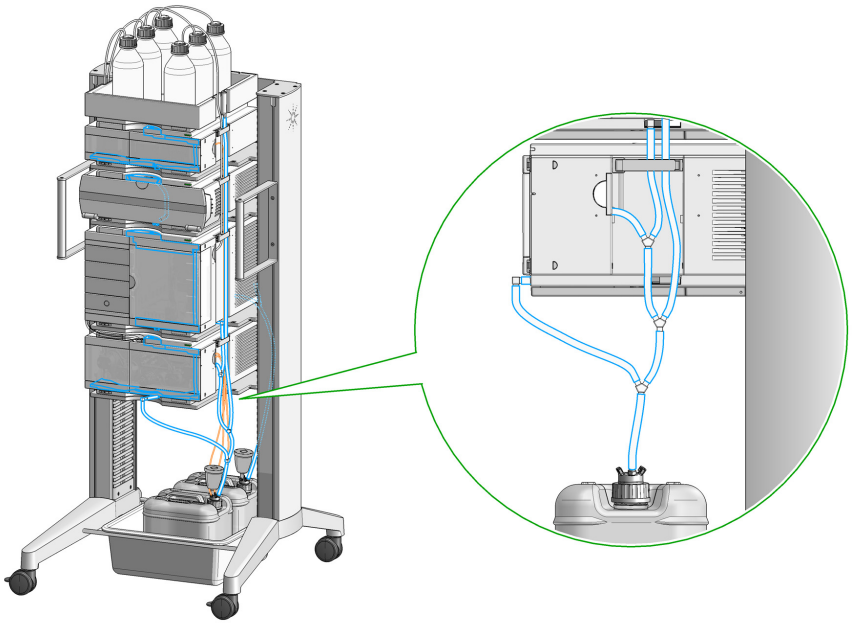


Figure 7 Infinity II Leak Waste Concept (Flex Bench installation)

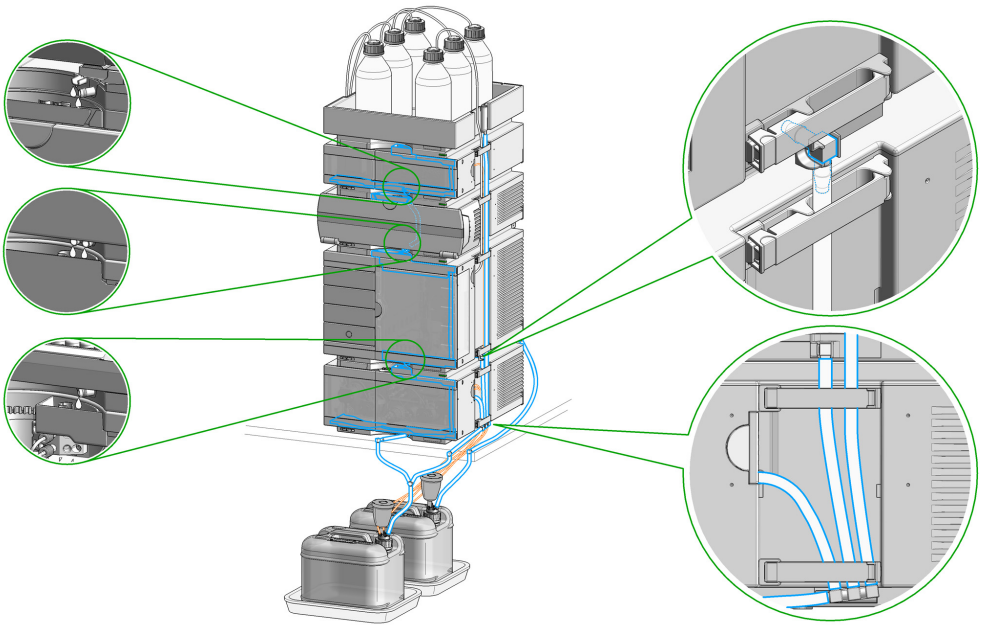


Figure 8 Infinity II Single Stack Leak Waste Concept (bench installation)

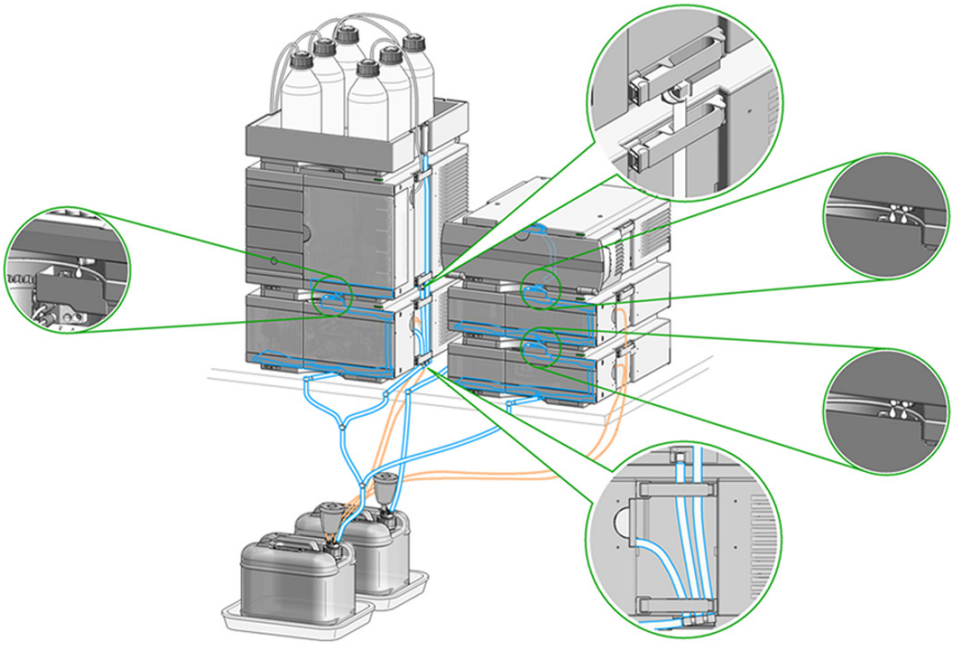


Figure 9 Infinity II Two Stack Leak Waste Concept (bench installation)

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

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.

Leak Sensor

CAUTION

Solvent incompatibility

The solvent DMF (dimethylformamide) leads to corrosion of the leak sensor. The material of the leak sensor, PVDF (polyvinylidene fluoride), is incompatible with DMF.

- ✓ **Do not use DMF as mobile phase.**
- ✓ **Check the leak sensor regularly for corrosion.**

2 Site Requirements and Specifications

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

Site Requirements

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

Power Considerations

The module power supply has wide ranging capability. It accepts any line voltage in the range described in Table 1 on page 31. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Hazard of electrical shock or damage of your instrumentation

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

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

WARNING

Electrical shock hazard

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

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

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

WARNING

Inaccessible power plug.

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

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

Power Cords

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

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

WARNING

Unintended use of power cords

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

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

WARNING

Absence of ground connection

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

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

WARNING

Electrical shock hazard

Solvents may damage electrical cables.

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

Bench Space

The module dimensions and weight (see Table 1 on page 31) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

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

The module should be operated in a horizontal position.

NOTE

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

Condensation

CAUTION

Condensation within the module

Condensation can damage the system electronics.

- ✓ **Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.**
- ✓ **If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.**

Physical Specifications

Physical Specifications G7116B

Table 1 Physical Specifications G7116B

Type	Specification	Comments
Weight	12.5 kg (27.6 lbs)	
Dimensions (height × width × depth)	160 x 435 x 436 mm (6.3 x 17.1 x 17.2 inches) Width with column identification kit: 472 mm	G7116B may have a Column ID tag reader on both sides.
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	150 VA, 150 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)	
Safety standards: IEC, EN, CSA, UL	Overvoltage category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

Physical Specifications G7116A

Table 2 Physical Specifications G7116A

Type	Specification	Comments
Weight	12.5 kg (27.6 lbs)	
Dimensions (height × width × depth)	160 x 435 x 436 mm (6.3 x 17.1 x 17.2 inches) Width with column identification kit: 460 mm	G7116A only has a Column ID tag reader on the left hand side.
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	150 VA, 150 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)	
Safety standards: IEC, EN, CSA, UL	Overvoltage category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

Performance Specifications

Performance Specifications G7116B

Table 3 Performance Specifications G7116B

Feature	Specification	Comment
Operating principle	Thermostatted column compartment with dual, independent Peltier element. Solvent pre-heating and still-air operation for reduction of chromatographic band broadening under UHPLC-conditions. Up to four devices can be clustered and controlled by a single user interface for additional flexibility.[1]	
Temperature range	20 °C below ambient (minimum 4 °C) to 110 °C	2
Temperature range increment	Settable in steps of 0.1 °C	2
Temperature stability	±0.03 °C	2
Temperature accuracy	±0.5 °C (with calibration at 40 °C)	2
Temperature precision	0.05 °C	2
Independent temperature zones	2 (in single device) Up to 8 in clustered configuration[1]	
Column capacity	8 columns of 100 mm length plus Quick Connect fittings or pre-columns 4 columns of 300 mm length plus Quick Connect fittings or pre-columns Selection of columns by single optional integrated 8-column selector valve (1300 bar) Maximum of 32 columns of 100 mm length plus Quick Connect fittings or pre-columns 16 columns of 300 mm length plus Quick Connect fittings or pre-columns with clustering[1] of four devices.	

Table 3 Performance Specifications G7116B

Feature	Specification	Comment
Heat-up/cool-down time	5 min from ambient to 40 °C 10 min from 40 °C to 20 °C <30 min from 25 °C to 100 °C	2
Solvent heat exchangers	Individually quick-installable for every column. Available at 1 µL internal volume, 0.075 mm i.d. capillary (ultra-low dispersion), 1.6 µL internal volume, 0.12 mm i.d. capillary (standard) and 3 µL internal volume, 0.12 mm i.d. capillary (high-flow).	
Valve options	1 x integrated valve drive as option 2 x external valve drives as option to host user-exchangeable Quick Change valve heads (up to 1300 bar) of different formats: 2-position/6-port, 2-position/10-port, 4-column selection (4-position/10-port) up to 800 bar, 6-column selection (6-position/14-port), 8-column selection (8-position/18-port). Valve heads are automatically identified by their RFID tag.	
Column identification	Optionally, column identification kit to track history of up to eight columns. Mounted on left- and right-hand side of module.	
Instrument control	LC and CE Drivers A.02.11 or above Agilent Instant Pilot (G4208A) B.02.19 or above InfinityLab LC Companion (G7108A) 1.1 or above. Lab Advisor B.02.06 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC & CE Drivers.
Communication	Controller Area Network (CAN)	G7116B is a hosted module. (The LC stack needs to contain suitable host module or a LAN card for communication and control).
Maintenance and safety-related features	Extensive diagnostics, error detection and display (through Instant Pilot control module and Agilent Lab Advisor), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in main maintenance areas. Door-open sensor.	
GLP features	Valve heads carrying tags with serial number, pressure rating, number of switches and valve type. Concept of column identification.	
Housing	All materials recyclable	

[1] Requires LC and CE drivers A.02.12 or above

[2] All specifications are valid for distilled water at ambient temperature (25 °C), set point at 40 °C and a stable flow range from 0.2 - 5 mL/min. Equilibration time: 10 min.

Performance Specifications G7116A

Table 4 Performance Specifications G7116A

Type	Specification	Comments
Operating principle	Thermostatted column compartment with dual, independent Peltier-element. Solvent pre-heating and still-air operation for reduction of chromatographic band-broadening under UHPLC-conditions.	
Temperature range	10 °C below ambient (minimum 4 °C) to 85 °C	1
Temperature range increment	Settable in steps of 0.1 °C	1
Temperature stability	±0.1 °C	1
Temperature accuracy	±0.5 °C (with calibration at 40 °C)	1
Temperature precision	0.05 °C	1
Independent temperature zones	2 in single device	
Column capacity	4 columns of up to 300 mm length plus InfinityLab Quick Connect fittings or pre-column. The number of pre-column Quick Connect Heat Exchangers is scalable - each column can be equipped with an individual heat exchanger for best performance. 4-column selector valve is available to access each column without replumbing.	
Heat-up/cool-down time	5 min from ambient to 40 °C 10 min from 40 °C to 20 °C <25 min from 25 °C to 85 °C	1
Solvent heat exchangers	Individually quick-installable for every column. Available at 3 µL internal volume, 0.17 mm i.d. capillary (large ID), 6 µL internal volume, 0.17 mm i.d. capillary (large ID high flow) and 9 µL internal volume, 0.17 mm i.d. capillary (bio-inert, metal-free).	
Valve options	1 x integrated valve drive as option to host user-exchangeable Quick Change valve heads (up to 800 bar) of different formats: 2-position/6-port, 2-position/10-port, 4-column selection (4-position/10-port). Also available in bio-inert materials. Valve heads are automatically identified by their RFID tag.	

Table 4 Performance Specifications G7116A

Type	Specification	Comments
Column identification	Optionally, column identification kit to track history of up to four columns. Mounted on the left hand-side of module.	
Instrument control	LC and CE Drivers A.02.14 or above. Agilent Instant Pilot (G4208A) B.02.20 or above. InfinityLab LC Companion (G7108A) 1.1 or above. Lab Advisor B.02.08 or above.	For details about supported software versions refer to the compatibility matrix of your version of the LC & CE Drivers
Communication	Controller Area Network (CAN)	G7116A is a hosted module. (The LC stack needs to contain suitable host module or a LAN card for communication and control).
Maintenance and safety-related features	Extensive diagnostics, error detection and display (through Instant Pilot control module and Agilent Lab Advisor), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Valve heads carrying tags with serial number, pressure rating, number of switches and valve type. Concept of column identification.	
Housing	All materials recyclable.	

[1] All specifications are valid for distilled water at ambient temperature (25 °C), set point at 40 °C and a stable flow range from 0.2 - 5 mL/min. Equilibration time: 10 min.

Valve Specifications

Table 5 G4239C (5067-4233), 8-Position/18-Port Valve 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	8 column selection
Port size	Accepts M4 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 6 G4237A (5067-4279), 4-Position/10-Port Valve 800 bar

Type	Specification
Maximum pressure	800 bar
Typical application	4 column selection
Port size	Accepts M4 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 7 G4231C (5067-4241), 2-Position/6-Port Valve 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	Any two-way switching, e.g. between two detectors, between waste and detector, between two columns
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 8 G4231A (5067-4282), 2-Position/6-Port Valve 800 bar

Type	Specification
Maximum pressure	800 bar
Typical application	Any two-way switching, e.g. between two detectors, between waste and detector, between two columns
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 9 G4232D (5067-4240), 2-Position/10-Port Valve 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	Anything a 2-Position/6-Port valve can do plus alternating column regeneration
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 10 G4232C (5067-4283), 2-Position/10-Port Valve 800 bar

Type	Specification
Maximum pressure	800 bar
Typical application	Anything a 2-Position/6-Port valve can do plus alternating column regeneration
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 11 G4234C (5067-4273), 6-Position/14-Port Valve 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	6 column selection
Port size	Accepts M4 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 12 G4234A (5067-4284), 6-Position/14-Port Valve 800 bar

Type	Specification
Maximum pressure	800 bar
Typical application	6 column selection
Port size	Accepts M4 male threaded fittings
Liquid contacts	PEEK, Stainless steel
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Table 13 G5641A (5067-6682), 2-position/10-port Bio valve head 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	Anything a 2-position/6-port valve can do plus alternating column regeneration
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, MP35N
pH range	0 – 14[1]

[1] incompatible with some mineral acids. For more information see Solvent Information.

Extended Specifications

The G7116A MCT is delivered with Large ID Quick Connect Heat Exchanger (0.17 mm with 3 µL internal volume) that is suitable for standard applications.

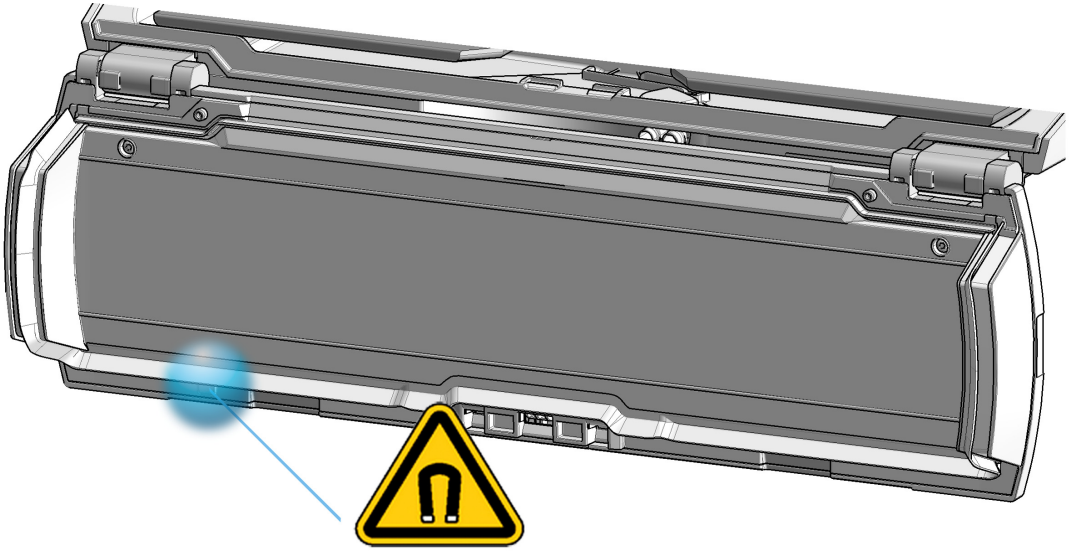
The G7116B MCT is delivered with Low Dispersion Quick Connect Heat Exchanger (0.12 mm with 1.6 µL internal volume) that is suitable for standard applications. Additional flavors of Quick Connect Heat Exchangers are available for optimization regarding better heating performance at higher flow rates (>2.5 mL) or for reducing the dispersion volume for low flow applications.

3 Using the Module

This chapter gives instructions on how to use the module.

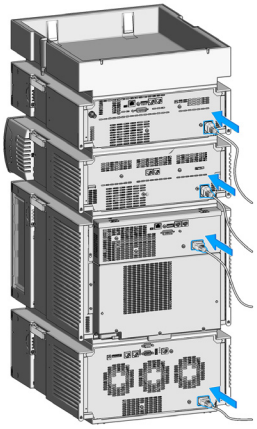
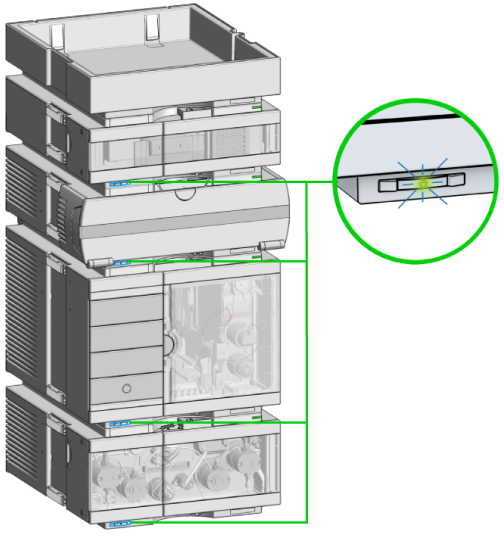
Magnets

1 Magnet in the front door of the Multicolumn Thermostat.

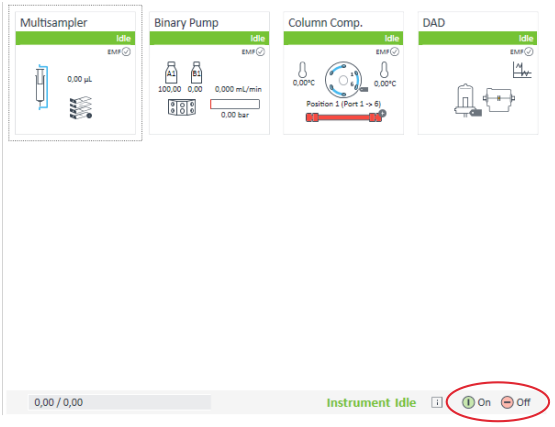


Turn on/off

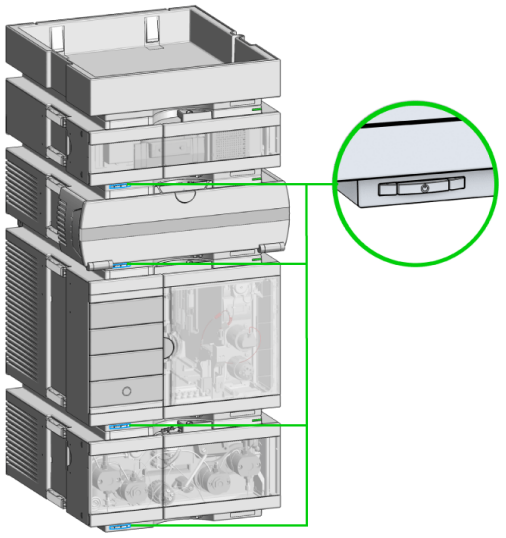
This procedure exemplarily shows an arbitrary LC stack configuration.

1 	2  Power switch: On

3 Turn instrument **On/Off** with the control software.

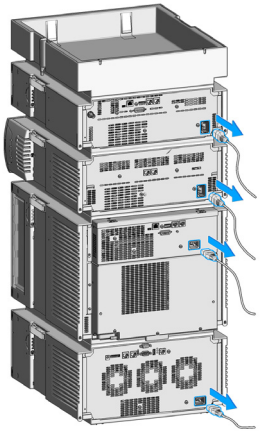


4



Power switch: Off

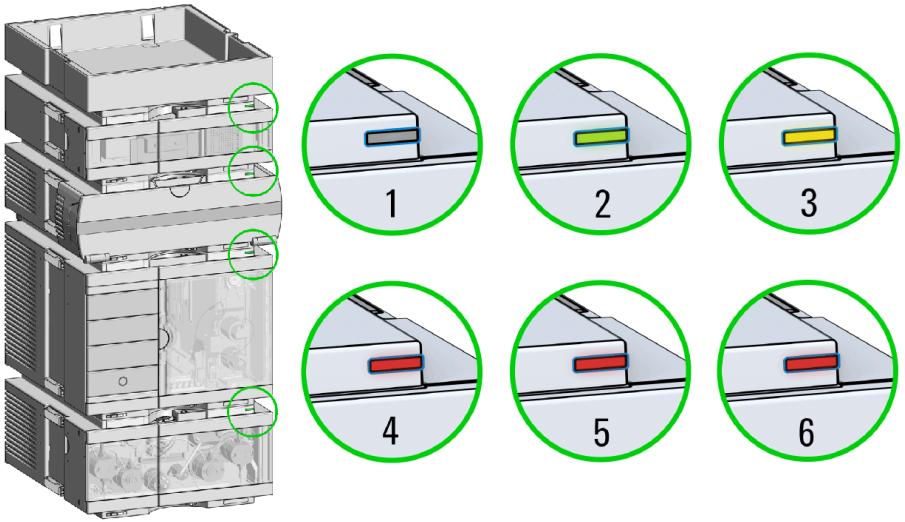
5



Status Indicators

This procedure exemplarily shows an arbitrary LC stack configuration.

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

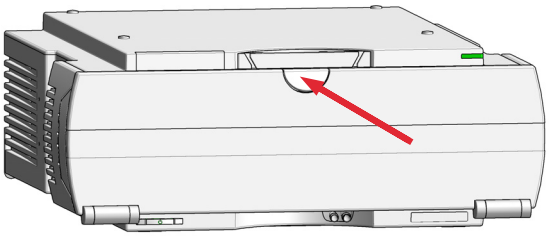
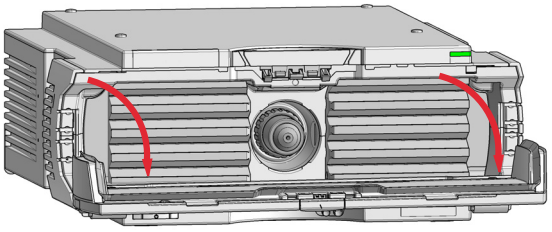


Status indicators

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.

Open the Front Door

The front door opens in two angles: 90° and 180°. In the 90° position, it can be used as a tray.

1 Press the release button to open the front door. 	**2** Open the door in a 90° angle to use it as a tray. 

Install Heat Exchanger

For bio-inert modules use bio-inert parts only!

For 1290 Infinity II Bio LC modules, use bio / bio-compatible parts only.
Do not mix parts between 1260 Infinity II Bio-Inert LC modules and 1290 Infinity II Bio LC modules.

Modified design of Quick Connect Heat Exchangers allows simplified installation of the heat exchanger in the Multicolumn Thermostat (MCT).

New design Quick Connect Heat Exchangers do not have twist lock clips on the front side of the heat exchanger. Instead, Quick Connect Heat Exchangers include two column holders to fix the heat exchanger in the MCT heater block.

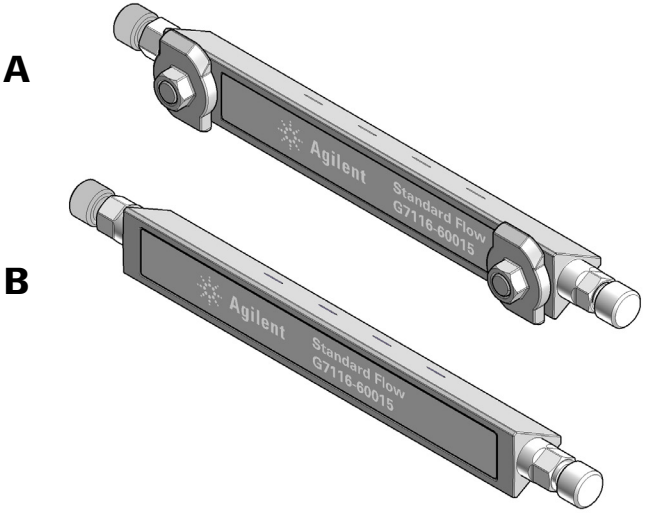


Figure 10 Quick Connect Heat Exchangers of the old design (top, A) and new design (bottom, B)

Tools required

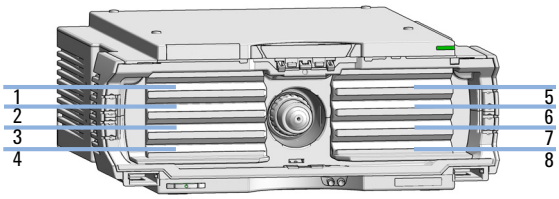
p/n	Description
5043-0915	Fitting mounting tool
5023-2502	Hex driver SW-6.35, slitted
8710-0510	Open-end wrench 1/4 — 5/16 inch

Parts required

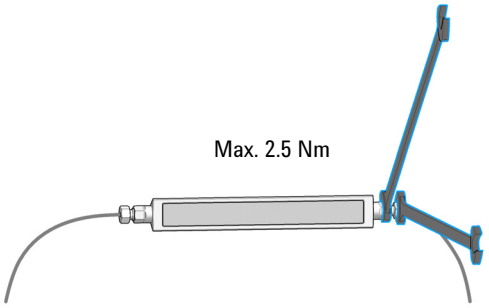
p/n	Description
	For 1290:
G7116-60015	Quick Connect Heat Exchanger Standard
G7116-60021	Quick Connect Heat Exchanger Ultra Low Dispersion
G7116-60031	Quick Connect Heat Exchanger High Flow
5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm (from heat exchanger to column)
G7116-68003	Column Holder Lamella, 2/pk
	For 1260:
G7116-60061	Quick Connect Heat Exchanger Large ID High Flow
5500-1193	InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket (from heat exchanger to column)
G7116-60051	Quick Connect Heat Exchanger Large ID
5067-5966	InfinityLab Quick Turn Fitting
G7167-68703	Fitting Intermediate Kit
G7116-68003	Column Holder Lamella, 2/pk
	Bio-inert option:
G7116-60041	Quick Connect Heat Exchanger Bio-inert
5067-4780	Bio Capillary 0.17 mm x 300 mm, 1.6 mm OD socket (from column to detector)
0100-1516	Finger-tight fitting PEEK, 2/pk
5067-4741	ZDV union (Bio-inert)
5067-5403	UHP fitting
G7116-68003	Column Holder Lamella, 2/pk
	Bio-compatible option:
G7116-60071	Quick Connect Bio Heat Exchanger Standard Flow

Parts required	p/n	Description
	G7116-60081	Quick Connect Bio Heat Exchanger High Flow
	G7116-68003	Column Holder Lamella, 2/pk
	5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
	5067-5966	InfinityLab Quick Turn Fitting
	5500-1578	Quick Connect Capillary MP35N 0.12 mm x 105 mm
	5067-5965	InfinityLab Quick Connect LC fitting

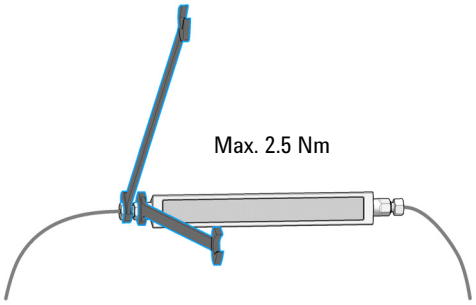
1 Possible positions for heat exchangers. If only one column is used, the preferred positions are 2, 3, 6, or 7.



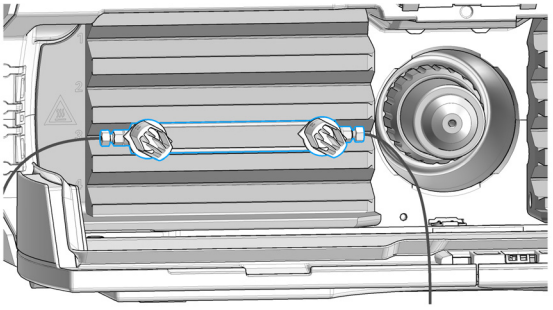
2 Connect the sampler outlet capillary (or the capillary from the column selection valve) to the inlet port of the heat exchanger.

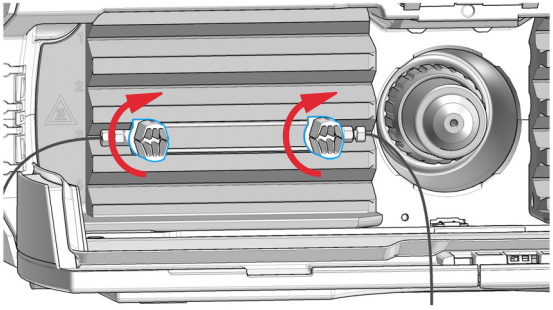


3 Connect the column connection capillary to the outlet of the Quick Connect Heat Exchanger.



4 Position the heat exchanger in the groove of the MCT heater block and prepare column holders to fix the heat exchanger.



5 Turn column holders to fix the Quick Connect Heat Exchanger in the MCT. 	

NOTE The column holder clip can be mounted at any free spot on top of the heat exchanger.

Exchange a Column

Tools required	p/n	Description
	5043-0915	Fitting mounting tool
	8710-0510	Open-end wrench 1/4 — 5/16 inch

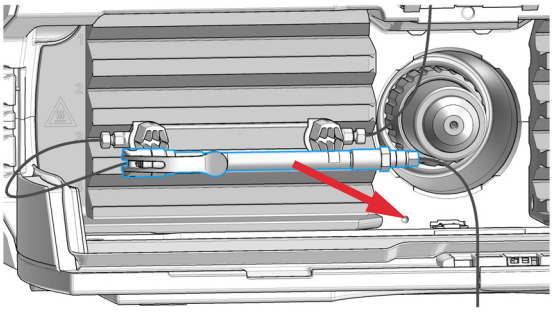
Parts required	p/n	Description
		For 1290:
	5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm (from heat exchanger to column inlet)
	5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket (from column to detector)
	5067-5966	InfinityLab Quick Turn Fitting
		For 1260:
	5500-1193	InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket (from heat exchanger to column)
	5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket (from column to detector)
	5067-5966	InfinityLab Quick Turn Fitting (column inlet)
	0100-1516	Finger-tight fitting PEEK, 2/pk (column outlet)
		Bio-inert option:
	5067-4780	Bio Capillary 0.17 mm x 300 mm, 1.6 mm OD socket (from column to detector)
	5067-5966	InfinityLab Quick Turn Fitting (column inlet)
	0100-1516	Finger-tight fitting PEEK, 2/pk (column outlet)
		Bio-compatible option:
	5067-5966	InfinityLab Quick Turn Fitting
	5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
	5500-1578	Quick Connect Capillary MP35N 0.12 mm x 105 mm
	5067-5965	InfinityLab Quick Connect LC fitting

Preparations

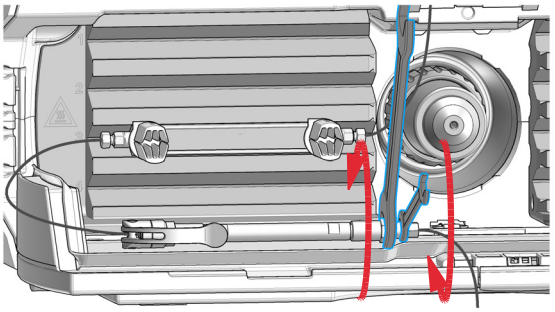
- Heat exchanger(s) installed in MCT
- Column holder clip(s) installed in the heater block on top of heat exchanger(s)
- Column inlet capillary connected to heat exchanger outlet

Remove a column

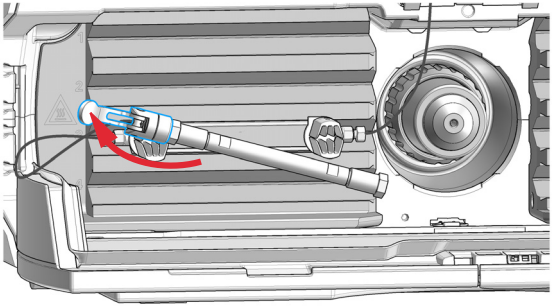
1 Remove the column from the column holder.



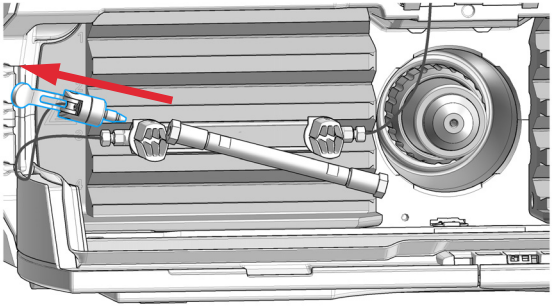
2 Disconnect the column outlet.



3 Open the lever of the Quick Connect Fitting.

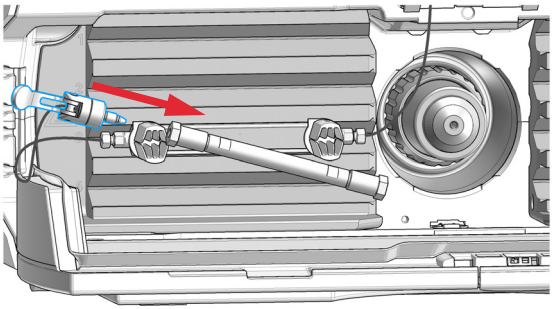


4 Unscrew and remove the Quick Connect Fitting from the column inlet.

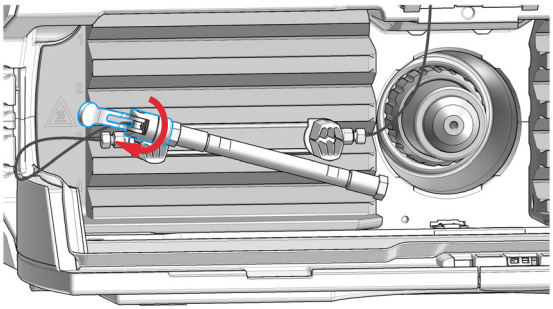


Install a column

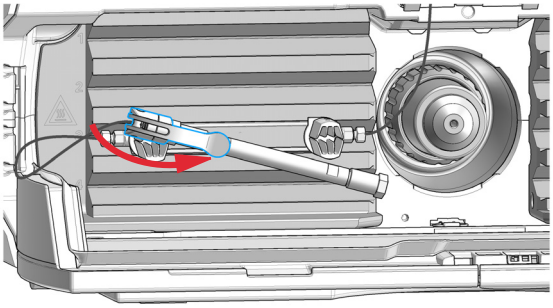
1 Connect the column inlet capillary to the column inlet using the Quick Connect Fitting.



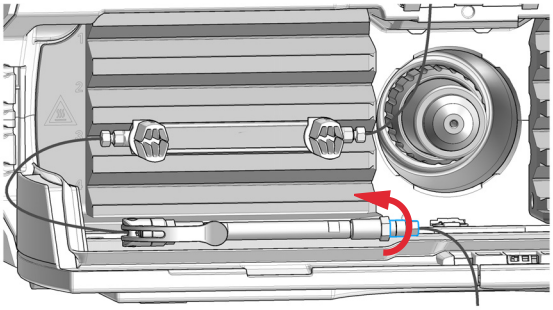
2 Turn the column onto the Quick Connect Fitting until it is finger-tight.



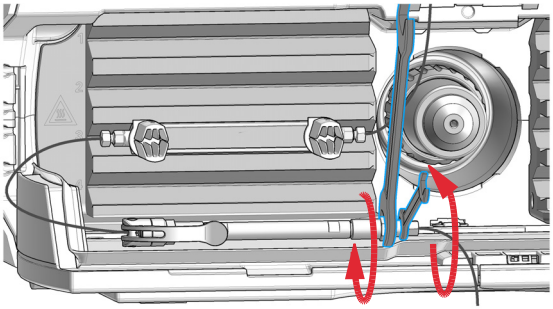
3 Close the lever to make a leak-tight connection.



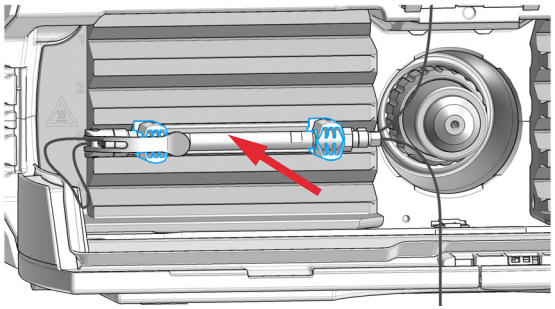
4 Connect the capillary to detector to the column outlet. When using the Quick Turn Fitting, tighten the fitting until it is finger-tight.



5 Use a wrench to counter the column while tightening the capillary fitting.



6 Position the column into the column holder clip(s).



7 Configure the column. For further information see Agilent Information Center or the online help of your CDS.

Installing Valve Heads

If ordered, the valve drives are factory-installed in the Multicolumn Thermostat. The valve heads are interchangeable and can be easily mounted.

At the first installation, the transportation lock and the dummy valve have to be removed, see "Remove the Transportation Lock and the Valve Dummy" on page 54. The valve heads can be installed by mounting the valve heads onto the valve drives and fastening the nut manually (do not use any tools).

Be sure that the guide pin snaps into the groove of the valve drive thread.

NOTE

The valves are mounted on pull-out rails to allow easy installation of capillaries. Push the valve gently into its housing until it snaps into the inner position, push it again and it slides out.

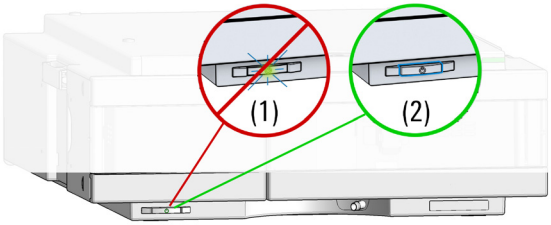
When all capillaries are installed, push the valve back into its housing, see "Install the Valve Head and Connect Capillaries" on page 56.

Remove the Transportation Lock and the Valve Dummy

The following procedure demonstrates the necessary steps for installing the valve head to the valve drive of a Multicolumn Thermostat (MCT).

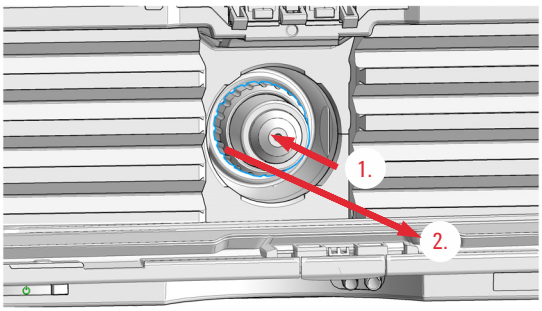
For the installation of a valve head to a G1170A Valve Drive you can ignore the steps that describe the MCT features of the transportation lock and spring loaded valve drive.

1 Switch off the module.

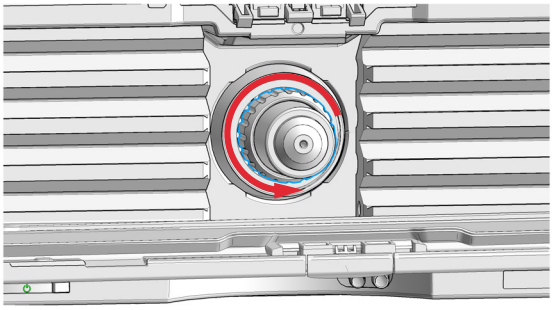


2 When unscrewing the transportation lock, push it back until the last screw is removed - the valve rail is spring-loaded.

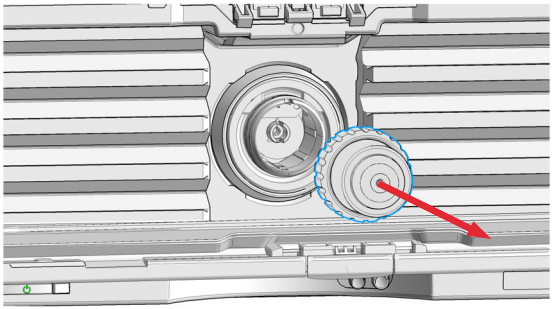
3 Press on the valve dummy (1.) to release it (2.) (spring-loaded valve rail).



4 Unscrew the valve dummy.



5 Remove the valve dummy from the valve drive.



Install the Valve Head and Connect Capillaries

For bio-inert modules use bio-inert parts only!

For 1290 Infinity II Bio LC modules, use bio / bio-compatible parts only.
Do not mix parts between 1260 Infinity II Bio-Inert LC modules and 1290 Infinity II Bio LC modules.

CAUTION

The valve actuator contains sensitive optical parts, which need to be protected from dust and other pollution. Pollution of these parts can impair the accurate selection of valve ports and therefore bias measurement results.

- ✓ **Always install a valve head for operation and storage. For protecting the actuator, a dummy valve head can be used instead of a functional valve. Do not touch parts inside the actuator.**

CAUTION

Column Damage or Bias Measurement Results

Switching the valve to a wrong position can damage the column or bias measurement results.

- ✓ **Fit the lobe to the groove to make sure the valve is switched to the correct position.**

CAUTION

Valve Damage

Using a low pressure valve on the high pressure side can damage the valve.

- ✓ **When using multiple column compartments as part of a method development solution, make sure that the high pressure valve head is connected to the autosampler and the low pressure valve head is connected to the detector.**

NOTE

For information about the compatibility mode of 800 bar valve heads see Information on RFID Tag Technical Note (01200-90134).

NOTE

For a correct installation of the valve head, the outside pin (red) must completely fit into the outside groove on the valve drive's shaft (red). A correct installation is only possible if the two pins (green and blue) on the valve head fit into their corresponding grooves on the valve drive's actuator axis. Their match depends on the diameter of the pin and groove.

NOTE

The tag reader reads the valve head properties from the valve head RFID tag during initialization of the module. Valve properties will not be updated, if the valve head is replaced while the module is on. Selection of valve port positions can fail, if the instrument does not know the properties of the installed valve.

NOTE

To allow correct valve identification, power off the valve drive for at least 10 s.

NOTE

For firmware requirements see Information on RFID Tag Technical Note (01200-90134) which is included to each valve head.

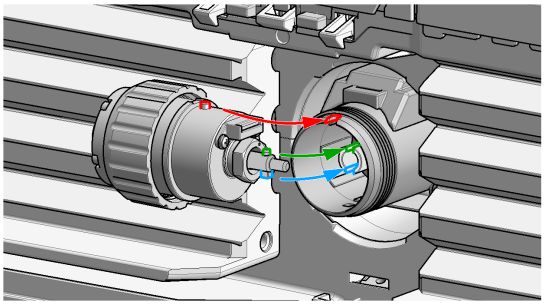
CAUTION

Sample degradation and contamination of the instrument

Metal parts in the flow path can interact with the bio-molecules in the sample leading to sample degradation and contamination.

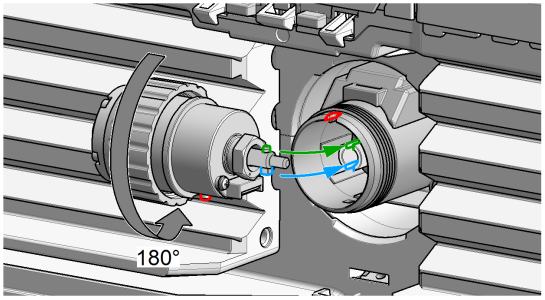
- ✓ **For bio applications, always use dedicated bio parts, which can be identified by the bio-inert symbol or other markers described in this manual.**
- ✓ **Do not mix bio, and non-bio modules or parts in a bio system.**

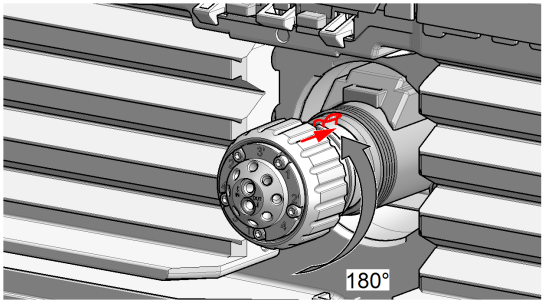
1 Insert the valve head into the valve shaft.



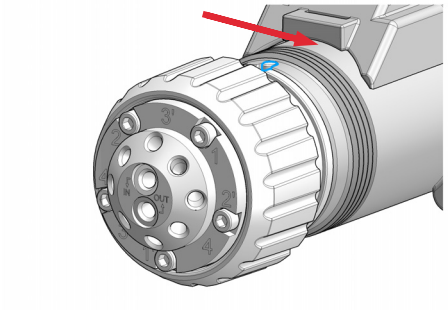
OR

If the outside pin does not fit into the outside groove, you have to turn the valve head until you feel that the two pins snap into the grooves. Now you should feel additional resistance from the valve drive while continuously turning the valve head until the pin fits into the groove.



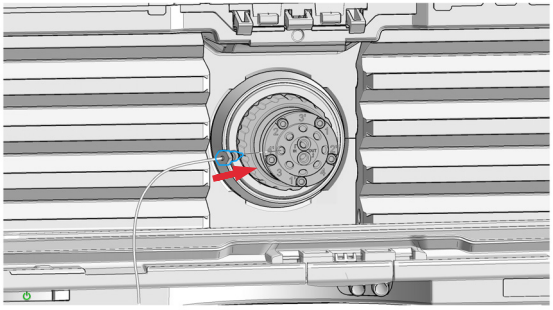
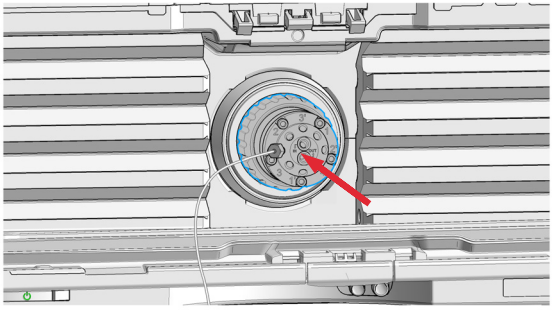


2 When the outer pin is locked into the groove, manually screw the nut onto the valve head.



NOTE

Fasten the nut manually. Do not use any tools.

3 Install all required capillary connections to the valve. 	**4** Push the valve head until it snaps in and stays in the rear position. 
5 Power on or power-cycle your module, so the valve head gets recognized during module initialization.	

Installing the capillaries

The 2-position/10-port valve can be used here in the same way as a 2-position/6-port valve, just follow the rerouting diagram below.

Map the ports from the 2-position/6-port valve to the corresponding ports of the 2-position/10-port valve according to the red arrows. For example, mount the capillary connected to port 6 (2-position/6-port) at port 2 instead.

Connect port 1 and port 8 with a 120 mm length capillary. Plug plastic fittings into ports 9 and 10.

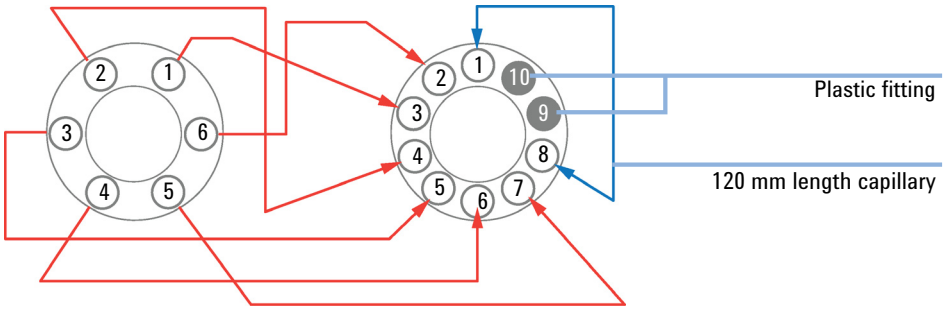


Figure 11 Rerouting of 2-position/10-port valve to match 2-position/6-port valve

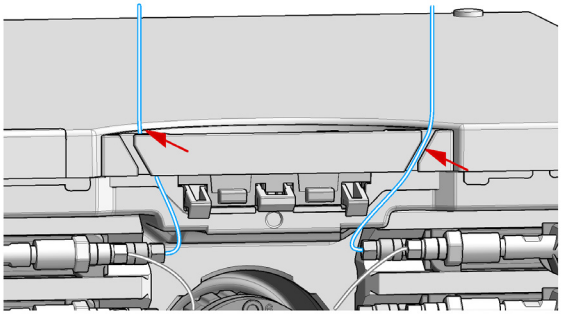
NOTE Use utmost care to avoid any void volumes caused by poor connections.

1. Connect the capillaries going to a valve and fasten them immediately with a spanner.
2. Starting from position one through six (ten, respectively), connect respective capillaries to the heat exchangers. First, finger-tighten and then use a spanner.
3. Finger-tighten the capillaries going from heat exchangers to columns on the heat exchanger side, then fasten all fittings with a spanner.
4. Mount heat exchangers into the MCT.
5. Connect column inlet capillaries to the columns.
6. Connect column outlet capillaries to the columns.

7 Fasten all fittings on attached modules (autosampler, detector, additional pumps). Fit all unused valve ports with blank nuts.

8 Push the valve into the rear position.

9 Place the capillaries that go to another module or waste into the capillary guides to prevent squeezing them when closing the front cover.



10 Stow any excess lengths of the capillaries.

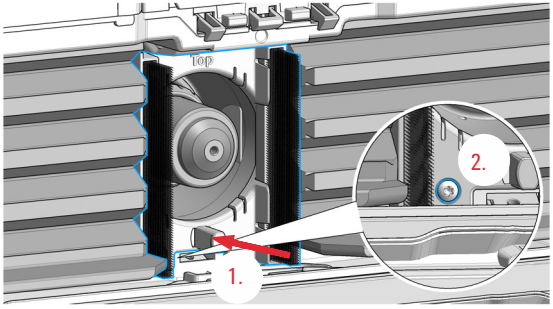
11 Perform a final leak check.

Install the Divider Assembly

Parts required	p/n	Description
	G7116-60006	Divider Assembly MCT

NOTE The Divider Assembly must be installed if different temperatures are used on the right and the left heater element to separate these two temperature zones.

1 Push the rear part of the Divider Assembly into position (1.) and fix it with the screw (2.).



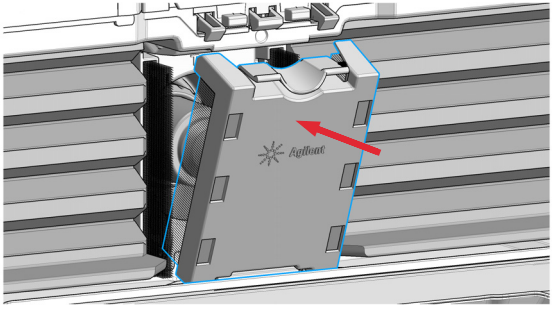
2 Install the valve head if used.

See "Replace Valve Heads" on page 135.

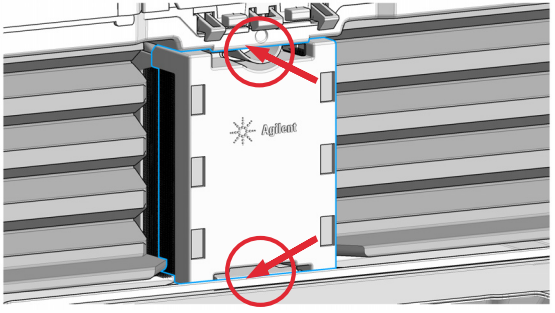
3 Install all capillaries and heat exchangers required.

For details, refer to "Install Heat Exchanger" on page 47, and "Exchange a Column" on page 51.

4 Install the front part of the Divider Assembly by putting it on top.

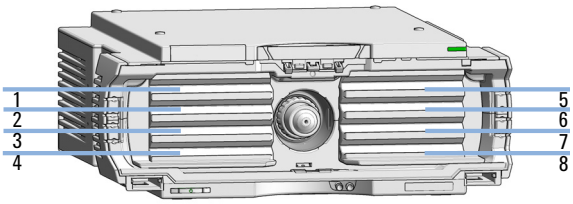


5 The front plate should be flush with the top and the bottom edge of the MCT housing.



Install the Thermal Equilibration Device

The InfinityLab Thermal Equilibration Device occupies the top row of the Multicolumn Thermostat (MCT) (1, 5). Therefore, Quick Connect Heat Exchangers and columns cannot be installed in the top row. Up to 6 columns can be installed in the MCT when two InfinityLab Thermal Equilibration Devices are installed at the same time.



Tools required	p/n	Description
	5023-2502	Hex driver SW-6.35, slitted

Preparations Install Quick Change Valve Head and columns according to the instructions in *Multicolumn Thermostat User Manual*.

NOTE Divider assembly cannot be installed in the MCT together with the Thermal Equilibration Device at the same time.

WARNING

Hot Surfaces

When an InfinityLab Thermal Equilibration Device is installed, it might be hot.

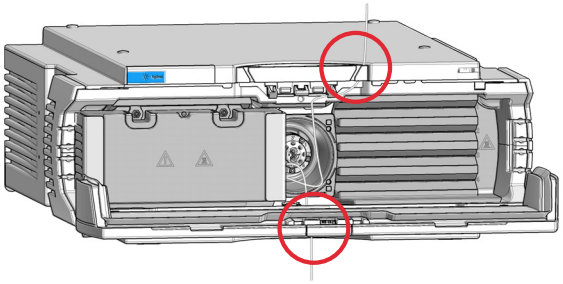
✓ **Allow the InfinityLab Thermal Equilibration Device to cool down before removing it and performing any procedures with column/valve installation/deinstallation.**

1 Check that the column in use is no longer than 30 cm.
2 Place the InfinityLab Thermal Equilibration Device covering one or more installed columns in the way that the twist-lock clips are located at the top of the device.
3 Guide capillaries (and column ID tag cords, if installed) through silicone side covers.
4 To avoid obstruction of the capillary guidance, remove the side covers of the InfinityLab Thermal Equilibration Devices that point towards the valve.

NOTE This measure is only necessary if several columns are connected to the column selection valve and two InfinityLab Thermal Equilibration Devices are installed in one MCT.

5 Turn twist-lock clips with the hex-driver to fix the InfinityLab Thermal Equilibration Device in place.
6 Guide the capillaries through the recesses provided at the top and bottom of the module.

NOTE This measure prevents the capillaries from being squeezed through the doors.



7 Close the MCT door.
8 Let the system equilibrate before beginning the analysis.

Installing and Using Column ID Tags

Install the Column Identification Option

Parts required

p/n	Description
5067-5915	Column ID Kit Left
5067-5916	Column ID Kit Right
5067-5917	InfinityLab Column Identification Tag

Preparations Power off the instrument.

CAUTION

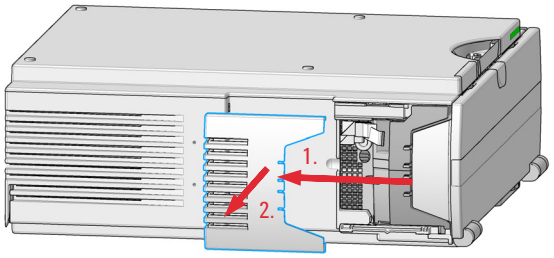
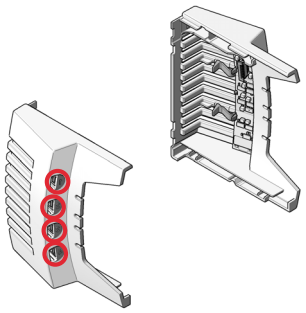
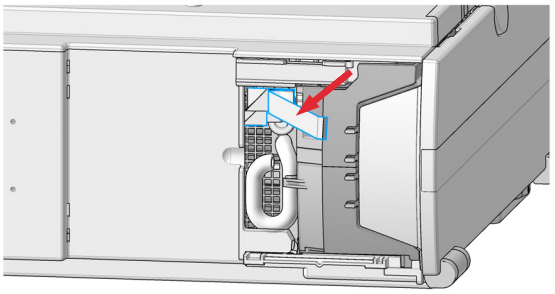
Electronic boards and components are sensitive to electrostatic discharge (ESD).

ESD can damage electronic boards and components.

✓ **Be sure to hold the column ID modules by the plastic parts, and do not touch the electrical components. Do not touch the pins of the flex-board connector.**

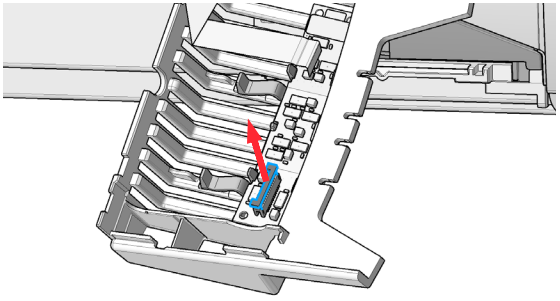
NOTE

In the Agilent 1260 Infinity II Multicolumn Thermostat (G7116A), the column ID module is installed on the left side of the MCT only.

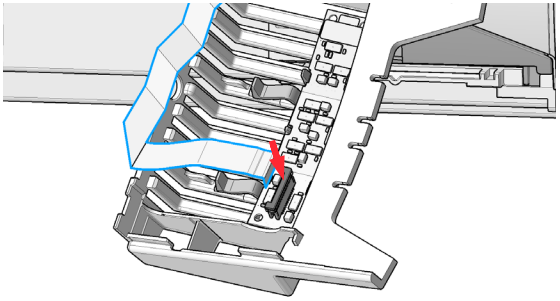
1 Remove any tube guides and tube clip holders that may already be installed on the sides of the MCT cover.	**2** Unlock the left and right (G7116B only) side cover inserts by pushing them to the rear and put them aside. 
3 Identify the left and right (G7116B only) column ID module. The ID sockets 1 to 4 are numbered from top to bottom. 	**4** Take the end of the preinstalled flex-board connector out of the holder. 

5 Connect the flex cable to the column ID module.

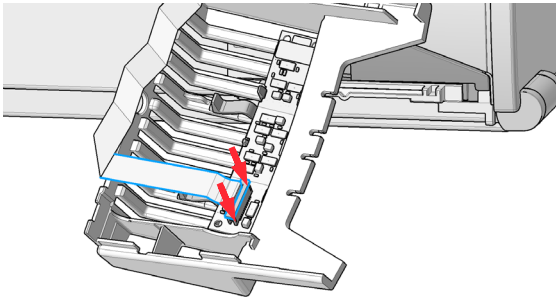
a Open the locking mechanism of the connector by lifting up the frame.



b Push in the cable with the contacts facing to the rear.

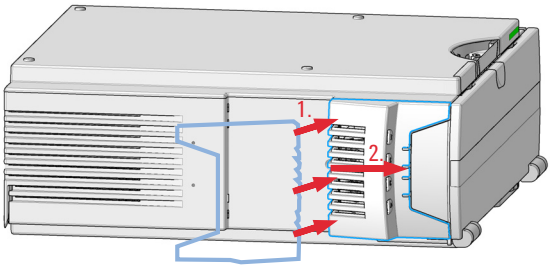


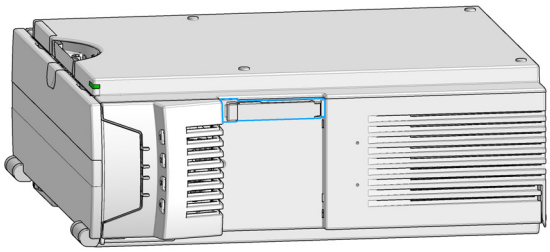
c Close the locking mechanism.



d Verify that the cable is properly attached to the connector without visible offset.

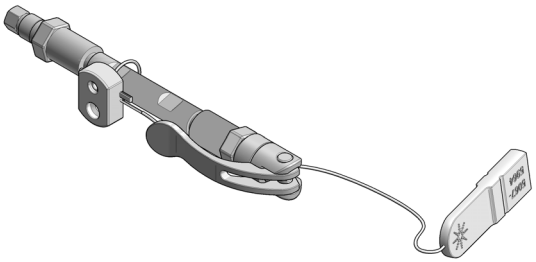
6 Attach the column ID module to the MCT cover.



7 Repeat steps 4 to 9 for the column ID module on the other side (for G7116B, on the right).	**8** Install the waste tube clip holder (example shows a G7116B). 

Connecting the Column ID Tags

1 If the column has no Column ID Tag, fit a tag by slipping the loop over one end of the column and pulling it tight through the plastic holder.



NOTE

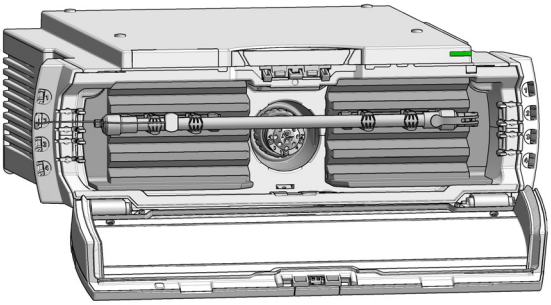
Once the loop has been pulled tight, the tag can no longer be removed from the column.

2 Install the column in the column compartment, see "Exchange a Column" on page 51.

3 Plug the free end of the Column ID Tag into the adjacent socket in the column tag reader unit.

NOTE

It is important that the Column ID Tag is plugged into the adjacent socket in a logical order (that is, first column from the top into "1", second column from the top into "2", and so on). Otherwise, it is easy to confuse the columns and their locations during column assignment in a CDS.



NOTE If you have a full-length column, we recommend that you use the adjacent socket on the left column tag reader.

Using Column ID Tags

The Agilent InfinityLab Column Identification Tag is designed to enable the automatical detection of the columns installed in the column thermostat and help the user to track the usage of the columns in the laboratory. The column identification tag contains information about not only the physical properties of the column but also about its usage. Two types of information are stored:

- *Static* fields contain information on the physical characteristics of the column such as the length, internal diameter and particle size. Typically, this information stays the same for the lifetime of the column.
- *Dynamic* fields contain information on the usage of the column, such as the number of injections and maximum measured temperature. The information stored in the dynamic fields will be automatically updated each time a new analysis is performed with the column. These fields are read-only from the perspective of the user, meaning that their content cannot be manually edited or erased.

NOTE The information in the dynamic fields cannot be erased by any means.

For *pre-labeled* Agilent columns, the static fields are pre-populated with information and set to read-only for compliance reasons, except for the **Void Volume** and **Comment** fields. The *dynamic* fields are blank by default and will be automatically edited by the system upon using the column.

On the contrary, *custom* column identification tags enable the user to edit the content for all *static* fields, as long as the tag is not sealed. This can be beneficial when using non-Agilent columns. After entering all the necessary information, the custom tag can be sealed to prevent any further modification of the content in the static fields. The content of the *dynamic* fields cannot be manually edited or erased, not even for the *custom* tags.

NOTE When the column identification tag is sealed, the static fields will become write-protected and only the dynamic fields will remain available for updating. The only exceptions from this are the *static* fields **Void Volume** and **Comment**.

There are two ways to edit the content of custom column identification tags:

- One way is to type in all the necessary information manually, using the **Column Assignment** tab of the control interface.
- The other one is to import the data from a database (an existing catalog or inventory, or the Agilent columns guide). This option is available only for the OpenLab CDS ChemStation (C.01.07 SR2 or higher).

NOTE

It may take up to several seconds for the column tag to be read and the tables to be updated.

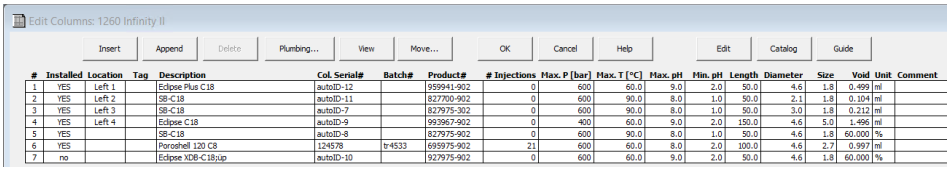
When plugging a new tag into the tag reader, the content that is stored on it will be automatically imported into the **Edit Columns** tab (only for OpenLab CDS ChemStation, see "Using Column ID Tags with ChemStation" on page 72 for more information) and the **Column Assignment** tab of the control interface.

Using Column ID Tags with ChemStation

1 In the **Method and Run Control** view of the Agilent OpenLAB CDS ChemStation Edition, select **Columns** from the **Instrument** menu.

The **Edit Columns** dialog box is displayed.

If the **Edit Columns** table is empty, go straight to Step 3.



#	Installed	Location	Tag	Description	Col. Serial#	Batch#	Product#	# Injections	Max. P [bar]	Max. T [°C]	Max. pH	Min. pH	Length	Diameter	Size	Void	Unit	Comment
1	YES	Left 1		Eclipse Plus C18	autoID-12		959941-902	0	600	60.0	9.0	2.0	50.0	4.6	1.8	0.499	ml	
2	YES	Left 2		SB-C18	autoID-11		827700-902	0	600	90.0	8.0	1.0	50.0	2.1	1.8	0.104	ml	
3	YES	Left 3		SB-C18	autoID-7		827975-302	0	600	90.0	8.0	1.0	50.0	3.0	1.8	0.212	ml	
4	YES	Left 4		Eclipse C18	autoID-9		993967-902	0	400	60.0	9.0	2.0	150.0	4.6	5.0	1.496	ml	
5	YES			SB-C18	autoID-8		827975-902	0	600	90.0	8.0	1.0	50.0	4.6	1.8	60.000	%	
6	YES			Poroshell 120 C8	124578	tr4533	695975-902	21	600	60.0	8.0	2.0	100.0	4.6	2.7	0.997	ml	
7	no			Eclipse XDB-C18;up	autoID-10		927975-902	0	600	60.0	9.0	2.0	50.0	4.6	1.8	60.000	%	

Figure 12 The ChemStation Edit Columns table

2 Select a line in the table that contains column information as close as possible to the column you are adding. The selected line acts as a template for the new column.

NOTE

Column catalogs are available only in OpenLab CDS ChemStation Edition C.01.07 SR2 and above with drivers A.02.14 and above. Click the **Catalog** button to display a dialog box that allows you to choose how to load the catalog into the table.

3 Click the **Insert** button to insert a line above the currently selected line, or the **Append** button to add a line to the end of the table.

The new line contains a copy of the information in the template line.

4 Click the **Edit** button to display a dialog box that allows you to edit the column-specific information such as **Serial Number**, **Batch Number** and **Description.**

5 Add or edit the other column-specific information (for example, maximum pressure, maximum temperature, length, diameter, particle size) in the **Edit Columns** table.

6 If the column is installed and will be used in the Multicolumn Thermostat, select **YES** in the **Installed** column.

7 Click the **Plumbing** button.

The **Column Assignment** dialog box is displayed.

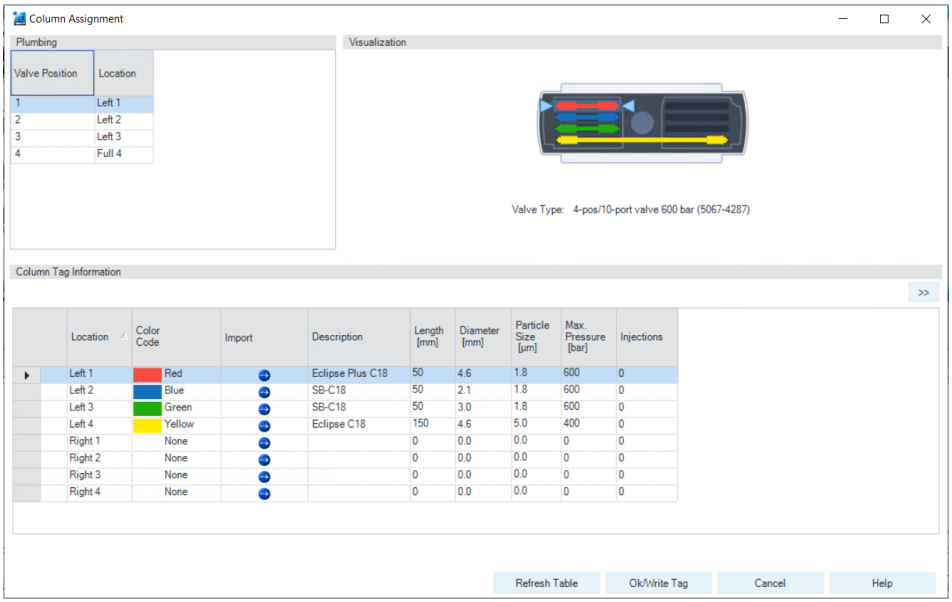


Figure 13 Column Assignment dialog box

The **Column Assignment** dialog box allows you to specify and review detailed information about the columns attached to each position in the column compartment. The information in the **Column Assignment** dialog box is in three sections:

1 The **Plumbing** section contains a table where you can specify the plumbing assignment for each valve position.

2 The **Visualization** section gives a visual representation of the Multicolumn Thermostat configuration.

3 The **Column Tag Information** table shows the information stored on the column tag(s) of the installed column(s). For more details, see "The Column Tag Information Table" on page 79.

8 Click in the **Import** column of an empty line in the **Column Tag Information** table.

The list of columns from the ChemStation's **Edit Columns** table is displayed.

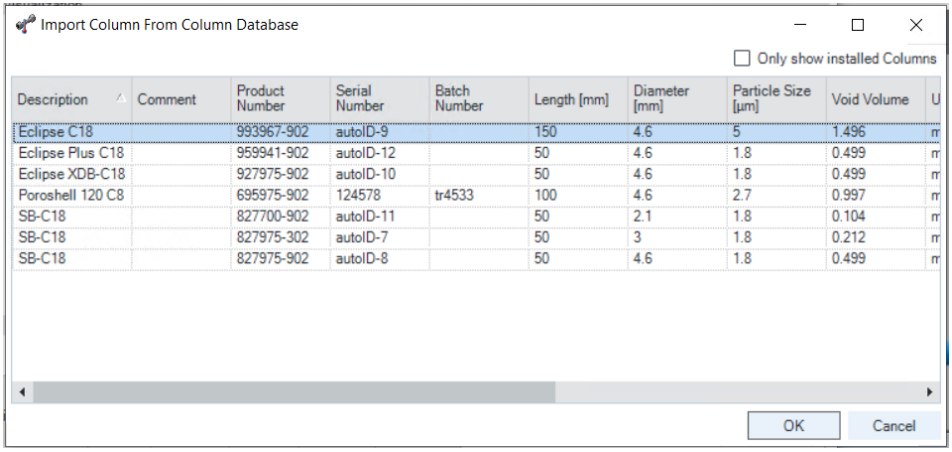


Figure 14 The list of columns from the ChemStation's Edit Columns table

To reduce the list to only those columns that are marked as **Installed**, mark the **Only show installed Columns** check box.

9 Select the column information to import from the list of columns and click **OK**.

The column information is imported into the **Column Tag Information** table.

NOTE It may take several seconds before the information appears in the **Column Tag Information** table.

NOTE The characters semicolon (;), single quote (') and double quote (") are invalid for the **Column Tag Information** table. If these characters are used in any field of the table, an error is displayed, and **OK/Write Tag** button is disabled. You must delete all invalid characters before you can write the data to the tag.

The **Description** and **Comment** fields are limited to 32 characters in the **Column Tag Information** table.

NOTE At this stage, you can assign a color to the column using the drop-down list in the **Color Code** column; this information is displayed in the **Visualization** panel, but is not written to the tag.

10 Click the **>>** button at the top right of the **Column Tag Information** table to show the hidden table columns. Use the horizontal scroll bar to access the columns at the right of the table.

11 If all the information for the column is correct, click the **Ok/Write Tag** button to write the information to the column ID tag.

The information in the ChemStation's **Edit Columns** table is also updated.

12 You can edit the information on the column ID tag using the ChemStation **Edit Columns** table. When you have finished editing the information, repeat steps 7 to 9 to update the information in the tag.

13 When you are sure that you will not make any more changes to the information in the tag, you can irrevocably seal the tag to set all static fields to read-only. Right-click in the appropriate line in the **Column Tag Information** table and select **Seal Column Tag** from the context menu.

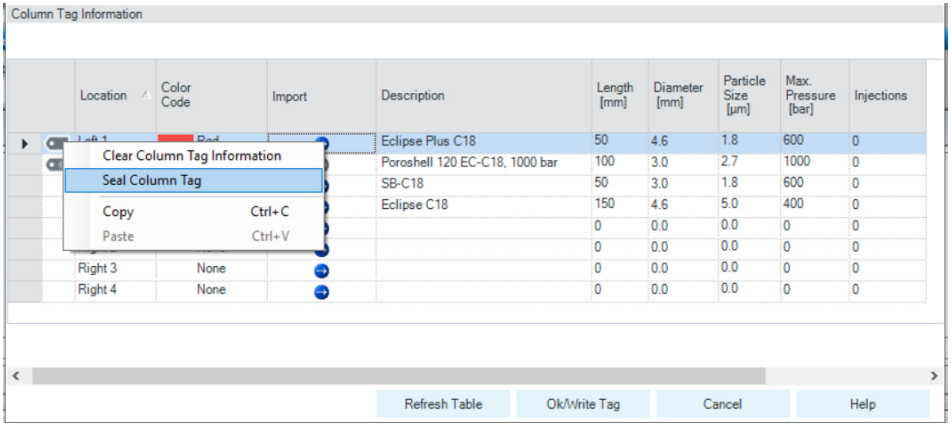


Figure 15 The Column Tag Information table context menu

NOTE

Once a column ID tag has been sealed, the static fields cannot be edited.

Until the column ID tag has been sealed, you can delete all information in static fields on the tag using the **Clear Column Tag Information** command from the context menu.

The sealed column is shown in the **Column Tag Information** table with the icon at the beginning of the row. In the **Edit Columns** table of the ChemStation, it is shown with **Sealed** in the **Tag** column.

The **Plumbing** button of the ChemStation **Edit Columns** table displays the **Column Assignment** dialog box. It can also be displayed by selecting **Column Assignment** from the context menu of the column compartment Dashboard panel in the ChemStation's **Method and Control** view.

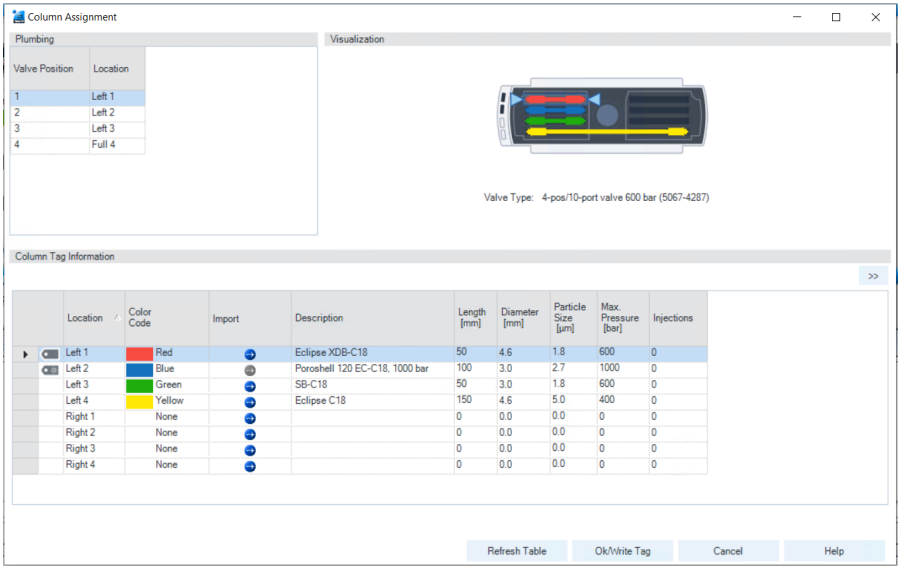


Figure 16 Column Assignment dialog box overview

The **Column Assignment** dialog box has three sections that give you information about the column:

- The **Plumbing** section shows the valve connections to the positions in the column compartment.

NOTE

Make the connections to give the shortest distances between the valve ports and the columns, and use a logical order (left column 1 to port 1-1', left column 2 to port 2-2' and so on). Avoid leaving unused ports between used ones.

- The **Visualization** section gives a visual representation of the configuration of the columns in the column compartment; the columns are color coded.
  - Place the mouse cursor over a column to display a tooltip of the column information from the column ID tag.
  - Click a column to highlight the column information in the **Column Tag Information** table.
- The **Column Tag Information** shows the information in the column ID tags for all columns in the configuration, including their location in the column compartment and their color codes.

The column compartment panel of the Dashboard in the ChemStation's **Method and Control** view also allows you a quick view of the column ID tag information.

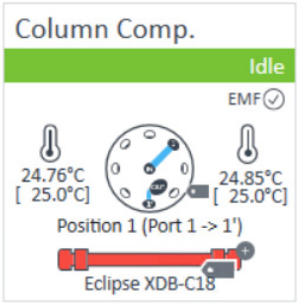


Figure 17 The dashboard panel of the column compartment

Place the mouse cursor over the column ID tag icon ( ); the tooltip shows the information currently stored on the column ID tag.

The column ID tag icon changes according to its state as described in "The Column Tag Information Table" on page 79.

Availability of Column Information

The ChemStation Columns Table

The **Edit Columns** dialog box, which you access using the **Columns** command of the **Instrument** menu in **Method and Run Control** view, shows the detailed information about the columns attached to each position in the device. The table contains all the column-specific information stored in the column ID tags (see "Column Tag Information" on page 80) plus the following possible additional columns:

Installed	**YES** when the column is installed in a device. **no** when the column is not installed in a device.
Location	Shows the location in the device to which the plumbing of the valve position leads.
Dev. Serial#	Present only for a valve thermostat cluster. Shows the serial number of the device that contains the column.
Tag	Shows if the column has column ID tag (**Used**), if it sealed (**Sealed**) or the column has no tag (empty).

The table includes not only the columns that are installed in the column thermostat device(s), but also the inventory of other available columns, for example, columns that have been used in the past. The ChemStation also provides a catalog of column types, which you can load into the **Edit Columns** table to act as templates for other columns.

The Column Tag Information Table

The **Column Assignment** dialog box, which you access using the **Column Assignment** command of the dashboard context menu, shows the detailed information about the columns attached to each position in the device. The dialog box includes the **Column Tag Information** table, which contains all the column-specific information stored on the column ID tags (see "Column Tag Information" on page 80) plus the following possible additional columns:

Tag Status	Shows the status of the column ID tag: • Empty: The position is empty or has a column without a column ID tag. •  : A column with a column ID tag is installed at this position. •  : A column with a sealed column ID tag is installed at this position. •  : A column with a prelabeled column ID tag supplied by Agilent Technologies is installed at this position.
Location	Shows the location in the device to which the plumbing of the valve position leads. For a valve thermostat cluster, the **Column Host** (the device where the column is installed) is also shown.
Color Code	Shows the color representing the column currently occupying the valve position.
Import	Present only when the CDS is an Agilent OpenLab CDS ChemStation Edition. Click the  icon to display a dialog box listing all the columns entered in the ChemStation's **Edit Columns** table, from which you can select appropriate information to import.

By default, only the **Column Tag Information** table columns up to and including the **Injection** column are displayed. Click the **>>** button at the top right of the table to show the full table.

Column Tag Information

The column ID tag contains the following information:

Field	Description	Type	Read/Write permission pre-labeled tag	Read/Write permission custom tag
Description	A description of the column.	Static	Read	Write
Length	The length of the column in mm.	Static	Read	Write
Diameter	The internal diameter of the column in mm.	Static	Read	Write
Particle Size	The particle size of the column packing material in µm.	Static	Read	Write
Maximum Pressure	The maximum pressure supported by the column.	Static	Read	Write
Number of Injections	The number of injections that have been made on the column.	Dynamic	Read	Read
Product Number	The product number of the column.	Static	Read	Write
Maximum Measured Temperature	The highest temperature (in °C) experienced by the column to date.	Dynamic	Read	Read
Maximum Temperature	The safe maximum operating temperature of the column (in °C).	Static	Read	Write
Minimum pH	The minimum pH supported by the column.	Static	Read	Write
Maximum pH	The maximum pH supported by the column.	Static	Read	Write
Void Volume (mL)	The void volume of the column and fittings.	Static	Write	Write
First Injection	The date and time of the first injection onto the column.	Dynamic	Read	Read
Recent Injection	The date and time of the most recent injection onto the column.	Dynamic	Read	Read
Manufacturing Date	The date of manufacture of the column.	Static	Read	Write
Agilent Column	Whether or not the column was supplied by Agilent Technologies.	Static	Read	Write
Serial Number	The serial number of the column.	Static	Read	Write
Batch Number	The batch number of the column.	Static	Read	Write
Tag Sealed	Whether or not all static fields except **Comment** and **Void Volume** are set irrevocably to read-only.	Static	Read	Write
Comment	A user-generated comment about the column.	Static	Write	Write

Agilent Local Control Modules

Agilent InfinityLab Companion G7108AA

The Agilent InfinityLab Companion gives you complete control, system monitoring, signal plotting, and diagnostic capabilities for a wide range of LC system modules.

The instrument control solution is available as full package including all hardware and accessories, but can also be used on your own mobile devices like tablets, mobile phones and other electronic equipment.

Combining the conveniences of the Agilent Instant Pilot features with state-of-the-art mobile technology, the Agilent InfinityLab Companion gives you maximum flexibility and ease of use to control and monitor your LC system modules.

Features:

- Complete local control and monitoring of Agilent Infinity II LC modules
- Excellent usability and ease of use through a user interface specifically tailored for mobile devices - simple, intuitive touch-enabled, and visual controllable.
- High flexibility through a modern “Bring your own device” approach. Connection between LC module and mobile device either wireless via Wi-Fi or wired over USB cable (with full package).
- Convenient, ergonomic operation either handheld or attached to a module at the stack with newly developed, secure tablet holder (included in the full package).
- Preconfigured tablet with all required software already installed (included in the full package).
- Centerpiece of the solution is a USB dongle that activates the complete intelligence of the InfinityLab Companion on the instrument stack.

The InfinityLab Companion provides:

- fast and direct control in front of the instrument
- a clear overview of the system status
- control functionalities
- access to method parameters and sequences
- a logbook showing events from the modules
- diagnostic tests

4 Preparing the Module

This chapter provides information on how to set up the module for an analysis and explains the basic settings.

Leak and Waste Handling

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

- ✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- ✓ **Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).**
- ✓ **Avoid high vapor concentrations. Keep the solvent temperature at least 40 °C (72 °F) below the boiling point of the solvent used. This includes the solvent temperature in the sample compartment. For the solvents methanol and ethanol keep the solvent temperature at least 25 °C (45 °F) below the boiling point.**
- ✓ **Do not operate the instrument in an explosive atmosphere.**
- ✓ **Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).**
- ✓ **Reduce the volume of substances to the minimum required for the analysis.**
- ✓ **Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.**
- ✓ **Ground the waste container.**
- ✓ **Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.**
- ✓ **To achieve maximal safety, regularly check the tubing for correct installation.**

NOTE

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

For details on correct installation, see separate installation documentation.

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.

Solvent Information

Observe the following recommendations on the use of solvents.

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

General Information about Solvent/Material Compatibility

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

Disclaimer

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

MP35N

MP35N is a nonmagnetic, nickel-cobalt-chromium-molybdenum alloy demonstrating excellent corrosion resistance (for example, against nitric and sulfuric acids, sodium hydroxide, and seawater) over a wide range of concentrations and temperatures. In addition, this alloy shows exceptional resistance to high-temperature oxidation. Due to excellent chemical resistance and toughness, the alloy is used in diverse applications: dental products, medical devices, nonmagnetic electrical components, chemical and food processing equipment, marine equipment. Treatment of MP35N alloy samples with 10 % NaCl in HCl (pH 2.0) does not reveal any detectable corrosion. MP35N also demonstrates excellent corrosion resistance in a humid environment. Although the influence of a broad variety of solvents and conditions has been tested, users should keep in mind that multiple factors can affect corrosion rates, such as temperature, concentration, pH, impurities, stress, surface finish, and dissimilar metal contacts.

Polyphenylene Sulfide (PPS)

Polyphenylene sulfide has outstanding stability even at elevated temperatures. It is resistant to dilute solutions of most inorganic acids, but it can be attacked by some organic compounds and oxidizing reagents. Nonoxidizing inorganic acids, such as sulfuric acid and phosphoric acid, have little effect on polyphenylene sulfide, but at high concentrations and temperatures, they can still cause material damage. Nonoxidizing organic chemicals generally have little effect on polyphenylene sulfide stability, but amines, aromatic compounds, and halogenated compounds may cause some swelling and softening over extended periods of time at elevated temperatures. Strong oxidizing acids, such as nitric acid (> 0.1 %), hydrogen halides (> 0.1 %), peroxy acids (> 1 %), or chlorosulfuric acid degrade polyphenylene sulfide. It is not recommended to use polyphenylene sulfide with oxidizing material, such as sodium hypochlorite and hydrogen peroxide. However, under mild environmental conditions, at low concentrations and for short exposure times, polyphenylene sulfide can withstand these chemicals, for example, as ingredients of common disinfectant solutions.

PEEK

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

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

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

When used above room temperature, PEEK is sensitive to bases and various organic solvents, which can cause it to swell. Under such conditions, normal PEEK capillaries are sensitive to high pressure. Therefore, Agilent uses stainless steel cladded PEEK capillaries in bio-inert systems. The use of stainless steel cladded PEEK capillaries keeps the flow path free of steel and ensures pressure stability up to 600 bar. If in doubt, consult the available literature about the chemical compatibility of PEEK.

Polyimide

Agilent uses semi-crystalline polyimide for rotor seals in valves and needle seats in autosamplers. One supplier of polyimide is DuPont, which brands polyimide as Vespel, which is also used by Agilent.

Polyimide is stable in a pH range between 1 and 10 and in most organic solvents. It is incompatible with concentrated mineral acids (e.g. sulphuric acid), glacial acetic acid, DMSO and THF. It is also degraded by nucleophilic substances like ammonia (e.g. ammonium salts in basic conditions) or acetates.

Polyethylene (PE)

Agilent uses UHMW (ultra-high molecular weight)-PE/PTFE blends for yellow piston and wash seals, which are used in 1290 Infinity pumps, 1290 Infinity II pumps, the G7104C and for normal phase applications in 1260 Infinity pumps.

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

Tantalum (Ta)

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

Stainless Steel (SST)

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

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

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

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

Titanium (Ti)

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

Diamond-Like Carbon (DLC)

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

Fused silica and Quartz (SiO_2)

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

Gold

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

Zirconium Oxide (ZrO_2)

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

Platinum/Iridium

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

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

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

TFE/PDD copolymer tubings, which are used in all Agilent degassers except G1322A/G7122A, are not compatible with fluorinated solvents like Freon, Fluorinert, or Vertrel. They have limited life time in the presence of hexafluoroisopropanol (HFIP). To ensure the longest possible life with HFIP, it is best to dedicate a particular chamber to this solvent, not to switch solvents, and not to let dry out the chamber. For optimizing the life of the pressure sensor, do not leave HFIP in the chamber when the unit is off.

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

Sapphire, Ruby and Al_2O_3-based ceramics

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

Capillary Coding Guide

Syntax for Capillary Description

The tables below are your guide to identifying the proper specifications for your capillary. On all capillaries, dimensions are noted in id (mm), length (mm) and, where applicable, volume (µL). When you receive your capillary, these abbreviations are printed on the packaging.

Using the guide: This fitting is coded as *SPF*, for Swagelok, PEEK, Fingertight.

Table 14 Capillary coding guide

Type **The type gives some indication on the primary function, like a loop or a connection capillary.**		**Material** **The material indicates which raw material is used.**		**Fitting left/fitting right** **The fitting left/right indicate which fitting is used on both ends of the capillary.**	
Key	**Description**	**Key**	**Description**	**Key**	**Description**
Capillary	Connection capillaries	ST	Stainless steel	W	Swagelok + 0.8 mm Port id
Loop	Loop capillaries	Ti	Titanium	S	Swagelok + 1.6 mm Port id
Seat	Autosampler needle seats	PK	PEEK	M	Metric M4 + 0.8 mm Port id
Tube	Tubing	FS/PK	PEEK-coated fused silica[1]	E	Metric M3 + 1.6 mm Port id
Heat exchanger	Heat exchanger	PK/ST	Stainless steel-coated PEEK[2]	U	Swagelok union
		PFFE	PTFE	L	Long
		FS	Fused silica	X	Extra long
		MP35 N	Nickel-cobalt-chromium-molybdenium alloy	H	Long head
				G	Small head SW 4
				N	Small head SW 5
				F	Finger-tight

Table 14 Capillary coding guide

Type The type gives some indication on the primary function, like a loop or a connection capillary.		Material The material indicates which raw material is used.		Fitting left/fitting right The fitting left/right indicate which fitting is used on both ends of the capillary.	
Key	**Description**	**Key**	**Description**	**Key**	**Description**
				V	1200 bar
				B	Bio
				P	PEEK
				I	Intermediate

1 Fused silica in contact with solvent

2 Stainless steel-coated PEEK

At-a-Glance Color-Coding Keys

The color of your capillary will help you quickly identify the capillary id.

Table 15 Color-coding key for Agilent capillary tubing

Internal diameter in mm		Color code
0.015		Orange
0.025		Yellow
0.05		Beige
0.075		Black
0.075	MP35N	Black with orange stripe
0.1		Purple
0.12		Red
0.12	MP35N	Red with orange stripe
0.17		Green
0.17	MP35N	Green with orange stripe
0.20/0.25		Blue
0.20/0.25	MP35N	Blue with orange stripe
0.3		Grey
0.50		Bone White

HINT

As you move to smaller-volume, high efficiency columns, you'll want to use narrow id tubing, as opposed to the wider id tubing used for conventional HPLC instruments

Install Capillary Connections

Capillaries and connections depend on which system is installed.

Table 16 Capillary connections for 1260 Infinity II systems

p/n	From	To
Bottle Head Assembly (G7120-60007)	Solvent Bottle	Infinity II Pump
Capillary ST 0.17 mm x 500 mm SI/SI (5500-1246)	Pump	Sampler
Capillary, ST, 0.17 mm x 900 mm SI/SX (5500-1217)	Pump	Vialsampler with ICC
Capillary ST 0.17 mm x 500 mm SI/SI (5500-1246)	Multisampler	MCT Valve/Heat Exchanger
Capillary, ST, 0.17 mm x 400 mm SL/SL (5500-1252)	Vialsampler	MCT Valve/Heat Exchanger
Capillary ST 0.17 mm x 105 mm SL/SL (5500-1240)	Vialsampler	ICC Heat Exchanger
Capillary, ST, 0.17 mm x 120 mm SL/SL, long socket (5500-1250)	ICC Heat Exchanger	Column
InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket (5500-1193)	MCT Heat Exchanger	Column
InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket (5500-1191)	Column/MCT Valve	Detector
Waste accessory kit (5062-8535)	VWD	Waste
Tube PTFE 0.7 mm x 5 m, 1.6 mm od (5062-2462)	DAD/FLD	Waste
Analytical tubing kit 0.25 mm i.d. PTFE-ESD (G5664-68712)	Detector	Fraction Collector

Table 17 Capillary connections for 1290 Infinity II systems

p/n	From	To
Bottle Head Assembly (G7120-60007)	Solvent Bottle	Infinity II Pump
Capillary ST 0.17 mm x 400 mm SI/SI (5500-1245)	Pump	Sampler
Capillary, ST, 0.17 mm x 900 mm SI/SX (5500-1217)	Pump	Vialsampler with ICC
Capillary ST 0.12 mm x 500 mm SL/S (5500-1157)	Multisampler	MCT Valve/Heat Exchanger
Capillary ST 0.12 mm x 400 mm SL/SL (5500-1251)	Vialsampler	MCT Valve/Heat Exchanger
Capillary ST 0.12 mm x 105 mm SL/SL (5500-1238)	Vialsampler	ICC Heat Exchanger
Capillary ST 0.12 mm x 120 mm SL/SL, long socket (5500-1249)	ICC Heat Exchanger	Column
Capillary ST 0.12 mm x 105 mm SL (5500-1201)	MCT Heat Exchanger	Column
InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket (5500-1191)	Column/MCT Valve	Detector
Waste accessory kit (5062-8535)	VWD	Waste
Tube PTFE 0.7 mm x 5 m, 1.6 mm od (5062-2462)	DAD/FLD	Waste
Analytical tubing kit 0.25 mm i.d. PTFE-ESD (G5664-68712)	Detector	Fraction Collector

Table 18 Capillary connections for 1260 Infinity II Bio-inert LC

p/n	From	To
Bottle Head Assembly (G7120-60007)	Solvent Bottle	Infinity II Pump
Capillary Ti 0.17 mm x 500 mm, SL/SLV (5500-1264)	Pump	Multisampler
Capillary PK/ST 0.17 mm x 500 mm, RLO/RLO (Bio-inert) (G5667-81005)	Multisampler	MCT
ZDV union (Bio-inert) (5067-4741)	Capillary	Bio-inert Heat Exchanger
Quick Connect Heat Exchanger Bio-inert (G7116-60041)		
Capillary PEEK 0.18 mm x 1.5 m (0890-1763) and PEEK Fittings 10/PK (5063-6591)	Column/MCT Valve	Detector
Waste accessory kit (5062-8535)	VWD	Waste
Tube PTFE 0.7 mm x 5 m, 1.6 mm od (5062-2462)	DAD/FLD	Waste
Analytical tubing kit 0.25 mm i.d. PTFE-ESD (G5664-68712)	Detector	Fraction Collector

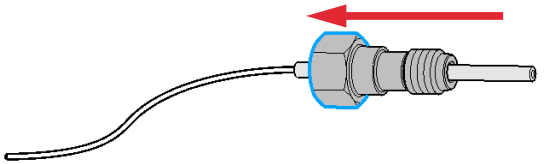
Table 19 Capillary connections for 1290 Infinity II Bio LC

p/n	From	To
Bottle Head Assembly (G7120-60007)	Solvent Bottle	Infinity II Pump
Capillary MP35N 0.17 mm x 500 mm, SI/SI (5500-1419)	Pump	Multisampler
Capillary MP35N 0.12 mm x 500 mm SI/SI (5500-1279)	Multisampler	MCT
Quick Connect Capillary MP35N 0.12 mm x 105 mm (5500-1578)	MCT Heat Exchanger	Column
Quick Turn Capillary MP35N 0.12 mm x 280 mm (5500-1596)	Column/MCT Valve	Detector (DAD)
Quick Turn Capillary MP35N 0.12 mm x 500 mm (5500-1598)	Column/MCT Valve	Detector (VWD)
Waste accessory kit (5062-8535)	VWD	Waste
Tube PTFE 0.7 mm x 5 m, 1.6 mm od (5062-2462)	DAD/FLD	Waste
Analytical tubing kit 0.25 mm i.d. PTFE-ESD (G5664-68712)	Detector	Fraction Collector

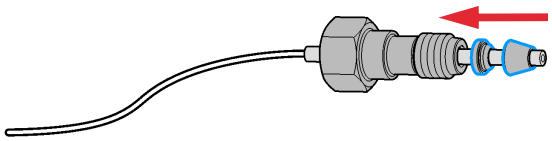
For correct installation of capillary connections it's important to choose the correct fittings, see "Syntax for Capillary Description" on page 92.

1 Select a nut that is long enough for the fitting you'll be using.

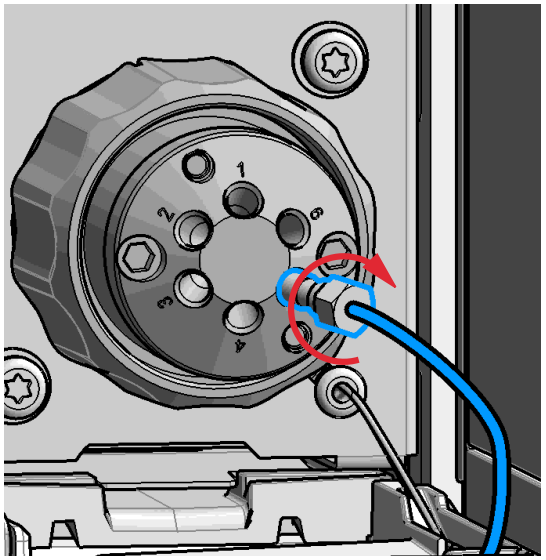
2 Slide the nut over the end of the tubing or capillary.



3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.

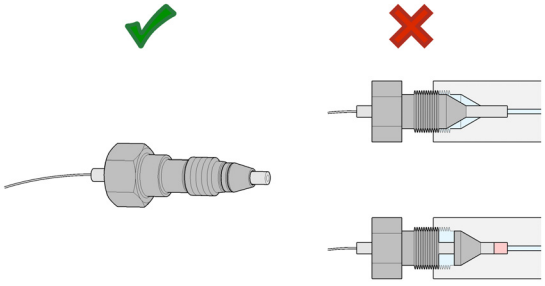


4 Use a column or injection valve to gently tighten the fitting which forces the ferrule to seat onto the tubing or capillary.



NOTE

Don't overtighten. Overtightening will shorten the lifetime of the fitting.

5 Loosen the nut and verify that the ferrule is correctly positioned on the tubing or capillary. 	

NOTE

The first time that the swagelock fitting is used on a column or an injection valve, the position of the ferrule is permanently set. If changing from a column or an injection valve to another, the fitting may leak or decrease the quality of the separation by contributing to band broadening.

5 Optimization

This chapter provides information on how to optimize the Multicolumn Thermostat.

Optimizing the Column Compartment

For best performance results of the multicolumn compartment:

- Use short connection capillaries and place them close to the heat exchanger. This reduces heat dissipation and excessive band broadening.
- See the *Accessories and Consumables* section for additional available heat exchangers with various internal volumes to address certain applications in terms of flow rates and dispersion volume optimization.
- Keep the left and right heat exchanger temperature the same unless you do specific applications.

  Use the Divider Assembly, which is a part of the *Accessory Kit for G7116B*, whenever you work with different temperatures on the left and right heater element to verify an optimized separation of both temperature zones. See also "Install the Divider Assembly" on page 62.
- Keep the front cover closed during analysis.

6 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

Available Tests vs User Interfaces

- Depending on the user interface, the available tests and the screens/reports may vary (see chapter *"Test Functions and Calibrations"*).
- Preferred tool should be the Agilent Lab Advisor software, see "Agilent Lab Advisor Software" on page 104.
- The Agilent ChemStation may 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 (basic license, shipped with an Agilent LC pump) is a standalone product that can be used with or without a chromatographic data system. Agilent Lab Advisor helps to manage the lab for high-quality chromatographic results by providing a detailed system overview of all connected analytical instruments with instrument status, Early Maintenance Feedback counters (EMF), instrument configuration information, and diagnostic tests. With the push of a button, a detailed diagnostic report can be generated. Upon request, the user can send this report to Agilent for a significantly improved troubleshooting and repair process.

The Agilent Lab Advisor software is available in two versions:

- Lab Advisor Basic
- Lab Advisor Advanced

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

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

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

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

7 Error Information

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 G HPLC modules.

Timeout

Error ID: 0062

The timeout threshold was exceeded.

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

Shutdown

Error ID: 0063

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

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

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

Remote Timeout

Error ID: 0070

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

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

Lost CAN Partner

Error ID: 0071

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

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

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

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 Condensation.	Use a higher temperature setpoint.
2 Loose column fittings.	Ensure all fittings are tight.
3 Broken capillary.	Exchange defective capillaries.
4 Leaking column-switching valve seal.	Exchange the valve seal.

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.
4 Power switch assembly defective.	Please contact your Agilent service representative.

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.

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 mainboard.	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 mainboard.	Please contact your Agilent service representative.

MCT Error Messages

These errors are module specific.

VALVE INIT FAILED

Error ID: 32030

During initialization, the valve actuator turns until the encoder reads the reference index position. An error is generated, if the reference index cannot be found within a given time.

Probable cause	Suggested actions
1 Defect in cable connection of valve drive control.	Please contact your Agilent service representative.
2 Defect in cable connection of valve actuator encoder reader.	Please contact your Agilent service representative.
3 Defect of valve drive or valve actuator encoder reader.	Please contact your Agilent service representative.

VALVE FAILED

Error ID: 32031

Switching of the valve failed.

Probable cause	Suggested actions
1 Mechanical problems. Friction too high or blockages on the valve drive's motor or on the valve head.	• Check valve head for correct installation. • Try to identify the source of trouble by installing a different valve head if possible. • Contact your Agilent service representative.
2 Defective sensor on the valve drive motor	• Check valve head for correct installation. • Try to identify the source of trouble (valve head or drive) by installing a different valve head if possible. • Contact your Agilent service representative.

VALVE TAG VIOLATION

Error ID: 32032

Reading the valve tag failed.

Probable cause	Suggested actions
1 A valve head has been exchanged (hot-plugged) while the valve drive was still powered on.	• For changing the valve head follow the instructions "Replace Valve Heads." It is important to have the MCT switched off for at least 10 s after a new valve head has been installed. • Contact your Agilent service representative.

WRONG VALVE

Error ID: 32130

Valve not supported in this module.

Probable cause	Suggested actions
1 A valve head has been installed which is not supported by G7116A.	Only valve heads up to 800 bar or with up to four positions can be used in G7116A. Exchange the valve head with a suitable one. For changing the valve head follow the instructions *Replace Valve Heads*.

NOTE

For G7116B:

- G4232D (5067-4240: 2-position/10-port Valve 1300 bar)
- G4231C (5067-4241: 2-position/6-port Valve 1300 bar)
- G4234A (5067-4284: 6-position/14-port Valve 800 bar)
- G4234C (5067-4273: 6-position/14-port Valve 1300 bar)
- G4239C (5067-4233: 8-position/18-port Valve 1300 bar)
- 5067-4237: 8-position/9-port Valve 1300 bar

For G7116B Bio:

- G5641A (5067-6682: 2-position/10-port Valve 1300 bar, bio)

For G7116A:

- G4232C (5067-4283: 2-position/10-port Valve 800 bar)
- G4231A (5067-4282: 2-position/6-port Valve 800 bar)
- G4237A (5067-4279: 4-position/10-port Valve 800 bar)

For G7116A Bio-inert:

- G5632A (5067-4132: 2-position/10-port Valve 600 bar, bio-inert)
- G5631A (5067-4148: 2-position/6-port Valve 600 bar, bio-inert)
- G5639A (5067-4134: 4-position/10-port Valve 600 bar, bio-inert)

WAIT TIMEOUT

Error ID: 32044 (left), 32045 (right)

Wait operation for temperature timed out.

Probable cause	Suggested actions
1 Defective heater.	Contact your Agilent service representative.
2 Defective mainboard.	Please contact your Agilent service representative.

HEATEX OVERTEMP

Error ID: 32080 (left), 32081 (right)

The temperature of the Peltier heat sink has exceeded the maximum limit.

Probable cause	Suggested actions
1 Defective heater assembly.	Please contact your Agilent service representative.
2 Defective mainboard.	Please contact your Agilent service representative.

UHX SENSOR ERROR

Error ID: 32090 (left), 32091 (right)

Upper heat exchanger sensor has an error.

Probable cause	Suggested actions
1 Defective sensor.	Please contact your Agilent service representative.
2 Defective cable.	Please contact your Agilent service representative.
3 Defective mainboard.	Please contact your Agilent service representative.

LHX SENSOR ERROR

Error ID: 32092 (left), 32093 (right)

Lower heat exchanger sensor has an error.

Probable cause	Suggested actions
1 Defective sensor.	Please contact your Agilent service representative.
2 Defective cable.	Please contact your Agilent service representative.
3 Defective mainboard.	Please contact your Agilent service representative.

LHS SENSOR ERROR

Error ID: 32094 (left), 32095 (right)

Heat sink sensor has an error.

Probable cause	Suggested actions
1 Defective sensor.	Please contact your Agilent service representative.
2 Defective cable.	Please contact your Agilent service representative.
3 Defective mainboard.	Please contact your Agilent service representative.

PELTIER OVERCURRENT

Error ID: 32098 (left), 32099 (right)

Probable cause	Suggested actions
1 Defective sensor.	Please contact your Agilent service representative.
2 Defective mainboard.	Please contact your Agilent service representative.
3 Defective cable.	Please contact your Agilent service representative.

LEFT PELTIER ERROR

Error ID: 32096

Left Peltier hardware is not operational.

Probable cause	Suggested actions
1 Defect heater element.	Please contact your Agilent service representative.
2 Defective mainboard.	Please contact your Agilent service representative.

RIGHT PELTIER ERROR

Error ID: 32097

Right Peltier hardware is not operational.

Probable cause	Suggested actions
1 Defect heater element.	Please contact your Agilent service representative.
2 Defective mainboard.	Please contact your Agilent service representative.

8 Test Functions and Calibrations

This chapter describes the module's built-in test functions.

Tests and Calibrations in Agilent Lab Advisor

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

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

Thermostat Test

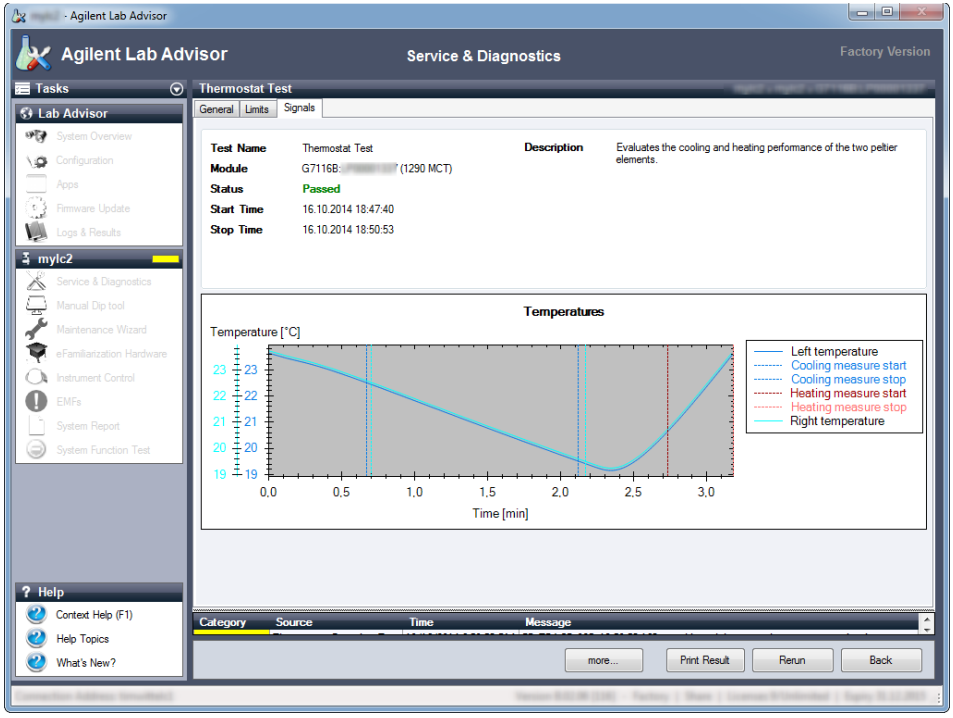
Thermostat Test Description

The **Thermostat Test** is used to evaluate the cooling and heating performance of the two Peltier elements.

The instrument starts the test when the heater temperature is within 5 °C of the current measured ambient temperature. After the start, the instrument is cooling down to 4 °C below the starting temperature. The cool-down time is used to determine the cooling performance. In the next step, the heating performance is calculated by heating up to the test starting temperature.

Thermostat Test Result

A typical **Thermostat Test** profile is shown below.



System Pressure Test

For running a **System Pressure Test**, please refer to the corresponding pump manual. The **System Pressure Test** may be used for testing the tightness of a valve installed in the MCT.

CAUTION

Wrong use of System Pressure Test may damage components.

✓ **Do not use higher test max. pressure settings as the lowest rated pressure component in the tests flow path.**

NOTE

Use appropriate blank nuts to plug ports on the column selection valves:

- Blank Nut SL (5067-6127) for standard ports on stainless steel valves,
- M4 Blank nut (5067-6141) for M4 ports on stainless steel valves,
- Blank nut long 10-32, PEEK (5043-0277) for bio-inert and bio valves.

Sensors Offset Calibration

The **Sensors Offset Calibration** tries to find the offset between the two sensors built into the heat exchanger. The idea is to bring both sides to ambient temperature and minimize temperature difference between the heat sink and heat exchanger. This is to ensure that no temperature gradient inside the heat exchanger is present and both temperature sensors are exposed to the exact same temperature.

Because the lower sensor responds much faster to temperature changes by the Peltier, it is also important, that the heat sink is at the same temperature as the heat exchanger. Otherwise, a temperature flow from or to the heat exchanger would generate differences in temperature measured by each sensor.

Required:

- After replacement of heater assembly.
- After replacement of mainboard.

9 Maintenance

This chapter describes the maintenance of the MCT.

Introduction to Maintenance

The module is designed for easy maintenance. The most frequent maintenance such as maintaining valve heads (if optional valve drive is installed) or replacing heat exchangers can be done from the front with the module in place in the system stack.

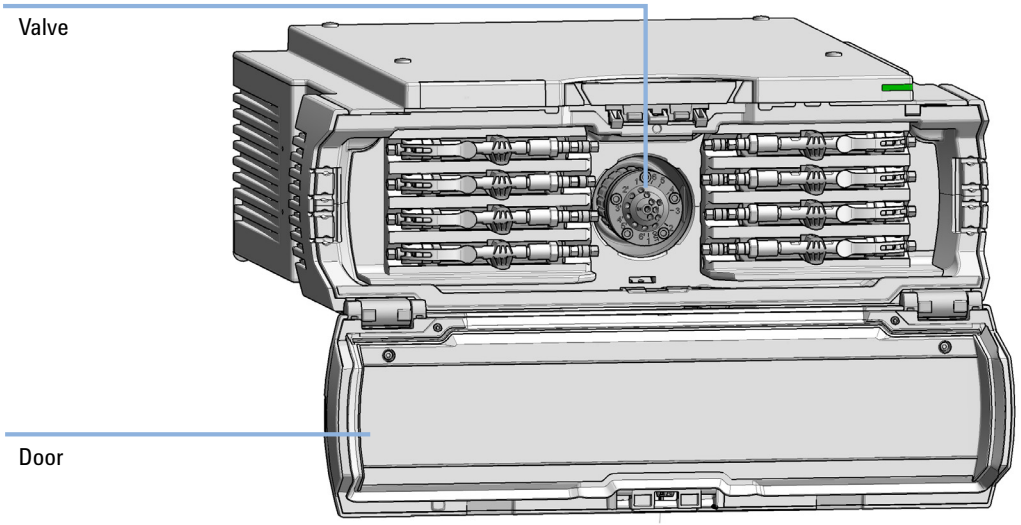


Figure 18 Overview of maintenance parts (G7116B)

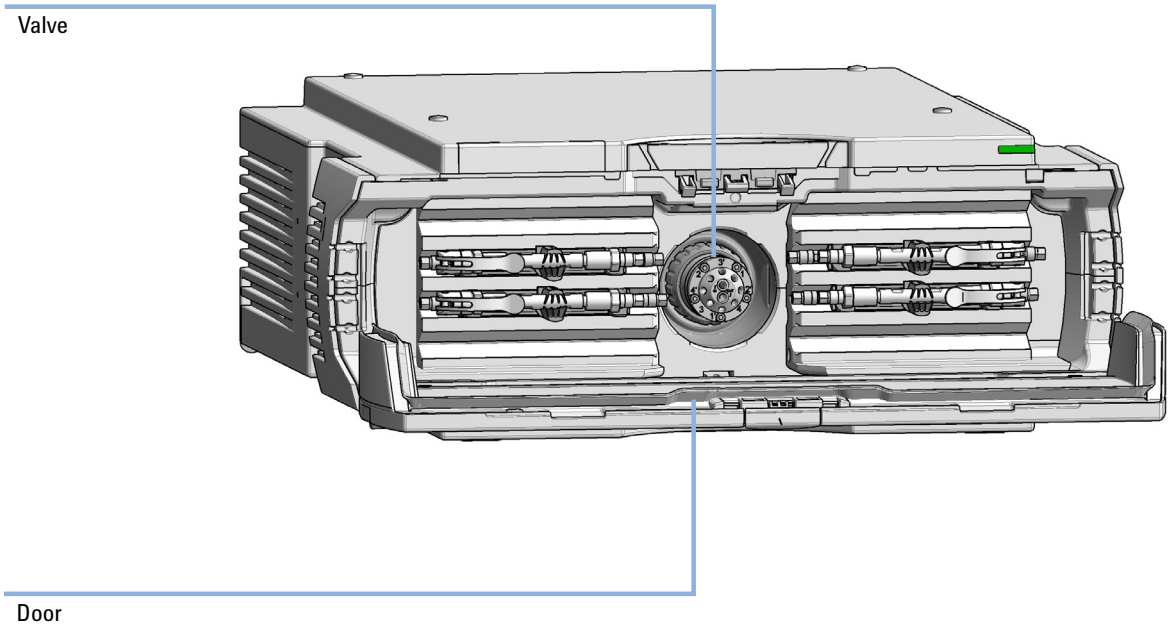


Figure 19 Overview of maintenance parts (G7116A)

NOTE

There are no serviceable parts inside.

Do not open the module.

Cautions and Warnings

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

WARNING

Hot heat exchangers

The column compartment has two heat exchanger assemblies that might be hot.

- ✓ **Allow them to cool down before starting repairs.**

WARNING

Electrical shock

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

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

WARNING

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

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

- ✓ Always unplug the power cable before opening the cover.
- ✓ Do not connect the power cable to the instrument while the covers are removed.

WARNING

Personal injury or damage to the product

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

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

CAUTION

Safety standards for external equipment

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

CAUTION

Sample degradation and contamination of the instrument

Metal parts in the flow path can interact with the bio-molecules in the sample leading to sample degradation and contamination.

- ✓ For bio applications, always use dedicated bio parts, which can be identified by the bio-inert symbol or other markers described in this manual.
- ✓ Do not mix bio, and non-bio modules or parts in a bio system.

Overview of Maintenance

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

Table 20 Maintenance procedures

Procedure	Typical Frequency	Notes
"Cleaning the Module" on page 130	If necessary	
"Install Heat Exchanger" on page 47	When new application requires a change	
"Installing the capillaries" on page 60	When new application requires a change	
"Correcting Leaks" on page 131	If a leak has occurred	Check for leaks
"Maintain the Column Switching Valve" on page 132	If the valve performance shows indication of leakage or wear	
"Replace Valve Heads" on page 135	When repair is not possible or when new application requires a change	
"Prepare the MCT for Transportation" on page 139	If the MCT shall be transported	
"Replace the Module Firmware" on page 140	If necessary	

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. Avoid using organic solvents for cleaning purposes. They can cause damage to plastic parts.

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.**

NOTE

A solution of 70 % isopropanol and 30 % water might be used if the surface of the module needs to be disinfected.

Correcting Leaks

When

If a leakage has occurred at the heat exchanger or at the capillary connections or at the column switching valve.

Tools required

Description

Tissue

Pipette

Wrench, 1/4 – 5/16 inch
(for capillary connections)

1. Remove the door.
2. Use a pipette and tissue to dry the leak sensor area.
3. Observe the capillary connections and the column switching valve for leaks and correct, if required.
4. Reinstall the door.

Maintain the Column Switching Valve

For bio-inert modules use bio-inert parts only!

For 1290 Infinity II Bio LC modules, use bio / bio-compatible parts only.
Do not mix parts between 1260 Infinity II Bio-Inert LC modules and 1290 Infinity II Bio LC modules.

When If valve leaks.

Tools required

Description
Hexagonal key, 9/64 inch
Hexagonal key, 3/32 inch
Wrench, 1/4 inch
Hexagonal driver SW-6.35 slitted
Hexagonal driver SW-4 slitted

1 Remove capillaries from ports.
2 Loosen each fixing stator screw two turns at a time. Remove the bolts from the head.
3 Remove the stator head (and stator face if applicable).
4 Remove the stator ring.
5 Remove the rotor seal (and isolation seal if damaged or contaminated).
6 Install the new isolation seal (if required). Ensure the metal spring inside the ring faces towards the valve body.
7 Install the new rotor seal.
8 Replace the stator ring. Ensure the stator ring is flush with the valve body.
9 Place the new (if required) stator face in place on the stator head. Reinstall the stator head.
10 Insert the stator screws in the stator head. Tighten the screws alternately two turns at a time until the stator head is secure.
11 Reconnect the pump capillaries to the valve ports.

CAUTION

Wrong use of the System Pressure Test may damage valve.

✓ **Always select an appropriate pressure limit for the test. Do not exceed the maximum pressure of pressure sensitive components, for example, set the Maximum Pressure to 800 bar, if an 800 bar Quick Change Valve Head is installed.**

12 Perform the **System Pressure Test** to ensure the valve is leak tight.

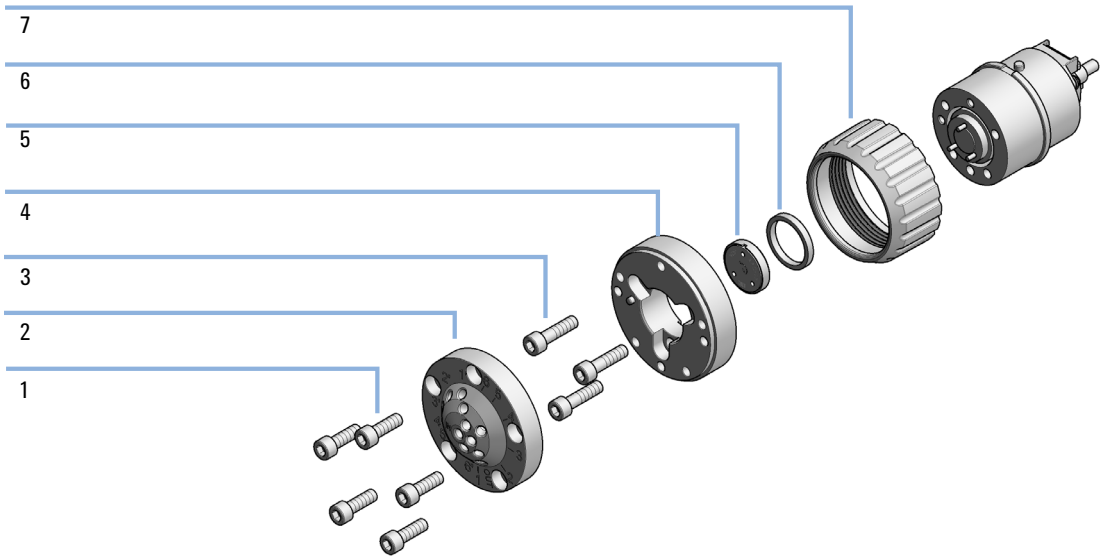


Figure 20 Valve Head Parts (example)

1	Stator screws
2	Stator head assembly
3	Stator ring screws (not available)
4	Stator ring (available for service only)
5	Rotor seal
6	Bearing ring
7	Spanner nut (available for service only)

NOTE

Figure 20 on page 134 illustrates replacement parts for the valve heads, with the 6-column selector valve as an example. The valves can vary in their appearance and do not necessarily include all of the illustrated parts. Neither, every spare part is available for each flavor of the valve.

Use "Valve Options Overview (G7116B)" on page 146 and "Valve Options Overview (G7116A)" on page 148 for identification of the required part numbers.

Replace Valve Heads

Several optional valve heads are available, which can be installed and exchanged easily.

Parts required

Description

Agilent Quick Change Valve Head.

For details, see "Valve Options Overview (G7116B)" on page 146 and "Valve Options Overview (G7116A)" on page 148.

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

- ✓ **Be sure that no solvent can drop out of the solvent connections when removing them from your valve head.**
- ✓ **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.**

CAUTION

Valve Damage

Using a low pressure valve on the high pressure side can damage the valve.

- ✓ **When using multiple column compartments as part of a method development solution, make sure that the high pressure valve head is connected to the autosampler and the low pressure valve head is connected to the detector.**

NOTE

For details, please refer to the *InfinityLab LC Method Development Solutions User Guide*.

CAUTION

Column Damage or Bias Measurement Results

Switching the valve to a wrong position can damage the column or bias measurement results.

- ✓ **Fit the lobe to the groove to make sure the valve is switched to the correct position.**

CAUTION

The valve actuator contains sensitive optical parts, which need to be protected from dust and other pollution. Pollution of these parts can impair the accurate selection of valve ports and therefore bias measurement results.

- ✓ **Always install a valve head for operation and storage. For protecting the actuator, a dummy valve head (part of Transportation Lock Kit (G1316-67001)) can be used instead of a functional valve. Do not touch parts inside the actuator.**

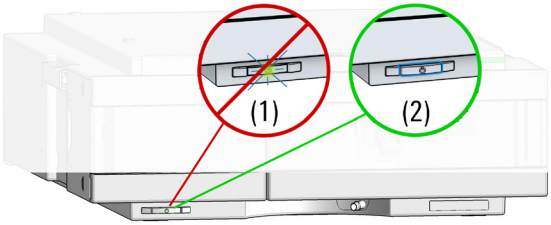
NOTE

The tag reader reads the valve head properties from the valve head RFID tag during initialization of the module. Valve properties will not be updated, if the valve head is replaced while the module is on. Selection of valve port positions can fail, if the instrument does not know the properties of the installed valve.

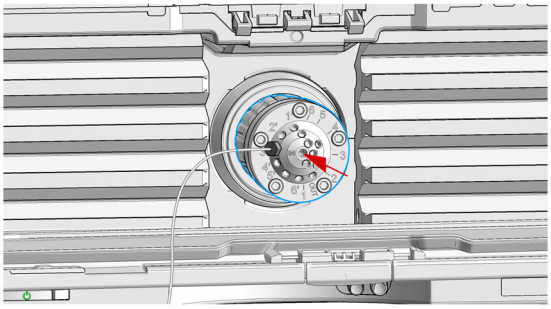
NOTE

To have the valve correctly recognized by the Agilent Infinity Valve Drive you must have the valve drive powered off for at least 10 seconds.

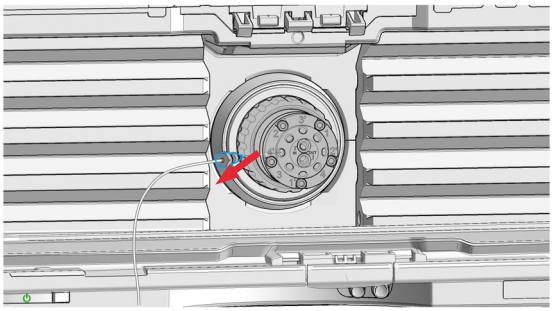
1 Switch off the module.



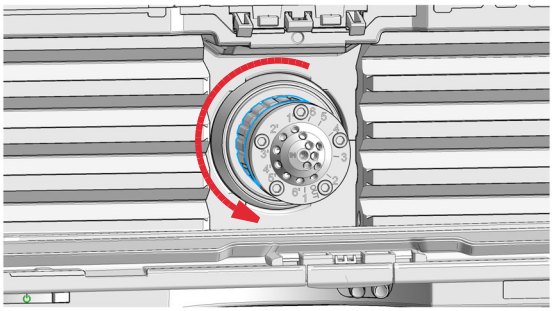
2 Push the valve head to bring it to its outer position.



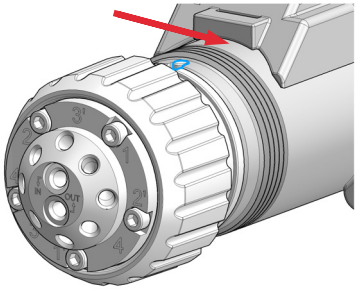
3 Remove all capillary connections from the valve head.



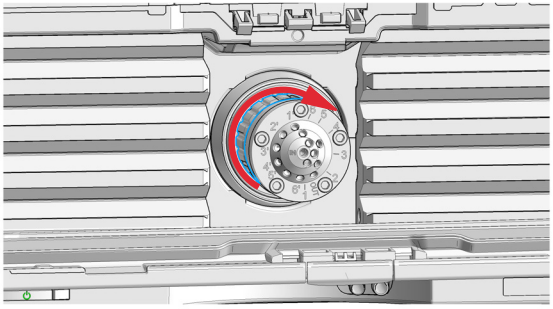
4 Unscrew the nut and remove the valve head.

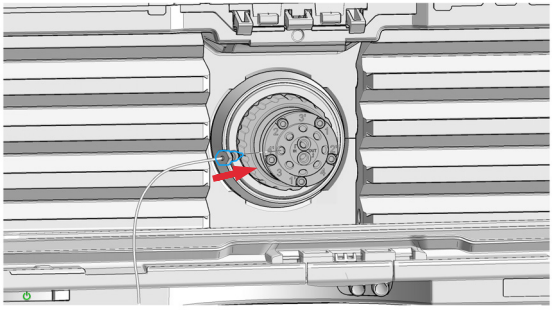
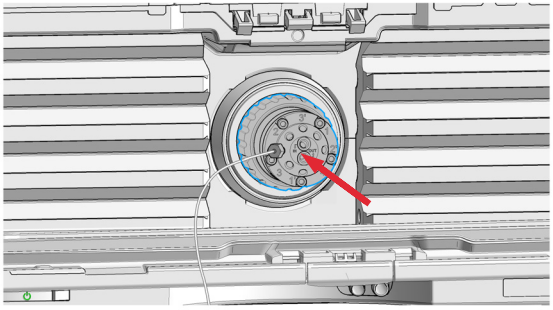
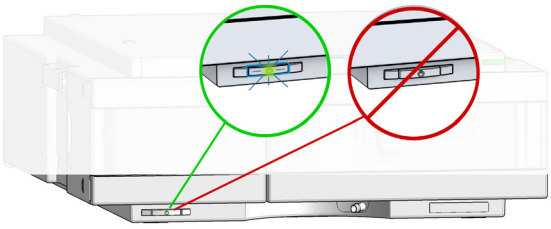


5 Put the new valve head onto the valve drive such that the lobe fits to the groove (see also "Installing Valve Heads" on page 54).



6 Fasten the valve head onto the valve drive using the union nut (see also "Installing Valve Heads" on page 54).



7 Install all required capillary connections to the valve. 	**8** Push the valve head until it snaps in and stays in the rear position. 
9 Switch on the module. 	

Prepare the MCT for Transportation

When If an MCT including the Valve Drive Option shall be transported

NOTE The module has been shipped with transportation locks, which must be used for transportation protection.

CAUTION

Damage to Internal Parts

Mechanical shocks for example when being transported by car or shipped by post.

✓ **Install a lock (Transportation Lock Kit (G1316-67001)).**

1 Remove the valve head as described in "Replace Valve Heads" on page 135.
2 Replace the valve head by the transportation valve head. Bring the transportation valve head to the outer position.
3 Fix the Transportation Lock to the MCT.

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

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 FW Update Tool and the documentation from the Agilent web.
   http://www.agilent.com/en-us/firmwareDownload?whid=69761
2. For loading the firmware into the module follow the instructions in the documentation.

Module Specific Information

Module is a hosted module and always needs to be connected to a host with matching firmware of same revision.

10 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

Plastic Parts

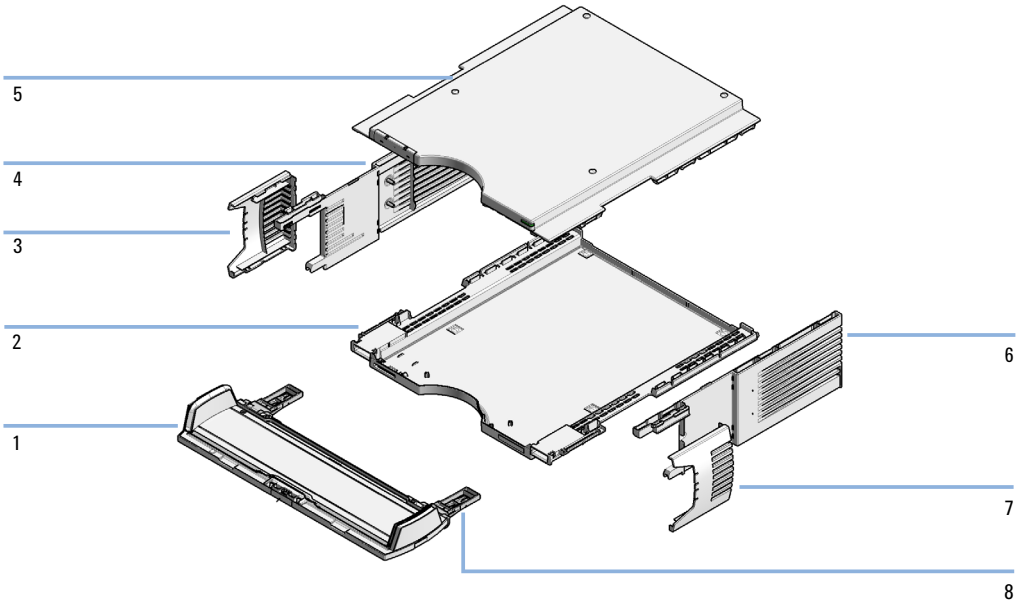


Figure 21 Plastic parts

Item	p/n	Description
1	G7116-60004	Door Kit Infinity II MCT (for G7116B)
OR 1	G7116-60001	Door Kit Infinity II MCT (for G7116A)
	G7116-68713	Cabinet Kit Infinity II MCT includes parts 2 – 7:
2	G7116-40100	Base Cover Infinity II MCT
3	G7116-40103	Side Cover Left Insert Infinity II MCT
4		Side Cover Left Infinity II MCT (available only as a part of the kit)
5		Top Cover Kit Infinity II (available only as a part of the kit)
6		Side Cover Right Infinity II MCT (available only as a part of the kit)
7	G7116-40106	Side Cover Right Insert Infinity II MCT
8	G7116-67004	MCT Hinge Base Assembly Kit (repair kit for MCT door hinge base)
	G7116-60003	Transportation Foam Assembly (not shown)

Leak Parts

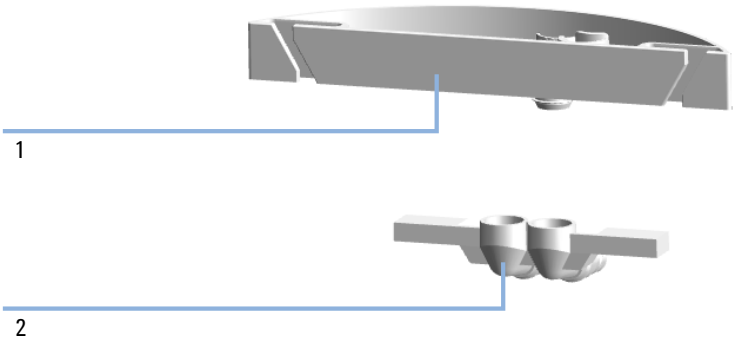


Figure 22 Plastic parts

Item	p/n	Description
1	G7116-40043	Leak Adapter Top MCT
2	G7116-40013	Leak Adapter Hitch MCT

Valve Options and Parts

MCT:

p/n	Description
G1353D	Valve drive upgrade kit for MCT

External Valve Drive:

p/n	Description
G1170A	External Valve Drive
5067-6138	Valve Holder Kit Right-IF-II-G
5067-6139	Valve Holder Kit Left-IF-II-G
G1170-68705	Accessory Kit with Clamp for mounting on 1290 Infinity II module

Valve Head Parts

NOTE

The figure below illustrates replacement parts for the valve heads, with the 12-position/13-port Selector valve as an example. The valves can vary in their appearance and do not necessarily include all of the illustrated parts. Neither, every spare part is available for each flavor of the valve.

Use the tables ("Valve Options Overview (G7116B)" on page 146 and "Valve Options Overview (G7116A)" on page 148) for identification of the required part numbers.

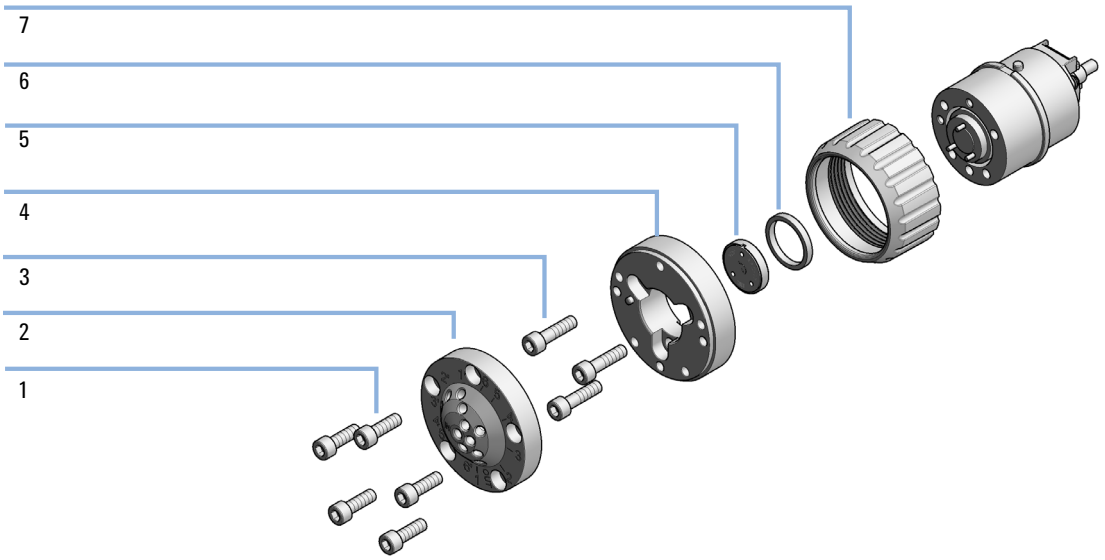


Figure 23 Valve Head Parts (example)

1	Stator screws
2	Stator head assembly
3	Stator ring screws (not available)
4	Stator ring (available for service only)
5	Rotor seal
6	Bearing ring
7	Spanner nut (available for service only)

Valve Options Overview (for G7116B)

Valve Options Overview (G7116B)

Table 21 Replacement parts standard valve heads for G7116B

Valve Head	Rotor Seal	Stator Head	Stator Screws	Stator Ring
5067-4233 8-Position/18-Port Valve 1300 bar	5068-0200 (PEEK)	5068-0199	5068-0089	n.a.
5067-4241 2-Position/6-Port Valve 1300 bar	5068-0207 (PEEK)	5068-0006	1535-4857	5068-0120
5067-4240 2-Position/10-Port Valve 1300 bar	5068-0205 (PEEK)	5068-0011	5068-0019	n.a.
5067-4273 6-Position/14-Port Valve 1300 bar	5068-0242 (PEEK)	5068-0241	5068-0089	n.a.
5067-4284 6-Position/14-Port Valve 800 bar	5068-0298 (PEEK)	5068-0241	5068-0089	n.a.
5067-6682 2-Position/10-Port Valve Bio 1300 bar	5068-0205 (PEEK)	5068-0286	5068-0019	n.a.
5067-4237 8-Position/9-Port Valve 1300 bar	5068-0202 (PEEK)	5068-0001	1535-4857	5068-0120

Obsolete Valve Heads

The following 1200 bar valve heads are no longer orderable:

Table 22 Replacement parts obsolete valve heads for G7116B

Valve Head	Rotor Seal	Stator Head	Stator Screws	Stator Ring
5067-4121 8-Position/9-Port Valve 1200 bar	5068-0002 (Vespel)	5068-0001	1535-4857	5068-0127
5067-4117 2-Position/6-Port Valve 1200 bar	5068-0008 (Vespel)	5068-0006	1535-4857	5068-0127
5067-4118 2-Position/10-Port Valve 1200 bar	5068-0012 (Vespel)	5068-0011	5068-0019	n.a.
5067-4142 6-Position/14-Port Valve 1200 bar	5068-0067 (Vespel)	5068-0077	5068-0089	n.a.

Valve Options Overview (for G7116A)

Valve Options Overview (G7116A)

Table 23 Replacement parts standard valve heads for G7116A

Valve Head	Rotor Seal	Stator Head	Stator Screws	Stator Ring	Stator face	Other
5067-4279 4-Position/10-Port Valve 800 bar	5068-0264 (PEEK)	5068-0263	5068-0019	n.a.	n.a.	Bearing ring: 1535-4045
5067-4282 2-Position/6-Port Valve 800 bar	0101-1409 (PEEK)	0101-1417	1535-4857	5068-0120	n.a.	Bearing ring: 1535-4045
5067-4148 2-Position/6-Port Bio-Inert Valve 600 bar	0101-1409 (PEEK)	5068-0060	5068-0020 (10/pack)	n.a.	0100-1851 (ceramic)	Bearing ring: 1535-4045
5067-4132 2-Position/10-Port Bio-Inert Valve 600 bar	5068-0041 (PEEK)	5068-0040	5068-0059	n.a.	5068-0095	Bearing ring: 1535-4045
5067-4283 2-Position/10-Port Valve 800 bar	0101-1415 (PEEK)	5068-0165	5068-0019	n.a.	n.a.	Bearing ring: 1535-4045
5067-4134 4-Position/10-Port Bio-Inert Valve 600 bar	5068-0045 (PEEK)	5068-0044	5068-0059	n.a.	5068-0093	Bearing ring: 1535-4045

Obsolete Valve Heads

The following 600 bar valve heads are no longer orderable:

Table 24 Replacement parts obsolete valve heads for G7116A

Valve Head	Rotor Seal	Stator Head	Stator Screws	Stator Ring
5067-4287 4-Position/10-Port Valve 600 bar	5068-0264 (PEEK)	5068-0263	5068-0019	n.a.
5067-4137 2-Position/6-Port Valve 600 bar	0101-1409 (PEEK)	0101-1417	5068-0018	5068-0127
5067-4145 2-Position/10-Port Valve 600 bar	0101-1415 (PEEK)	5068-0165	5068-0019	n.a.

Column ID Parts

Column ID Upgrade Kit (for G7116B)

p/n	Description
G4750B	Column ID upgrade kit for G7116B

Column ID Upgrade Kit (for G7116A)

p/n	Description
G4750A	Column ID upgrade kit for G7116A

Column ID Parts (for G7116B)

p/n	Description
G7116-81001	Column ID flex-board connection, right
G7116-81002	Column ID flex-board connection, left
5067-5915	Column ID Kit Left
5067-5916	Column ID Kit Right
5067-5917	InfinityLab Column Identification Tag

Column ID Parts (for G7116A)

p/n	Description
G7116-81002	Column ID flex-board connection, left
5067-5915	Column ID Kit Left
5067-5917	InfinityLab Column Identification Tag

Accessories and Consumables

Accessories and Consumables (for G7116B)

G7116-68705 Accessory Kit (for G7116B)

The Accessory Kit (for G7116B) contains accessories and tools needed for the installation and maintenance.

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6/9 mm
5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket
5067-5966	InfinityLab Quick Turn Fitting
5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm
G7116-60015	Quick Connect Heat Exchanger Standard
G7116-68003	Column Holder Lamella, 2/pk (delivered as a part of G7116-60015)
5043-0915	Fitting mounting tool
G7116-60006	Divider Assembly MCT
5022-2184	Union, stand LC flow, no fitting
	Double Drain Connector

G7116-68707 Accessory Kit Bio (for G7116B)

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6/9 mm
5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
5067-5966	InfinityLab Quick Turn Fitting
G7116-60071	Quick Connect Bio Heat Exchanger Standard Flow
G7116-68003	Column Holder Lamella, 2/pk (delivered as a part of G7116-60071)
5043-0915	Fitting mounting tool
G7116-60006	Divider Assembly MCT
5023-2625	Union MP35N Double Drain Connector
5500-1578	Quick Connect Capillary MP35N 0.12 mm x 105 mm
5067-5965	InfinityLab Quick Connect LC fitting
5500-1598	Quick Turn Capillary MP35N 0.12 mm x 500 mm

Available Consumables (for G7116B)

p/n	Description
G7116-68003	Column Holder Lamella, 2/pk
G7116-68004	Column Holder Clamp, 2/pk
5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket Capillary from column outlet to DAD, no fittings.
G7116-60006	Divider Assembly MCT For separating different temperature zones between left and right heater elements.
5067-5917	InfinityLab Column Identification Tag Blank column ID tag (column ID tag reader kit is required)
G7116-60013	InfinityLab Thermal Equilibration Device

Accessories and Consumables (for G7116A)

G7116-68755 Accessory Kit (for G7116A)

The Accessory Kit (for G7116A) contains accessories and tools needed for the installation and maintenance.

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6/9 mm
0100-1516	Finger-tight fitting PEEK, 2/pk
5500-1193	InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket
G7167-68703	Fitting Intermediate Kit
G7116-60051	Quick Connect Heat Exchanger Large ID
G7116-68003	Column Holder Lamella, 2/pk (delivered as a part of G7116-60051)
5043-0915	Fitting mounting tool
5067-5966	InfinityLab Quick Turn Fitting
5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket
5022-2184	Union, stand LC flow, no fitting
	Double Drain Connector

G7116-68715 Bio-inert Accessory Kit (for G7116A)

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5067-4780	Bio Capillary 0.17 mm x 300 mm, 1.6 mm OD socket
G7116-68003	Column Holder Lamella, 2/pk
0100-1516	Finger-tight fitting PEEK, 2/pk
G7116-60041	Quick Connect Heat Exchanger Bio-inert
5043-0915	Fitting mounting tool
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6/9 mm
5067-5403	UHP fitting
5067-4741	ZDV union (Bio-inert)

Available Consumables (for G7116A)

p/n	Description
G7116-68003	Column Holder Lamella, 2/pk
G7116-68004	Column Holder Clamp, 2/pk
G7116-60006	Divider Assembly MCT For separating different temperature zones between left and right heater elements.
5067-5917	InfinityLab Column Identification Tag Blank column ID tag (column ID tag reader kit is required)
5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket Capillary from column outlet to DAD, no fittings.
G7116-60013	InfinityLab Thermal Equilibration Device

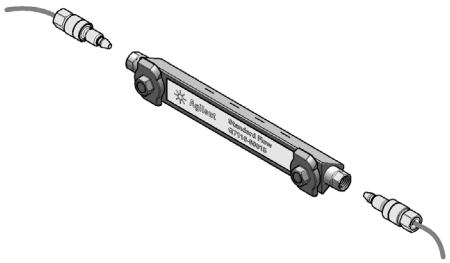
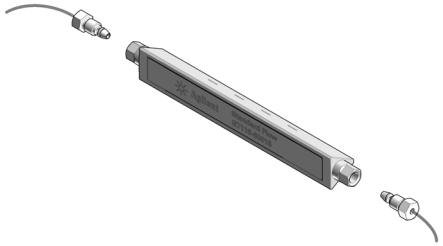
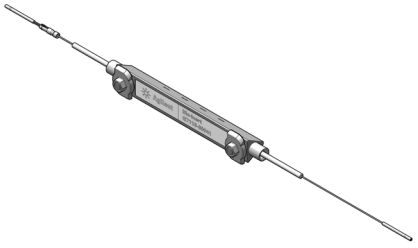
Additional Heater Devices

Table 25 Heat Exchanger Overview

Flow rate	0.075 mm i.d. capillary	0.12 mm i.d. capillary	0.17 mm i.d. capillary
< 2 mL/min	*Ultra-low Dispersion* G7116-60021 (Internal volume: 1.0 µL)	*Standard Flow* G7116-60015 (Internal volume: 1.6 µL)	*Large ID* G7116-60051 (Internal volume: 3.0 µL)
> 2 mL/min		*High Flow* G7116-60031 (Internal volume: 3.0 µL)	*Large ID High Flow* G7116-60061 (Internal volume: 6.0 µL)
Bio, all flow rates	*Bio Ultra-low Dispersion* G7116-60091 (Internal volume: 1.0 µL)	*Bio Standard Flow* G7116-60071 (Internal volume: 1.6 µL) *Bio High Flow* G7116-60081 (Internal volume: 3.0 µL)	*Bio-inert* G7116-60041 (Internal volume: 9.0 µL)

Quick Connect Heat Exchangers with 0.12 mm and 0.075 mm i.d. capillary are suitable for G7116B. Quick Connect Heat Exchangers with 0.17 mm i.d. are suitable for G7116A.

Table 26 InfinityLab Quick Connect Heat Exchangers

Item	Description
	Old design Quick Connect Heat Exchanger: twist lock clips of the Quick Connect Heat Exchanger are used to secure the Quick Connect Heat Exchanger in the heater block of the MCT.
	New design Quick Connect Heat Exchanger: column holders (lamella type G7116-68003 or clamp type G7116-68004) are used to secure the Quick Connect Heat Exchanger in the heater block of the MCT. G7116-68003 lamella type column holders are delivered as a part of the Quick Connect Heat Exchanger and do not need to be ordered separately.
	Design has been changed for all Quick Connect Heat Exchangers except G7116-60041, Quick Connect Heat Exchanger Bio-inert.

InfinityLab Quick Connect and Quick Turn Fittings

InfinityLab Quick Connect Fittings

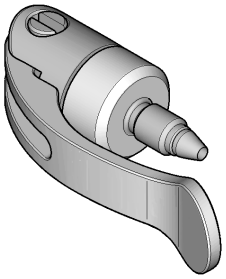


Figure 24 InfinityLab Quick Connect Fitting

p/n	Description
5067-5965	InfinityLab Quick Connect LC fitting (fitting without preinstalled capillary)
5043-0924	Front Ferrule for Quick Connect/Turn Fitting
5067-5961	InfinityLab Quick Connect Assy ST 0.075 mm x 105 mm
5067-6163	InfinityLab Quick Connect Assy ST 0.075 mm x 150 mm
5067-6164	InfinityLab Quick Connect Assy ST 0.075 mm x 220 mm
5067-6165	InfinityLab Quick Connect Assy ST 0.075 mm x 280 mm
5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm
5067-5958	InfinityLab Quick Connect Assy ST 0.12 mm x 150 mm
5067-5959	InfinityLab Quick Connect Assy ST 0.12 mm x 220 mm
5067-5960	InfinityLab Quick Connect Assy ST 0.12 mm x 280 mm
5067-6166	InfinityLab Quick Connect Assy ST 0.17 mm x 105 mm
5067-6167	InfinityLab Quick Connect Assy ST 0.17 mm x 150 mm
5067-6168	InfinityLab Quick Connect Assy ST 0.17 mm x 220 mm
5067-6169	InfinityLab Quick Connect Assy ST 0.17 mm x 280 mm

InfinityLab Quick Connect Fitting Replacement Capillaries

p/n	Description
5500-1174	InfinityLab Capillary ST 0.075 mm x 105 mm
5500-1175	InfinityLab Capillary ST 0.075 mm x 150 mm
5500-1176	InfinityLab Capillary ST 0.075 mm x 220 mm
5500-1177	InfinityLab Capillary ST 0.075 mm x 250 mm
5500-1178	InfinityLab Capillary ST 0.075 mm x 280 mm
5500-1173	InfinityLab Capillary ST 0.12 mm x 105 mm
5500-1172	InfinityLab Capillary ST 0.12 mm x 150 mm
5500-1171	InfinityLab Capillary ST 0.12 mm x 220 mm
5500-1170	InfinityLab Capillary ST 0.12 mm x 280 mm
5500-1179	InfinityLab Capillary ST 0.12 mm x 400 mm
5500-1180	InfinityLab Capillary ST 0.12 mm x 500 mm
5500-1181	InfinityLab Capillary ST 0.17 mm x 105 mm
5500-1182	InfinityLab Capillary ST 0.17 mm x 150 mm
5500-1183	InfinityLab Capillary ST 0.17 mm x 220 mm
5500-1230	InfinityLab Capillary ST 0.17 mm x 280 mm
5500-1231	InfinityLab Capillary ST 0.17 mm x 500 mm
5500-1259	InfinityLab Capillary ST 0.25 mm x 150 mm
5500-1260	InfinityLab Capillary ST 0.25 mm x 400 mm

InfinityLab Quick Turn Fitting

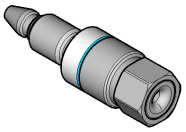


Figure 25 InfinityLab Quick Turn Fitting

p/n	Description
5067-5966	InfinityLab Quick Turn Fitting
5043-0924	Front Ferrule for Quick Connect/Turn Fitting

Capillaries for use with the InfinityLab Quick Turn Fitting

p/n	Description
5500-1198	Capillary ST 0.075 mm x 105 mm, long socket
5500-1232	Capillary ST 0.075 mm x 150 mm, long socket
5500-1206	Capillary ST 0.075 mm x 250 mm, long socket
5500-1205	Capillary ST 0.075 mm x 500 mm, long socket
5500-1188	Quick Turn Capillary ST 0.12 mm x 105 mm, long socket
5500-1189	Capillary ST 0.12 x 150 mm, long socket
5500-1233	Capillary ST 0.12 mm x 180 mm, long socket
5500-1190	Capillary ST 0.12 mm x 200 mm, long socket
5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket
5500-1192	Capillary ST 0.12 mm x 500 mm, long socket
5500-1193	InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket
5500-1194	Capillary ST 0.17 mm x 150 mm, long socket
5500-1234	Capillary ST 0.17 mm x 180 mm, long socket
5500-1195	Capillary ST 0.17 mm x 200 mm, long socket
5500-1196	Capillary ST 0.17 mm x 280 mm, long socket
5500-1235	Capillary ST 0.17 mm x 380 mm, long socket
5500-1236	Capillary ST 0.17 mm x 400 mm, long socket
5500-1197	Capillary ST 0.17 mm x 500 mm, long socket
5500-1237	Capillary 0.17 mm x 700 mm, ns/ns
5500-1262	Capillary 0.25 mm x 150 mm, ns/ns
5500-1263	Capillary ST 0.25 mm x 400 mm, long socket
5500-1200	Quick Turn Capillary ST 0.12 mm x 130 mm SL/M
5500-1288	Capillary ST 0.12 mm x 150 mm, long socket, M4
5500-1290	Capillary ST 0.17 mm x 150 mm, long socket, M4

InfinityLab Quick Connect Fitting Replacement Bio-compatible Capillaries

NOTE

Bio-compatible MP35N capillaries are color-coded and have an orange stripe in addition to color-coding of capillary internal diameters (0.075 mm - black, 0.12 mm - red, 0.17 mm - green, 0.25 mm - blue).

p/n	Description
5500-1474	Quick Connect Capillary MP35N 0.075 mm x 105 mm
5500-1475	Quick Connect Capillary MP35N 0.075 mm x 150 mm
5500-1576	Quick Connect Capillary MP35N 0.075 mm x 220 mm
5500-1577	Quick Connect Capillary MP35N 0.075 mm x 280 mm
5500-1578	Quick Connect Capillary MP35N 0.12 mm x 105 mm
5500-1579	Quick Connect Capillary MP35N 0.12 mm x 150 mm
5500-1580	Quick Connect Capillary MP35N 0.12 mm x 220 mm
5500-1581	Quick Connect Capillary MP35N 0.12 mm x 280 mm
5500-1582	Quick Connect Capillary MP35N 0.12 mm x 400 mm
5500-1583	Quick Connect Capillary MP35N 0.12 mm x 500 mm
5500-1584	Quick Connect Capillary MP35N 0.17 mm x 105 mm
5500-1585	Quick Connect Capillary MP35N 0.17 mm x 150 mm
5500-1586	Quick Connect Capillary MP35N 0.17 mm x 220 mm
5500-1587	Quick Connect Capillary MP35N 0.17 mm x 280 mm
5500-1588	Quick Connect Capillary MP35N 0.17 mm x 500 mm

InfinityLab Quick Turn Fitting Replacement Bio-compatible Capillaries

NOTE

Bio-compatible MP35N capillaries are color-coded and have an orange stripe in addition to color-coding of capillary internal diameters (0.075 mm - black, 0.12 mm - red, 0.17 mm - green, 0.25 mm - blue).

p/n	Description
5500-1589	Quick Turn Capillary MP35N 0.075 mm x 105 mm
5500-1590	Quick Turn Capillary MP35N 0.075 mm x 150 mm
5500-1591	Quick Turn Capillary MP35N 0.075 mm x 250 mm
5500-1592	Quick Turn Capillary MP35N 0.075 mm x 500 mm
5500-1593	Quick Turn Capillary MP35N 0.12 mm x 105 mm
5500-1594	Quick Turn Capillary MP35N 0.12 mm x 150 mm
5500-1595	Quick Turn Capillary MP35N 0.12 mm x 200 mm
5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
5500-1597	Quick Turn Capillary MP35N 0.12 mm x 400 mm
5500-1598	Quick Turn Capillary MP35N 0.12 mm x 500 mm
5500-1599	Quick Turn Capillary MP35N 0.17 mm x 105 mm
5500-1600	Quick Turn Capillary MP35N 0.17 mm x 150 mm
5500-1601	Quick Turn Capillary MP35N 0.17 mm x 200 mm
5500-1602	Quick Turn Capillary MP35N 0.17 mm x 280 mm
5500-1603	Quick Turn Capillary MP35N 0.17 mm x 400 mm
5500-1604	Quick Turn Capillary MP35N 0.17 mm x 500 mm
5500-1605	Quick Turn Capillary MP35N 0.17 mm x 700 mm

11 Identifying Cables

This chapter provides information on cables used with the Agilent Infinity and Infinity II Series 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
5188-8059	ERI-Extension-Cable 1.2 m
5061-3378	Remote Cable to 35900 A/D converter
01046-60201	Agilent module to general purpose
5188-8057	Fraction Collection ERI remote Y-cable

CAN cables

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

LAN cables

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

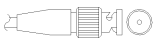
RS-232 cables (not for FUSION board)

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

USB cables

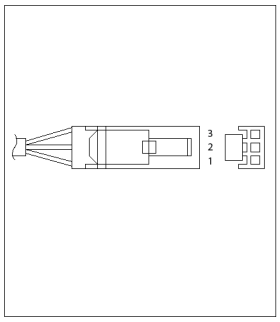
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

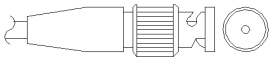


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

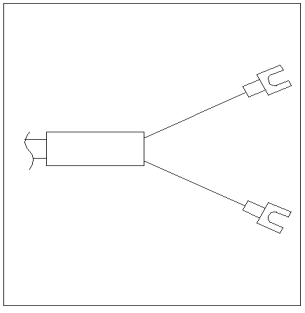
Agilent Module to 35900 A/D converters

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

Agilent Module to BNC Connector

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

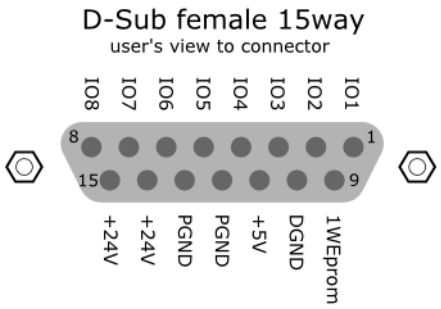
Agilent Module to General Purpose

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

Remote Cables

ERI (Enhanced Remote Interface)

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

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

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

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

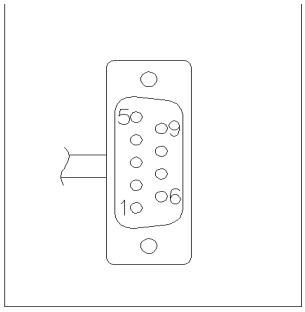
- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

Table 27 5188-8057 ERI to APG and RJ45

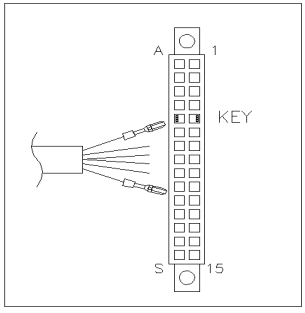
p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trigger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shielding	NC		

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

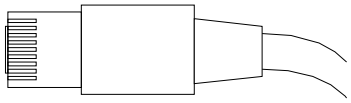
Agilent Module to Agilent 35900 A/D Converters

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

Agilent Module to General Purpose

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

CAN/LAN Cables



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

CAN Cables

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

LAN Cables

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

RS-232 Cables

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

USB

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

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

12 Hardware Information

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

Firmware Description

The firmware of the instrument consists of two independent sections:

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

Resident System

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

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- 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- 232)
- 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/ERI 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 with the Agilent Lab Advisor software with files on the hard disk (latest version should be used).

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

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

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

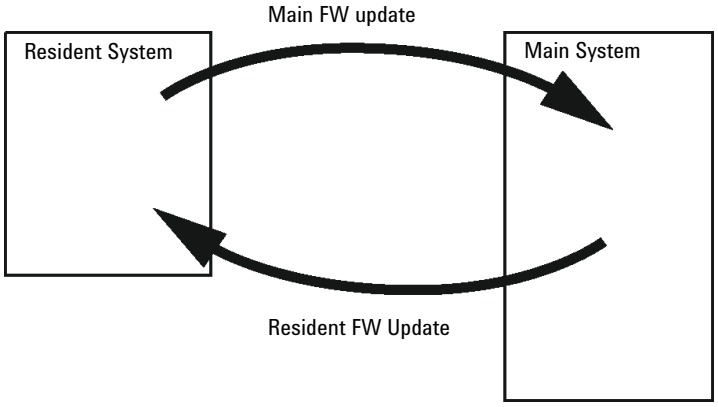


Figure 26 Firmware Update Mechanism

NOTE

Some modules are limited in downgrading due to their mainboard 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 is used and the feature set of the original one is lost. After re-branding (e.g. from G1314B to G1314C), the original feature set is available again.

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

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

Rear View of the Module

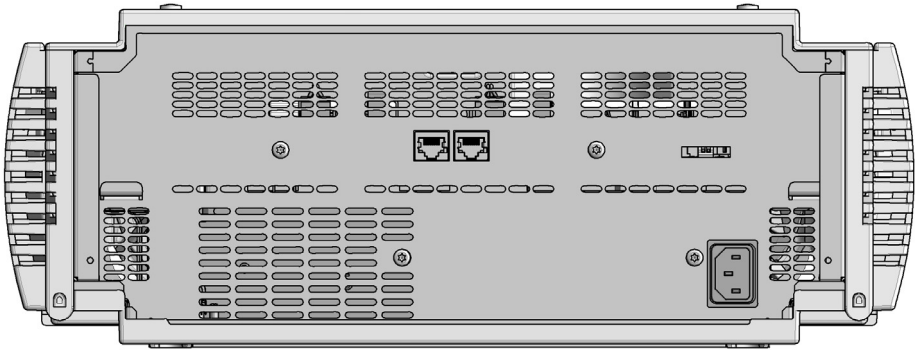


Figure 27 Rear view of the Multicolumn Thermostat G7116A/B

Information on Instrument Serial Number

Serial Number Information 1200 Series and 1290 Infinity

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

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

Serial Number Information 1260/1290 Infinity

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

CCXZZ00000	Format
CC	Country of manufacturing • DE = Germany • JP = Japan • CN = China
X	Alphabetic character A-Z (used by manufacturing)
ZZ	Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)
00000	Serial number

Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

Table 28 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Pumps							
G7104A/C	2	No	Yes	Yes	1	A	
G7110B	2	Yes	Yes	No	No	E	
G7111A/B, G5654A	2	Yes	Yes	No	No	E	
G7112B	2	Yes	Yes	No	No	E	
G7120A, G7132A	2	No	Yes	Yes	1	A	
G7161A/B	2	Yes	Yes	No	No	E	
Samplers							
G7129A/B/C	2	Yes	Yes	No	No	E	
G7167A/B, G7137A, G5668A, G3167A	2	Yes	Yes	No	No	E	
G7157A	2	Yes	Yes	No	No	E	
Detectors							
G7114A/B	2	Yes	Yes	No	1	E	
G7115A	2	Yes	Yes	No	1	E	
G7117A/B/C	2	Yes	Yes	No	1	E	
G7121A/B	2	Yes	Yes	No	1	E	
G7162A/B	2	Yes	Yes	No	1	E	
G7165A	2	Yes	Yes	No	1	E	

Table 28 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Fraction Collectors							
G7158B	2	Yes	Yes	No	No	E	
G7159B	2	Yes	Yes	No	No	E	
G7166A	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card
G1364E/F, G5664B	2	Yes	Yes	No	No	E	THERMOSTAT for G1330B
Others							
G1170A	2	No	No	No	No	No	
G7116A/B	2	No	No	No	No	No	Requires a host module with on-board LAN or with additional G1369C LAN Card.
G7122A	No	No	No	Yes	No	A	
G7170B	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card

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

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

Overview Interfaces

CAN

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

LAN

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

NOTE

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

USB

The USB interface replaces the RS-232 Serial interface in new FUSION generation modules. For details on USB refer to "USB (Universal Serial Bus)" on page 189.

Analog Signal Output

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

Remote (ERI)

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

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

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

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

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

NOTE

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

Table 29 ERI signal distribution

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

Special Interfaces

There is no special interface for this module.

ERI (Enhanced Remote Interface)

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

ERI Description

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

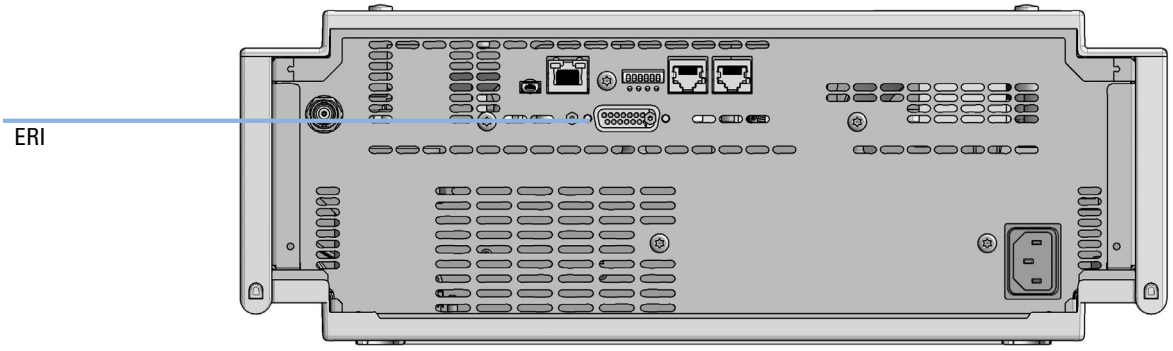
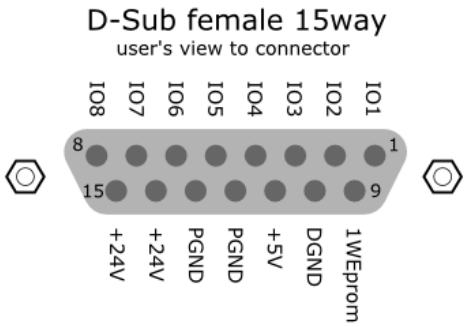


Figure 28 Location of the ERI interface (example shows a G7114A/B VWD)



Pin	Enhanced Remote
1	IO 1 (START REQUEST)
2	IO 2 (STOP)
3	IO 3 (READY)
4	IO 4 (POWER ON)
5	IO 5 (NOT USED)
6	IO 6 (SHUT DOWN)
7	IO 7 (START)
8	IO 8 (PREPARE)
9	1 wire DATA
10	DGND
11	+5 V ERI out
12	PGND
13	PGND
14	+24 V ERI out
15	+24 V ERI out

IO (Input/Output) Lines

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

1-Wire Data (Future Use)

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

5V Distribution (Future Use)

- Available directly after turning on the hosting module (assures that the firmware can detect certain basic functionality of the device).
- For digital circuits or similar.
- Provides 500 mA maximum.
- Short-circuit proof with automatic switch off (by firmware).

24V Distribution (Future Use)

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

USB (Universal Serial Bus)

USB (Universal Serial Bus) - replaces RS232, supports:

- a PC with control software (for example Agilent Lab Advisor)
- USB Flash Disk

2-bit Configuration Switch

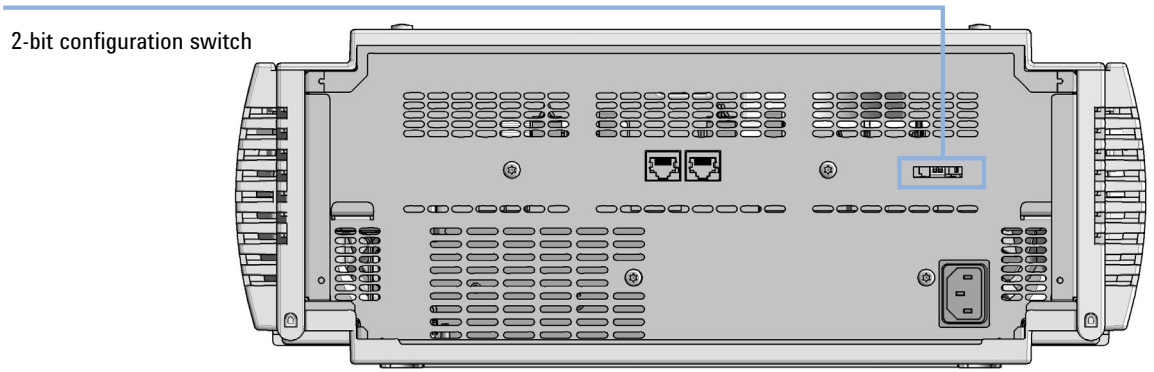


Figure 29 Location of Configuration Switch

Table 30 Dip switches settings for G7116A/B

Mode Select	1	2
Default	up	up
Coldstart	up	down
Boot resident	down	up
Not supported	down	down

Instrument Layout

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

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

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components that are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of use of the module and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the use 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.

13 Appendix

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 198.

Ground the Instrument

WARNING

Missing electrical ground

Electrical shock

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

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

- ✓ **Do not operate the instrument in the presence of flammable gases or fumes.**

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

- ✓ **Do Not Remove the Instrument Cover**
- ✓ **Only Agilent authorized personnel are allowed to remove instrument covers. Always disconnect the power cables and any external circuits before removing the instrument cover.**

Do Not Modify the Instrument

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

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

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

Solvents

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

- ✓ **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- ✓ **Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).**
- ✓ **Avoid high vapor concentrations. Keep the solvent temperature at least 40 °C (72 °F) below the boiling point of the solvent used. This includes the solvent temperature in the sample compartment. For the solvents methanol and ethanol keep the solvent temperature at least 25 °C (45 °F) below the boiling point.**
- ✓ **Do not operate the instrument in an explosive atmosphere.**
- ✓ **Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).**
- ✓ **Reduce the volume of substances to the minimum required for the analysis.**
- ✓ **Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.**
- ✓ **Ground the waste container.**
- ✓ **Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.**
- ✓ **To achieve maximal safety, regularly check the tubing for correct installation.**

NOTE

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

Safety Symbols

Table 31 Symbols

	The apparatus is marked with this symbol when the user shall 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.
	Sample Cooler 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.
	Flammable Material For Sample Thermostat which uses flammable refrigerant consult Agilent Information Center / User Manual before attempting to install or service this equipment. All safety precautions must be followed.
	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 31 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

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

NOTE

Do not dispose of in domestic household waste

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

Radio Interference

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

Test and Measurement

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

Sound Emission Certification for Federal Republic of Germany

Sound pressure

Sound pressure Lp <70 db(A) according to DIN EN ISO 7779

Schalldruckpegel

Schalldruckpegel Lp <70 db(A) nach DIN EN ISO 7779

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

In This Book

This manual contains technical reference information about the Agilent 1290 Infinity II Multicolumn Thermostat (G7116B) and Agilent 1260 Infinity II Multicolumn Thermostat (G7116A).

The manual describes the following:

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

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