



# Agilent 1290 Infinity Flexible Cube

User Manual



**Agilent Technologies**

# Notices

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## In This Guide...

This manual covers the Agilent 1290 Infinity Flexible Cube (G4227A)

### **1 Introduction**

This chapter gives an introduction to the module, instrument overview and internal connectors

### **2 Site Requirements and Specifications**

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

### **3 Installing the Module**

This chapter gives information about the preferred stack setup for your system and the installation of your Flexible Cube.

### **4 LAN Configuration**

This chapter provides information on connecting the module to the Agilent Data System.

### **5 Using the Module**

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

### **6 Optimizing the Autosampler with the Flexible Cube**

This chapter provides information on how to optimize the Autosampler and the Flexible Cube for a minimum carry over and fastest cycle times.

### **7 Troubleshooting and Diagnostics**

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

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### **8 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.

### **9 Maintenance and Repair**

This chapter describes the maintenance of the module.

### **10 Parts and Materials for Maintenance**

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

### **11 Identifying Cables**

This chapter provides information on cables used with the 1290 series of HPLC modules.

### **12 Appendix**

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

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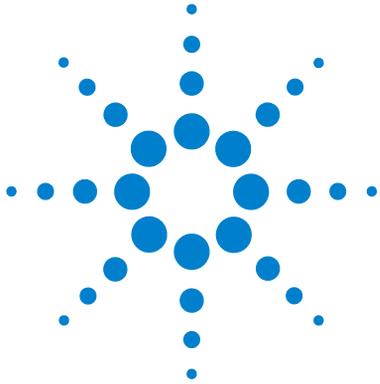
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This chapter gives an introduction to the module, instrument overview and internal connectors



## Features

The Agilent 1290 Infinity Flexible Cube introduces an unprecedented flexibility to the Agilent 1290 Infinity System. It includes options to reduce Carry Over and will later, with addition of valve pods, be able to convert the G4226A Autosampler for fixed loop injections or be used as a multipurpose valve box.

The G4227A Flexible Cube is capable of reducing carry over to a minimum and maintains that level between the maintenance intervals of the Autosampler.

For specifications, see [“Performance Specifications”](#) on page 34.

### NOTE

This 1290 Infinity Flexible Cube has been introduced as part of the Agilent 1290 Infinity Liquid Chromatograph.

---

## Overview of the Module

The Agilent 1290 Infinity Flexible Cube comprises a flush pump that can deliver flow between 1 and 4 mL/min from 3 different solvent bottles and a valve drive for later use with different valve pods. It also includes a second valve drive slot. The initial revision of the Agilent 1290 Infinity Flexible Cube supports only the needle seat back flush option. Other options will follow later and will include a possibility to convert the G4226A Autosampler for fixed loop injections.

## Flexible Cube Principle

The Flexible Cube is added to the 1290 Infinity system to reduce carry over in the Autosampler. This is achieved by flushing the needle seat and rotor seal with up to 3 different solvents which may have different properties and solvent strengths.

The flush pump outlet capillary is connected to the port 4 of the autosampler, which normally holds the waste line. If the autosampler is in bypass mode the flush pump connects to the needle seat and can flush backwards through the needle seat into the waste line attached to the needle seat outlet port.

Besides chemistry effects of solvents and sample the Agilent 1290 Infinity Flexible Cube will not influence injection precision or accuracy of the Autosampler in use. The Flexible Cube is not part of the high pressure flow path.

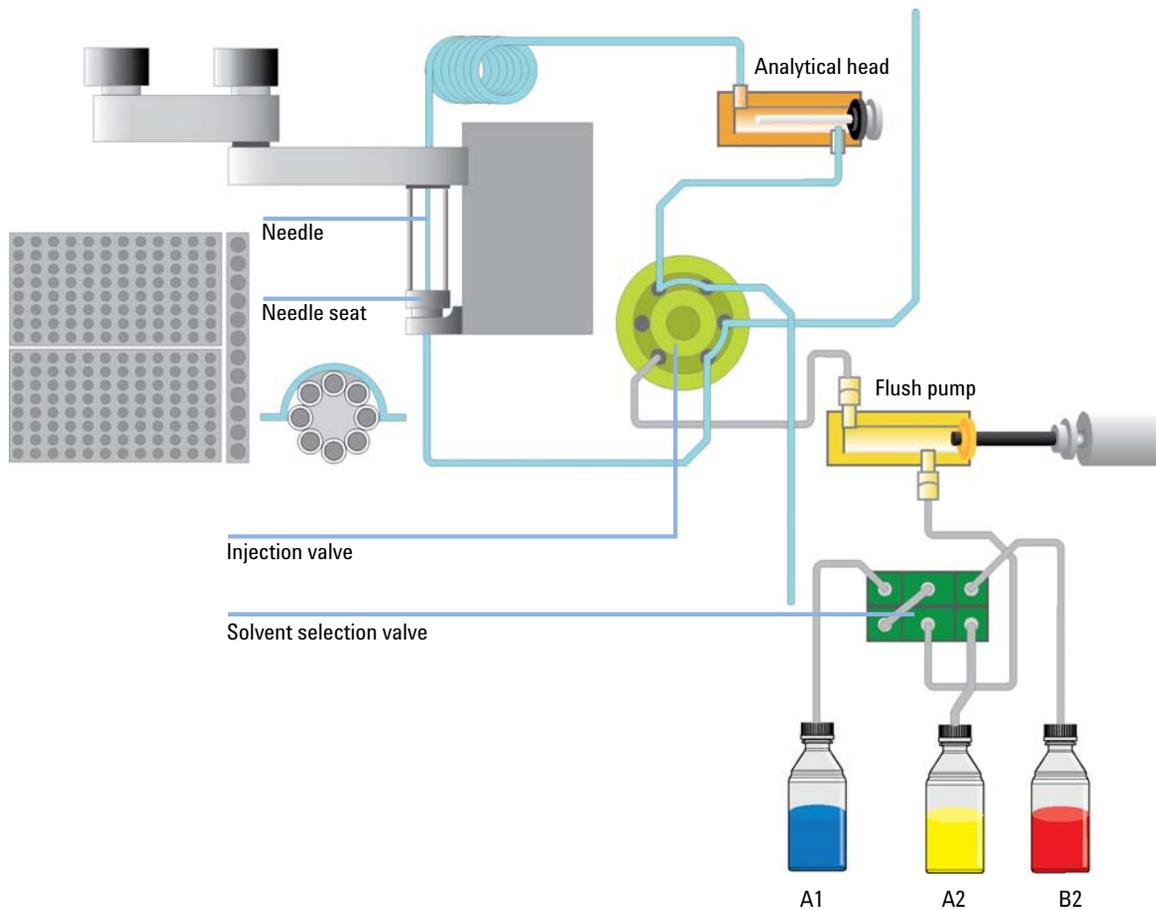
### NOTE

The needle wash port and the needle seat back flushing function may generate large amount of waste. Make sure to have the waste tubing installed in the autosampler and a waste container with sufficient capacity available.

---

Following the injection sequence, using a Flexible Cube, is described with regards to cleaning the sampler.

1 Mainpass



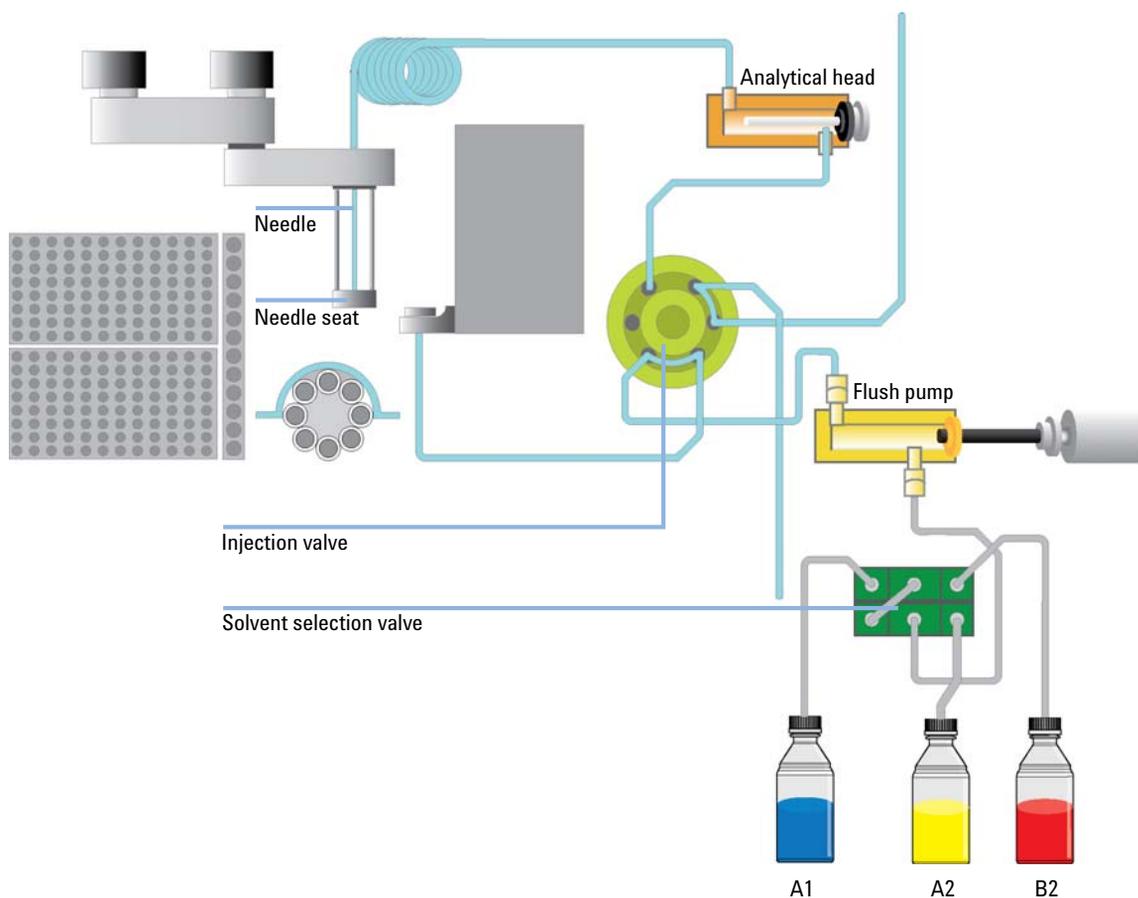
**Figure 1** Mainpass

The analytical pump is connected to the autosampler sampling loop, and the mobile phase is flowing through the autosampler injection loop continuously and thereby cleaning the insides of the tubings.

# 1 Introduction

## Flexible Cube Principle

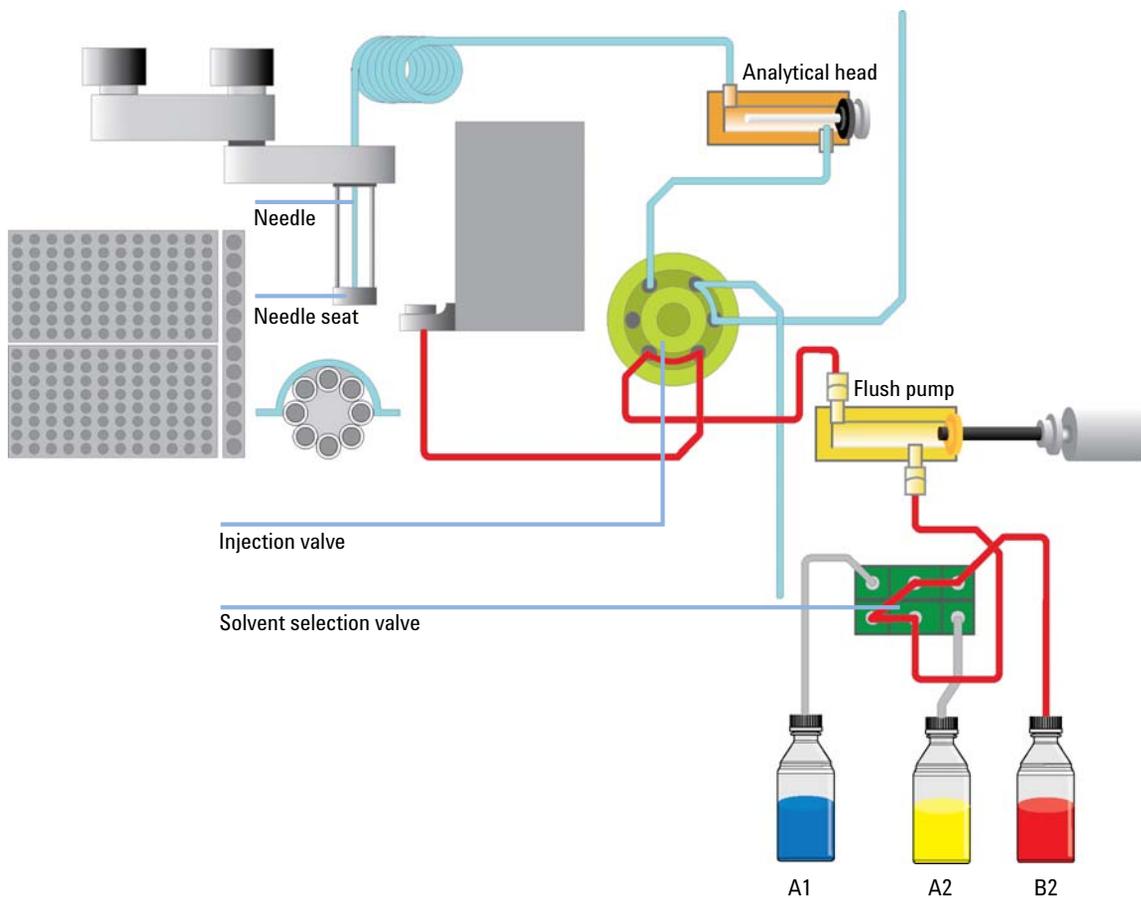
### 2 Switch to Bypass



**Figure 2** Switch to Bypass

The injection valve is switched to bypass, removing the injection loop from the high pressure flow path and connecting the flush pump with the needle seat.

3 Flush with dissolving solvent #1 (A2)



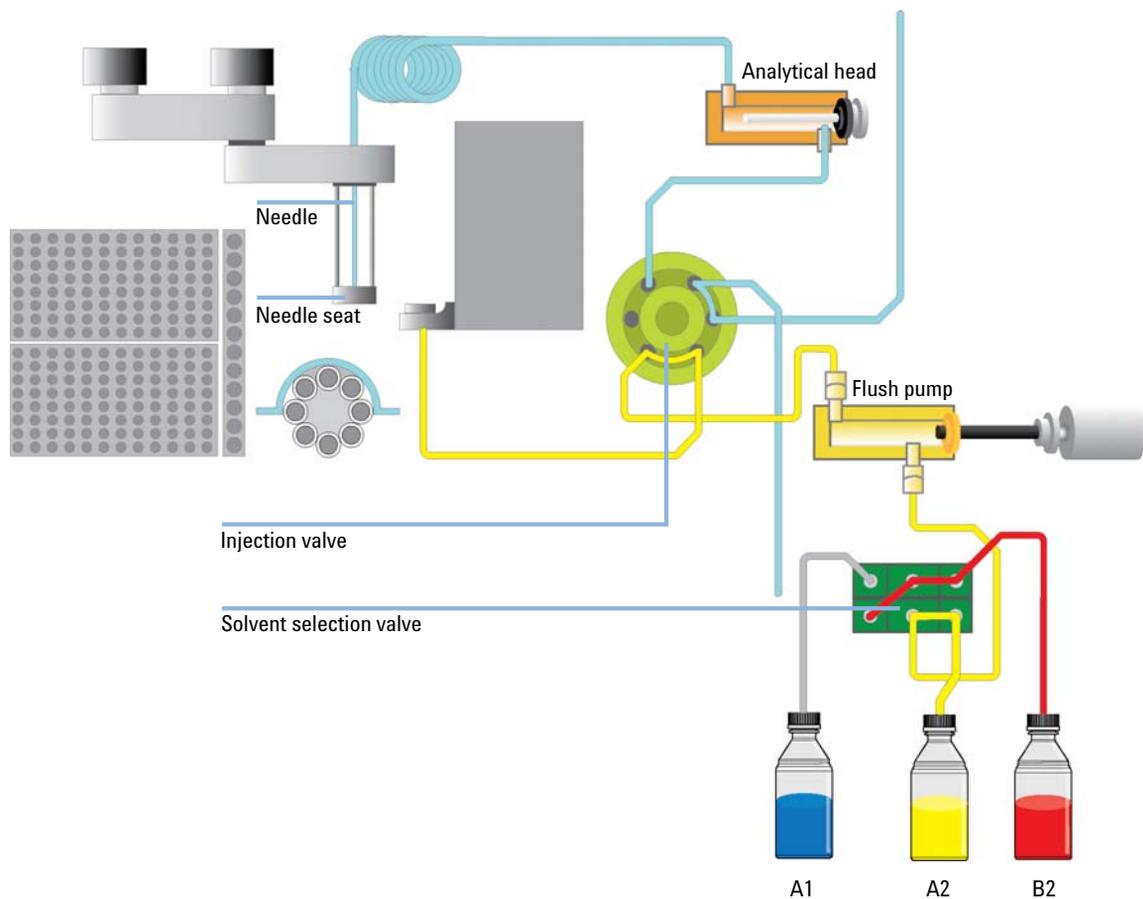
**Figure 3** Flush with dissolving solvent #1 (A2)

The first cleaning solvent available for flushing is normally of a high organic concentration with appropriate modifiers. This solvent should be able to dissolve most components of the sample, and thereby remove them from the Autosampler flow path.

# 1 Introduction

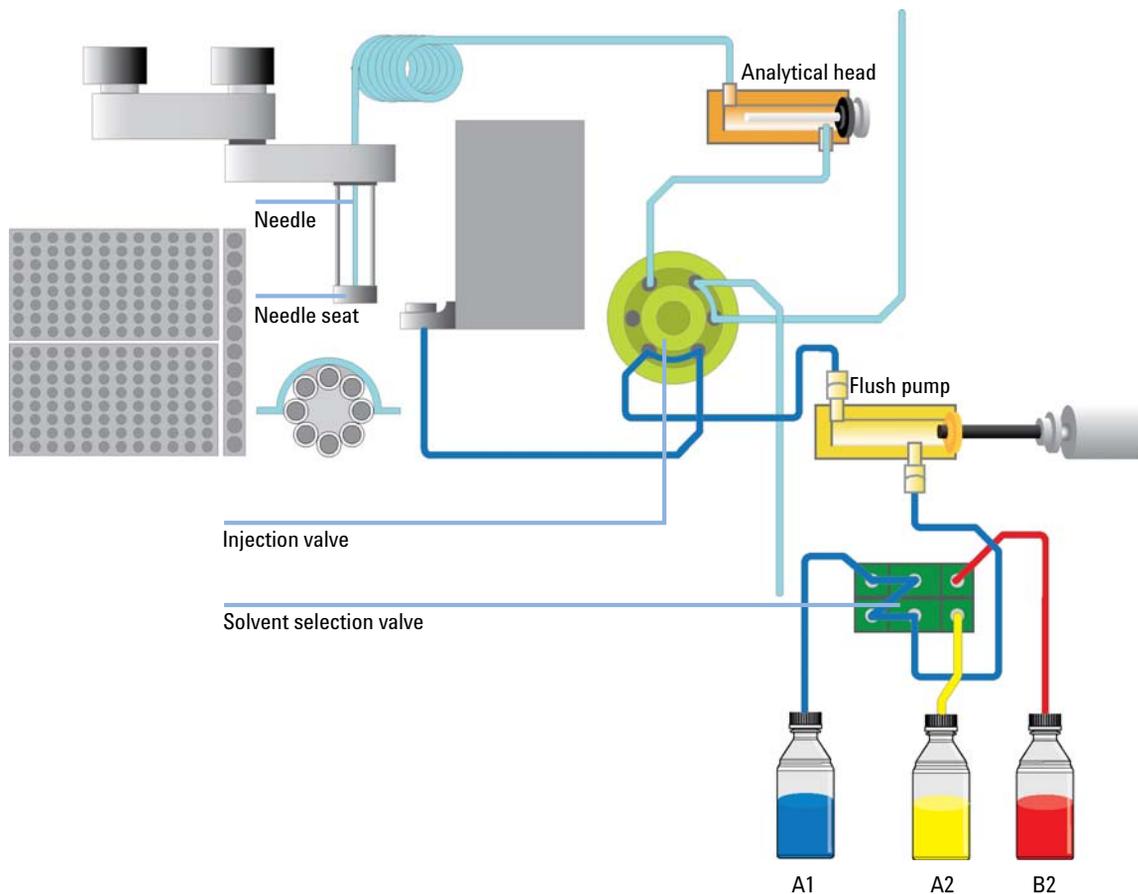
## Flexible Cube Principle

### 4 Flush with dissolving solvent #2 (B2)



If this is not sufficient to reduce the carry over a dissolving solvent #2 may be used with either different modifiers and/or a really strong cleaning solvent.

## 5 Flush with Starting condition (A1)

**Figure 4** Flush with Starting condition (A1)

Solvent #3 is always set for the final flush and should be the starting condition of the gradient or lower solution strength, as this solvent will be in the needle seat and seat capillary at the point of injection and might lead to reduced resolution if stronger elution strength than mobile phase.

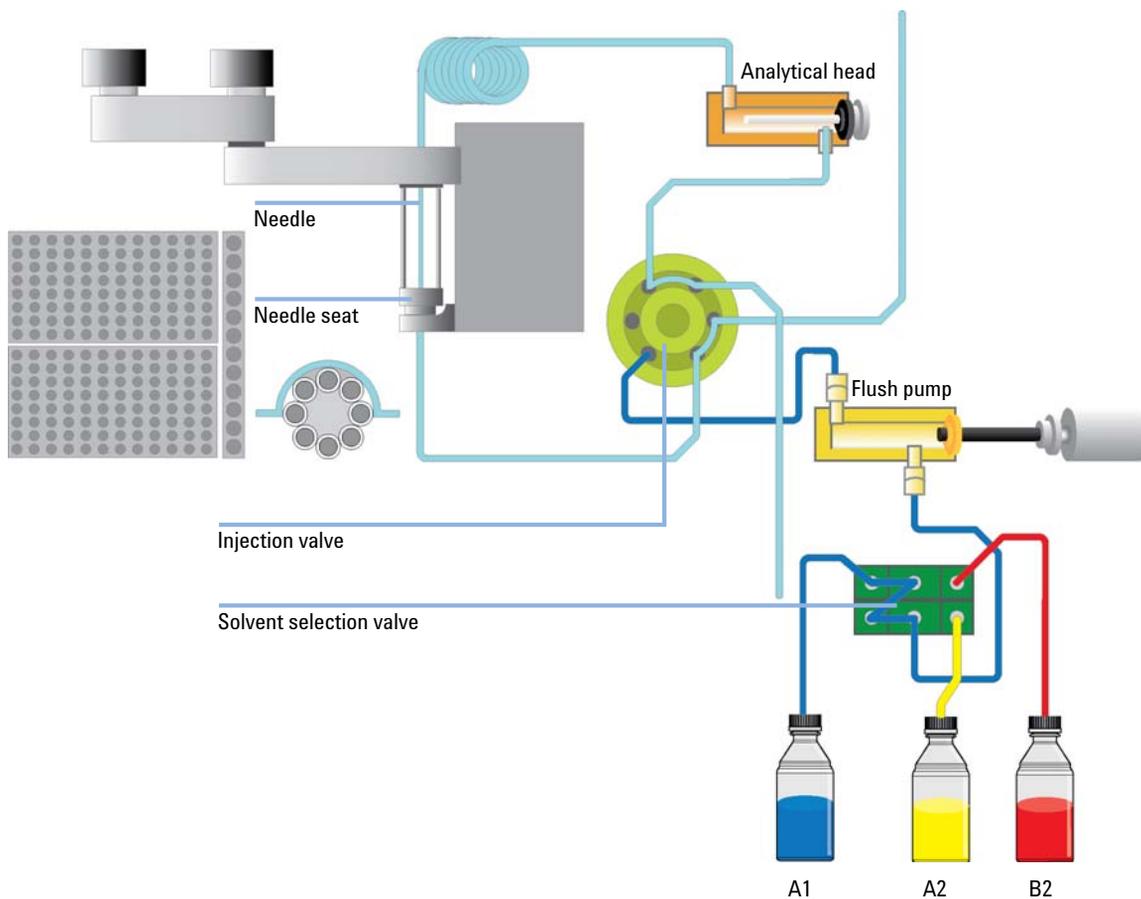
**NOTE**

Any flushing solvent used must be miscible with previous solvent. If this is not the case it can result in precipitations, blockages or reduced performance of the instrument.

# 1 Introduction

## Flexible Cube Principle

### 6 Switch back to Mainpass



**Figure 5** Switch back to Mainpass

When the complete flushing procedure has finished the autosampler switches back to Mainpass operation and thereby introduce the sample to the flow path.

## Early Maintenance Feedback

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

### EMF Counters

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

### Using the EMF Counters

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

### Setting the EMF Limits

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

## Instrument Layout

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

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

## Electrical Connections

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

**NOTE**

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

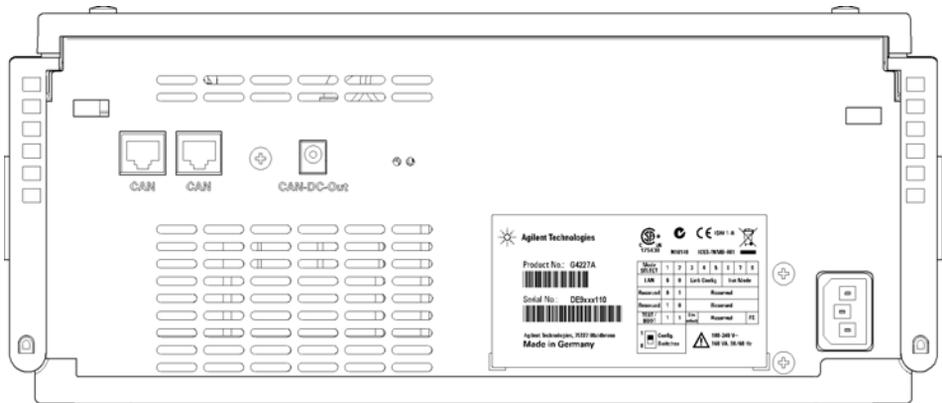
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## Serial Number Information (ALL)

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

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

## Rear View of the Module



**Figure 6** Rear View of Flexible Cube – Electrical Connections and Label

## Interfaces

The Agilent 1290 Infinity modules provide the following interfaces:

**Table 1** Agilent 1290 Infinity interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Comment
G4220A	2	no	yes	yes	no	yes	
G4226A	2	yes	no	yes	no	yes	
G1316C	2	no	no	yes	no	yes	
G4227A	2	no	no	no	no	no	
G4212A	2	no	yes	yes	1	yes	Preferred host for LAN access

### NOTE

The detector with on-board LAN is the preferred access point for control via LAN of the detector and/or the 1290 Infinity system. The inter-module communication is done via CAN.

- CAN connectors as interface to other modules,
- LAN connector as interface to the Agilent ChemStation or other control software,
- RS-232C as interface to a computer,
- REMOTE connector as interface to other Agilent products,
- Analog Output connector(s) for signal output.

## Overview Interfaces

### CAN

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

### LAN

The modules have either an interface slot for an LAN card (e.g. Agilent G1369A LAN Interface) or they have an on-board LAN interface. This interface allows the control of the module/system via a connected PC with the appropriate control software (e.g. Agilent ChemStation). Exception: The G1316 TCC and the G1322/G1379 degasser have neither on-board LAN nor a LAN interface.

#### NOTE

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

---

### RS-232C (Serial)

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

#### NOTE

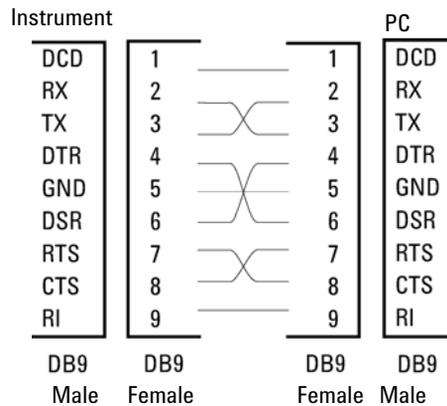
There is no configuration possible on main boards with on-board LAN. These are pre-configured for

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

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

**Table 2** RS-232C Connection Table

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



**Figure 7** RS-232 Cable

## Analog Signal Output

The analog signal output (e.g. detector signal or pump pressure signal) can be distributed to a recording device.

## APG Remote

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

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

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

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

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

### NOTE

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

**Table 3** Remote Signal Distribution

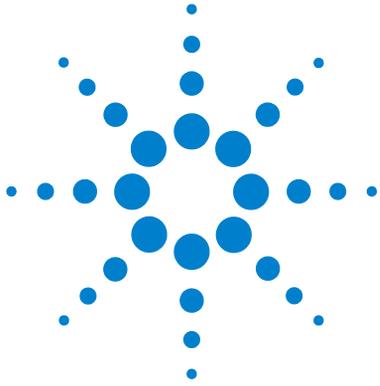
Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.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

### Special Interfaces

Some modules have module specific interfaces/connectors. They are described in the module documentation.

# 1 Introduction

## Interfaces



## 2 Site Requirements and Specifications

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



## Site Requirements

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

### Power Considerations

The module power supply has wide ranging capability. It accepts any line voltage in the range described in [Table 4](#) on page 33. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

#### WARNING

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

→ Connect your instrument to the specified line voltage only.

---

#### WARNING

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

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

→ Always unplug the power cable before opening the cover.

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

---

#### CAUTION

Unaccessible power plug.

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

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

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

---

## Power Cords

Different power cords are offered as options with the module. The female end of all power cords is identical. It plugs into the power-input socket at the rear. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

### **WARNING**

#### **Absence of ground connection or use of unspecified power cord**

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

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

### **WARNING**

#### **Use of unsupplied cables**

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

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

### **WARNING**

#### **Unintended use of supplied power cords**

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

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

## Bench Space

The module dimensions and weight (see [Table 4](#) on page 33) 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 should carry an Agilent system, make sure that the bench is designed to bear the weight of all modules.

The module should be operated in a horizontal position.

## Condensation

### CAUTION

Condensation within the module

Condensation will damage the system electronics.

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

## Physical Specifications

**Table 4** Physical Specifications

Type	Specification	Comments
Weight	8.2 kg (18.1 lbs)	
Dimensions (width × depth × height)	345 x 435 x 140 mm (13.5 x 17 x 5.5 inches)	
Line voltage	100 – 240 VAC, ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5%	
Power consumption	80 VA / 45W / 154 BTU	Maximum
Ambient operating temperature	4–55 °C (39–131 °F)	
Ambient non-operating temperature	-40–70 °C (-4–158 °F)	
Humidity	< 95%, at 40 °C	Non-condensing
Operating Altitude	Up to 2000 m (6562 ft)	
Non-operating altitude	Up to 4600 m (15091 ft)	For storing the module
Safety standards: IEC, CSA, UL	Installation Category II, Pollution Degree 2	For indoor use only. Research Use Only.

## Performance Specifications

**Table 5** Performance Specifications

Type	Specification	Comment
Injection range	0.1 – 20 µL 0.1 – 40 µL 0.1 – 100 µL in 0.1 µL increments	With 20 mL loop installed With 40 mL loop installed With 100 mL loop installed (as provided by G4226A sampler)
Precision	Precision of G4226A sampler will not be influenced	
Accuracy	Accuracy of G4226A sampler will not be influenced	
Sampler pressure range	Up to 1200 bar	
Flush types available	Needle seat back-flushing Needle wash intern Needle wash extern	by G4227A Flexible Cube by G4226A sampler by G4226A sampler
Pressure range of Flush pump	Up to 50 bar	
Flow rate of Flush pump	Up to 4 mL/min	
Number of solvents	Up to 3 solvents	
Sample viscosity range	0.2 – 5 cp	
Flush time	<p>Flush time depends on method-parameters used, e.g. number of solvents and selected flush-duration. Flushing is done in parallel to running analysis.</p> <p>Needle seat flush time to flush with 1 mL of solvent at maximum flow including solvent exchange typically requires 38 s.</p>	

**Table 5** Performance Specifications

Type	Specification	Comment
Carry Over	Typically <0.001 % (10 ppm)	For measurement conditions, see <sup>1, 2, 3, 4</sup>
Control and data evaluation	Agilent ChemStation for LC EZChrom Elite	B.04.02 SP1 or later 3.3.2 SP1 or later G4226A autosampler requires firmware A06.30 or later.
Local Control	Agilent Instant Pilot (G4208A)	B.02.08 or later
Communications	Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals, optional four external contact closures and BCD vial number output.	
Safety and maintenance	Extensive diagnostics, error detection and display (through Control Module and ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors.	
Housing	All materials recyclable.	

<sup>1</sup> Chromatographic conditions: Column: Agilent ZORBAX SB-C18, 2.1 x 50 mm 1.8 μm (p/n 827700-902); mobile phase: A: 0.1 % TFA in water, B: 0.1 % TFA in acetonitrile; isocratic : %B=35 %; flow rate: 0.5 mL/min; temperature: 30 °C

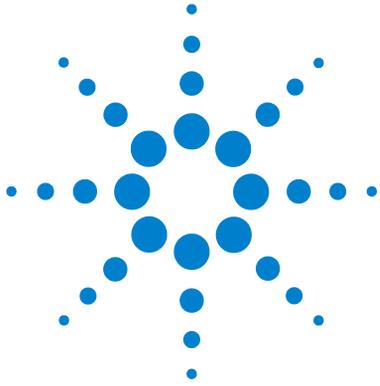
<sup>2</sup> Cleaning procedure: Wash solution: 2 min with water + 0.1 % TFA at 4 mL/min; needle wash with solvent A 15 s.

<sup>3</sup> UV-detection: Sample : 1200 ng/μl chlorhexidine (dissolved in mobile phase A), 1 μL injected and measured on G4212A DAD (10 mm cell); Wavelength: 257 nm +/- 4; ref. 360 nm +/- 16; slit 4 nm, 10 Hz

<sup>4</sup> MS-detection: Sample : 50 ng/μl chlorhexidine (dissolved in mobile phase A), 1 μL injected and measured on Agilent 6460 QQQ (in specified conditions); MRM 1: 505.5 → 170 (CE: 36 V); MRM 3: 505.5 → 201.2 (CE: 20 V); fragmentor: 150 V, delta EMV(+): 200 V

## **2 Site Requirements and Specifications**

### **Performance Specifications**



## 3 Installing the Module

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Installing the Module	47
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This chapter gives information about the preferred stack setup for your system and the installation of your Flexible Cube.



## Unpacking the Module

### Damaged Packaging

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

#### CAUTION

"Defective on arrival" problems

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

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

## Delivery Checklist

Ensure all parts and materials have been delivered with your module. The delivery checklist is shown below. For parts identification please check the illustrated parts breakdown in “[Parts and Materials for Maintenance](#)” on page 109. Please report any missing or damaged parts to your local Agilent Technologies sales and service office.

**Table 6** Flexible Cube Checklist

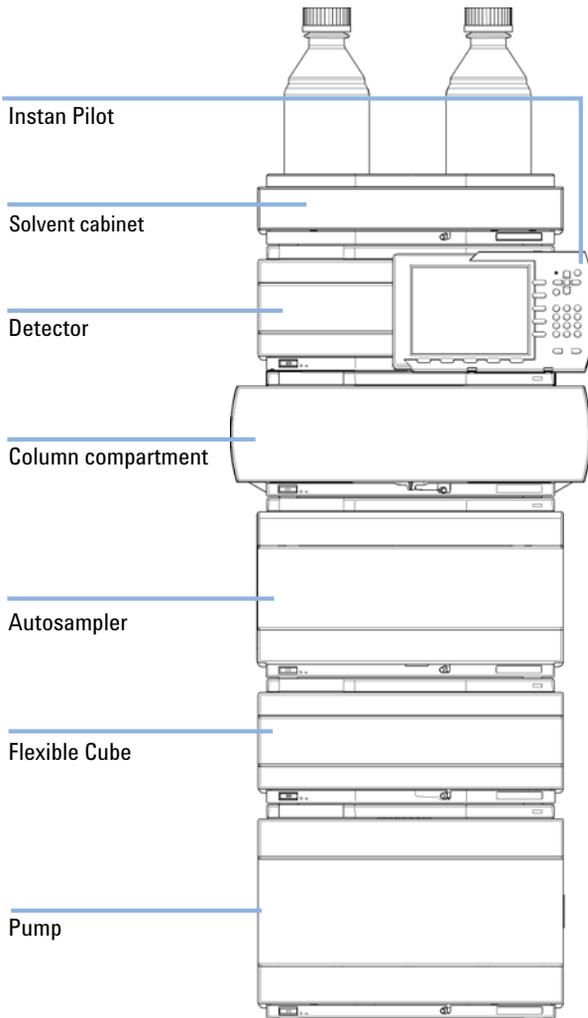
Description	Quantity
Flexible Cube	1
Power Cable	1
User Manual	1
Standard Accessory Kit (see “ <a href="#">HPLC System Tool Kit</a> ” on page 112)	1
Flexible Cube Accessory Kit (see “ <a href="#">Flexible Cube Accessory Kit</a> ” on page 112)	1

## Optimizing the Stack Configuration

If your module is part of a complete Agilent 1290 Infinity Liquid Chromatograph, you can ensure optimum performance by installing the following configurations. These configurations optimize the system flow path, ensuring minimum delay volume.

For other possible configurations, please refer to the Agilent 1290 Infinity System Manual.

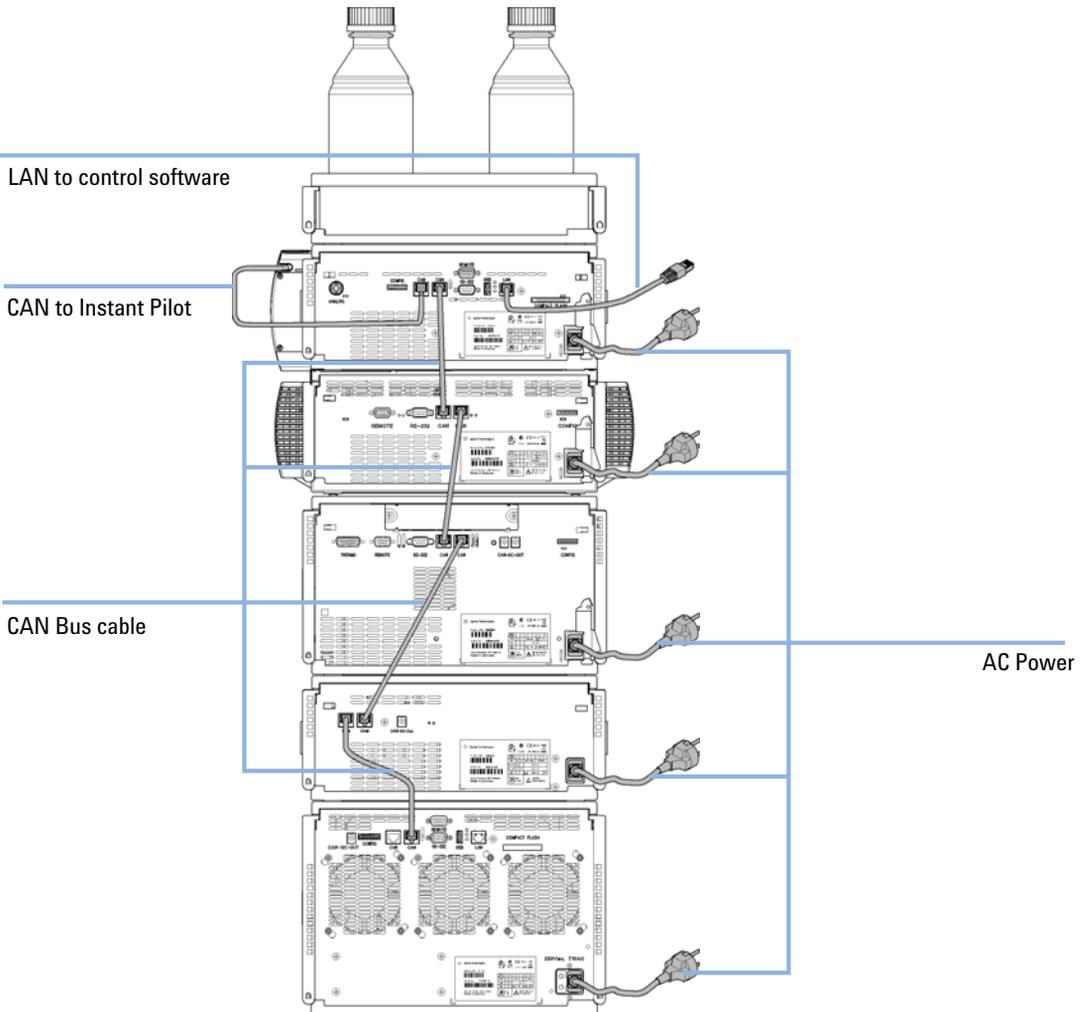
## One Stack Configuration



**Figure 8** Supported One Stack Configuration (Front View)

### 3 Installing the Module

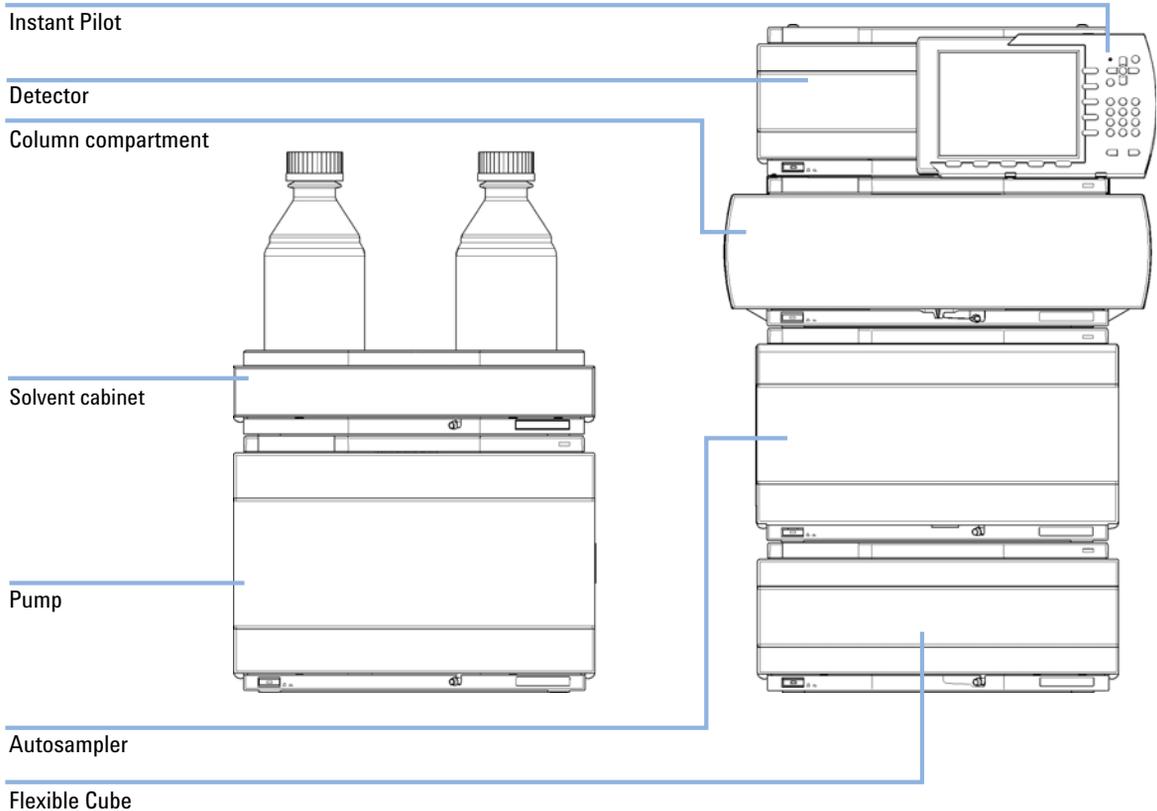
#### Optimizing the Stack Configuration



**Figure 9** Supported One Stack Configuration (Rear View)

## Supported Two Stack Configurations

### Two Stack Configuration (Standard)



**Figure 10** Supported Two Stack Configuration Front View (Standard)

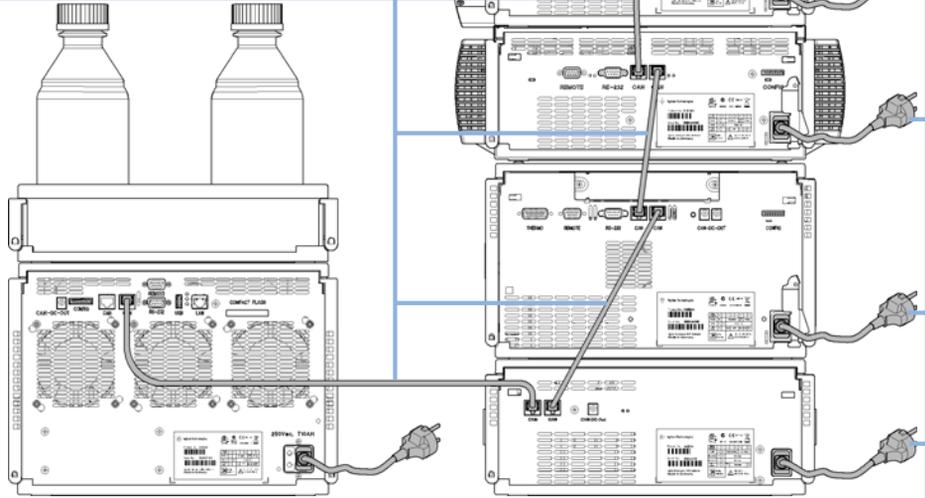
### 3 Installing the Module

#### Optimizing the Stack Configuration

LAN to control software

CAN to Instant Pilot

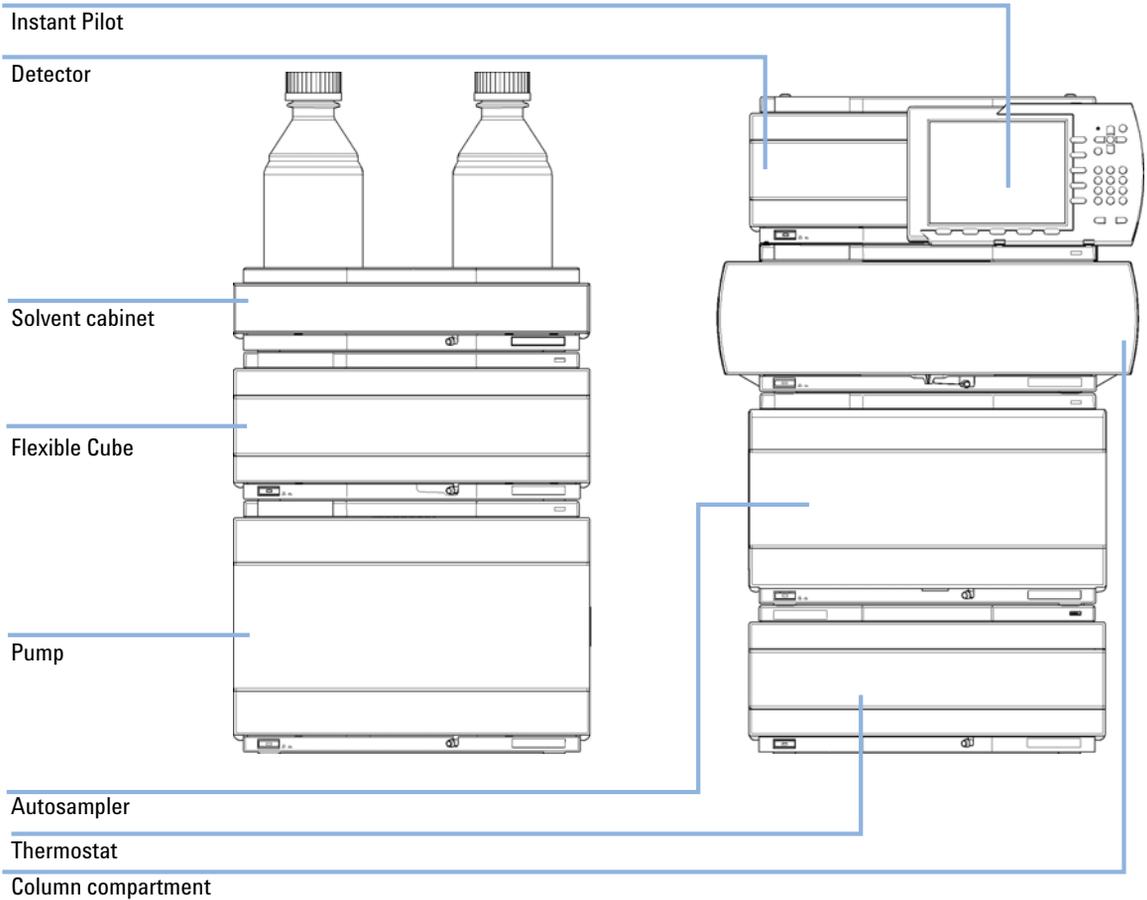
CAN Bus cable



AC Power

**Figure 11** Supported Two Stack Configuration Rear View (Standard)

### Two Stack Configuration (Thermostatted)



**Figure 12** Supported Two Stack Configuration Front View (Thermostatted)

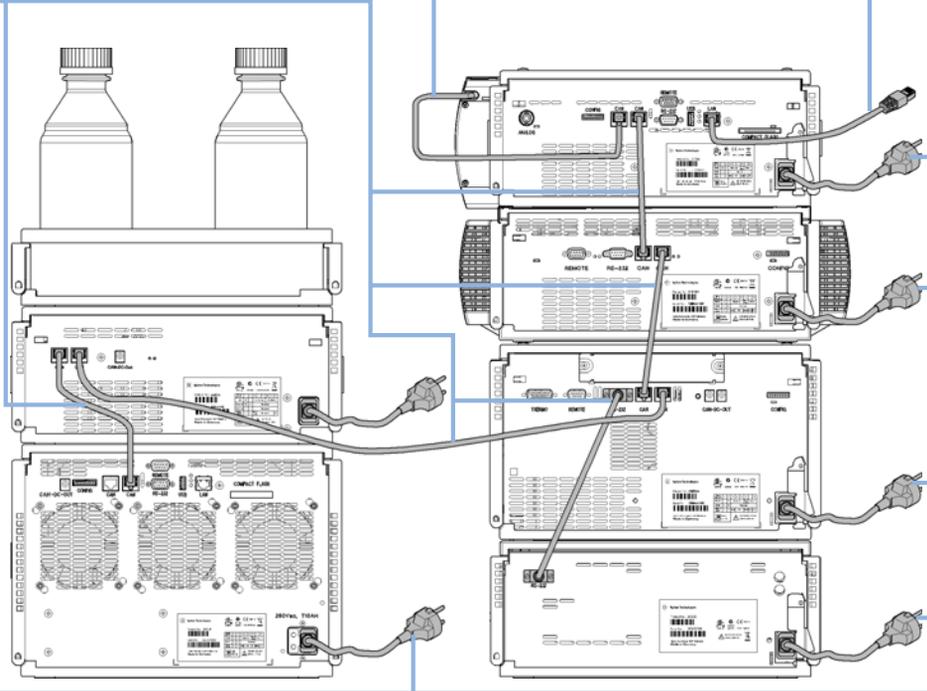
### 3 Installing the Module

#### Optimizing the Stack Configuration

LAN to control software

CAN to Instant Pilot

CAN Bus cable



AC Power

**Figure 13** Supported Two Stack Configuration Rear View (Thermostatted)

## Installing the Module

Parts required	#	Description
	G4227-64010	Agilent 1290 Infinity Flexible Cube Power cord
<b>Software required</b>	Data System and/or Instant Pilot G4208A with the appropriate revisions, see <a href="#">“Performance Specifications”</a> on page 34.	
<b>Preparations</b>	Locate bench space Provide power connections Unpack the module	

### 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.**

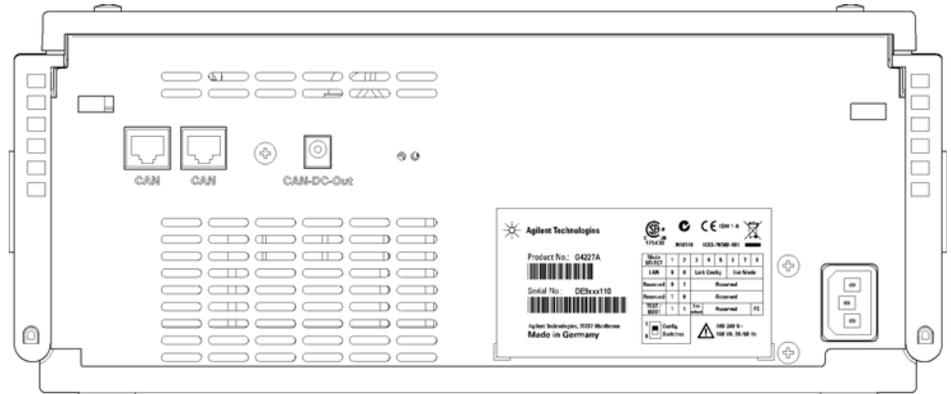
- Make sure that it is always possible to access the power plug.
- Remove the power cable from the instrument before opening the cover.
- Do not connect the power cable to the Instrument while the covers are removed.

- 
- 1 Place the Flexible Cube in the stack, see [“Optimizing the Stack Configuration”](#) on page 40.
  - 2 Ensure the line power switch on the front of the module is OFF (switch stands out).

### 3 Installing the Module

#### Installing the Module

- 3 Connect the power cable to the power connector at the rear of the module.



**Figure 14** Moduler Rear View

- 4 Connect the CAN cable to other modules.
- 5 Turn on power by pushing the button at the lower left hand side of the module.

The status LED should be green.

#### NOTE

The module is turned on when the line power switch is pressed and the green indicator lamp is illuminated. The module is turned off when the line power switch is protruding and the green light is off.

## Flow Connections to the Module

<b>Parts required</b>	#	<b>Description</b>
	G4227-68705	Flexible Cube Accessory Kit
<b>Hardware required</b>	System	
<b>Software required</b>	Data System and/or Instant Pilot G4208 with the appropriate revision, see <a href="#">“Performance Specifications”</a> on page 34	
<b>Preparations</b>	Flexible Cube is installed in system.	

### 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.

### CAUTION

Over pressure in the capillary

Damage to the flush pump

- Do not leave the Autosampler to Flexible Cube capillary installed if the Flexible Cube is not part of the Software configuration or if turned off during operation.

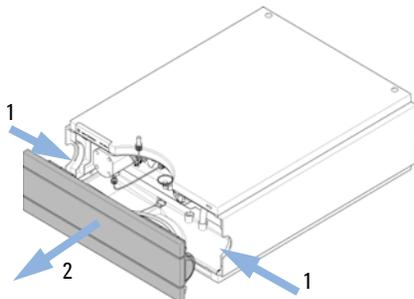
### NOTE

This procedure shows the Flexible Cube outside of a system. In an Agilent 1290 Infinity Liquid Chromatograph, the Flexible Cube is located between a G4220A Binary pump (below) and the G4226A Autosampler (above), see [“Optimizing the Stack Configuration”](#) on page 40.

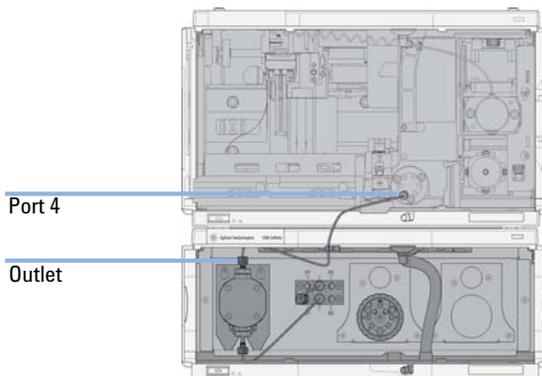
### 3 Installing the Module

#### Flow Connections to the Module

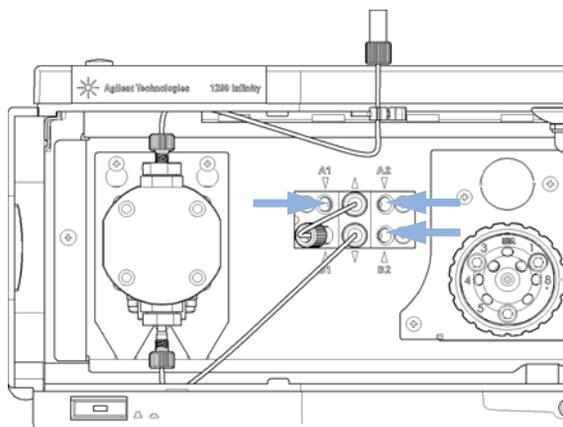
- 1** Open the front cover by pressing the buttons on the side of the Autosampler and Flexible Cube modules.



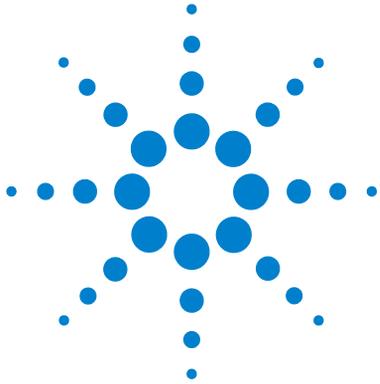
- 2** Install the capillary from the pump outlet into the port 4 of the injection valve.



- 3** Install the bottle head assemblies into the solvent selection valve of the Flexible Cube.



- 4** Install low restriction needle seat from accessory kit into autosampler (see autosampler manual - Maintenance section for procedure).



## 4 LAN Configuration

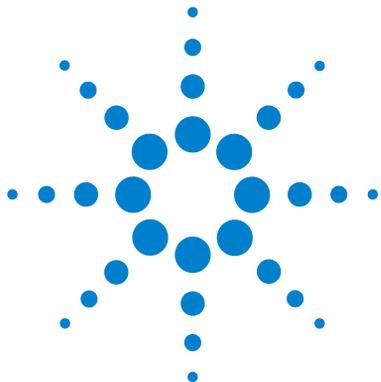
LAN-Configuration 52

This chapter provides information on connecting the module to the Agilent Data System.



## **LAN-Configuration**

It is not recommended to connect an Agilent 1290 Infinity system via the G4227A Flexible Cube. The G4212A Diode Array Detector is producing the most data in the stack, followed by the G4220A Binary pump, and it is therefore highly recommended to use either of these modules for the LAN connection.



## 5 Using the Module

Setting up the Flexible Cube with Agilent ChemStation	54
The Flexible Cube User Interface	55
Control Settings	57
Method Parameter Settings	58
Module Configuration	59

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



## 5 Using the Module

### Setting up the Flexible Cube with Agilent ChemStation

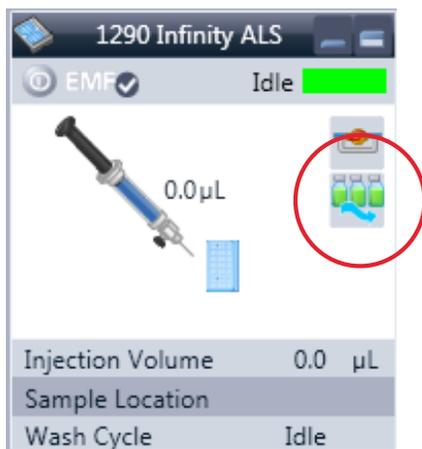
# Setting up the Flexible Cube with Agilent ChemStation

The setup of the Flexible Cube is shown with the Agilent ChemStation B.04.02 SP1. Depending on the controller (e.g. Agilent Instant Pilot, EZChrom Elite) the screens look different.

#### NOTE

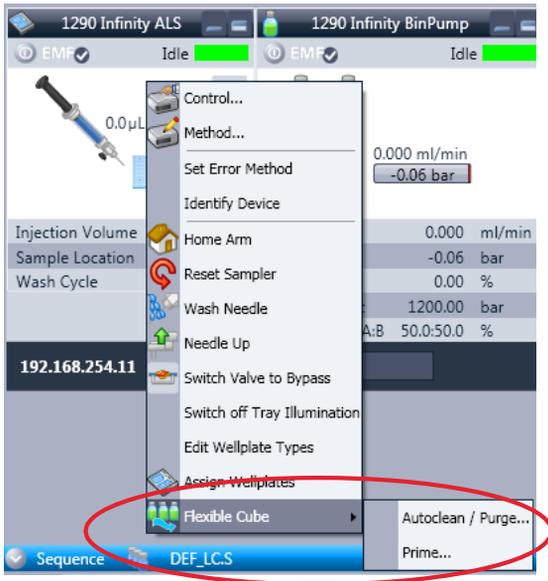
This section describes the Flexible Cube settings only. For information on the Agilent ChemStation or other 1290 Infinity modules refer to the corresponding documentation or the 1290 Infinity System Manual.

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



**Figure 15** ChemStation Method & Run Control

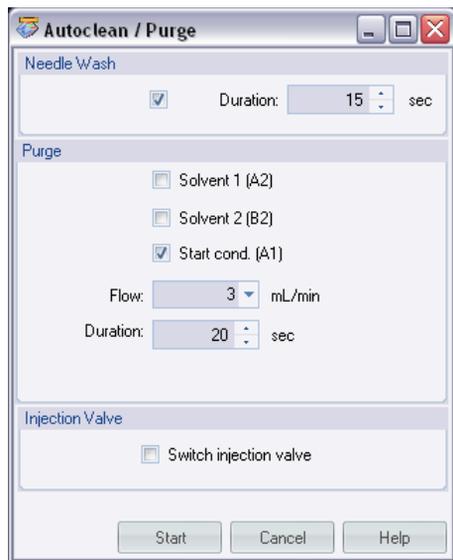
## The Flexible Cube User Interface



- A right-click into the *Active Area* will open a menu to
- Show the Control User Interface (special module settings)
  - Show the Method User interface (same as via menu Instrument – Setup G4226A)
  - And Flexible Cube specific items:
    - Autoclean / Purge
    - Prime

## 5 Using the Module

### Setting up the Flexible Cube with Agilent ChemStation



#### Autoclean:

The Autoclean function allows for a complete cleaning of the Autosampler. This process has been automated for ease of use and can be configured according to needs and setup.

- Needle Wash – Activate needle wash and setting of the wash time.
- Purge – Configure which solvents to use for needle seat back flushing and with what flowrate for how long.
- Injection valve – Can be selected for cleaning of the injection valve. This will switch the injection valve between mainpass and bypass a number of times.

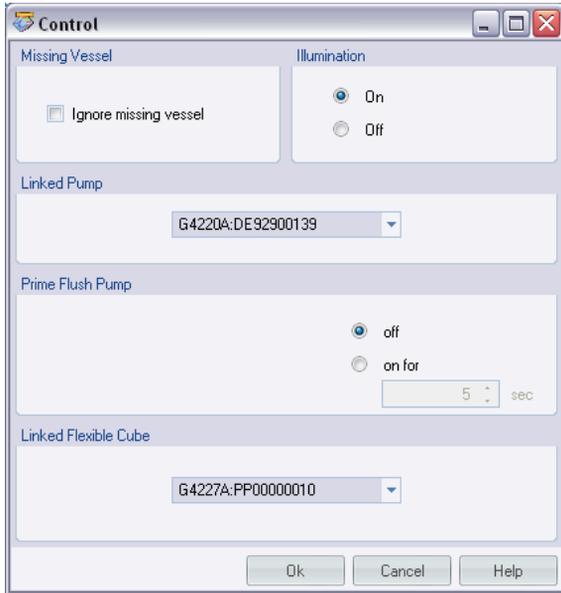
#### Prime:

Priming can be used when the flush lines have run dry or flush solvents have been changed. This feature primes the flush solvent inlet lines with fresh solvent.

It can be configured what solvent lines to prime and additionally the needle wash port can also be primed with solvent.

## Control Settings

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



### Linked Flexible Cube:

To configure which Flexible Cube delivers flow to the Autosampler.

### Prime Flush Pump:

Priming the Needle wash port for a given period of time.

## Method Parameter Settings

These settings are available via **Menu > Instrument > Setup Agilent 1290 Infinity Autosampler** or via right click on the Active area.

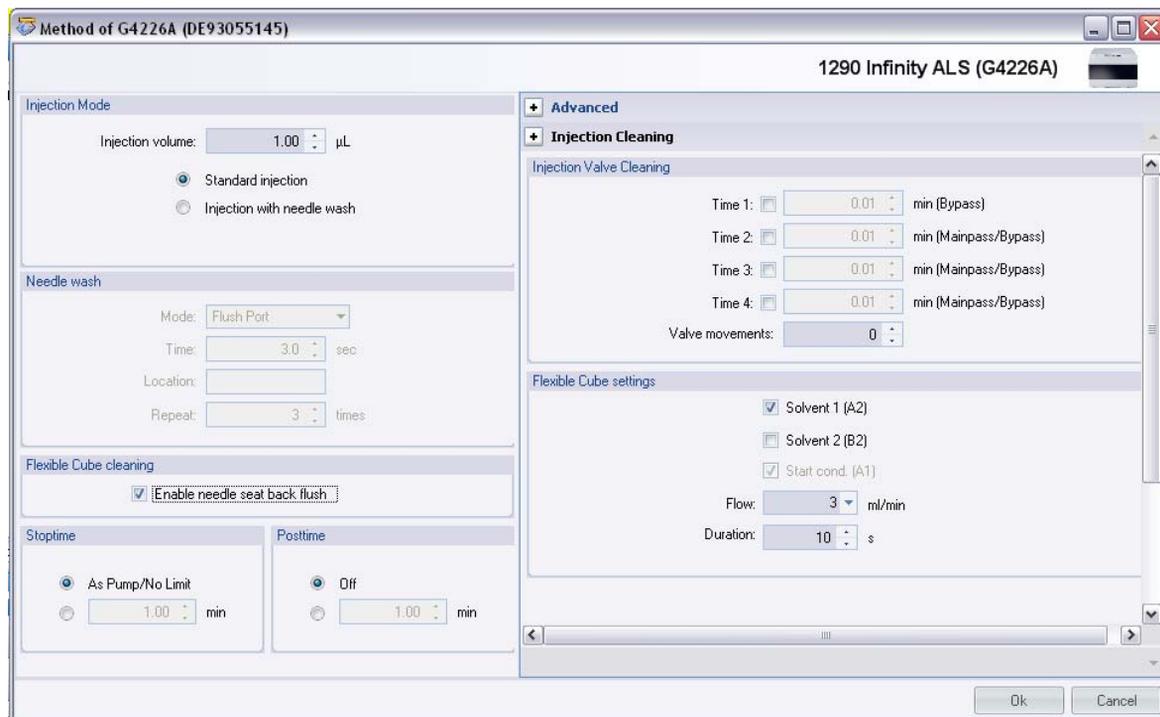
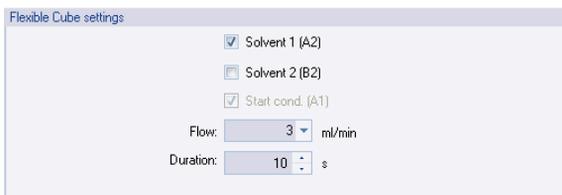


Figure 16 Method Parameter Settings



### Flexible Cube cleaning

In order to activate the Flexible Cube cleaning process the Enable needle seat back flush has to be checked.



### Flexible Cube settings

The setup includes choosing what solvent to use. Note that the Start Cond. (A1) cannot be deselected. Additionally the flow rate and duration can be selected.

## Module Configuration

**CAUTION**

Over pressure in the capillary

Damage to the flush pump

→ Do not leave the Autosampler to Flexible Cube capillary installed if the Flexible Cube is not part of the Software configuration or if turned off during operation.

---

These settings are available via menu **Instrument > More 1290 Infinity ALS > Control Configuration**.

## 5 Using the Module

### Setting up the Flexible Cube with Agilent ChemStation

**1100/1200 HipALS Configuration: Instrument 1**

**Communication**

Device name: 1290 Infinity ALS  
Type ID: G4226A  
Serial number: DE93055145  
Firmware revision: T.06.30 [008]  
Connection settings...

**Options**

Syringe: 20  $\mu$ L  
Seat Capillary: 1.2  $\mu$ L  
Max. injection volume: 20.00  $\mu$ L

External contacts board installed

use BCD port for  
 Location  Binary Output

BCD port output format  
 BCD  Binary

Thermostat installed  
 Flexible Cube installed  
 Rinse valve installed  
 Rinse valve enabled

Define Wellplates...

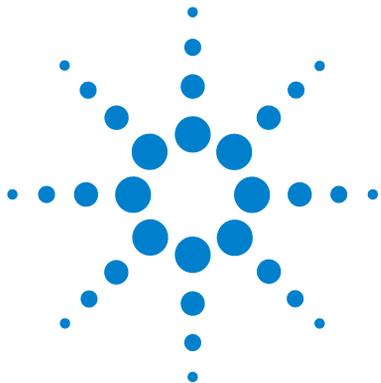
OK Cancel Help

#### Options:

Lists installed options for the G4226A Autosampler.

#### Flexible Cube installed:

If the **Flexible Cube** option is checked the **Flexible Cube cleaning** features becomes activated in the **Method and Configuration** screens.



## 6 Optimizing the Autosampler with the Flexible Cube

Preparing the Autosampler and Flexible Cube	62
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Internal Needle Wash	65
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Needle Seat Back Flush	67
Valve Rinse	69
How to Achieve Highest Throughput Using the Flexible Cube	72

This chapter provides information on how to optimize the Autosampler and the Flexible Cube for a minimum carry over and fastest cycle times.



## Preparing the Autosampler and Flexible Cube

For best performance of the Autosampler with Flexible Cube

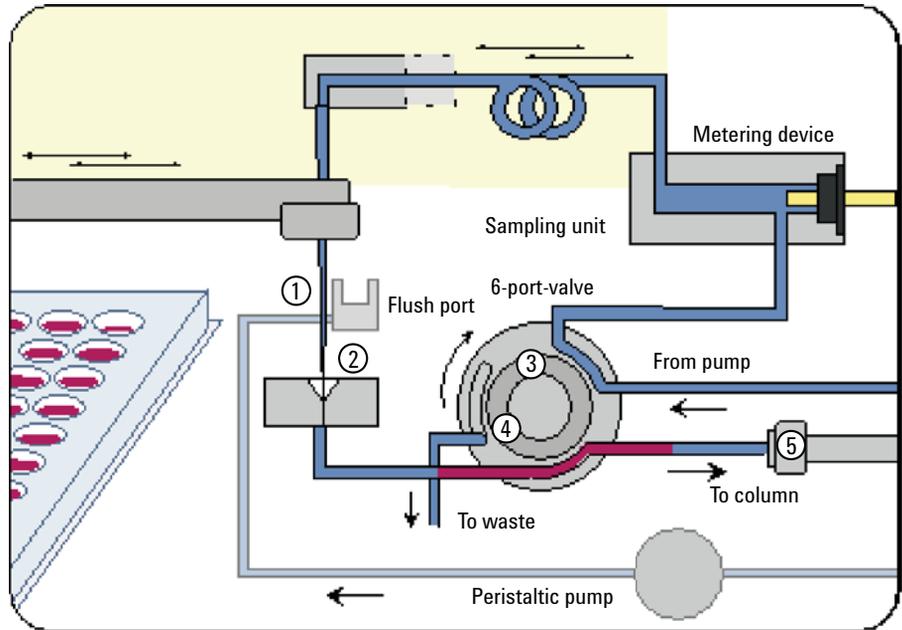
- Place solvent cabinet with the solvent bottles always on top (or at a higher level) of the Flexible Cube.
- It is recommended to purge the flush pump before starting a sequence, to ensure air free solvent in Autosampler capillaries
- When changing solvent bottles, prime the Flexible Cube to ensure purged solvent lines.
- Use separate solvent bottle for external needle wash in Autosampler. The Flexible Cube features solvent bottle filling tools that calculate the filling of the solvent bottles based on solvent consumption. Each solvent line is calculated separately.
- Use inlet filters for flush solvent bottles.
- It is recommended to sonicate solvent #3 which should be set to the chromatographic starting condition before use, to avoid generation of air bubbles.

## How to Achieve Lowest Carry Over

Carryover is measured when residual peaks from a previous active-containing injection appear in a subsequent blank solvent injection. There will be carry over between active injections which may lead to erroneous results. The level of carryover is reported as the area of the peak in the blank solution expressed as a percentage of the area in the previous active injection.

Reducing the Carry over is an important part during any method development process. The flush solvents and flush timing has to be adjusted to the sample solvent, sample components injected and the mobile phase in use.

## 6 Optimizing the Autosampler with the Flexible Cube How to Achieve Lowest Carry Over



**Figure 17** Potential Sources of Carry Over

1	Adsorption to needle and capillary material or bad design.
2	Needle seat design, improper sealing, worn out.
3	Valve Rotor/Stator, bad design, wear.
4	Capillary fittings misadjusted (at all connections contaminated with the sample!).
5	Column related carry-over (all fittings and connections of the column, packing, stationary phase-sample interaction).

The Agilent 1290 Infinity Autosampler is optimized for lowest carryover by careful design of the flow path and use of materials in which sample adsorption is minimized. A carryover amount of 0.002 % should be achievable even when a triple quadrupole mass spectrometer is used as detector. Operating settings of the Autosampler allow the user to set appropriate parameters to minimize carryover in any application involving compounds liable to stick in the system.

The following functions of the Autosampler can be used to minimize carryover:

- Internal needle wash
- External needle wash
- Needle seat back flush
- Injection valve cleaning

The flow path, including the inside of the needle, is continuously flushed in normal operation, providing lowest carryover for most applications.

**NOTE**

Not correctly applied fittings are the sole largest contributor to system carry over. Make sure to use correct fittings and to tighten the fittings correctly.

## Internal Needle Wash

Due to adsorption of sample compounds to the surface of the needle sample discrimination and/or carry over effects can occur. This effect might be eliminated by having the entire gradient profile flow through the sampling loop of the Autosampler.

Automated delay volume reduction (ADVR) and overlapped injection will reduce the delay volume but will also reduce the internal flushing of the Autosampler needle and should not be used with analytes where sample discrimination might be a problem.

## External Needle Wash

Adsorption of sample compounds to the outer surface of the needle might lead to contamination of sample vial septa and needle seat. The outside of the needle can be washed using a wash vial in a specific location or the needle can be washed using the flush port. If a wash vial in a tray location specified by the user is chosen then this vial should have no septum and should contain a solvent suitable for washing the sample from the needle. The septum is not used to avoid wiping contamination off the needle on the downstream only to re-apply it on the upstroke. The needle can be dipped into the vial multiple times. This will be effective in removing a small degree of carryover but for more effective washing of the outside of the needle use the flush port. The flush port is located above and behind the needle seat and a peristaltic pump delivers the wash solvent. It has a volume of 0.68 mL and the peristaltic pump delivers 6 mL/min, which means the flush port volume is completely refilled with fresh solvent in 7 s. If the flush port is selected, the user can set how long the outside of the needle is to be washed with fresh solvent. This may be as low as two or three seconds in routine situations where carryover is less of a problem and 10 – 20 s for more complete washing. It is recommended that washing the outside of the needle in the flush port should be standard procedure to avoid contaminating the needle seat.

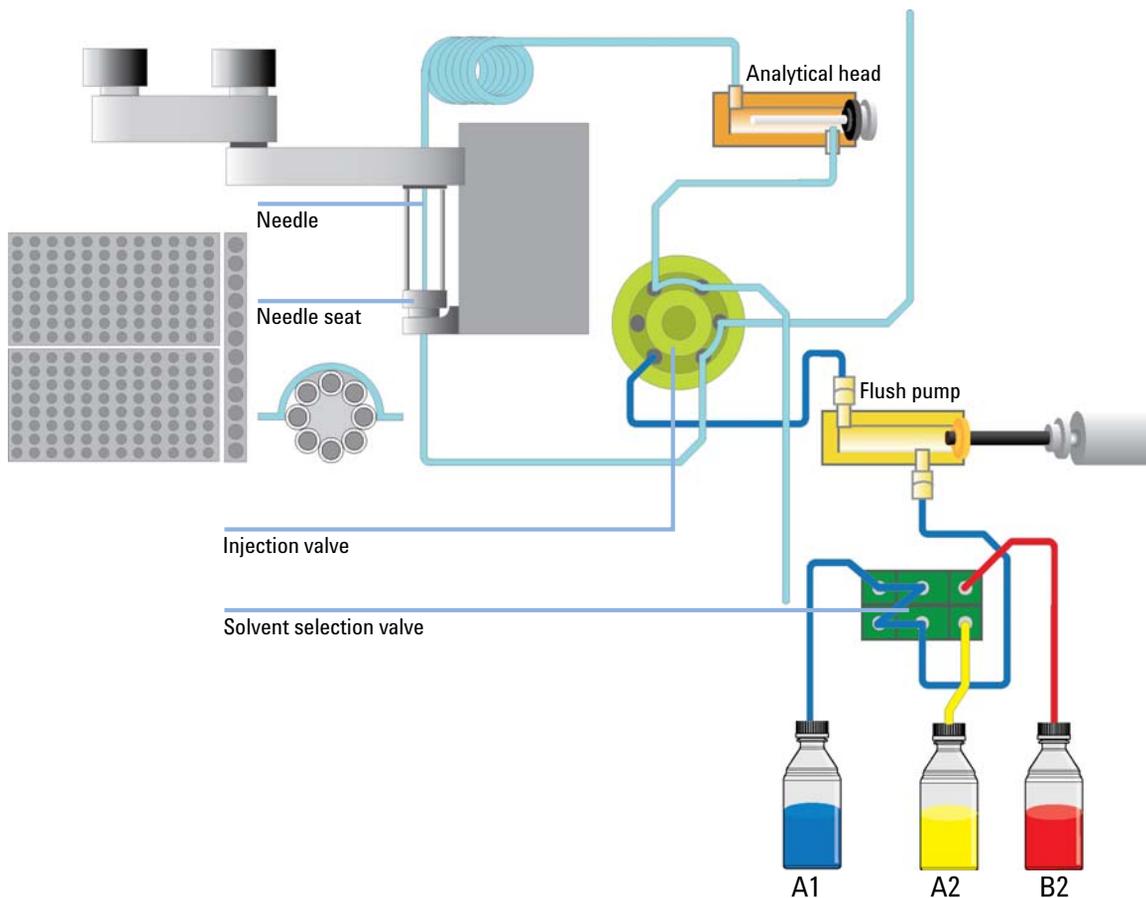
For samples where the outside of the needle cannot be cleaned sufficiently with water or alcohol from the flush pump use wash vials with an appropriate solvent. With an injector program several wash vials can be used for cleaning.

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

## Needle Seat Back Flush

Due to wear and tear in the needle seat and the rotor seal the carry over performance of the Autosampler is being reduced over time. To eliminate this effect, a back flushing of the needle seat can be used to restore performance.

If the needle seat or rotor seal becomes contaminated it will have to be back-flushed, by manually changing the flow connections, to clean it. This is one of the tasks that can be automated using the Flexible Cube module.



**Figure 18** Schematic of Autosampler with Flexible Cube Setup

## 6 Optimizing the Autosampler with the Flexible Cube

### How to Achieve Lowest Carry Over

If compounds are analyzed which are highly sticky and cannot be removed completely by an exterior needle wash they will contaminate the injector needle seat. To avoid the manual procedure of back flushing the Flexible Cube can be introduced into the LC system. The Flexible Cube contains a single piston pump and up to three solvent selection valves. This setup allows flushing the needle seat backwards with three different solvents of different strength. The flushing procedure starts prior to the injection to remove residues from the last injection while the needle is drawing the sample and then flushed from the outside in the flush port. Thereby, it is recommended to start with the strong dissolving solvent #1 and if necessary to continue with strong dissolving solvent #2. Prior to injection the seat and seat capillary should be flushed with solvent #3 to set it similar to chromatographic starting conditions.

To get the most efficient washing of the injection valve and needle seat, the flow rate chosen should be as high as possible. The flow rate might be restricted if using highly viscous wash solvents due to back pressure or if using a very low viscosity wash solvent due to jet stream effects. Recommended wash solution for most applications is a water methanol mixture, run at 4 mL/min flow rate.

The choice of dissolving solvents greatly depends on analyte and solvents in use. Normally the Dissolving solvent #1 should be of a high organic concentration with appropriate modifiers. If this is not sufficient to reduce the carry over a dissolving solvent #2 may be used with either different modifiers and/or a really strong cleaning solvent. Solvent #3 is always set for the final flush and should be the starting condition of the gradient or lower solution strength, as this solvent will be in the needle seat and seat capillary at the point of injection.

#### NOTE

Any flushing solvent used must be miscible with previous solvent. If this is not the case it can result in precipitations, blockages or reduced performance of the instrument.

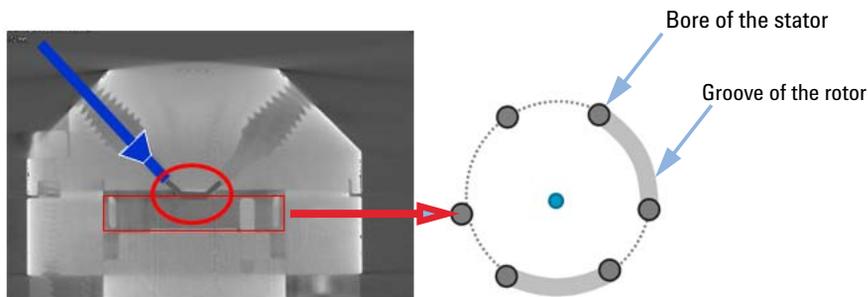
## Valve Rinse

Cavitations created due to wear will have an effect on the carry over performance of the injection valve. By switching the valve back and forth these cavitations will be flushed and cleaned and long term carry over performance can be achieved.

### NOTE

At each time, the valve is switched twice, from mainpass to bypass to mainpass. These additional switches must be taken into account when calculating the number of runs that can be executed until the rotor seal of the injection valve needs to be replaced (EMF). The rotor seal of the Autosampler has a lifetime of around 30000 switches.

When other measures have failed to eliminate carryover it might be that analyte is sticking inside the injector valve. The injector valve can be set to make additional switching movements to clean out the flow path in the valve if problems occur here with carryover.



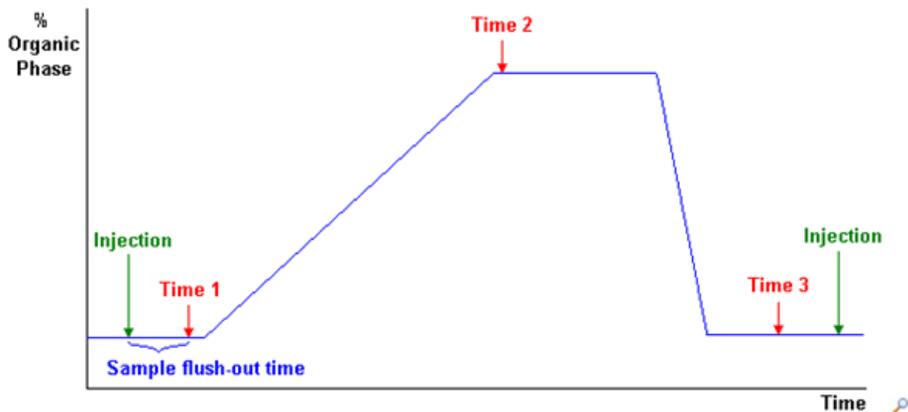
**Figure 19** The Problem Zone of the Injection Valve

If the problem compounds need a high percentage of organic phase for elution, it is recommended to switch the injection valve at the high percentage of organic phase after the last peak has eluted. It is also recommended to switch the injection valve again after the initial conditions for the mobile phase have stabilized. This ensures that the bypass groove in the rotor seal of the valve contains the gradient start conditions, which is especially important when using short narrow bore columns.

## 6 Optimizing the Autosampler with the Flexible Cube

### How to Achieve Lowest Carry Over

The Injection Valve Cleaning section allows you to specify the valve switching times anytime appropriate.



Times 1 to 4 are the times when the valve switches, to bypass (for time 1) or to mainpass and bypass (for times 2, 3 and 4). The times must be specified in ascending order. You can also switch the times to off. Between the first and second, and second and third valve switches, a rinse is executed using the rinse volumes specified in the Injector Cleaning section.

### Valve movements

You specify the number of times that the valve switches from mainpass to bypass at times 2, 3 and 4 in the field. The maximum value is 2; default is 1.

- Time 1 Valve switch directly after sample has been flushed out at high % water might be useful if sample is highly soluble in water.
- Time 2 Valve switch at high % organic phase to effectively remove sample from injection valve grooves, while avoiding sample retardation on the column.
- Time 3 Valve switch at low % organic phase to effectively remove organic solvent from injection valve groove.
- Time 4 Used to repeat valve switch 1, 2 or 3 in the case of extremely sticky sample or solvents.

#### NOTE

At each time, the valve is switched twice, from mainpass to bypass to mainpass. These additional switches must be taken into account when calculating the number of runs that can be executed until the rotor seal of the injection valve needs to be replaced (EMF).

### Calculation of Time 1

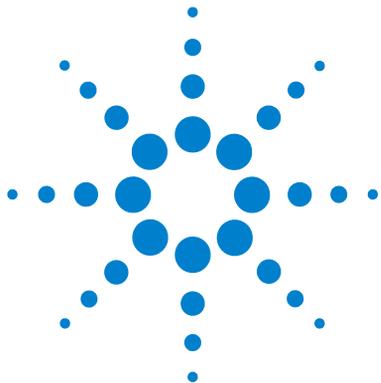
Time 1 = Sample flush-out factor \* Total flush-out volume/Flow rate

Total flush-out volume = Injection volume + Seat capillary volume + Valve volume

## **How to Achieve Highest Throughput Using the Flexible Cube**

A high throughput of the system can still be achieved by using the high throughput features of the autosampler. Any wash cycle will increase the cycle time of the system. The shortest cycle times using the flush function of the Flexible Cube can be achieved when only flushing with solvent #3 set to the chromatographic starting conditions only. The volume which has to be flushed can be calculated by adding the volume of the autosampler valve and the volume of the autosampler seat capillary. With the known flow rate of the pump in the Flexible Cube the flushing time can be calculated with the desired factor to flush the volume once or multiple times. A minimum of 5 seconds is recommended in order to get solvent in the needle seat exchanged.

For sticky samples or if sample discrimination is a problem it can be necessary to use multiple solvents. This will increase the minimum cycle time achievable. Typically one strong dissolving solvent and a solvent set to the chromatographic starting conditions is sufficient, but in case solubility issues between strong dissolving solvent and sample it might be necessary to use a second strong dissolving solvent. Typically a flushing time of the needle seat of about 15 s at 4 mL/min for each solvent is sufficient or at least a good starting condition.



## 7 Troubleshooting and Diagnostics

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



## Overview of the Module's Indicators and Test Functions

### Status Indicators

The module is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the module. The status indicators provide a quick visual check of the operation of the module.

### Error Messages

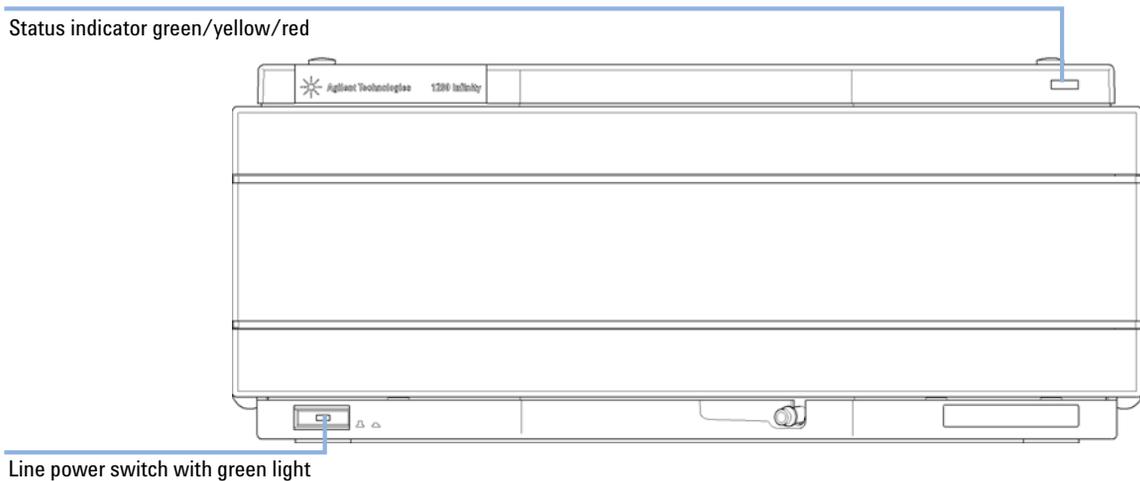
In the event of an electronic, mechanical or hydraulic failure, the module generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided (see chapter Error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

### Diagnostic Signals

The module has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing baseline problems; see Diagnostic Signals.

## Status Indicators

Two status indicators are located on the front of the module. The lower left indicates the power supply status, the upper right indicates the module status.



**Figure 20** Location of Status Indicators

## Power Supply Indicator

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

## Module Status Indicator

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

- When the status indicator is *OFF* (and power switch light is on), the module is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the module is performing an analysis (*run mode*).
- A *yellow* indicator indicates a *not-ready* condition. The module is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a set point), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the module has detected an internal problem which affects correct operation of the module. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.
- A *red-blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).
- A *fast red-blinking* indicator indicates that the module is in boot loader mode (e.g. during update of main firmware). In such as case try to re-boot the module or try a cold-start.

## User Interfaces

- Preferred tool should be the Agilent Diagnostic Software, see “[Agilent Lab Advisor Software](#)” on page 78.
- The Agilent ChemStation B.04.02 and above do not include any maintenance/test functions.
- Screenshots used within these procedures are based on the Agilent Lab Advisor Software.

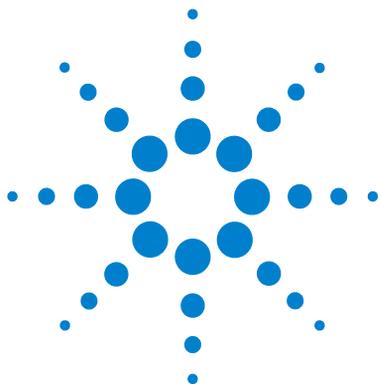
## Agilent Lab Advisor Software

The Agilent Lab Advisor software is a standalone product that can be used with or without data system. Agilent Lab Advisor software helps to manage the lab for high quality chromatographic results and can monitor in real time a single Agilent LC or all the Agilent GCs and LCs configured on the lab intranet.

Agilent Lab Advisor software provides diagnostic capabilities for all Agilent 1200 Infinity Series modules. This includes diagnostic capabilities, calibration procedures and maintenance routines for all the maintenance routines.

The Agilent Lab Advisor software also allows users to monitor the status of their LC instruments. The Early Maintenance Feedback (EMF) feature helps to carry out preventive maintenance. In addition, users can generate a status report for each individual LC instrument. The tests and diagnostic features as 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.

This manual provides lists with the names of Error Messages, Not Ready messages, and other common issues.



## 8 Error Information

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



## What Are Error Messages

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

## General Error Messages

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

### Timeout

The timeout threshold was exceeded.

#### Probable cause

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

#### Suggested actions

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

## Shut-Down

An external instrument has generated a shut-down signal on the remote line.

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

### Probable cause

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

### Suggested actions

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

## Remote Timeout

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

### Probable cause

- 1 Not-ready condition in one of the instruments connected to the remote line.
- 2 Defective remote cable.
- 3 Defective components in the instrument showing the not-ready condition.

### Suggested actions

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

## Synchronization Lost

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

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

### Probable cause

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

### Suggested actions

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

## Leak Sensor Short

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

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

### Probable cause

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

### Suggested actions

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

## Leak Sensor Open

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

- 1 Leak sensor not connected to the main board.
- 2 Defective leak sensor.
- 3 Leak sensor incorrectly routed, being pinched by a metal component.

### Suggested actions

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

## Compensation Sensor Open

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

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

### Probable cause

- 1 Defective main board.

### Suggested actions

- Please contact your Agilent service representative.

## Compensation Sensor Short

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

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

### Probable cause

- 1 Defective main board.

### Suggested actions

Please contact your Agilent service representative.

## Fan Failed

The cooling fan in the module has failed.

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

### Probable cause

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

### Suggested actions

Please contact your Agilent service representative.

Please contact your Agilent service representative.

Please contact your Agilent service representative.

## Leak

A leak was detected in the module.

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

### Probable cause

- 1 Loose fittings.
- 2 Broken capillary.

### Suggested actions

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

## Open Cover

The top foam has been removed.

### Probable cause

- 1 Foam not activating the sensor.
- 2 Dirty or defective sensor.

### Suggested actions

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

## Cover Violation

The top foam has been removed.

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

### Probable cause

- 1 The top foam was removed during operation.

- 2 Foam not activating the sensor.

### Suggested actions

Please contact your Agilent service representative.

Please contact your Agilent service representative.

## Module Specific Error Messages

These error messages are specific for the Flexible Cube.

### Flexcube has a leakage

A leak was detected in the module.

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

#### Probable cause

- 1 Loose fitting
- 2 Broken tubing

#### Suggested actions

- Ensure all fittings are tight
- Exchange defective tubing

## Flexcube fan failed

The cooling fan in the module has failed.

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

### Probable cause

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

### Suggested actions

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

## Pump failed at ejecting or at initializing

The stepper motor of the flush pump did not reach its end position.

If the flush pump is pumping against a restriction it will lose steps and thereby lose the position. It will then not be able to reach its home position, and an error message is generated.

### Probable cause

- 1 Blocked needle seat
- 2 Tubing not correctly installed
- 3 Flexible Cube not configured in software
- 4 Defective flush pump

### Suggested actions

- Replace blocked needle seat
- Configure tubing to position 4 of injection valve.
- Configure Flexible Cube correctly
- Please contact your Agilent service representative

## **Valve failed to switch or didn't initialize**

Lost steps of the valve encoder.

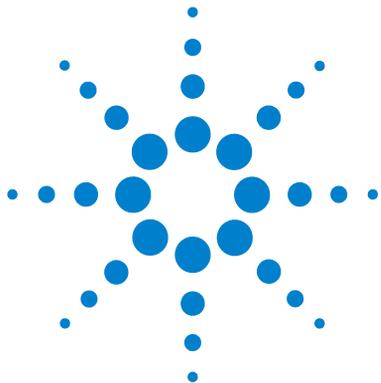
The valve drive has lost its position information and is not able to initialize.

### **Probable cause**

- 1** Valve drive mechanically blocked or defect

### **Suggested actions**

- Check installation of valve head
- Please contact your Agilent service representative



## 9 Maintenance and Repair

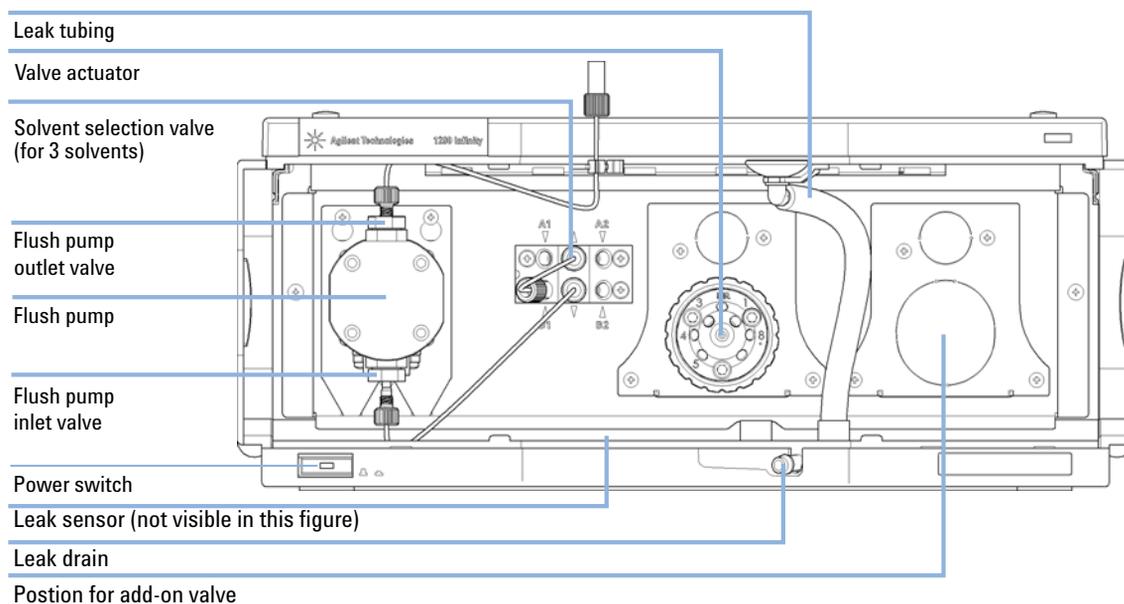
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This chapter describes the maintenance of the module.



## Introduction to Maintenance

Figure 21 on page 92 shows the main user accessible assemblies of the Agilent 1290 Infinity Flexible Cube. These parts can be accessed from the front (simple repairs) and don't require to remove the Flexible Cube from the system stack.



**Figure 21** Front of the Flexible Cube

## Warnings and Cautions

### WARNING

#### **Toxic and hazardous solvents and flammable liquids**

**The handling of solvents and reagents can hold health risks.**

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

### 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 metal top cover of the module. No serviceable parts inside.
  - Only certified persons are authorized to carry out repairs inside the module.
- 

### 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. electrical shock, when the cover is opened and the module is connected to power.**

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

**WARNING**

**Personal injury or damage to the product**

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

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

---

**CAUTION**

**Safety standards for external equipment**

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

---

## **Overview of Maintenance**

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

## Cleaning the Module

The module case should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and mild detergent. Do not use an excessively damp cloth as liquid may drip into the module.

### **WARNING**

**Liquid dripping into the electronic compartment of your module.**

**Liquid in the module electronics can cause shock hazard and damage the module.**

- Do not use an excessively damp cloth during cleaning.
  - Drain all solvent lines before opening any fittings.
-

## Exchange Flush Pump Inlet Valve

**When** If the Flush pump delivery test fails or if the Inlet valve show signs of malfunction.

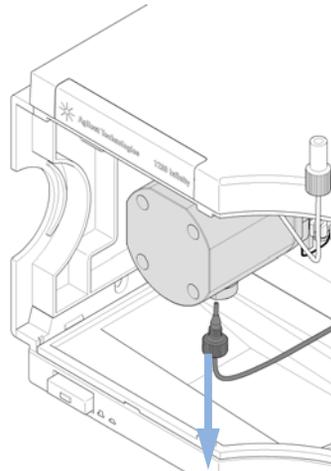
**Tools required** Wrench open 14 mm (p/n 8710-1924)

Parts required	#	Description
	5067-4717	Inlet valve

**Preparations** In order to avoid leaks, place the solvent bottles at or below the level of the pump head.

**1** Open the front door of the module.

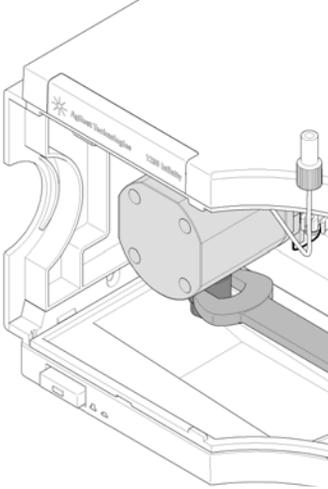
**2** Disconnect the finger tight fitting of the Inlet capillary at the bottom of the Flush pump.



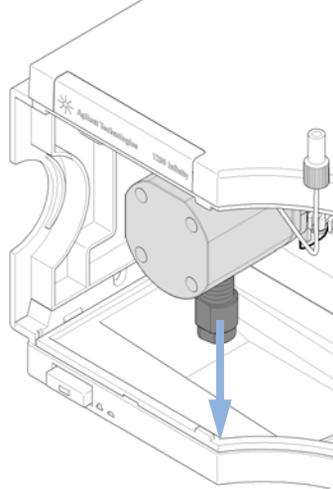
## 9 Maintenance and Repair

### Exchange Flush Pump Inlet Valve

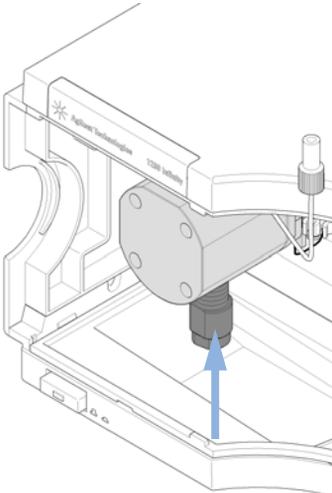
**3** With a 14 mm wrench on the flange closest to the pump head, unscrew the valve.



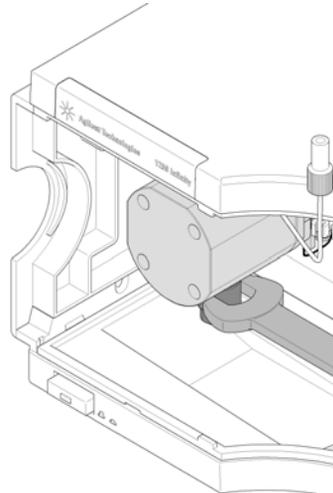
**4** Remove the valve by moving it downwards.



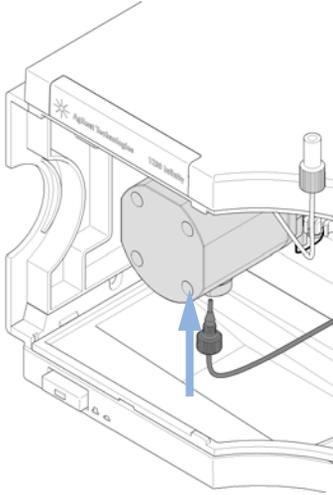
**5** Insert the new valve.



**6** Tighten the valve with a 14 mm wrench attached to the flange closest to the pump head.



**7** Reconnect the finger tight fitting at the inlet of the flush pump.



**8** Close the front cover and prime the flush pump before use to warrant trouble free usage.

## 9 Maintenance and Repair

### Exchange Flush Pump Outlet Valve

# Exchange Flush Pump Outlet Valve

**When** If the Flush pump delivery test fails or if the Outlet valve show signs of malfunction.

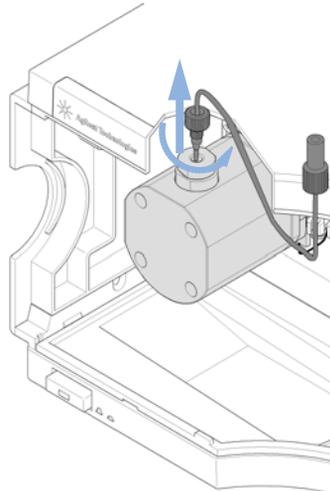
**Tools required**

- 1/4 inch X 5/16 inch wrench (p/n 8710-0510)
- Wrench open 14 mm (p/n 8710-1924)

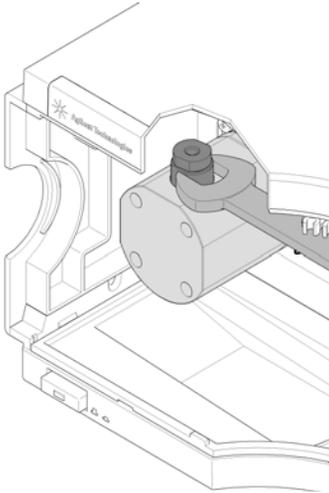
<b>Parts required</b>	<b>#</b>	<b>Description</b>
	5067-4716	Outlet valve

**1** Open the front door of the module.

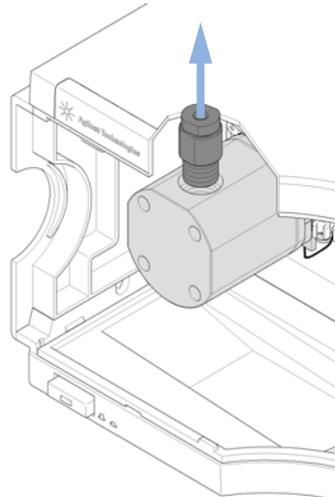
**2** With a ¼ inch wrench disconnect the capillary at the top of the Outlet valve.



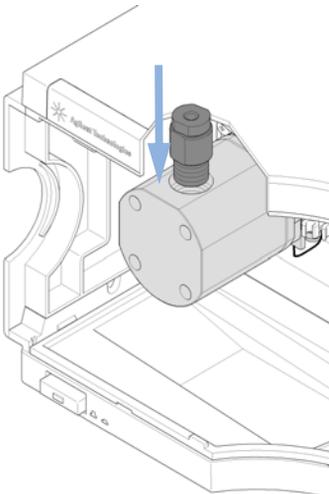
**3** With a 14 mm wrench on the flange closest to the pump head, unscrew the valve.



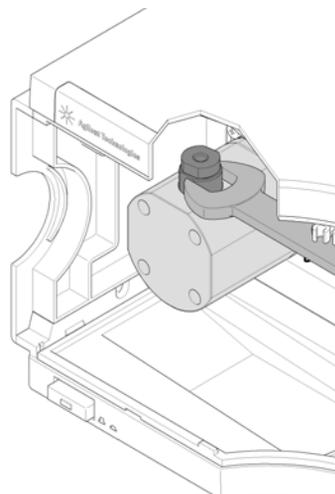
**4** Remove the valve by lifting it upwards.



**5** Insert the new valve.



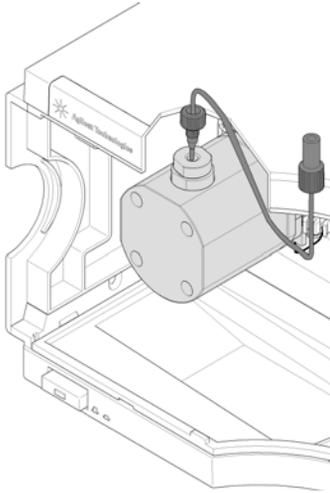
**6** Tighten the valve with a 14 mm wrench attached to the flange closest to the pump head.



## 9 Maintenance and Repair

### Exchange Flush Pump Outlet Valve

- 7** Reconnect the capillary with a ¼ inch wrench at the outlet of the flush pump.



- 8** Close the front cover and prime the flush pump before use to warrant trouble free usage.

## Exchange Valve Rotor Seal

**When** When rotor seal is visibly damaged, blocked or leaks.

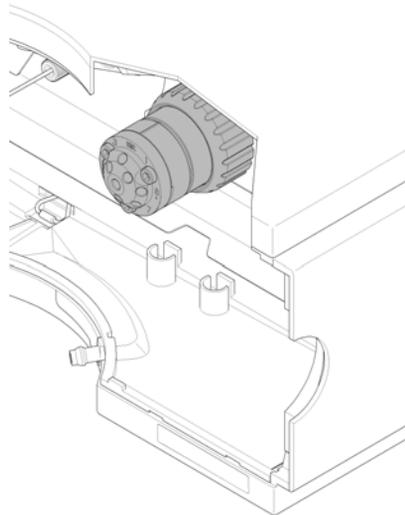
**Tools required** 1/4 inch X 5/16 inch wrench (p/n 8710-0510)  
Hex key 9/64 inch 15 cm long T-handle (p/n 8710-2394)

Parts required	#	Description
	Part number depending on valve pod in use	Rotor seal

**Preparations** In order to avoid leaks, place the solvent bottles at or below the level of the pump head.

**1** Open the front door of the module.

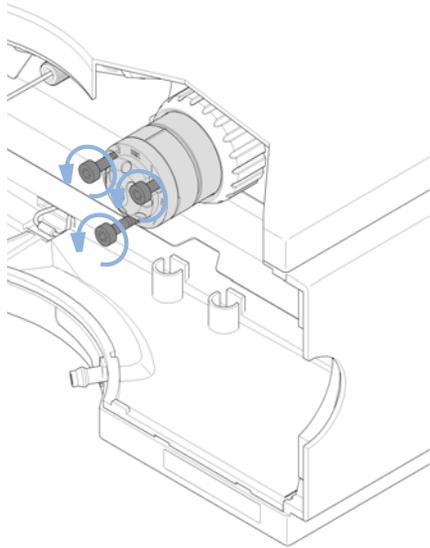
**2** Remove all capillaries from the valve head.



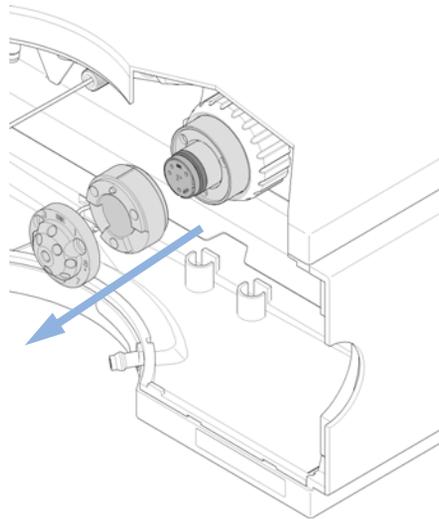
## 9 Maintenance and Repair

### Exchange Valve Rotor Seal

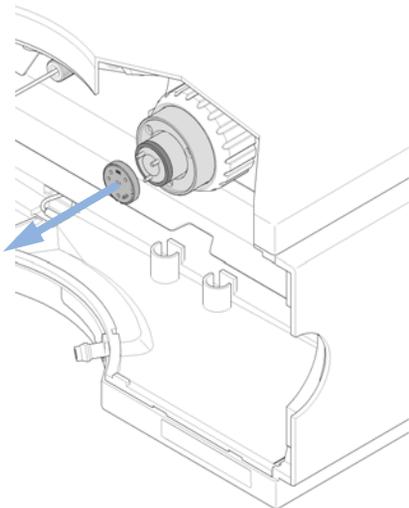
**3** With a 9/64 inch hex key unscrew the stator screws.



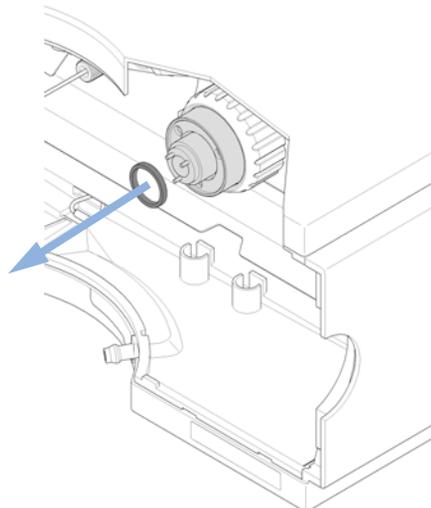
**4** Remove the stator head and the stator ring.



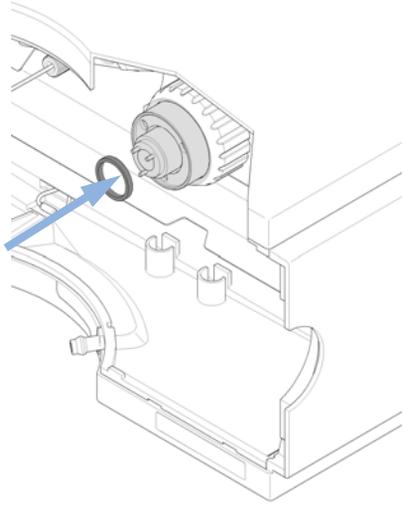
**5** Remove the rotor seal.



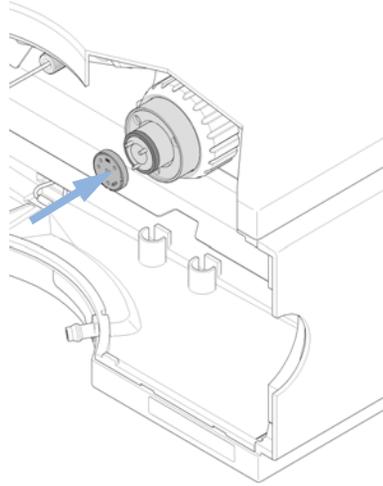
**6** Remove the Isolation seal.



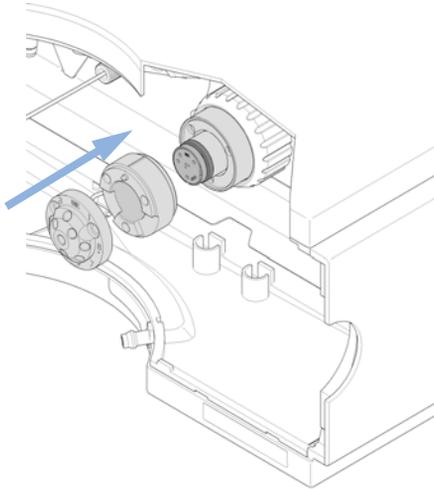
**7** Replace the Isolation seal.



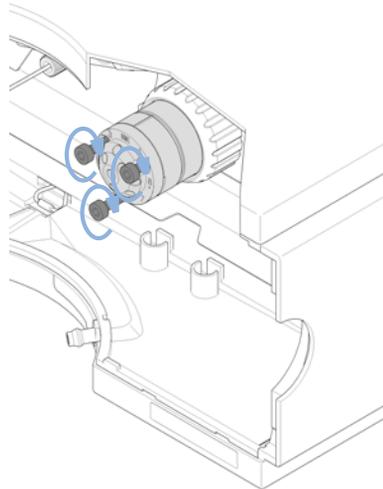
**8** Install new rotor seal.



**9** Install the stator head and the stator ring.



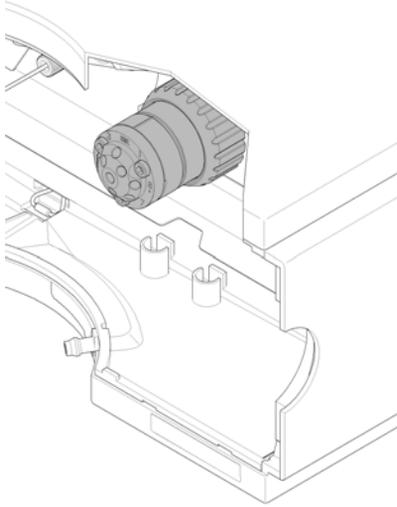
**10** With a 9/64 inch hex key alternately tighten the stator screws.



## 9 Maintenance and Repair

### Exchange Valve Rotor Seal

**11** Reinstall all capillaries to the valve head depending on the type and usage of the valve.



**12** Close the front cover and prime the flush pump before use to warrant trouble free usage.

## Replacing Module Firmware

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

- Tools required**
- LAN/RS-232 Firmware Update Tool or
  - Agilent Lab Advisor software
  - Instant Pilot G4208A (only if supported by module)

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

**Preparations** Read update documentation provided with the Firmware Update Tool.

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

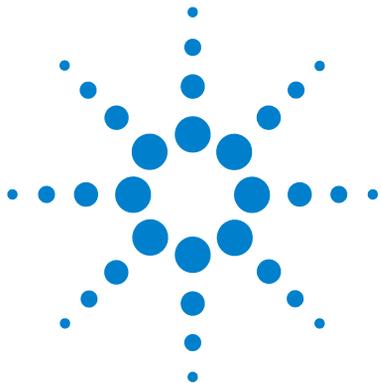
- 1** Download the required module firmware, the latest LAN/RS-232 FW Update Tool and the documentation from the Agilent web.
  - [http://www.chem.agilent.com/scripts/cag\\_firmware.asp](http://www.chem.agilent.com/scripts/cag_firmware.asp).
- 2** To load the firmware into the module follow the instructions in the documentation.

*Module Specific Information*

There is no specific information for this module.

## **9 Maintenance and Repair**

### **Replacing Module Firmware**



## 10 Parts and Materials for Maintenance

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Parts overview	111
Accessory Kits	112

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



## 10 Parts and Materials for Maintenance

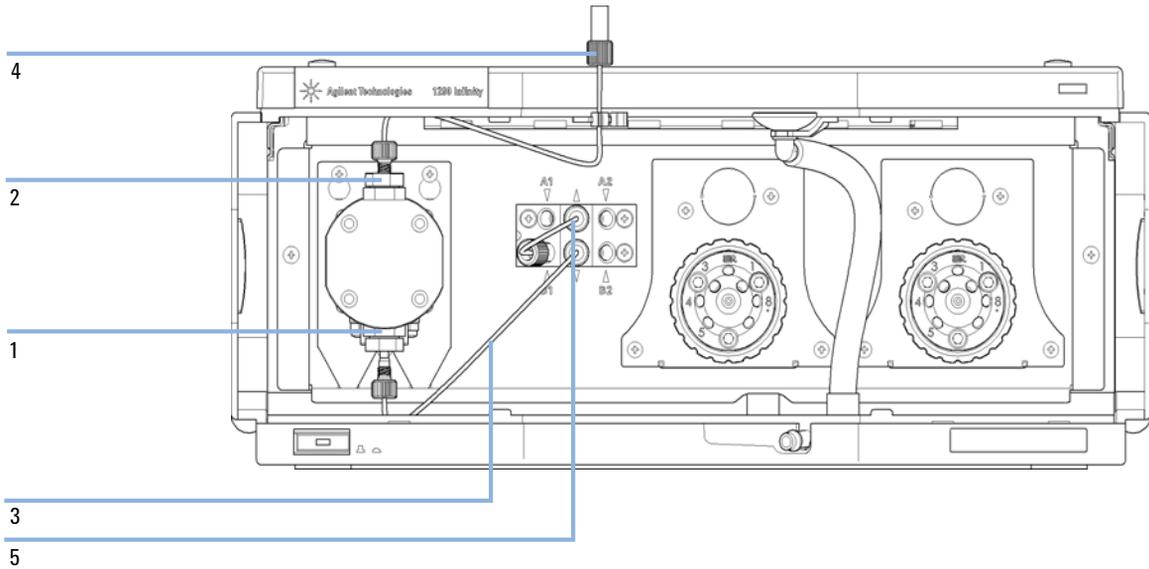
### Capillaries

# Capillaries

<b>Item</b>	<b>p/n</b>	<b>Description</b>
1	5067-4680	Tubing Kit 600 mm; 130 bar
2	G4280-67304	Solvent selection valve to flush pump tubing
3	5067-4697	Solvent selection valve bridge tubing

## Parts overview

Item	p/n	Description
1	5067-4717	Inlet valve
2	5067-4716	Outlet valve
3	G4280-67304	Solvent selection valve to flush pump tubing
4	5067-4680	Tubing Kit 600 mm; 130 bar
5	5067-4697	Solvent selection valve bridge tubing



**Figure 22** Parts overview

## Accessory Kits

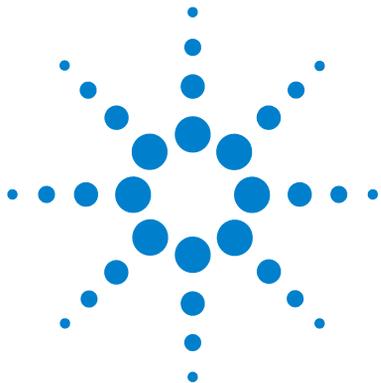
### HPLC System Tool Kit

HPLC System Tool Kit (p/n G4203-68708) contains some accessories and tools needed for installation and repair of the module.

### Flexible Cube Accessory Kit

Flexible Cube Accessory Kit (p/n G4227-68705) contains some accessories and tools needed for installation and repair of the module.

<b>p/n</b>	<b>Description</b>
0100-1816	Fitting Waste Tube to Purge Valve
0890-1711	Leak tubing 185 mm
0890-2207	Tubing/Sleeving-Flex
5067-4680	Tubing Kit 600 mm; 130 bar
5067-4701	SS-Capillary_300x0.25mm ps ps 2sh
5181-1519	CAN cable, Agilent module to module, 1 m
5959-3878	CTN.SOLV.CABIN.
9301-1420	Solvent bottle, transparent
G4220-60007	Bottle Head Assembly
G4226-87012	Needle seat



## 11 Identifying Cables

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This chapter provides information on cables used with the 1290 series of HPLC 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	Connector, Agilent module to 3394/6 integrators
35900-60750	Agilent 35900A A/D converter
01046-60105	Connector, Agilent module to general purpose

### Remote cables

p/n	Description
03394-60600	Connector, Agilent module to 3396A Series I integrators 3396 Series II / 3395A integrator, see details in section <a href="#">“Remote Cables”</a> on page 118
03396-61010	Connector, Agilent module to 3396 Series III / 3395B integrators
5061-3378	Connector, Agilent module to Agilent 35900 A/D converters (or HP 1050/1046A/1049A)
01046-60201	Connector, Agilent module to general purpose

### BCD cables

p/n	Description
03396-60560	Connector, Agilent module to 3396 integrators
G1351-81600	Connector, Agilent module to general purpose

### CAN cables

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

### LAN cables

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

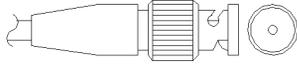
### External Contact Cable

p/n	Description
G1103-61611	External contact cable - Agilent module interface board to general purposes

### RS-232 cables

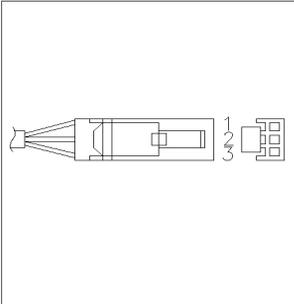
p/n	Description
G1530-60600	RS-232 cable, 2 m
RS232-61600	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

## Analog Cables

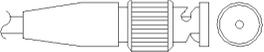


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

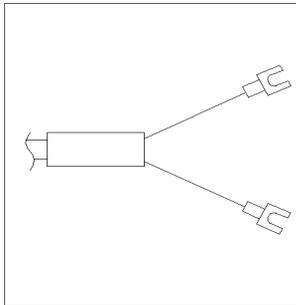
### Agilent Module to 3394/6 Integrators

Connector, Agilent module to 3394/6 integrators (p/n 35900-60750)	Pin 3394/6	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

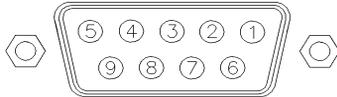
### Agilent Module to BNC Connector

Connector, 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

Connector, Agilent module to general purpose (p/n 01046-60105)	Pin 3394/6	Pin Agilent module	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

## Remote Cables



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

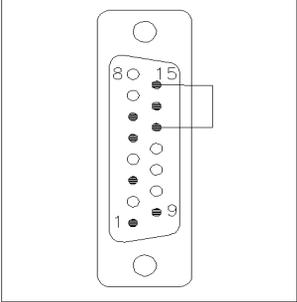
### Agilent Module to 3396A Integrators

Connector, Agilent module to 3396A Series I integrators (p/n 03394-60600)	Pin 3394	Pin Agilent module	Signal Name	Active (TTL)
<p>A diagram of the Agilent module connector showing a vertical row of pins. Pins 1, 3, 5, 7, 9, 13, and 15 are labeled. Pin 1 is at the bottom, and pin 15 is at the top. Pins 8 and 15 are also labeled on the left side of the connector.</p>	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

### Agilent Module to 3396 Series II / 3395A Integrators

Use the cable Connector, Agilent module to 3396A Series I integrators (p/n 03394-60600) and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

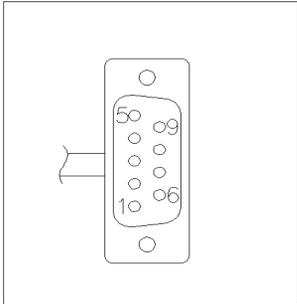
### Agilent Module to 3396 Series III / 3395B Integrators

Connector, Agilent module to 3396 Series III / 3395B integrators (p/n 03396-61010)	Pin 33XX	Pin Agilent module	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	14	7 - Red	Ready	High
	4	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

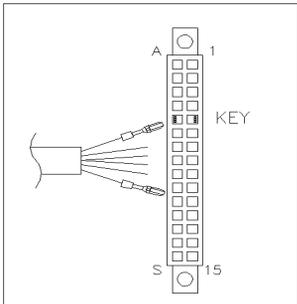
## 11 Identifying Cables

### Remote Cables

### Agilent Module to Agilent 35900 A/D Converters (or HP 1050/1046A/1049A)

Connector, Agilent module to Agilent 35900 A/D converters (or HP 1050/1046A/1049A) (p/n 5061-3378)	Pin HP 1050/....	Pin Agilent modul	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

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

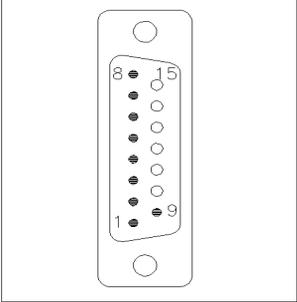
### Agilent Module to General Purpose

Connector, 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

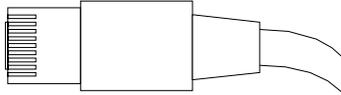
## 11 Identifying Cables

### BCD Cables

#### Agilent Module to 3396 Integrators

Connector, Agilent module to 3396 integrators (p/n 03396-60560)	Pin 3392/3	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.

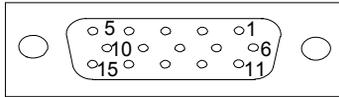
### CAN Cables

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)

## External Contact Cable



One end of this cable provides a 15-pin plug to be connected to Agilent modules interface board. The other end is for general purpose.

### Agilent Module Interface Board to general purposes

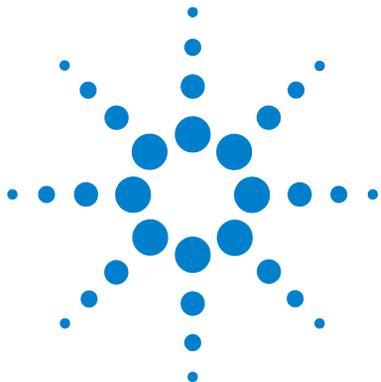
Connector External contact cable - Agilent module interface board to general purposes (p/n G1103-61611)	Color	Pin Agilent module	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected
	Brown/green	14	Not connected
	White/yellow	15	Not connected

## Agilent Module to PC

<b>p/n</b>	<b>Description</b>
G1530-60600	RS-232 cable, 2 m
RS232-61600	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

## **11 Identifying Cables**

### **Agilent Module to PC**



## 12 Appendix

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Agilent Technologies on Internet	135

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



## General Safety Information

### General Safety Information

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

#### **WARNING**

**Ensure the proper usage of the equipment.**

**The protection provided by the equipment may be impaired.**

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

---

### Safety Standards

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

### Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired,

the instrument must be made inoperative and be secured against any intended operation.

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

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided whenever possible. When inevitable, this has to be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

When working with solvents please observe appropriate safety procedures (e.g. goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

## Safety Symbols

Table 7 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.

### 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.

## The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC)

### Abstract

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

#### NOTE



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

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.

*Do not dispose off in domestic household waste*

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

## **Radio Interference**

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

### **Test and Measurement**

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

## Sound Emission

### Manufacturer's Declaration

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

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

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

## Flow Cell

### Flow Cell

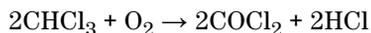
To protect optimal functionality of your flow-cell:

- Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.

### Use of Solvents

Observe the following recommendations on the use of solvents.

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



This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol,

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides,
- Solvents containing strong complexing agents (e.g. EDTA),
- Mixtures of carbon tetrachloride with 2-propanol or THF.

## Agilent Technologies on Internet

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

<http://www.agilent.com>

Select Products/Chemical Analysis

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

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## In This Book

This manual contains technical reference information about the Agilent 1290 Infinity Flexible Cube G4227A.

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

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