



Agilent 1260 Infinity Diode Array and Multiple Wavelength Detector

User Manual



Agilent Technologies

Notices

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In This Guide...

This manual covers the Agilent 1260 Infinity Diode Array and Multiple Wavelength Detector modules:

- G1315C - 1260 DAD VL+
- G1365C - 1260 MWD
- G1315D - 1260 DAD VL
- G1365D - 1260 MWD VL

1 Introduction

This chapter gives an introduction to the detector, 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 module.

4 LAN Configuration

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

5 Using the Detector

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

6 How to optimize the Detector

This chapter provides information on how to optimize the detector.

7 Troubleshooting and Diagnostics

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

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 Test Functions

This chapter describes the detector's built in test functions.

10 Maintenance

This chapter describes the maintenance of the detector.

11 Parts for Maintenance

This chapter provides information on parts for maintenance.

12 Identifying Cables

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

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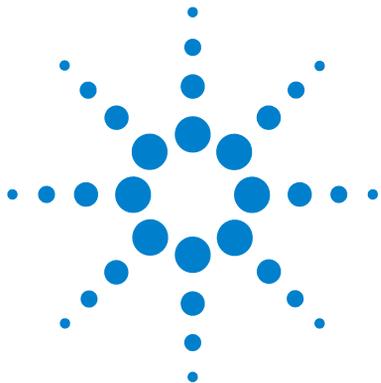
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This chapter gives an introduction to the detector, instrument overview and internal connectors.



Introduction to the Detector

The detector is designed for highest optical performance, GLP compliance and easy maintenance. It includes the following features:

- 80 Hz data acquisition rate for (ultra-) fast LC applications (requires internal hard disk, G1315C and G1365C only),
- data recovery (DRC) feature provides data-never-lost insurance (requires internal hard disk, G1315C and G1365C only),
- RFID tags for all flow cells and UV-lamps provides traceable information about these assemblies,
- long-life deuterium with RFID tag and tungsten lamps for highest intensity and lowest detection limit over a wavelength range of 190–950 nm,
- no loss in sensitivity for up to eight wavelengths simultaneous,
- programmable slit from 1–16 nm for complete optimization of sensitivity, linearity and spectral resolution,
- optional flow-cell cartridges with RFID tag (standard 10 mm 13 μ l, semi-micro 6 mm 5 μ l, micro 3 mm 2 μ l, 80 nl, 500 nl, 10 mm, high pressure 10 mm 1.7 μ l and prep-cells) are available and can be used depending on the application needs,
- easy front access to lamps and flow cell for fast replacement, and
- built-in holmium oxide filter for fast wavelength accuracy verification,
- built-in temperature control for improved baseline stability,
- additional diagnostic signals for temperature and lamp voltage monitoring,

For specifications, see “[Performance Specifications](#)” on page 38.

Optical System

The optical system of the detector is shown in Figure below. Its illumination source is a combination of a deuterium-arc-discharge lamp for the ultraviolet (UV) wavelength range and a tungsten lamp for the visible (VIS) and short-wave near-infrared (SWNIR) wavelength range. The image of the filament of the tungsten lamp is focused on the discharge aperture of the deuterium lamp by means of a special rear-access lamp design which allows both light sources to be optically combined and share a common axis to the source lens. The achromat (source lens) forms a single, focused beam of light through the flow cell. Each cell room and lamp are separated by a quartz window which can be cleaned or replaced. In the spectrograph, light is being dispersed onto the diode array by a holographic grating. This allows simultaneous access to all wavelength information.

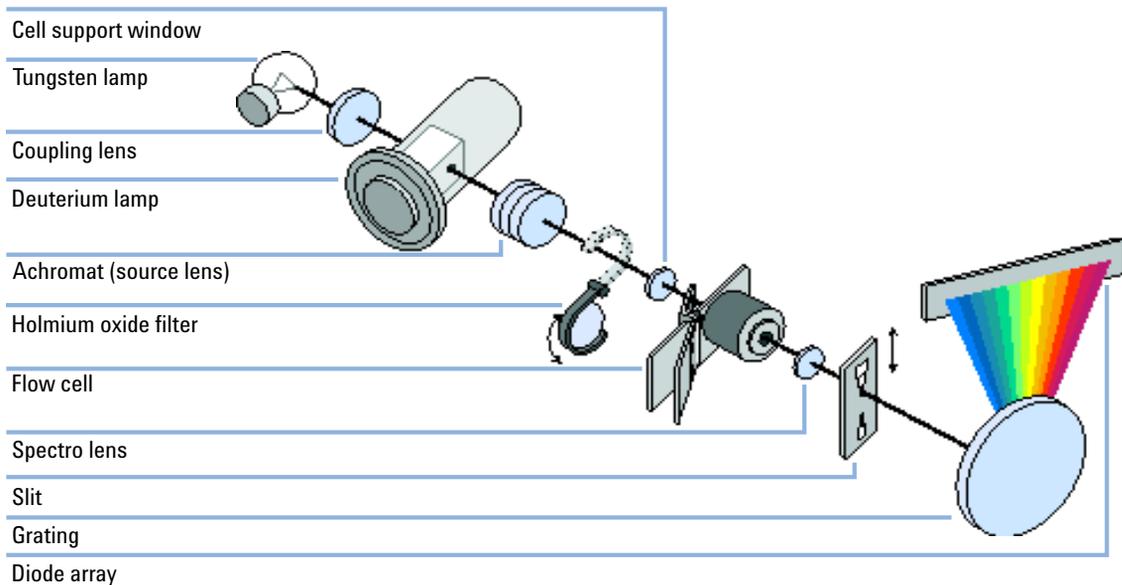


Figure 1 Optical System of the Detector

Lamps The light source for the UV-wavelength range is a deuterium lamp with a shine-through aperture. As a result of plasma discharge in low-pressure deuterium gas, the lamp emits light over the 190 nm to approximately 800 nm wavelength range. The light source for the visible and SWNIR wavelength range is a low noise tungsten lamp. This lamp emits light over the wavelength range 470 – 950 nm.

Achromat (Source Lens) The achromat receives the light from both lamps and focuses it so that the beam passes through the flow cell.

Holmium Oxide Filter The holmium oxide filter is electromechanically actuated. During the holmium filter test it moves into the light path.

Cell Support Window The cell support window assembly separates the holmium filter area from the flow cell area.

Flow Cell Compartment The optical unit has a flow cell compartment for easy access to flow cells. A variety of optional flow cells can be inserted using the same quick, simple mounting system. The flow cell can be removed to check the optical and electronic performance of the detector without having influences from the flow cell.

Spectrograph The spectrograph material is ceramic to reduce thermal effects to a minimum. The spectrograph consists of the spectrograph lens, the variable entrance slit, the grating and the photodiode array with front-end electronics. The spectrograph lens refocuses the light beam after it has passed through the flow cell. The sampling interval of the diode array is < 1 nm over the wavelength range 190 – 950 nm. Depending on the wavelength this varies from 1.0 to 1.25 diodes per nanometer (for example a diode every 0.8 to 1 nm).

For a small wavelength range, the small non-linearity could be neglected. With the wavelength range from 190 – 950 nm a new approach is required to achieve wavelength accuracy over the full range. Each spectrograph is calibrated individually. The calibration data is stored in the spectrograph on an EEPROM. Based on these data, the built-in processors calculate absorbance data with linear intervals (1.0, 2.0, ...) between data points. This results in an excellent wavelength accuracy and instrument-to-instrument reproducibility.

Variable Entrance Slit System The micro-slit system makes use of the mechanical properties of silicon combined with the precise structuring capabilities of bulk micro-machining. It combines the required optical functions – slit and shutter – in a simple and compact component. The slit width is directly controlled by the micro-processor of the instrument and can be set as method parameter.

Grating The combination of dispersion and spectral imaging is accomplished by using a concave holographic grating. The grating separates the light beam into all its component wavelengths and reflects the light onto the photodiode array.

Diode Array The diode array is a series of 1024 individual photodiodes and control circuits located on a ceramic carrier. With a wavelength range from 190 – 950 nm the sampling interval is < 1 nm.

Early Maintenance Feedback (EMF)

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.
- Two independent analog outputs provide signals for integrators or data handling.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the RS-232C connector may be used to control the module from a computer through a RS-232C connection. This connector is activated and can be configured with the configuration switch.
- The power input socket accepts a line voltage of 100 – 240 VAC \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.

NOTE

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

Serial Number Information (ALL)

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

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

Rear view of the module

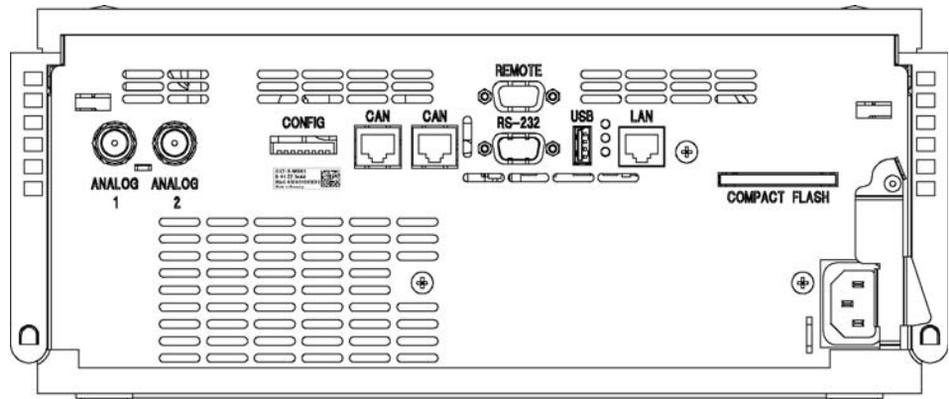


Figure 2 Rear View of Detector

Interfaces

The Agilent 1200 Infinity Series modules provide the following interfaces:

Table 1 Agilent 1200 Infinity Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Special
Pumps							
G1310B Iso Pump G1311B Quat Pump G1311C Quat Pump VL G1312B Bin Pump G1312C Bin Pump VL 1376A Cap Pump G2226A Nano Pump	2	Yes	No	Yes	1	Yes	
G4220A/B Bin Pump	2	No	Yes	Yes	No	Yes	
G1361A Prep Pump	2	Yes	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves
Samplers							
G1329B ALS G2260A Prep ALS	2	Yes	No	Yes	No	Yes	THERMOSTAT for G1330B
G1364B FC-PS G1364C FC-AS G1364D FC- μ S G1367E HiP ALS G1377A HiP micro ALS G2258A DL ALS	2	Yes	No	Yes	No	Yes	THERMOSTAT for G1330B CAN-DC- OUT for CAN slaves
G4226A ALS	2	Yes	No	Yes	No	Yes	
Detectors							
G1314B VWD VL G1314C VWD VL+	2	Yes	No	Yes	1	Yes	
G1314E/F VWD	2	No	Yes	Yes	1	Yes	

Table 1 Agilent 1200 Infinity Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Special
G4212A/B DAD	2	No	Yes	Yes	1	Yes	
G1315C DAD VL+ G1365C MWD G1315D DAD VL G1365D MWD VL	2	No	Yes	Yes	2	Yes	
G1321B FLD G1362A RID	2	Yes	No	Yes	1	Yes	
G4280A ELSD	No	No	No	Yes	Yes	Yes	EXT Contact AUTOZERO
Others							
G1316A/C TCC	2	No	No	Yes	No	Yes	
G1322A DEG	No	No	No	No	No	Yes	AUX
G1379B DEG	No	No	No	Yes	No	No	AUX
G4227A Flex Cube	2	No	No	No	No	No	
G4240A CHIP CUBE	2	Yes	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves THERMOSTAT for G1330A/B (NOT USED)

NOTE

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

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

Interfaces Overview

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/B LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a connected PC with the appropriate control software.

NOTE

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

RS-232C (Serial)

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

NOTE

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

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

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

Table 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

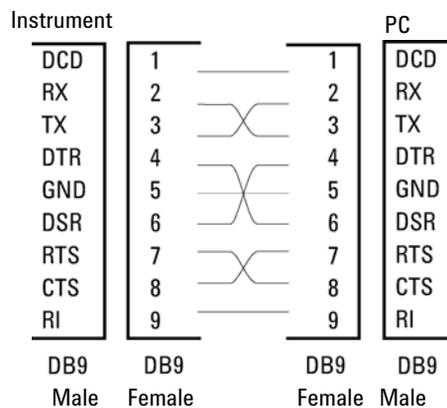


Figure 3 RS-232 Cable

Analog Signal Output

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

APG Remote

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

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

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

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

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

NOTE

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

Table 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.

Setting the 8-bit Configuration Switch

Setting the 8-bit Configuration Switch (with On-Board LAN)

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

All modules with on-board LAN, e.g. G1315/65C/D, G1314D/E, G4212A, G4220A:

- Default is ALL switches DOWN (best settings) - Bootp mode for LAN.
- For specific LAN modes switches 3-8 must be set as required.
- For boot/test modes switches 1+2 must be UP plus required mode.

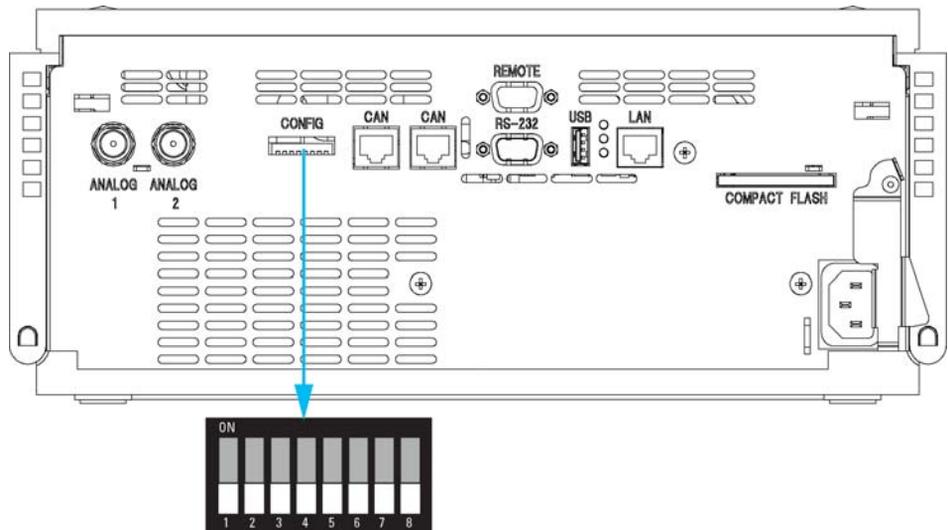


Figure 4 Location of Configuration Switch

NOTE

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

Table 4 8-bit Configuration Switch (with on-board LAN)

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

Legend:

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

NOTE

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

Setting the 8-bit Configuration Switch (without On-Board LAN)

The 8-bit configuration switch is located at the rear of the module.

Modules that do not have their own LAN interface (e.g. the TCC) can be controlled through the LAN interface of another module and a CAN connection to that module.

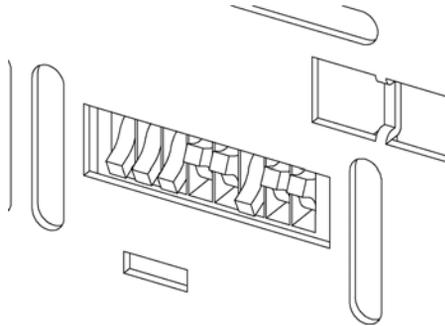


Figure 5 Configuration switch (settings depend on configured mode)

All modules without on-board LAN:

- default is ALL DIPS DOWN (best settings) - Bootp mode for LAN
- for boot/test modes DIPS 1+2 must be UP plus required mode

Switch settings provide configuration parameters for GPIB address, serial communication protocol and instrument specific initialization procedures.

NOTE

With the introduction of the Agilent 1260 Infinity, all GPIB interfaces have been removed. The preferred communication is LAN.

NOTE

The following tables represent the configuration switch settings for the modules without on-board LAN only.

Table 5 8-bit Configuration Switch (without on-board LAN)

Mode Select	1	2	3	4	5	6	7	8
RS-232C	0	1	Baudrate			Data Bits	Parity	
Reserved	1	0	Reserved					
TEST/BOOT	1	1	RSVD	SYS		RSVD	RSVD	FC

NOTE

The LAN settings are done on the LAN Interface Card G1369A/B. Refer to the documentation provided with the card.

Communication Settings for RS-232C

The communication protocol used in the column compartment supports only hardware handshake (CTS/RTR).

Switches 1 in down and 2 in up position define that the RS-232C parameters will be changed. Once the change has been completed, the column instrument must be powered up again in order to store the values in the non-volatile memory.

Table 6 Communication Settings for RS-232C Communication (without on-board LAN)

Mode Select	1	2	3	4	5	6	7	8
RS-232C	0	1	Baudrate			Data Bits	Parity	

Use the following tables for selecting the setting which you want to use for RS-232C communication. The number 0 means that the switch is down and 1 means that the switch is up.

Table 7 Baudrate Settings (without on-board LAN)

Switches			Baud Rate	Switches			Baud Rate
3	4	5		3	4	5	
0	0	0	9600	1	0	0	9600
0	0	1	1200	1	0	1	14400
0	1	0	2400	1	1	0	19200
0	1	1	4800	1	1	1	38400

Table 8 Data Bit Settings (without on-board LAN)

Switch 6	Data Word Size
0	7 Bit Communication
1	8 Bit Communication

Table 9 Parity Settings (without on-board LAN)

Switches		Parity
7	8	
0	0	No Parity
1	0	Odd Parity
1	1	Even Parity

One start bit and one stop bit are always used (not selectable).

Per default, the module will turn into 19200 baud, 8 data bit with no parity.

Special Settings

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

NOTE

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

Boot-Resident

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

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

Table 10 Boot Resident Settings (without on-board LAN)

	Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
LAN	TEST/BOOT	1	1	1	0	0	0	0	0
No LAN	TEST/BOOT	1	1	0	0	1	0	0	0

Forced Cold Start

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

CAUTION

Loss of data

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

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

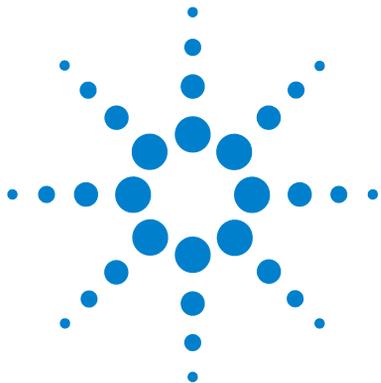
If you use the following switch settings and power the instrument up again, a forced cold start has been completed.

Table 11 Forced Cold Start Settings (without on-board LAN)

	Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
LAN	TEST/BOOT	1	1	0	0	0	0	0	1
No LAN	TEST/BOOT	1	1	0	0	1	0	0	1

1 Introduction

Setting the 8-bit Configuration Switch



2 Site Requirements and Specifications

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Physical Specifications	37
Performance Specifications	38
Specifications	38
Specification Conditions	41

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 12](#) on page 37. 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 12](#) on page 37) 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.

Environment

Your detector will work within the specifications at ambient temperatures and relative humidity described in [Table 12](#) on page 37.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 °F/hour) over one hour period. Our published drift specification (refer also to “[Specifications](#)” on page 38) is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/hour (1.8 °F/hour). Turbulences around one minute or less can be ignored.

NOTE

The module is designed to operate in a typical electromagnetic environment (EN61326-1) where RF transmitters, such as mobile phones, should not be used in close proximity.

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 12 Physical Specifications

Type	Specification	Comments
Weight	11.5 kg (26 lbs)	
Dimensions (height × width × depth)	140 x 345 x 435 mm (5.5 x 13.5 x 17 inches)	
Line voltage	100 – 240 VAC, ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5%	
Power consumption	160 VA / 160 W / 546 BTU	Maximum
Ambient operating temperature	0–55 °C (32–131 °F)	
Ambient non-operating temperature	-40–70 °C (-4–158 °F)	
Humidity	< 95%, at 25–40 °C (77–104 °F)	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.

Performance Specifications

Specifications

Table 13 Performance Specifications G1315C/D and G1365C/D

Type	Specification	Comments
Detection type	1024-element photodiode array	
Light source	Deuterium and tungsten lamps	The UV-lamp is equipped with RFID tag that holds lamp typical information.
Data rate	up to 80 Hz (G1315C/G1365C) up to 20 Hz (G1315D/G1365D)	
Wavelength range	190 – 950 nm	
Short term noise (ASTM) Single and Multi-Wavelength	$< \pm 0.7 \cdot 10^{-5}$ AU at 254 and 750 nm	see "Specification Conditions" below
Drift	$< 0.9 \cdot 10^{-3}$ AU/h at 254 nm	see "Specification Conditions" below
Linear absorbance range	> 2 AU (5 %) at 265 nm	see "Specification Conditions" below
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Wavelength bunching	1 – 400 nm	Programmable in steps of 1 nm
Slit width	1, 2, 4, 8, 16 nm	Programmable slit
Diode width	< 1 nm	

Table 13 Performance Specifications G1315C/D and G1365C/D

Type	Specification	Comments
Flow cells	Standard: 13 µL volume, 10 mm cell path length and 120 bar (1740 psi) pressure maximum Semi-micro: 5 µL volume, 6 mm cell path length and 120 bar (1740 psi) pressure maximum Micro: 2 µL volume, 3 mm cell path length, 120 bar (1740 psi) pressure maximum Semin-nano: 500 nL volume, 10 mm cell path length and 50 bar (725 psi) pressure maximum Nano: 80 nL volume, 10 mm cell path length and 50 bar (725 psi) pressure maximum High pressure: 1.7 µL volume, 6 mm cell path length and 400 bar (5800 psi) pressure maximum Prep SST: 3 mm cell path length and 120 bar (1740 psi) pressure maximum Prep Quartz: 0.3 mm cell path length and 20 bar (290 psi) pressure maximum Prep Quartz: 0.06 mm cell path length and 20 bar (290 psi) pressure maximum	See “ Optimization Overview ” on page 117 All flow cells are equipped with RFID tags that hold cell typical information.
Time programmable	Wavelength, polarity, peak width, lamp bandwidth, autobalance, wavelength range, threshold, spectra storage mode	
Spectral tools	Data analysis software for spectra evaluation, including spectral libraries and peak purity functions	
Control and data evaluation	Agilent ChemStation for LC (32-bit)	For 1260 systems: <ul style="list-style-type: none"> • Revision B.04.02 DSP2 or above For 1100/1200 systems: <ul style="list-style-type: none"> • Revision B.01.03 or above (G1315C/G1365C) • Revision B.01.03 SR-2 / B.02.01 SR-2 or above (G1315D/G1365D)
Local Control	Agilent Instant Pilot (G4208A)	For 1260 systems: <ul style="list-style-type: none"> • B.02.11 or above For other systems: <ul style="list-style-type: none"> • B.02.09 or above
Analog outputs	Recorder/integrator: 100 mV or 1 V, output range 0.001 – 2 AU, two outputs	

2 Site Requirements and Specifications

Performance Specifications

Table 13 Performance Specifications G1315C/D and G1365C/D

Type	Specification	Comments
Communications	Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN	
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	RFID for electronics records of flow cell and UV lamp conditions (path length, volume, product number, serial number, test passed, usage) Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user-settable limits and feedback messages. Electronic records of maintenance and errors. Verification of wavelength accuracy with built-in holmium oxide filter.	
Housing	All materials recyclable.	
Others	Electronic temperature control (ETC) for the complete optical unit	

Specification Conditions

ASTM: “Standard Practice for Variable Wavelength Photometric Detectors Used in Liquid Chromatography”.

Reference conditions: cell path length 10 mm, wavelength 254 and 750 nm with reference wavelength 360 nm/100 nm, slit width 4 nm, time constant 2 s (equal to response time 4 s), flow 1 mL/min LC-grade Methanol.

Linearity: Linearity is measured with caffeine at 265 nm/4 nm with slit width 4 nm and TC 2 s (or with RT 4 s) with 10 mm pathlength.

For environmental conditions refer to “[Environment](#)” on page 36

NOTE

The specifications are based on the standard RFID tag lamp (2140-0820) and may be not achieved when other lamp types or aged lamps are used.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 °F/hour) over one hour period. Our published drift specification is based on these conditions. Larger ambient temperature changes will result in larger drift. Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/hour (1.8 °F/hour). Turbulences around one minute or less can be ignored.

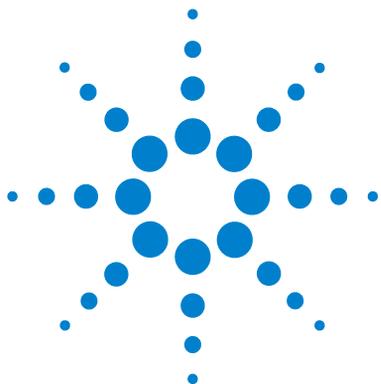
Performance tests should be done with a completely warmed up optical unit (> two hours). ASTM measurements require that the detector should be turned on at least 24 h before start of testing.

Time Constant versus Response Time

According to ASTM E1657-98 „Standard Practice of Testing Variable-Wavelength Photometric Detectors Used in Liquid Chromatography” the time constant is converted to response time by multiplying by the factor 2.2.

2 Site Requirements and Specifications

Performance Specifications



3 Installing the Module

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



Unpacking the Detector

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 the detector. The delivery checklist is shown below. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 14 Detector Checklist

Description	Quantity
Detector	1
CompactFlash Card	1 (installed) G1315C/G1365C only
Power cable	1
Cross-over network cable	1
Twisted pair network cable	1
Flow cell	As ordered
User Manual	on Documentation CD (part of the shipment - not module specific)
Accessory kit (p/n G1315-68755)	1

Optimizing the Stack Configuration

If your detector is part of a complete Agilent 1200 Series system, you can ensure optimum performance by installing the following configuration. This configuration optimizes the system flow path, ensuring minimum delay volume.

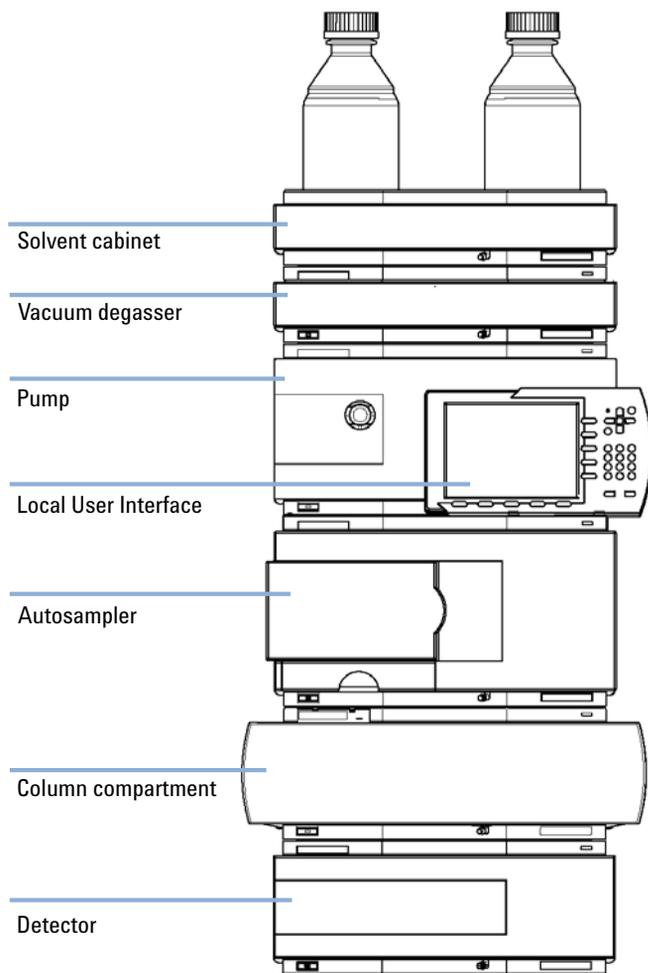


Figure 6 Recommended Stack Configuration for 1260 (Front View)

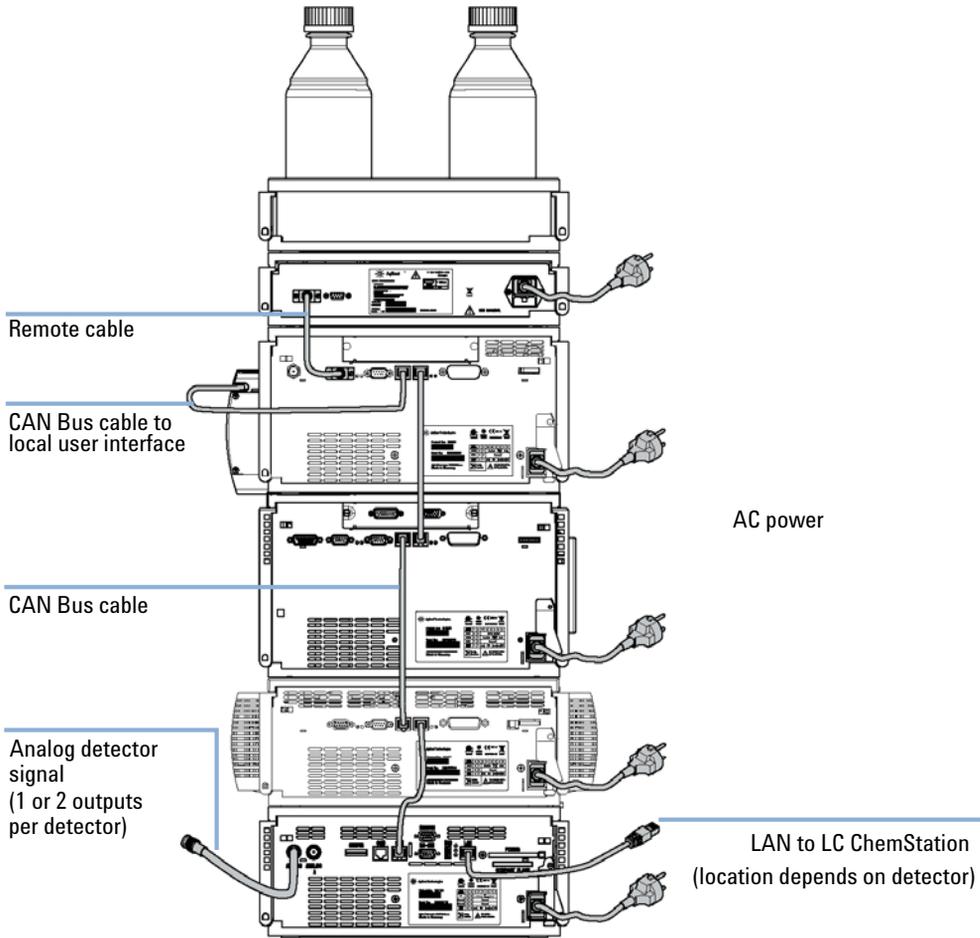


Figure 7 Recommended Stack Configuration (Rear View)

Two Stack Configuration

To avoid excessive height of the stack when the autosampler thermostat is added to the system it is recommended to form two stacks. Some users prefer the lower height of this arrangement even without the autosampler thermostat. A slightly longer capillary is required between the pump and autosampler. (See [Figure 8](#) on page 48 and [Figure 9](#) on page 49).

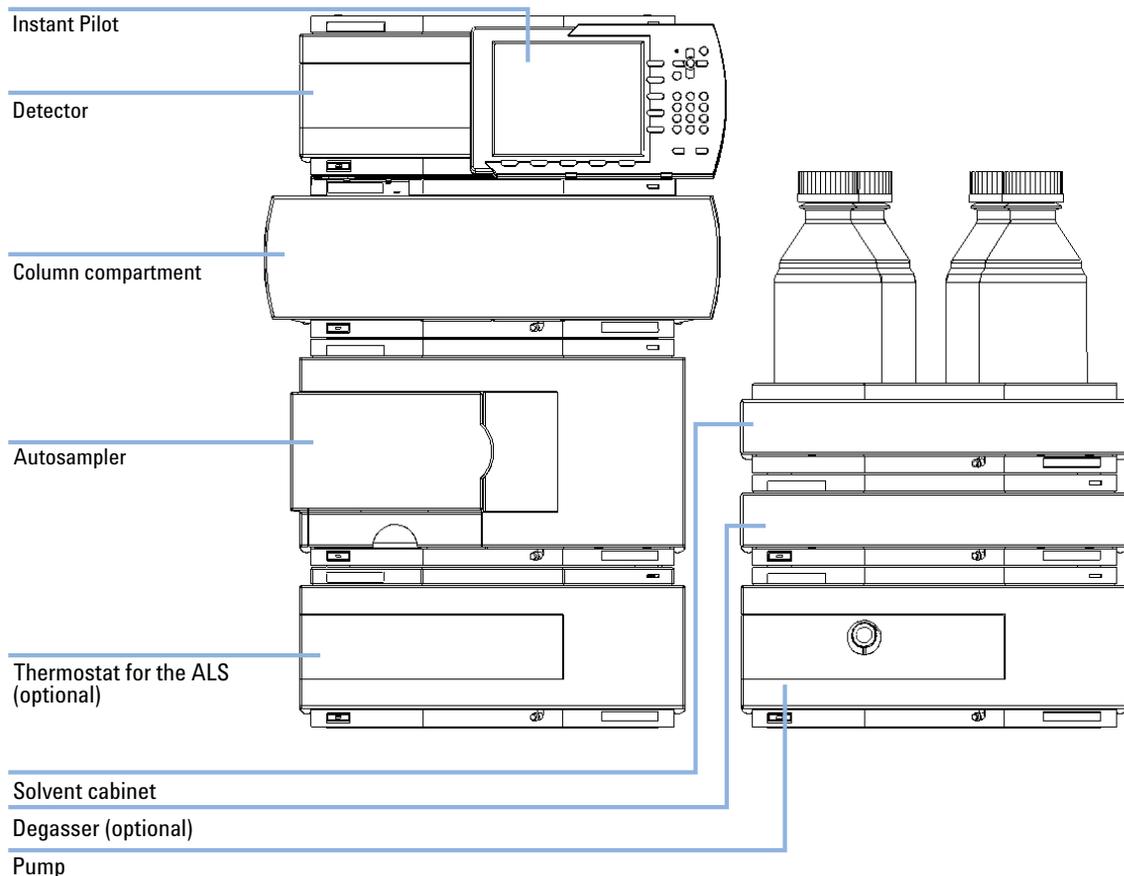


Figure 8 Recommended Two Stack Configuration for 1260 (Front View)

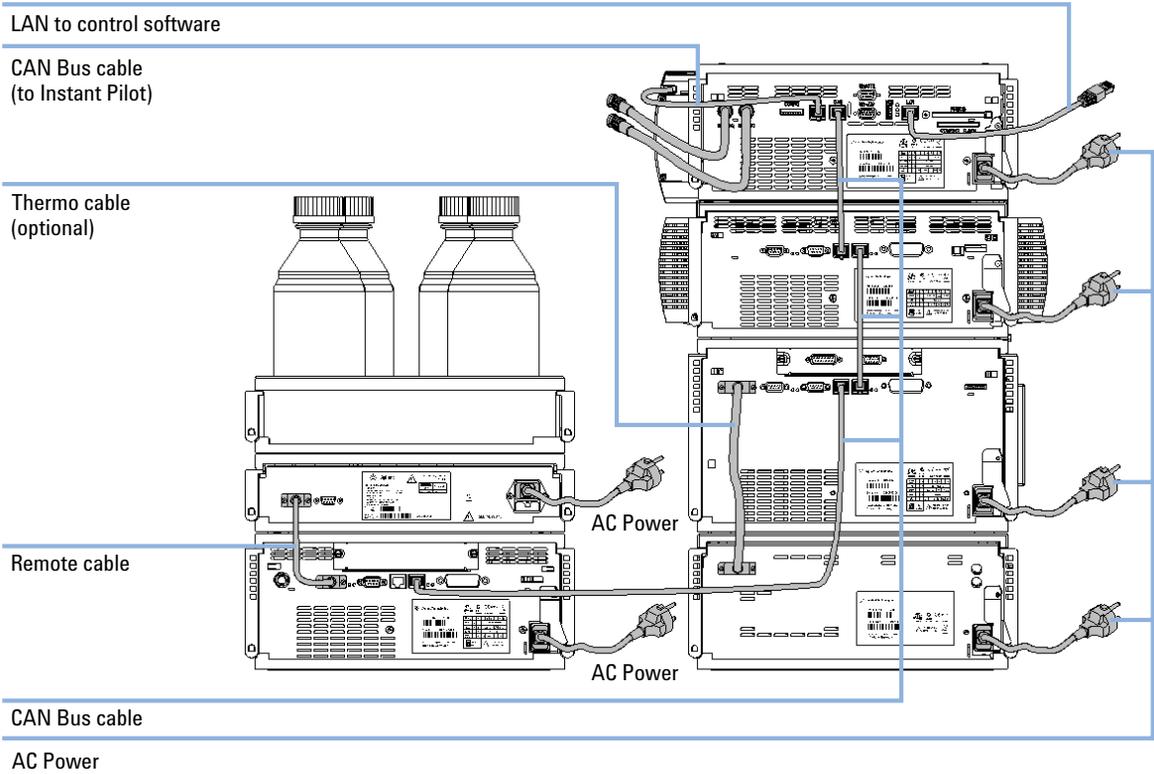


Figure 9 Recommended Two Stack Configuration for 1260 (Rear View)

Installing the Detector

Parts required	Description Power cord LAN cable (cross-over or twisted pair network cable) All modules in the stack should have the latest firmware installed. If other revisions are required, check with the Agilent support for best match.
Hardware required	Detector (as ordered)
Software required	Appropriate control software or G4208A Instant Pilot (optional).
Preparations	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.

NOTE

Before adding a G1315C/D and G1365C/D into an existing system assure that the existing modules have been updated to firmware revision A.06.02/B.01.02 or above. Otherwise the ChemStation "[Performance Specifications](#)" on page 38 will not recognize modules.

NOTE

For G1315C and G1365C assure that the CompactFlash Card is installed in the rear of the module (required for operation).

- 1 Note the MAC address of the LAN interface (rear of the module, under the configuration switch, see [Figure 10](#) on page 51). It's required for “[LAN Configuration](#)” on page 57.
- 2 Place the module in the stack or on the bench in a horizontal position.
- 3 Ensure the line power switch at the front of the module is OFF.
- 4 Connect the power cable to the power connector at the rear of the module.

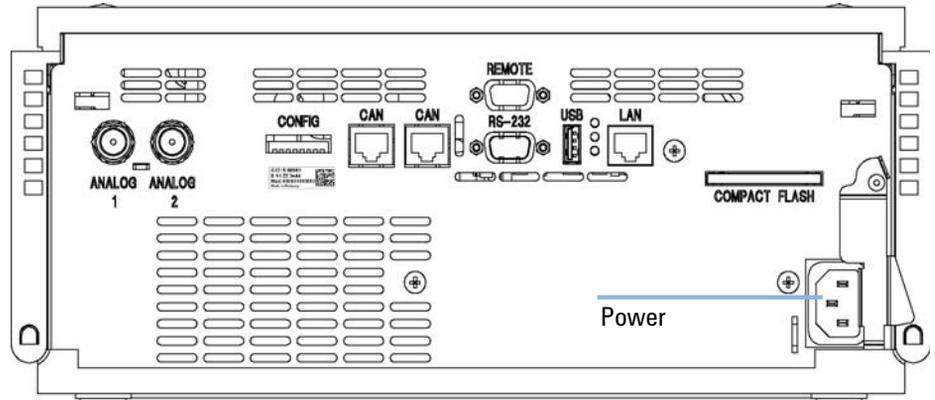


Figure 10 Rear View of Detector

- 5 Connect the CAN cable to other Agilent 1200 Series modules.
- 6 Connect the LAN cable (e.g. from a Agilent ChemStation as controller) to the detector's LAN connector.

NOTE

In multi-detector configurations the LAN of the G1315C/D and G1365C/D must be used due to its higher data load.

- 7 Connect the analog cable(s) (optional).
- 8 Connect the APG remote cable (optional) for non-Agilent 1200 Series instruments.

3 Installing the Module

Installing the Detector

- 9 Turn on power by pushing the button at the lower left hand side of the module. The status LED should be green.

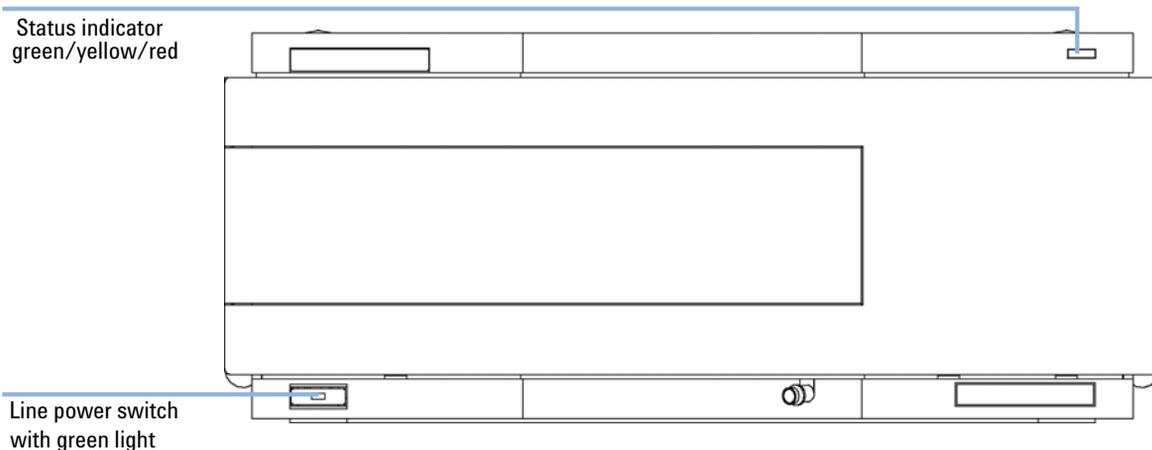


Figure 11 Front View of Detector

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.

NOTE

The module was shipped with default configuration settings. To change these settings see [“Configuration Switch”](#) on page 60.

Flow Connections to the Detector

Parts required	#	Description
	G1315-68755	Accessory kit

Hardware required Other modules

Preparations Detector is installed in the LC system.

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

NOTE

The flow cell is shipped with a filling of isopropanol (also recommended when the instrument and/or flow cell is shipped to another location). This is to avoid breakage due to subambient conditions.

NOTE

The detector should be operated with the front cover in place to protect the flow cell area against strong drafts from the outside and to cover the deuterium lamp.

Some types of the Agilent deuterium lamps show a light ring during operation. This is not harmful, refer to [“UV-Radiation”](#) on page 272.

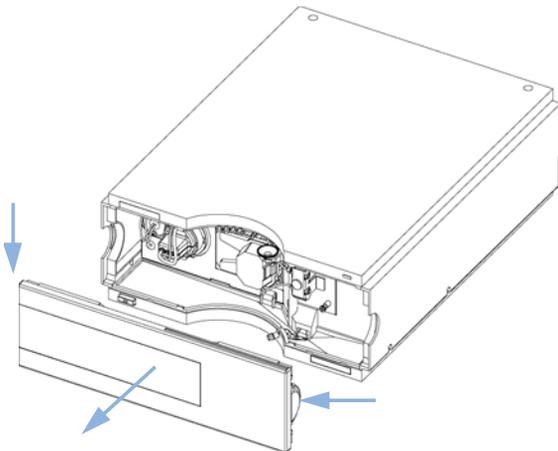
3 Installing the Module

Flow Connections to the Detector

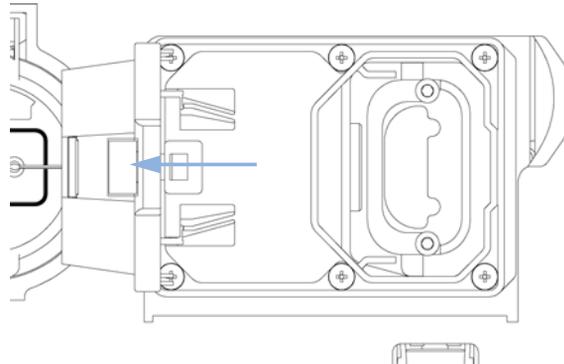
NOTE

The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column). For details see [“Replacing Capillaries on a Standard Flow Cell”](#) on page 209.

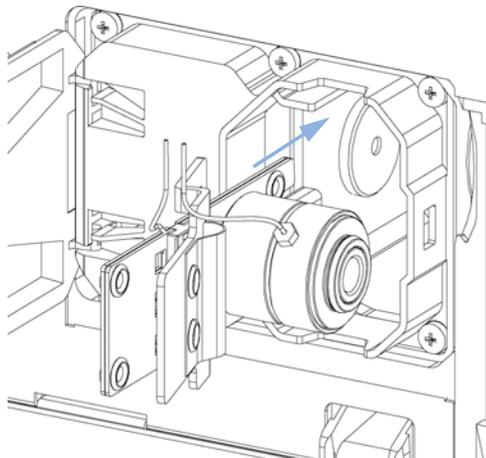
- 1** Press the release buttons and remove the front cover to gain access to the flow cell area.



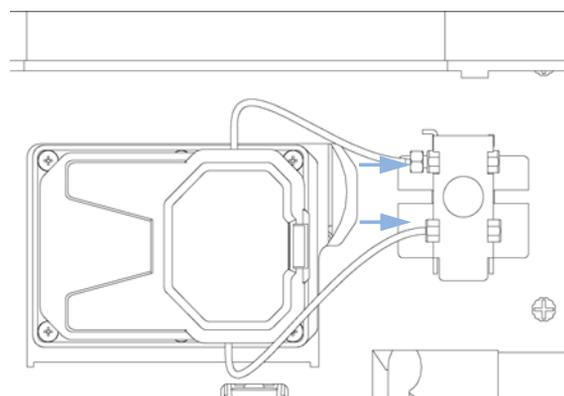
- 2** Press the release button and open the flow cell door.



- 3** Insert the flow cell.

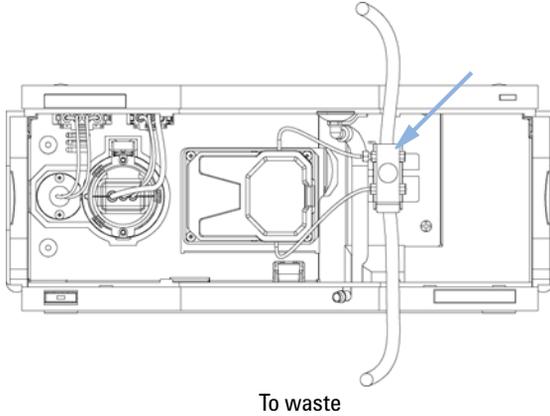


- 4** Connect the flow cell capillaries to the capillary holder (top is inlet, bottom is outlet).

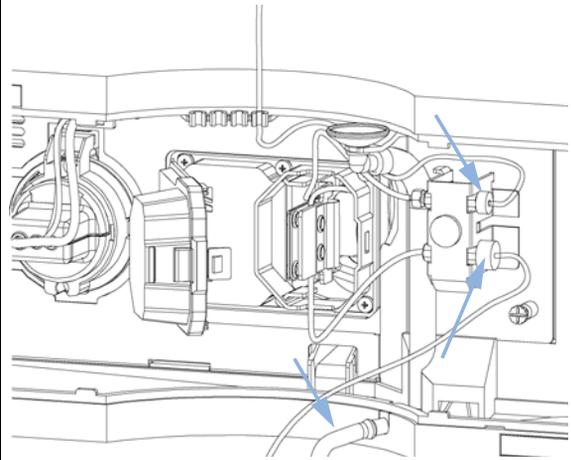


- 5** If another Agilent module is positioned on top of the detector, route the tubing assembly waste from the accessory kit behind the capillary holder and connect the top end to the other module's waste outlet.

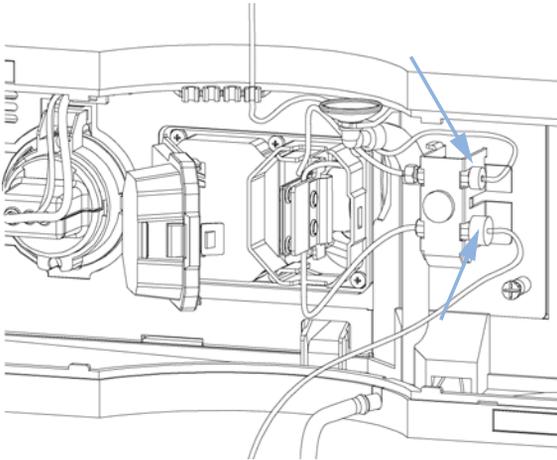
To other module



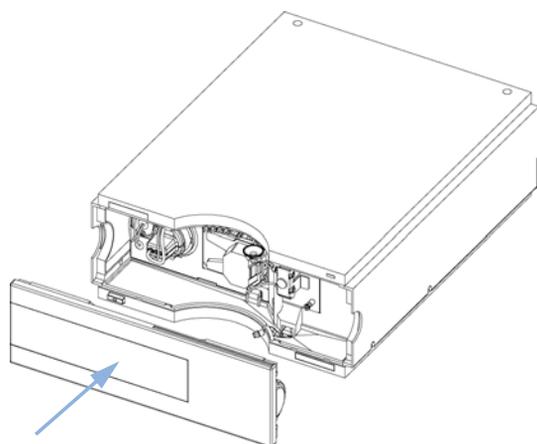
- 6** Connect the capillary from the column to the capillary holder (top). Connect the teflon waste tubing to the flow cell outlet fitting (bottom) and the corrugated waste tubing to the leak outlet.



- 7** Remove the flow cell and establish a flow and observe for leaks.



- 8** Insert the flow cell, close the cover and replace the front cover.

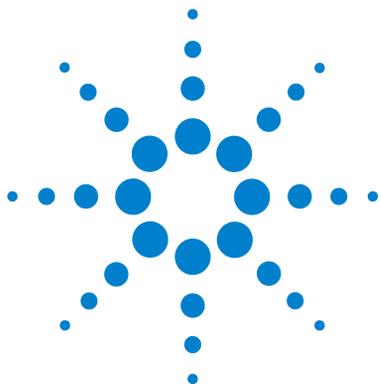


The installation of the detector is complete now.

3 **Installing the Module** Setting up the LAN access

Setting up the LAN access

Please follow the instructions in [“LAN Configuration”](#) on page 57



4 LAN Configuration

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



What you have to do first

The module has an on-board LAN communication interface.

- 1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear of the module underneath the configuration switch (see [Figure 13](#) on page 58).



Part number of the detector main board
Revision Code, Vendor, Year and Week of assembly
MAC address
Country of Origin

Figure 12 MAC-Label

- 2 Connect the instrument's LAN interface (see [Figure 13](#) on page 58) to
 - the PC network card using a crossover network cable (point-to-point) or
 - a hub or switch using a standard LAN cable.

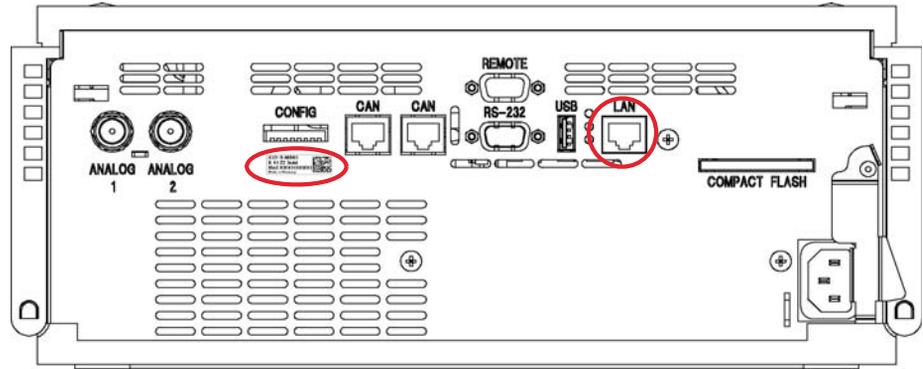


Figure 13 Location of LAN interface and MAC label

TCP/IP parameter configuration

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

- IP address
- Subnet Mask
- Default Gateway

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

- by automatically requesting the parameters from a network-based BOOTP Server (using the so-called Bootstrap Protocol)
- by manually setting the parameters using Telnet
- by manually setting the parameters using the Instant Pilot (G4208A)

The LAN interface differentiates between several initialization modes. The initialization mode (short form 'init mode') defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived from a Bootp cycle, non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see [Table 18](#) on page 65.

Configuration Switch

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

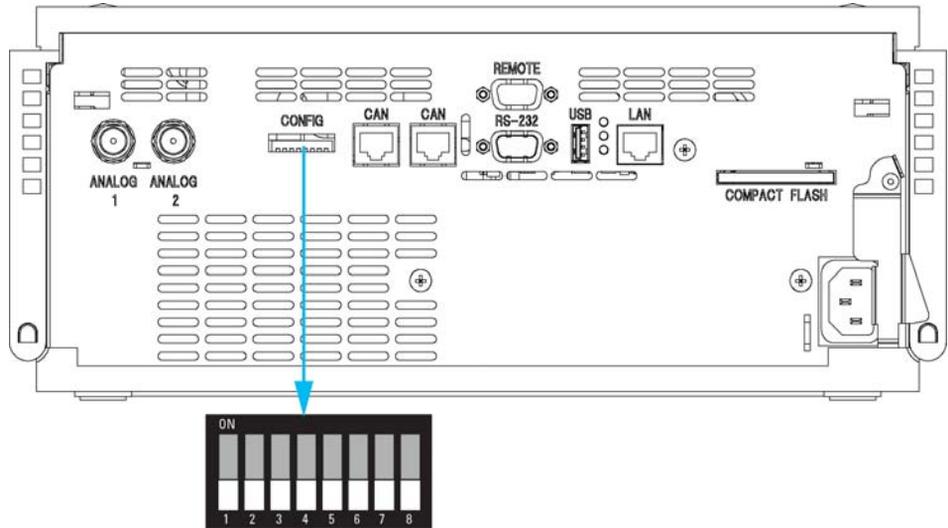


Figure 14 Location of Configuration Switch

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

NOTE

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

Table 15 Factory Default Settings

Initialization ('Init') Mode	Bootp, all switches down. For details see "Initialization mode selection" on page 61
Link Configuration	speed and duplex mode determined by auto-negotiation, for details see "Link configuration selection" on page 65

Initialization mode selection

The following initialization (init) modes are selectable:

Table 16 Initialization Mode Switches

	SW 6	SW 7	SW 8	Init Mode
	OFF	OFF	OFF	Bootp
	OFF	OFF	ON	Bootp & Store
	OFF	ON	OFF	Using Stored
	OFF	ON	ON	Using Default

Bootp

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

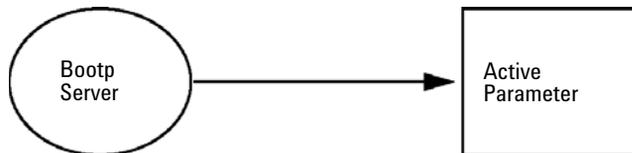


Figure 15 Bootp (Principle)

Bootp & Store

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

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

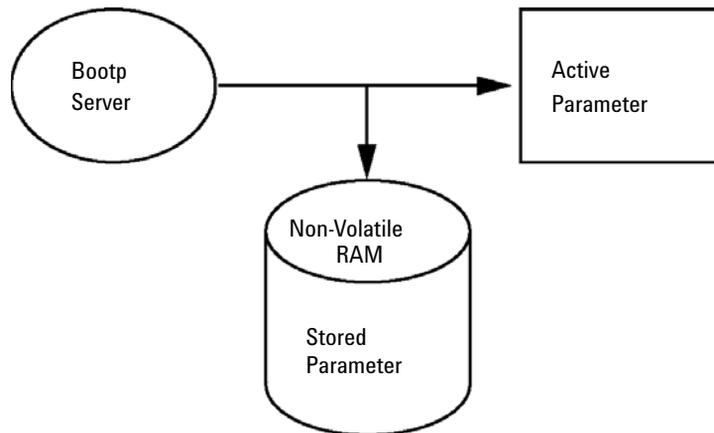


Figure 16 Bootp & Store (Principle)

NOTE

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

Using Stored

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

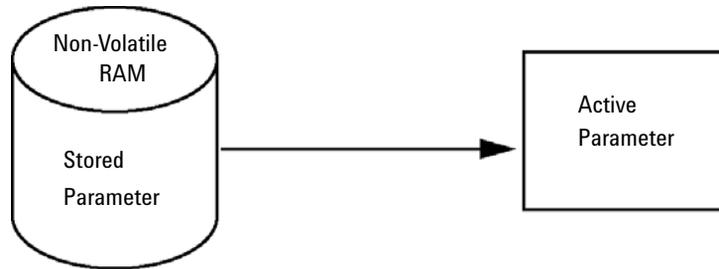


Figure 17 Using Stored (Principle)

Using Default

When **Using Default** is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see [Table 17](#) on page 64.

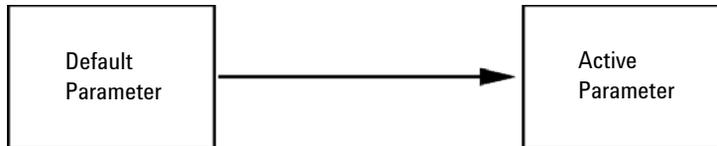


Figure 18 Using Default (Principle)

NOTE

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

Table 17 Using Default Parameters

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

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

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

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

NOTE

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

Link configuration selection

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

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

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

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

Table 18 Link Configuration Switches

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

Automatic Configuration with BootP

NOTE

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

NOTE

Assure that the detector configuration switch is set properly. The setting should be either **BootP** or **BootP & Store**, see [Table 16](#) on page 61.

NOTE

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

NOTE

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

About Agilent BootP Service

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

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

How BootP Service Works

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

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

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

Situation: Cannot Establish LAN Communication

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

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

Installation of BootP Service

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

- 1 Log on as Administrator or other user with Administrator privileges.
- 2 Close all Windows programs.
- 3 Insert the Agilent ChemStation software DVD into the drive. If the setup program starts automatically, click **Cancel** to stop it.
- 4 Open Windows Explorer.
- 5 Go to the BootP directory on the Agilent ChemStation DVD and double-click **BootPPackage.msi**.
- 6 If necessary, click the **Agilent BootP Service...** icon in the task bar.
- 7 The **Welcome** screen of the **Agilent BootP Service Setup Wizard** appears. Click **Next**.
- 8 The **End-User License Agreement** screen appears. Read the terms, indicate acceptance, then click **Next**.
- 9 The **Destination Folder** selection screen appears. Install BootP to the default folder or click **Browse** to choose another location. Click **Next**.
The default location for installation is:
C:\Program Files\Agilent\BootPService\
10 Click **Install** to begin installation.

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

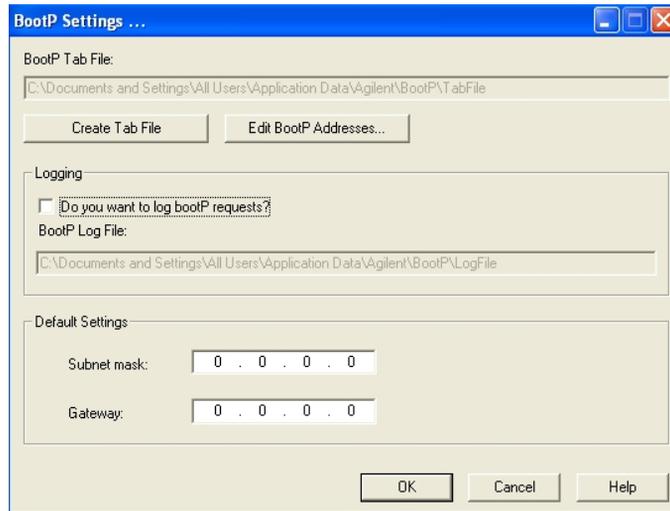


Figure 19 BootP Settings screen

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

Defaults can be used:

- The default subnet mask is 255.255.255.0.
- The default gateway is 10.1.1.101.

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

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

15 Remove the DVD from the drive.

This completes installation.

16 Start the BootP service. On the Windows® desktop, select **Start > Control Panel > Services**. Select the **Agilent BootP Service** and click **Start**.

Two Methods to Determine the MAC Address

Enabling logging to discover the MAC address using BootP

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

- 1 Open BootP Settings from **Start > All Programs > Agilent BootP Service > EditBootPSettings**.
- 2 In **BootP Settings...** check **Do you want to log BootP requests?** to enable logging.



Figure 20 Enable BootP logging

The log file is located in

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

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

- 3 Click **OK** to save the values or **Cancel** to discard them. The editing ends.
- 4 After each modification of the BootP settings (i.e. **EditBootPSettings**) a stop or start of the BootP service is required for the BootP service to accept changes. See “[Stopping the Agilent BootP Service](#)” on page 74 or “[Restarting the Agilent BootP Service](#)” on page 75.
- 5 Uncheck the **Do you want to log BootP requests?** box after configuring instruments; otherwise, the log file will quickly fill up disk space.

Determining the MAC address directly from the LAN Interface card label

- 1 Turn off the instrument.
- 2 Read the MAC address from the label and record it.

The MAC address is printed on a label on the rear of the module. It is the number below the barcode and after the colon (:), and usually begins with the letters AD, see [Figure 12](#) on page 58 and [Figure 13](#) on page 58.

- 3 Turn on the instrument.

Assigning IP Addresses Using the Agilent BootP Service

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

Determining the MAC address of the instrument using BootP Service

- 1 Power cycle the Instrument.
- 2 After the instrument completes self-test, open the log file of the BootP Service using Notepad.
 - The default location for the logfile is C:\Documents and Settings\All Users\Application Data\Agilent\BootP\LogFile.
 - The logfile will not be updated if it is open.

The contents will be similar to the following:

02/25/10 15:30:49 PM

Status: BootP Request received at outermost layer

Status: BootP Request received from hardware address: 0010835675AC

Error: Hardware address not found in BootPTAB: 0010835675AC

Status: BootP Request finished processing at outermost layer

- 3 Record the hardware (MAC) address (for example, 0010835675AC).
- 4 The Error means the MAC address has not been assigned an IP address and the Tab File does not have this entry. The MAC address is saved to the Tab File when an IP address is assigned.
- 5 Close the log file before turning on another instrument.
- 6 Uncheck the **Do you want to log BootP requests?** box after configuring instruments to avoid having the logfile use up excessive disk space.

Adding each instrument to the network using BootP

- 1 Follow **Start > All Programs > Agilent BootP Service** and select **Edit BootP Settings**. The BootP Settings screen appears.
- 2 Uncheck the **Do you want to log BootP requests?** once all instruments have been added.

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

- 3 Click **Edit BootP Addresses...** The **Edit BootP Addresses** screen appears.
- 4 Click **Add...** The **Add BootP Entry** screen appears.

The screenshot shows a dialog box titled "Add BootP Entry". It contains the following fields and controls:

- Mac Address: [Empty text box]
- Host Name: [Empty text box]
- IP Address: [Empty text box with dots for separators]
- Comment: [Empty text box]
- Subnet Mask: [Text box containing "255 . 255 . 255 . 0"]
- Gateway: [Empty text box with dots for separators]
- Buttons: OK, Cancel, Help

Figure 21 Enable BootP logging

5 Make these entries for the instrument:

- MAC address
- Host name, Enter a Hostname of your choice.
The Host Name must begin with "alpha" characters (i.e. LC1260)
- IP address
- Comment (optional)
- Subnet mask
- Gateway address (optional)

The configuration information entered is saved in the Tab File.

6 Click **OK**.

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

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

9 After each modification of the BootP settings (i.e. EditBootPSettings) a stop or start of the BootP service is required for the BootP service to accept changes. See [“Stopping the Agilent BootP Service”](#) on page 74 or [“Restarting the Agilent BootP Service”](#) on page 75.

10 Power cycle the Instrument.

OR

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

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

Ping 10.1.1.101 for example.

The Tab File is located at

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

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

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

Stopping the Agilent BootP Service

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

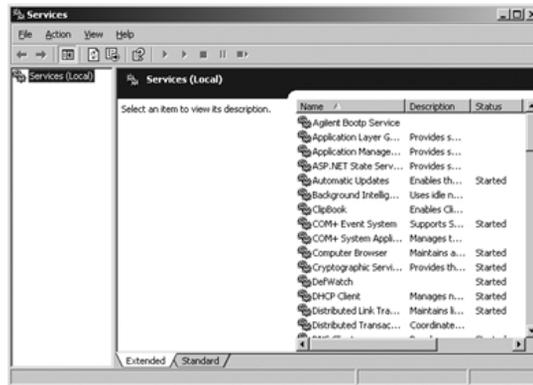


Figure 22 Windows Services screen

- 2 Right-click **Agilent BootP Service**.
- 3 Select **Stop**.
- 4 Close the **Services and Administrative Tools** screen.

Editing the IP address and other parameters in EditBootPSettings

- 1 Select **Start > All Programs > Agilent BootP Service** and select **Edit BootP Settings**. The **BootP Settings** screen appears.
- 2 When the **BootP Settings** screen is first opened, it shows the default settings from installation.
- 3 Press **Edit BootP Addresses...** to edit the Tab File.

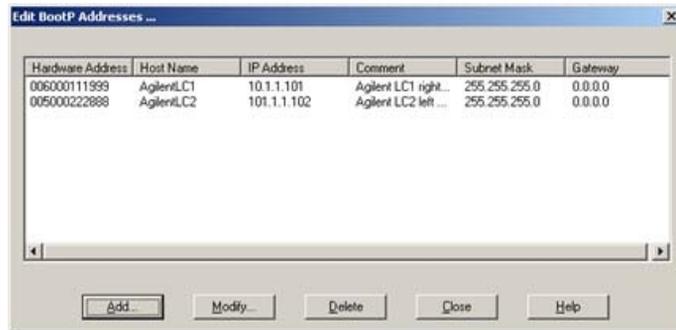


Figure 23 Edit BootP Adresses screen

- 4 In the **Edit BootP Addresses...** screen press **Add...** to create a new entry or select an existing line from the table and press **Modify...** or **Delete** to change the IP address, comment, subnet mask, for example, in the Tab File.
If you change the IP address, it will be necessary to power cycle the instrument for the changes to take effect.
- 5 Leave **Edit BootP Addresses...** by pressing **Close**.
- 6 Exit BootP Settings by pressing OK.

Restarting the Agilent BootP Service

- 1 In the Windows control panel, select **Administrative Tools > Services**. The **Services** screen appears, see [Figure 22](#) on page 74.
- 2 Right-click **Agilent BootP Service** and select **Start**.
- 3 Close the **Services and Administrative Tools** screens.

Storing the settings permanently with Bootp

If you want to change parameters of the module using the Bootp follow the instructions below.

- 1 Turn off the module.
- 2 Change the module's settings of the Configuration Switch to “*Bootp & Store*” mode, see [Table 16](#) on page 61.
- 3 Start the Agilent Bootp Service and open its window.
- 4 If required, modify the parameters for the module according to your needs using the existing configuration.
- 5 Press **OK** to exit the Bootp Manager.
- 6 Now turn on the module and view the Bootp Server window. After some time the Agilent Bootp Service will display the request from the LAN interface. The parameters are now stored permanently in the non-volatile memory of the module.
- 7 Close the Agilent Bootp Service and turn off the module.
- 8 Change the settings of the module’s Configuration Switch to “*Using Stored*” mode, see [Table 16](#) on page 61.
- 9 Power cycle the module. The module can be accessed now via LAN without the Agilent Bootp Service.

Manual Configuration

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

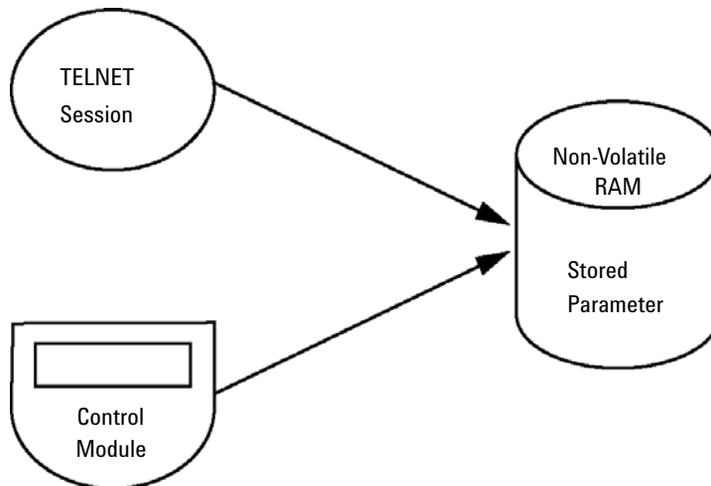
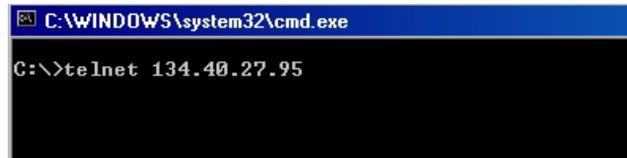


Figure 24 Manual Configuration (Principle)

With Telnet

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

- 1 Open the system (DOS) prompt window by clicking on Windows **START** button and select “**Run...**”. Type “cmd” and press OK.
- 2 Type the following at the system (DOS) prompt:
 - `c:\>telnet <IP address>` or
 - `c:\>telnet <host name>`

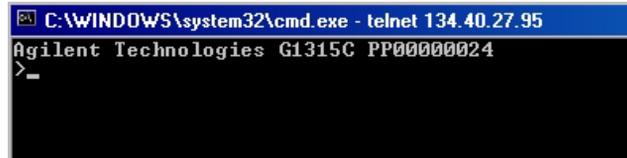


```
C:\WINDOWS\system32\cmd.exe
C:\>telnet 134.40.27.95
```

Figure 25 Telnet - Starting a session

where <IP address> may be the assigned address from a Bootp cycle, a configuration session with the Handheld Controller, or the default IP address (see “[Configuration Switch](#)” on page 60).

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



```
C:\WINDOWS\system32\cmd.exe - telnet 134.40.27.95
Agilent Technologies G1315C PP00000024
>_
```

Figure 26 A connection to the module is made

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

```

C:\WINDOWS\system32\cmd.exe - telnet 134.40.27.95
Agilent Technologies G1315C PP00000024
>?
command syntax          description
-----
?                        display help info
/                        display current LAN settings
ip <x.x.x.x>             set IP Address
sm <x.x.x.x>             set Subnet Mask
gw <x.x.x.x>             set Default Gateway
exit                    exit shell
>

```

Figure 27 Telnet Commands

Table 19 Telnet Commands

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

- 4 To change a parameter follows the style:

- parameter value, for example:
ip 134.40.27.230

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

4 LAN Configuration

Manual Configuration

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

```
C:\WINDOWS\system32\cmd.exe - telnet 134.40.27.95
>>
LAN Status Page
-----
MAC Address   : 0030D30A0838
-----
Init Mode     : Using Stored
-----
TCP/IP Properties
- active -
IP Address    : 134.40.27.95
Subnet Mask   : 255.255.248.0
Def. Gateway  : 134.40.24.1
-----
TCP/IP Status : Ready
-----
Controllers   : no connections
>_
```

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

Figure 28 Telnet - Current settings in "Using Stored" mode

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

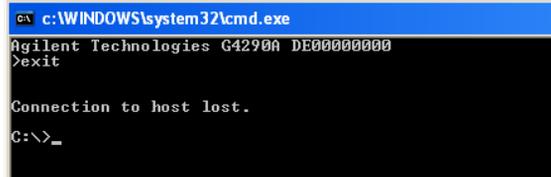
```
C:\WINDOWS\system32\cmd.exe - telnet 134.40.27.95
>ip 134.40.27.99
>>
LAN Status Page
-----
MAC Address   : 0030D30A0838
-----
Init Mode     : Using Stored
-----
TCP/IP Properties
- active -
IP Address    : 134.40.27.95
Subnet Mask   : 255.255.248.0
Def. Gateway  : 134.40.24.1
- stored -
IP Address    : 134.40.27.99
Subnet Mask   : 255.255.248.0
Def. Gateway  : 134.40.24.1
-----
TCP/IP Status : Ready
-----
Controllers   : no connections
>_
```

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

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

Figure 29 Telnet - Change IP settings

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



```
CA c:\WINDOWS\system32\cmd.exe
Agilent Technologies G4290A DE00000000
>exit

Connection to host lost.
C:\>_
```

Figure 30 Closing the Telnet Session

NOTE

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

With the Instant Pilot (G4208A)

To configure the TCP/IP parameters before connecting the module to the network, the Instant Pilot (G4208A) can be used.

- 1 From the Welcome screen press the **More** button.
- 2 Select **Configure**.
- 3 Press the **DAD** button.
- 4 Scroll down to the LAN settings.

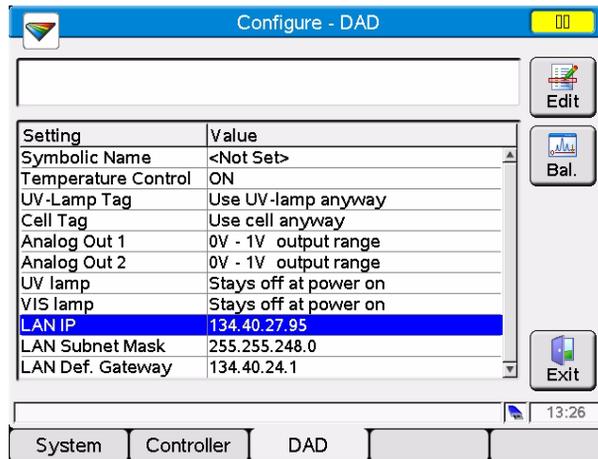
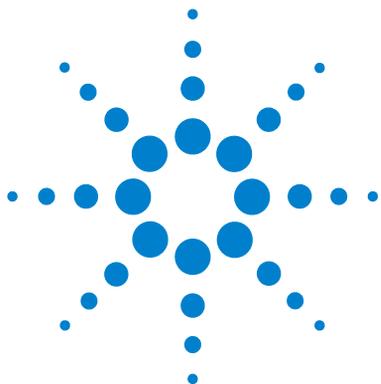


Figure 31 Instant Pilot - LAN Configuration

- 5 Press the **Edit** button (only visible if not in Edit mode), perform the required changes and press the **Done** button.
- 6 Leave the screen by clicking **Exit**.



5 Using the Detector

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



Setting up an Analysis

This chapter may be used to

- Prepare the system,
- Get to know the set up of an HPLC analysis and
- Use it as an instrument check to demonstrate that all modules of the system are correctly installed and connected. It is not a test of the instrument performance.
- Learn about special settings

Before Using the System

Solvent Information

Observe recommendations on the use of solvents in chapter “Solvents”.

Priming and Purging the System

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

Table 20 Choice of Priming Solvents for Different Purposes

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

NOTE

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

- 1** Open the purge valve of your pump (by turning it counterclockwise) and set flow rate to 3-5 ml/min.
- 2** Flush all tubes with at least 30 ml of solvent.
- 3** Set flow to required value of your application and close the purge valve. Pump for approximately 10 minutes before starting your application.

Requirements and Conditions

Parts and Material required

Table 21 on page 86 lists the parts and material you need for the set up of the analysis. Some of these are optional (not required for the basic system).

Table 21 Parts and Material required

Agilent 1260 Infinity system	Pump (plus degassing)
	Autosampler
	Detector, standard flow cell installed
	<ul style="list-style-type: none"> • Agilent ChemStation or • Instant Pilot G4208 (optional for basic operation) or with with the appropriate revisions, see “Performance Specifications” on page 38.
	System should be correctly set up for LAN communication with the Data System
Column:	Zorbax Eclipse XDB C18, 150 mm x 4.6 mm, 5 µm (p/n 993967-906)
Standard:	Agilent isocratic checkout sample (p/n 01080-68704). This 0.5 mL ampoule contains 0.15 wt.% dimethylphthalate, 0.15 wt.% diethylphthalate, 0.01 wt.% biphenyl, 0.03 wt.% o-terphenyl in methanol.

Conditions

A single injection of the isocratic test standard is made under the conditions given in [Table 22](#) on page 87:

Table 22 Conditions

Flow	1.5 ml/minute
Stoptime	8 minutes
Solvent	100% (30% water/70% Acetonitrile)
Temperature	Ambient
Wavelength	sample 254 nm (4 nm bandwidth) reference 360 nm (100 nm bandwidth)
Injection Volume	1 µl

Typical Chromatogram

A typical chromatogram for this analysis is shown in [Figure 32](#) on page 88. The exact profile of the chromatogram will depend on the chromatographic conditions. Variations in solvent quality, column packing, standard concentration and column temperature will all have a potential effect on peak retention and response.

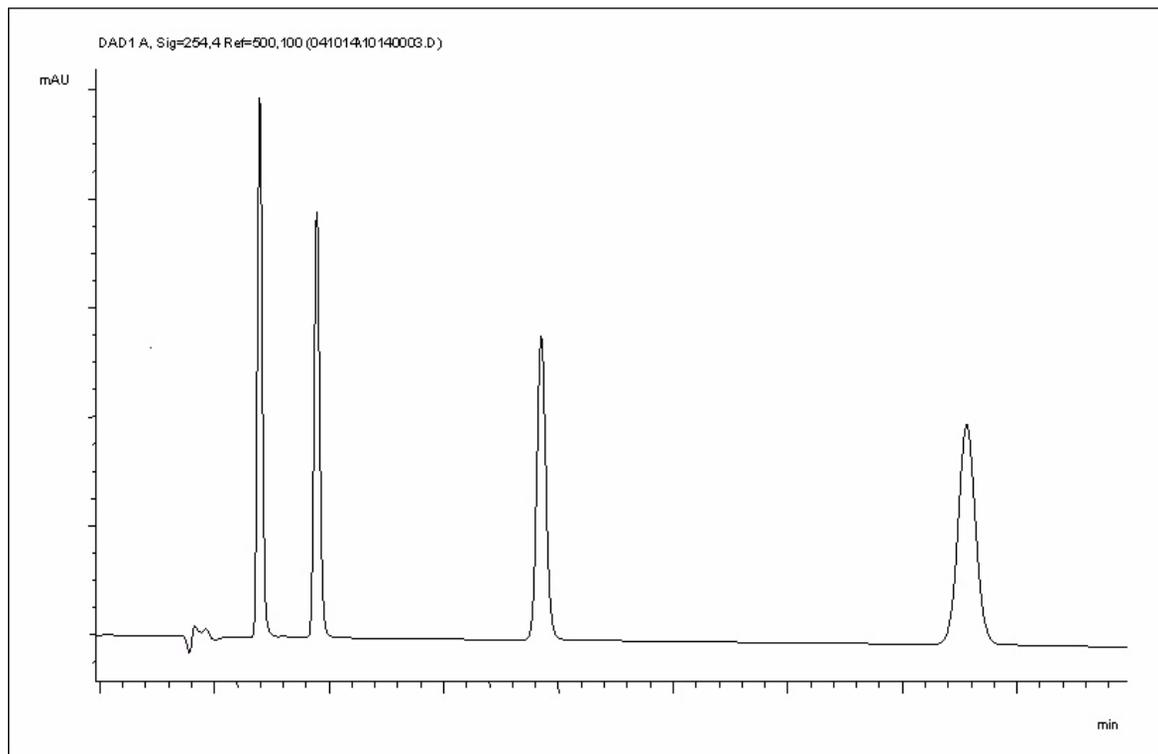


Figure 32 Typical Chromatogram with UV-detector

Optimization of the System

The settings used for this analysis are specific for this purpose. For other applications the system can be optimized in various ways. Please refer to the section “[Optimizing the Detector](#)” on page 113.

Preparing the HPLC System

- 1 Turn on the Agilent ChemStation PC and the monitor.
- 2 Turn on the HPLC modules.
- 3 Start the Agilent ChemStation software. If the pump, autosampler, thermostatted column compartment and detector are found, the ChemStation screen should look like shown in Figure below.

The System status is red (Not Ready).

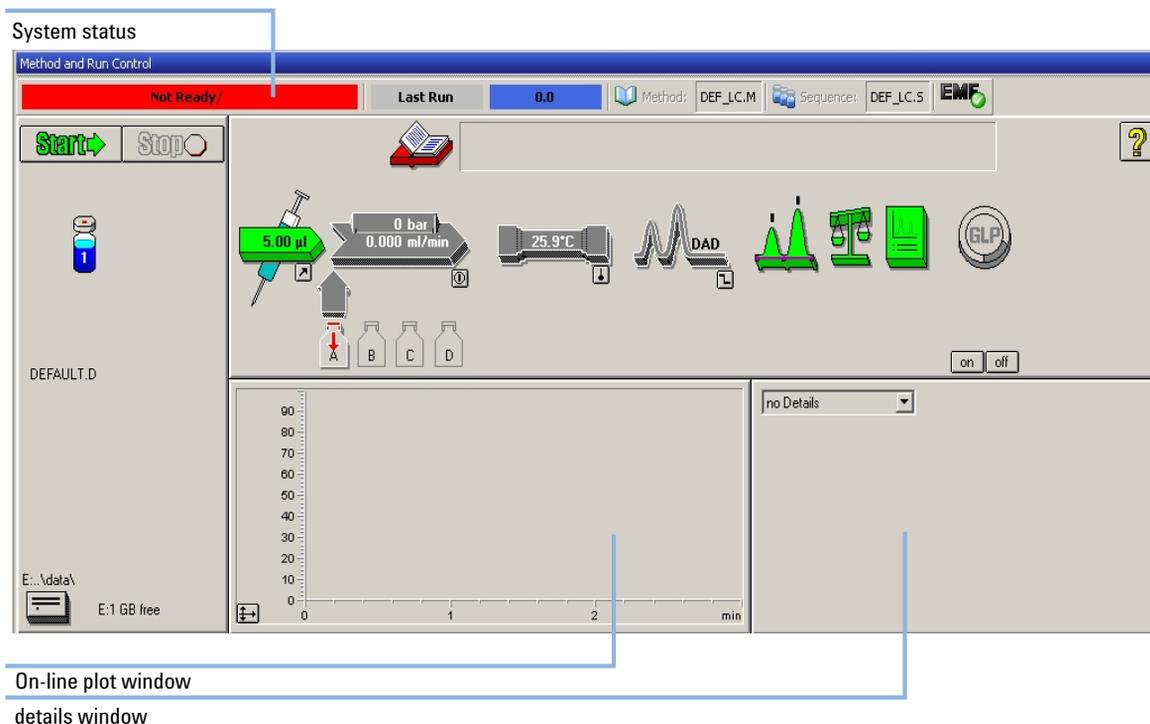


Figure 33 Initial ChemStation screen (Method and Run Control)

- 4 Turn on the detector lamp, pump and autosampler by clicking the **System On** button or the buttons below the module icons on the graphical user interface (GUI). After some time, the pump, thermostatted column compartment and detector module will turn to green.

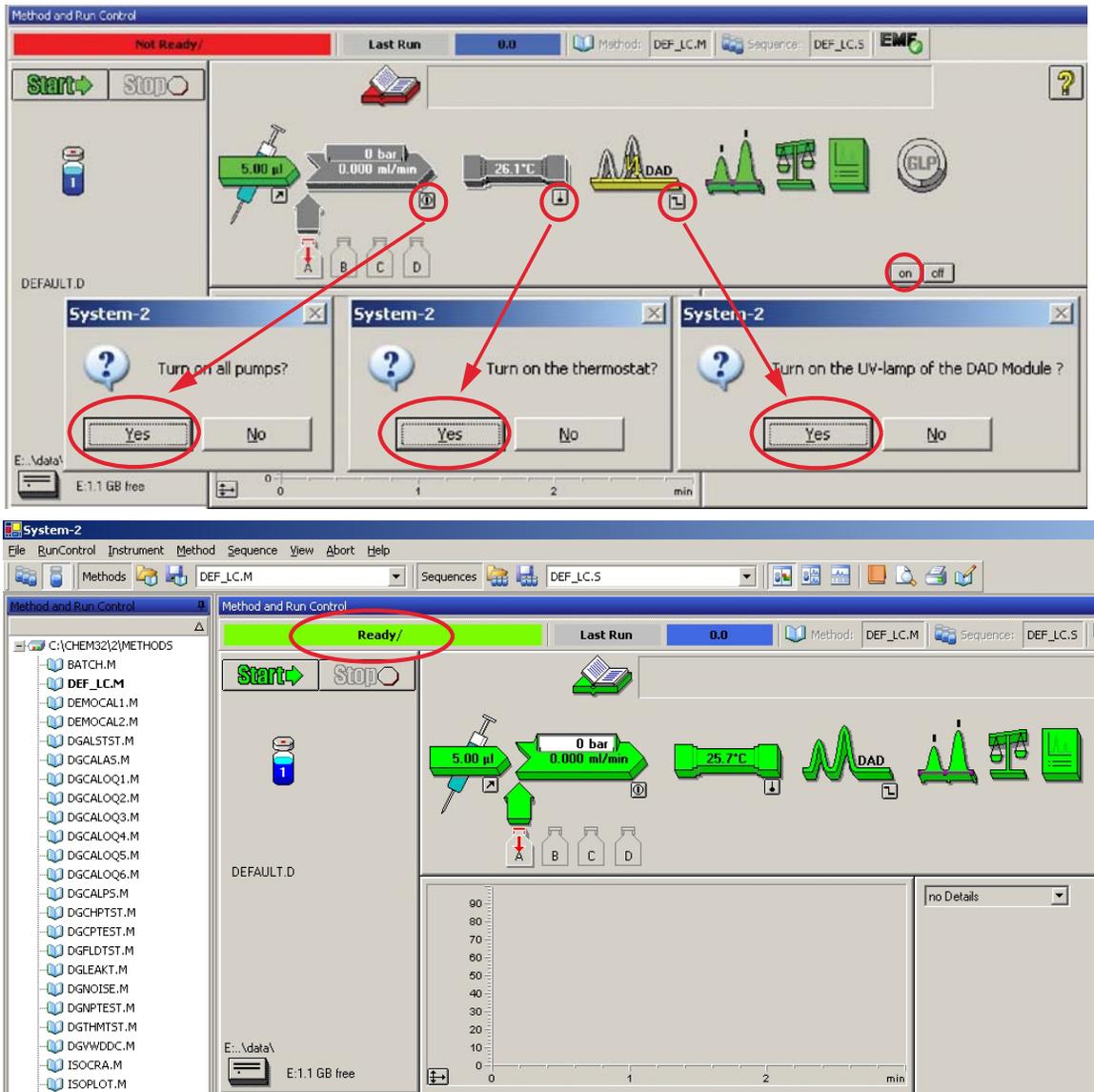


Figure 34 Turning on the HPLC Module

5 Using the Detector

Setting up an Analysis

- 5 Purge the pump. For more information see “[Priming and Purging the System](#)” on page 84.
- 6 Allow the detector to warm up at least 60 minutes to provide a stable baseline (see example in [Figure 35](#) on page 92 and [Table 23](#) on page 92).

NOTE

For reproducible chromatography, the detector and lamp should be on for at least one hour. Otherwise the detector baseline may still drift (depending on the environment). See also section *Wander/Drift Problems Due to Temperature Changes* in the *Service Manual*.

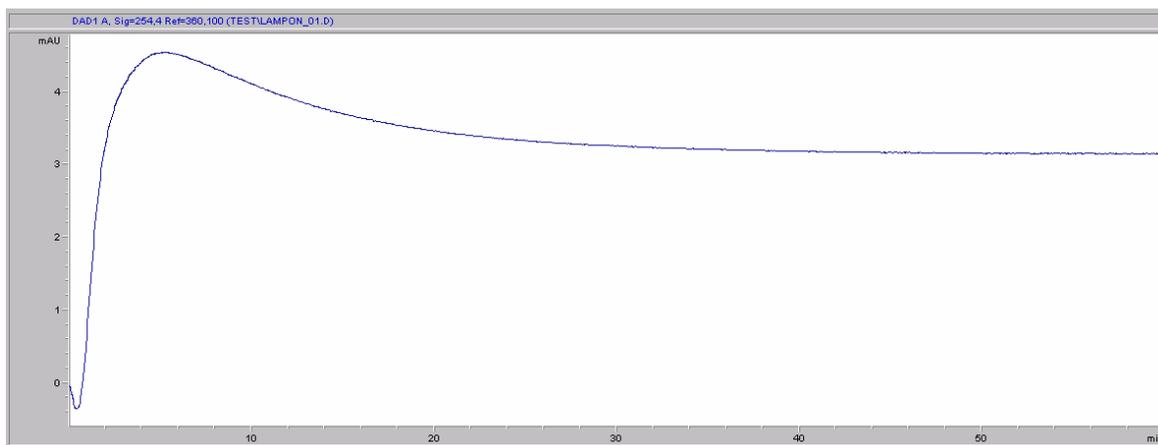


Figure 35 Stabilization of Baseline (both lamps turned on at the same time)

Table 23 Baseline drift after lamp turn on (example from Figure above)

Time [minutes]	Drift [mAU/hr]
17 - 20	2.6
27 - 30	0.8
37 - 40	0.4
47 - 50	0.2
57 - 60	< 0.2

- 7 For the isocratic pump, fill the solvent bottle with the mixture of HPLC-grade bi-distilled water (30 %) and acetonitrile (70 %). For binary- and quaternary pumps you can use separate bottles.
- 8 Click on the **Load Method** button and select DEF_LC.M and press **OK**. Alternative double-click on the method in the method window. The default LC method parameters are transferred into the modules.

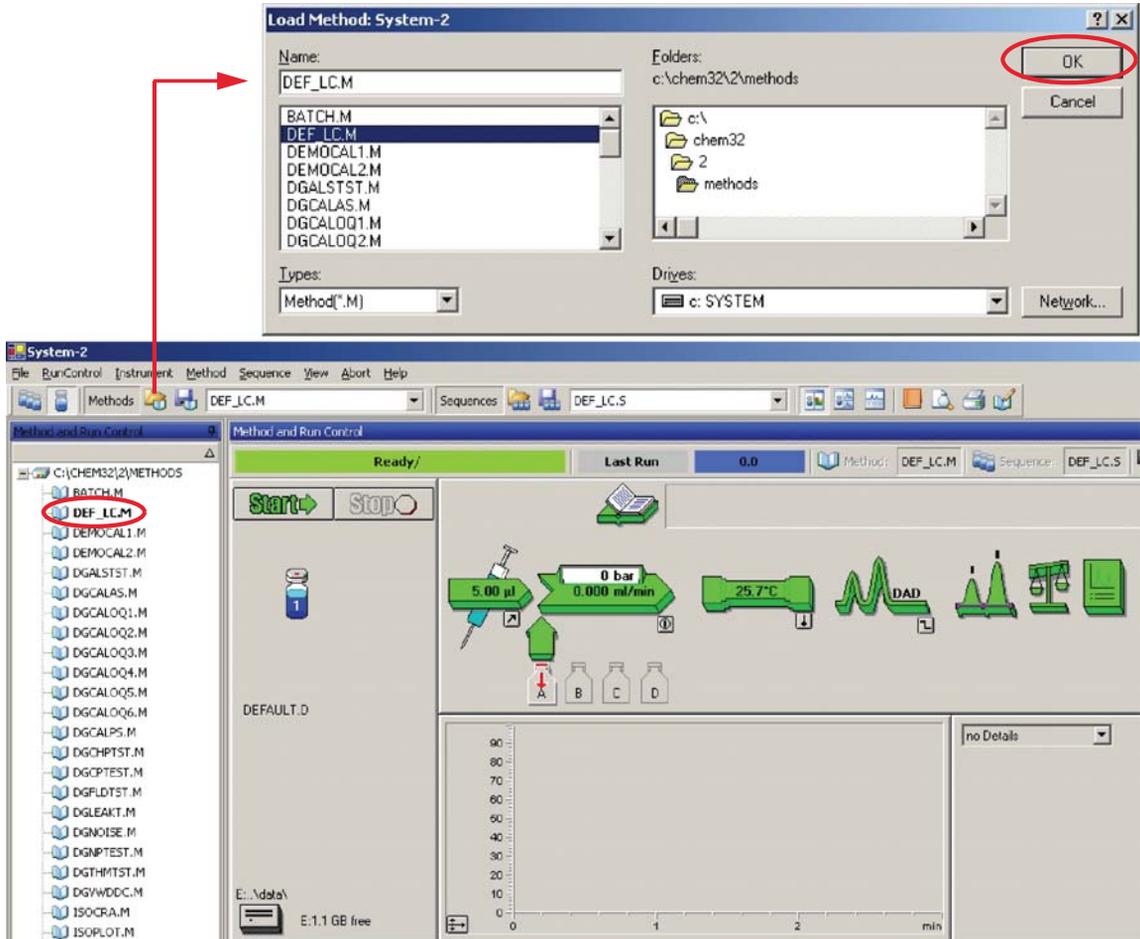


Figure 36 Loading Default LC Method

5 Using the Detector

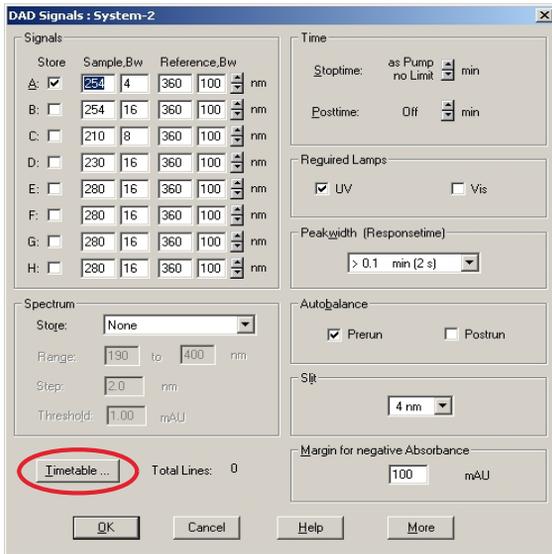
Setting up an Analysis

- Click on the module icons (see Figure below) and open the **Setup** of these modules. Figure on page 95 shows the detector settings (do not change the detector parameters at this time).

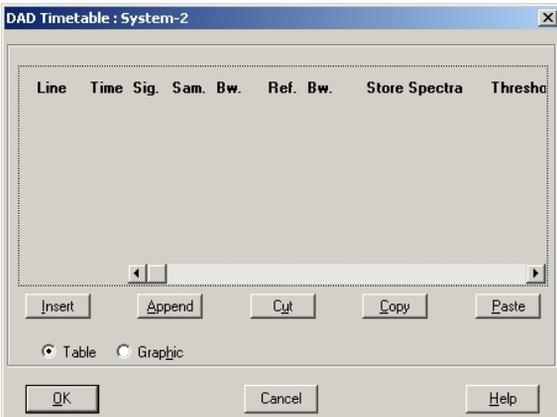


Figure 37 Open the module menu

10 Enter the pump parameters mentioned under [Table 22](#) on page 87.



- up to 8 signals (A to H) with individual wavelength settings can be selected.
- spectrum settings, “[Spectrum Settings \(DAD only\)](#)” on page 108
- stop and post time can be set (if required)
- depending on the application, the lamps can be selected (one or both).
- peak width depends on the peaks in the chromatogram, “[Peakwidth Settings](#)” on page 110
- autobalance to zero absorbance (on the analog output plus offset) at begin and/or end of run.
- mechanical slit width can be changed for further optimization, “[Slit Settings](#)” on page 112
- margin for negative absorbance, “[Margin for Negative Absorbance Settings](#)” on page 113
- Under **More** additional diagnostic signals can be added for troubleshooting purpose, see section “Diagnostic Signals” in the *Service Manual*.



- time table for programmable actions during the run.
NOTE: The Agilent G1315C/D and G1365C/D time table can contain a maximum of 60 rows.

11 Pump the water/acetonitrile (30/70 %) mobile phase through the column for 10 minutes for equilibration.

5 Using the Detector Setting up an Analysis

- 12 Click the button  and select **Change...** to open the Signal Plot information. Select the **Pump: Pressure** and the **DAD A: Signal 254,4** as signals. Change the Y-range for the DAD to 1 mAU and the offset to 20% and the pressure offset to 50%. The X-axis range should be 15 minutes. Press **OK** to exit this screen.

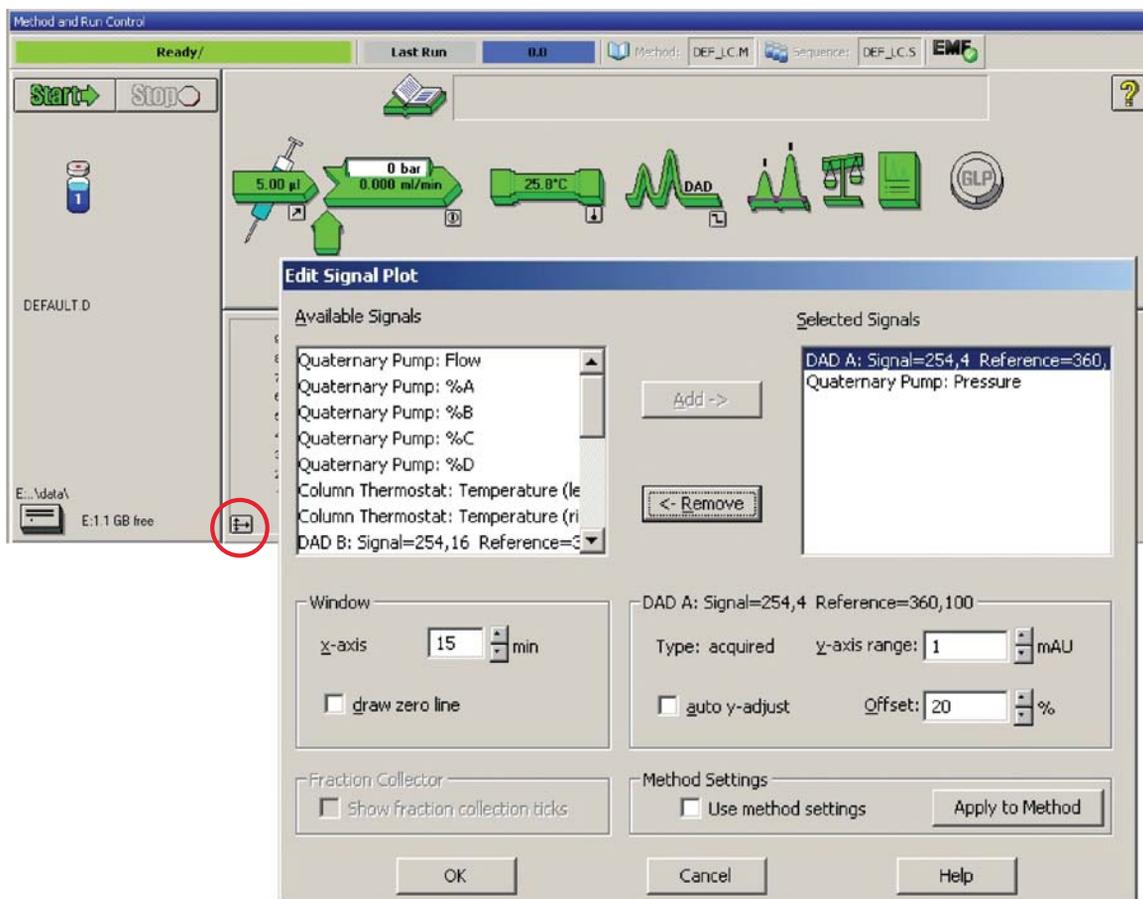


Figure 38 Edit Signal Plot Window

The Online Plot ([Figure 39](#) on page 97) shows both, the pump pressure and the detector absorbance signals. Pressing **Adjust** the signals can be reset to the offset value and **Balance** would do a balance on the detector.

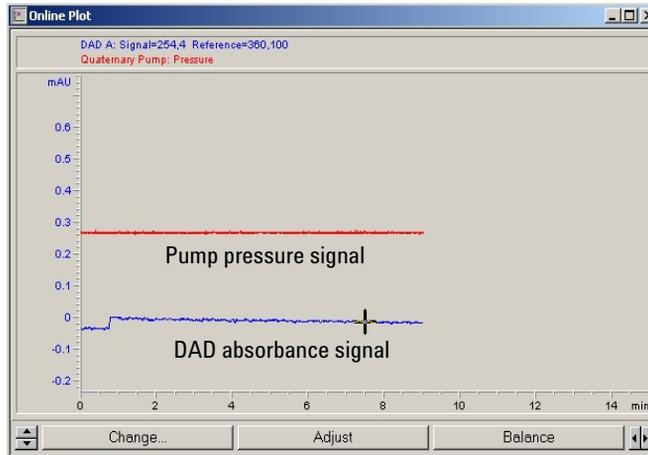


Figure 39 Online Plot Window

13 If both baselines are stable, set the Y-range for the detector signal to 100 mAU.

NOTE

If you start with a new UV-lamp for the first time, the lamp may show initial drift for some time (burn-in effect).

5 Using the Detector

Setting up an Analysis

14 Select the menu item **RunControl** -> **Sample Info** and enter information about this application (see figure below). Press **OK** to leave this screen.

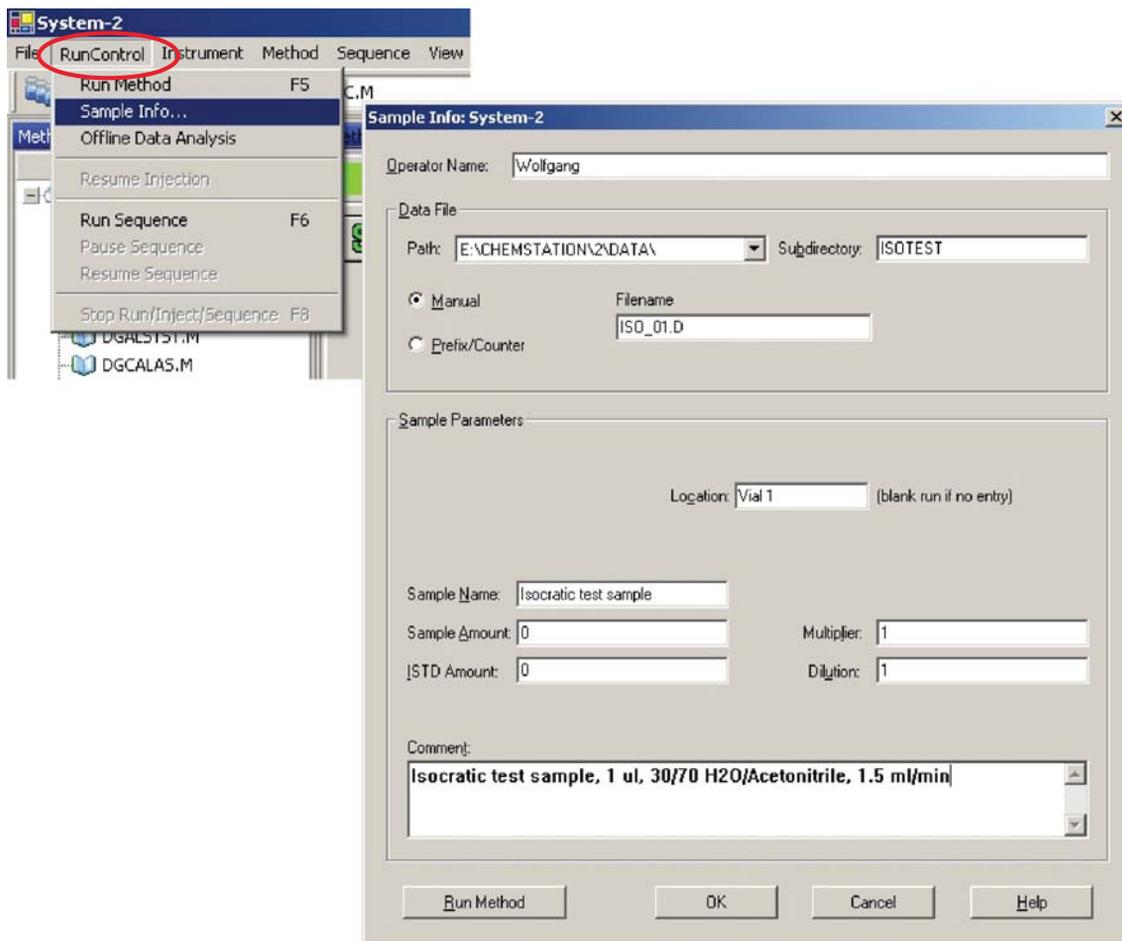


Figure 40 Sample Information

15 Fill the content of an isocratic standard sample ampoule into a vial and seal the vial with a cap and place the vial into autosampler tray (position #1).

Running the Sample and Verifying the Results

- 1 To start a run select the menu item **RunControl -> Run Method**.
- 2 This will start the modules and the online plot on the Agilent ChemStation will show the resulting chromatogram.

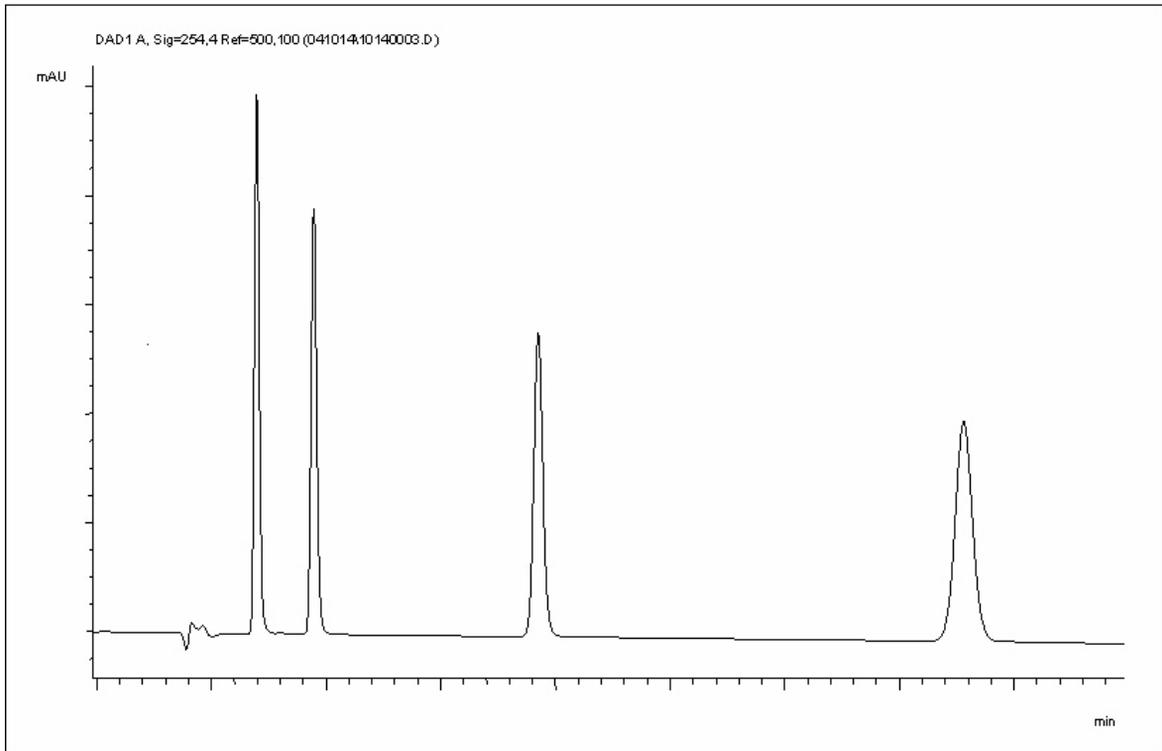


Figure 41 Chromatogram with Isocratic Test Sample

NOTE

Information about using the Data Analysis functions can be obtained from the *Using your ChemStation* manual supplied with your system.

Special Settings of the Detector

In this chapter special settings of the G1315C/D and G1365C/D are described (based on the Agilent ChemStation B.02.01).

Control Settings

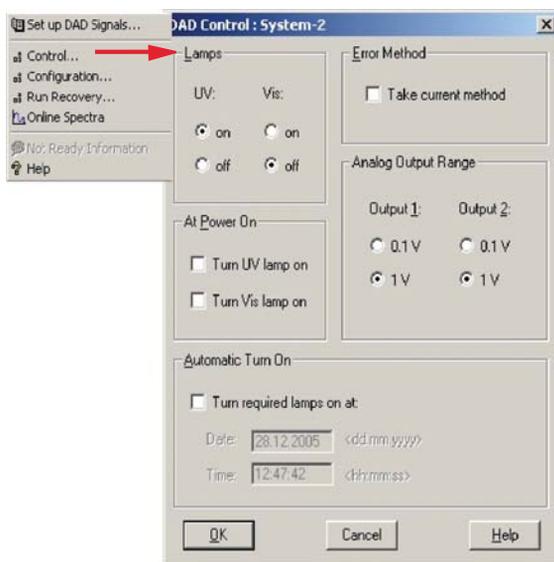
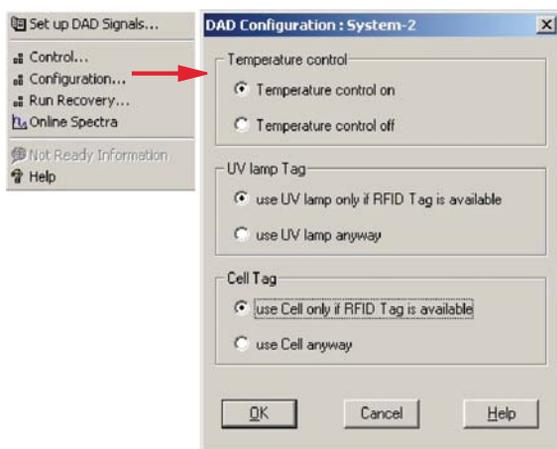


Figure 42 Detector control settings

- **Lamps:** turn on and off of UV- and Vis lamp
- **At Power On:** automatic lamp-on at power on.
- **Error Method:** take error method or current method (in case of an error)
- **Analog Output Range:** can be set to either 100 mV or 1 V full scale, "Analog Output Settings" on page 107
- **Automatic Turn On:** lamps can be programmed (detector must be on for this).
- **Help:** online help.

Configuration Settings



- **Temperature Control:** the optical unit is kept on constant temperature and improves the baseline stability in unstable environments. See also note below.
- **UV lamp tag:** for Agilent lamps with I.D. tags. If no I.D. tag lamp is used, detector icon will become grey (lamp tag not ready) and analysis is disabled.
- **Cell tag:** for Agilent flow cells with I.D. tags. If no I.D. tag cell is used, detector icon will become grey (cell tag not ready) and analysis is disabled.
- **Help:** online help.

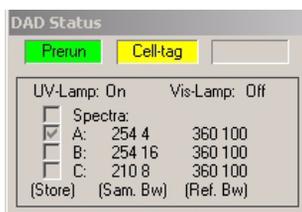


Figure 43 Detector configuration settings

The detector status shows “Cell-tag” in yellow in case the flow cell with the I.D. tag is not inserted. The detector icon is gray and the system is not ready.

NOTE

If the flow cell temperature is critical for your chromatography, you may set the Temperature Control to off. This will lower the optical unit and flow cell temperature by some degree C.

For more details see “Principle of Temperature Control” in the *Service Manual*.

Online Spectra (DAD only)

- 1 To view the online spectra during the run select **Online Spectra**.

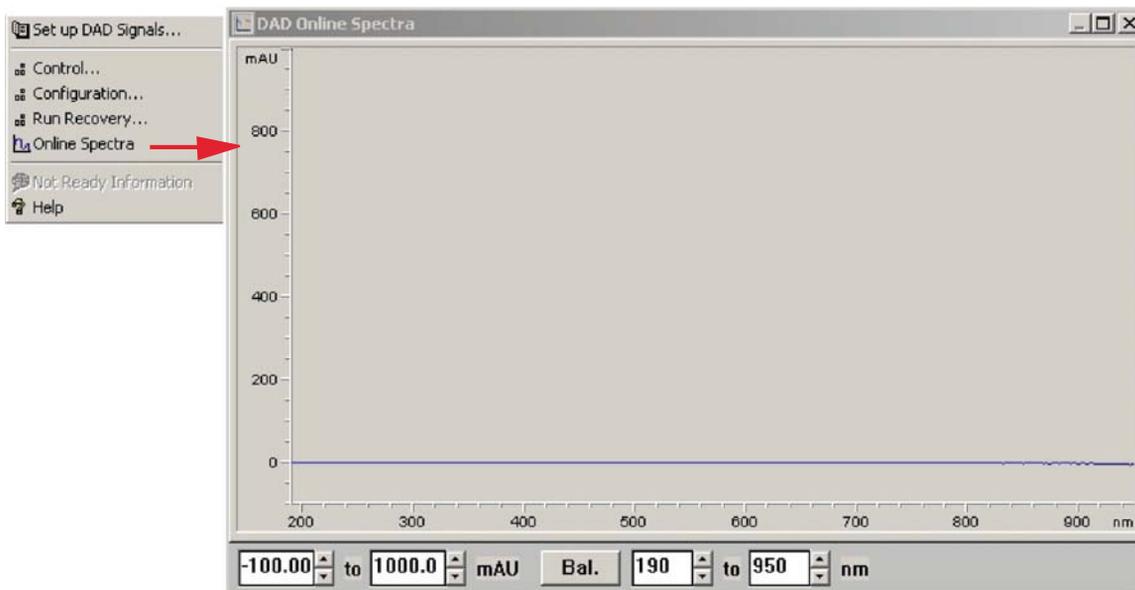


Figure 44 Online Spectra Window

- 2 Change the absorbance and wavelength range according your needs.

Run Recovery Settings

CAUTION

For this recovery mode the CompactFlash Card must be in the detector.

If the LAN communication is interrupted, no data is stored.

→ Have the CompactFlash Card always inserted.

The detector supports run buffering, which means that an amount of run data (*.uv and *.ch files) is stored in a storage medium (CompactFlash Card) in the detector until either it is overwritten or the detector undergoes a power cycle.

If there is a temporary network failure or the PC is not able to constantly take the data, the stored data is transferred to the ChemStation automatically when the network connection is restored or the PC can take the data, so that no loss of data occurs.

If there is a permanent network failure, the Run Recovery dialog box allows you to restore the stored data to the data directory. From there you can copy the files to the directory where the files are corrupted or not complete.

NOTE

On very large recovery files it may take a long time to restore it to the Agilent ChemStation.

A sequence will be stopped in case of a network problem.

NOTE

When during recovery an error "Method/Sequence stopped" appears, the instrument logbook shows an entry "No Run data available in device". In this case refer to "[No Run Data Available In Device](#)" on page 158.

Automated Run Recovery in case of temporary communication failures

Table 24 Automated Run Recovery in case of temporary communication failures

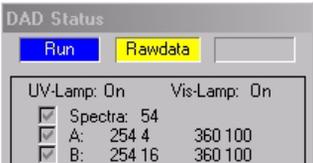
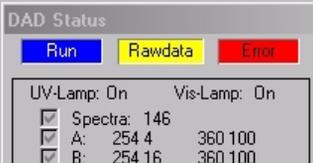
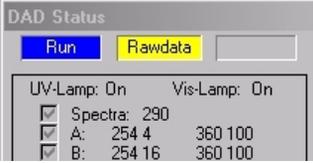
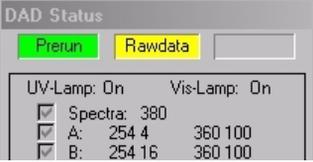
Situation	Reaction	On ChemStation
All OK	<ul style="list-style-type: none"> Run in progress - Data Analysis Run / Rawdata Elapsed run time is running Spectra counter is running Data are stored on PC and on card 	 <p>DAD Status</p> <p>Run Rawdata</p> <p>UV-Lamp: On Vis-Lamp: On</p> <p><input checked="" type="checkbox"/> Spectra: 54</p> <p><input checked="" type="checkbox"/> A: 254 4 360 100</p> <p><input checked="" type="checkbox"/> B: 254 16 360 100</p>
LAN breaks	<ul style="list-style-type: none"> Run in progress - Data Analysis Run / Rawdata Error Power Fail Elapsed run time stops Spectra counter stops Data continues to be stored on card 	 <p>DAD Status</p> <p>Run Rawdata Error</p> <p>UV-Lamp: On Vis-Lamp: On</p> <p><input checked="" type="checkbox"/> Spectra: 146</p> <p><input checked="" type="checkbox"/> A: 254 4 360 100</p> <p><input checked="" type="checkbox"/> B: 254 16 360 100</p>
LAN recovers	<ul style="list-style-type: none"> Run in progress - Data Analysis Run / Rawdata Error Power Fail cleared Elapsed run time continues at actual time Spectra counter continues Data continues to be stored on PC and on card ChemStation tries already to add missing data (depends on the data load). 	 <p>DAD Status</p> <p>Run Rawdata</p> <p>UV-Lamp: On Vis-Lamp: On</p> <p><input checked="" type="checkbox"/> Spectra: 290</p> <p><input checked="" type="checkbox"/> A: 254 4 360 100</p> <p><input checked="" type="checkbox"/> B: 254 16 360 100</p>

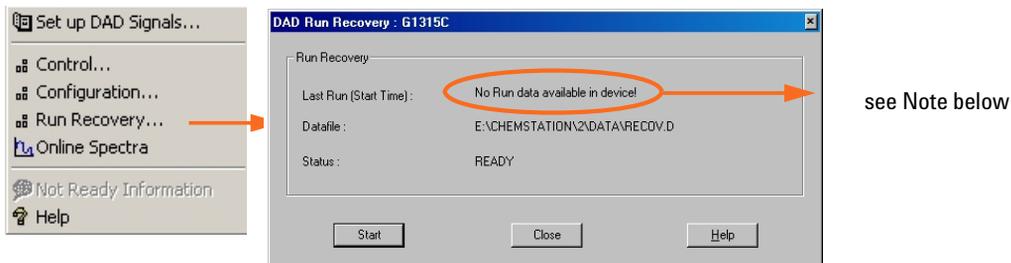
Table 24 Automated Run Recovery in case of temporary communication failures

Situation	Reaction	On ChemStation
Stop time elapsed	<ul style="list-style-type: none"> • Run in progress - Data Analysis • Prerun / Rawdata • Elapsed run time stops • Spectra counter continues • ChemStation continues to add missing data 	 <p>DAD Status window showing: Prerun (green), Rawdata (yellow), UV-Lamp: On, Vis-Lamp: On, Spectra: 380, A: 254.4 360.100, B: 254.16 360.100.</p>
Run ends	<ul style="list-style-type: none"> • Ready • Run finished • Prerun / Ready 	 <p>DAD Status window showing: Prerun (green), Ready (green), UV-Lamp: On, Vis-Lamp: On, Spectra: 380, A: 254.4 360.100, B: 254.16 360.100.</p>

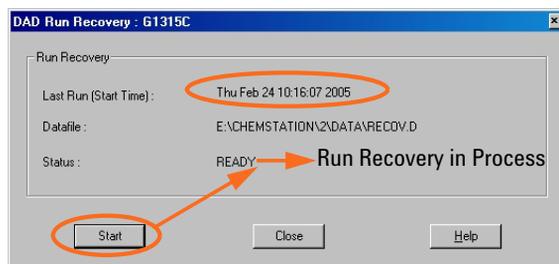
NOTE

If the detector status window is not opened, you will realize only the Power Fail error and the long Run In Progress information until the data is recovered from disk.

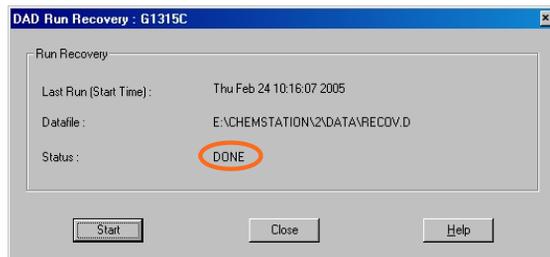
Manual Run Recovery in case of permanent communication failures



Start a recover



After a recover



NOTE

When during recovery an error "Method/Sequence stopped" appears, the instrument logbook shows an entry "No Run data available in device". In this case refer to "No Run Data Available In Device" on page 158

Analog Output Settings

To change the Output Range of the analog outputs see “Control Settings” on page 100.

- 1 To change the offset and the attenuation select **Analog Outputs**.
- 2 Change the ranges for absorbance and wavelength according your needs.

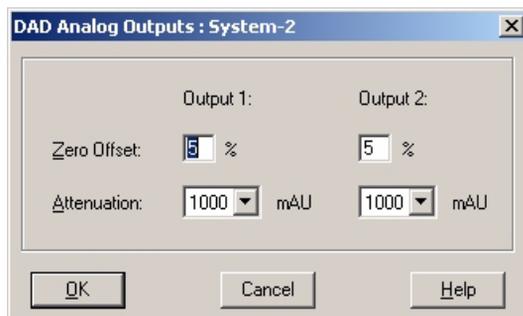
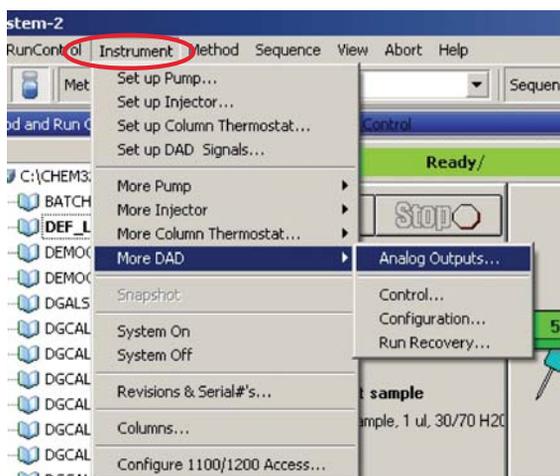


Figure 45 Analog Output Settings

Zero Offset Limits: 1 to 99% in steps of 1%
Attenuation Limits: 0.98 to 2000 mAU at discrete values for either 100 mV or 1 V full scale

- 3 Change the values if required.

Spectrum Settings (DAD only)

To change the Spectra settings open.

- 1 To change the Spectra settings select **Setup Detector Signals**.
- 2 In the section Spectrum click on the drop-down list and chose a parameter. [Table 25](#) on page 109 shows the possible parameters.
- 3 Change the Range, Step width and Threshold according to your needs.

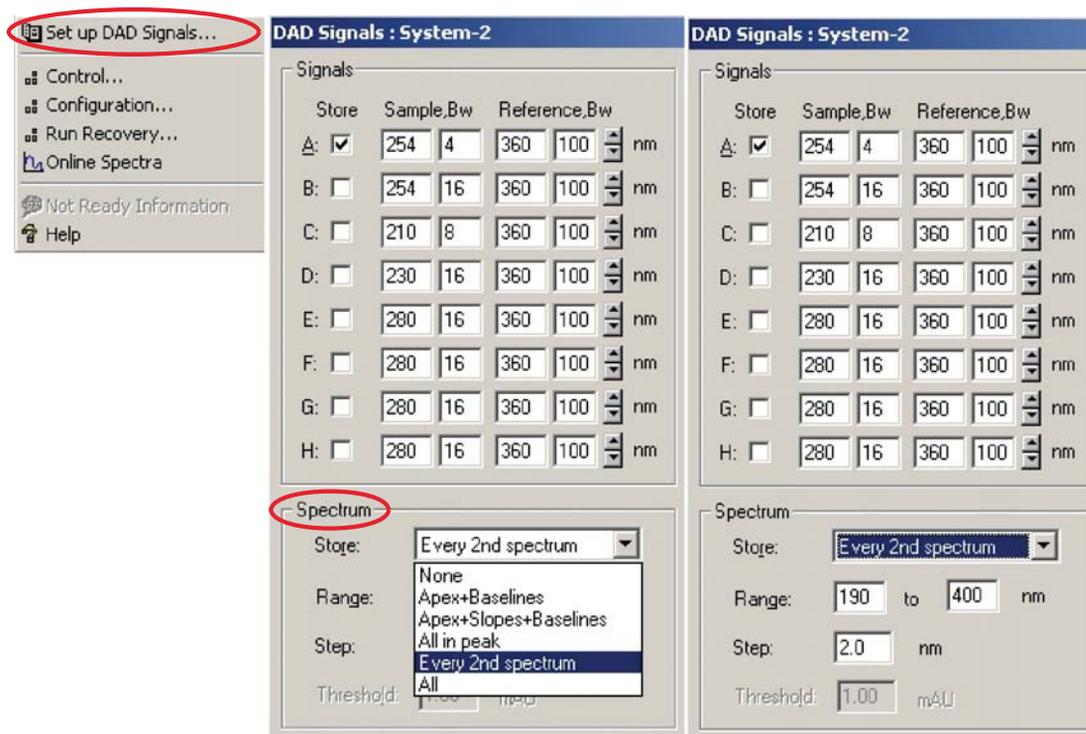


Figure 46 Spectra Settings

Table 25 Spectrum Settings

Store	Defines at which points on “signal A” spectra will be taken and saved. Signal A is used to control the “peak controlled spectra acquisition”; the other signals have no influence on spectra acquisition.
None	No spectra are taken.
Apex + Baselines	Spectra are taken at the apex and baselines of the peak.
Apex + Slopes + Baselines	Spectra are taken at the apex, baselines, upslope, and downslope of the peak.
All in Peak	All spectra within the peak are taken.
NOTE	The three spectra acquisition types mentioned above are also referred to as peak-controlled spectra acquisition. The peak detection is done by the detector firmware based on the threshold and peakwidth parameters you set for the DAD. If you want to use peak-controlled spectra storage, make sure that you set these parameters to recognize all the peaks of interest. The integration algorithm also includes peak detection based on the threshold and peakwidth parameters set in the integration events.
Every 2nd spectrum	Spectra are taken continuously as for All, but only every second spectrum is stored; other spectra are discarded. This reduces the amount of data storage necessary.
All	Spectra are taken continuously depending on the setting of the Peakwidth. Eight spectra are acquired per Peakwidth. The acquisition time for one spectrum is slightly less than the Peakwidth divided by 8, that is, greater than or equal to 0.01s and less than or equal to 2.55s.
NOTE	If there are no peaks in Signal A, there are no spectra. You cannot process spectra present in other signals.
Range	Range defines the wavelength range for spectral storage. Limits: 190 to 950 nm in steps of 1 nm for both low and high values. The high value must be greater than the low value by at least 2 nm.
Step	Step defines the wavelength resolution for spectral storage. Limits: 0.10 to 100.00 nm in steps of 0.1 nm.
Threshold	The threshold is the height in mAU of the smallest expected peak. The peak detector ignores any peaks which are lower than the threshold value and does not save spectra. Limits: 0.001 to 1000.00 mAU in steps of 0.001 mAU. Usable for modes Apex + Baselines, Apex + Slopes + Baselines and All in Peak

Peakwidth Settings

NOTE

Do not use peak width shorter than necessary

Do not use 0.025 sec response time (no filtering/high noise and no need (actually ultra-fast LC doesn't deliver peaks < 0.0025 min / < 0.15 sec))

- 1 To change the Peakwidth settings select **Setup Detector Signals**.
- 2 In the section Peakwidth (Responsetime) click on the drop-down list.
- 3 Change the Peakwidth according to your needs.



Peakwidth enables you to select the peak width (response time) for your analysis. The peak width is defined as the width of a peak, in minutes, at half the peak height. Set the peak width to the narrowest expected peak in your chromatogram. The peak width sets the optimum response time for your detector. The peak detector ignores any peaks that are considerably narrower, or wider, than the peak width setting. The response time is the time between 10% and 90% of the output signal in response to an input step function. When the All spectrum storage option is selected, then spectra are acquired continuously depending on the setting of the peak width. The time specified by the peak width is used as a factor in the acquisition of spectra. The acquisition time for one spectrum is slightly less than the peak width divided by 8, that is the acquisition time is between 0.0125 seconds (80 Hz) and 3.2 seconds.

Limits: When you set the peak width (in minutes), the corresponding response time is set automatically and the appropriate data rate for signal and spectra acquisition is selected as shown in the table below.

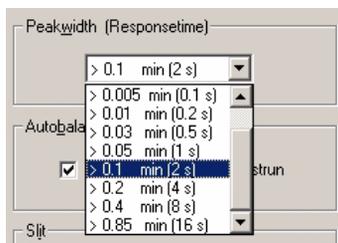


Figure 47 Peakwidth Setting

Table 26 Peak Width — Response Time — Data Rate

Peak Width (min)	Response Time (sec)	Data Rate (Hz)	Detector
<0.0025	0.025	80	G1315C/G1365C only
>0.0025	0.05	80	G1315C/G1365C only
>0.005	0.1	40	G1315C/G1365C only
>0.01	0.2	20	G1315C/D and G1365C/D
>0.03	0.5	10	G1315C/D and G1365C/D
>0.05	1.0	5	G1315C/D and G1365C/D
>0.10	2.0	2.5	G1315C/D and G1365C/D
>0.20	4.0	1.25	G1315C/D and G1365C/D
>0.40	8.0	0.62	G1315C/D and G1365C/D
>0.85	16.0	0.31	G1315C/D and G1365C/D

Slit Settings

- 1 To change the Slit settings select **Setup Detector Signals**.
- 2 In the section Slit click on the drop-down list.
- 3 Change the Slit width according to your needs.



The Slit group allows you to select the optical bandwidth of the detector; the narrower the slit, the smaller the optical bandwidth of the instrument, but the lower its sensitivity. The smaller the optical bandwidth the higher the spectral resolution. To set the slit width, display the drop-down list and select an appropriate slit width from the list.

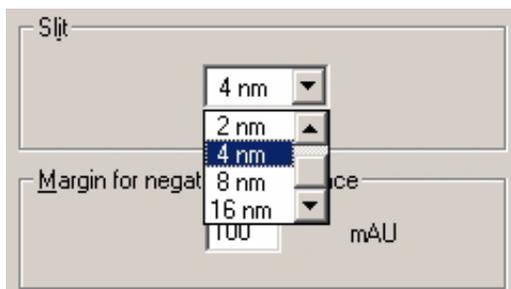


Figure 48 Slit Settings

Margin for Negative Absorbance Settings

- 1 To change the settings select **Setup Detector Signals**.
- 2 In the section Margin for Negative Absorbance change the value according to your needs.



Use this field to modify the detector's signal handling to increase the margin for negative absorbance. Use this option if, for example, your solvent gradient produces a decreasing baseline absorbance, and for GPC analyses.
Limits: 100 to 4000 mAU.



Figure 49 Margin for Negative Absorbance

NOTE

The higher the value the greater the baseline noise. Set this value only if you expect negative absorbance greater than -100 mAU.

Optimizing the Detector

Additional theoretical information can be found in chapter “[How to optimize the Detector](#)” on page 115.

Special Setups with Multiple DAD-MWDs

NOTE

The G1315C/D and G1365C/D detectors are based on the same new hardware/electronic platform.

The G1315A/B and G1365A/B detectors are based on the old hardware/electronic platform.

Two detectors of same type (e.g. G1315C/D and G1315C/D)

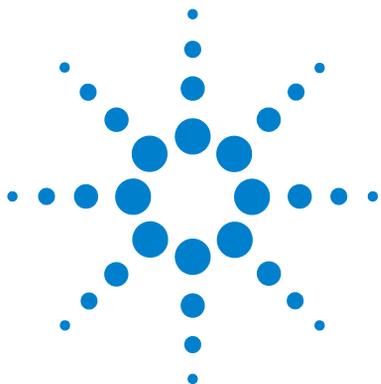
If you have two G1315C/D DAD or G1365C/D MWD in the same system then you can rearrange the order in the menu **Instrument - Configure 1200 Access** to assign a specific detector as detector 1 and 2.

NOTE

The diagnostics, tests and OQ/PV should be done with only one detector configured.

Two detectors of similar type (e.g. G1315C/D and G1315A/B)

If you have similar detectors in the same system, the G1315C/D will be automatically always detector 2 while the G1315A/B is detector 1 independent from its location in the stack. This cannot be changed.



6 How to optimize the Detector

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Ratio Qualifiers for Selective Detection of Compound Classes	131

This chapter provides information on how to optimize the detector.



Introduction

The detector has a variety of parameters that can be used to optimize performance. Depending on whether signal or spectral data need to be optimized, different settings are recommended. The following sections describe optimization for:

- signal sensitivity, selectivity and linearity,
- spectral sensitivity and resolution (DAD only), and
- disk space required for storing data.

NOTE

The information in this chapter should be seen as a basic introduction to diode array detector techniques. Some of these techniques may not be available in the instrument software controlling the detector.

How to Get the Best Detector Performance

The information below will guide you on how to get the best detector performance. Follow these rules as a start for new applications. It gives rules-of-thumb for optimizing detector parameters.

Optimization Overview

Table 27 Optimization Overview

Parameter	Impact
1 Selection of flow cell <ul style="list-style-type: none"> Choose flow cell according to used column, see Figure 50 on page 118. 	<ul style="list-style-type: none"> peak resolution versus sensitivity
2 Connection of flow cell <ul style="list-style-type: none"> For flow rates from 0.5 ml/min connect column using the zero-dead-volume fittings of the detector. For small column i.d. (e.g 1 mm) the inlet capillary of the micro flow cell can be connected directly to the column. 	<ul style="list-style-type: none"> chromatographic resolution
3 Setting the peak width (response time) <ul style="list-style-type: none"> Use peak width according Figure 50 on page 118 as starting point. Set the peak-width close to the width of a narrow peak of interest in your chromatogram. 	<ul style="list-style-type: none"> peak resolution versus sensitivity versus disk space
4 Setting wavelength and bandwidth <ul style="list-style-type: none"> Sample wavelength: <ul style="list-style-type: none"> Never miss a peak by the use of a browser wavelength like 250 nm with 100 nm bandwidth. Select specific wavelength with reduced bandwidth if you need selectivity, e.g. 250,10 nm and 360,100 nm as reference wavelength. Set the sample wavelength to a peak or valley in the spectrum to get best linearity for high concentrations. Reference wavelength: <ul style="list-style-type: none"> Select the reference wavelength with broad bandwidth (30...100 nm) wavelength range where your analytes have little or no absorbance (e.g. sample at 254 nm, reference at 320 nm). 	<ul style="list-style-type: none"> sensitivity versus selectivity sensitivity versus linearity baseline drift due to RI effects.

6 How to optimize the Detector

Optimization Overview

Table 27 Optimization Overview

Parameter	Impact
5 Setting the slit width	
<ul style="list-style-type: none"> Use 4 nm slit for normal applications. Use narrow slit (e.g 1 nm) if your analytes have narrow absorbance bands and for high concentrations. Use a wide slit (e.g. 16 nm) to detect very low concentrations. Optimizing spectral acquisition (DAD only) Select spectra acquisition mode according to your needs (see Table 25 on page 109). Set the spectral wavelength range (for colorless samples 190...400 nm is sufficient). Set step to 4 nm for normal use; set small step (and slit width) if high resolution of spectra with fine structure is wanted. 	<ul style="list-style-type: none"> spectral resolution, sensitivity and linearity.

Typical column length	Typical peak width	Recommended flow cell					
T <= 5 cm	0.025 min	Micro or Semi-nano					
10 cm	0.05 min		Semi-micro flow cell				High pressure flow cell for pressures above 100bar
20 cm	0.1 min			Standard flow cell			
>= 40 cm	0.2 min						
	Typical flow rate	0.01 ... 0.2 ml/min	0.2 ... 0.4 ml/min	0.4 ... 0.4 ml/min	1 ... 5 ml/min	0.01 ... 5 ml/min	
	Internal column diameter	0.5 ... 1 mm	2.1 mm	3.0 mm	4.6 mm		

Figure 50 Choosing a Flow Cell in HPLC

Optimizing for Sensitivity, Selectivity, Linearity and Dispersion

Flow Cell Path Length

Lambert-Beer's law shows a linear relationship between the flow cell path length and absorbance.

$$\text{Absorbance} = -\log T = \log \frac{I_0}{I} = \epsilon \times C \times d$$

where

T is the transmission, defined as the quotient of the intensity of the transmitted light I divided by the intensity of the incident light, I₀,

ε is the extinction coefficient, which is a characteristic of a given substance under a precisely-defined set of conditions of wavelength, solvent, temperature and other parameters,

C [mol/L] is the concentration of the absorbing species, and

d [cm] is the path length of the cell used for the measurement.

Therefore, flow cells with longer path lengths yield higher signals. Although noise usually increases little with increasing path length, there is a gain in signal-to-noise ratio. For example, in [Figure 51](#) on page 120 the noise increased by less than 10 % but a 70 % increase in signal intensity was achieved by increasing the path length from 6 – 10 mm.

When increasing the path length, the cell volume usually increases – in our example from 5 – 13 μL. Typically, this causes more peak dispersion. As [Figure 51](#) on page 120 demonstrates, this did not affect the resolution in the gradient separation in our example.

As a rule-of-thumb the flow cell volume should be about 1/3 of the peak volume at half height. To determine the volume of your peaks, take the peak width as reported in the integration results multiply it by the flow rate and divide it by 3).

6 How to optimize the Detector

Optimizing for Sensitivity, Selectivity, Linearity and Dispersion

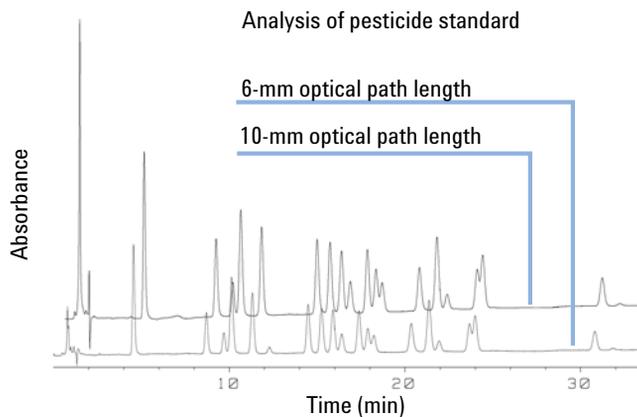


Figure 51 Influence of Cell Path Length on Signal Height

Traditionally LC analysis with UV detectors is based on comparing measurements with internal or external standards. To check photometric accuracy of the detector it is necessary to have more precise information on path lengths of the flow cells.

The correct response is:

expected response * correction factor

Please find below the details of the flow cells:

Table 28 Correction factors for flow cells

Flow cell	Path length (actual)	Correction factor
Standard flow cell, 10 mm, 13 μ L, 120 bar (12 MPa) (p/n G1315-60022)	9.80 \pm 0.07 mm	10/9.8
Semi-micro flow cell, 6 mm, 5 μ L, 120 bar (12 MPa) (p/n G1315-60025)	5.80 \pm 0.07 mm	6/5.8
Micro flow cell, 3 mm, 2 μ L, 120 bar (12 MPa) (p/n G1315-60024)	3.00 +0.05 mm/-0.07 mm	3/3
Semi-nano flow cell kit, 10 mm, 500 nL, 5 MPa (p/n G1315-68724)	10.00 \pm 0.02 mm	10/10
Nano flow cell kit, 10 mm, 80 nL, 5 MPa (p/n G1315-68716)	6.00 \pm 0.02 mm	6/6

Peak width (response time)

Response time describes how fast the detector signal follows a sudden change of absorbance in the flow cell. The detector uses digital filters to adapt response time to the width of the peaks in your chromatogram. These filters do not affect peak area nor peak symmetry. When set correctly, such filters reduce baseline noise significantly (Figure 52 on page 121), but reduce peak height only slightly. In addition, these filters reduce the data rate to allow optimum integration and display of your peaks and to minimize disk space required to store chromatograms and spectra.

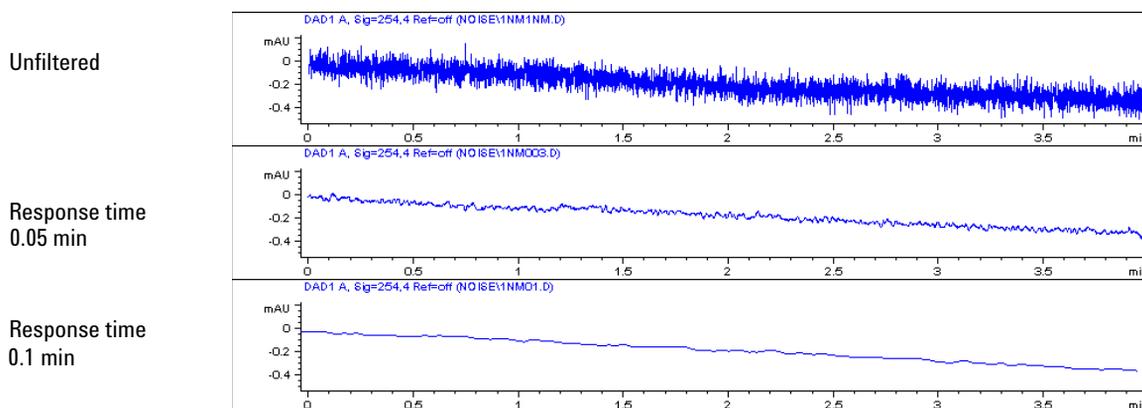


Figure 52 Influence of Response Time on Signal and Noise

Table 29 on page 122 lists the filter choices of the detector. To get optimum results, set peak width as close as possible to a narrow peak of interest in your chromatogram. Response time will be approximately 1/3 of the peak width, resulting in less than 5 % peak-height reduction and less than 5 % additional peak dispersion. Decreasing the peak width setting in the detector will result in less than 5 % gain in peak height but baseline noise will increase by a factor of 1.4 for a factor of 2 response-time reduction. Increasing peak width (response time) by factor of two from the recommended setting (over-filtering) will reduce peak height by about 20 % and reduce baseline noise by a factor of 1.4. This gives you the best possible signal-to-noise ratio, but may affect peak resolution.

6 How to optimize the Detector

Optimizing for Sensitivity, Selectivity, Linearity and Dispersion

Table 29 Peak Width — Response Time — Data Rate

Peak Width [minutes]	Response Time [seconds]	Data Rate [Hz]	Detector
<0.0025	0.025	80	G1315C/G1365C only
>0.0025	0.05	80	G1315C/G1365C only
>0.005	0.1	40	G1315C/G1365C only
>0.01	0.2	20	G1315C/D and G1365C/D
>0.03	0.5	10	G1315C/D and G1365C/D
>0.05	1.0	5	G1315C/D and G1365C/D
>0.10	2.0	2.5	G1315C/D and G1365C/D
>0.20	4.0	1.25	G1315C/D and G1365C/D
>0.40	8.0	0.62	G1315C/D and G1365C/D
>0.85	16.0	0.31	G1315C/D and G1365C/D

Sample and Reference Wavelength and Bandwidth

The detector measures absorbance simultaneously at wavelengths from 190 to 950 nm. Two lamps provide good sensitivity over the whole wavelength range. The deuterium discharge lamp provides the energy for the UV range (190 to 400 nm) and the tungsten lamp emits light from 400 to 950 nm for the visible and short wave near infrared.

If you know little about the analytes in your sample, use both lamps and store all spectra over the full wavelength range. This provides full information but fills up your disk space rather quickly. Spectra can be used to check a peak's purity and identity. Spectral information is also useful to optimize wavelength settings for your chromatographic signal.

The detector can compute and store at run time up to 8 signals with these properties:

- sample wavelength, the center of a wavelength band with the width of sample bandwidth (BW), and optionally
- reference wavelength, the center of a wavelength band with the width of reference bandwidth.

The signals comprises a series of data points over time, with the average absorbance in the sample wavelength band minus the average absorbance of the reference wavelength band.

Signal A in the detector default method is set to sample 250,100, reference 360,100, that is, the average absorbance from 200 – 300 nm minus the average absorbance from 300 – 400 nm. As all analytes show higher absorbance at 200 – 300 nm than at 300 – 400 nm, this signal will show you virtually every compound which can be detected by UV absorbance.

Many compounds show absorbance bands in the spectrum. [Figure 53](#) on page 124 shows the spectrum of anisic acid as an example.

To optimize for lowest possible detectable concentrations of anisic acid, set the sample wavelength to the peak of the absorbance band (that is, 252 nm) and the sample bandwidth to the width of the absorbance band (that is, 30 nm). A reference of 360,100 is adequate. Anisic acid does not absorb in this range.

If you work with high concentrations, you may get better linearity above 1.5 AU by setting the sample wavelength to a valley in the spectrum, like 225 nm for anisic acid.

6 How to optimize the Detector

Optimizing for Sensitivity, Selectivity, Linearity and Dispersion

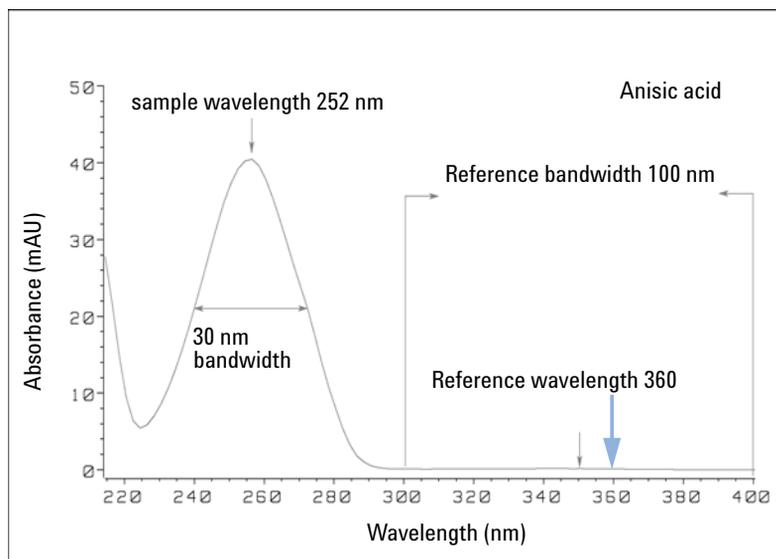


Figure 53 Optimization of Wavelength Setting

A wide bandwidth has the advantage of reducing noise by averaging over a wavelength range – compared to a 4 nm bandwidth, the baseline noise is reduced by a factor of approximately 2.5, whereas the signal is about 75 % of a 4 nm wide band. The signal-to-noise ratio for a 30 nm bandwidth is twice that for a 4 nm bandwidth in our example.

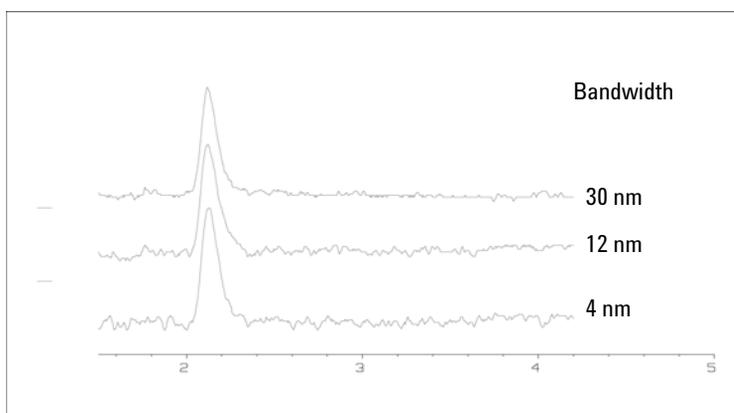


Figure 54 Influence of Bandwidth on Signal and Noise

Because the detector averages absorbance values that are calculated for each wavelength, using a wide bandwidth does not negatively impact linearity.

The use of a reference wavelength is highly recommended to further reduce baseline drift and wander induced by room temperature fluctuations or refractive index changes during a gradient.

An example of the reduction of baseline drifts is shown in [Figure 55](#) on page 125 for PTH-amino acids. Without a reference wavelength, the chromatogram drifts downwards due to refractive index changes induced by the gradient. This is almost completely eliminated by using a reference wavelength. With this technique, PTH-amino acids can be quantified in the low picomole range even in a gradient analysis.

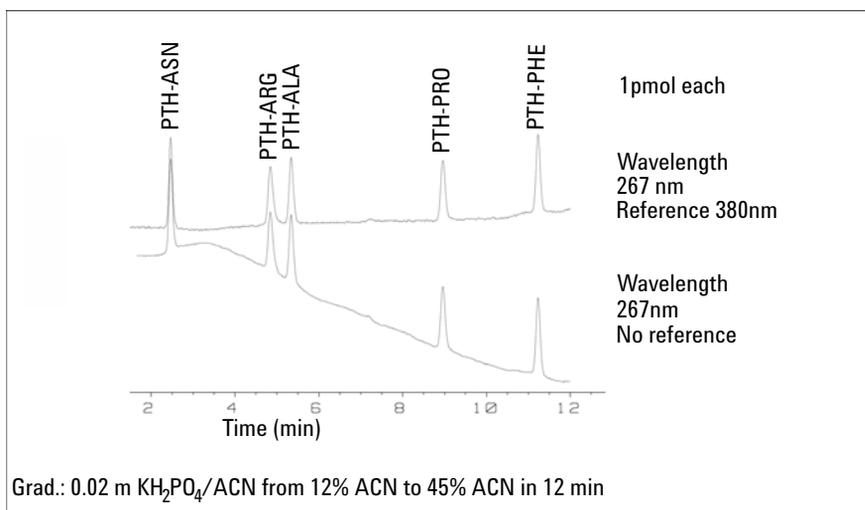


Figure 55 Gradient Analysis of PTH-Amino Acids (1 pmol each), with and without Reference

Slit Width

The detector has a variable slit at the entrance of the spectrograph. This is an effective tool to adapt the detector to changing demand of different analytical problems.

A narrow slit provides spectral resolution for analytes with very fine structures in the absorbance spectrum. An example of such a spectrum is benzene. The five main absorbance bands (fingers) are only 2.5 nm wide and just 6 nm apart from each other.

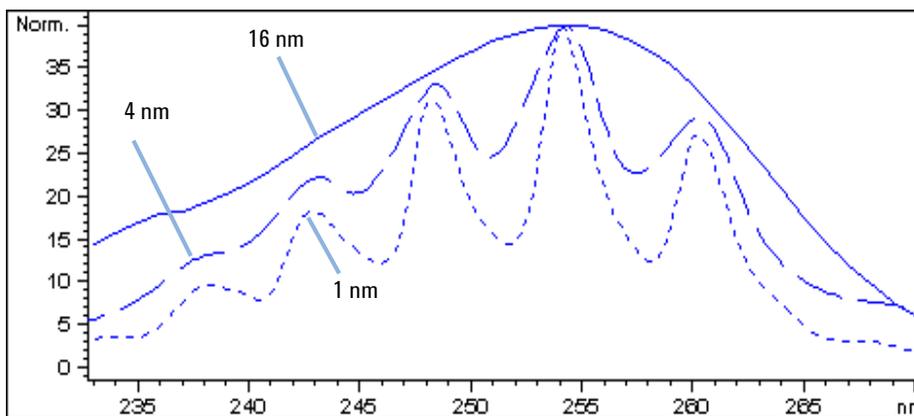


Figure 56 Benzene at 1, 4 and 16 nm slit width (principle)

A wide slit uses more of the light shining through the flow cell. This gives lower baseline noise as shown in [Figure 57](#) on page 127.

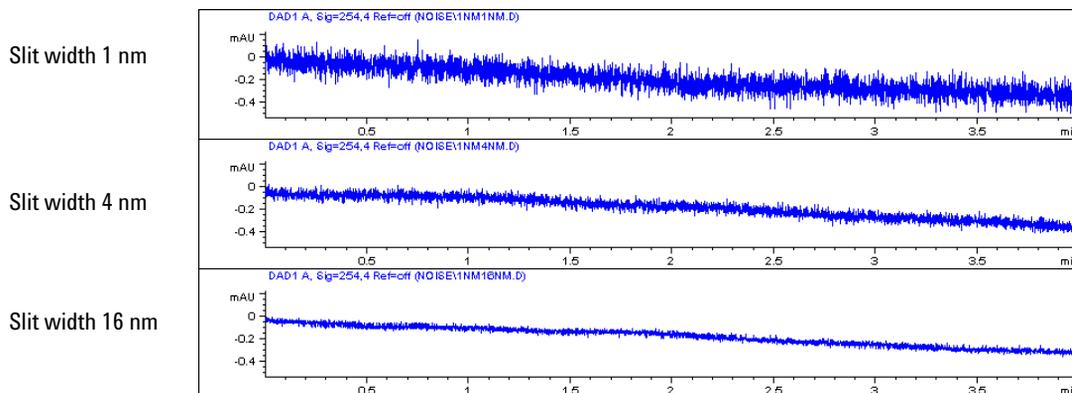


Figure 57 Influence of the Slit Width on Baseline Noise

However, with a wider slit, the spectrograph's optical resolution (its ability to distinguish between different wavelengths) diminishes. Any photodiode receives light within a range of wavelength determined by the slit width. This explains why the fine spectral structure of benzene disappears when using a 16-nm wide slit.

Furthermore, the absorbance is no longer strictly linear with concentration for wavelengths at a steep slope of a compound's spectrum.

Substances with fine structures and steep slopes like benzene are very rare.

In most cases the width of absorbance bands in the spectrum is more like 30 nm as with anisic acid (Figure 53 on page 124).

In most situations, a slit width of 4 nm will give the best results.

Use a narrow slit (1 or 2 nm) if you want to identify compounds with fine spectral structures or if you need to quantify at high concentrations (> 1000 mAU) with a wavelength at the slope of the spectrum. Signals with a wide bandwidth can be used to reduce baseline noise. Because (digital) bandwidth is computed as average of absorbance, there is no impact on linearity.

Use a wide (8 or 16 nm) slit when your sample contains very small concentrations. Always use signals with bandwidth at least as wide as the slit width.

Optimizing Spectral Acquisition (DAD only)

Storage of all spectra consumes a lot of disk space. It is very useful to have all spectra available during optimization of a method or when analyzing unique samples. However when running many samples of the same type, the large size of data files with all spectra may become a burden. The detector provides functions to reduce the amount of data, yet retaining the relevant spectral information.

For spectra options see [Table 25](#) on page 109.

Range

Only the wavelength range where the compounds in your sample absorb contains information that is useful for purity checks and library searches. Reducing the spectrum storage range saves disk space.

Step

Most substances have broad absorbance bands. Display of spectra, peak purity and library search works best if a spectrum contains 5 to 10 data points per width of the absorbance bands. For anisic acid (the example used before) a step of 4 nm would be sufficient. However a step of 2 nm gives a more optimal display of the spectrum.

Threshold

Sets the peak detector. Only spectra from peaks higher than threshold will be stored when a peak-controlled storage mode is selected.

Margin for Negative Absorbance

The detector adjusts its gain during *balance* such that the baseline may drift slightly negative (about -100 mAU). In some special case, for example, when gradient with absorbing solvents are used, the baseline may drift to more negative values.

Only for such cases, increase the margin for negative absorbance to avoid overflow of the analog-to-digital converter.

Optimizing Selectivity

Quantifying Coeluting Peaks by Peak Suppression

In chromatography, two compounds may often elute together. A conventional dual-signal detector can only detect and quantify both compounds independently from each other if their spectra do not overlap. However, in most cases this is highly unlikely.

With a dual-channel detector based on diode-array technology, quantifying two compounds is possible even when both compounds absorb over the whole wavelength range. The procedure is called peak suppression or signal subtraction. As an example, the analysis of hydrochlorothiazide in the presence of caffeine is described. If hydrochlorothiazide is analyzed in biological samples, there is always a risk that caffeine is present which might interfere chromatographically with hydrochlorothiazide. As the spectra in [Figure 58](#) on page 129 shows, hydrochlorothiazide is best detected at 222 nm, where caffeine also shows significant absorbance. It would therefore be impossible, with a conventional variable wavelength detector, to detect hydrochlorothiazide quantitatively when caffeine is present.

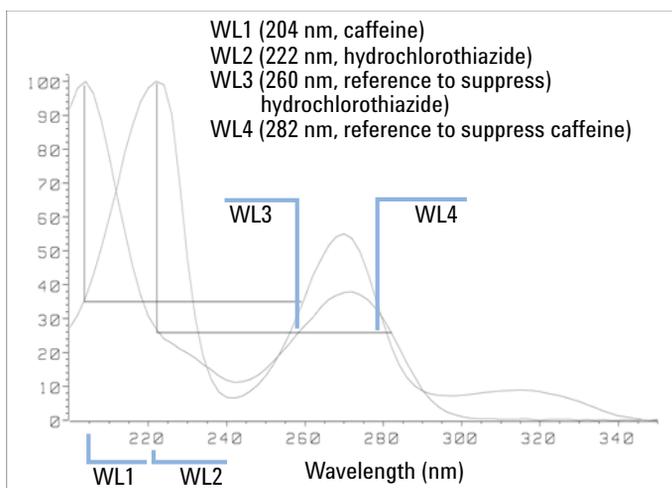


Figure 58 Wavelength Selection for Peak Suppression

6 How to optimize the Detector

Optimizing Selectivity

With a UV-visible detector based on a diode array and the correct choice of a reference wavelength setting, quantitative detection is possible. To suppress caffeine, the reference wavelength must be set to 282 nm. At this wavelength, caffeine shows exactly the same absorbance as at 222 nm. When the absorbance values are subtracted from each another, any indication of the presence of caffeine is eliminated. In the same way, hydrochlorothiazide can be suppressed if caffeine is to be quantified. In this case the wavelength is set to 204 nm and the reference wavelength to 260 nm. [Figure 59](#) on page 130 shows the chromatographic results of the peak suppression technique.

The trade-off for this procedure is a loss in sensitivity. The sample signal decreases by the absorbance at the reference wavelength relative to the signal wavelength. Sensitivity may be decreased by as much as 10–30 %.

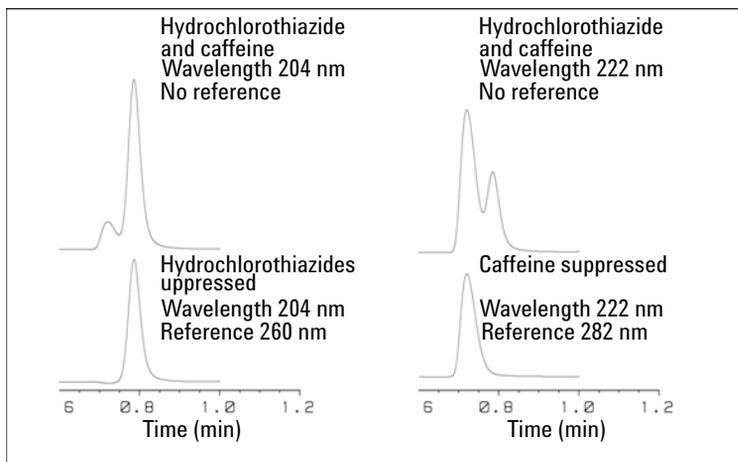


Figure 59 Peak Suppression Using Reference Wavelength

Ratio Qualifiers for Selective Detection of Compound Classes

Ratio qualifiers can be used where, in a complex sample, only one particular class needs to be analyzed – a parent drug and its metabolites in a biological sample, for example. Another example is the selective analysis of derivatives after pre- or post-column derivatization. Specifying a signal ratio that is typical for the sample class is one way of selectively plotting only those peaks that are of interest. The signal output remains at zero so long as the ratio is out of the user-specified ratio range. When the ratio falls within the range, the signal output corresponds to the normal absorbance, giving single, clear peaks on a flat baseline. An example is shown in [Figure 60](#) on page 131 and [Figure 61](#) on page 132.

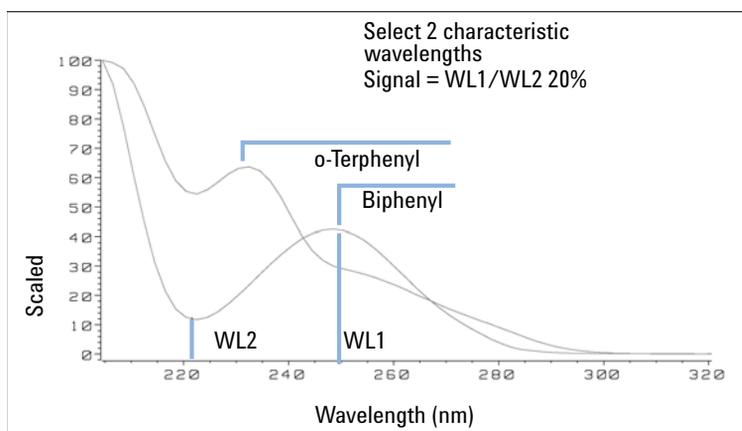


Figure 60 Wavelength Selection for Ratio Qualifiers

6 How to optimize the Detector

Optimizing Selectivity

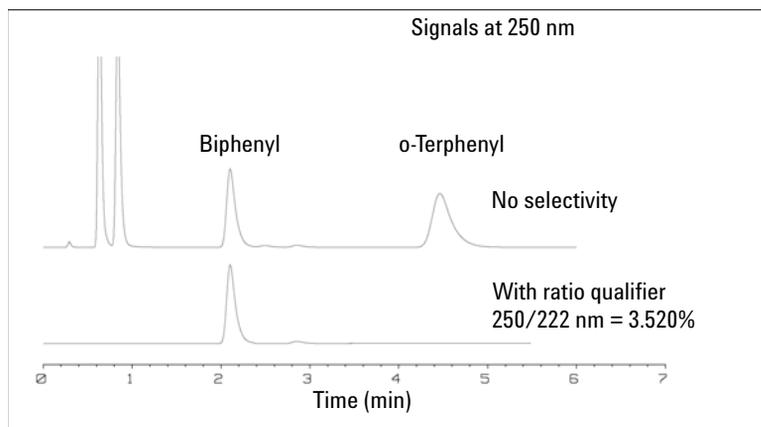
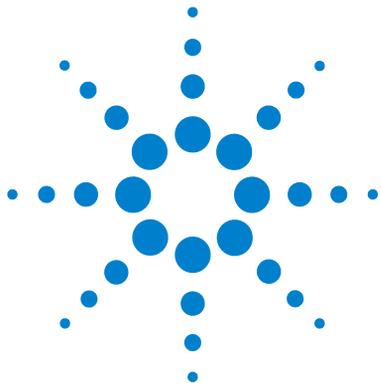


Figure 61 Selectivity by Ratio Qualifiers

In a four-component mixture, only biphenyl was recorded. The other three peaks were suppressed because they did not meet the ratio-qualifier criterion and therefore the output was set to zero. The characteristic wavelengths 249 nm (λ_1) and 224 nm (λ_2) were found from the spectra shown in [Figure 60](#) on page 131. The ratio range was set at 2 – 2.4 ($2.2 \pm 10\%$). Only when the ratio between 249 and 224 nm was within this range, is the signal plotted. Of all four peaks, only the third fulfilled the criterion ([Figure 61](#) on page 132). The others were not plotted.



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 [“Error Information”](#) on page 139).

Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components (see [“Test Functions”](#) on page 161).

Wavelength Verification / Recalibration

Wavelength recalibration is recommended after exchange of lamps and flow cells, maintenance of flow cells, repair of internal components, and on a regular basis to ensure correct operation of the module. The module uses the deuterium alpha and beta emission lines for wavelength calibration (see [“Wavelength Verification and Recalibration”](#) on page 183).

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.

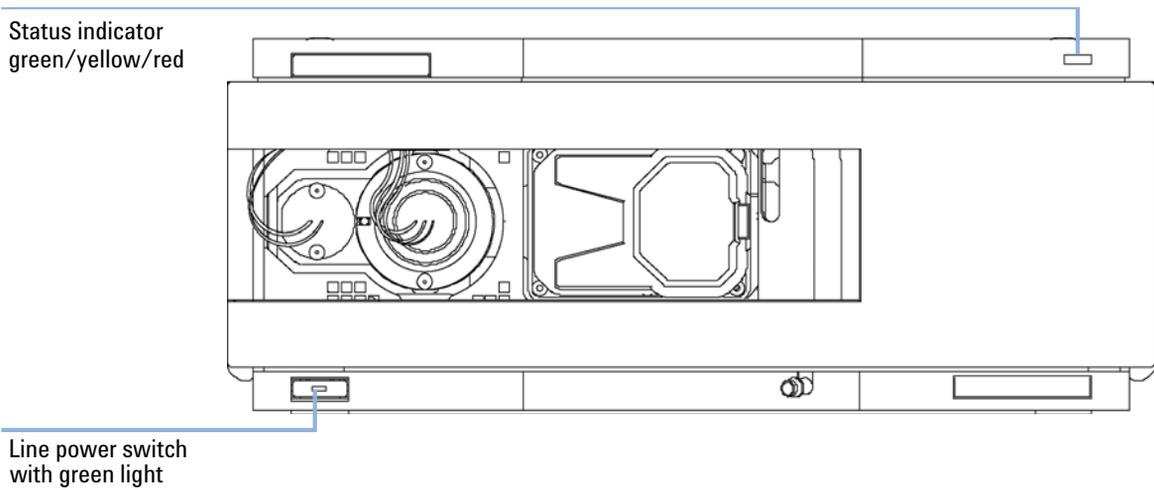


Figure 62 Location of Status Indicators

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* (modules with on-board LAN) or *yellow-blinking* (modules without on-board LAN) indicator indicates that the module is in resident mode (e.g. during update of main firmware).
- A *fast red-blinking* (modules with on-board LAN) or *fast yellow-blinking* (modules without on-board LAN) indicator indicates that the module is in boot loader mode (e.g. during update of main firmware). In such a case try to re-boot the module or try a cold-start.

User Interfaces

NOTE

Depending on the used interface, the available tests and the screens/reports may vary.

Preferred tool should be the Agilent Diagnostic Software, see [“Agilent Lab Advisor Software”](#) on page 138.

Screenshots used within these procedures are based on the Agilent ChemStation.

In future, a user interface may not show the Diagnostics/Tests anymore. Then the Agilent Diagnostic Software must be used instead.

The Agilent ChemStation may not include any maintenance/test functions.

Table 30 Test Functions available vs. User Interface

Test	Diagnostic Software	ChemStation	Instant Pilot G4208A
Selftest	Yes	Yes	No
Filter	Yes	Yes	No
Slit	Yes	Yes	No
D/A Converter	Yes	Yes	No
Test Chromatogram	Yes	Yes (*)	No
Wavelength Calibration	Yes	Yes	Yes
Lamp Intensity	Yes	Yes	Yes
Holmium	Yes	Yes	Yes
Cell	Yes	Yes	Yes
Dark Current	Yes	Yes	Yes

* requires a command via command line

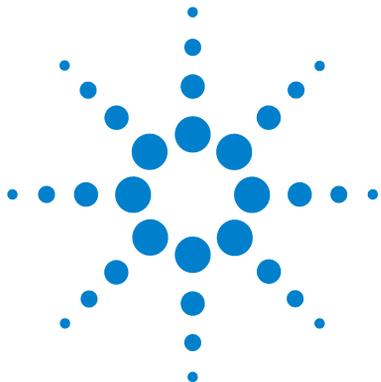
Agilent Lab Advisor Software

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.



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8 Error Information

Agilent Lab Advisor Software

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

Remote Timeout

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

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

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.
 - Correct the routing of the cable.
 - If cable defective, exchange the leak sensor.

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.

This limit is given by 2 revolutions/second for longer than 5 seconds.

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.
- 3 Leaking flow cell.

Suggested actions

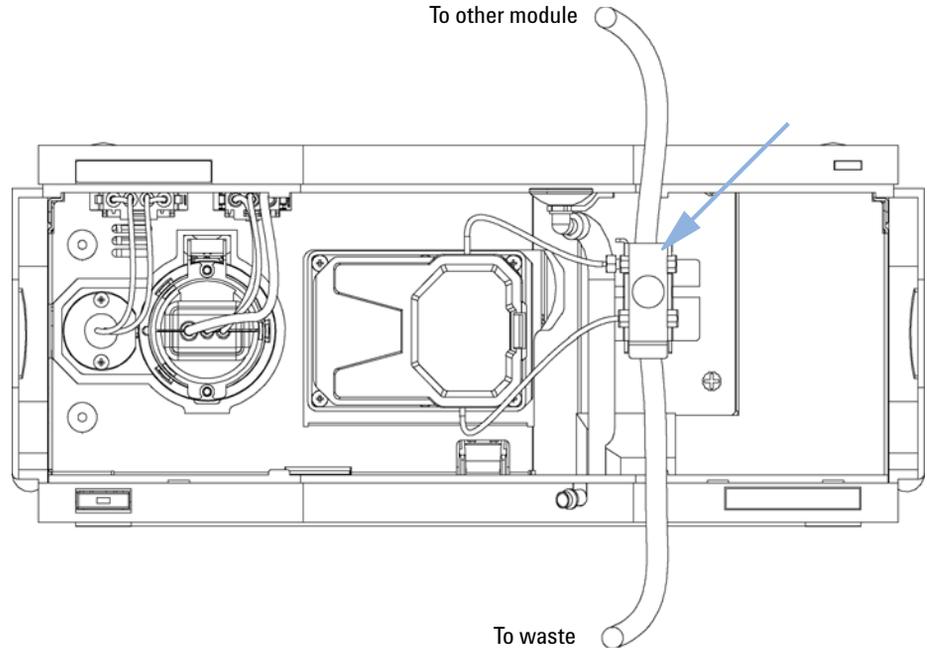
- Ensure all fittings are tight.
- Exchange defective capillaries.
- Exchange flow cell components.

Additional Information

A leak error may be caused by the Aligent 1200 sampler. In each sampler injection sequence, step# 2 ejects the mobile phase stored in the metering head during the previous injection. This mobile phase is ejected through the short plastic tube connected to port# 4 of the sampler switching valve. The output of port# 4 is integrated into the sampler's contingency leak drain system, which eventually terminates in the leak pan of the bottom module of the stack - the detector. With normal injection volumes and run times, the output of port# 4 is small, and evaporates right in the sampler leak pan. However, the output of port# 4 is significant, and a substantial volume of ejected mobile phase reaches the detector leak pan.

There are two possible fixes. Select the one which is most convenient.

- 1 The waste drain plumbing orientation as shown in the figure below, eliminates the possibility of any leak drainage from above reaching the detector leak pan. The leak drain for the detector can be connected to the detector's leak drain fitting, and taken to waste separately.



- 2 If it is desired that the system has only one leak drain tube, then it's possible to increase the length of the small plastic tube which is connected to port# 4 of the sampler switching valve. This tube can then be taken to waste separately. The tube which normally serves as the detector cell outlet tube can be used for this purpose.

Open Cover

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, the fan is switched off, and the error message is generated.

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

Detector Error Messages

These errors are detector specific.

Visible Lamp Current

The visible lamp current is missing.

The processor continually monitors the lamp current during operation. If the current falls below the lower current limit, the error message is generated.

Probable cause

- 1 Lamp disconnected.
- 2 Defective visible lamp.
- 3 Defective connector or cable.
- 4 Defective power supply.

Suggested actions

- Ensure the visible lamp connector is seated firmly.
- Exchange the visible lamp.
- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

Visible Lamp Voltage

The visible lamp voltage is missing.

The processor continually monitors the voltage across the lamp during operation. If the lamp voltage falls below the lower limit, the error message is generated.

Probable cause

- 1 Defective connector or cable.
- 2 Defective power supply.

Suggested actions

- Exchange the detector main board.
- Exchange the power supply.

Diode Current Leakage

When the detector is switched on, the processor checks the leakage current of each of the optical diodes. If the leakage current exceeds the upper limit, the error message is generated.

Probable cause

- 1 Defective PDA/optical unit.
- 2 Defective connector or cable.

Suggested actions

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

UV Lamp Current

The UV lamp current is missing.

The processor continually monitors the anode current drawn by the lamp during operation. If the anode current falls below the lower current limit, the error message is generated.

Probable cause

- 1 Lamp disconnected.
- 2 Defective UV lamp or non-Agilent lamp.
- 3 Defective detector main board.
- 4 Defective power supply.

Suggested actions

- Ensure the UV lamp connector is seated firmly.
- Exchange the UV lamp.
- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

UV Lamp Voltage

The UV lamp anode voltage is missing.

The processor continually monitors the anode voltage across the lamp during operation. If the anode voltage falls below the lower limit, the error message is generated.

Probable cause

- 1 Defective UV lamp or non-Agilent lamp.
- 2 Defective detector main board.
- 3 Defective power supply.

Suggested actions

- Exchange the UV lamp.
- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

UV Ignition Failed

The UV lamp failed to ignite.

The processor monitors the UV lamp current during the ignition cycle. If the lamp current does not rise above the lower limit within 2 – 5 seconds, the error message is generated.

Probable cause

- 1 Lamp too hot. Hot gas discharge lamps may not ignite as easily as cold lamps.
- 2 Lamp disconnected.
- 3 Defective UV lamp or non-Agilent lamp.
- 4 Defective detector main board.
- 5 Defective power supply.

Suggested actions

- Switch off the lamp and allow it to cool down for at least 15 minutes.
- Ensure the lamp is connected.
- Exchange the UV lamp.
- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

UV Heater Current

The UV lamp heater current is missing.

During UV lamp ignition, the processor monitors the heater current. If the current does not rise above the lower limit within one second, the error message is generated.

Probable cause	Suggested actions
1 Lamp disconnected.	Ensure the UV lamp is connected.
2 Ignition started without the top foam in place.	Please contact your Agilent service representative.
3 Defective UV lamp or non-Agilent lamp.	Exchange the UV lamp.
4 Defective detector main board.	Please contact your Agilent service representative.
5 Defective power supply.	Please contact your Agilent service representative.

Calibration Values Invalid

The calibration values read from the spectrometer ROM are invalid.

After recalibration, the calibration values are stored in ROM. The processor periodically checks if the calibration data are valid. If the data are invalid or cannot be read from the spectrometer ROM, the error message is generated.

Probable cause	Suggested actions
1 Defective connector or cable.	Please contact your Agilent service representative.
2 Defective PDA/optical unit.	Please contact your Agilent service representative.

Holmium Oxide Test Failed

Probable cause

- 1 Lamps switched off.
- 2 Defective or dirty flow cell.
- 3 Defective filter assembly.
- 4 Defective achromat assembly.
- 5 Defective PDA/optical unit.

Suggested actions

- Ensure the lamps are switched on.
- Ensure the flow cell is inserted correctly, and is free from contamination (cell windows, buffers etc.).
- Exchange the filter assembly.
- Exchange the achromat assembly.
- Exchange the optical unit.

Illegal Value From Temperature Sensor

This temperature sensor delivered a value outside the allowed range. The parameter of this event equals the measured temperature in 1/100 centigrade. As a result the temperature control is switched off.

Probable cause

- 1 Dirty or defective sensor.
- 2 Detector is exposed to illegal ambient conditions.

Suggested actions

- Please contact your Agilent service representative. Links:
- Verify that the ambient conditions are within the allowed range.

Illegal Value From Air Inlet Temperature Sensor

This temperature sensor (located on the detector main board) delivered a value outside the allowed range. The parameter of this event equals the measured temperature in 1/100 centigrade. As a result the temperature control is switched off.

Probable cause

- 1 The temperature sensor is defect.
- 2 Detector is exposed to illegal ambient conditions.

Suggested actions

- Please contact your Agilent service representative.
- Verify that the ambient conditions are within the allowed range.

Wavelength Recalibration Lost

The calibration information needed for your detector to operate correctly has been lost.

During calibration of the detector the calibration values are stored in ROM. If no data is available in the spectrometer ROM, the error message is generated.

Probable cause

- 1 The detector is new.
- 2 The detector has been repaired.

Suggested actions

- Recalibrate the detector.
- Please contact your Agilent service representative.

Heater Failed

Every time the deuterium lamp or the tungsten lamp is switched on or off a heater self-test is performed. If the test fails an error event is created. As a result the temperature control is switched off.

Probable cause

- 1 Defective connector or cable.
- 2 Defective heater.

Suggested actions

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

Heater Power At Limit

The available power of the heater reached either the upper or lower limit. This event is sent only once per run. The parameter determines which limit has been hit:

0 means upper power limit hit (excessive ambient temperature drop).

1 means lower power limit hit (excessive ambient temperature increase).

Probable cause

- 1 Ambient conditions have changed too much during the run, so that optimum results may not be guaranteed.

Suggested actions

- Verify that the reproducibility of your results is not affected.
- Expose the detector to more stable ambient conditions.

DSP Not Running

This error message comes up when the communication between the optical unit and the main board has a problem.

Probable cause

- 1 Random communication error.
- 2 Defective detector main board.
- 3 Defective PDA/optical unit.

Suggested actions

- Switch the detector off and on again at the power switch. If the error reoccurs:
 - Please contact your Agilent service representative.
- Please contact your Agilent service representative.
- Please contact your Agilent service representative.

No Run Data Available In Device

In a very rare case the capacity of the CompactFlash Card is not sufficient. This could happen for example when the interrupt of LAN communication takes longer and the detector uses special settings (e.g full data rate at 80 Hz plus full spectra plus all signals) during data buffering.

Probable cause

- 1 CompactFlash Card is full.

Suggested actions

- Correct communication problem.
- Reduce data rate.

Instrument Logbook

```

Method          Instrument run started                09:44:46 11/20/05
1200 DAD 1      Power on                    10:07:24 11/20/05
1200 DAD 1      UV-lamp on                      10:07:24 11/20/05
1200 DAD 1      Vis-lamp on                      10:07:24 11/20/05
1200 DAD 1      No Run data available in device! 10:07:24 11/20/05
CP Macro        Analyzing rawdata SHORT_02.D       10:07:25 11/20/05
Method          Instrument Error - Method/Sequence stopped 10:07:25 11/20/05
Method          Method aborted                      10:09:52 11/20/05
  
```

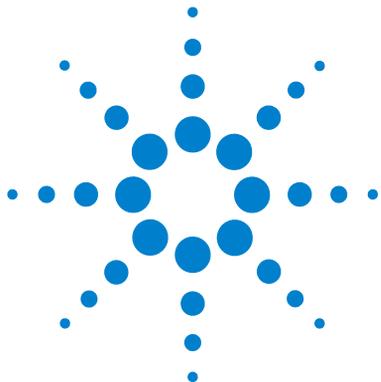
Figure 63 Instrument Logbook

NOTE

The logbook does not indicate a communication loss (power fail). It just shows the recovering (Power on, Lamps on).

8 Error Information

Detector Error Messages



9 Test Functions

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This chapter describes the detector's built in test functions.



Self-test

The DAD self-test (see [Figure 64](#) on page 163) runs a series of individual tests, and evaluates the results automatically. The following tests are run:

- Filter Test
- Slit Test
- Dark Current Test
- Intensity Test
- Wavelength Calibration Test
- Holmium Test
- Spectral Flatness Test
- ASTM Noise Test (optional)

The self-test can be run once or repetitively. When set up to run repetitively, the tests run in series continually until stopped by the user. Running the test repetitively is useful when troubleshooting problems which occur intermittently.

The ASTM noise test determines the detector baseline noise (254nm) while pumping water at 1ml/min. The test requires approximately 20 minutes to run, and can be included or excluded from the self-test sequence as required.

Setup of the self test is done in the Self Test dialog box. Select either Single Test or Repetitive Tests. Check the ASTM Noise Test checkbox to include the noise test in the self test.

Agilent G1315 Self Test Results			
	Limits	Measured	Result
Filter test	0.005..0.5 AU	0.27 AU	Passed
Slit test	0.7..1.3	1.08	Passed
Dark current test	0..12000 cts	7977..8026 cts	Passed
Min. intensity (190nm - 220nm)	> 2000 cts	18042 cts	Passed
Min. intensity (221nm - 350nm)	> 5000 cts	28451 cts	Passed
Min. intensity (351nm - 500nm)	> 2000 cts	16886 cts	Passed
Min. intensity (501nm - 950nm)	> 2000 cts	14683 cts	Passed
Max. intensity (190nm - 350nm)	< 450000 cts	89461 cts	Passed
Max. intensity (700nm - 950nm)	< 300000 cts	63609 cts	Passed
Max. intensity (D2 alpha line)	< 1200000 cts	169947 cts	Passed
Wavelength at 486.0nm	485.5..486.5 nm	486.31 nm	Passed
Wavelength at 656.1nm	655.6..656.6 nm	656.25 nm	Passed
Holmium test	-1..1 nm	0.30 nm	Passed
Spectral flatness	< 0.002 AU	0.0000 AU	Passed
ASTM noise (20 min. at 254nm)	<= 0.02 mAU	0.0096 mAU	Passed

Figure 64 Self-test Results (report)

For details refer to the individual tests on the following pages.

Filter Test

The filter test checks the correct operation of the filter assembly. When the test is started, the holmium oxide filter is moved into position. During filter movement, the absorbance signal is monitored. As the edge of the filter passes through the light path, an absorbance maximum is seen. Once the filter is in position, the absorbance maximum (of holmium oxide) is determined. Finally, the filter is moved out of the light path. During movement, an additional absorbance maximum is expected as the edge of the filter passes through the light path. The test passes successfully, if the two maxima resulting from the edge of the filter assembly (during filter movement) are seen, and the absorbance maximum of holmium oxide is within the limits.

```
Instrument:      G1315C
Serial Number:  PP00000024
Operator:       Wolfgang
Date:          25.02.2005
Time:          14:55:42
File:          C:\CHEM32\2\DIAGNOSE\DAD_FILTER3.DGR
```

	Result	Status

DAD Filter Test		
Date: 25.02.2005; Time: 14:55:42		
Expected total time: approx. 45s.		
Test Procedure:		
1. Measuring and evaluating filter test result	0.16	done

Figure 65 Filter Test Results (report)

Filter Test Evaluation

Filter Test Failed

Test Failed

Probable cause

- 1 Filter assembly (lever and filter) not installed.
- 2 Defective filter motor.

Suggested actions

- Install the filter assembly.
- Exchange the filter motor.

Holmium Oxide Maximum out of Limits

Probable cause

- 1 Holmium oxide filter not installed.
- 2 Dirty or contaminated filter.

Suggested actions

- Install the holmium oxide filter.
- Exchange the holmium oxide filter.

Slit Test

The slit test verifies correct operation of the micromechanical slit. During the test, the slit is moved through all slit positions while the detector monitors the lamp intensity change. When the slit position is changed, the intensity drop (move to smaller slit) or intensity increase (move to larger slit) must be within a defined range. If the intensity changes are outside the expected range, the test fails.

Slit Test Evaluation

Slit Test Evaluation

Limit: 0.7 - 1.3

Test Failed

Probable cause

- 1 Flow cell still installed.
- 2 Old or non-Agilent lamp.
- 3 Defective slit assembly (stray light).
- 4 Defective detector main board.
- 5 Defective optical unit.

Suggested actions

- Remove the flow cell.
- Run the “[Intensity Test](#)” on page 170. Exchange the lamp if old or defective.
- Exchange the slit assembly.
- Exchange the detector main board.
- Exchange the optical unit.

Dark-Current Test

The dark-current test measures the leakage current from each diode. The test is used to check for leaking diodes which may cause non-linearity at specific wavelengths. During the test, the slit assembly moves to the dark position, cutting off all light falling onto the diode array. Next, the leakage current from each diode is measured, and displayed graphically (see [Figure 66](#) on page 168). The leakage current (represented in *counts*) for each diode should fall within the limits (red bands) shown in the plot (see [Figure 66](#) on page 168).

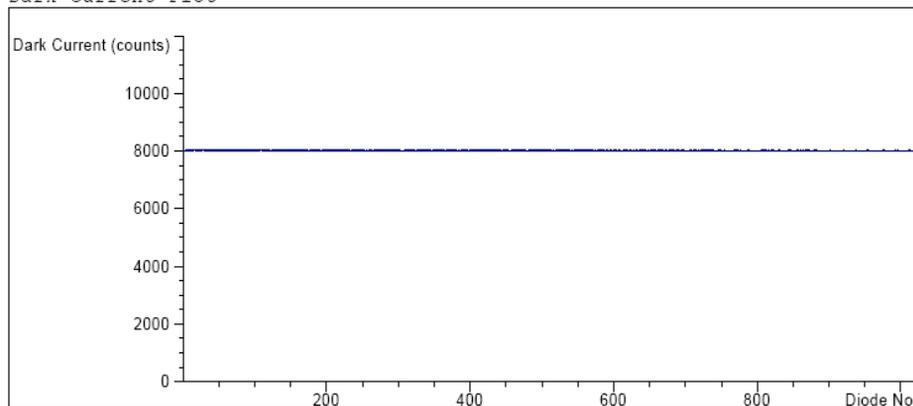
Dark-Current Test Evaluation

Dark-Current Test Evaluation

Limit: 0... 12000 counts

Instrument: G1315C
Serial Number: PP00000024
Operator: Wolfgang
Date: 25.02.2005
Time: 14:50:12
File: C:\CHEM32\2\DIAGNOSE\DAD_DARK2.DGR

Dark Current Plot



Dark Current Test Results

	Specification	Measured	Result
Dark current maximum value	≤ 12000 cts	8056 cts	Passed
Dark current minimum value	> 0 cts	7994 cts	Passed

Figure 66 Dark-Current Test Results (report)

Test Failed

Dark-Current Test Evaluation

Probable cause

- 1 Defective slit assembly (stray light).
- 2 Defective detector main board.
- 3 Defective PDA/optical unit.

Suggested actions

Run the “[Slit Test](#)” on page 166 (part of the “[Self-test](#)” on page 162).

Exchange the detector main board.

Exchange the optical unit.

Intensity Test

NOTE

The test is for the standard flow cells (10 mm and 6 mm pathlength) only. The nano-flow cells (80 nl and 500 nl) cannot be run with this test due to its low volume.

The intensity test measures the intensity of the deuterium and tungsten lamps over the full wavelength range (190 – 950 nm). Four spectral ranges are used to evaluate the intensity spectrum. The test is used to determine the performance of the lamps and optics (see also “[Cell Test](#)” on page 179). When the test is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell. The shape of the intensity spectrum is primarily dependent on the lamp, grating, and diode array characteristics. Therefore, intensity spectra will differ slightly between instruments. [Figure 67](#) on page 171 shows a typical intensity test spectrum.

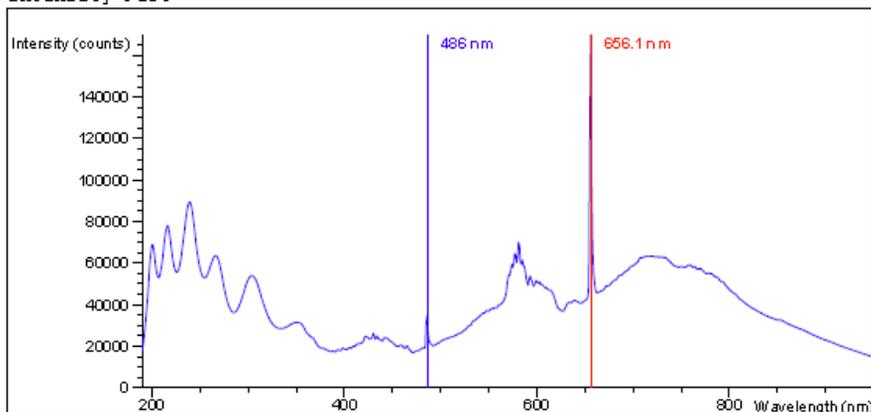
Intensity Test Evaluation

Intensity Test Evaluation

The Agilent LabAdvisor, ChemStation and Instant Pilot evaluate four spectral ranges automatically, and display the limits for each range, the measured intensity counts, and *passed* or *failed* for each spectral range (see Figure 67 on page 171).

```
Instrument:      G1315C
Serial Number:  DE60755000
Operator:
Date:           3/17/2009
Time:           1:24:38 PM
```

Intensity Plot



Intensity Test Results

	Specification	Measured	Result
-----		68.08 h	
Accumulated UV lamp on time			
Lowest intensity in range 190nm - 220nm:	> 2000 cts	18069 cts	Passed
Lowest intensity in range 221nm - 350nm:	> 5000 cts	28464 cts	Passed
Lowest intensity in range 351nm - 500nm:	> 2000 cts	16889 cts	Passed
Lowest intensity in range 501nm - 950nm:	> 2000 cts	14665 cts	Passed
Highest intensity in range 190nm - 350nm:	< 450000 cts	89478 cts	Passed
Highest intensity in range 700nm - 950nm:	< 300000 cts	63598 cts	Passed
Highest intensity for the D2 alpha line:	< 1200000 cts	169933 cts	Passed

Figure 67 Intensity Test Results (report)

In case of low counts in one or more ranges, start the testing with the comparison of values with flow cell vs. flow cell removed.

Contaminations of the cell windows and/or the lenses (there are 3 between vis-lamp and flow cell), will reduce the light throughput.

If the detector fails in the range 501 nm - 950 nm, check

- is the VIS-lamp ON? If not, turn it on.
- is VIS-lamp glass bulb blackened or broken? If yes, replace VIS-lamp.
- does the UV-lamp show a reflective coating towards the VIS-lamp? If yes, replace UV-lamp.

Example (measured without flow cell):

VIS-LAMP OFF or defect:	110 counts
VIS-LAMP ON and OK:	13613 counts

Test Failed

Probable cause	Suggested actions
1 Absorbing solvent or air bubble in flow cell.	Ensure the flow cell is filled with water, and free from air bubbles.
2 Dirty or contaminated flow cell.	Run the cell test (see "Cell Test" on page 179). If the test fails, exchange the flow cell windows.
3 Dirty or contaminated optical components (achromat, windows).	Clean optical components with alcohol and lint-free cloth or replace the parts.
4 Old or non-Agilent lamp.	Exchange the lamp.

NOTE

If the lamp fails in a single range there might be no reason to change the lamp if the application is not run in that specific range.

Redo the test with removed flow cell. If the counts increase drastically (more than a factor of 2, then flow cell components are contaminated and may require maintenance/service.

If the intervals of lamp replacements are getting shorter, the Agilent service should check the optical unit for contaminated components in the light path (coupling lens, source lens, cell support assembly and flow cell windows).

Holmium Oxide Test

The holmium oxide test uses three characteristic absorbance maxima of the built-in holmium oxide filter to verify wavelength accuracy (see also [“Wavelength Verification and Recalibration”](#) on page 183). When the test is started, the 1-nm slit is moved into the light path automatically. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

NOTE

See also [“Declaration of Conformity for HOX2 Filter”](#) on page 275.

Holmium Oxide Test Evaluation

Holmium Oxide Test Evaluation

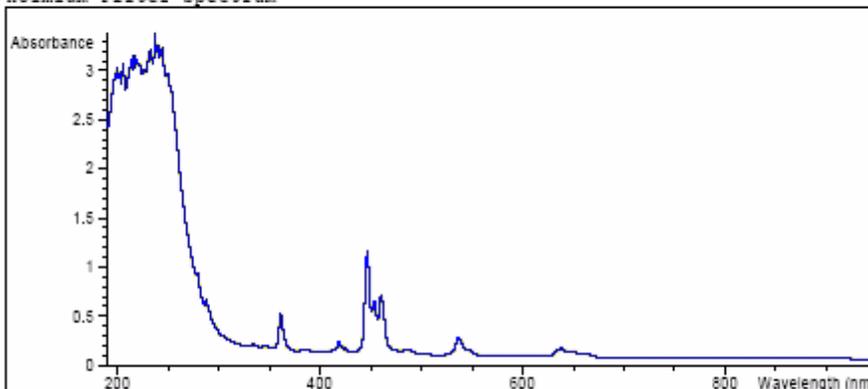
Limits:

361.0 nm	360.0 - 362.0 nm (± 1 nm)
453.7 nm	452.7 - 454.7 nm (± 1 nm)
536.7 nm	535.7 - 537.7 nm (± 1 nm)

The test is evaluated by the instrument, and the measured maxima are displayed automatically. The test fails if one or more of the maxima lies outside of the limits (see [Figure 68](#) on page 175).

Instrument: G1315C
 Serial Number: FP00000024
 Operator: Wolfgang
 Date: 25.02.2005
 Time: 14:30:08
 File: C:\CHEM32\2\DIAGNOSE\DAD_FILTER2.DGR

Holmium Filter Spectrum



Holmium Filter Test Results

	Specification	Measured	Result
Wavelength 1: 361.0 nm	360..362 nm	360.9 nm	Passed
Wavelength 2: 453.7 nm	452.7..454.7 nm	453.4 nm	Passed
Wavelength 3: 536.7 nm	535.7..537.7 nm	536.8 nm	Passed

Figure 68 Holmium Oxide Test Results (report)

9 Test Functions

Holmium Oxide Test

Test Failed

Probable cause	Suggested actions
1 Absorbing solvent or air bubble in flow cell.	Ensure the flow cell is filled with water.
2 Incorrect calibration	Recalibrate (see “Wavelength Verification and Recalibration” on page 183) and repeat the test.
3 Dirty or contaminated flow cell.	Run the cell test (see “Cell Test” on page 179). If the test fails, exchange the flow cell windows.
4 Dirty or contaminated optical components (achromat, windows).	Clean optical components with alcohol and lint-free cloth or replace the parts (see “Intensity Test” on page 170).
5 Old or non-Agilent lamp.	Exchange the UV lamp.

Spectral flatness test

The spectral flatness test determines the maximum noise (in mAU) on the spectrum. The test is run with the flowcell removed to eliminate effects due to absorbing solvent or a dirty flowcell. First, a detector balance is done. Next, a spectrum (no flowcell) is taken.

Theoretically, the spectrum should be flat, however, in practice, noise is superimposed on the spectrum. The amplitude of the noise is a measure of the optical and electronic performance.

NOTE

This test is part of the detector self test only, see “Self-test” on page 162.

Spectral Flatness Evaluation

Spectral Flatness Evaluation

Limit is < 0.002 AU

Test Failed

Probable cause

- 1 Old or non-Agilent lamp.
- 2 Defective DAM board
- 3 Defective optical unit.

Suggested actions

- Run the Intensity Test.
 - Exchange the lamp if old or defective.
- Exchange the DAM board.
- Exchange the optical unit.

ASTM Noise Test

The ASTM noise test determines the detector noise over a period of 20 minutes. The test is done with the flowcell removed, so the test results are not influenced by solvent or pump effects. On completion of the test, the noise result is displayed automatically.

NOTE

This test is part of the detector self test only, see “Self-test” on page 162.

ASTM Noise Test Evaluation

ASTM Noise Test Evaluation

Limit is ± 0.02 mAU

Test Failed

Probable cause

- 1 Insufficient lamp warm-up time
- 2 Old or non-Agilent lamp.

Suggested actions

- Allow lamp to warm-up for at least 1 hour.
- Exchange the lamp.

Cell Test

The cell test measures the intensity of the deuterium and tungsten lamps over the full wavelength range (190 – 950 nm), once with the flow cell installed, and once with the flow cell removed. The resulting intensity ratio is a measure of the amount of light absorbed by the flow cell. The test can be used to check for dirty or contaminated flow cell windows. When the test is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

NOTE

This test should be performed initially with a new detector/flow cell. The values should be kept for later reference/comparison.

Cell Test Evaluation

Cell Test Evaluation

The Agilent ChemStation calculates the intensity ratio automatically. The intensity ratio (typically between 0.5 and 0.7 for new standard flow cells and 0.1 to 0.3 for new micro- and high pressure cells) is dependent on the degree of contamination of the flow cell windows, and on the type of flow cell used.

```
Instrument:      G1315C
Serial Number:  PP00000024
Operator:       Wolfgang
Date:          25.02.2005
Time:          14:54:22
File:          C:\CHEM32\2\DIAGNOSE\DAD_CELL2.DGR
```

	Result	Status

Detector Cell Test		
Date: 25.02.2005; Time: 14:54:22		
Expected total time: approx. 45 s.		
Test Procedure:		
1. If cell not in place, install it		done
2. Measuring intensity with cell	42053	done
3. Remove cell		done
4. Measuring intensity without cell	42034	done
5. Calculating intensity ratio	1.0	done

Figure 69 Cell Test Results (report) with no flow cell inserted

NOTE

This test can be used for the standard flow cells only. The nano flow cells will give very low values due to their design.

Test Failed (low ratio value)

Probable cause

- 1 Absorbing solvent or air bubble in flow cell.
- 2 Dirty or contaminated flow cell.

Suggested actions

- Ensure the flow cell is filled with water, and free from air bubbles.
- Exchange the flow cell windows.

Using the Built-in Test Chromatogram

This function is available from the Agilent ChemStation, LabAdvisor and Instant Pilot.

The built-in Test Chromatogram can be used to check the signal path from the detector to the data system and the data analysis or via the analog output to the integrator or data system. The chromatogram is continuously repeated until a stop is executed either by means of a stop time or manually.

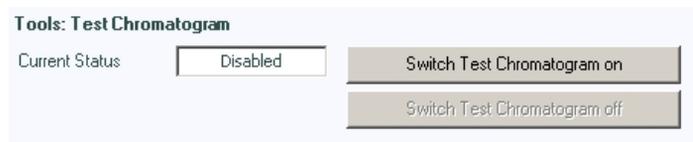
NOTE

The peak height is always the same but the area and the retention time depend on the set peakwidth, see examples below.

Procedure Using the Agilent LabAdvisor

This procedure works for all Agilent 1200 Infinity detectors (DAD, MWD, VWD, FLD and RID). The example figure is from the RID detector.

- 1 Assure that the default LC method is loaded via the control software.
- 2 Start the Agilent LabAdvisor software (B.01.03 SP4 or later) and open the detector's **Tools** selection.
- 3 Open the test chromatogram screen



- 4 Turn the **Test Chromatogram** on.
- 5 Change to the detector's **Module Service Center** and add the detector signal to the Signal Plot window.

9 Test Functions

Using the Built-in Test Chromatogram

6 To start a test chromatogram enter in the command line: STRT

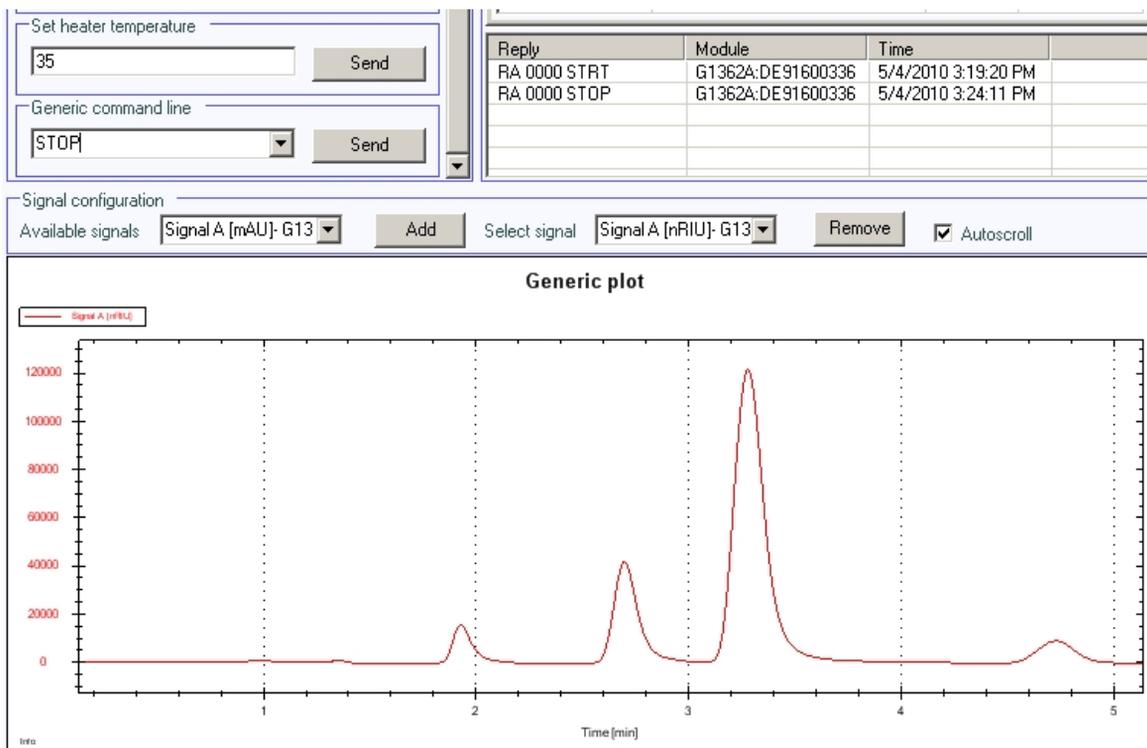


Figure 70 Test Chromatogram with Agilent LabAdvisor

7 To stop the test chromatogram enter in the command line: STOP

NOTE

The test chromatogram is switched off automatically at the end of a run.

Wavelength Verification and Recalibration

The detector uses the alpha (656.1 nm) and beta (486 nm) emission lines of the deuterium lamp for wavelength calibration. The sharp emission lines enable more accurate calibration than is possible with holmium oxide. When verification is started, the 1-nm slit is moved into the light path automatically, and the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with bubble free degassed HPLC water in the flow cell.

If a deviation is found and displayed, it can be recalibrated by pressing Adjust. The deviations are tracked in the Calibration History (diagnosis buffer in the detector).

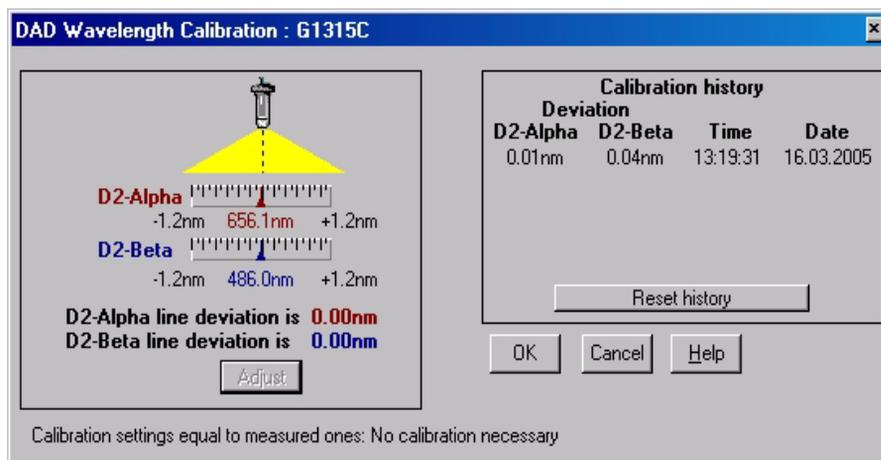


Figure 71 Wavelength Verification and Recalibration

Wavelength calibration should be done

- after maintenance of the flow cell,
- lamp exchange, or
- after a major repair, like processor board or optical unit exchange, see also “Replacing the Module’s Firmware” on page 229.

After calibration, the holmium oxide test (see [Figure 68](#) on page 175) provides verification of wavelength accuracy at three additional wavelengths.

Test Chromatogram

A pre-defined test chromatogram on the detector main board is processed through ADC like normal signals from the diodes and can be used to check the Analog-to-Digital Converter and the data handling system. The signal is available at the analog output and on the LAN.

NOTE

The run time of the chromatogram is depending on the setting for response time (peak width). If no stop time is set the chromatogram will repeat continuously.

Table 31 Test Chromatogram Settings (examples)

Response time	Set Run Time
0.1 sec	0.28 min
0.2 sec	0.6 min
0.5 sec	1.2 min
1 sec	2.3 min
2 sec (default)	4.5 min
4 sec	9 min
8 sec	18 min
16 sec	36 min

Table 32 Test Chromatogram - Peak Heights

Peak	Absorbance (approx.)
1	38 mAU
2	100 mAU
3	290 mAU
4	20 mAU

Test Chromatogram with Agilent ChemStation

- 1 The test can be started via the command line.
- 2 To start the test
PRINT SENDMODULE\$(NDAD, "SIMU:DFLT") for DAD or
PRINT SENDMODULE\$(NMWD, "SIMU:DFLT") for MWD.
- 3 Reply: RA 00000 SIMU:DFLT
- 4 Start the run. On completion of the run, or when the run is stopped, the test chromatogram is deactivate.

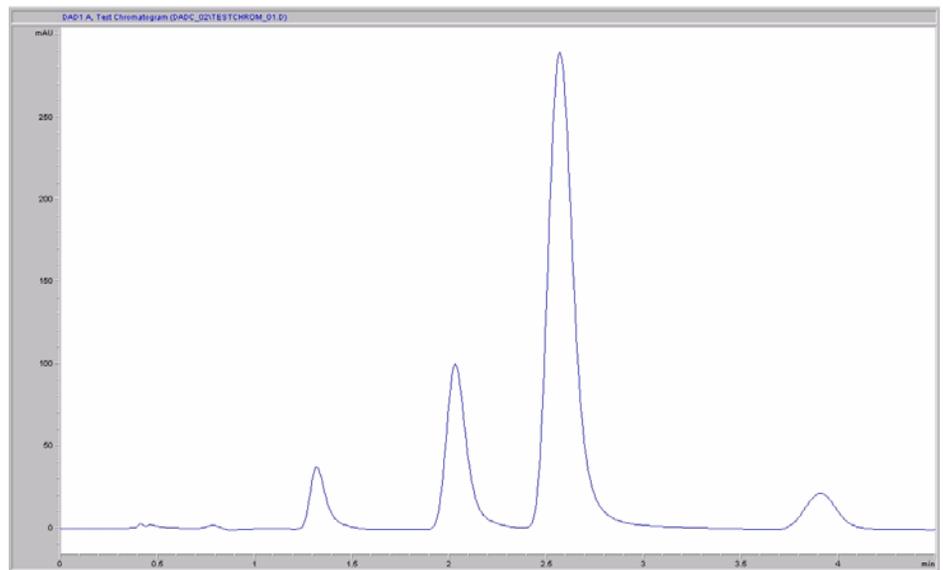


Figure 72 Test Chromatogram on Agilent ChemStation (response time 2 seconds)

Diagnosis Information on Agilent ChemStation

The Agilent ChemStation provides certain information on various assemblies in the detector.

- 1 Open the Diagnosis and change to detailed view.
- 2 Click on the assembly of interest and select “Update Variables Display”. [Figure](#) on page 187 shows an example.

[Table 33](#) on page 186 lists the assemblies which provide detailed information.

Table 33 Diagnosis - detailed information

Assembly	Details
General	Product number, firmware revision, manufacturing date (of instrument or, if replaced, of main board), serial number, accumulated on-time, spectrometer serial number.
Vis lamp	Accumulated on-time, actual on-time, lamp switch on, accumulated on time switches, switch on voltage/current, lamp current, lamp voltage/current
UV lamp	Accumulated on-time, actual on-time, lamp ignitions, accumulated on time reset, ignition voltage/current, lamp voltage, lamp voltage/current. Available with ID-tag lamp only. product number, serial number, production date, last intensity test
Holmium Filter	Filter movements, filter moves reset log
Flow Cell	Available with ID-tag flow cells only. Product number, production date, pathlength, max pressure, serial number, volume, last cell test
Micro Slit	Slit movements, filter moves reset log

Details of UV-lamp with RFID tag

Diode Array Detector - UV Lamp

Accum. UV On Time	179.83 h	Accum. On Time Reset	Show
UV Lamp On Time	0.00 h	Ignition Voltage/Current	Show
Number of Ignitions	70	UV Lamp Voltage	Show
Product Number	2140-0820	UV Lamp Volt./Current	Show
Serial Number	213913	Last Intensity Test	02.01.2006
Production Date	08.10.2004		

Copy to Memo Pad Send Changes Cancel Changes

Details of flow cell with RFID tag

Diode Array Detector - Cell

Product Number	G1315-60022	Serial Number	DE515H0876
Production Date	22.09.2005	Path Length	10 mm
Volume	13000 nl	Max Pressure	120 bar
Last Cell Test	22.09.2005		

Copy to Memo Pad Send Changes Cancel Changes

Figure 73 Diagnosis screen in Agilent ChemStation (detailed view)

D/A Converter (DAC) Test

The detector provides analog output of chromatographic signals for use with integrators, chart recorders or data systems. The analog signal is converted from the digital format by the digital-analog-converter (DAC).

The DAC test is used to verify correct operation of the digital-analog-converter by applying a digital test signal to the DAC.

The DAC outputs an analog signal of approximately 50 mV (if the zero offset of the analog output is set to the default value of 5 %) which can be plotted on an integrator. A continuous square wave with an amplitude of 10 μ V and a frequency of approximately 1 cycle/24 seconds is applied to the signal.

The amplitude of the square wave and the peak-to-peak noise are used to evaluate the DAC test.

When If the analog detector signal is noisy or missing.

Preparations Lamp must be on for at least 10 minutes. Connect integrator, chart recorder or data system to the detector analog output.

Running the test with Agilent LabAdvisor

- 1 Run the **D/A Converter (DAC) Test** (for further information see Online-Help of user interface).

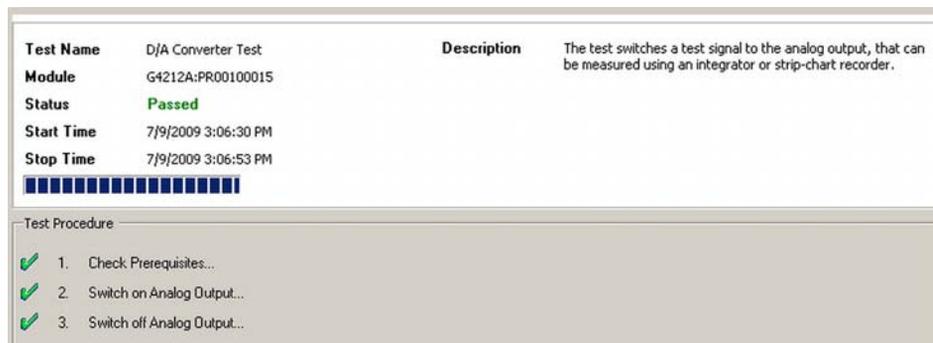


Figure 74 D/A Converter (DAC) Test – Results

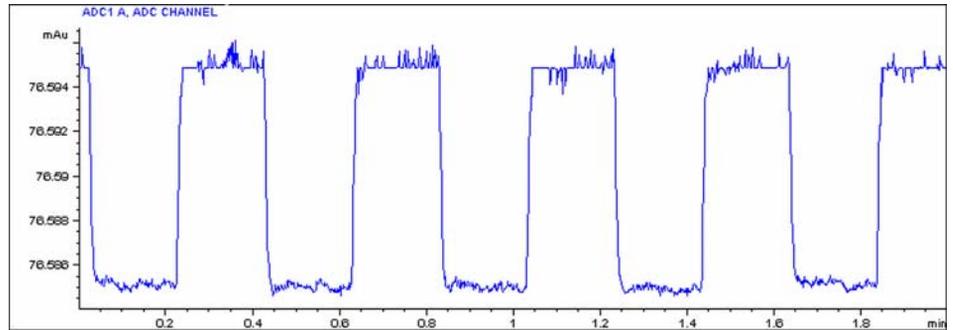


Figure 75 D/A Converter (DAC) Test – Example of Integrator Plot

Running the Test with Instant Pilot

The test can be started via the command line.

- 1 To start the test
TEST: DAC 1
Reply: RA 00000 TEST:DAC 1
- 2 To stop the test
TEST: DAC 0
Reply: RA 00000 TEST:DAC 0

Test Failed

D/A Converter (DAC) Test Evaluation

The noise on the step should be less than 3 μ V.

Probable cause

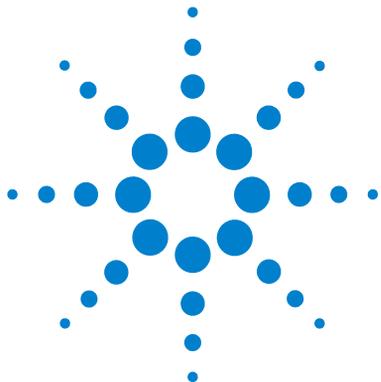
- 1 Bad cable or grounding problem between detector and external device.
- 2 Defective detector main board.

Suggested actions

- Check or replace the cable.
- Exchange the detector main board.

9 Test Functions

D/A Converter (DAC) Test



10 Maintenance

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This chapter describes the maintenance of the detector.



10 Maintenance

Introduction to Maintenance

Introduction to Maintenance

The module is designed for easy maintenance. Maintenance can be done from the front with module in place in the system stack.

NOTE

There are no serviceable parts inside.

Do not open the module.

Cautions and Warnings

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

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

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

WARNING

Eye damage by detector light



Eye damage may result from directly viewing the UV-light produced by the lamp of the optical system used in this product.

- Always turn the lamp of the optical system off before removing it.
-

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.
-

10 Maintenance

Cautions and Warnings

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 (simple repairs) of the detector that can be carried out without opening the main cover.

Table 34 Overview of Maintenance

Procedure	Typical Frequency	Notes
Cleaning of module	If required.	
Deuterium lamp or tungsten lamp exchange	If noise and/or drift exceeds your application limits or lamp does not ignite.	An intensity test should be performed after replacement.
Flow cell exchange	If application requires a different flow cell type.	A holmium or wavelength calibration test should be performed after replacement.
Flow cell parts Cleaning or exchange	If leaking or if intensity drops due to contaminated flow cell windows.	A pressure tightness test should be done after repair.
Holmium oxide filter Cleaning or exchange	If contaminated.	A holmium or wavelength calibration test should be performed after replacement.
Leak sensor drying	If leak has occurred.	Check for leaks.
Leak handling System replacement	If broken or corroded.	Check for leaks.

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 allowing liquid to 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.
-

Exchanging a Lamp

When If noise or drift exceeds application limits or lamp does not ignite

Tools required Screwdriver POZI 1 PT3

Parts required	#	p/n	Description
	1	2140-0820	Longlife Deuterium lamp "C" (with black cover and RFID tag)
	1	G1103-60001	Tungsten lamp

Preparations Turn the lamp(s) off.

WARNING

Eye damage by detector light



Eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.

→ Always turn the deuterium lamp off before removing it.

WARNING

Injury by touching hot lamp

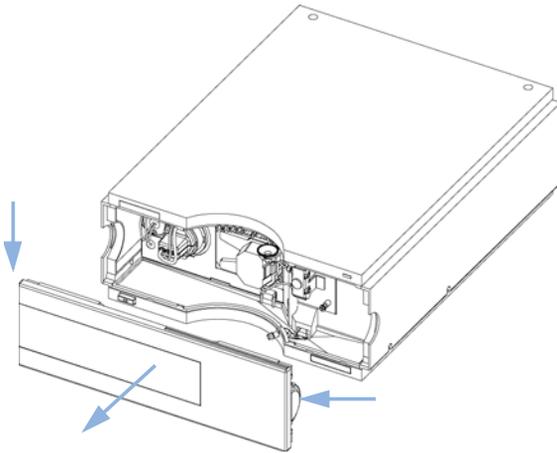
If the detector has been in use, the lamp may be hot.

→ If so, wait for lamp to cool down.

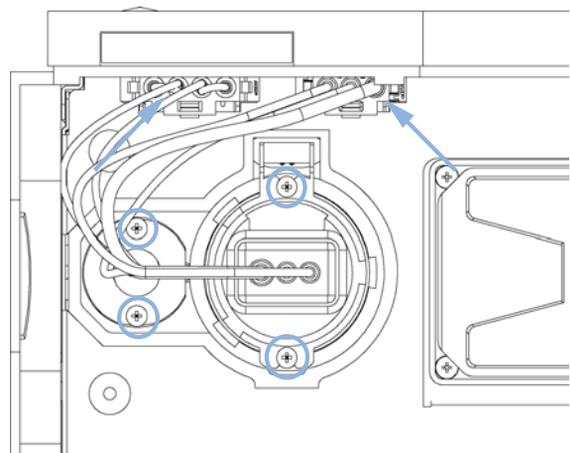
10 Maintenance

Exchanging a Lamp

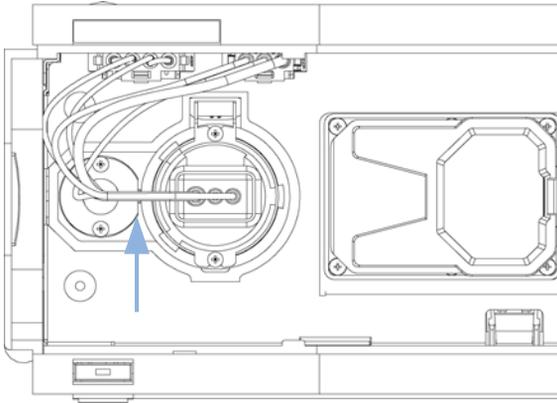
- 1** Press the release buttons and remove the front cover to gain access to the flow cell area.



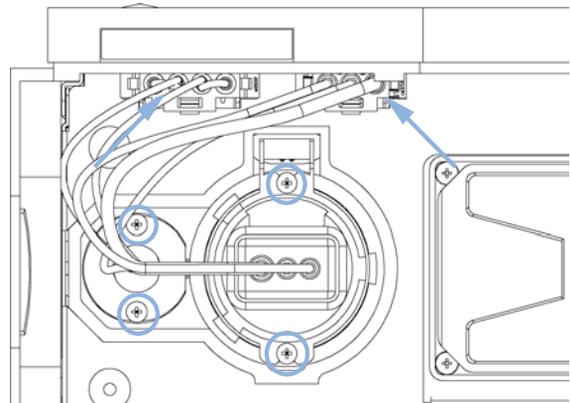
- 2** Disconnect lamp from the connector, unscrew the Vis-lamp (left) and/or UV-lamp (right) and remove the lamp. Do not touch the glass bulb with your fingers.



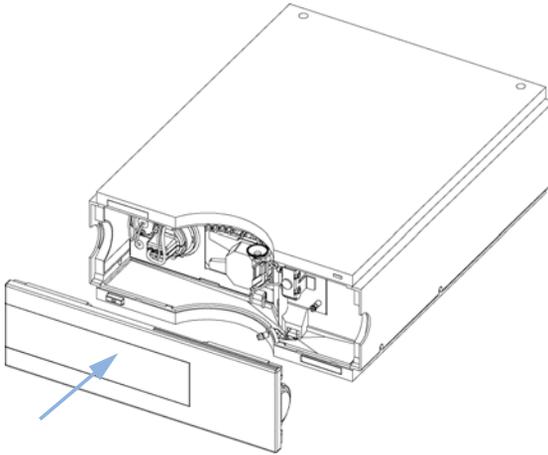
- 3** When replacing the Vis-lamp, assure that the Vis-lamp is inserted as shown (flat edge towards the deuterium lamp).



- 4** Insert the lamp. Fix the screws and reconnect the lamp to connector.



5 Replace the front cover.



Next Steps:

- 6** Reset the lamp counter as described in the user interface documentation (lamps with I.D. tag cannot be reset).
- 7** Turn the lamp on and give the lamp 10 minutes to warm up.
- 8** Perform a [“Wavelength Verification and Recalibration”](#) on page 183 or a [“Holmium Oxide Test”](#) on page 174 to check the correct positioning of the UV-lamp.
- 9** Perform an [“Intensity Test”](#) on page 170.

10 Maintenance

Exchanging a Flow Cell

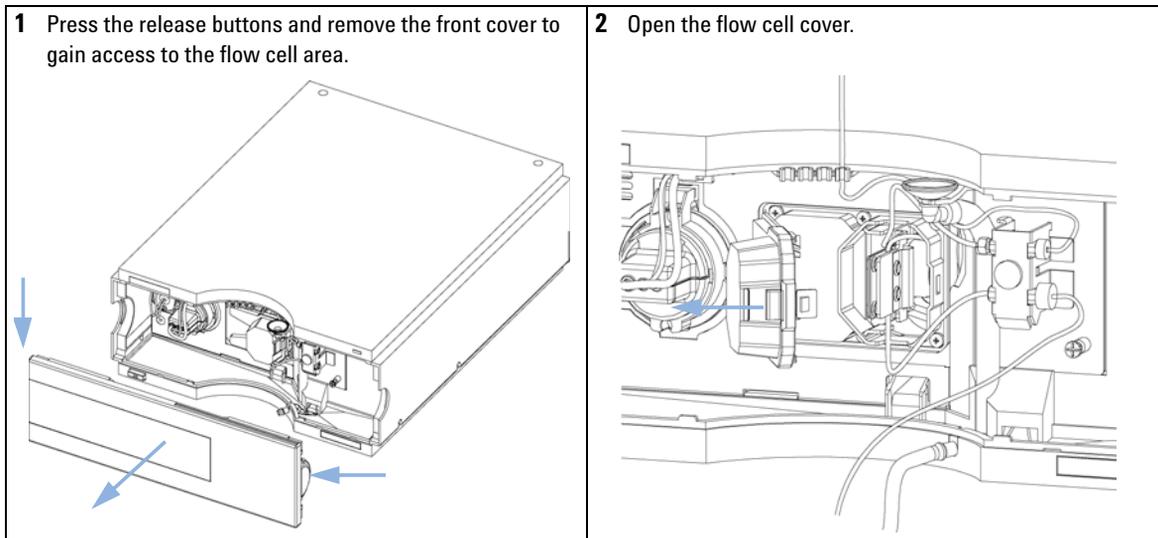
Exchanging a Flow Cell

When If an application needs a different type of flow cell or the flow cell needs repair.

Tools required Two 1/4 inch wrenches for capillary connections

Parts required	#	p/n	Description
	1	G1315-60022	Standard flow cell, 10 mm, 13 μ L, 120 bar (12 MPa)
	1	G1315-60025	Semi-micro flow cell, 6 mm, 5 μ L, 120 bar (12 MPa)
	1	G1315-60024	Micro flow cell, 3 mm, 2 μ L, 120 bar (12 MPa)
	1	G1315-60015	High pressure flow cell, 6 mm, 1.7 μ L, 400 bar (40 MPa)
	1		Nano flow cell, refer to "Nano Flow Cell - Replacing or Cleaning" on page 218

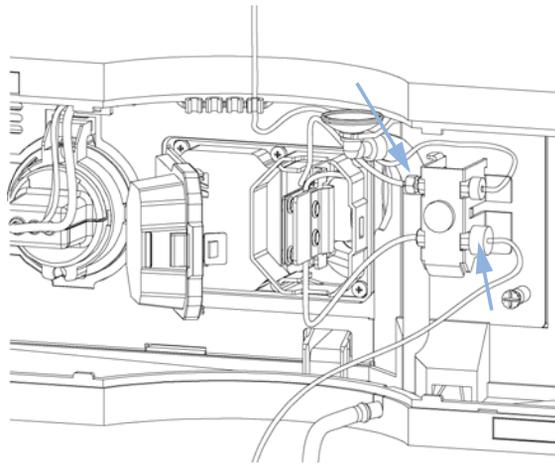
Preparations Turn the lamp(s) off.
Remove the front cover.



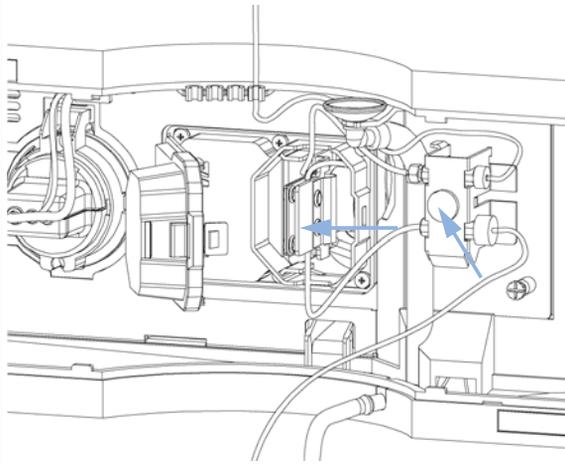
NOTE

Depending on the system setup, the inlet capillary might be routed directly from the module above or below to the cell and not to the capillary holder.

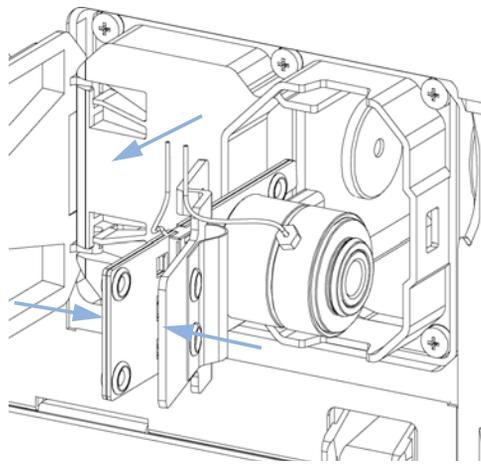
- 3** Disconnect the flow cell inlet capillary (top) and the waste tubing (bottom) from the unions.



- 4** Loosen the thumb screw and remove the flow cell outlet capillary (bottom) with the union.



- 5** Remove the flow cell while pressing the flow cell holder.



10 Maintenance

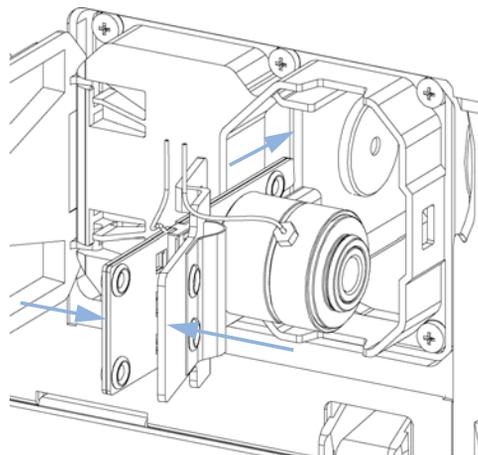
Exchanging a Flow Cell

NOTE

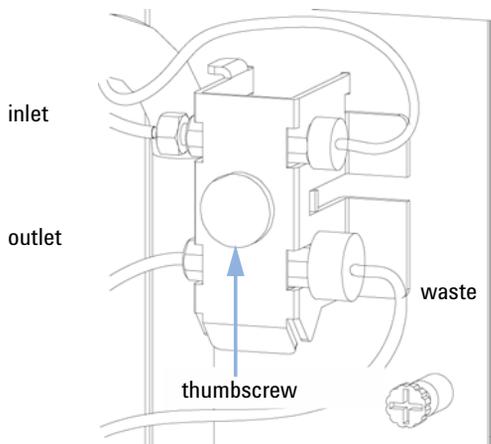
The label attached to the flow cell provides information on part number, path length, volume and maximum pressure.

If you want to replace flow cell parts, “[Maintenance of Standard, Semi-Micro or Micro Flow Cell](#)” on page 203 or “[Maintenance of High Pressure Flow Cell](#)” on page 207.

6 Insert the flow cell while pressing the flow cell holder.



7 Insert the flow cell capillaries into the union holder (top is inlet, bottom is outlet). Tighten the thumb screw and Reconnect the waste tubing (bottom) to the union.



NOTE

To check for leaks, establish a flow and observe the flow cell (outside of the cell compartment) and all capillary connections.

Next Steps:

- 8 Perform a “[Wavelength Verification and Recalibration](#)” on page 183 or a “[Holmium Oxide Test](#)” on page 174 to check the correct positioning of the flow cell.
- 9 Replace the front cover.

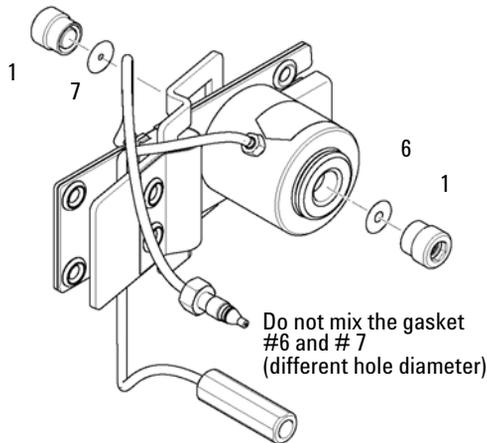
Maintenance of Standard, Semi-Micro or Micro Flow Cell

When	If the flow cell needs repair due to leaks or contaminations (reduced light throughput)
Tools required	Two 1/4 inch wrenches for capillary connections hexagonal key 4 mm Tooth picks
Parts required	Description For parts, see “Standard Flow Cell” on page 234, “Semi-Micro Flow Cell Parts” on page 236, “Micro Flow Cell” on page 238.
Preparations	Turn the flow off. Remove the front cover. Remove the flow cell, see “Exchanging a Flow Cell” on page 200.

NOTE

The gaskets used in the standard and semi-micro/micro flow cell are different.

- 1** Use a 4 mm hex key to unscrew the window assembly [1] and remove the gasket [2] from the cell body.



NOTE

If you want to replace the gasket only, continue with the step “Insert a new gasket”.

Do not mix the gasket #6 and #7. They are different for standard and semi-micro flow cell.

NOTE

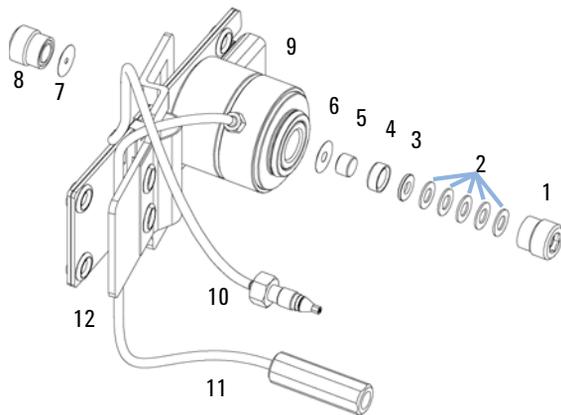
If the washers fall out of the window assembly, they must be inserted in the correct order with the Teflon® ring to prevent any leaks from the flow cell window.

10 Maintenance

Maintenance of Standard, Semi-Micro or Micro Flow Cell

2 Use a tooth pick to remove the quartz window from the window assembly.

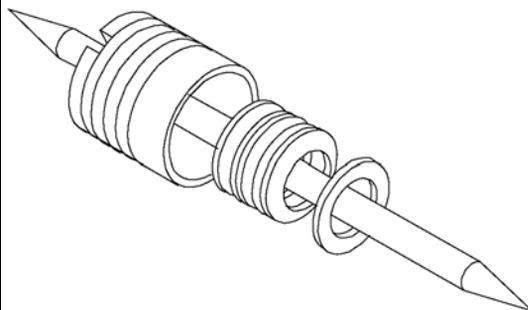
3 Orientation of Flow Cell Parts (“Standard Flow Cell” on page 234)



NOTE

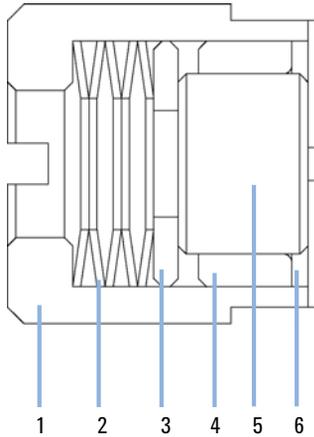
Gaskets # 6 and #7 have different hole diameters.

4 Assemble the washers and the window assembly in correct order.



Maintenance of Standard, Semi-Micro or Micro Flow Cell

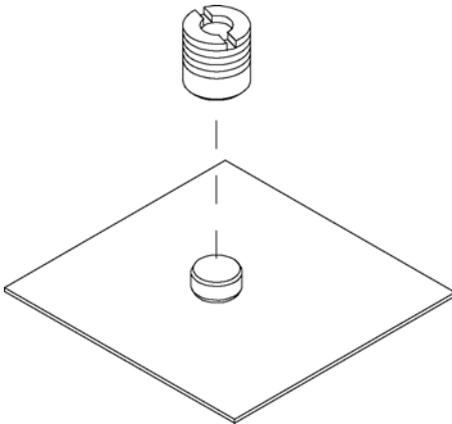
5 Correct orientation of spring washers [2] is required.



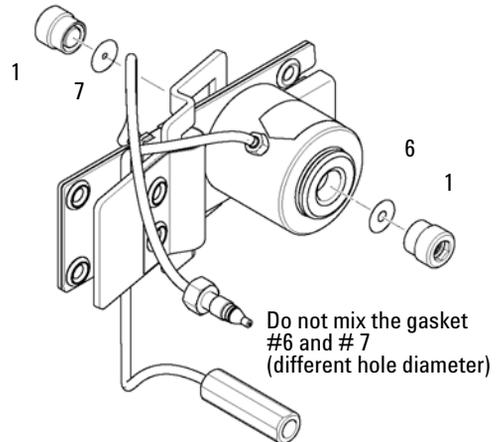
6 Press the Teflon® ring into the window assembly.



7 Press the window assembly onto the new or cleaned quartz window.



8 Insert a new gasket [6, 7] and the window assembly [1] into the cell body. Assure, that the gasket is on the bottom.



10 Maintenance

Maintenance of Standard, Semi-Micro or Micro Flow Cell

Next Steps:

- 9 Using a 4-mm hex key, tighten the window screw hand tight plus a quarter turn.
- 10 Reconnect the capillaries, see [“Exchanging a Flow Cell”](#) on page 200.
- 11 Perform a leak test.
- 12 Insert the flow cell.
- 13 Replace the front cover
- 14 Perform a [“Wavelength Verification and Recalibration”](#) on page 183 or a [“Holmium Oxide Test”](#) on page 174 to check the correct positioning of the flow cell.

Maintenance of High Pressure Flow Cell

When If the flow cell needs repair due to leaks or contaminations (reduced light throughput)

Tools required

- Two 1/4 inch wrenches for capillary connections hexagonal key 4 mm
- Tooth picks

Parts required

Description
For parts see [“High Pressure Flow Cell”](#) on page 248

Preparations

- Turn the flow off.
- Remove the front cover.
- Remove the flow cell, see [“Exchanging a Flow Cell”](#) on page 200.

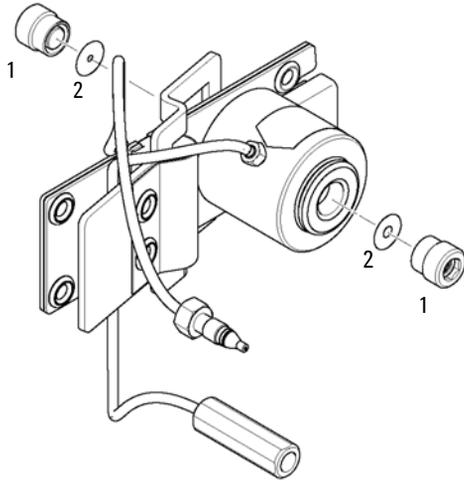
NOTE

All descriptions in this procedure are based on the default orientation of the cell (as it is manufactured). The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column).

10 Maintenance

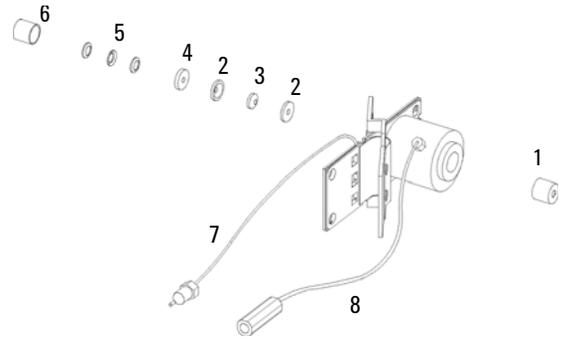
Maintenance of High Pressure Flow Cell

- 1** Use a 4 mm hex key to unscrew the window assembly [1] and remove the gasket [2] from the cell body.



If you want to replace the gasket only, continue with step 8, [“Maintenance of Standard, Semi-Micro or Micro Flow Cell”](#) on page 203.

- 2** Use a tooth pick to remove the quartz window from the window assembly.



- 3** Follow the procedure [“Maintenance of Standard, Semi-Micro or Micro Flow Cell”](#) on page 203 for reassembling.

Replacing Capillaries on a Standard Flow Cell

When	If the capillary is blocked
Tools required	Two 1/4 inch wrenches for capillary connections Wrench 4 mm for capillary connections Screwdriver Pozi 1 PT3
Parts required	Description For parts see “Standard Flow Cell” on page 234.
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see “Exchanging a Flow Cell” on page 200.

NOTE

All descriptions in this procedure are based on the default orientation of the cell (as it is manufactured). The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column).

NOTE

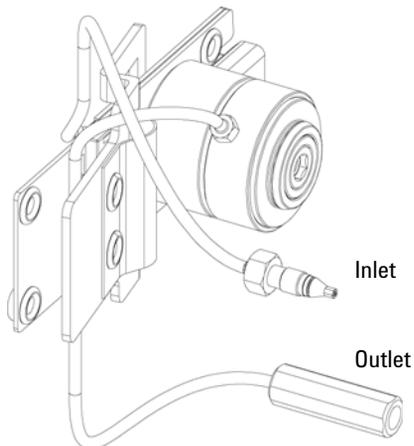
The fittings at the flow cell body are special types for low dead volumes and not compatible with other fittings.

When retightening the fittings, make sure that they are carefully tightened (handtight plus 1/4 turn with a wrench). Otherwise damage of the flow cell body or blockage may result.

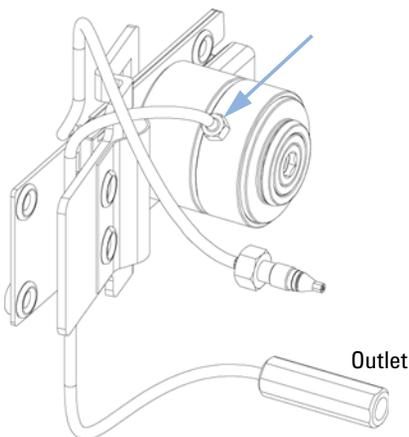
10 Maintenance

Replacing Capillaries on a Standard Flow Cell

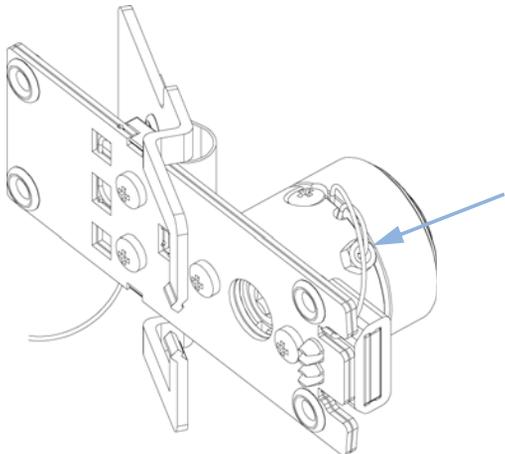
- 1** Identify the inlet and outlet capillaries. To replace the inlet capillary, continue with step "To replace the inlet capillary, use a 4-mm wrench for the fitting."



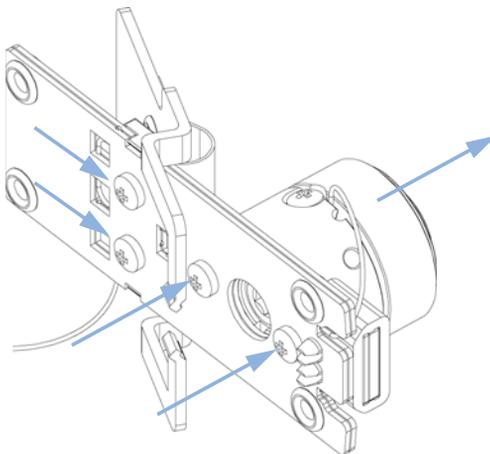
- 2** After replacing the outlet capillary, fix it handtight first. Then do a 1/4 turn with a 4-mm wrench.



- 3** To replace the inlet capillary, use a 4-mm wrench for the fitting.

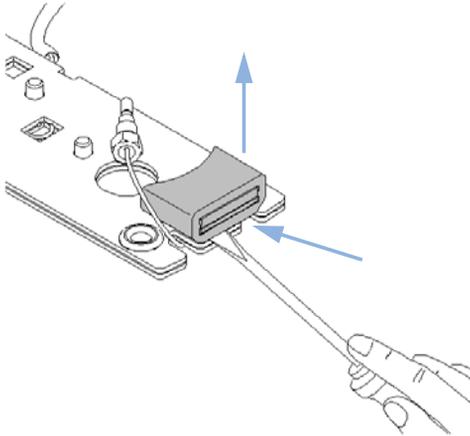


- 4** Unscrew the cell body from the heat exchanger and the heat exchanger from the clamp unit.

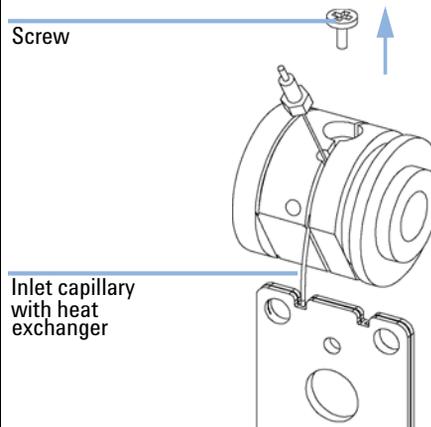


Replacing Capillaries on a Standard Flow Cell

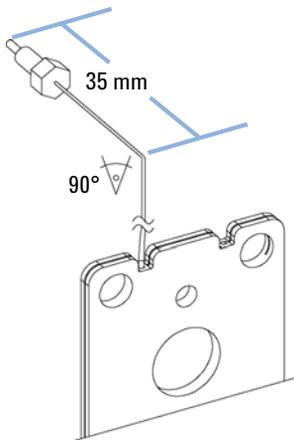
- 5** Use a small flat screw driver to carefully lift off the I.D. tag. Shown is the default orientation. See Note at the beginning of this section.



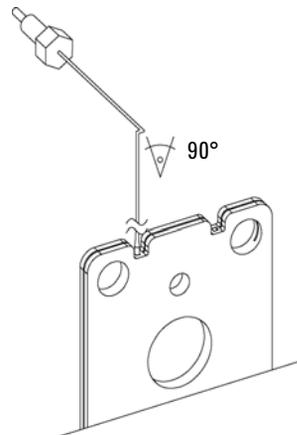
- 6** Unscrew the fixing screw and unwrap the inlet capillary from the groove in the flow cell body.



- 7** Take the new inlet capillary and bend it 90° about 35 mm from its end.



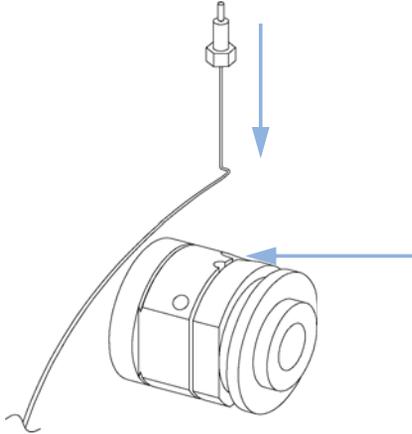
- 8** Bend the capillary again by 90° as shown below.



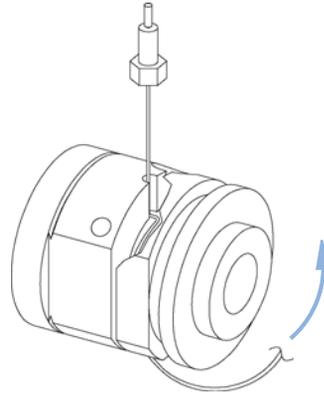
10 Maintenance

Replacing Capillaries on a Standard Flow Cell

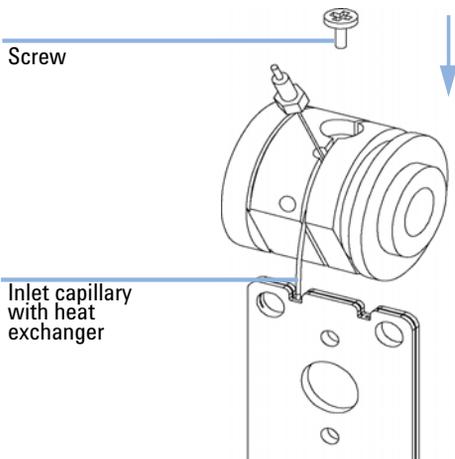
9 Insert the capillary into the hole between fixing screw and the inlet fitting..



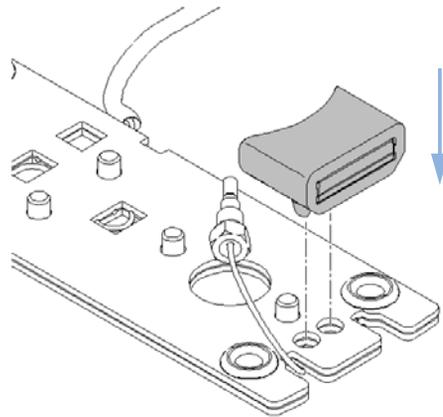
10 The capillary lays in the groove and should be tied around the body (in the groove) 5 times.



11 Insert the fixing screw, so that the capillary cannot leave the groove.

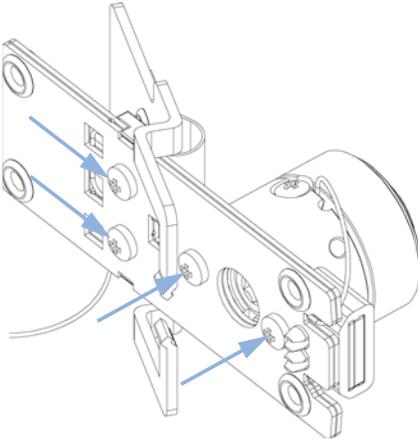


12 Carefully insert the I.D. tag into the new heat exchanger. Shown is the default orientation. See Note at the beginning of this section.

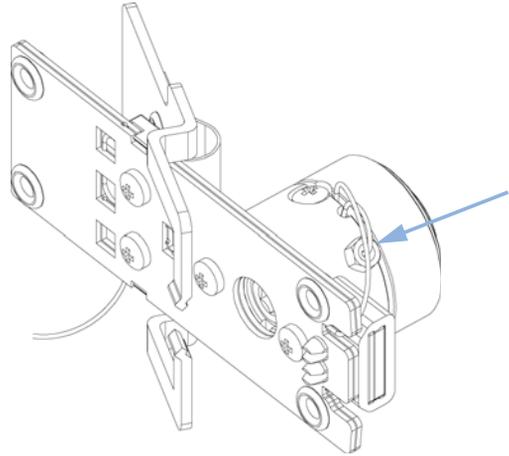


Replacing Capillaries on a Standard Flow Cell

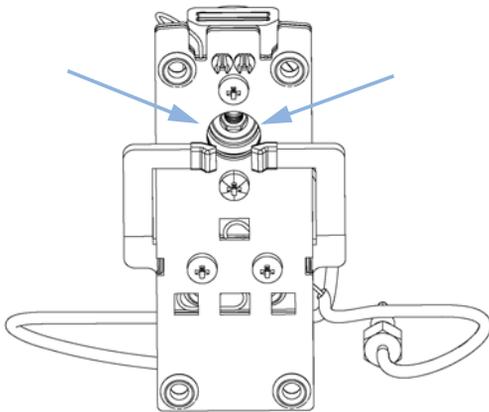
13 Fix the heat exchanger to the clamp unit and the flow cell body to the heat exchanger.



14 Fix the inlet capillary to the flow cell body handtight first. Then do a 1/4 turn with a 4-mm wrench.



15 Check for a centered holder vs. hole. If required adjust with the holder screws.

**Next Steps:**

16 Reconnect the capillaries, see [“Exchanging a Flow Cell”](#) on page 200.

17 Perform a leak test.

18 Insert the flow cell.

19 Replace the front cover.

20 Perform a [“Wavelength Verification and Recalibration”](#) on page 183 or a [“Holmium Oxide Test”](#) on page 174 to check the correct positioning of the flow cell.

10 Maintenance

Replacing Capillaries on a Semi-Micro and Micro Flow Cell

Replacing Capillaries on a Semi-Micro and Micro Flow Cell

When	If the capillary is blocked
Tools required	Two 1/4 inch wrenches for capillary connections Wrench 4 mm for capillary connections Screwdriver Pozi 1 PT3
Parts required	Description For parts see “Semi-Micro Flow Cell Parts” on page 236 or “Micro Flow Cell” on page 238.
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, “Exchanging a Flow Cell” on page 200.

NOTE

All descriptions in this procedure are based on the default orientation of the cell (as it is manufactured). The heat exchanger/capillary and the cell body can be fixed mirror symmetrically to have both capillaries routed to the bottom or to the top (depending on the routing of the capillaries to the column).

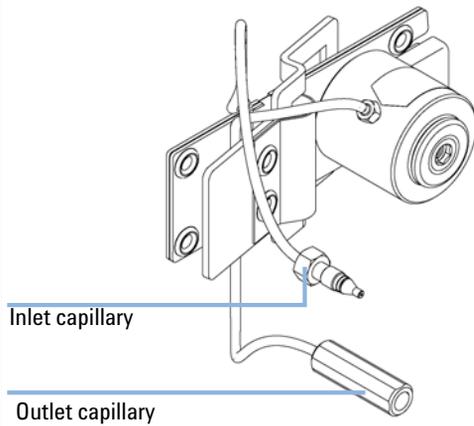
NOTE

The fittings at the flow cell body are special types for low dead volumes and not compatible with other fittings.

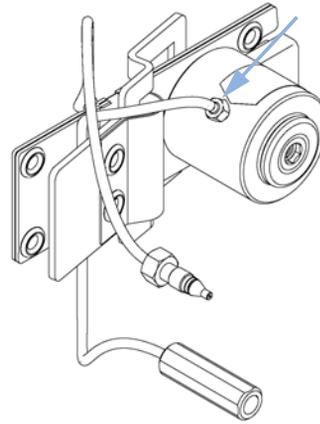
When retightening the fittings, make sure that they are carefully tightened (handtight plus 1/4 turn with a wrench). Otherwise damage of the flow cell body or blockage may result.

Replacing Capillaries on a Semi-Micro and Micro Flow Cell

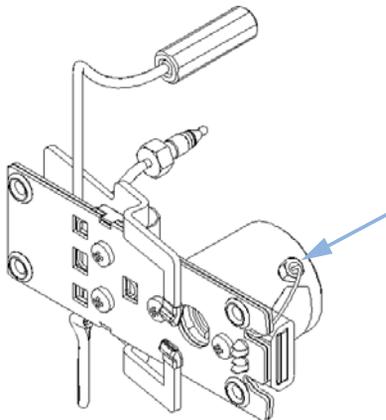
- 1** Identify the inlet and outlet capillaries.



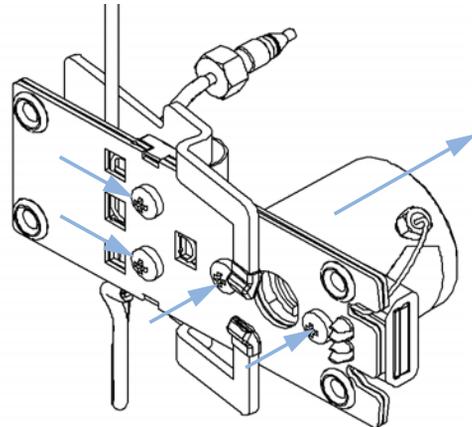
- 2** After replacing the outlet capillary, fix it handtight first. Then do a 1/4 turn with a 4-mm wrench.



- 3** To replace the inlet capillary, use a 4-mm wrench for the fitting.



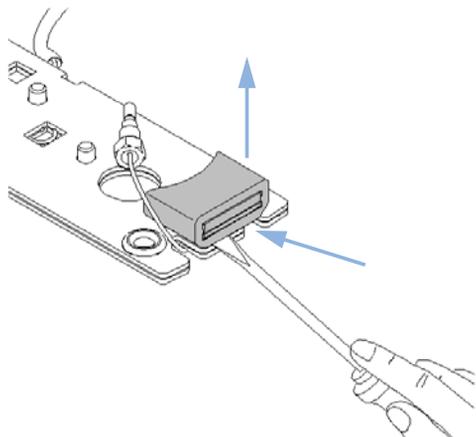
- 4** Unscrew the cell body from the heat exchanger and the heat exchanger from the clamp unit.



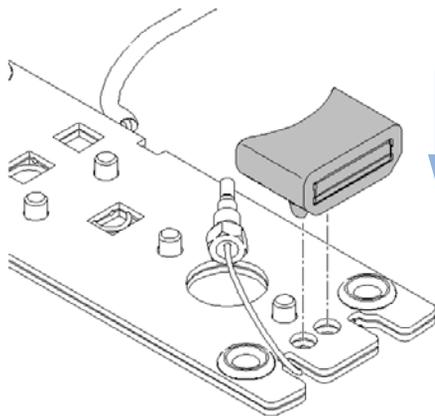
10 Maintenance

Replacing Capillaries on a Semi-Micro and Micro Flow Cell

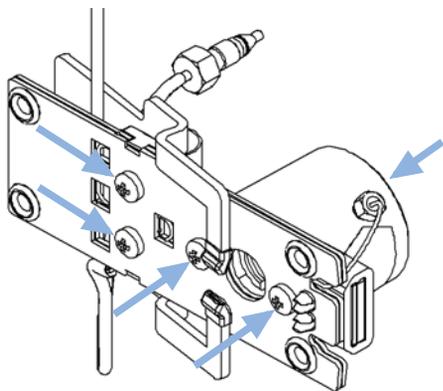
- 5** Use a small flat screw driver to carefully lift off the I.D. tag. Shown is the default orientation. See Note at the beginning of this section.



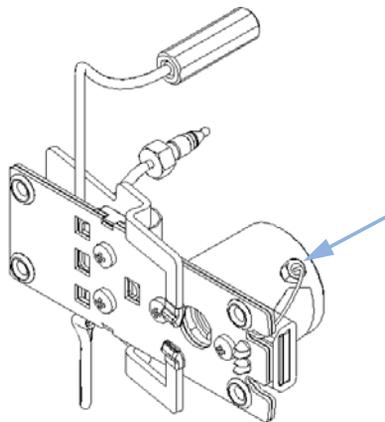
- 6** Carefully insert the I.D. tag into the new heat exchanger. Shown is the default orientation. See Note at the beginning of this section.



- 7** Fix the new heat exchanger to the clamp unit and the heat exchanger to the cell body.

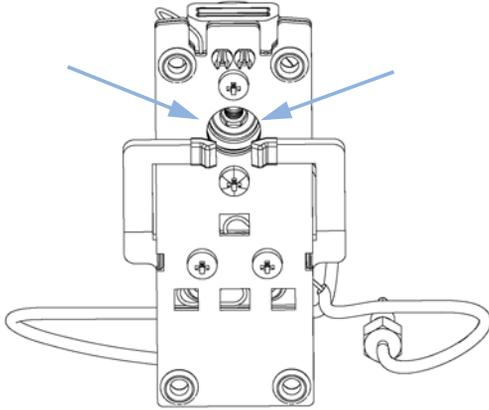


- 8** Fix the inlet capillary to the flow cell body handtight first. Then do a 1/4 turn with a 4-mm wrench.



Replacing Capillaries on a Semi-Micro and Micro Flow Cell

- 9** Check for a centered holder vs. hole. If required adjust with the holder screws.

**Next Steps:**

- 10** Reconnect the capillaries, see “[Exchanging a Flow Cell](#)” on page 200.
- 11** Perform a leak test.
- 12** Insert the flow cell.
- 13** Replace the front cover.
- 14** Perform a “[Wavelength Verification and Recalibration](#)” on page 183 or a “[Holmium Oxide Test](#)” on page 174 to check the correct positioning of the flow cell.

10 Maintenance

Nano Flow Cell - Replacing or Cleaning

Nano Flow Cell - Replacing or Cleaning

When	If parts are contaminated or leaky.
Tools required	Screwdriver POZI 1 PT3 Two 1/4 inch wrenches for capillary connections
Parts required	Description For parts identification refer to “ Nano Flow Cells ” on page 244 (80 nL and 500 nL).
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see “ Exchanging a Flow Cell ” on page 200.

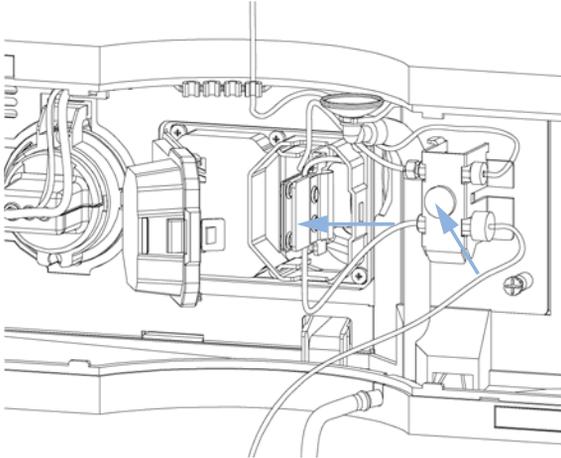
NOTE

For details refer to the technical note that comes with the nano-flow cell kit.

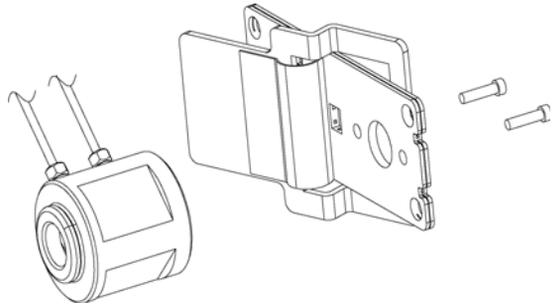
NOTE

The quartz block can be cleaned with alcohol. DO NOT touch the inlet and outlet windows at the quartz block.

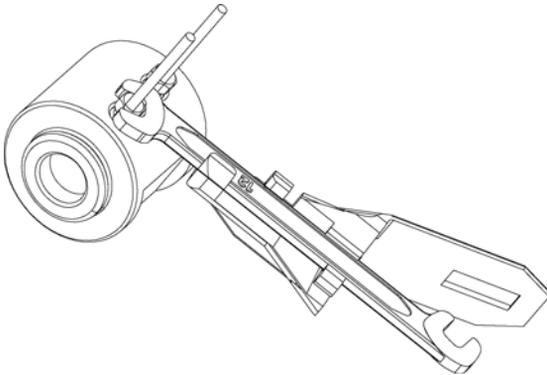
- 1** Disconnect the capillaries from the capillary holder and remove the flow cell.



- 2** Unscrew the cell body from the holder.



- 3** Unscrew the capillaries from the flow cell. DO NOT use the adapter at this time!



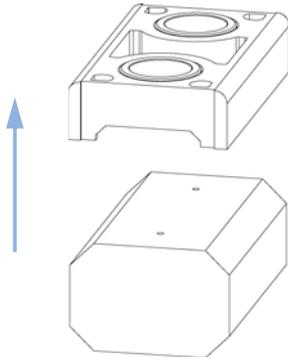
- 4** Using for example a toothpick, press on the plastic part and slide the quartz body out of the cell housing.



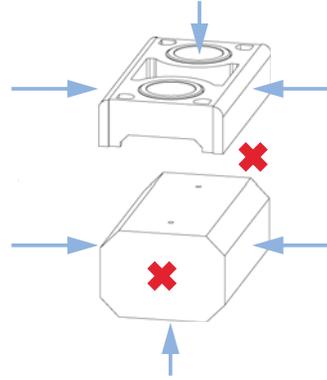
10 Maintenance

Nano Flow Cell - Replacing or Cleaning

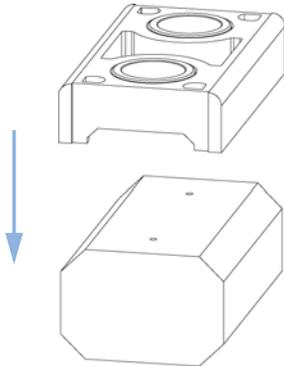
- 5** The quartz body and the cell seal assembly can be separated for cleaning purpose.



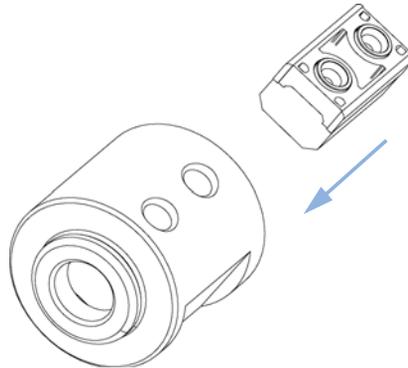
- 6** This figure shows the correct holding of the quartz body and the cell seal assembly.



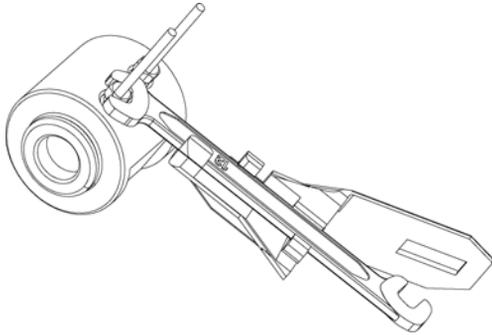
- 7** Replace the cell seal assembly onto the quartz body. Always use a new seal assembly to exclude damage during disassembling.



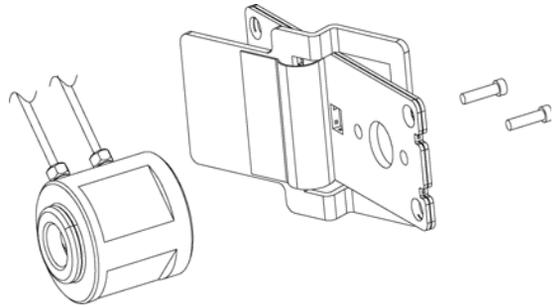
- 8** Slide the quartz body completely into the cell body to the front stop (use for example a toothpick).



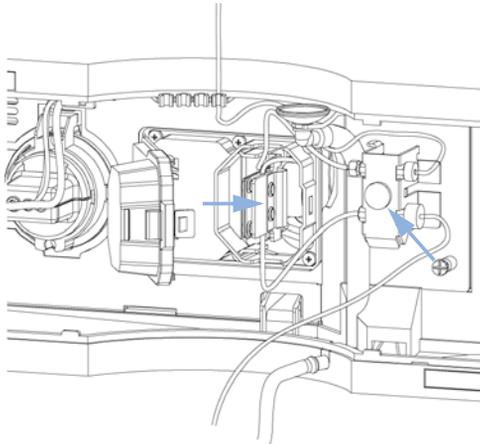
- 9** Insert the flow cell capillaries and tighten them fingertight. Use the wrench and torque adapter as described on [Figure 76](#) on page 222 and tighten the fittings alternately.



- 10** Reassemble the flow cell body to the holder.



- 11** Re-install the flow cell and connect the capillaries to the union holder.



Next Steps:

- 12** Perform a leak test with the flow cell outside of the detector.
- 13** If no leak is observed, install the flow cell and you are ready to work.
- 14** Make sure that the flow cell assembly is inserted correctly and fits perfectly in the optical unit (especially when PEEK capillaries are used).

10 Maintenance

Nano Flow Cell - Replacing or Cleaning

NOTE

The cell body can be fitted in two positions to allow the capillaries routed upwards or downwards (depending on where the column is located). Route the capillaries directly column (inlet) and waste assembly (outlet).

NOTE

With the instrument accessory kit comes a 4-mm wrench and with the Sealing Kit a special adapter. Both together work as a torque wrench with pre-defined torque (maximum allowed torque for the cell fittings is 0.7 Nm). It can be used to tight the capillary fittings at the flow cell body. The wrench has to be plugged into the adapter as shown in [Figure 76](#) on page 222.

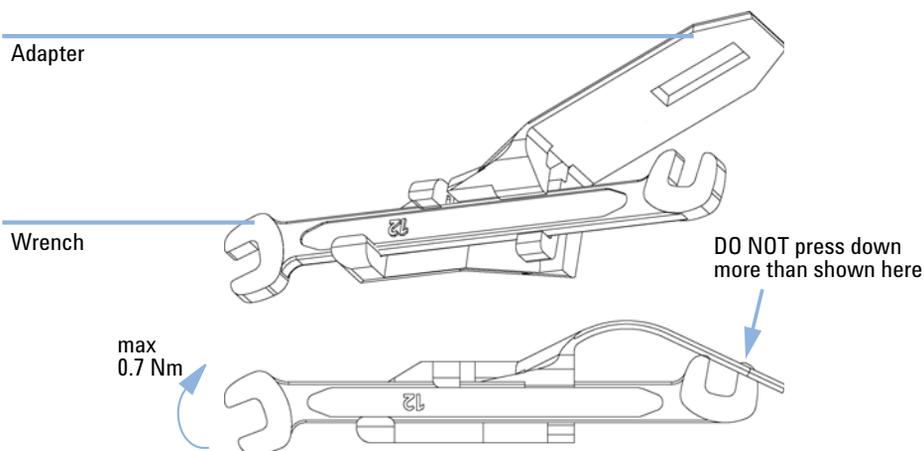


Figure 76 Wrench plus Torque Adapter

Cleaning or Exchanging the Holmium Oxide Filter

When	If holmium oxide filter is contaminated						
Tools required	Screwdriver POZI 1 PT3 Screwdriver flat blade Two 1/4 inch wrenches for capillary connections A pair of tweezers						
Parts required	<table> <thead> <tr> <th>#</th> <th>p/n</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>79880-22711</td> <td>Holmium oxide filter</td> </tr> </tbody> </table>	#	p/n	Description	1	79880-22711	Holmium oxide filter
#	p/n	Description					
1	79880-22711	Holmium oxide filter					
Preparations	Turn the lamp(s) off. Remove the front cover. Remove the flow cell, see “Exchanging a Flow Cell” on page 200.						

NOTE

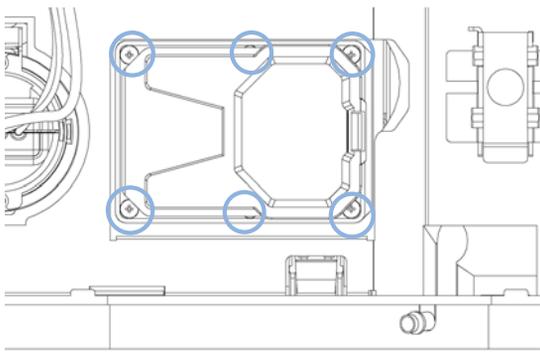
See also [“Declaration of Conformity for HOX2 Filter”](#) on page 275.

The glass tends to build a film on its surface even under normal environmental conditions. This is a phenomenon, which can be found also on the surface of several other glasses and has something to do with the composition of the glass. There is no indication, that the film has an influence on the measurement. Even in the case of a thick film, which scatters the light remarkably, no shift of the peak positions is to be expected. A slight change in the absorbance might be possible. Other components within the light path (lenses, windows, ...) are also changing their behavior over the time.

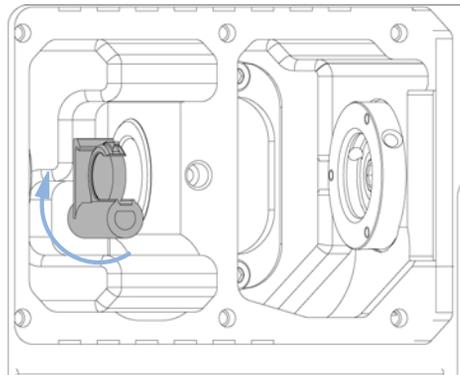
10 Maintenance

Cleaning or Exchanging the Holmium Oxide Filter

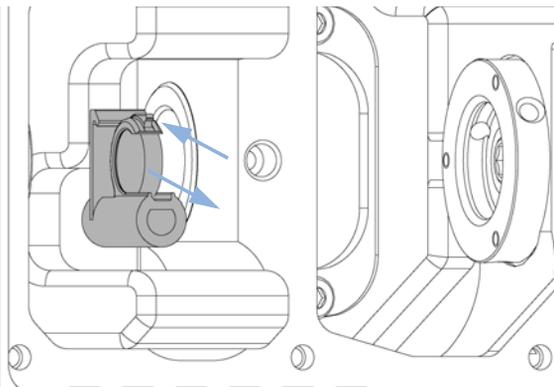
1 Unscrew the six screws and remove the flow cell cover.



2 If not already in this position, move the filter up.



3 While releasing the holder with a screw driver (at the top), carefully remove the holmium oxide filter.

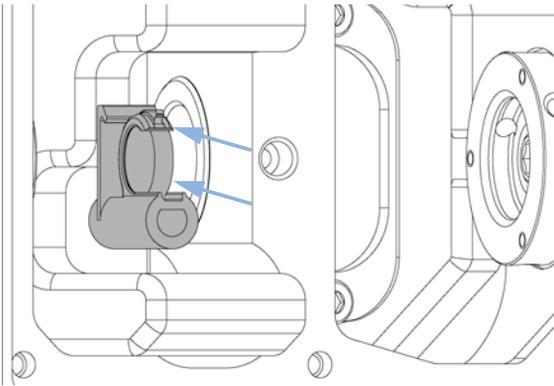


NOTE

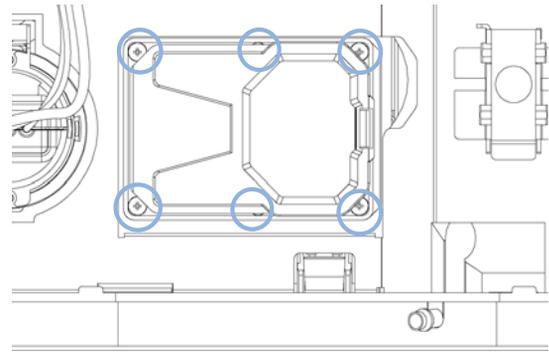
Do not scratch the holmium oxide filter.

The holmium oxide filter can be cleaned with alcohol and a lint-free cloth.

- 4** While releasing the holder with a screw driver, carefully insert the holmium oxide filter.



- 5** Replace the flow cell cover and fix the six screws.



Next Steps:

- 6** Perform a holmium oxide test, see [“Holmium Oxide Test”](#) on page 174 to check the proper function of the holmium oxide filter.
- 7** Insert the flow cell, see [“Exchanging a Flow Cell”](#) on page 200.
- 8** Replace the front cover.
- 9** Turn on the flow.

Correcting Leaks

When If a leakage has occurred in the flow cell area or at the heat exchanger or at the capillary connections

Tools required Tissue
Two 1/4 inch wrenches for capillary connections

Preparations Remove the front cover.

- 1 Use tissue to dry the leak sensor area and the leak pan.
- 2 Observe the capillary connections and the flow cell area for leaks and correct, if required.

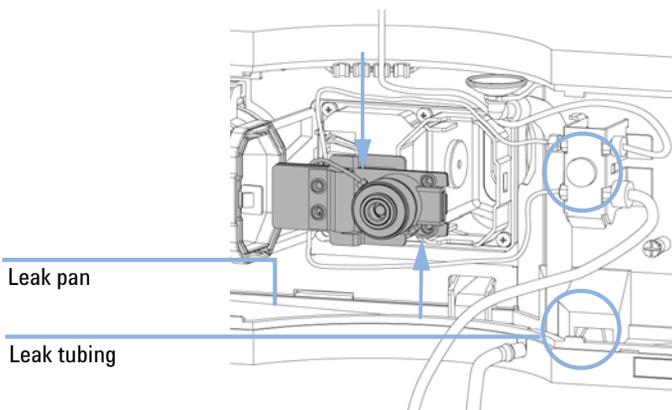


Figure 77 Observing for Leaks

- 3 Replace the front cover.

Replacing Leak Handling System Parts

When If the parts are corroded or broken

Tools required None

Parts required	#	p/n	Description
	1	5061-3388	Leak funnel
	1	5041-8389	Leak funnel holder
	1	5062-2463	Corrugated tubing, PP, 6.5 mm id, 5 m

Preparations Remove the front cover.

- 1 Pull the leak funnel out of the leak funnel holder.
- 2 Pull out the leak funnel with the tubing.
- 3 Insert the leak funnel with the tubing in its position.
- 4 Insert the leak funnel into the leak funnel holder.

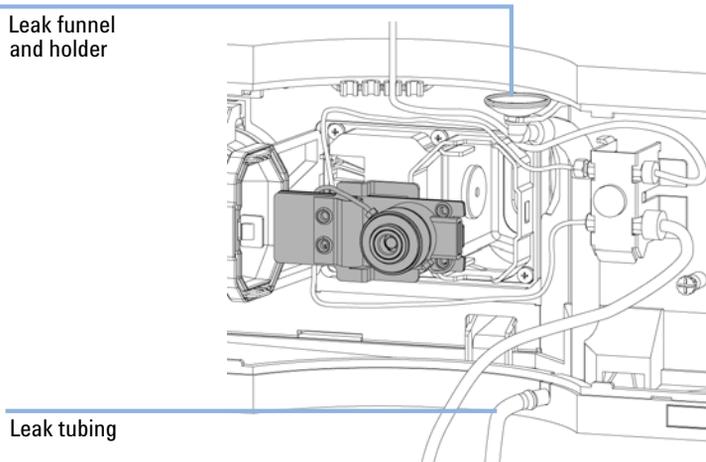


Figure 78 Replacing Leak Handling System Parts

- 5 Replace the front cover.

10 Maintenance

Replacing the CompactFlash Card (G1315C/G1365C only)

Replacing the CompactFlash Card (G1315C/G1365C only)

When	If defective		
Tools required	None		
Parts required	#	p/n	Description
	1	01100-68700	CompactFlash Card Kit
Preparations	Turn the detector OFF and have access to the rear of the detector.		

NOTE

The G1315C and G1365C is equipped with a CompactFlash card. This CompactFlash card is required for the operation of the detector (data buffering). DO NOT use other types of CompactFlash cards. Only CompactFlash cards supplied with the detector or as replacement with above part number are tested with the detector.

- 1 Remove the CompactFlash card by pulling it out of its slot in the rear of the detector.
- 2 Install the new CompactFlash card into the slot.
- 3 Turn the detector ON.

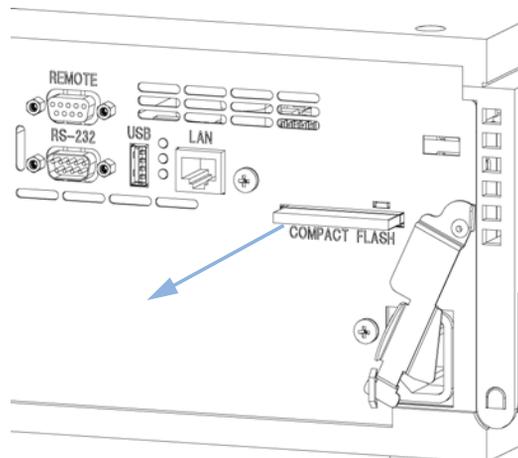


Figure 79 Replacing CompactFlash card

Replacing the Module's 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 Diagnostic 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.
- 2 To load the firmware into the module follow the instructions in the documentation.

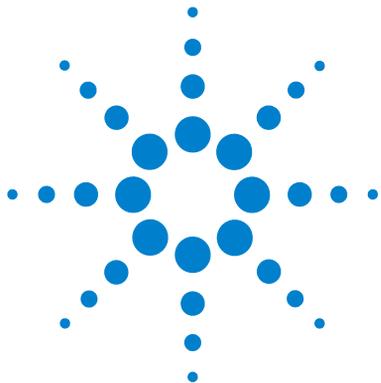
10 Maintenance

Replacing the Module's Firmware

Module Specific Information

Table 35 Module Specific Information (G1315C/D and G1365C/D)

	G1315C DAD VL+ / G1365C MWD	G1315D DAD / G1365D MWD
Initial firmware (main and resident)	B.01.02	B.01.04
Compatibility with 1260/1290 Infinity modules	When using the G1315C/D and G1365C/D in a system, all other modules must have firmware revision A.06.xx or B.06.xx or above (main and resident) from the same revision set (e.g. A.06.30/B.06.30).	
Compatibility with 1100/1200 series modules	When using the G1315C/D and G1365C/D in a system, all other modules must have firmware revision A.06.xx or B.01.02 or above (main and resident). Otherwise the communication will not work.	
Conversion to / emulation of G1315B or G1365B	Not possible due to different hardware and electronic platform.	



11 Parts for Maintenance

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Semi-Micro Flow Cell Parts	236
Micro Flow Cell	238
Prep Flow Cell - SST	240
Prep Flow Cell - Quartz	242
Nano Flow Cells	244
High Pressure Flow Cell	248
Accessory Kits	250

This chapter provides information on parts for maintenance.



Overview of Maintenance Parts

Item	p/n	Description
1	5065-9982	Plastics kit (includes base, top, left and right sides)
2	G4208-67001	Instant Pilot G4208A (requires firmware B.02.08 or above)
3		Flow cells with ID tag
4	G1315-87311	Capillary column – detector 380 mm lg, 0.17 i.d., (includes ferrule front 1/16", ferrule back 1/16" and fitting 1/16").
5	5022-6515	Union ZDV
6	G1315-68707	Flow cell door (seal included)
	5022-2112	Screw cover
7	79880-22711	Holmium oxide filter
8	2140-0820	Longlife Deuterium lamp "C" (with black cover and RFID tag)
9	G1103-60001	Tungsten lamp
10	5041-8388	Leak funnel
11	5041-8389	Leak funnel
12	5041-8387	Tube clip
13	5062-2463	Corrugated tubing, PP, 6.5 mm id, 5 m
14	5062-2462	Teflon Tubing flexible i.d. 0.8 mm, o.d. 1.6 mm, 2 m, re-order 5 m (flow cell to waste)
	5181-1516	CAN cable, Agilent module to module, 0.5 m
	5181-1519	CAN cable, Agilent module to module, 1 m
	G1369B or G1369-60002	Interface board (LAN)
	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)
	01046-60105	Analog cable (BNC to general purpose, spade lugs)
	G1351-68701	Interface board (BCD) with external contacts and BCD outputs
	01100-68700	CompactFlash Card Kit

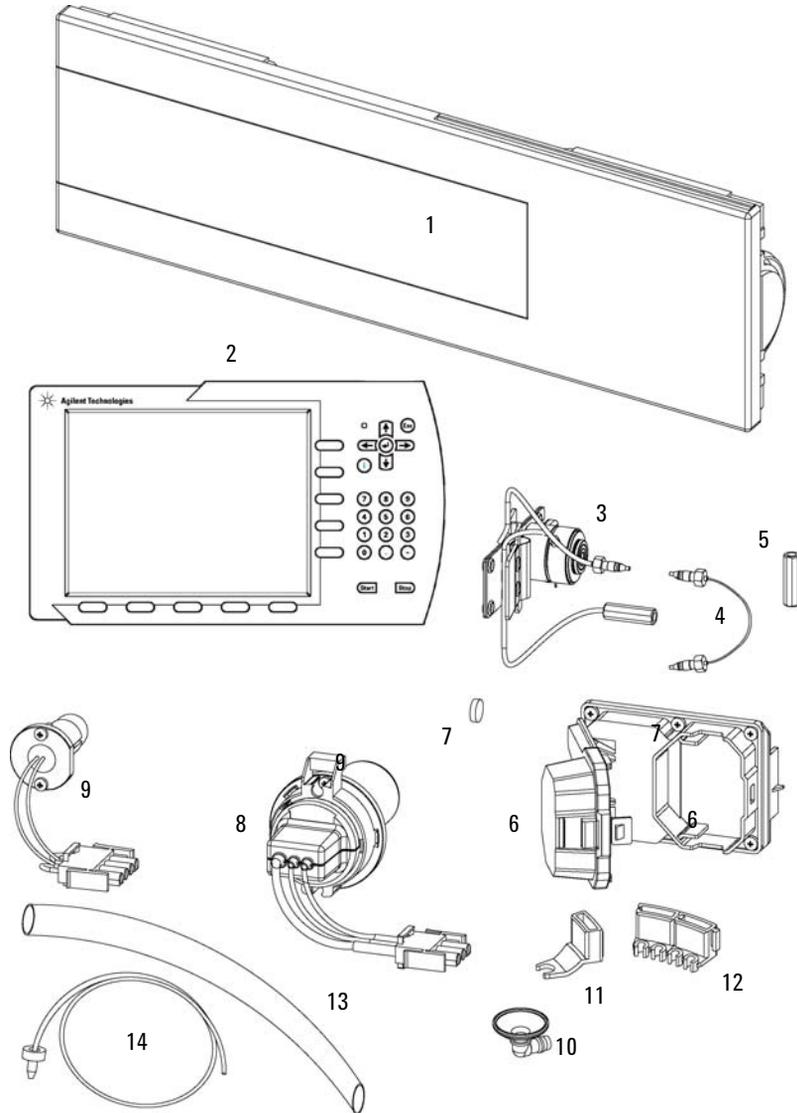


Figure 80 Maintenance Parts

Standard Flow Cell

Item	p/n	Description
	G1315-60022	Standard flow cell, 10 mm, 13 μ L, 120 bar (12 MPa)
1	79883-22402	Window screw
2	5062-8553	Spring washers
3	79883-28801	Compression washer
4	79883-22301	Window holder
5	1000-0488	Quartz window
6	G1315-68711	Gasket BACK (Teflon), 2.3 mm hole, outlet side (12/pk)
7	G1315-68710	Gasket FRONT (Teflon), 1.3 mm hole, inlet side (12/pk)
8		Window assembly (comprises window screw, spring washers, compression washer, window holder and quartz window)
9	G1315-87321	Capillary IN (0.17 mm, 590 mm lg) including heat exchanger
10	G1315-87302	Capillary OUT (0.17 mm, 200 mm lg)
11	G1315-84910	Clamp unit
	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp
	5022-2184	Union ZDV
	G1315-68712	Cell repair kit STD includes window screw kit, 4 mm hexagonal wrench and seal kit
	79883-68703	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers

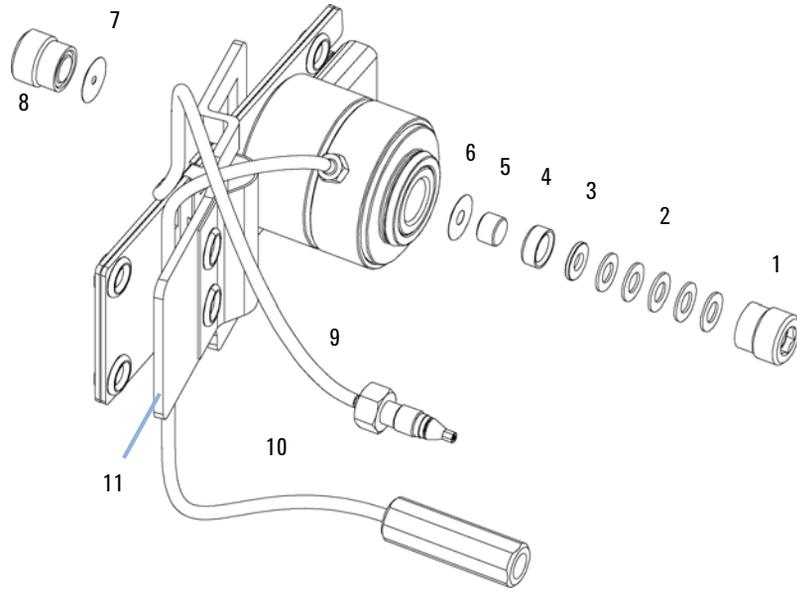


Figure 81 Standard Flow Cell Parts

NOTE

Gaskets # 6 and #7 have different hole diameters.

- 1 - window screw
- 2 - spring washers
- 3 - compression washer
- 4 - window holder
- 5 - quartz window
- 6 - Gasket

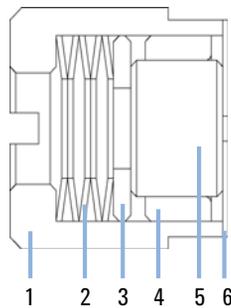


Figure 82 Orientation of Spring Washers

Semi-Micro Flow Cell Parts

Item	p/n	Description
	G1315-60025	Semi-micro flow cell, 6 mm, 5 µL, 120 bar (12 MPa)
1	79883-22402	Window screw
2	5062-8553	Spring washers
3	79883-28801	Compression washer
4	79883-22301	Window holder
5	1000-0488	Quartz window
6	79883-68702	Gasket BACK (Teflon), 1.8 mm hole, outlet side (12/pk)
7	G1315-68710	Gasket FRONT (Teflon), 1.3 mm hole, inlet side (12/pk)
8		Window assembly (comprises window screw, spring washers, compression washer, window holder and quartz window)
9	G1315-87319	Capillary IN (0.17 mm, 310 mm lg) including heat exchanger
10	G1315-87306	Capillary OUT (0.12 mm, 200 mm lg)
10	G1315-87302	Capillary OUT (0.17 mm, 200 mm lg)
11	G1315-84910	Clamp unit
	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp
	5022-2184	Union ZDV
	G1315-68713	Cell repair kit semi-micro, includes window screw kit, 4 mm hexagonal wrench and seal kits
	79883-68703	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers

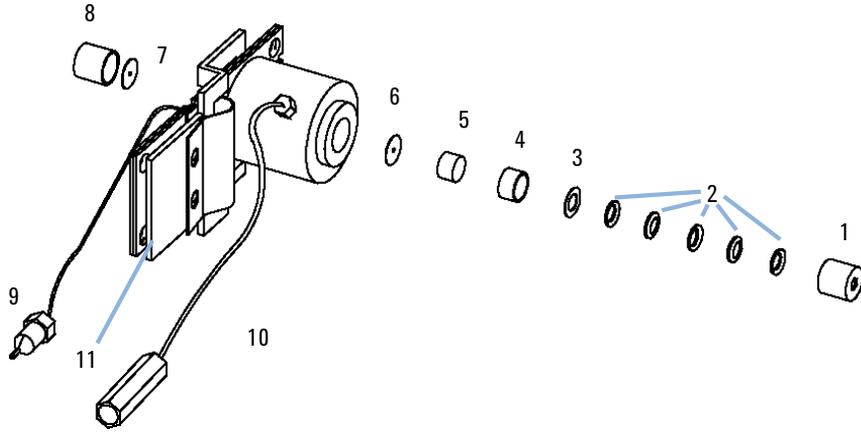


Figure 83 Semi-Micro Flow Cell Parts

NOTE

Gaskets # 6 and #7 have different hole diameters.

- 1 - window screw
- 2 - spring washers
- 3 - compression washer
- 4 - window holder
- 5 - quartz window
- 6 - Gasket

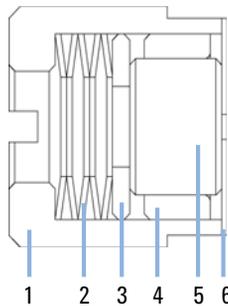


Figure 84 Orientation of Spring Washers

Micro Flow Cell

Item	p/n	Description
	G1315-60024	Micro flow cell, 3 mm, 2 µL, 120 bar (12 MPa)
1	79883-22402	Window screw
2	5062-8553	Spring washers
3	79883-28801	Compression washer
4	79883-22301	Window holder
5	1000-0488	Quartz window
6	79883-68702	Gasket BACK (Teflon), 1.8 mm hole, outlet side (12/pk)
7	G1315-68710	Gasket FRONT (Teflon), 1.3 mm hole, inlet side (12/pk)
8		Window assembly (comprises window screw, spring washers, compression washer, window holder and quartz window)
9	G1315-87339	DAD Heat Exchanger Capillary 310 mm, 0.12 mm i.d.
10	G1315-87306	Capillary OUT (0.12 mm, 200 mm lg)
10	G1315-87302	Capillary OUT (0.17 mm, 200 mm lg)
11	G1315-84910	Clamp unit
	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp
	5022-2184	Union ZDV
	G1315-68713	Cell repair kit semi-micro, includes window screw kit, 4 mm hexagonal wrench and seal kits
	79883-68703	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers

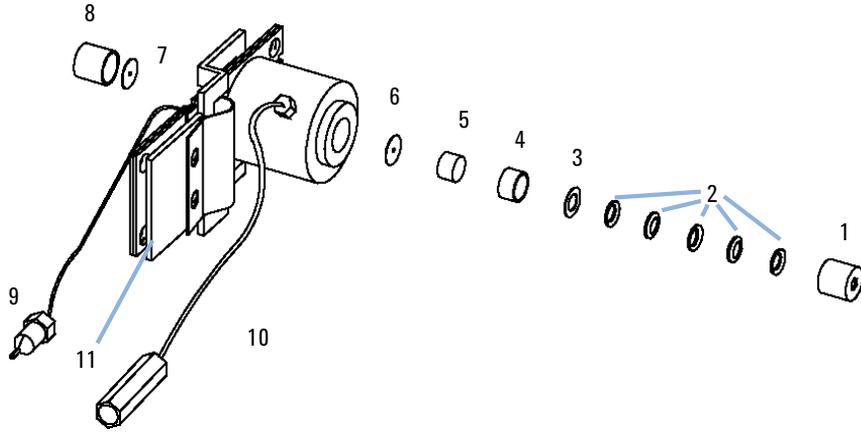


Figure 85 Micro Flow Cell Parts

NOTE

Gaskets # 6 and #7 have different hole diameters.

- 1 - window screw
- 2 - spring washers
- 3 - compression washer
- 4 - window holder
- 5 - quartz window
- 6 - Gasket

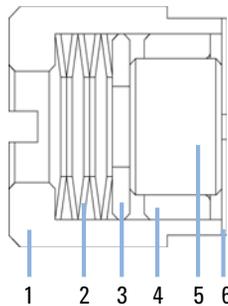


Figure 86 Orientation of Spring Washers

Prep Flow Cell - SST

NOTE

For more details on the Preparative Flow Cells refer to the technical note that comes with the flow cells.

Item	p/n	Description
	G1315-60016	Prep flow cell SST - 3 mm, 120 bar (12 MPa)
1	79883-22402	Window screw
2	5062-8553	Spring washers
3	79883-28801	Compression washer
4	79883-22301	Window holder
5	1000-0488	Quartz window
6	G1315-68711	Gasket BACK (Teflon), 2.3 mm hole, outlet side (12/pk)
7	G1315-68710	Gasket FRONT (Teflon), 1.3 mm hole, inlet side (12/pk)
8		Window assembly (comprises window screw, spring washers, compression washer, window holder and quartz window)
	79883-68703	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers
	G1315-68713	Cell repair kit semi-micro, includes window screw kit, 4 mm hexagonal wrench and seal kits
9	G1315-87305	Capillary SST, 250 mm length, 0.5 mm i.d., o.D. 0.9 mm with fittings for flow cell assembled
9a	5062-2418	1/16" fittings and ferrules 10/pk
10	G1315-27706	Cell body
11	G1315-84901	Clamp unit
12	G1315-84902	Handle for Clamp unit
13	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp

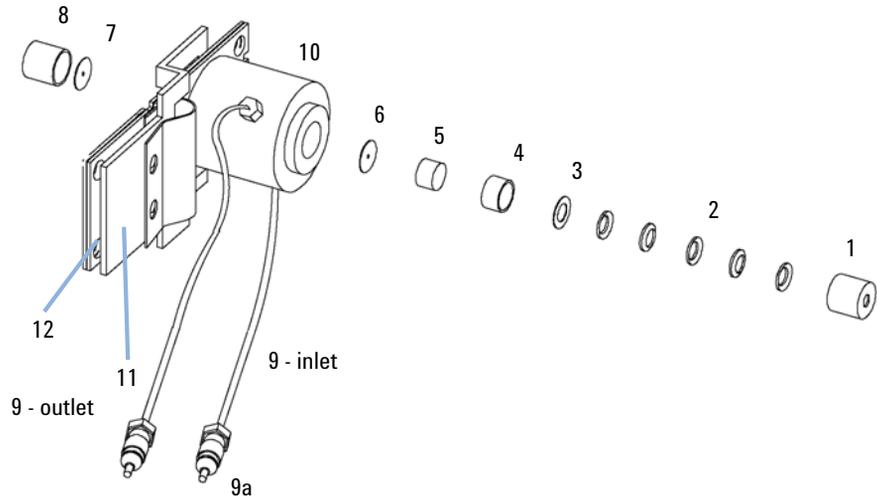


Figure 87 Prep Flow Cell - SST Parts

NOTE

Gaskets # 6 and #7 have different hole diameters.

- 1 - window screw
- 2 - spring washers
- 3 - compression washer
- 4 - window holder
- 5 - quartz window
- 6 - Gasket

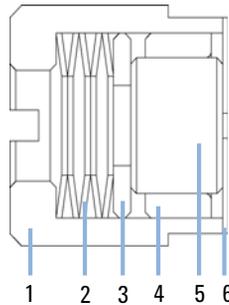


Figure 88 Orientation of Spring Washers

Prep Flow Cell - Quartz

NOTE

For more details on the Preparative Flow Cells refer to the technical note that comes with the flow cells.

Item	p/n	Description
	G1315-60017	Prep flow cell quartz, 0.3 mm, 20 bar (2 MPa)
	G1315-60018	Prep flow cell quartz, 0.06 mm (2 MPa)
1	G1315-67301	PTFE tubing 2 m length, 0.8 mm i.d., o.D. 1.6 mm
	G1315-67302	PTFE tubing 80 cm length, 0.5 mm i.d., o.D. 1.6 mm
2	0100-1516	Fitting male PEEK, 2/pk
3	G1315-27705	Cell housing
4	G1315-84901	Clamp unit
5	G1315-84902	Handle for Clamp unit
6	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp
7	G1315-80004	Quartz body - Prep Cell 0.3 mm
7	G1315-80003	Quartz body - Prep Cell 0.06 mm

NOTE

The flow cell comes with two tubings 0.8 mm i.d. and one 0.5 mm i.d. so that the combination at the flow cell could be either 0.8/0.8 or 0.5/0.8 (inlet/outlet).

Standard is 0.8/0.8. Depending on the system pressure (<30 mL/min) or bandbroadening, the inlet tubing might be changed to 0.5 mm.

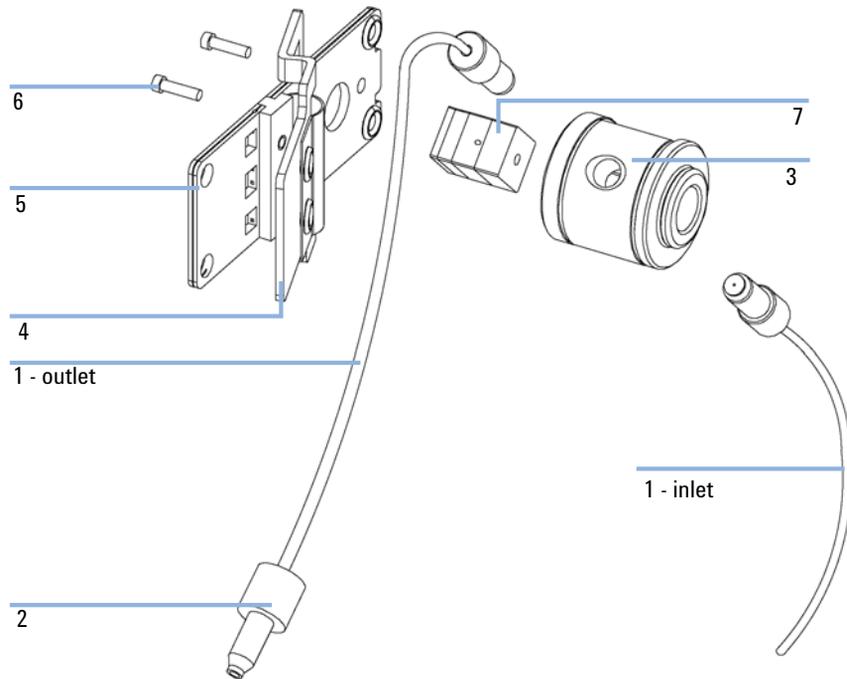


Figure 89 Prep Flow Cell - Quartz Parts

Nano Flow Cells

The following kits are available:

Table 36 Nano-flow cell kits

Part number	Comments
Semi-nano flow cell kit, 10 mm, 500 nL, 5 MPa (p/n G1315-68724)	completely assembled (includes items 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, and 16)
Nano flow cell kit, 10 mm, 80 nL, 5 MPa (p/n G1315-68716)	completely assembled (includes items 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, and 16)

Figure 90 on page 245 shows all parts delivered with the nano-flow cell kits.

Generic parts for both nano-flow cells:

Item	p/n	Description
3	5063-6593	Fitting Screw (for 4 mm wrench)
4		Cell ferrules are factory installed
5	5065-4422	PEEK fitting 1/32"
7	5063-6592	Litetouch ferrules LT-100, (1/32" Ferrule and SS lock ring)
8	5022-2146	Union Adjustment Tool
9	5022-2184	Union ZDV
10	G1315-45003	Torque adapter
14	G1315-84902	Handle for Clamp unit
15	G1315-84910	Clamp unit
16	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp
17	8710-1534	Wrench, 4 mm both ends, open end

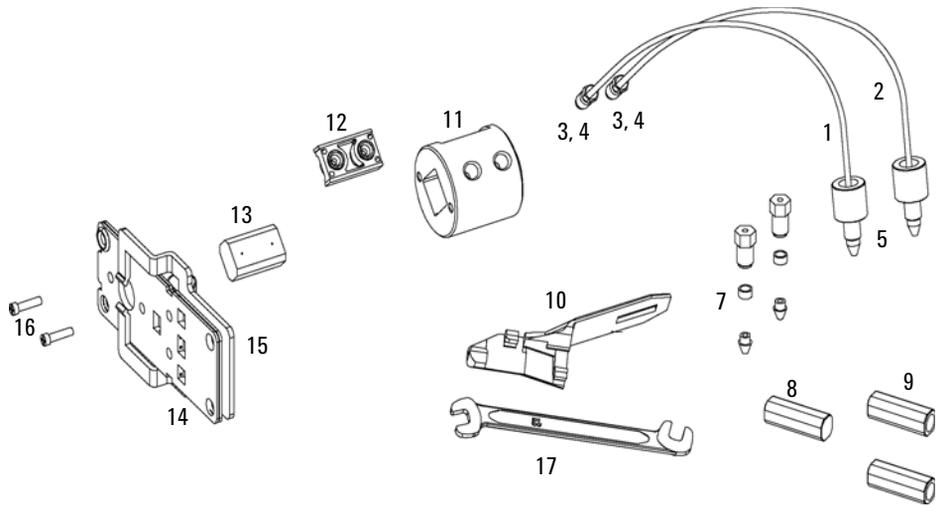


Figure 90 Content of kits

11 Parts for Maintenance

Nano Flow Cells

Specific parts for the semi-nano flow cell

Item	p/n	Description
	G1315-68724	Semi-nano flow cell kit, 10 mm, 500 nL, 5 MPa
1	G1315-87333	PEEK coated fused silica capillary Inlet (100 µm) pre-mounted to cell, includes Inlet capillary, 300 mm long, 100 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)
2	G1315-87338	PEEK coated fused silica capillary Outlet (100 µm) pre-mounted to cell, includes Outlet capillary, 120 mm long, 100 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)
1	G1315-87323	PEEK coated fused silica capillary Inlet (50 µm) alternative, includes Inlet capillary, 400 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)
2	G1315-87328	PEEK coated fused silica capillary Outlet (50 µm), alternative, includes Outlet capillary, 120 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)
11	G1315-27703	Cell Housing (500 nL)
12	G1315-87101	Cell Seal Assembly (500 nL)
13	G1315-80001	Quartz Body (500 nL)
	G1315-68715	Sealing Kit

Specific parts for the nano flow cell

Item	p/n	Description
	G1315-68716	Nano flow cell kit, 10 mm, 80 nL, 5 MPa
1	G1315-87323	PEEK coated fused silica capillary Inlet (50 µm) alternative, includes Inlet capillary, 400 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)
2	G1315-87328	PEEK coated fused silica capillary Outlet (50 µm), alternative, includes Outlet capillary, 120 mm long, 50 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)
1	G1315-87313	PEEK coated fused silica capillary Inlet (25 µm) alternative, includes Inlet capillary, 200 mm long, 25 µm i.d. with pre-fixed ferrules (#4) and fittings (#3), plus one PEEK Fitting FT (#5)
2	G1315-87318	PEEK coated fused silica capillary Outlet (25 µm) alternative, includes Outlet capillary, 600 mm long, 25 µm i.d. with pre-fixed ferrules (#4) and fitting (#3), plus one PEEK Fitting FT (#5)
	G1315-27704	Cell Housing (80 nL)
	G1315-42301	Cell Seal Assembly (80 nL)
	G1315-80002	Quartz Body (80 nL)
	G1315-68725	Sealing Kit 80 nL cell

High Pressure Flow Cell

Item	p/n	Description
	G1315-60015	High pressure flow cell, 6 mm, 1.7 μ L, 400 bar (40 MPa)
1		Window assembly, comprises items 2, 3, 4, 5 and 6
2	79883-27101	Seal ring
3	1000-0953	Quartz window
4	79883-28802	Compression washer
5	5062-8553	Spring washers
6	79883-22404	Window screw
7	G1315-87325	Capillary IN (0.12 mm, 290 mm lg) including heat exchanger
8	G1315-87306	Capillary OUT (0.12 mm, 200 mm lg)
9	G1315-84901	Clamp unit
	0515-1056	Screw M 2.5, 4 mm lg for cell body/clamp
	G1315-87312	Capillary column - detector 150 mm lg, 0.12 i.d.
	G1315-87311	Capillary column – detector 380 mm lg, 0.17 i.d., (includes ferrule front 1/16", ferrule back 1/16" and fitting 1/16").
	79883-68700	High pressure cell repair kit (includes 1 quartz window, 1 compression washer, 5 spring washers, 2 seal rings)

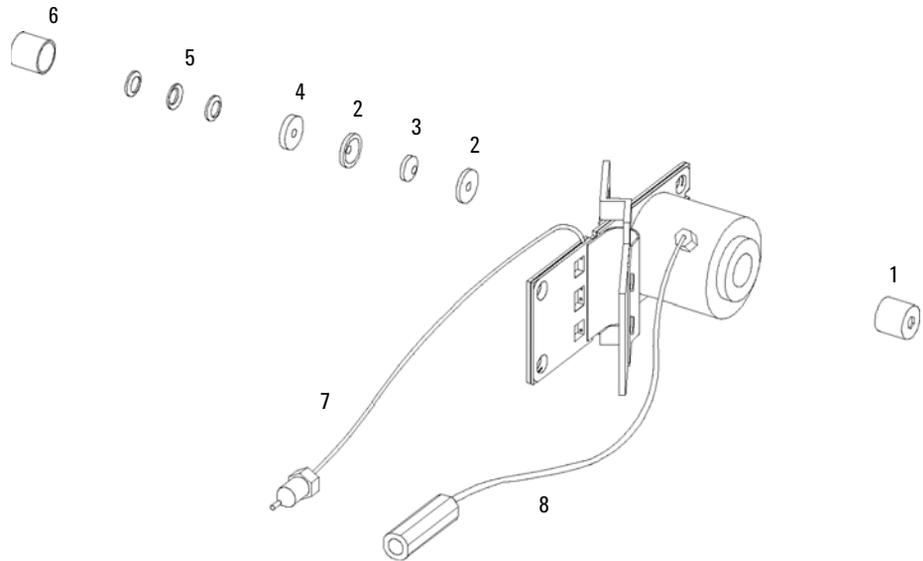


Figure 91 High pressure flow cell - parts

Accessory Kits

Accessory kit (p/n G1315-68755) contains some accessories and tools needed for installation and repair of the module.

Item	p/n	Description
	5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
1	5062-2462	Teflon Tubing flexible i.d. 0.8 mm, o.d. 1.6 mm, 2 m, re-order 5 m (flow cell to waste)
2	0100-1516	Fitting male PEEK, 2/pk
3	G1315-87311	Capillary column – detector 380 mm lg, 0.17 i.d., (includes ferrule front 1/16", ferrule back 1/16" and fitting 1/16").
4	5180-4108	Ferrule front 1/16" SST, qty=2, re-order pack of 10
5	5180-4114	Ferrule back 1/16" SST, qty=2, re-order pack of 10
6	5061-3303	Fitting 1/16" SST, qty=2, re-order pack of 10
	G1315-87303	Capillary SST column — detector 150 mm lg, 0.17 mm i.d.
	5181-1516	CAN cable, Agilent module to module, 0.5 m

Items 4, 5 and 6 are included in kit 5062-2418 1/16" Fittings and Ferrules (front/back) 10/PK.

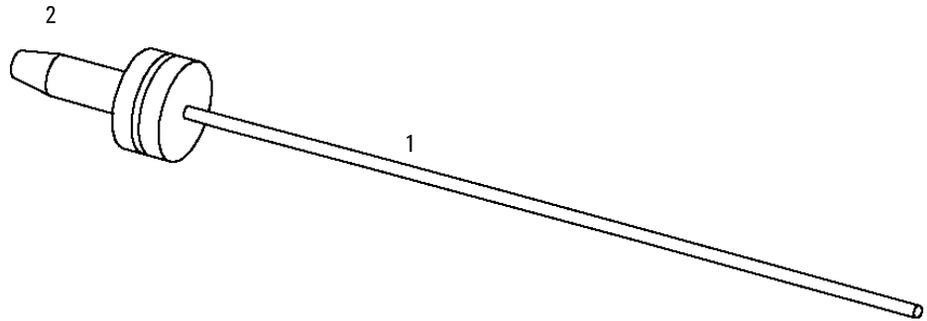


Figure 92 Waste Tubing Parts

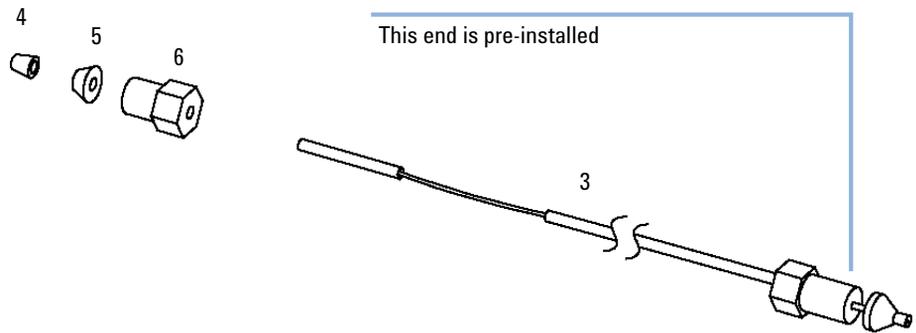
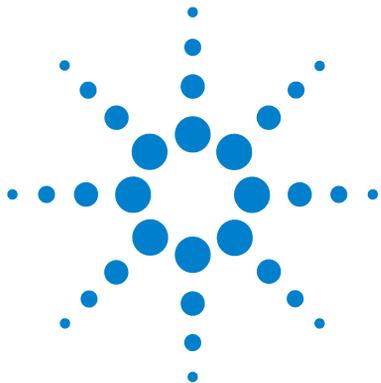


Figure 93 Inlet Capillary (Column-Detector) Parts

11 Parts for Maintenance

Accessory Kits



12 Identifying Cables

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Agilent 1200 module to PC	264

This chapter provides information on cables used with the 1200 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	Agilent module to 3394/6 integrators
35900-60750	Agilent 35900A A/D converter
01046-60105	Analog cable (BNC to general purpose, spade lugs)

Remote cables

p/n	Description
03394-60600	Agilent module to 3396A Series I integrators 3396 Series II / 3395A integrator, see details in section “Remote Cables” on page 258
03396-61010	Agilent module to 3396 Series III / 3395B integrators
5061-3378	Agilent module to Agilent 35900 A/D converters (or HP 1050/1046A/1049A)
01046-60201	Agilent module to general purpose

BCD cables

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

CAN cables

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

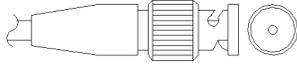
LAN cables

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

RS-232 cables

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

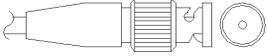


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

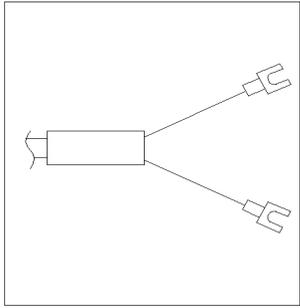
Agilent Module to 3394/6 Integrators

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

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

Agilent Module to General Purpose

p/n 01046-60105	Pin 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.

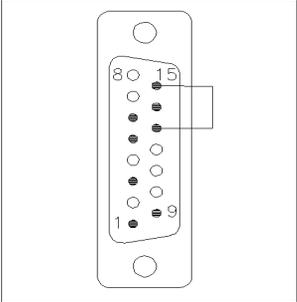
Agilent Module to 3396A Integrators

p/n 03394-60600	Pin 3394	Pin Agilent module	Signal Name	Active (TTL)
<p>A diagram of the Agilent module connector, which is a vertical rectangular component with two circular mounting holes at the top and bottom. It features a central row of nine pins, numbered 1 through 9 from bottom to top. The top row of pins is numbered 8, 15 from left to right, and the bottom row is numbered 1, 9 from left to right.</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	

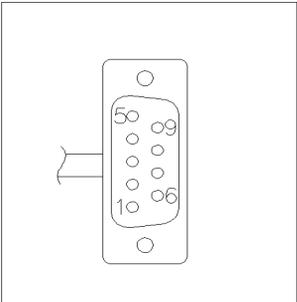
Agilent Module to 3396 Series II / 3395A Integrators

Use the cable 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

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	

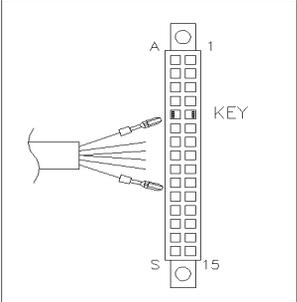
Agilent Module to Agilent 35900 A/D Converters

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

12 Identifying Cables

Remote Cables

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

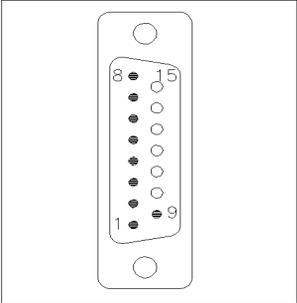
Agilent Module to General Purpose

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

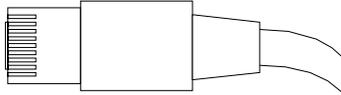
12 Identifying Cables

BCD Cables

Agilent Module to 3396 Integrators

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

CAN/LAN Cables



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

CAN Cables

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

LAN Cables

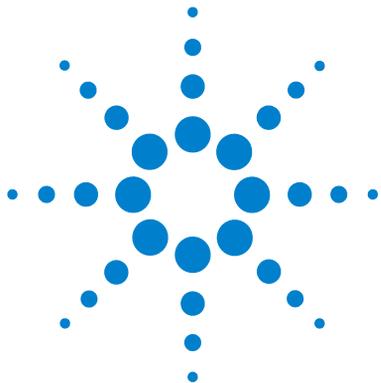
p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

12 Identifying Cables

Agilent 1200 module to PC

Agilent 1200 module to PC

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



13 Appendix

General Safety Information	266
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This chapter provides addition information on safety, legal and web.



General Safety Information

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

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

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

Safety Standards

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

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 37 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 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)

UV-Radiation

NOTE

This information is only valid for UV-lamps without cover (e.g. 2140-0590 and 2140-0813).

Emissions of ultraviolet radiation (200-315 nm) from this product is limited such that radiant exposure incident upon the unprotected skin or eye of operator or service personnel is limited to the following TLVs (Threshold Limit Values) according to the American Conference of Governmental Industrial Hygienists:

Table 38 UV-Radiation Limits

Exposure/day	Effective Irradiance
8 hours	0.1 $\mu\text{W}/\text{cm}^2$
10 minutes	5.0 $\mu\text{W}/\text{cm}^2$

Typically the radiation values are much smaller than these limits:

Table 39 UV-Radiation Typical Values

Position	Effective Irradiance
Lamp installed, 50 cm distance	Average 0.016 $\mu\text{W}/\text{cm}^2$
Lamp installed, 50 cm distance	Maximum 0.14 $\mu\text{W}/\text{cm}^2$

Solvent Information

Flow Cell

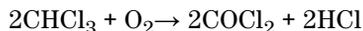
To protect optimal functionality of your flow-cell:

- Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.
- If the flow cell is transported while temperatures are below 5 °C, it must be assured that the cell is filled with alcohol.
- Aqueous solvents in the flow cell can build up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add a small % of organic solvents (e.g. acetonitrile or methanol ~5 %).

Use of Solvents

Observe the following recommendations on the use of solvents.

- Brown glass ware can avoid growth of algae.
- Small particles can permanently block capillaries and valves. Therefore always filter solvents through 0.4 µm filters.
- 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:



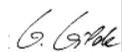
This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol,

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Solvent Information

- 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.

Declaration of Conformity for HOX2 Filter

Declaration of Conformity				
We herewith inform you that the				
Holmium Oxide Glass Filter				
used in Agilent's absorbance detectors listed in the table below meets the requirements of National Institute of Standards and Technology (NIST) to be applied as certified wavelength standard.				
According to the publication of NIST in J. Res. Natl. Inst. Stand. Technol. 112, 303-306 (2007) the holmium oxide glass filters are inherently stable with respect to the wavelength scale and need no recertification. The expanded uncertainty of the certified wavelength values is 0.2 nm.				
Agilent Technologies guarantees, as required by NIST, that the material of the filters is holmium oxide glass representing the inherently existent holmium oxide absorption bands.				
Test wavelengths:				
Product Number	Series	Measured Wavelength *	Wavelength Accuracy	Optical Bandwidth
79883A	1090	361.0 nm	+/- 1 nm	2 nm
79854A	1050	418.9 nm		
G1306A	1050	453.7 nm		
G1315A, G1365A	1100	536.7 nm		
G1315B/C, G1365B/C	1100 / 1200 / 1260			
G1600A, G7100A	CE			
79853C	1050	360.8nm 418.5nm 536.4nm	+/- 2 nm	6 nm
G1314A/B/C	1100 / 1200 / 1260	360.8nm 418.5nm	+/- 1 nm	6 nm
G1314D/E/F		418.5nm		
G4286..... 90A/B/C	1120 / 1220	536.4nm		
*) The variation in Measured Wavelength depends on the different Optical Bandwidth.				
May 19, 2010				
----- (Date)				
 ----- (R&D Manager)		 ----- (Quality Manager)		
P/N 89550-90501 		Revision: H Effective by: May 19, 2010		

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In This Book

This manual contains technical reference information about the Agilent 1260 Infinity diode array and multiple wavelength detectors G1315C/D and G1365C/D.

The manual describes the following:

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

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