Agilent

Agilent InfinityLab LC Series

Multicolumn Thermostats

User Manual

Notices

Document Information

The information in this document also applies to 1260 Infinity II and 1290 Infinity II modules.

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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.

Contents

In This Book

This manual covers the following Agilent InfinityLab LC Series modules:

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

1 Introduction

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

Product Description of the 1290 Infinity III Multicolumn Thermostat (G7116B)

The Agilent 1290 Infinity III 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.

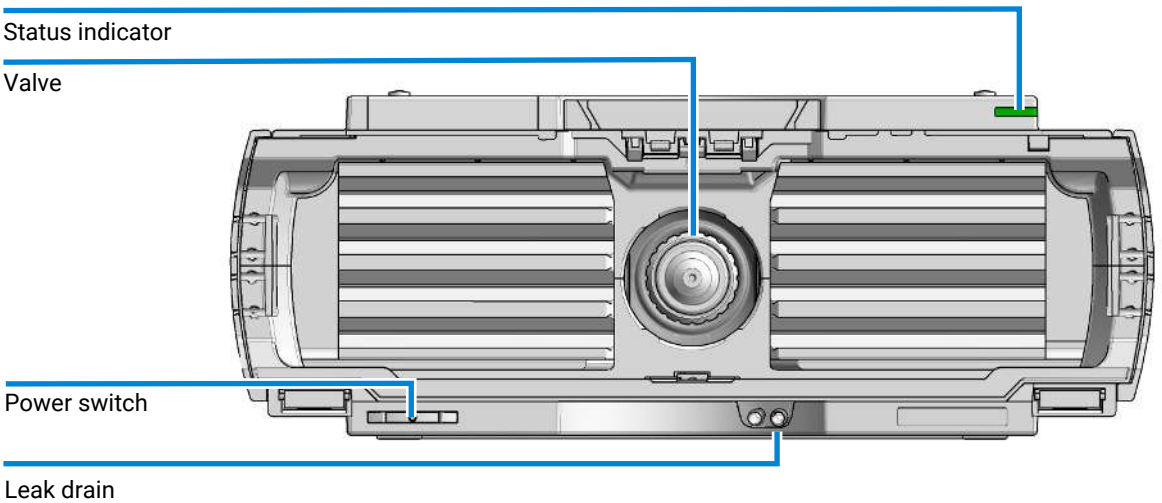


Figure 1: Overview of the Multicolumn Thermostat

Features of the 1290 Infinity III Multicolumn Thermostat (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.

Product Description of the 1260 Infinity III Multicolumn Thermostat (G7116A)

The Agilent 1260 Infinity III 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 III Series modules as well as with previous 1260 and 1290 Series modules.

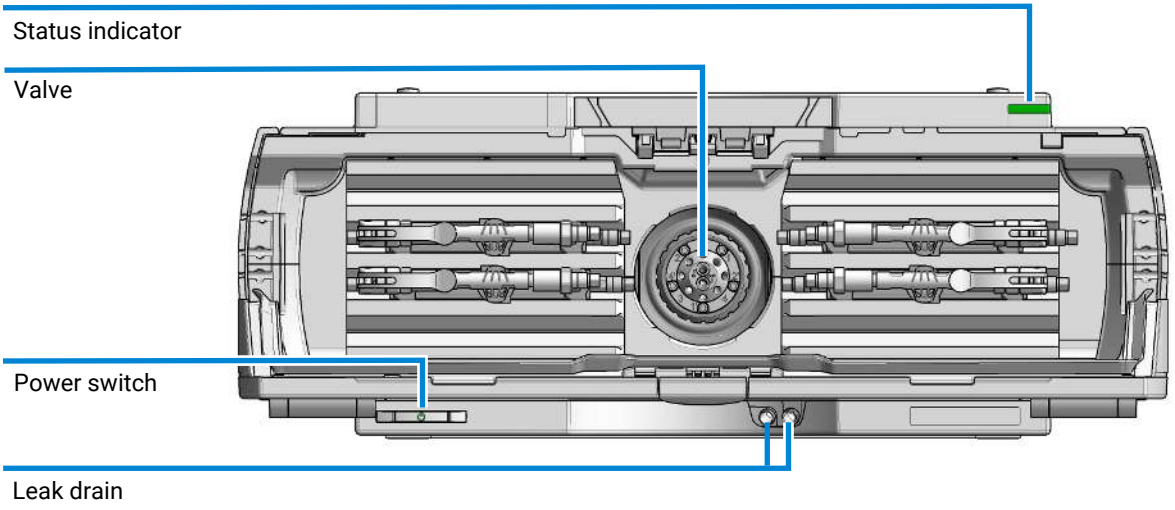


Figure 2: Overview of the Multicolumn Thermostat

Features of the 1260 Infinity III Multicolumn Thermostat (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

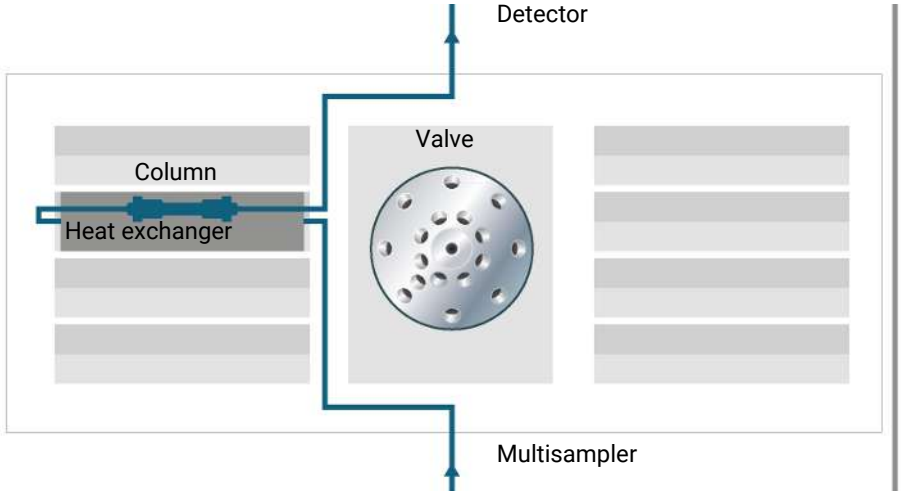


Figure 3: Hydraulic path

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.

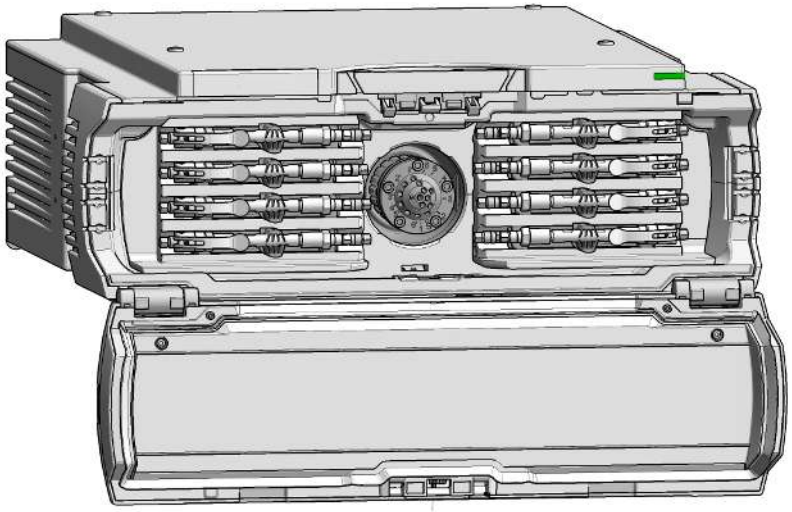


Figure 4: The 1290 Infinity III Multicolumn Thermostat (G7116B) equipped with an InfinityLab Quick Change 8-column selector valve head

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.

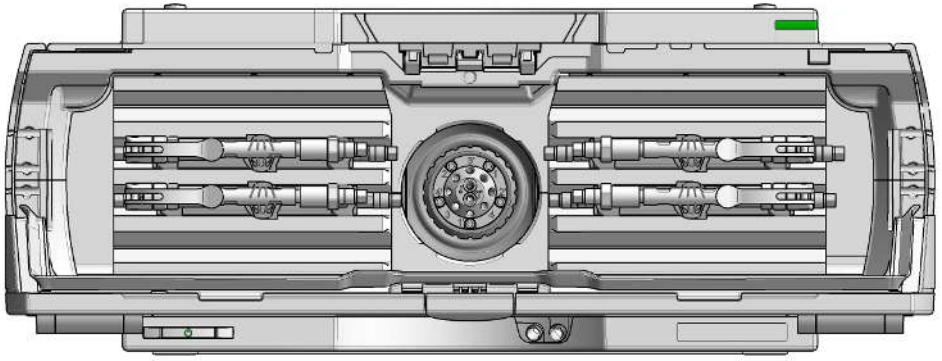


Figure 5: The 1260 Infinity III Multicolumn Thermostat (G7116A) equipped with an InfinityLab Quick Change 4-column selector valve head

Method Development

Advantages:

- Faster method development
- Automated method development possible

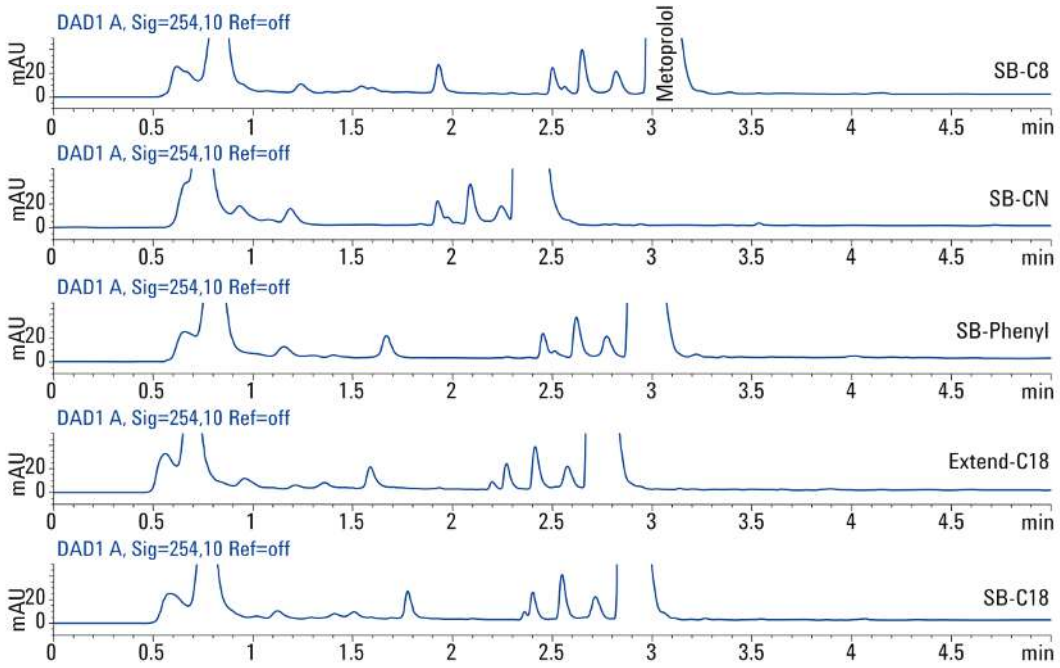


Figure 6: Different chromatographic results obtained for the same sample on five different stationary phases

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.

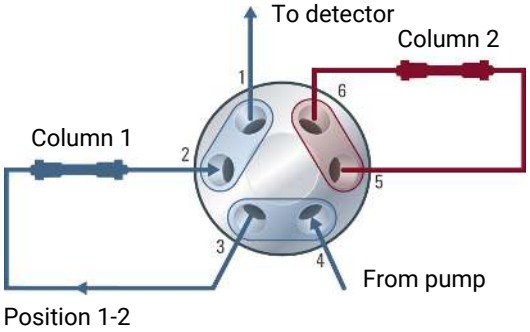
Refer to the table below for further information on which ports are connected to which position.

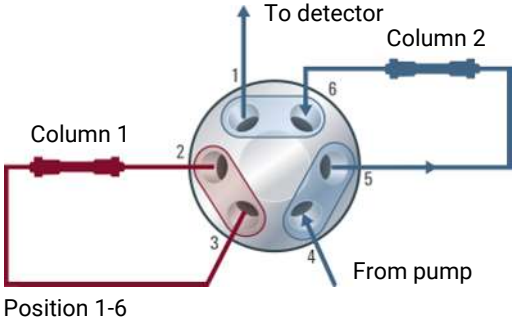
Modules	Valve	Position 1	Position 2
G1316A/B/C	2-position/6-port	1-2	1-6
G7116A/B, G1170A, G4227A	2-position/6-port	1-6	1-2
G1316A/B/C	2-position/10-port	1-2	1-10
G7116A/B, G1170A, G4227A	2-position/10-port	1-10	1-2

Dual Column Selection (2-Position/6-Port or 2-Position/10-Port Valves)

Advantages:

- Increase productivity
- Higher instrument up-time

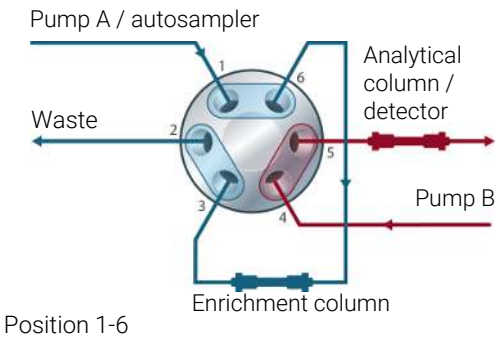


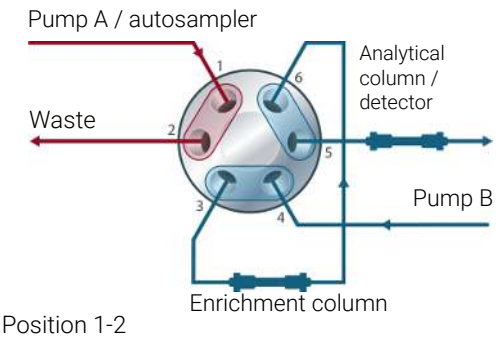


The valve can select either column 1 or column 2, allowing quick changes between two different stationary phases for separation selectivity, or immediate availability of a second and identical stationary phase in case the first column loses efficiency, when dealing with complex matrices for instance.

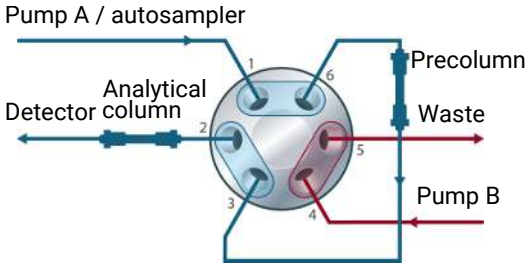
Sample Enrichment and Sample Cleanup (2-Position/6-Port or 2-Position/10-Port Valves)

Sample Enrichment

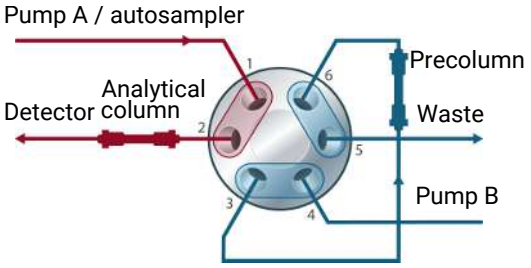




Sample Cleanup



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 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. 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

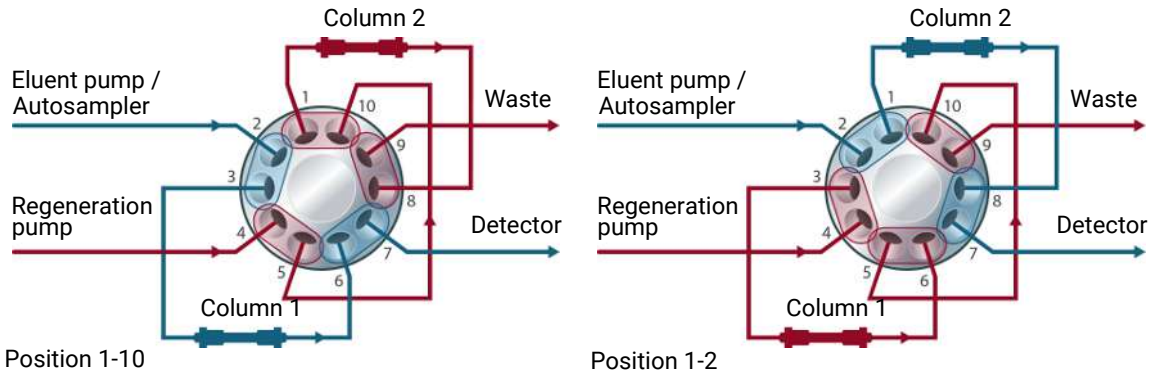
Cleanup methods handle analytes and matrices in the opposite way to enrichment methods. Matrix components are retained on the precolumn while the analytes pass through to the separation column. After the valve switches, an

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



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.

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 Specifications of the 1290 Infinity III Multicolumn Thermostat on page 25 and Specifications of the 1260 Infinity III Multicolumn Thermostat on page 28. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Incorrect line voltage at the module

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

- **Connect your module to the specified line voltage.**

WARNING

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

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

- **Make sure that it is always possible to access the power plug.**
- **Remove the power cable from the instrument before opening the cover.**
- **Do not connect the power cable to the Instrument while the covers are removed.**

WARNING **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 Specifications of the 1290 Infinity III Multicolumn Thermostat on page 25 and Specifications of the 1260 Infinity III Multicolumn Thermostat on page 28) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

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

The module should be operated in a horizontal position.

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.

Specifications of the 1290 Infinity III Multicolumn Thermostat

Table 1: Physical specifications of the 1290 Infinity III Multicolumn Thermostat (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

Table 2: Performance specifications of the 1290 Infinity III Multicolumn Thermostat (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]	
Designed for use with Agilent InfinityLab Assist	Intuitive User Interface, Automated Workflows, Predictive Maintenance & Assisted Troubleshooting	
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.	

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.

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 Instrument Control Framework (ICF) A.02.04 or above Lab Advisor B.02.06 or above InfinityLab Assist (G7180A) with firmware D.07.40 or above Agilent Instant Pilot (G4208A) B.02.19 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	

Specifications of the 1260 Infinity III Multicolumn Thermostat

Table 3: Physical specifications of the 1260 Infinity III Multicolumn Thermostat (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

Table 4: Performance specifications of the 1260 Infinity III Multicolumn Thermostat (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.	
Designed for use with Agilent InfinityLab Assist	Intuitive User Interface, Automated Workflows, Predictive Maintenance & Assisted Troubleshooting	

Type	Specification	Comments
Temperature range	10 °C below ambient (minimum 4 °C) to 85 °C	[3]
Temperature range increment	Settable in steps of 0.1 °C	[3]
Temperature stability	± 0.1 °C	[3]
Temperature accuracy	± 0.5 °C (with calibration at 40 °C)	[3]
Temperature precision	0.05 °C	[3]
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	[3]
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.	

3 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.

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. Instrument Control Framework (ICF) A.02.04 or above Lab Advisor B.02.08 or above InfinityLab Assist (G7180A) with firmware D.07.40 or above Agilent Instant Pilot (G4208A) B.02.20 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.	

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 [4]

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 [4]

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 [4]

4 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 [4]

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 [4]

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 [4]

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 [4]

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 [4]

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 [4]

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 Installation

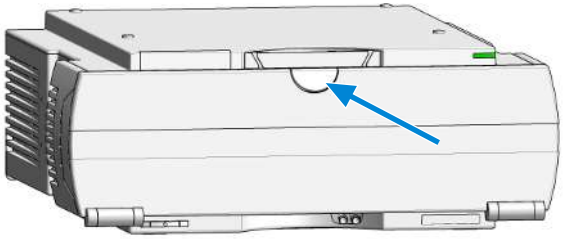
The installation of the module will be done by an Agilent service representative. In this chapter, only installation of user-installable options and accessories are described.

Installation of User-Installable Options and Accessories

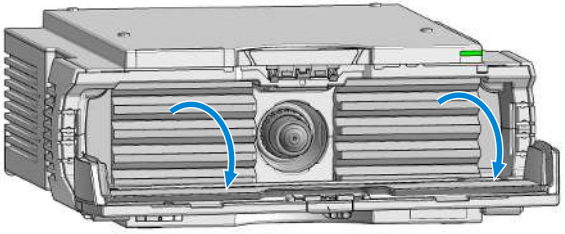
Open the Front Door

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!

Do not mix with bio / biocompatible parts.

For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

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.

A

B

Figure 7: Quick Connect Heat Exchangers of the old design (top, A) and new design (bottom, B)

Tools required	Qty.	p/n	Description
	1	5043-0915	Fitting mounting tool
	1	5023-2502	Hex driver SW-6.35, slitted
	2	8710-0510	Open-end wrench 1/4-5/16 inch

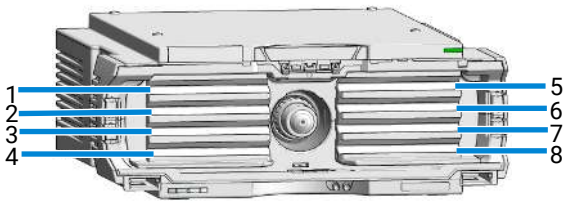
Parts required (For 1290)	Qty.	p/n	Description
	1	G7116-60015	Quick Connect Heat Exchanger Standard
	1	G7116-60021	Quick Connect Heat Exchanger Ultra Low Dispersion
	1	G7116-60031	Quick Connect Heat Exchanger High Flow
	1	5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm (from heat exchanger to column)
	1	G7116-68003	Column Holder Lamella, 2/pk

Parts required (For 1260)	Qty.	p/n	Description
	1	G7116-60061	Quick Connect Heat Exchanger Large ID High Flow
	1	5500-1193	InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket (from heat exchanger to column)
	1	G7116-60051	Quick Connect Heat Exchanger Large ID
	1	5067-5966	InfinityLab Quick Turn Fitting
	1	G7167-68703	Fitting Intermediate Kit
	1	G7116-68003	Column Holder Lamella, 2/pk

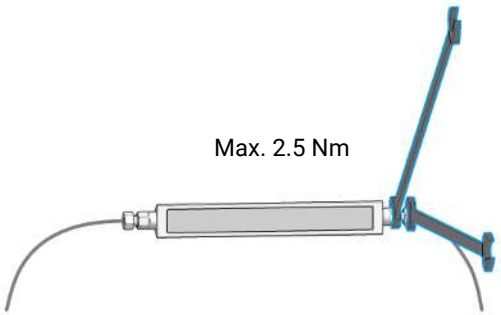
Parts required (Bio-inert option)	Qty.	p/n	Description
	1	G7116-60041	Quick Connect Heat Exchanger Bio-inert
	1	5067-4780	Bio Capillary 0.17 mm x 300 mm, 1.6 mm OD socket (from column to detector)
	1	0100-1516	Finger-tight fitting PEEK, 2/pk
	1	5067-4741	ZDV union (Bio-inert)
	1	5067-5403	UHP fitting
	1	G7116-68003	Column Holder Lamella, 2/pk

Parts required (Bio-compatible option)	Qty.	p/n	Description
	1	G7116-60071	Quick Connect Bio Heat Exchanger Standard Flow
	1	G7116-60081	Quick Connect Bio Heat Exchanger High Flow
	1	G7116-68003	Column Holder Lamella, 2/pk
	1	5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
	1	5067-5966	InfinityLab Quick Turn Fitting
	1	5500-1578	Quick Connect Capillary MP35N 0.12 mm x 105 mm
	1	5067-5965	InfinityLab Quick Connect LC fitting

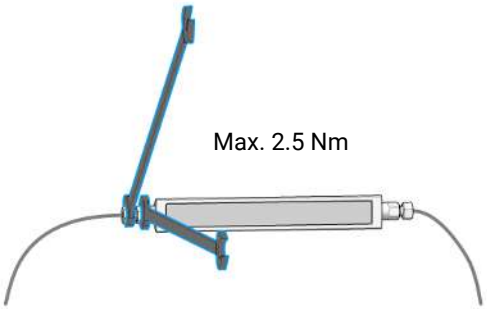
1 Possible positions for heat exchangers. If only one column is used, the preferred positions are 2, 3, 6, or 7.



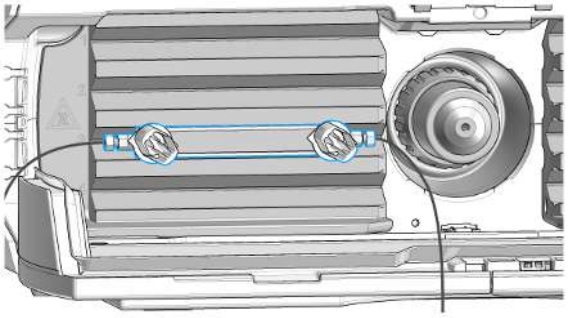
2 Connect the sampler outlet capillary (or the capillary from the column selection valve) to the inlet port of the heat exchanger.



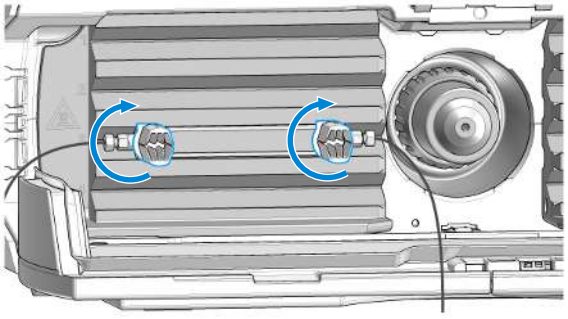
3 Connect the column connection capillary to the outlet of the Quick Connect Heat Exchanger.



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

This procedure describes the exchange of a column for a different one.

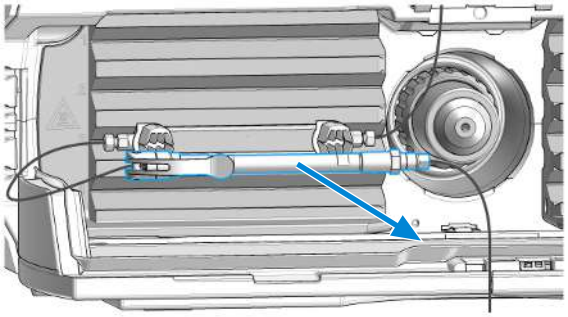
	Qty.	p/n	Description
Tools required	1	5043-0915	Fitting mounting tool, **OR**
	1	8710-0510	Open-end wrench 1/4-5/16 inch
Parts required (For 1290)	**Qty.**	**p/n**	**Description**
	1	5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm (from heat exchanger to column inlet)
	1	5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket (from column to detector)
	1	5067-5966	InfinityLab Quick Turn Fitting
Parts required (For 1260)	**Qty.**	**p/n**	**Description**
	1	5500-1193	InfinityLab Quick Turn Capillary ST 0.17 mm x 105 mm, long socket (from heat exchanger to column)
	1	5500-1191	InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket (from column to detector)
	1	5067-5966	InfinityLab Quick Turn Fitting (column inlet)
	1	0100-1516	Finger-tight fitting PEEK, 2/pk (column outlet)
Parts required (Bio-inert option)	**Qty.**	**p/n**	**Description**
	1	5067-4780	Bio Capillary 0.17 mm x 300 mm, 1.6 mm OD socket (from column to detector)
	1	5067-5966	InfinityLab Quick Turn Fitting (column inlet)
	1	0100-1516	Finger-tight fitting PEEK, 2/pk (column outlet)
Parts required (Bio-compatible option)	**Qty.**	**p/n**	**Description**
	1	5067-5966	InfinityLab Quick Turn Fitting
	1	5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
	1	5500-1578	Quick Connect Capillary MP35N 0.12 mm x 105 mm
	1	5067-5965	InfinityLab Quick Connect LC fitting

Preparations

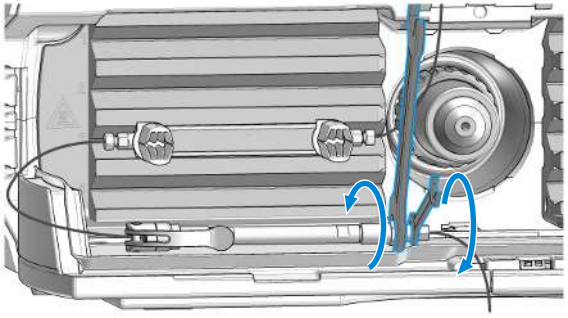
- Heat exchanger(s) installed in MCT
- Column holder clip(s) installed in the heater block on top of heat exchanger(s)
- Column inlet capillary connected to heat exchanger outlet
- Ensure the Heat Exchanger(s) and column holder clip(s) are installed.

Remove a Column

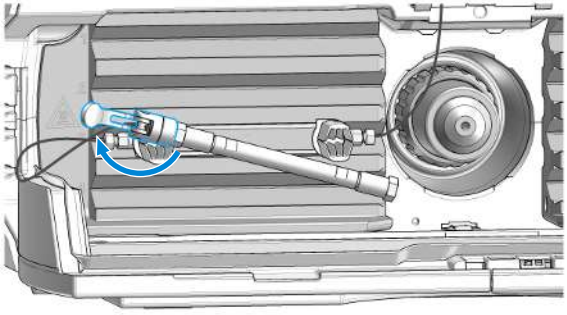
1 Remove the column from the column holder.



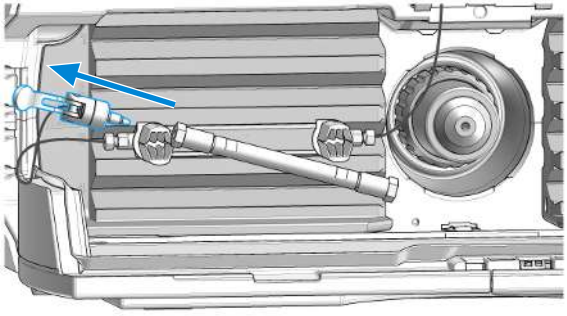
2 Disconnect the column outlet.



3 Open the lever of the Quick Connect Fitting.

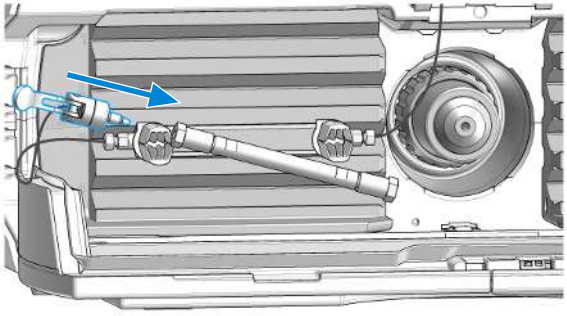


4 Unscrew and remove the Quick Connect Fitting from the column inlet.

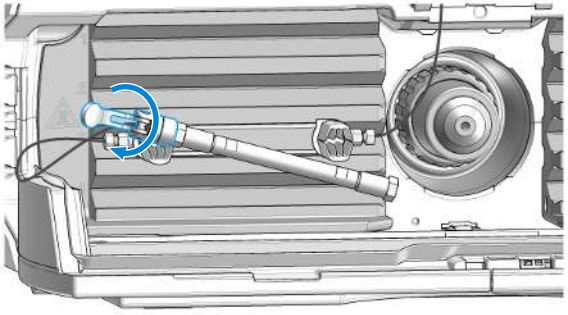


Install a Column

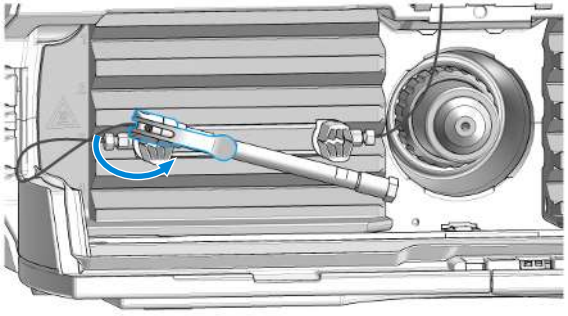
1 Connect the column inlet capillary to the column inlet using the Quick Connect Fitting.



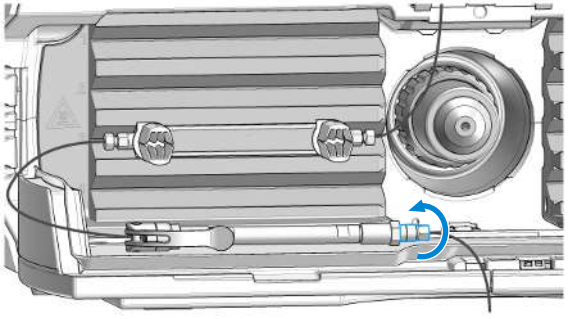
2 Turn the column onto the Quick Connect Fitting until it is finger-tight.



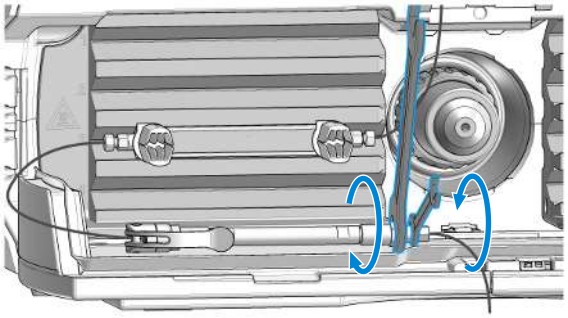
3 Close the lever to make a leak-tight connection.



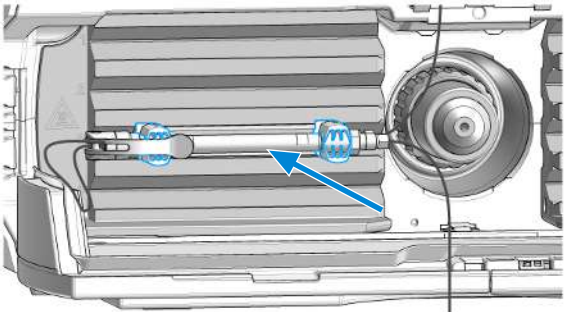
4 Connect the capillary to detector to the column outlet. When using the Quick Turn Fitting, tighten the fitting until it is finger-tight.



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 46. 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

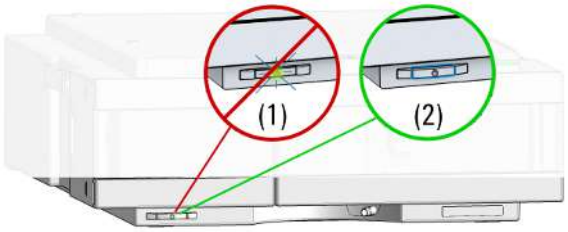
The valves are mounted on pull-out rails to allow easy installation of capillaries. Push the valve gently into its housing until it snaps into the inner position, push it again and it slides out.
When all capillaries are installed, push the valve back into its housing, see Install the Valve Head and Connect Capillaries on page 48.

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).

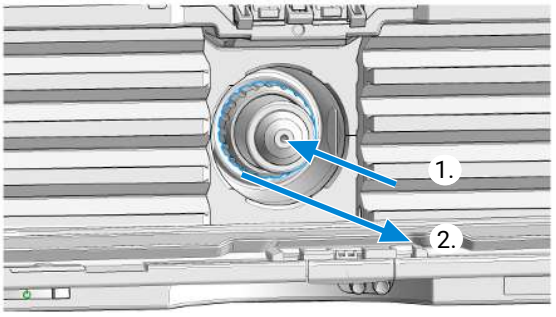
For the installation of a valve head to a G1170A Valve Drive you can ignore the steps that describe the MCT features of the transportation lock and spring loaded valve drive.

1 Switch off the module.

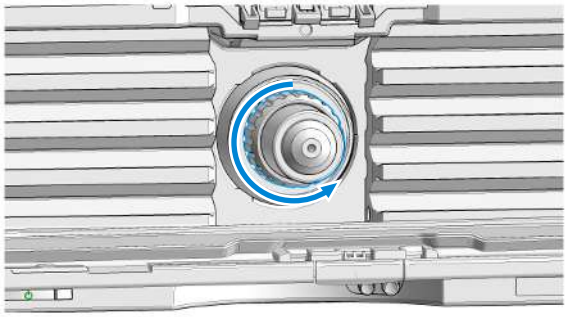


2 When unscrewing the transportation lock, push it back until the last screw is removed - the valve rail is spring-loaded.

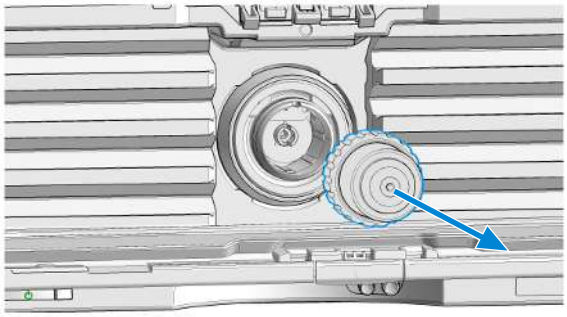
3 Press on the valve dummy (1.) to release it (2.) (spring-loaded valve rail).



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!

Do not mix with bio / biocompatible parts.

For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

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 01200-90134 (Information on RFID Tag Technical Note) .

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.

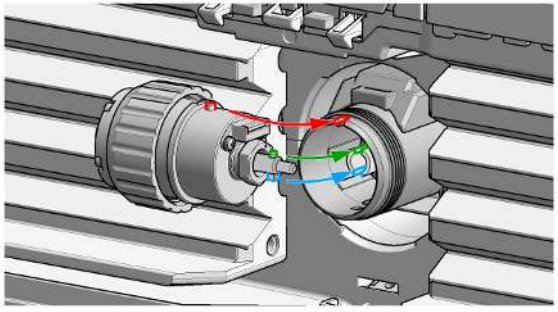
NOTE For firmware requirements see 01200-90134 (Information on RFID Tag Technical Note) which is included to each valve head.

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.

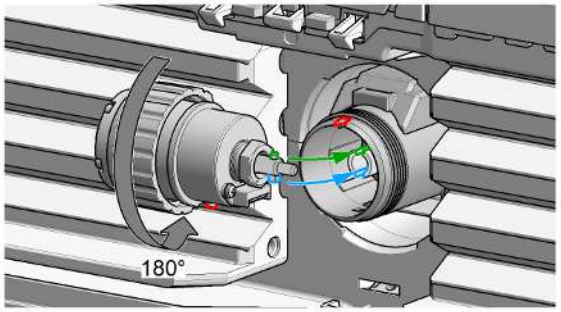
- For bio applications, always use dedicated bio parts, which can be identified by the bio-inert symbol or other markers described in this manual.
- Do not mix bio, and non-bio modules or parts in a bio system.

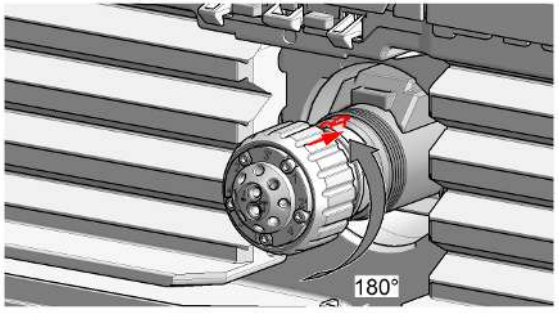
1 Insert the valve head into the valve shaft.



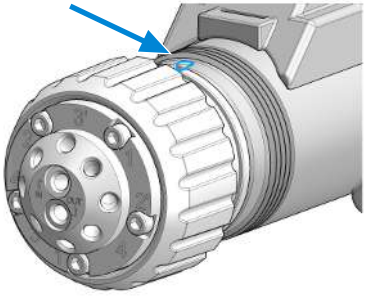
OR

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.



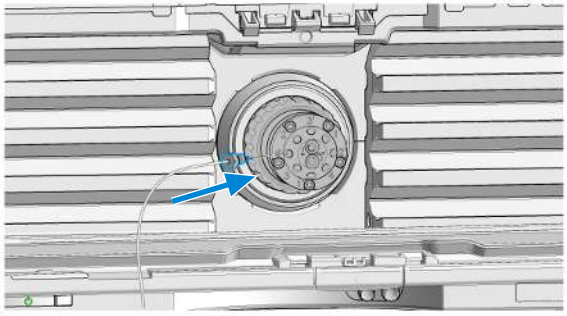


2 When the outer pin is locked into the groove, manually screw the nut onto the valve head.

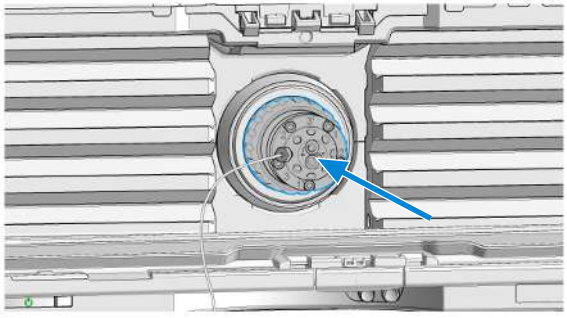


NOTE Fasten the nut manually. Do not use any tools.

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.

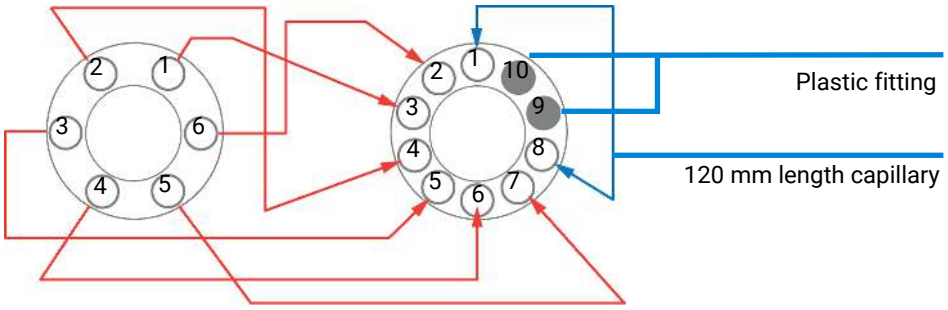


Figure 8: Rerouting of 2-position/10-port valve to match 2-position/6-port valve

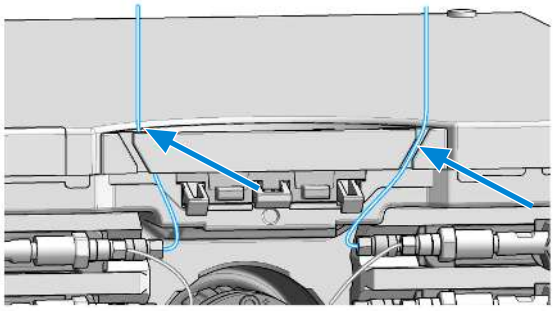
NOTE Use utmost care to avoid any void volumes caused by poor connections.

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.

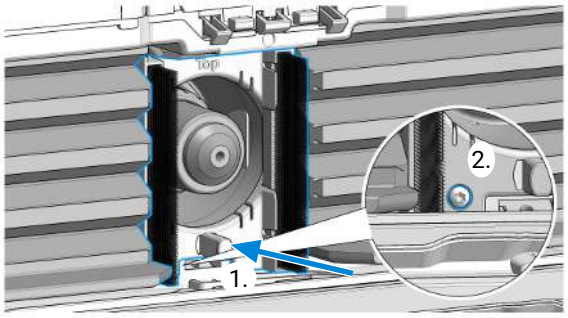
11 Perform a final leak check.

Install the Divider Assembly

Parts required	Qty.	p/n	Description
	1	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.).



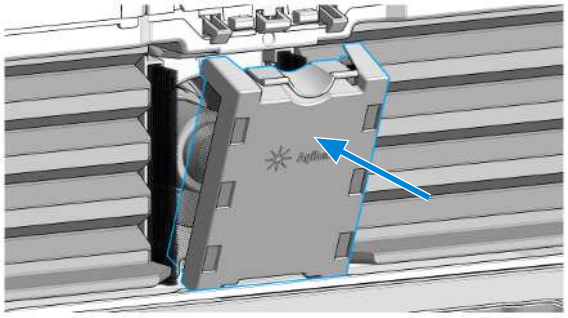
2 Install the valve head if used.

See Replace Valve Heads on page 158.

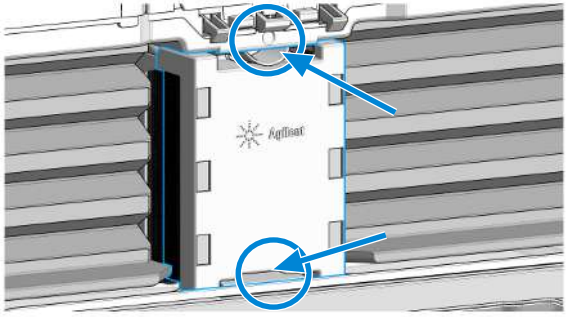
3 Install all capillaries and heat exchangers required.

For details, refer to Install Heat Exchanger on page 36, and Exchange a Column on page 40.

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

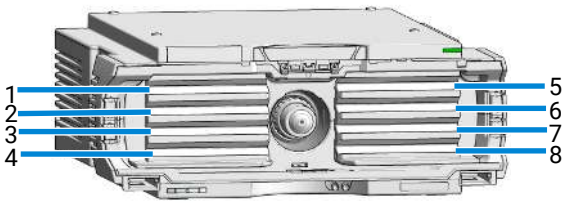


5 The front plate should be flush with the top and the bottom edge of the MCT housing.



Installation of the InfinityLab 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

Qty.	p/n	Description
1	5023-2502	Hex driver SW-6.35, slitted

Preparations

- Install Quick Change Valve Head and columns according to the instructions in *Agilent InfinityLab LC Series Multicolumn Thermostats User Manual (G7116-MCT-UseMa-en-SD-29000232.pdf, SD-29000232)* .

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.

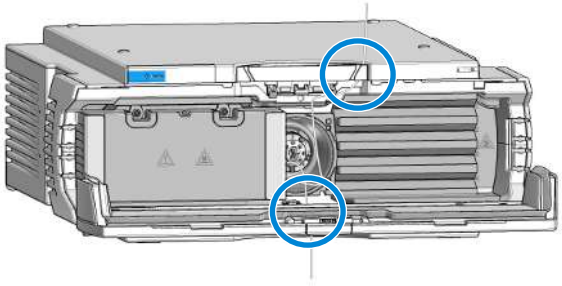
4 To avoid obstruction of the capillary guidance, remove the side covers of the InfinityLab Thermal Equilibration Devices that point towards the valve.

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.

Install the Column Identification Option

Parts required

Qty.	p/n	Description
1	5067-5915	Column ID Kit Left
1	5067-5916	Column ID Kit Right
1	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.

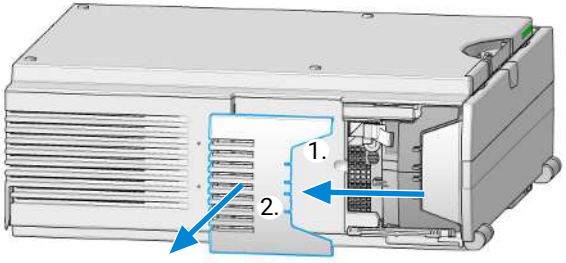
— Be sure to hold the column ID modules by the plastic parts, and do not touch the electrical components. Do not touch the pins of the flex-board connector.

NOTE

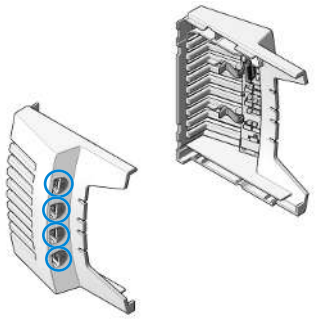
In the Agilent 1260 Infinity III Multicolumn Thermostat (G7116A), the column ID module is installed on the left side of the MCT only.

1 Remove any tube guides and tube clip holders that may already be installed on the sides of the MCT cover.

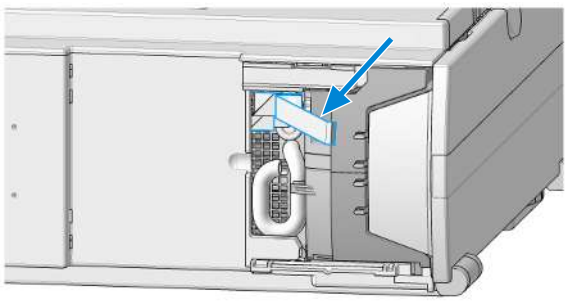
2 Unlock the left and right (G7116B only) side cover inserts by pushing them to the rear and put them aside.



3 Identify the left and right (G7116B only) column ID module. The ID sockets 1 to 4 are numbered from top to bottom.

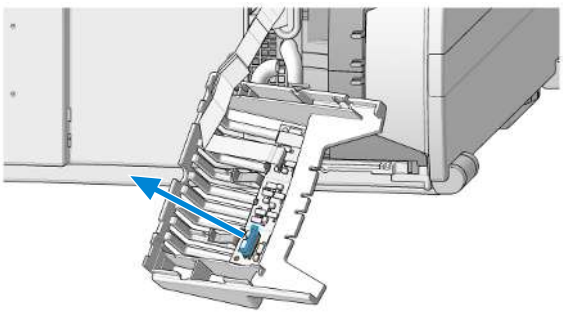


4 Take the end of the preinstalled flex-board connector out of the holder.

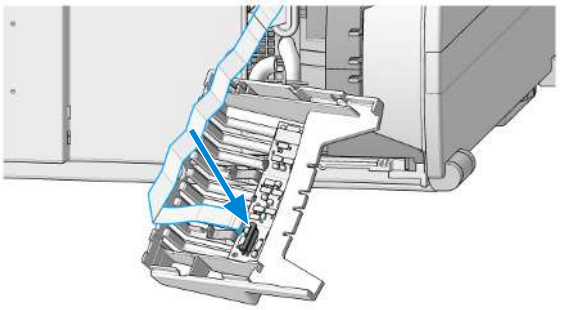


5 Connect the flex cable to the column ID module.

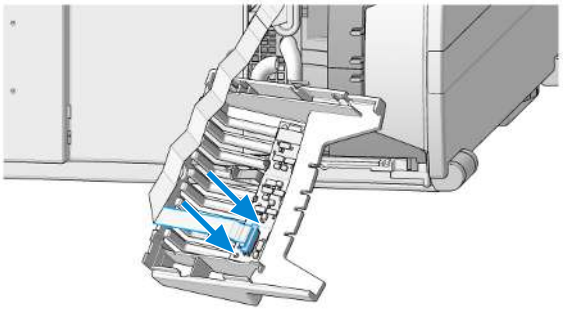
a Open the locking mechanism of the connector by lifting up the frame.



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

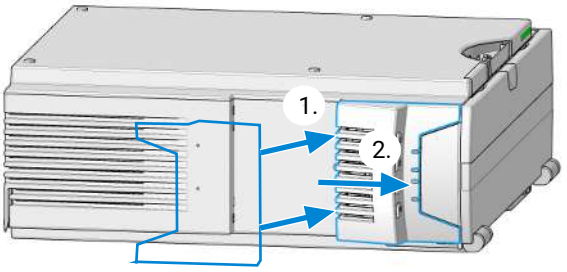


c Close the locking mechanism.



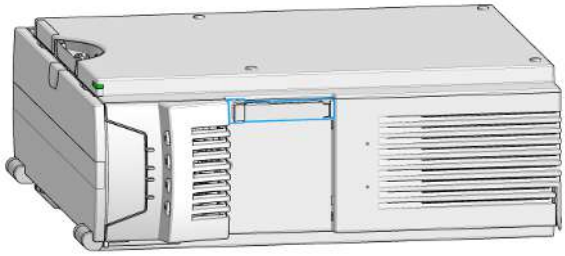
d Verify that the cable is properly attached to the connector without visible offset.

6 Attach the column ID module to the MCT cover.



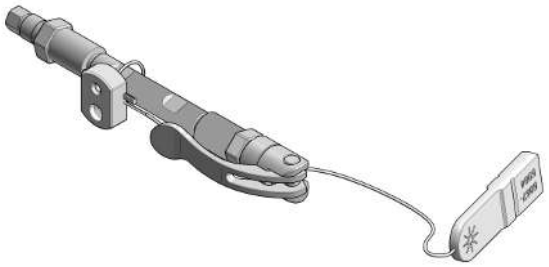
7 Repeat steps 4 to 9 for the column ID module on the other side (for G7116B, on the right).

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.

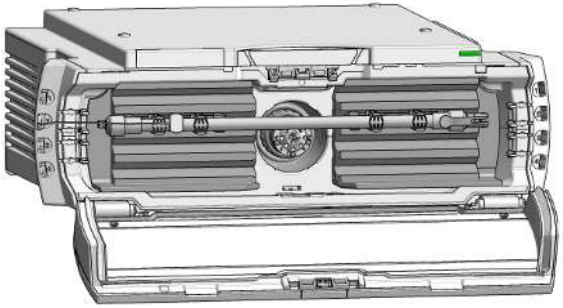


NOTE Once the loop has been pulled tight, the tag can no longer be removed from the column.

2 Install the column in the column compartment, see Exchange a Column on page 40.

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.

Installing Capillaries

This section provides information on how to install capillaries and fittings.

Install Capillaries

Capillaries and connections depend on which system is installed.

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

NOTE Agilent capillaries are color-coded for quick identification, see At-a-Glance Details About Agilent Capillaries on page 229.

Table 14: Capillary connections for 1260 Infinity III systems

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

Table 15: Capillary connections for 1290 Infinity III systems

p/n	From	To
G7120-60007 (Bottle Head Assembly)	Solvent Bottle	Infinity III Pump
5500-1245 (Capillary ST 0.17 mm x 400 mm SI/SI)	Pump	Sampler

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

Table 16: Capillary connections for 1260 Infinity III Bio-inert LC

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

Table 17: Capillary connections for 1290 Infinity III Bio LC

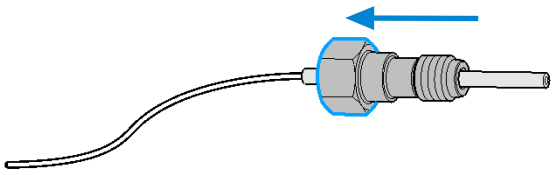
p/n	From	To
G7120-60007 (Bottle Head Assembly)	Solvent Bottle	Infinity III Pump

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

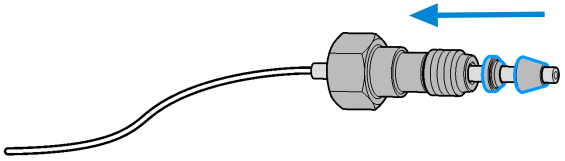
For correct installation of capillary connections it's important to choose the correct fittings, see Syntax for Capillary Description.

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.



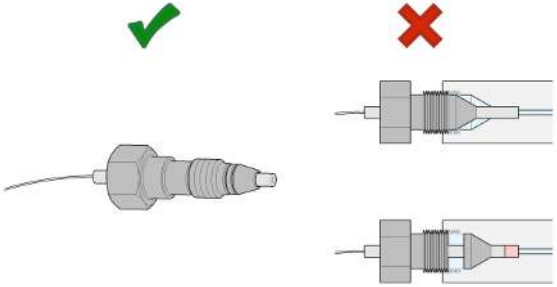
3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.



4 Use a stable port installed to the module to gently tighten the fitting facing to the module. Or use the column to tighten the fitting facing to the column. This measure forces the ferrule to seat onto the tubing or capillary.

NOTE Do not overtighten. Over-tightening 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 Swagelok 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.

For Bio and Bio-Inert Systems, the Swagelok instructions do not apply.

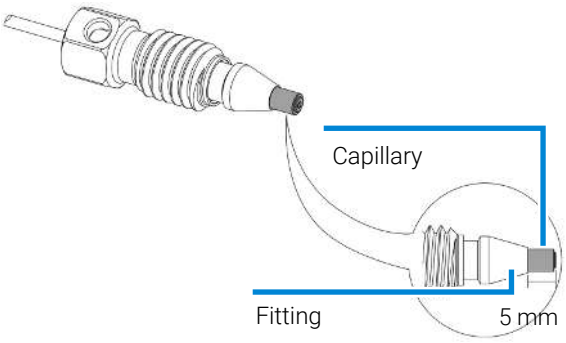
Install UHP-FF Fittings

Tools required

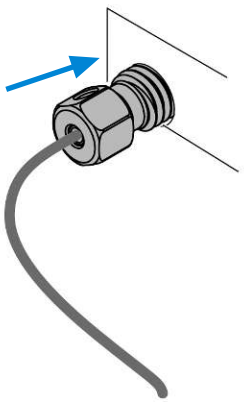
Qty.	p/n	Description
1	5043-0915	Fitting mounting tool

For details on necessary capillaries and fittings, see the part section of the manual.

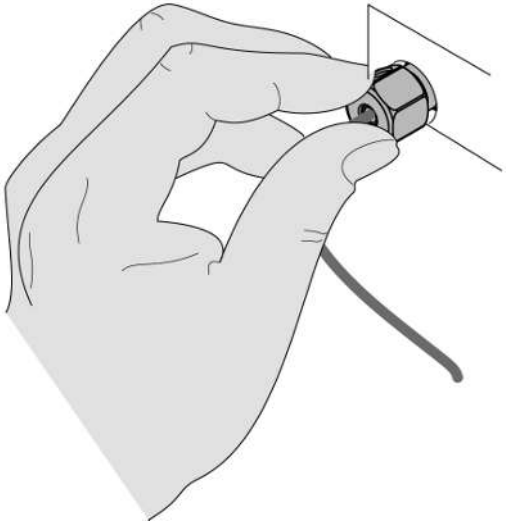
1 Slide the fitting on the capillary. Let the capillary jut out 5 mm.



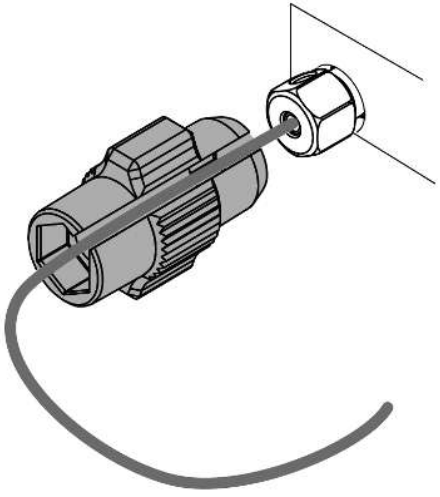
2 Insert the fitting to the receiving port and push the capillary to the bottom of the port.



3 Finger tighten the nut into the port until snug.



4 Use 5043-0915 (Fitting mounting tool) or a 5 mm hex wrench for fixing the fitting (maximum torque 0.8 Nm).



CAUTION

Potential damage of capillaries

— Do not remove fittings from used capillaries.

5 When using UHP-FF fittings with bio-inert capillaries, do not try to remove fittings from these capillaries. Bio-inert capillaries are using a PEEK front end, which may expand under pressure especially when being in contact with some organic solvents. If a fitting is moved across an expanded PEEK end, there is a risk of damaging the capillary by ripping off its end. Before re-installing such capillaries, push the ferrule towards the rear site for a small distance.

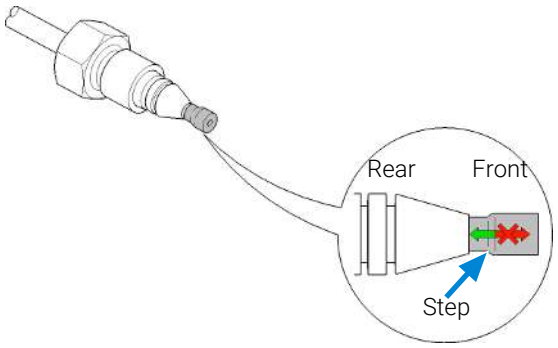


Figure 9: Capillary fitting

Handling Leak and Waste

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 III 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/III 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 Thermostat (condensate)
- from the pump's Seal Wash Sensor (if applicable)
- from the pump's Purge Valve or Multipurpose Valve

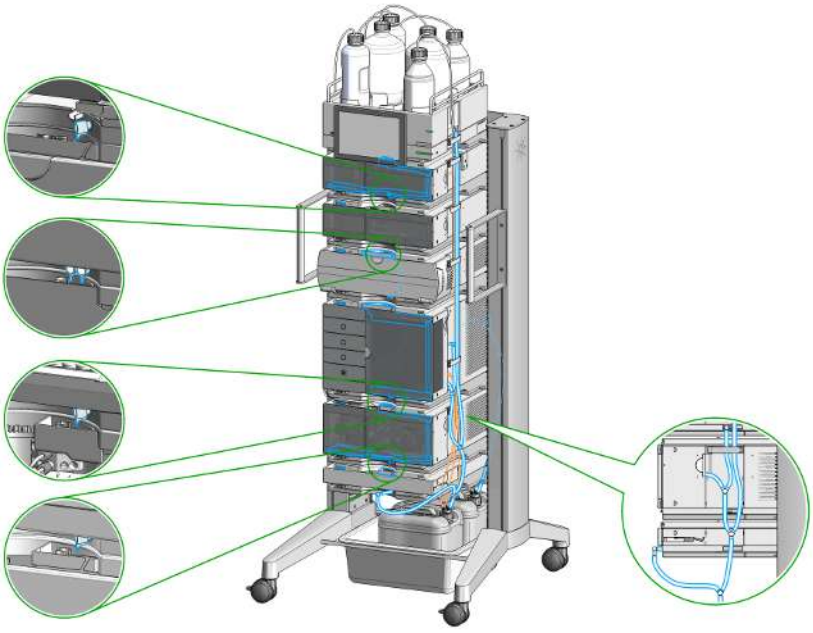


Figure 10: Infinity III Leak Waste Concept (Flex Bench installation)

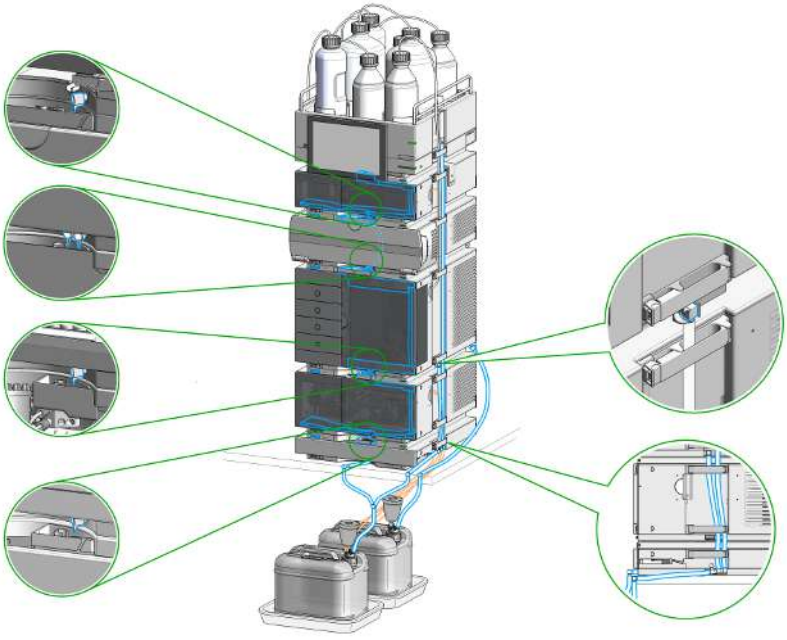


Figure 11: Infinity III Single Stack Leak Waste Concept (bench installation)

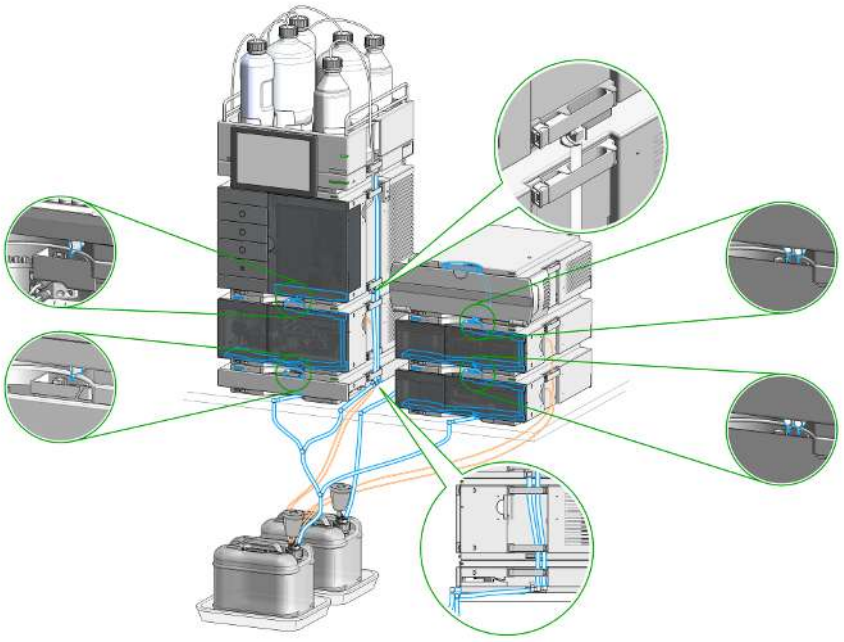


Figure 12: Infinity III Two Stack Leak Waste Concept (bench installation)

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

Drain Connectors Installation

Drain Connectors have been developed to improve leak drainage for low flow leaks of high viscosity solvents (for example, isopropanol) in Agilent InfinityLab LC Series Systems. Install these parts to modules where they are missing (usually preinstalled).

- Make sure that dripping adapters are correctly installed on each module in the LC stack, excluding lowest module.
- Remove the dripping adapter if it is appeared to be installed on the lowest module in the LC stack and connect waste tube instead.
- Consider 5004-0000 (Drain Connectors Kit) if drain adaptor is missing on some module(s).

For illustration, see Handling Leak and Waste on page 72.

Parts required

Qty.	p/n	Description
	5004-0000	Drain Connectors Kit

Content of Drain Connectors Kit (p/n 5004-0000)

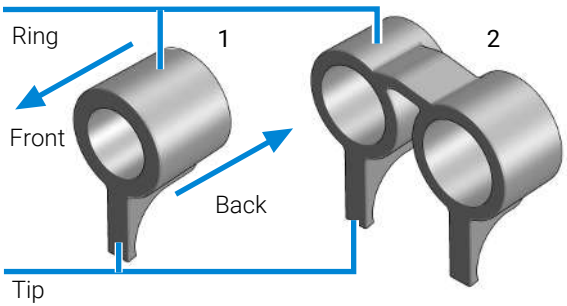


Figure 13: Overview of Drain Connectors: Single (left) and Double (right)

Qty.	p/n	Description
Parts can be ordered only as a complete kit.		
3	5043-1834	Single Drain Connector ID3.0-Long
1	5043-1836	Double Drain Connector-Long

Table 18: Compatibility of drain connectors and modules

Drain Connector Type	Compatible Module	Compatible Module Type
Double	G7116A/B	Column Compartment
Single	G7114A/B	Detector
	G7115A	
	G7117A/B/C	
	G7121A/B	
	G7162A/B	
	G7165A	
	G7129A/B/C	Sampler
	G7167A/B/C	
	G5668A	
	G7137A	
	G7157A	
	G4767A	
	G7122A	Degasser
	G7104A/C	Pump
	G7110B	
	G7111A/B	
	G7112B	
	G7120A	
	G7131A/C	
	G7132A	
	G5654A	
	G4782A	

Preparations

- Leak drains of LC modules are clean and free of salt or solvent residuals.

NOTE

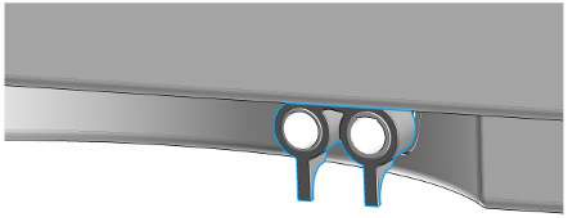
Do not install drain connectors on the bottom modules of the stack. Drain outlet of the bottom module has to be connected via waste tubing to a suitable waste container (see Leak and Waste Handling in the manual for a respective module).

NOTE In case of incorrect installation, drain connectors cannot fully perform the intended function.

NOTE It is not required to power off the HPLC stack to install Single and Double Drain Connectors. The installation of the connectors does not affect the analysis performed during the installation.

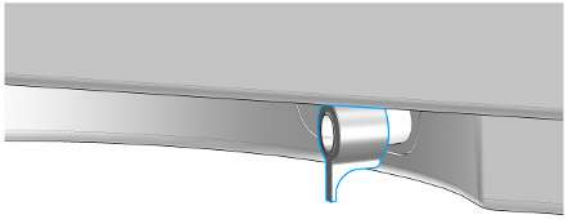
Install the Double Drain Connector on the leak drain of the 1260 Infinity III Multicolumn Thermostat (G7116A)/ 1290 Infinity III Multicolumn Thermostat (G7116B)

1 Align the rings with the leak drain outlets of the module, press slightly with the fingers, and slide the connector along the leak drain outlets until it is aligned with the front of the leak drain.



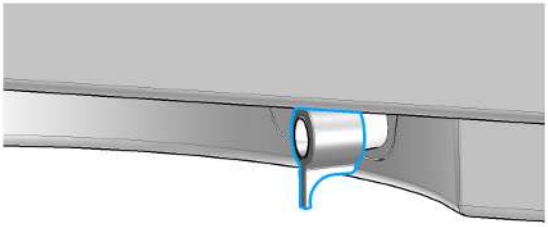
Install Single Drain Connectors on other modules in the LC stack

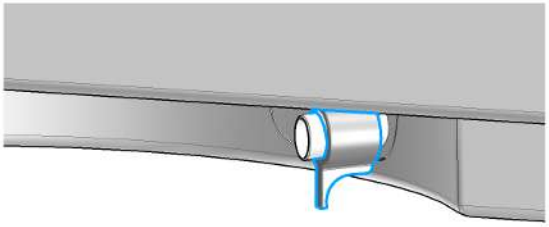
1 Align the ring with the leak drain outlet of the module, press slightly with the fingers, and slide the connector along the leak drain outlet until it is aligned with the front of the leak drain.



Make sure that the following requirements are covered:

- The tip of the drain connector points straight down.
- The leak drain outlets and the drain connectors are aligned properly.

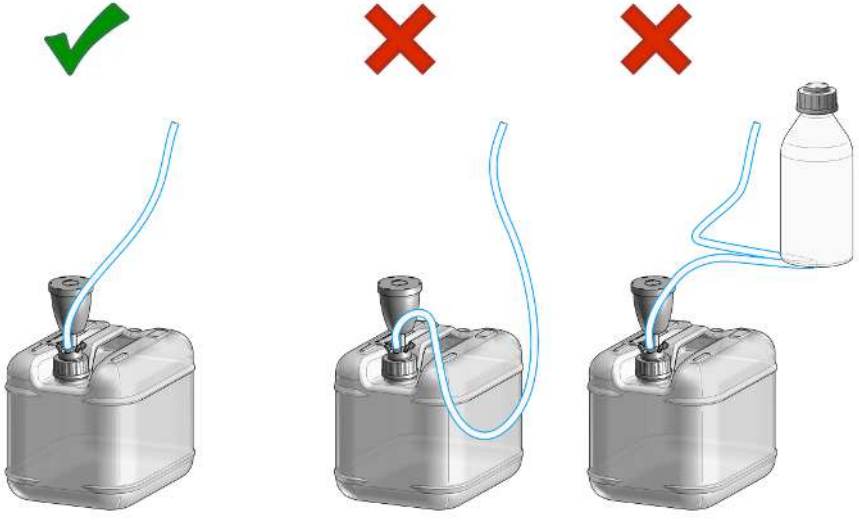




Waste Concept

Agilent recommends using the 5043-1221 (6 L waste can with 1 Stay Safe cap GL45 with 4 ports) 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.

Waste Guidance



NOTE

The waste drainage must go straight into the waste containers. The waste flow must not be restricted at bends or joints.

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.

Connecting Modules and Control Software

WARNING Use of unsupplied cables

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

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

4 Using the Module

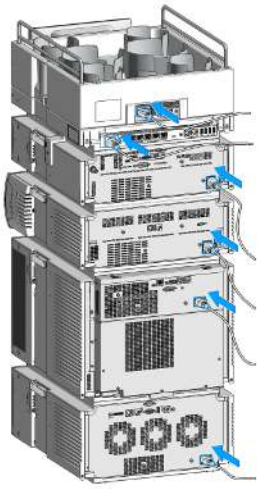
This chapter provides information on how to use the module.

General Information

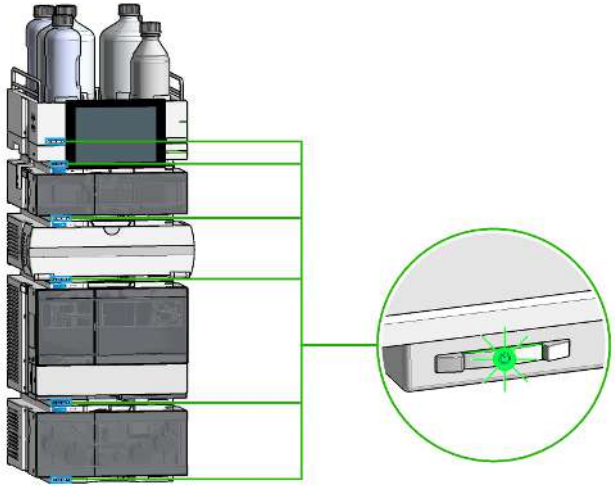
Turn On/Off

This procedure exemplarily shows an arbitrary LC stack configuration.

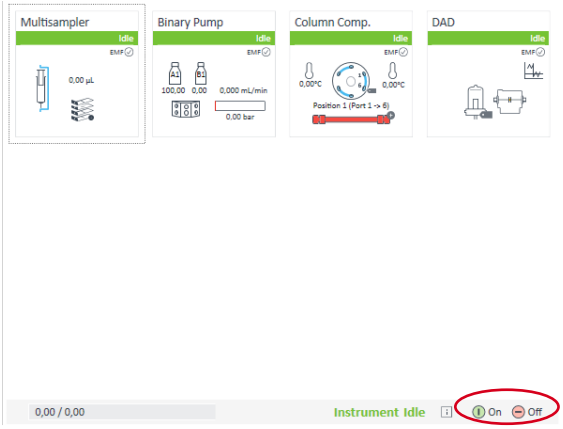
1



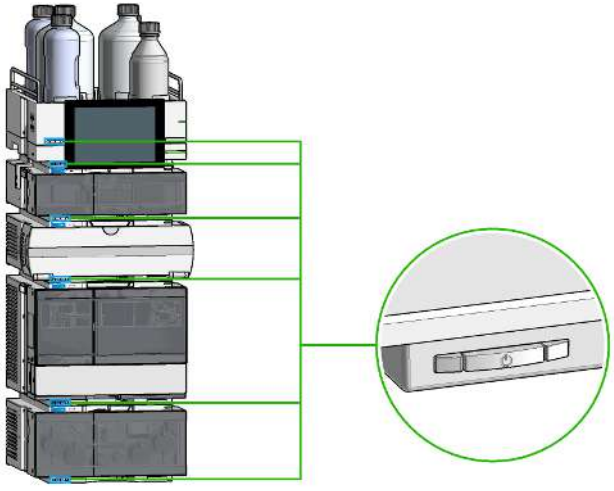
2 On/Off switch: On



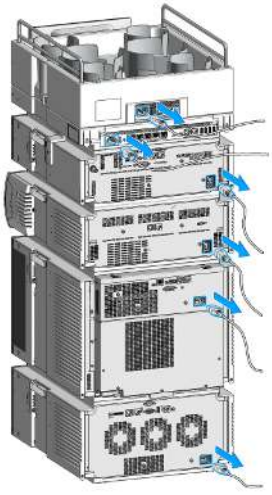
3 Turn instrument **On/Off** with the control software.



4 On/Off switch: Off



5



Status Indicators

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

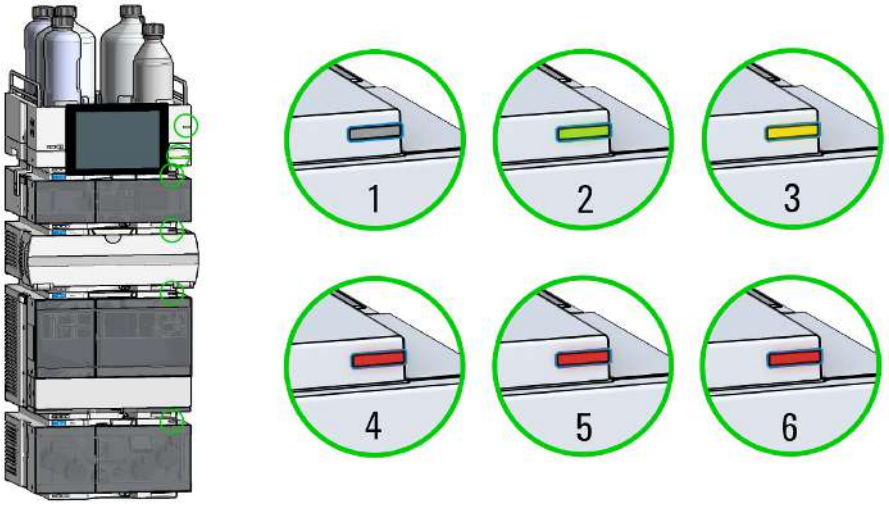


Figure 14: Arbitrary LC stack configuration (example)

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.

InfinityLab Assist Hub Status Indicator

The Assist Hub status indicator displays the status of the entire system. If a module in the system is not ready (yellow), the Assist Hub status indicator also shows not ready (yellow). The same applies for the module conditions **Idle**, **Run mode**, and **Error mode**.

Preparation of the System

Prepare a Run

This procedure exemplarily shows how to prepare a run. Parameters as shown in the screenshots may vary, depending on the system installed.

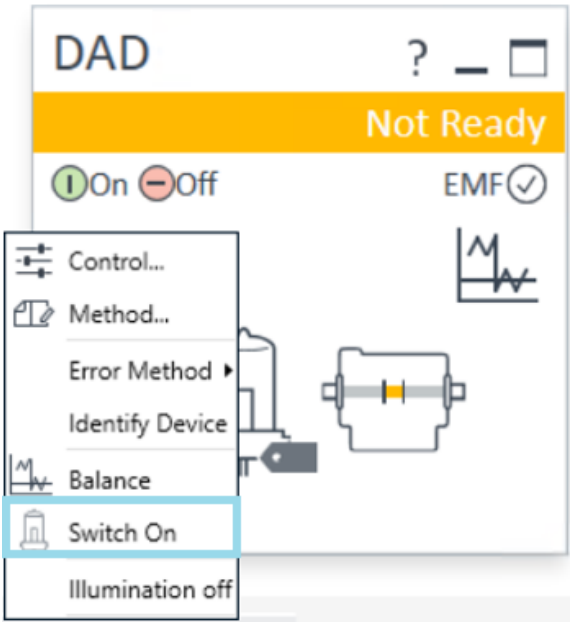
WARNING

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.**

1 Switch on the detector.

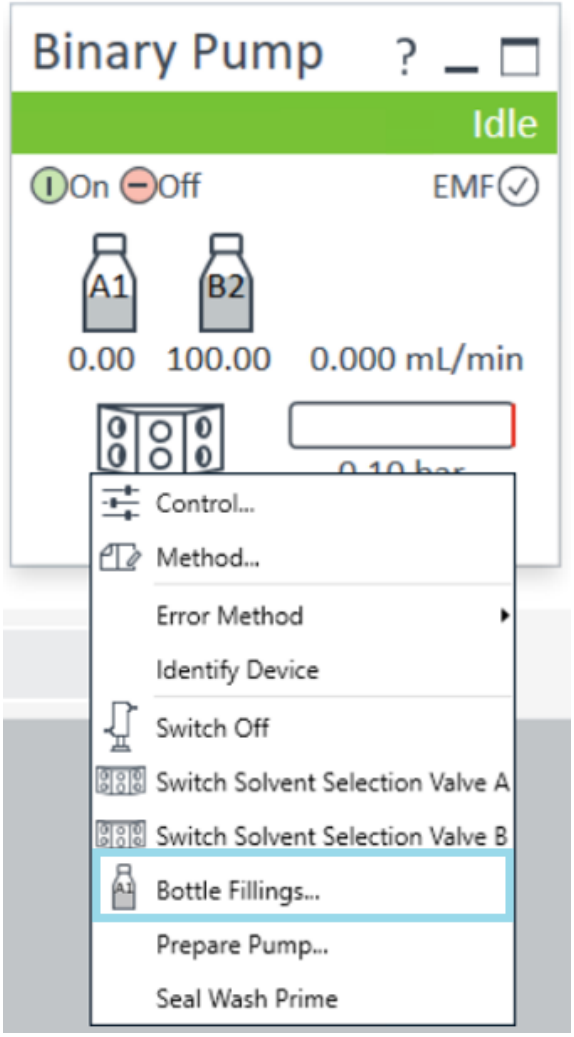


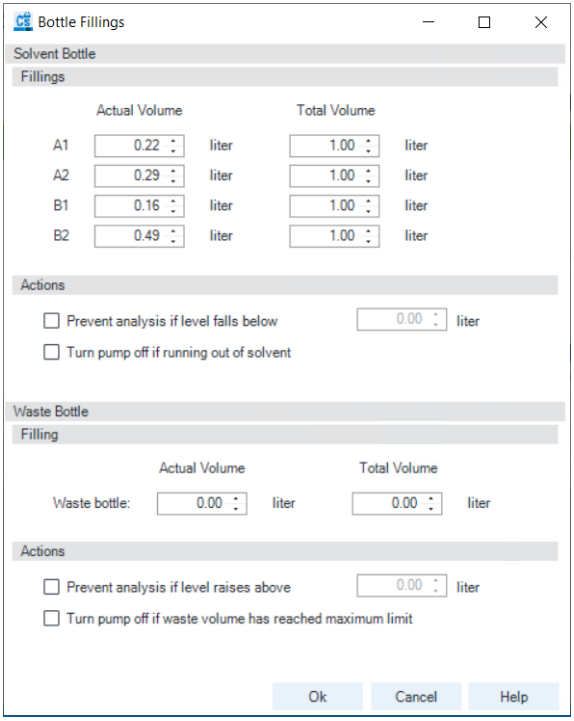
2 Fill the solvent bottles with adequate solvents for your application.

3 Place solvent tubings with bottle head assemblies into the solvent bottles.

4 Place solvent bottles into the solvent cabinet.

5 Solvent bottle filling dialog (in the software).





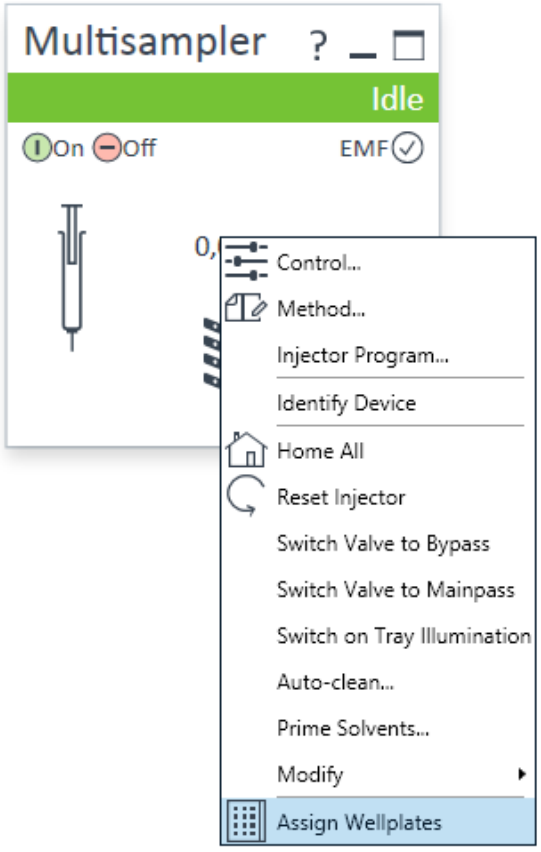
6 Purge the pump.

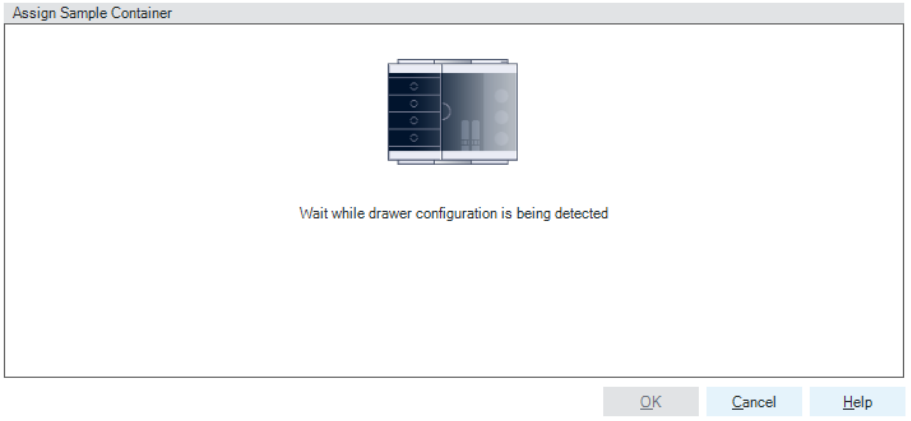
NOTE

For details on priming and purging, refer to the technical note *Best Practices for Using an Agilent LC System Technical Note (InfinityLab-BestPractice-en-SD-29000194.pdf, SD-29000194)*.

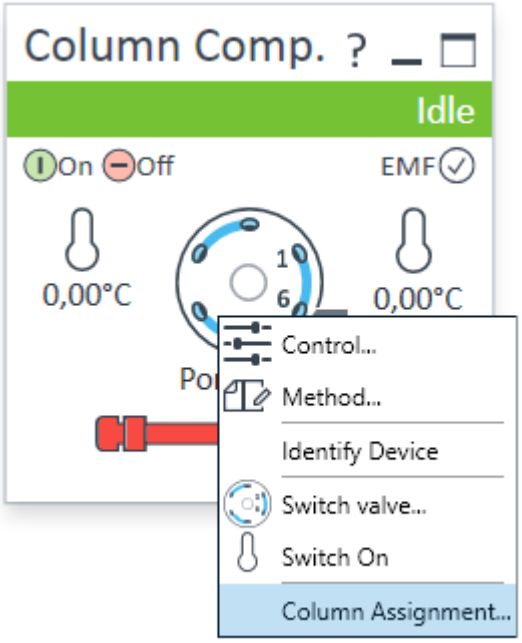
7 Change solvent type if necessary.

8 Choose the tray format of the sampler.

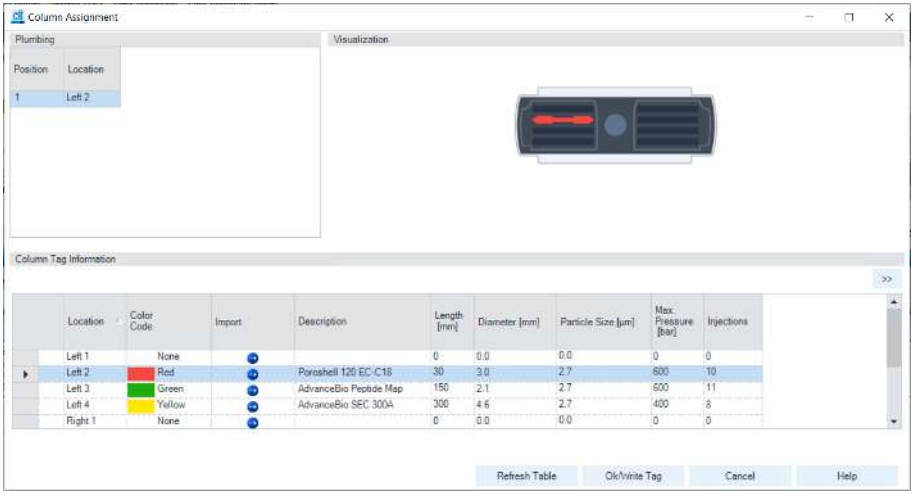




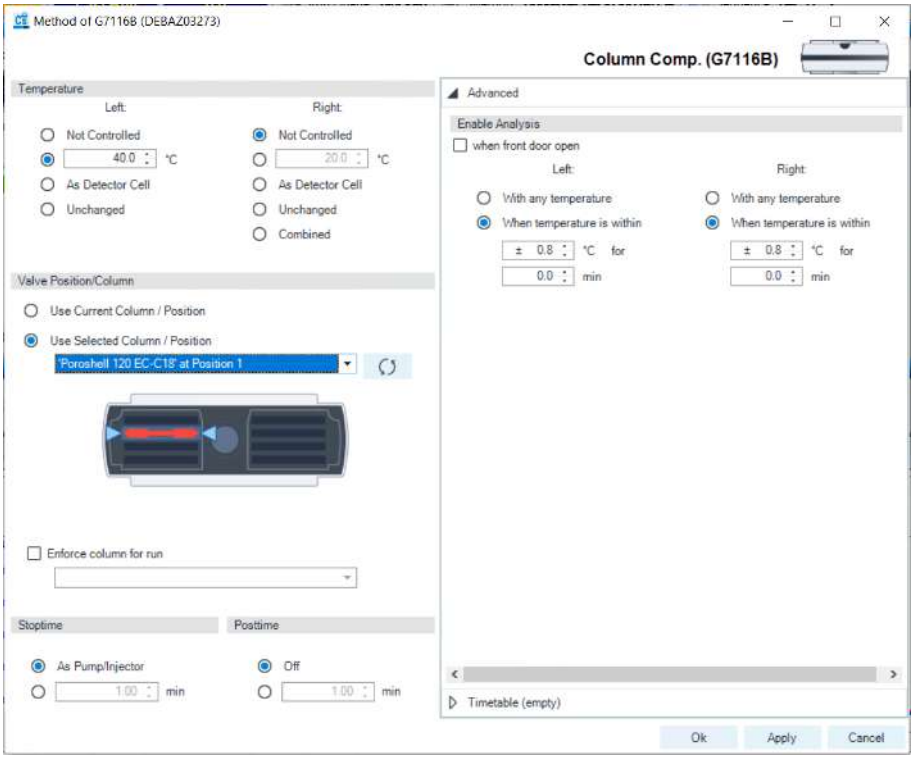
9 Add a new column.



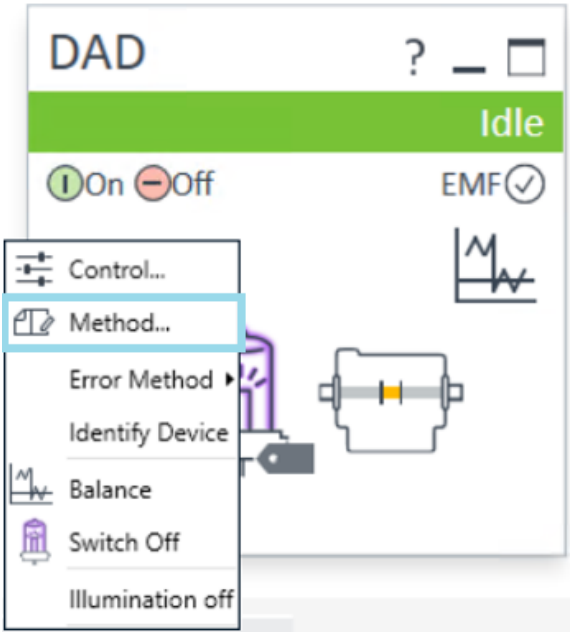
10 Enter the column information.



11 Select the column in the Method settings of the column compartment.



12 Set the detector parameters according to the needs of your method.


DAD
Idle
On
Off
EMF
Control...
Method...
Error Method
Identify Device
Balance
Switch Off
Illumination off

Prime and Purge the System

When the solvents have been exchanged or the pumping system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel between the solvent reservoir, vacuum degasser (when available in the system) and the pump. Solvents containing volatile ingredients will slightly lose these. Therefore priming of the pumping system is required before starting an application.

Table 19: Choice of priming solvents for different purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals
After the installation of normal phase seals (P/N 0905-1420)	Hexane + 5% Isopropanol	Good wetting properties

NOTE

The pump should never be used for priming empty tubings (never let the pump run dry). Use a syringe to draw enough solvent for completely filling the tubings to the pump inlet before continuing to prime with the pump.

1 Open the purge valve of your pump (by turning it counterclockwise) and set flow rate to 3 – 5 mL/min.

2 Flush all tubes with at least 30 mL of solvent.

3 Set flow to required value of your application and close the purge valve.

NOTE

Pump for approximately 10 minutes before starting your application.

Preparing the Module

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 98 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.

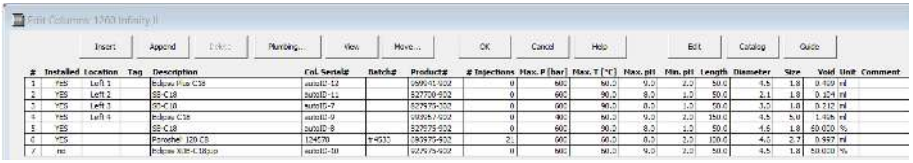


Figure 15: The ChemStation **Edit Columns** table

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.

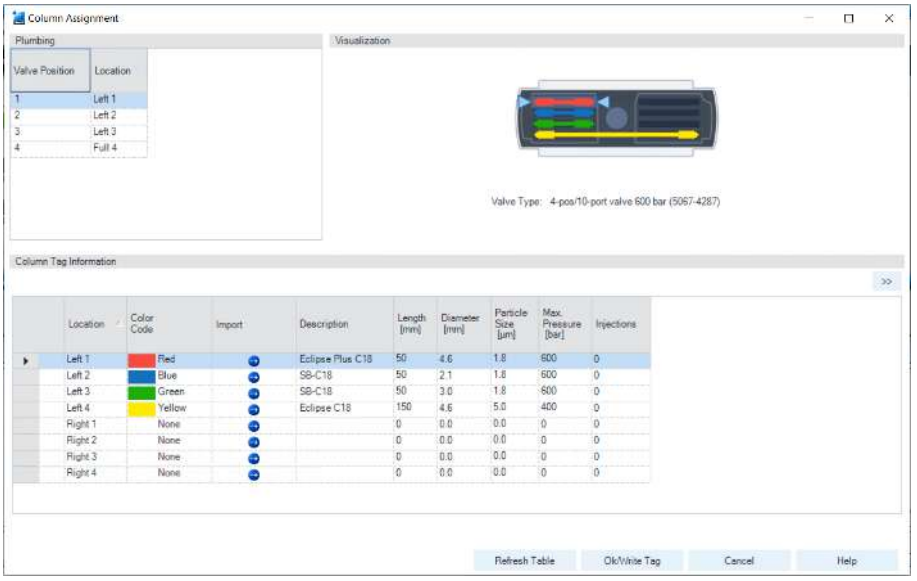


Figure 16: **Column Assignment** dialog box

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 105.

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.

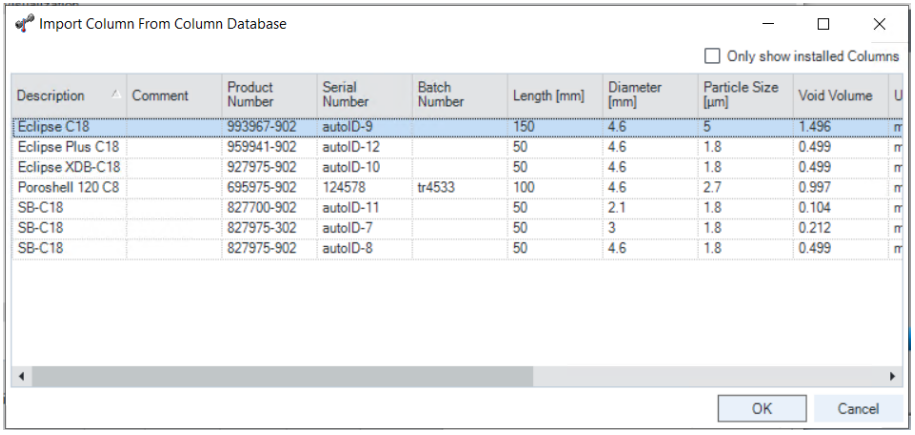


Figure 17: The list of columns from the ChemStation's **Edit Columns** table

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.

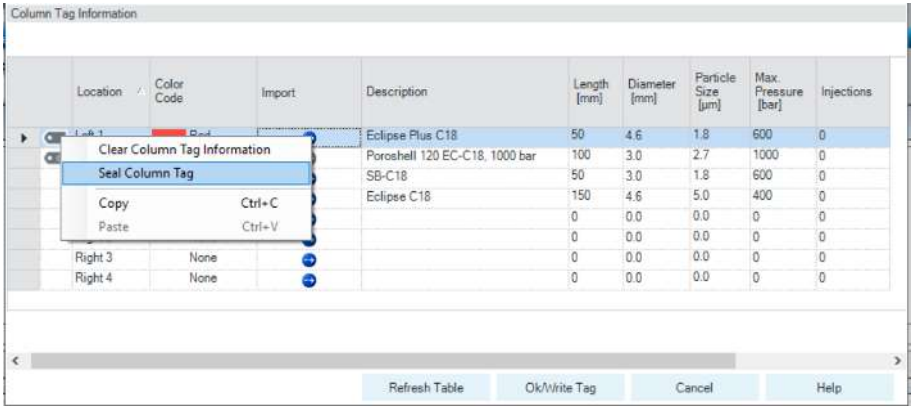


Figure 18: The **Column Tag Information** table context menu

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.

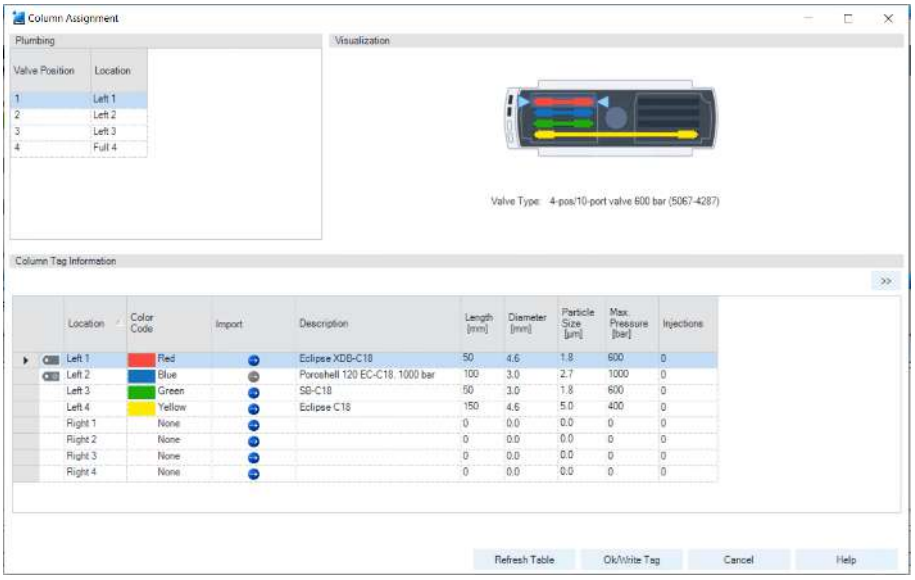


Figure 19: **Column Assignment** dialog box overview

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.

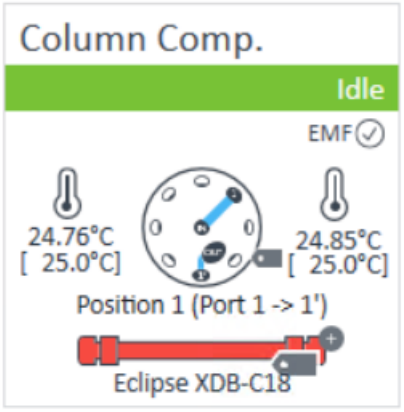


Figure 20: The dashboard panel of the column compartment

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 105.

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 107) 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 107) 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	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

5 Optimizing the Performance of the Module

This chapter provides information on how to optimize the module.

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 54.
- Keep the front cover closed during analysis.

6 Troubleshooting and Diagnostics

This chapter gives an overview of the maintenance, troubleshooting, and diagnostic features available.

Diagnostic Features

This section gives an overview of the diagnostic features available.

User Interfaces

InfinityLab Assist

InfinityLab Assist provides you with assisted troubleshooting and maintenance at your instrument.

If the system in use supports the InfinityLab Assist, follow the instructions provided. Else, the preferred solution is to use Agilent Lab Advisor Software.

- Depending on the user interface, the available tests and the screens/reports may vary.
- The preferred tool for troubleshooting and diagnostics should be Agilent Lab Advisor Software, see Agilent Lab Advisor Software on page 115.
- Screenshots used within these procedures are based on the Agilent Lab Advisor Software.

Troubleshooting With HPLC Advisor

Baseline, Peak Shape, Pressure, Retention related issues, can be solved using the HPLC Advisor App. For more information, see Troubleshooting Reversed-Phase Chromatographic Techniques With HPLC Advisor.

If using an InfinityLab Assist, navigate to **Health** > **Troubleshooting** to help solve baseline, peak shape, pressure, and retention related issues.

Maintenance and Troubleshooting Tools of the Module

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

Available Tests vs User Interfaces

- Depending on the user interface, the available tests and the screens/reports may vary (see Test Functions and Calibrations).
- Preferred tool should be the Agilent Lab Advisor software, see Agilent Lab Advisor Software on page 115.
- The Agilent ChemStation may not include any maintenance/test functions.
- Screenshots used within these procedures are based on the Agilent Lab Advisor software.

Thermostat Test

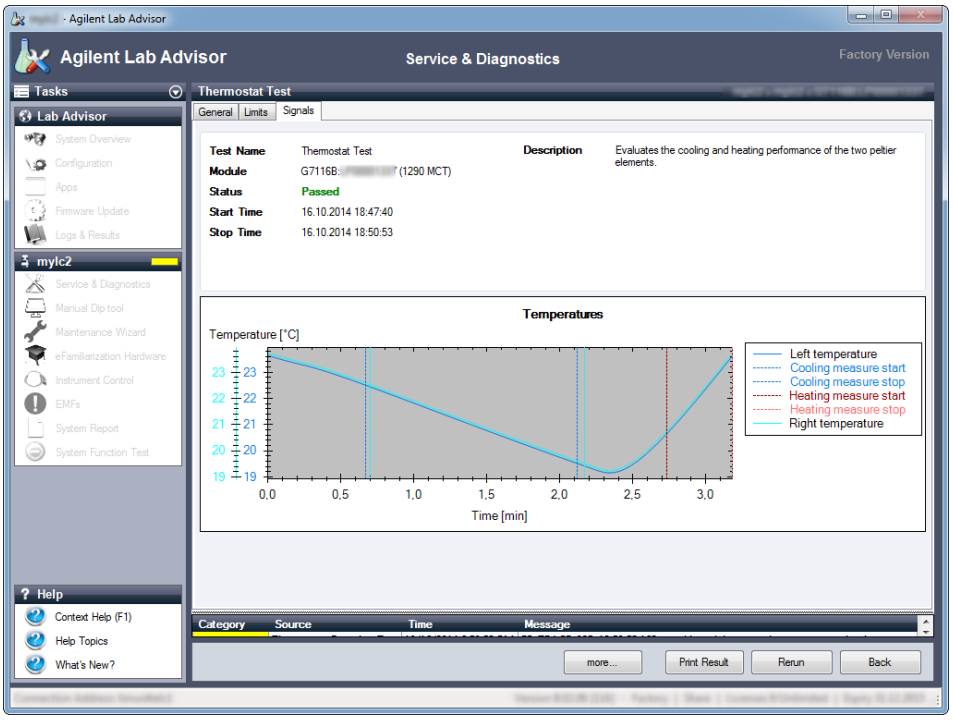
Thermostat Test Description

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:

- 5067-6127 (Blank nut SL) for standard ports on stainless steel valves,
- 5067-6141 (M4 Blank nut) for M4 ports on stainless steel valves,
- 5043-0277 (PEEK blank nut for bio-compatible devices) 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.

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 makes it possible 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 that 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).

If using the InfinityLab Assist, instrument errors will generate a notification. To view the probable causes and recommended actions for this error, click on Help button displayed on the notification.

General Error Messages

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

Timeout

Error ID: 62

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: 63

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. • Check the external vacuum degasser module (if installed) 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: 70

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: 71

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: 64

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 mainboard.

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

Leak Sensor Open

Error ID: 83

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 on/off 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	On/Off switch assembly defective.	• Please contact your Agilent service representative.

Leak Sensor Short

Error ID: 82

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.
3	On/Off switch assembly defective.	• Please contact your Agilent service representative.

Compensation Sensor Open

Error ID: 81

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 on/off switch board and the mainboard.	• Please contact your Agilent service representative.
2	Defective on/off switch assembly.	• Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 80

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	Defective on/off switch assembly.	• Please contact your Agilent service representative.
2	Loose connection between the on/off switch board and the mainboard.	• Please contact your Agilent service representative.

Fan Failed

Error ID: 68

The rotational speed is below acceptable limit.

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

Probable cause		Suggested actions
1	Fan cable disconnected.	• Please contact your Agilent service representative.
2	Defective fan.	• Please contact your Agilent service representative.
3	Defective 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 (valve head or drive) by installing a different valve head if possible. • Please 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. • Please 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. • Please contact your Agilent service representative.

WRONG VALVE

Error ID: 32130

Valve not supported in this module.

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)

Probable cause		Suggested actions
1	A valve head has been installed which is not supported by G7116A.	• Only valve heads up to 800 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. • 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*.

WAIT TIMEOUT (left)

Error ID: 32044

Wait operation for left temperature timed out.

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

WAIT TIMEOUT (right)

Error ID: 32045

Wait operation for right temperature timed out.

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

HEATEX OVERTEMP (left)

Error ID: 32080

The temperature of the left 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.

HEATEX OVERTEMP (right)

Error ID: 32081

The temperature of the right 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

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.

UHX SENSOR ERROR (right)

Error ID: 32091

Upper right 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 (left)

Error ID: 32092

Lower left 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 (right)

Error ID: 32093

Lower right 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 (left)

Error ID: 32094

Left 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.

LHS SENSOR ERROR (right)

Error ID: 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 ERROR (left)

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.

PELTIER ERROR (right)

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.

PELTIER OVERCURRENT (left)

Error ID: 32098

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 (right)

Error ID: 32099

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.

8 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.

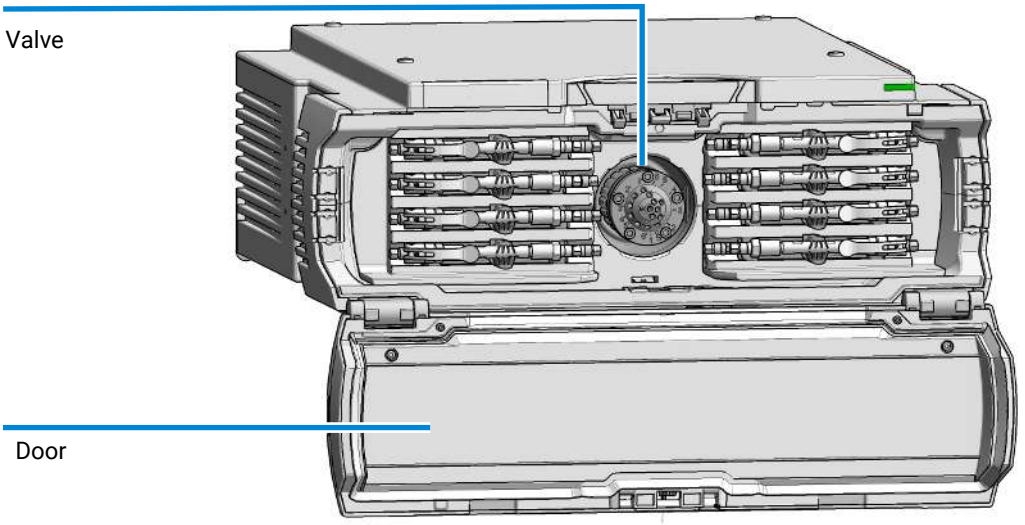


Figure 21: Overview of maintenance parts (G7116B)

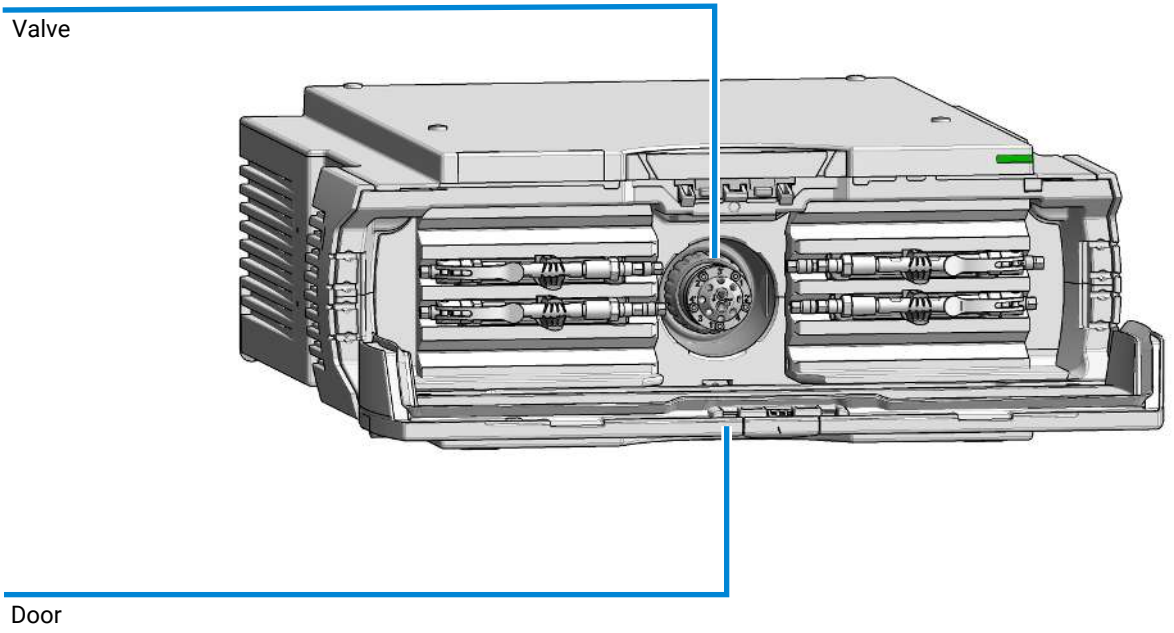


Figure 22: Overview of maintenance parts (G7116A)

NOTE

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

Safety Information Related to Maintenance

WARNING Fire and damage to the module

Wrong fuses

- Make sure that only fuses with the required rated current and of the specified type (super-fast, fast, time delay etc) are used for replacement.
- The use of repaired fuses and the short-circuiting of fuse-holders must be avoided.

WARNING Personal injury or damage to the product

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

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

WARNING Electrical shock

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

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

WARNING Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

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

WARNING **Hot heat exchangers**

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

— **Allow them to cool down before starting repairs.**

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

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

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

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

— **Do not operate the instrument in an explosive atmosphere.**

CAUTION Safety standards for external equipment

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

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 153	If necessary	
Install Heat Exchanger on page 36	When new application requires a change	
Installing the Capillaries on page 52	When new application requires a change	
Correcting Leaks on page 154	If a leak has occurred	Check for leaks
Replace Parts of Quick Change Valve Head on page 155	If the valve performance shows indication of leakage or wear	
Replace Valve Heads on page 158	When repair is not possible or when new application requires a change	
Prepare the MCT for Transportation on page 163	If the MCT shall be transported	
Replace the Module Firmware on page 164	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

Qty.	p/n	Description
1		Tissue
1		Pipette
1		Wrench, 1/4 – 5/16 (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.

Replace Parts of Quick Change Valve Head

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

Do not mix with bio / biocompatible parts.

For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

When

- If valve leaks.

Tools required

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

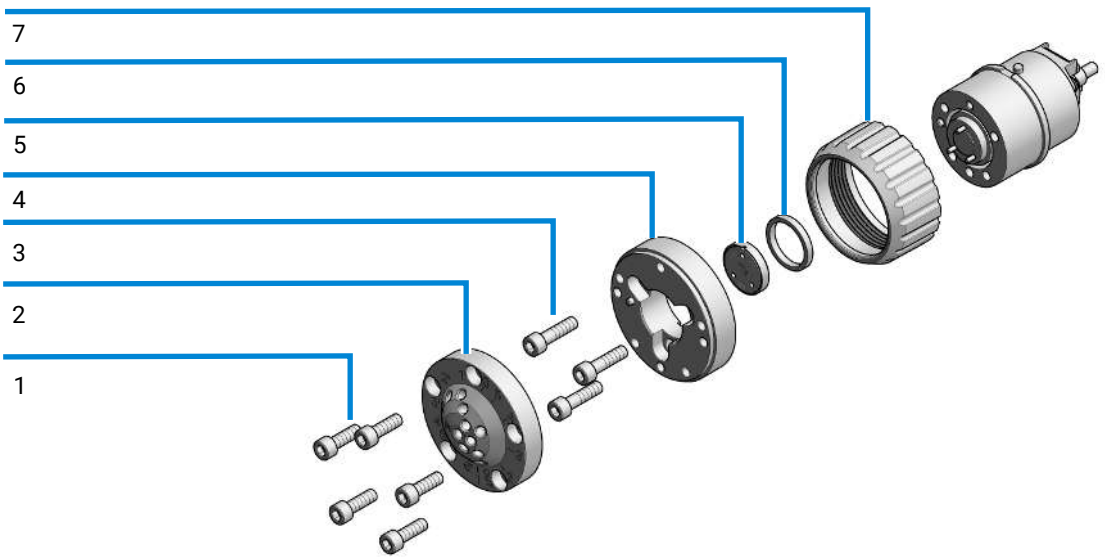


Figure 23: Valve Head Parts (example)

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)

NOTE

Figure 23 on page 157 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 171 and Valve Options Overview (G7116A) on page 172 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

Qty.	p/n	Description
1		Agilent Quick Change Valve Head

For details, see Valve Options Overview (G7116B) on page 171 and Valve Options Overview (G7116A) on page 172.

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 (InfinityLab-Method-Development-Solution-UseMa-en-SD-29000211.pdf, SD-29000211)*.

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 G1316-67001 (Transportation Lock Kit)) can be used instead of a functional valve. Do not touch parts inside the actuator.

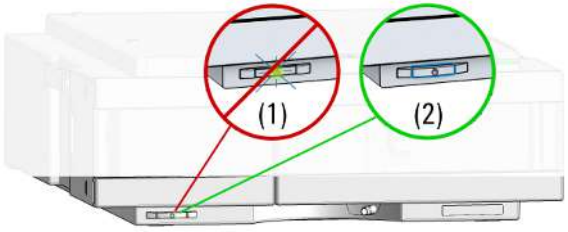
NOTE

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.

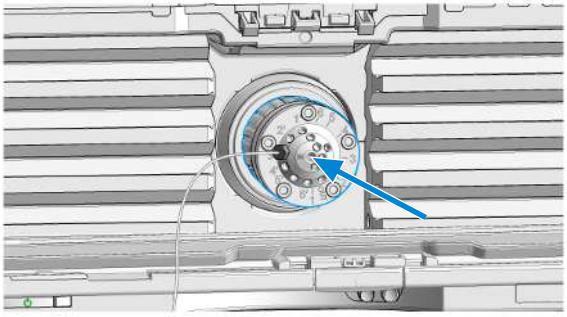
NOTE

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.

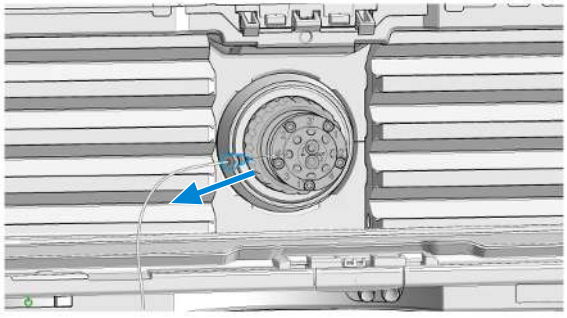
1 Switch off the module.



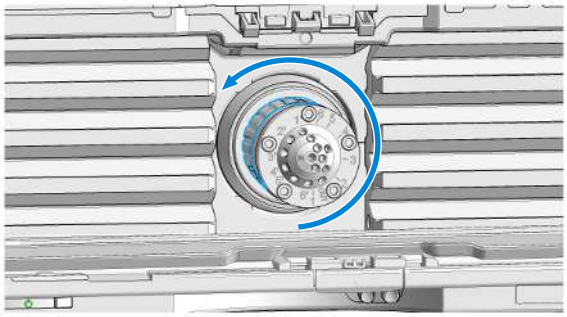
2 Push the valve head to bring it to its outer position.



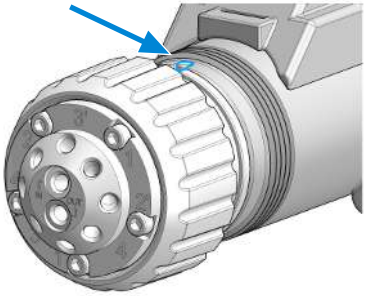
3 Remove all capillary connections from the valve head.



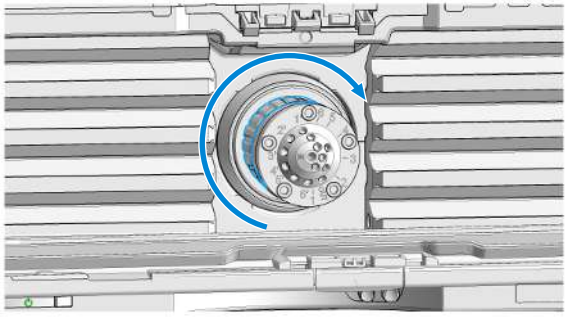
4 Unscrew the nut and remove the valve head.



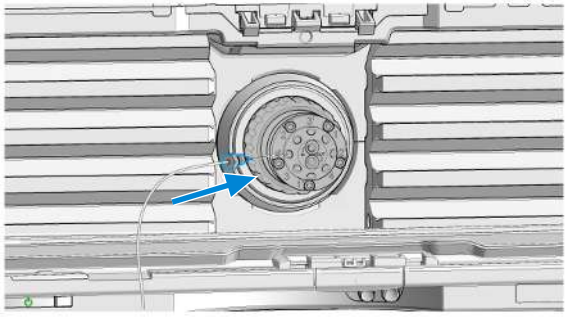
5 Put the new valve head onto the valve drive such that the lobe fits to the groove (see also G7116B_Installation of the Valve Heads on page 45).



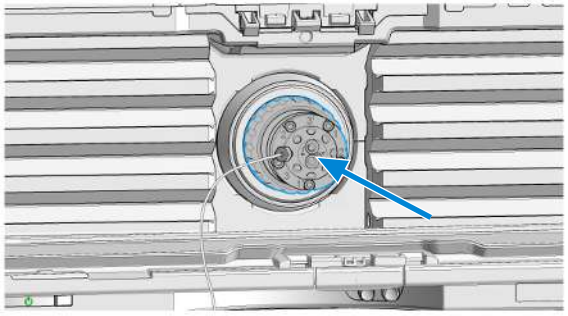
6 Fasten the valve head onto the valve drive using the union nut (see also G7116B_Installation of the Valve Heads on page 45).



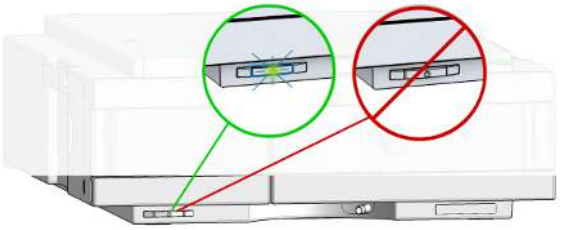
7 Install all required capillary connections to the valve.



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 (G1316-67001 (Transportation Lock Kit)).

1 Remove the valve head as described in Replace Valve Heads on page 158.

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

Install a newer firmware

- It fixes known problems of older versions, or
- It introduces new features, or
- It ensures keeping all systems at the same (validated) revision

When

Install an older firmware

- It ensures keeping all systems at the same (validated) revision, or
- It ensures compatibility after adding a new module to the system, or
- A third-party control software requires a special version

Software required

- Agilent Lab Advisor software

Tools required

Qty.	p/n	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.
https://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.

9 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

Plastic Parts

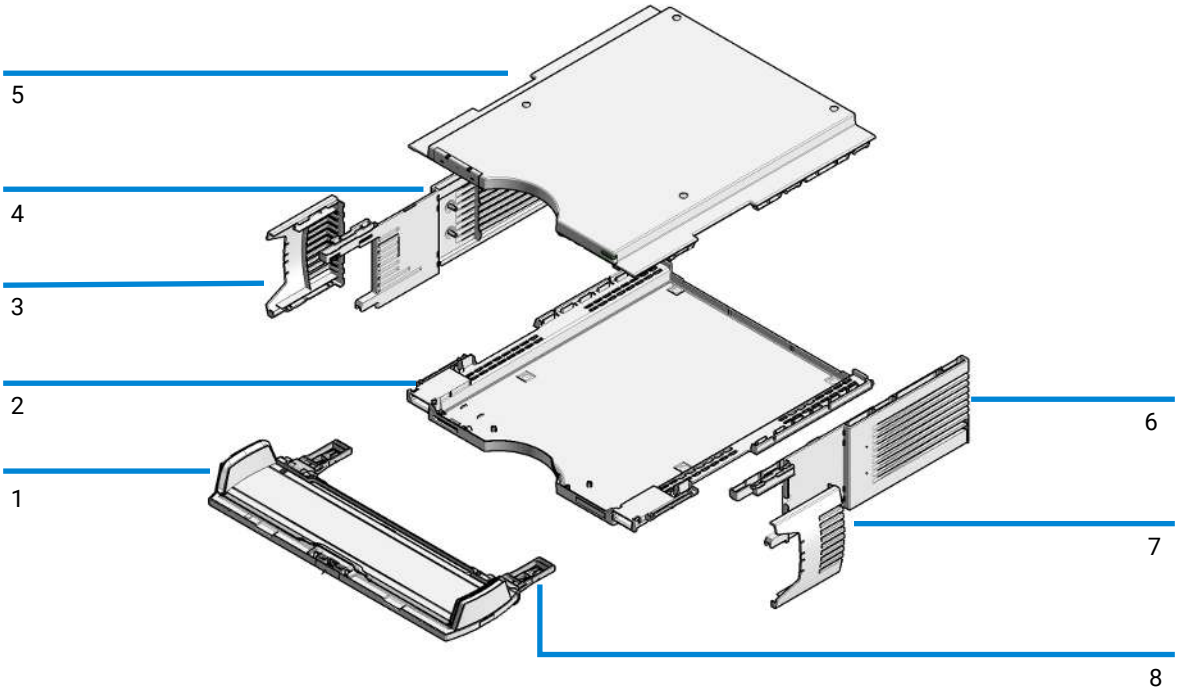


Figure 24: Plastic parts

#	p/n	Description
1	G7116-60004	Door-Kit TCC HE **OR**
1	G7116-60001	Door Kit Infinity II MCT (for G7116A) (obsolete)
	G7116-68713	Cabinet Kit MCT includes parts 2 – 7 :
2	G7116-40100	Base Cover MCT
3	G7116-40103	Side Cover Left Insert MCT
		Side Cover Left MCT (available only as a part of the kit)

#	p/n	Description
		Top Cover Kit (available only as a part of the kit)
		Side Cover Right MCT (available only as a part of the kit)
7	G7116-40106	Side Cover Right Insert 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

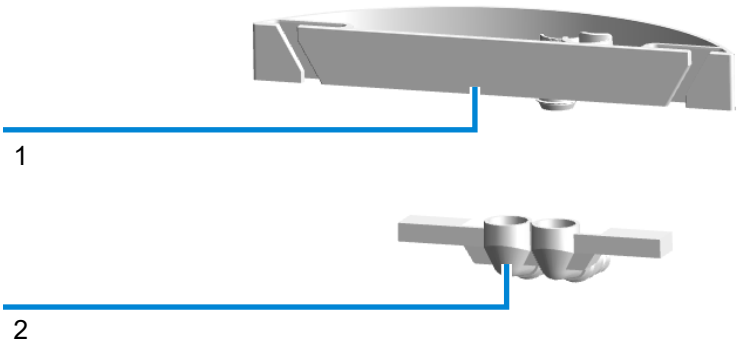


Figure 25: Plastic parts

#	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	1290 Infinity III Valve Drive
5067-6138	Infinity II & III Valve Holder Kit Right
5067-6139	Infinity II & III Valve Holder Kit Left
G1170-68705	Accessory Kit with Clamp for mounting on 1290 Infinity III 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 171 and Valve Options Overview (G7116A) on page 172) for identification of the required part numbers.

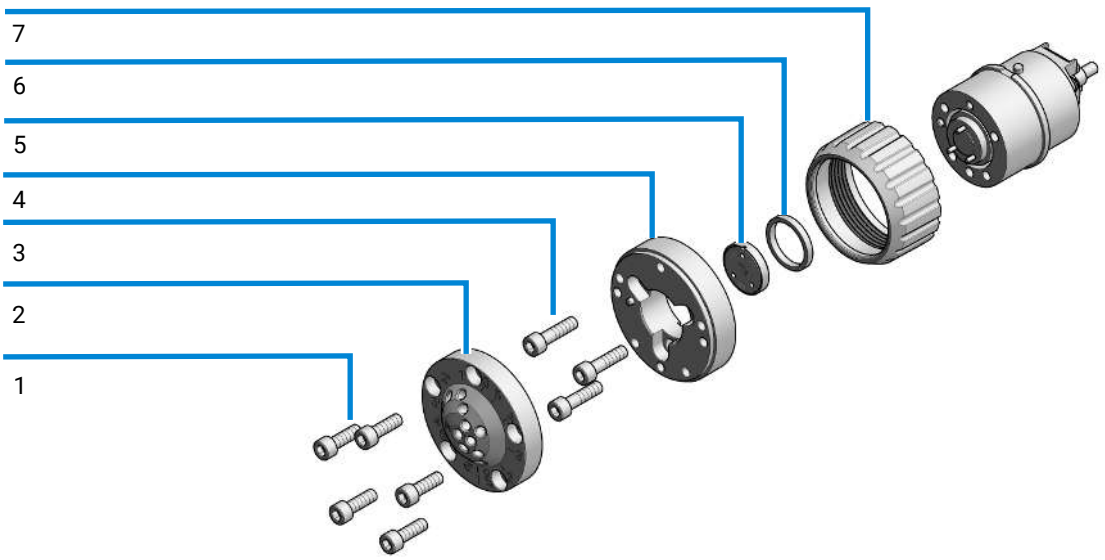


Figure 26: Valve Head Parts (example)

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)

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

Valve Head	Rotor Seal	Stator Head	Stator Screws	Stator Ring
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)

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

p/n	Description
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 mm/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 mm/9 mm
5500-1596	Quick Turn Capillary MP35N 0.12 mm x 280 mm
5067-5966	InfinityLab Quick Turn Fitting

p/n	Description
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 mm/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

p/n	Description
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6 mm/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

For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

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

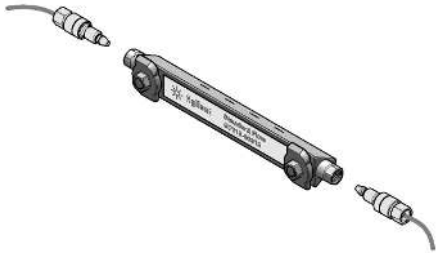
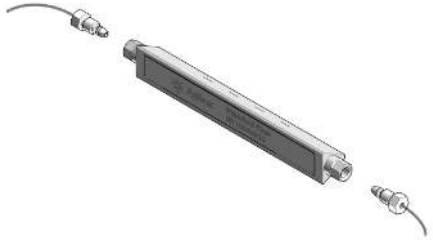
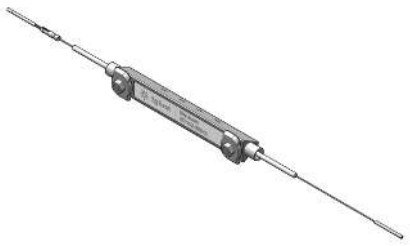
Do not mix with bio / biocompatible parts.

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 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 Bio-inert, all flow rates			*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

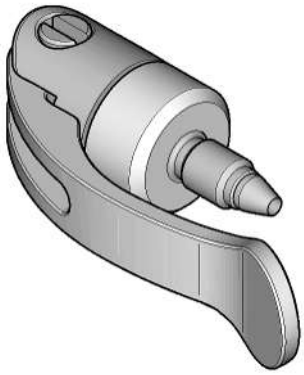


Figure 27: InfinityLab Quick Connect Fitting

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 28: 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

p/n	Description
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
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

p/n	Description
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

p/n	Description
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

10 Identifying Cables

This chapter provides information on cables used with the modules.

Cable Overview

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

Analog cables

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

Remote cables

p/n	Description
5188-8029	ERI to general purpose
5188-8044	Remote Cable ERI – ERI
5188-8045	Remote Cable APG – ERI
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)

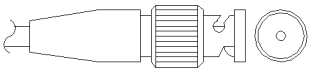
RS-232 cables

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

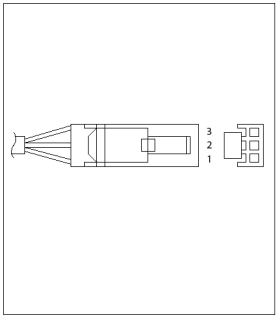
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

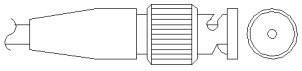


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

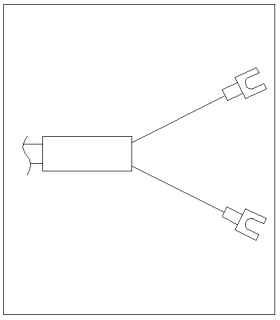
Agilent Module to 35900 A/D converters

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 +

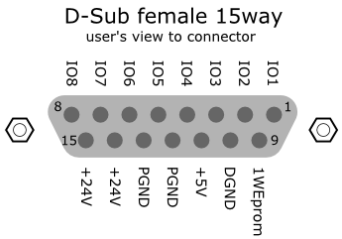
Agilent Module to General Purpose

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	PEAK DETECT	Low
	5	grey	IO5	POWER ON	High
	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			

NOTE Configuration is different with old firmware revisions.
The configuration for IO4 and IO5 is swapped for modules with firmware lower than D.07.10.

NOTE Peak Detection is used for LCMS systems connected with the Fraction Collection Remote Y-Cable (5188-8057).

- 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	

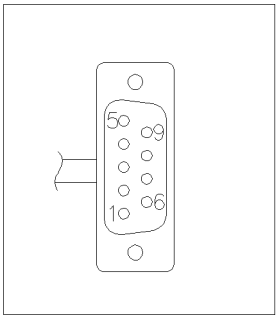
- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

Table 27: 5188-8057 ERI to APG and RJ45

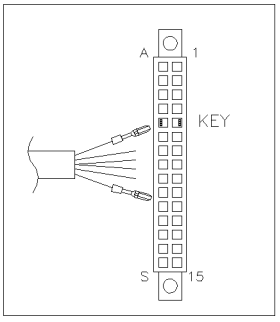
p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trigger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shielding	NC		

One end of these cables provides an 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.

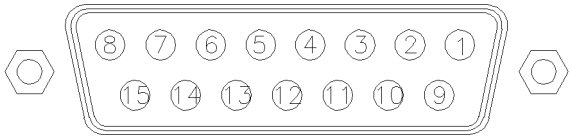
Agilent Module to Agilent 35900 A/D Converters

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

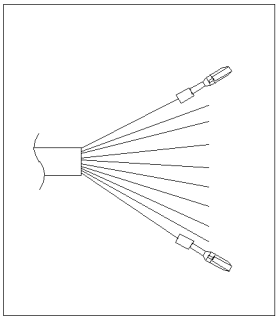
p/n 01046-60201	Wire Color	Pin Agilent module	Signal Name	Active (TTL)
	White	1	Digital ground	
	Brown	2	Prepare run	Low
	Gray	3	Start	Low
	Blue	4	Shut down	Low
	Pink	5	Not connected	
	Yellow	6	Power on	High
	Red	7	Ready	High
	Green	8	Stop	Low
	Black	9	Start request	Low

BCD Cables

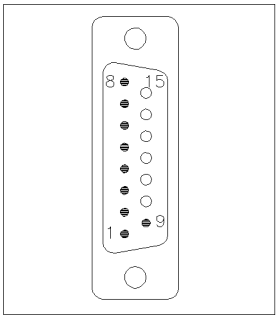


One end of these cables provides a 15-pin BCD connector to be connected to the Agilent modules. The other end depends on the instrument to be connected to

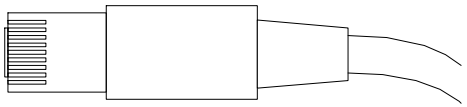
Agilent Module to General Purpose

p/n G1351-81600	Wire Color	Pin Agilent module	Signal Name	BCD Digit
	Green	1	BCD 5	20
	Violet	2	BCD 7	80
	Blue	3	BCD 6	40
	Yellow	4	BCD 4	10
	Black	5	BCD 0	1
	Orange	6	BCD 3	8
	Red	7	BCD 2	4
	Brown	8	BCD 1	2
	Gray	9	Digital ground	Gray
	Gray/pink	10	BCD 11	800
	Red/blue	11	BCD 10	400
	White/green	12	BCD 9	200
	Brown/green	13	BCD 8	100
	not connected	14		
	not connected	15	+ 5 V	Low

Agilent Module to 3396 Integrators

p/n 03396-60560	Pin 3396	Pin Agilent module	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	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)

11 Hardware Information

General Hardware Information

This section provides detailed hardware information on firmware that is valid for this module.

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: https://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.

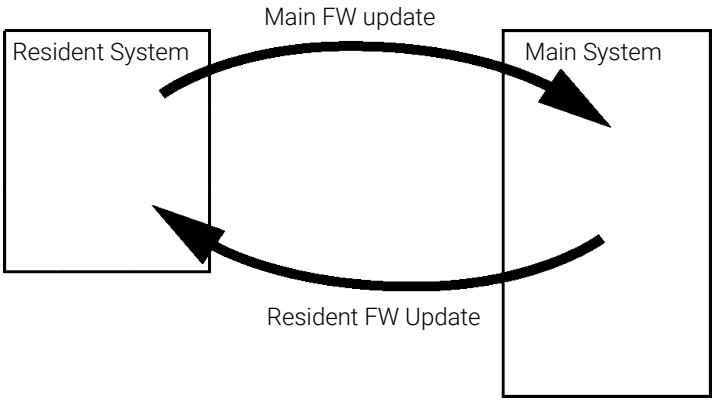


Figure 29: Firmware update mechanism

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.

- https://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.
- 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.

- 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.

WARNING **Electric shock due to insufficient insulation of connected instruments**

Personal injury or damage to the instrument

— **Any other instruments connected to this instrument shall be approved to a suitable safety standard and must include reinforced insulation from the mains.**

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

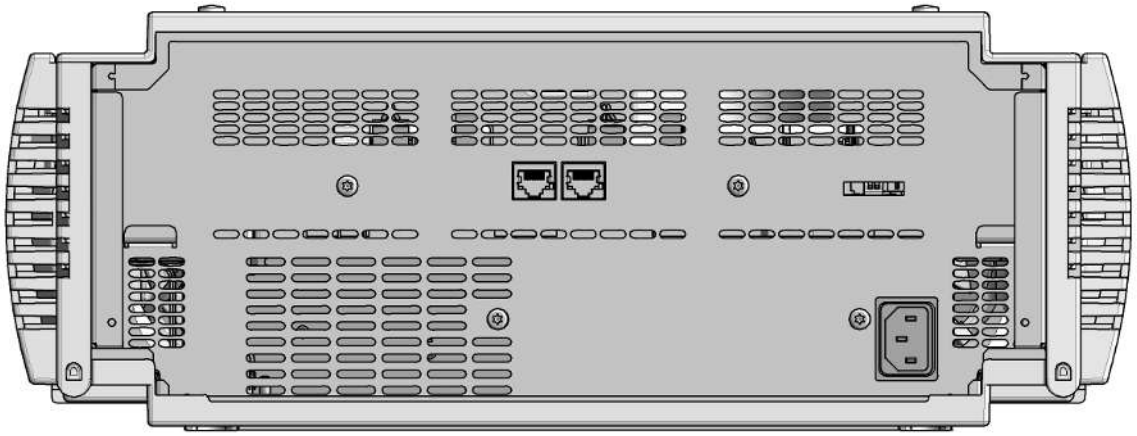


Figure 30: Rear view of the Multicolumn Thermostat G7116A/B

Serial Number Information

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

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

Serial Number Information

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/C, 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	
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							

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
G1170A	2	No	No	No	No	No	Requires a host module with on-board LAN or with additional G1369C LAN Card.
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

LAN connection is made between at least one of the Agilent modules and the Control PC.

- If an Assist Hub is installed, connect the LAN to the Lab LAN port of this module.
- If an Assist Hub is NOT installed and a detector (DAD/MWD/FLD/VWD/RID) is installed, connect the LAN to this module.
- If an Assist Hub is NOT installed and there are multiple detectors with spectral capabilities, consider using additional LAN connections for each detector.
- If an Assist Hub is installed, connect additional LAN connections from the detectors and pumps to the Assist Hub.

- 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 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

LAN connection is made between at least one of the Agilent modules and the Control PC.

- If an Assist Hub is installed, connect the LAN to the Lab LAN port of this module.
- If an Assist Hub is NOT installed and a detector (DAD/MWD/FLD/VWD/RID) is installed, connect the LAN to this module.
- If an Assist Hub is NOT installed and there are multiple detectors with spectral capabilities, consider using additional LAN connections for each detector.
- If an Assist Hub is installed, connect additional LAN connections from the detectors and pumps to the Assist Hub.

USB

The USB interface replaces the RS-232 Serial interface in new generation modules. For details on USB refer to USB (Universal Serial Bus) on page 212.

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

Pin	Signal	Description
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.

USB (Universal Serial Bus)

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

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

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 needs 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.

Module-Specific Hardware Information

2-bit Configuration Switch

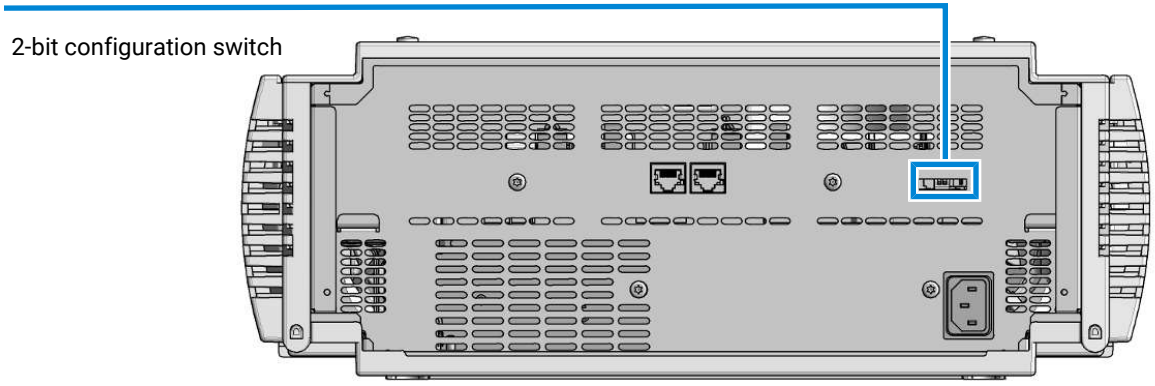


Figure 31: Location of configuration switch

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

12 Appendix

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

General Safety Information

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

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

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

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.

WARNING Use of unsupplied cables

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

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

NOTE Note the instrument's external markings described under Safety Symbols on page 221.

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.**

Solvent Information

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.

Recommendations on the Use of Solvents

Observe the following recommendations on the use of solvents.

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

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

    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, diisopropyl ether) should be filtered through dry aluminium oxide which adsorbs the peroxides,
  - solvents containing strong complexing agents (e.g. EDTA),
  - mixtures of carbon tetrachloride with 2-propanol or THF.
- Avoid the use of dimethyl formamide (DMF). Polyvinylidene fluoride (PVDF), which is used in leak sensors, is not resistant to DMF.

Magnets

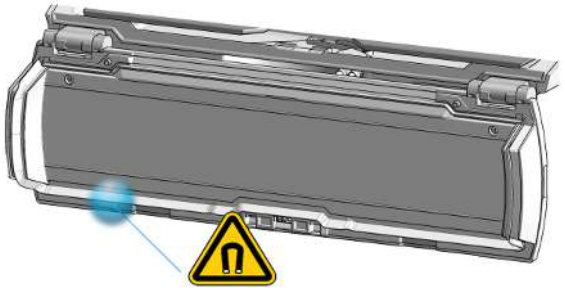


Figure 32: Magnet in the front door of the Multicolumn Thermostat

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.
	Indicates flammable material used. Consult the Agilent Information Center / User Manual before attempting to install or service this equipment. Follow all safety precautions.
	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.
REF	Product Number
SN	Serial Number
	Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the on/off 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.
	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.

Material Information

This section provides detailed information about materials used in the HPLC system and general information about solvent/material compatibility.

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 also cannot 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 nonconductive 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 are still some 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 clad PEEK capillaries in bio-inert systems. The use of stainless steel clad 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/III 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 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, diisopropyl ether). Such ethers should be filtered through dry aluminum 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, ethylenediaminetetraacetic 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 (dimethylformamide).

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.

At-a-Glance Details About Agilent Capillaries

The following section provides useful information about Agilent capillaries and its characteristics.

Syntax for capillary description

Type - Material - Capillary dimensions - Fitting Left/Fitting right

Table 32: Example for a capillary description

Code provided with the part	Meaing of the code
Color code: 	Material of the product is MP35N, the inner diameter is 0.20 or 0.25 mm
Capillary	The part is a connection capillary
MP35N	Material of the part is MP35N
0.25 x 80 mm	The part has an inner diameter of 0.25 mm and a length of 80 mm
SI/SI	Left fitting: Swagelok + 1.6 mm Port id, Intermediate Right fitting: Swagelok + 1.6 mm Port id, Intermediate

To get an overview of the code in use, see

- Color: Table 33 on page 230
- Type: Table 34 on page 230
- Material: Table 35 on page 231
- Dimension: Table 36 on page 231
- Fittings: Table 37 on page 232

Color Coding Guide

Table 33: 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

NOTE 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.

Abbreviation Guide for Type

Table 34: Type (gives some indication on the primary function, like a loop or a connection capillary)

Key	Description
Capillary	Connection capillaries
Loop	Loop capillaries
Seat	Autosampler needle seats

Key	Description
Tube	Tubing
Heat exchanger	Heat exchanger

Abbreviation Guide for Material

Table 35: Material (indicates which raw material is used for the capillary)

Key	Description
ST	Stainless steel
Ti	Titanium
PK	PEEK
FS/PK	PEEK-coated fused silica [5]
PK/ST	Stainless steel-coated PEEK [6]
PFFE	PTFE
FS	Fused silica
MP35N	Nickel-cobalt-chromium-molybdenium alloy

Abbreviation Guide for Capillary Dimensions

Table 36: Capillary dimensions (indicates inner diameter (id), length, and volume of the capillary)

Description
id (mm) x Length (mm)
Volume (µL)

5 Fused silica in contact with solvent

6 Stainless steel-coated PEEK

Abbreviation Guide for Fitting Left/Fitting Right

Table 37: Fitting left/fitting right (indicates which fitting is used on both ends of the capillary)

Key	Description
W	Swagelok + 0.8 mm Port id
S	Swagelok + 1.6 mm Port id
M	Metric M4 + 0.8 mm Port id
E	Metric M3 + 1.6 mm Port id
U	Swagelok union
L	Long
X	Extra long
H	Long head
G	Small head SW 4
N	Small head SW 5
F	Finger-tight
V	1200 bar
B	Bio
P	PEEK
I	Intermediate

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 https://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.

RFID Statement

Brasil

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para mais informações, consulte o site da Anatel: https://www.gov.br/anatel/pt-br.

Este produto não é apropriado para uso em ambientes domésticos, pois poderá causar interferências eletromagnéticas que obrigam o usuário a tomar medidas necessárias para minimizar estas interferências.

Canada

Statement according to RSS GEN Issue 5:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas causer d'interférences
2. Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

Mexico

La operación de este equipo está sujeta a las siguientes dos condiciones:

1. es posible que este equipo o dispositivo no cause interferencia perjudicial y
2. este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Thailand

เครื่องโทรคมนาคมและอุปกรณ์นี้มีความสอดคล้องตามมาตรฐานหรือข้อกำหนดทางเทคนิคของ กสทช.

This telecommuinication equipment conforms to NTC/NBTC technical requirement.

USA

1. User Information according to FCC 15.21:Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Part 15 Statement according to FCC 15.19:

   This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

CAUTION Do not change or modify the equipment.

Changes or modifications not expressly approved by Agilent could void your authority to operate the equipment.

NOTE This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Table 38: Operating frequencies and maximum power levels

Technology	Operating Frequencies/ Bands	Maximum Transmit Power Level
RFID	125 kHz	26.8 dBm

Sound Emission

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

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In This Book

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