Agilent 1200 Series Variable Wavelength Detector

G1314B / G1314C (SL)

Service Manual

Agilent Technologies

Notices

Manual Part Number

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Manual Structure

The **Service Manual G1314-90110** (English) contains the complete information about the Agilent 1200 Series Variable Wavelength Detector. It is available as Adobe Reader file (PDF) only.

The **User Manual G1314-90010** (English) and its localized versions contain a subset of the Service Manual and is shipped with the detector in printed matter.

Latest versions of the manuals can be obtained from the Agilent web.

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In This Manual…

This manual covers the Agilent 1200 Series Variable Wavelength Detectors

G1314B	Agilent 1200 Series VWD
G1314C	Agilent 1200 Series VWD-SL

1 Introduction to the Variable Wavelength Detector

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

2 Site Requirements and Specifications

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

3 Installing the Detector

This chapter describes the installation of the detector.

4 Using the Detector

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

5 How to optimize the detector

This chapter gives hints on how to select the detector parameters and the flow cell.

6 Troubleshooting and Diagnostics

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

7 Error Information

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

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

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This chapter describes the detector's built in diagnostics.

10 Maintenance and Repair

This chapter provides general information on maintenance and repair of the detector.

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This chapter describes the maintenance of the detector.

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This chapter provides information on parts for repair.

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1
Introduction to the Variable Wavelength Detector

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

Introduction to the Detector

The Agilent 1200 Series variable wavelength detector is designed for highest optical performance, GLP compliance and easy maintenance with:

- higher data rate (27/55Hz) for fast-HPLC with G1314C VWD-SL, see “Set the Detector Parameters" on page 73,
- deuterium lamp for highest intensity and lowest detection limit over a wavelength range of 190 to 600 nm,
- optional flow-cell cartridges (standard 10 mm 14 µl, high pressure 10 mm 14 µl, micro 5 mm 1 µl, semi-micro 6 mm 5 µl) are available and can be used depending on the application needs,
- easy front access to lamp and flow cell for fast replacement, and
- built-in holmium oxide filter for fast wavelength accuracy verification.

For specifications “Performance Specifications" on page 29.

Two version of the Agilent 1200 Series variable wavelength detector are available:

G1314B VWD	1200 Series Variable Wavelength Detector standard version
G1314C VWD-SL	1200 Series Variable Wavelength Detector SL high data rates for fast HPLC

NOTE The G1314C VWD-SL can be operated with a G1323B Control Module just in standard mode as G1314B - no higher data rate selection is available.

Optical System Overview

The optical system of the detector is shown in Figure 1. Its radiation source is a deuterium-arc discharge lamp for the ultraviolet (UV) wavelength range from 190 to 600 nm. The light beam from the deuterium lamp passes through a lens, a filter assembly (in position none, cut-off or holmium oxide), an entrance slit, a spherical mirror (M1), a grating, a second spherical mirror (M2), a beam splitter, and finally through a flow cell to the sample diode. The beam through the flow cell is absorbed depending on the solutions in the cell, in which UV absorption takes place, and the intensity is converted to an electrical signal by means of the sample photodiode. Part of the light is directed to the reference photodiode by the beam splitter to obtain a reference signal for compensation of intensity fluctuation of the light source. A slit in front of the reference photodiode cuts out light of the sample bandwidth. Wavelength selection is made by rotating the grating, which is driven directly by a stepper motor. This configuration allows fast change of the wavelength. The cutoff filter is moved into the lightpath above 370 nm to reduce higher order light.

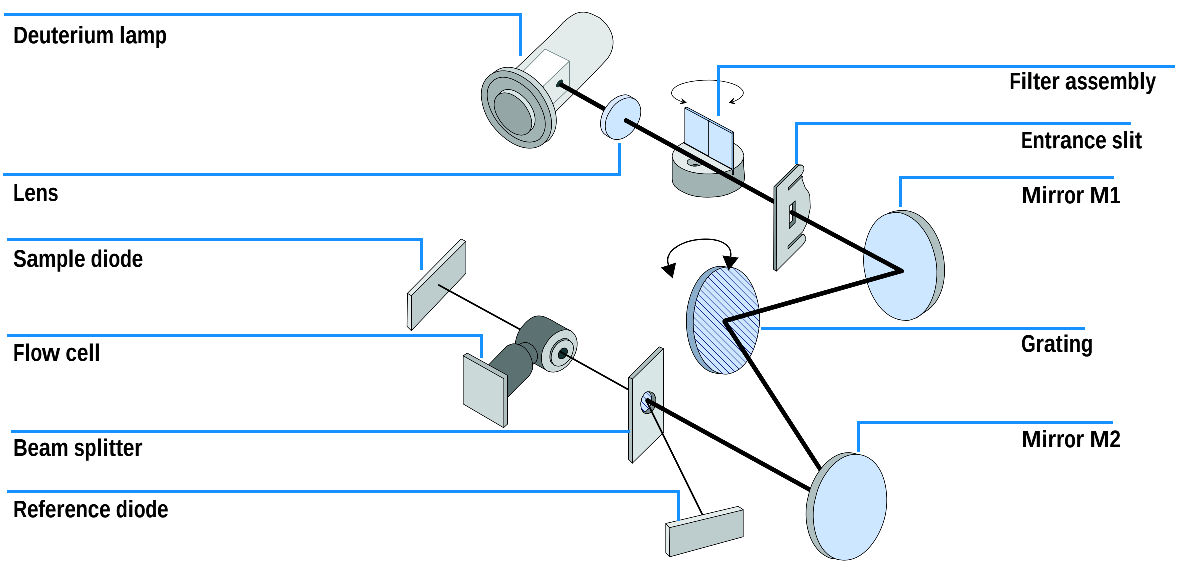


Figure 1 Optical Path of the Variable Wavelength Detector

Flow Cell

A variety of flow-cell cartridges can be inserted using the same quick and simple mounting system.

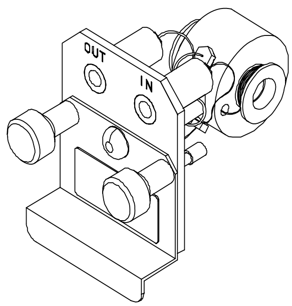


Figure 2 Cartridge Type Flow Cell

Table 1 Flow Cell Data

	STD	Semi-micro	High Pressure	Micro	
Maximum pressure	40 (4)	40 (4)	400 (40)	40 (4)	bar (MPa)
Path length	10 (conical)	6 (conical)	10 (conical)	5	mm
Volume	14	5	14	1	µl
Inlet i.d.	0.17	0.17	0.17	0.1	mm
Inlet length	750	750	750	555	mm
Outlet i.d.	0.25	0.25	0.25	0.25	mm
Outlet length	120	120	120	120	mm
Materials in contact with solvent	SST, quartz, PTFE, PEEK	SST, quartz, PTFE	SST, quartz, Kapton	SST, quartz, PTFE	

Lamp

The light source for the UV wavelength range is a deuterium lamp. As a result of plasma discharge in a low pressure deuterium gas, the lamp emits light over the 190 to 600 nm wavelength range.

Source Lens Assembly

The source lens receives the light from the deuterium lamp and focuses it onto the entrance slit.

Entrance Slit Assembly

The entrance slit assembly has an exchangeable slit. The standard one has a 1-mm slit. For replacement and calibration purposes to optimize the alignment, a slit with a hole is needed.

Filter Assembly

The filter assembly is electromechanically actuated. During wavelength calibrations it moves into the light path.

The filter assembly has two filters installed and is processor-controlled.

OPEN	**nothing in light path**
CUTOFF	**cut off filter in light path at λ > 370 nm**
HOLMIUM	**holmium oxide filter for wavelength check.**

A photo sensor determines the correct position.

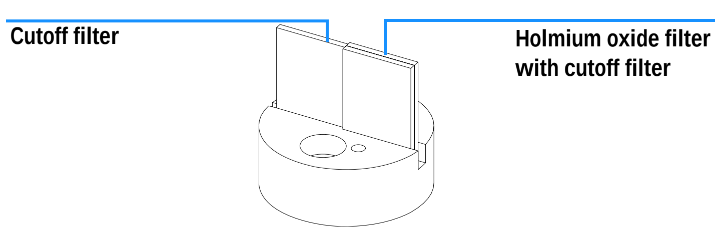


Figure 3 Filter Assembly

Mirror Assemblies M1 and M2

The instrument contains two spherical mirrors (M1 and M2). The beam adjustable is vertically and horizontally. Both mirrors are identical.

Grating Assembly

The grating separates the light beam into all its component wavelengths and reflects the light onto mirror #2.

Beam Splitter Assembly

The beam splitter splits the light beam. One part goes directly to the sample diode. The other part of the light beam goes to the reference diode.

Photo Diodes Assemblies

Two photo diode assemblies are installed in the optical unit. The sample diode assembly is located on the left side of the optical unit. The reference diode assembly is located in the front of the optical unit.

Photo Diode ADC (analog-to-digital converter)

The photo diode current is directly converted to 20-bit digital data direct photo current digitalization. The data is transferred to the detector main board (VWM). The photo diode ADC boards are located close to the photo diodes.

Electrical Connections

- The GPIB connector (G1314B only) is used to connect the detector with a computer. The address and control switch module next to the GPIB connector determines the GPIB address of your detector. The switches are preset to a default address (Table 46 on page 291 or Table 50 on page 296) and is recognized once after power is switched ON.
- The CAN bus is a serial bus with high speed data transfer. The two connectors for the CAN bus are used for internal Agilent 1200 Series module data transfer and synchronization.
- One analog output provides signals for integrators or data handling systems.
- The interface board slot is used for external contacts and BCD bottle number output or LAN connections.
- 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 (see "Communication Settings for RS-232C Communication" on page 297). See your software documentation for further information.
- The power input socket accepts a line voltage of 100 – 240 volts AC ± 10% with a line frequency of 50 or 60 Hz. Maximum power consumption is 220 VA. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply. The security lever at the power input socket prevents the module cover from being taken off when line power is still connected.

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

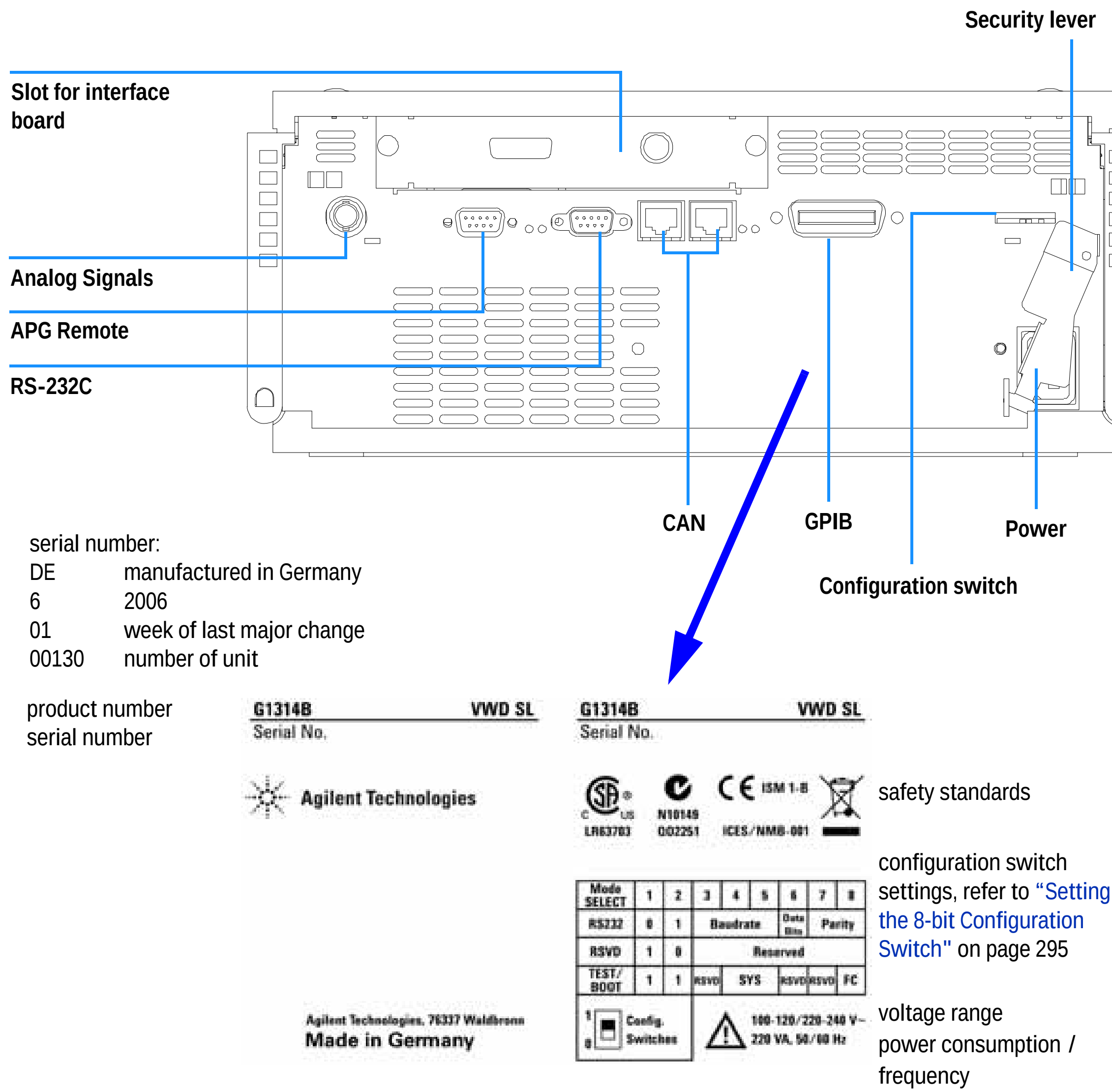


Figure 4 Rear View of Detector - Electrical Connections and Label

NOTE The G1314C VWD-SL has no GPIB connector.

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 foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

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

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components 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 instrument 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 Counter

The detector module provides a EMF counter for the lamp. The counter increments with lamp use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. The counter can be reset to zero after the lamp is exchanged. The detector provides the following EMF counters:

- Deuterium Lamp On-Time

Using the EMF Counters

The user-settable EMF limits for the EMF counter enables the early maintenance feedback to be adapted to specific user requirements. The useful lamp burn time is dependent on the requirements for the analysis (high or low sensitivity analysis, wavelength, and so on), 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, no EMF limit should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by lamp 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.

2
Site Requirements and Specifications

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

Site Requirements

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

Power Consideration

The detector power supply has wide ranging capabilities (see Table 2 on page 28). It accepts any line voltage in the above mentioned range. Consequently, there is no voltage selector in the rear of the detector. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING **To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the power switch ON the front panel is turned OFF.**

WARNING **Shock hazard or damage of your instrumentation can result, if the devices are connected to a line voltage higher than specified.**

CAUTION Make sure to have easy access to the power cable of the instrument, in order to disconnect the instrument from line.

Power Cords

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

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

Bench Space

The detector dimensions and weight (see Table 2 on page 28) allow to place the instrument on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inch) 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 a Agilent 1200 Series system, make sure that the bench is designed to bear the weight of all modules.

The detector should be operated in a horizontal position.

Environment

Your detector will work within specifications at ambient temperatures and relative humidity as described in Table 2 on page 28.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 °F/hour) measured over one hour period. Our published drift specification (refer also to “Performance Specifications" on page 29) 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.

CAUTION Do not store, ship or use your detector under conditions where temperature fluctuations could cause condensation within the detector. Condensation will damage the system electronics. If your detector was shipped in cold weather, leave it in its box and allow it to warm up slowly to room temperature to avoid condensation.

Physical Specifications

Table 2 Physical Specifications

Type	Specification	Comments
Weight	11 kg 25 lbs	
Dimensions (height × width × depth)	140 × 345 × 435 mm 5.5 × 13.5 × 17 inches	
Line voltage	100 – 240 VAC, ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5%	
Power consumption	220 VA, 85 W / 290 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 (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the instrument
Safety standards: IEC, CSA, UL, EN	Installation Category II, Pollution Degree 2. For indoor use only.	

Performance Specifications

Table 3 Performance Specifications Agilent 1200 Series Variable Wavelength Detector

Type	Specification	Comments
Detection type	Double-beam photometer	
Light source	Deuterium lamp	
Wavelength range	190–600 nm	
Short term noise (ASTM)	± 0.75 × 10^{-5} AU at 254 nm	See NOTE on page 30.
Drift	3 × 10^{-4} AU/hr at 254 nm	See NOTE on page 30
Linearity	> 2 AU (5%) upper limit	See NOTE on page 30
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Band width	6.5 nm typical	
Flow cells	Standard: 14-µl volume, 10-mm cell path length and 40 bar (588 psi) pressure maximum High pressure: 14-µl volume, 10-mm cell path length and 400 bar (5880 psi) pressure maximum Micro: 1-µl volume, 5-mm cell path length and 40 bar (588 psi) pressure maximum Semi-micro: 5-µl volume, 6-mm cell path length and 40 bar (588 psi) pressure maximum	Can be repaired on component level
Control and data evaluation	Agilent ChemStation for LC	
Analog outputs	Recorder/integrator: 100 mV or 1 V, output range 0.001 – 2 AU, one output	

Table 3 Performance Specifications Agilent 1200 Series Variable Wavelength Detector (continued)

Type	Specification	Comments
Communications	Controller-area network (CAN), GPIB, RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN optional	GPIB for G1314B only
Safety and maintenance	Extensive diagnostics, error detection and display (through control module and Agilent ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage 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.	

NOTE

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

Reference conditions: cell path length 10 mm, response time 2 s, flow 1 ml/min LC-grade methanol.

Linearity measured with caffeine at 265 nm.

3
Installing the Detector

This chapter describes the installation of the detector.

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 detector may have been damaged during shipment.

CAUTION If there are signs of damage, please do not attempt to install the detector.

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 4 Variable Wavelength Detector Checklist

Description	Quantity
Variable wavelength detector	1
Power cable	1
Flow cell	As ordered
User Manual	1
Accessory kit (see Table 5 on page 33)	1

Detector Accessory Kit Contents

Table 5 Accessory Kit Contents

Description	Part Number	Quantity
Accessory kit	G1314-68705	
CAN cable 0.5 m	5181-1516	1
PEEK outlet capillary kit	5062-8535	1
Fitting male PEEK	0100-1516	1
Hex key 1.5 mm	8710-2393	1
Hex key 4 mm	8710-2392	1
Wrench open end 1/4 – 5/16 inch	8710-0510	1
Wrench open end 4 mm	8710-1534	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.

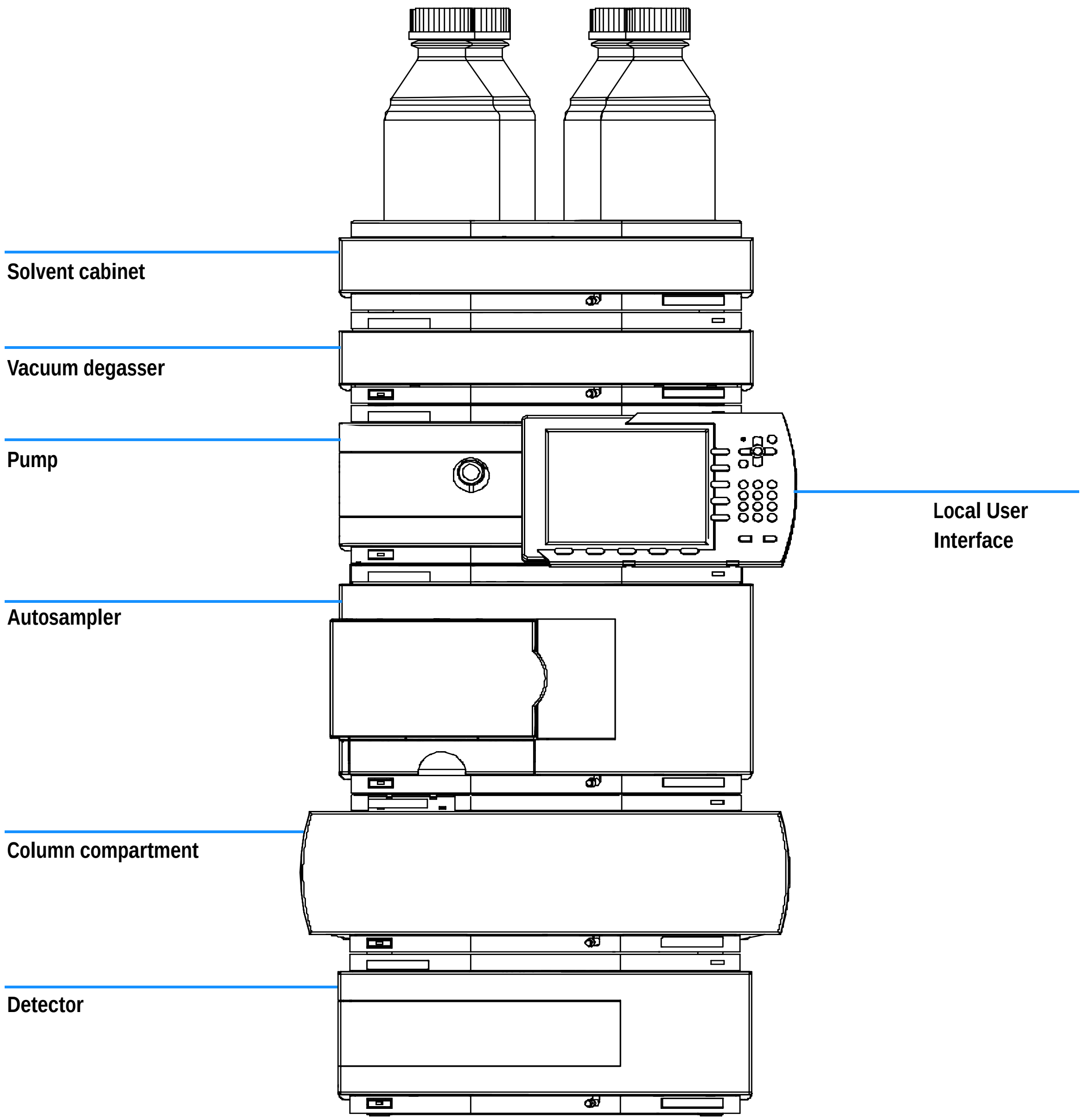


Figure 5 Recommended Stack Configuration (Front View)

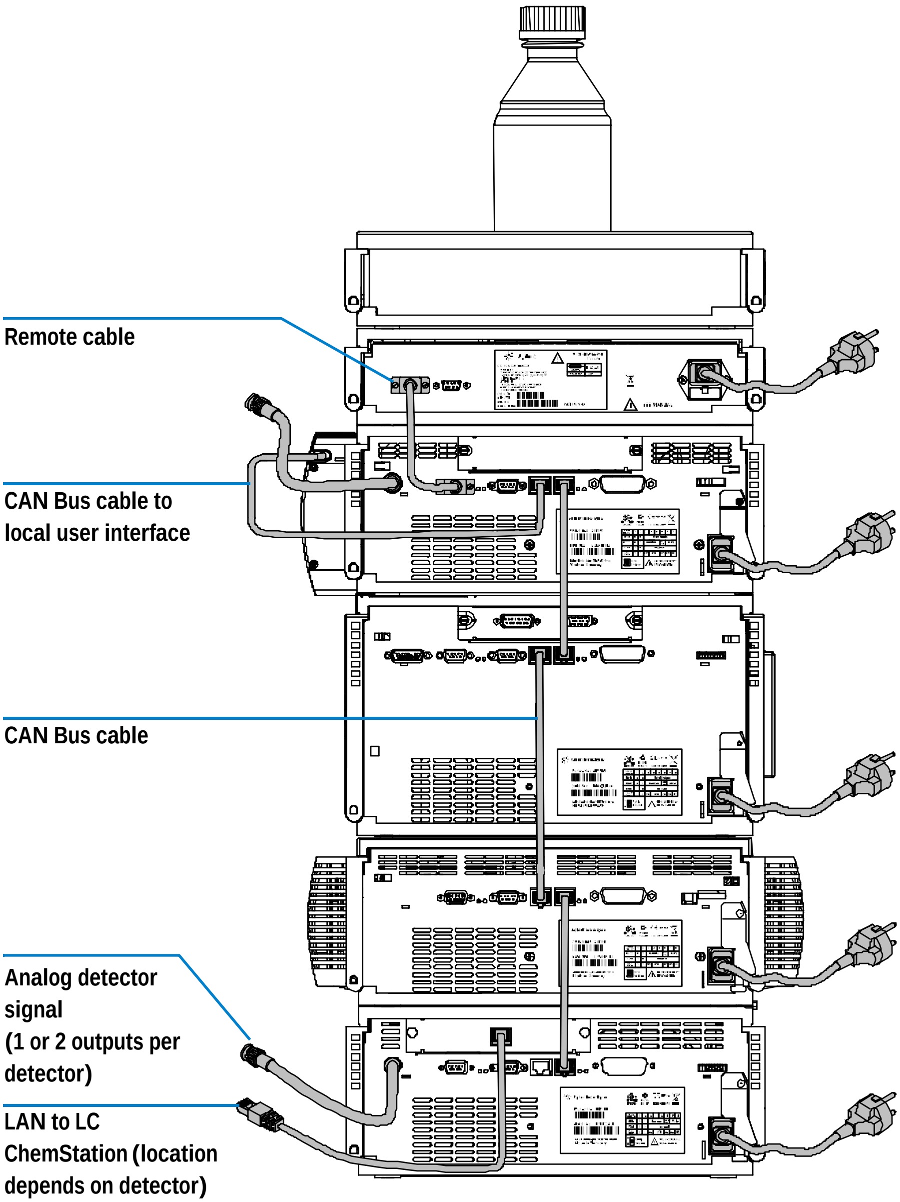


Figure 6 Recommended Stack Configuration (Rear View)

Installing the Detector

Preparations	Locate bench space. Provide power connections. Unpack the detector.
Parts required	Detector Power cord, for other cables see text below and "" on page 238 ChemStation and / or Control Module G1323B

1 Install the LAN interface board in the detector (if required), see "Replacing the Interface Board" on page 150.
2 Place the detector in the stack or on the bench in a horizontal position.
3 Ensure the line power switch at the front of the detector is OFF.

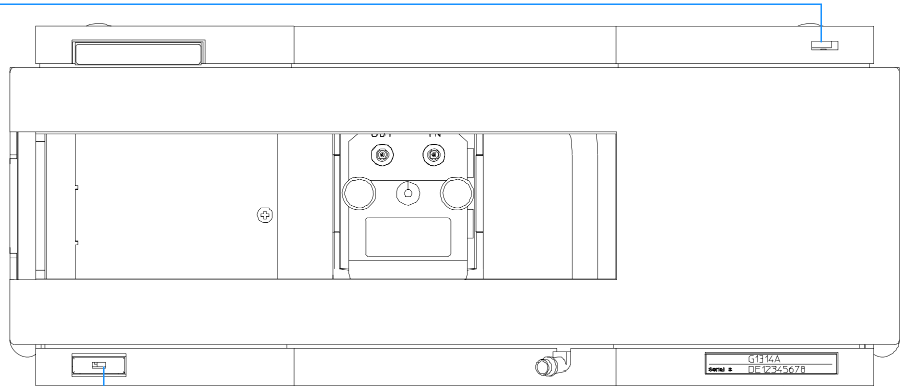


Figure 7 Front View of Detector

NOTE The figure above shows the flow cell already installed. The flow cell area is closed with a metal cover. The flow cell has to be installed as described in "Flow Connections to the Detector" on page 40.

4 Connect the power cable to the power connector at the rear of the detector.

5 Connect the CAN cable to other Agilent 1200 Series modules.

6 If a Agilent ChemStation is the controller, connect either

- the LAN connection to the LAN interface board in the detector

NOTE

If a Agilent 1200 DAD/MWD/FLD is in the system, the LAN should be connected to the DAD/MWD/FLD (due to higher data load).

7 Connect the analog cable (optional).

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

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

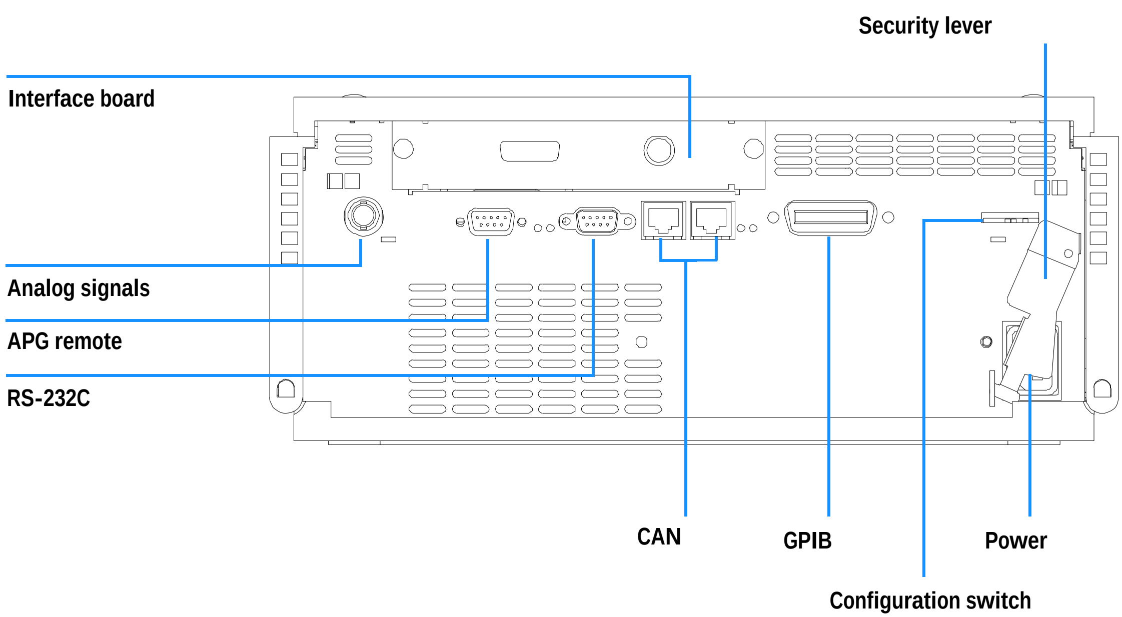


Figure 8 Rear View of Detector

NOTE

The detector is turned ON when the line power switch is pressed and the green indicator lamp is illuminated. The detector is turned OFF when the line power switch is protruding and the green light is OFF.

WARNING

To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the power switch at the front panel is turned OFF.

NOTE

The detector was shipped with default configuration settings. To change these settings, "Setting the 8-bit Configuration Switch" on page 295.

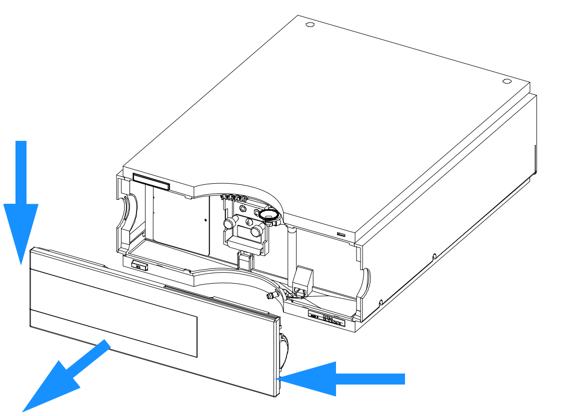
Flow Connections to the Detector

Preparations	Detector is installed in the LC system.
Parts required	Other modules Parts from accessory kit, see "Accessory Kit Contents" on page 33 Two wrenches 1/4–5/16 inch for capillary connections

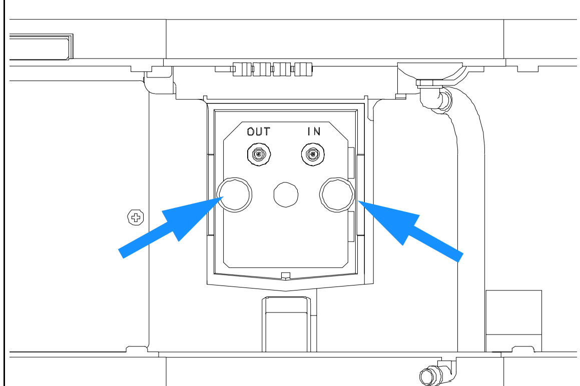
WARNING **When working with solvents please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when using toxic or hazardous solvents.**

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.

1 Press the release buttons and remove the front cover to have access to the flow cell area.

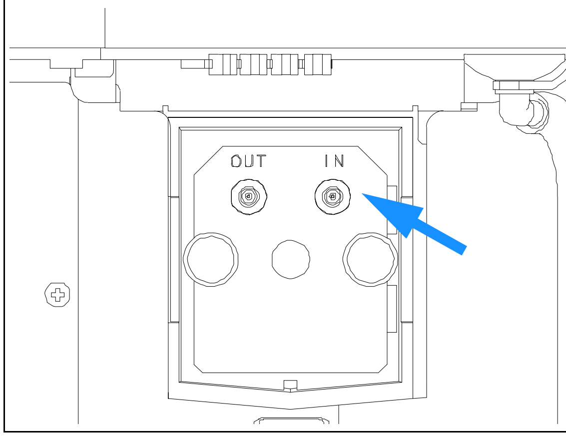


2 Remove the metal cover and install the flow cell. Tighten the cell screws.



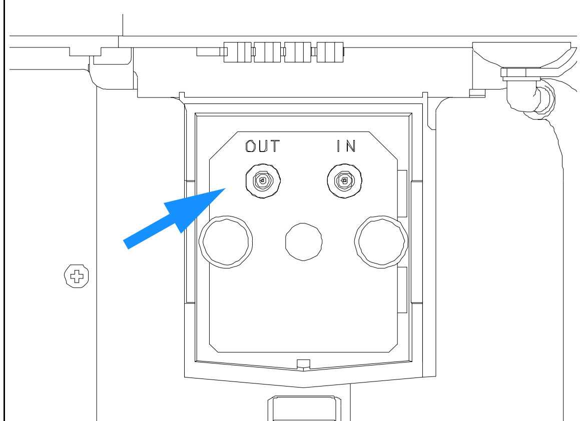
3 Assemble the column-detector capillary.
Depending on the flow cell type it may be a PEEK or SST capillary.

4 Connect the newly assembled fitting of the capillary to the inlet connector.

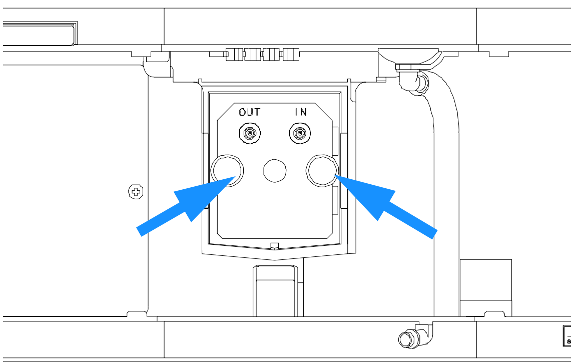


5 Connect the other end of the capillary to the column.

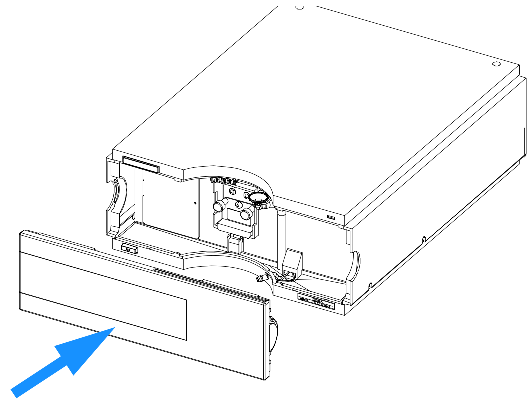
6 Connect the PEEK waste capillary to the outlet connector.



7 Establish a flow and observe for leakage.



8 Replace the front cover.



The installation of the detector is now complete.

NOTE

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

4
Using the Detector

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 can be used for

- preparing the system,
- to learn the set up of an HPLC analysis and
- to 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” in the pump’s reference manual.

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. Solvents containing volatile ingredients will slightly lose these. Therefore priming of the pumping system is required before starting an application.

Table 6 Choice of Priming Solvents for Different Purposes

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

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

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

Pump for approximately 10 minutes before starting your application.

Requirements and Conditions

What You Will Need

Table 7 lists the items you need to have for the set up of the analysis. Some of these are optional (not required for the basic system).

Table 7 What you will need

1200 system	Pump (plus degassing)
	Autosampler
	Detector, standard flow cell installed
	Agilent ChemStation (B.02.01 and above) or Instant Pilot G4208 (A.01.01 and above) (optional for basic operation) or Control Module G1323B (B.04.02 and above) (optional for basic operation), see note below.
	System should be correctly set up for LAN communication with the Agilent ChemStation
Column:	Zorbax Eclipse XDB-C18, 4.6 x 150 mm, 5 um Part No. 993967-902 or Part No. 5063-6600
Standard:	Part No. 01080-68704 0.15 wt.% dimethylphthalate, 0.15 wt.% diethylphthalate, 0.01 wt.% biphenyl, 0.03 wt.% o-terphenyl in methanol

NOTE

The G1314C VWD-SL can be operated with a G1323B Control Module just in standard mode as G1314B - no higher data rate selection is available.

Conditions

A single injection of the isocratic test standard is made under the conditions given in Table 8:

Table 8 Conditions

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

Typical Chromatogram

A typical chromatogram for this analysis is shown in Figure 9. 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.

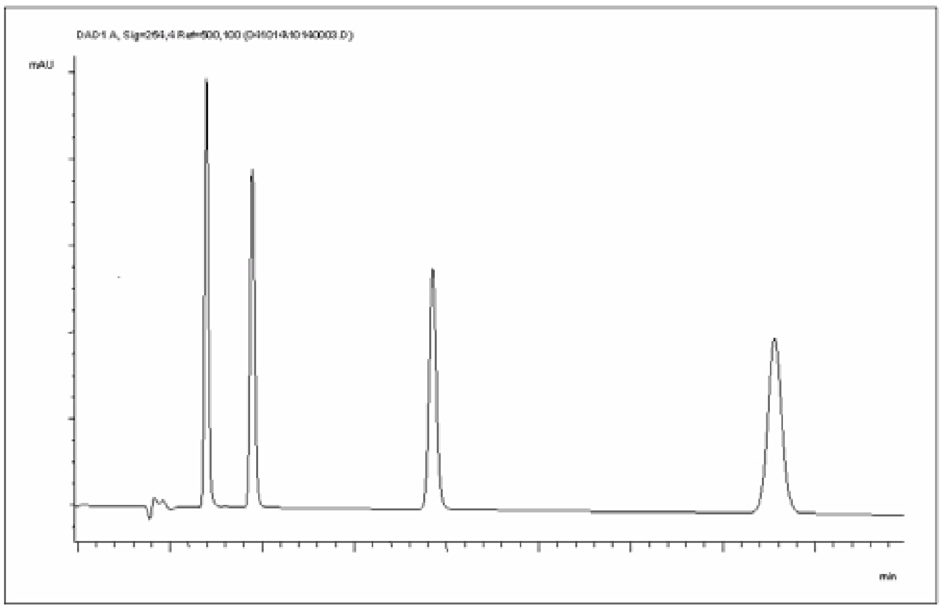


Figure 9 Typical Chromatogram with UV-detector

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 67 or “*Optimizing*” in the your *module’s Reference Manual.*

Preparing the HPLC System

1 Turn on the Agilent ChemStation PC and the monitor.

2 Turn on the 1200 series HPLC modules.

3 Start the Agilent ChemStation software (B.02.01). If the pump, autosampler, thermostatted column compartment and detector are found, the ChemStation screen should look like shown in Figure 10.

The System status is red (Not Ready).

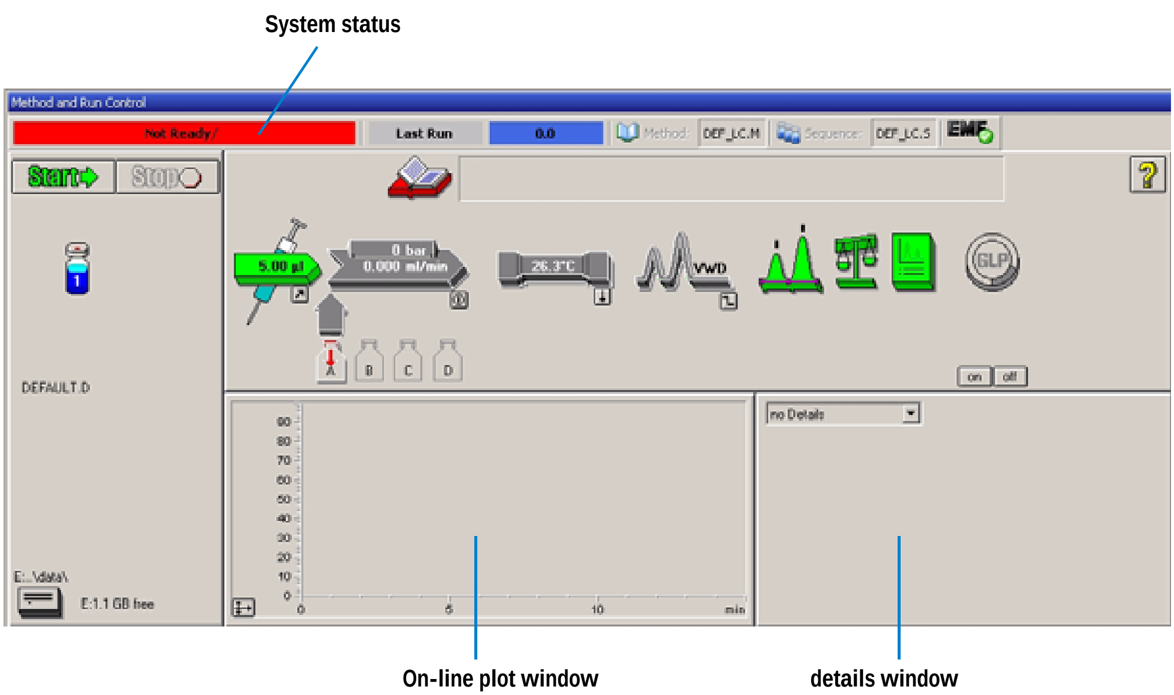


Figure 10 Initial ChemStation screen (Method and Run Control)

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.

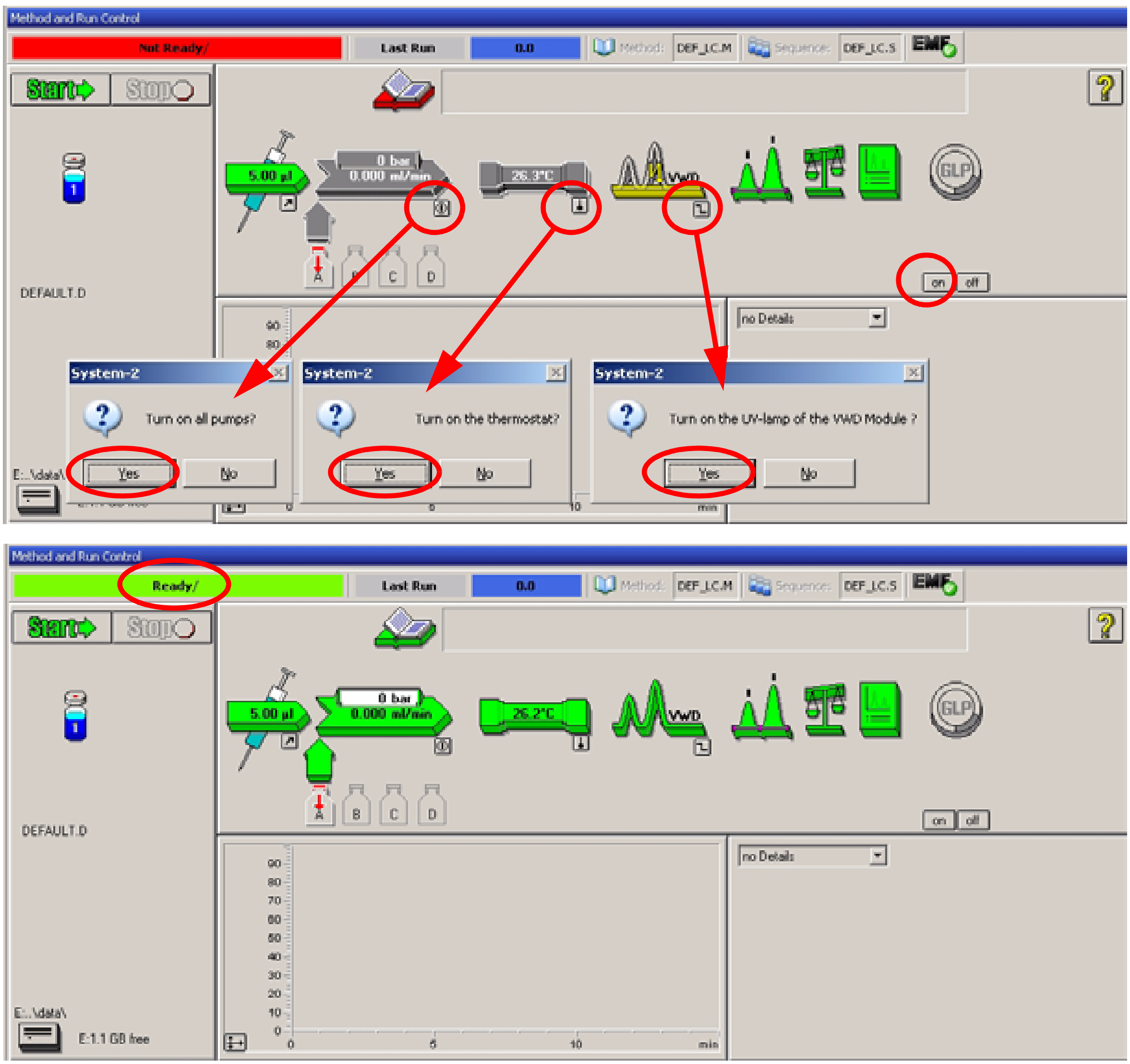


Figure 11 Turning on the HPLC Module

5 Purge the pump. For more information see "Priming and Purging the System" on page 44.

6 Allow the detector to warm up of at least 60 minutes to provide a stable baseline (see example in Figure 12).

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).

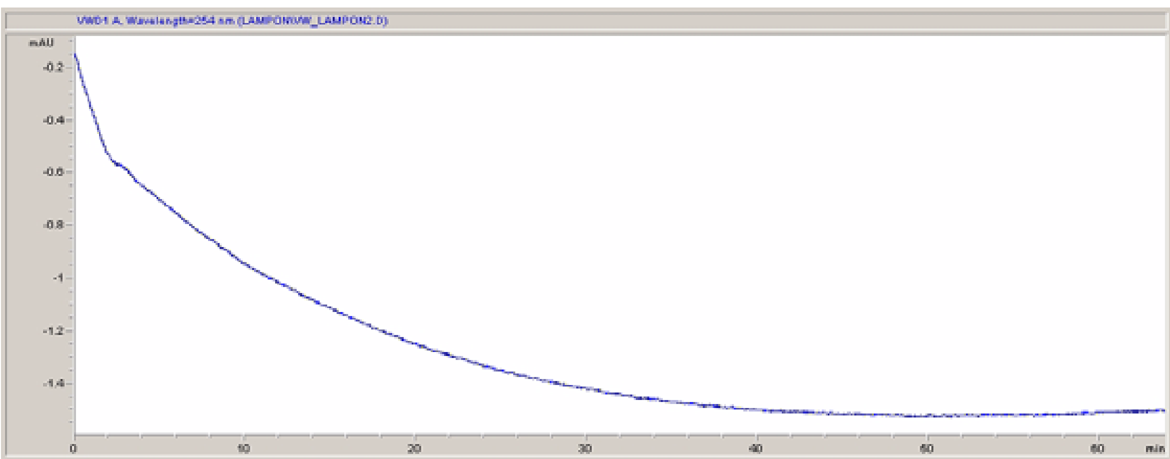


Figure 12 Stabilization of Baseline

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 1200 modules.

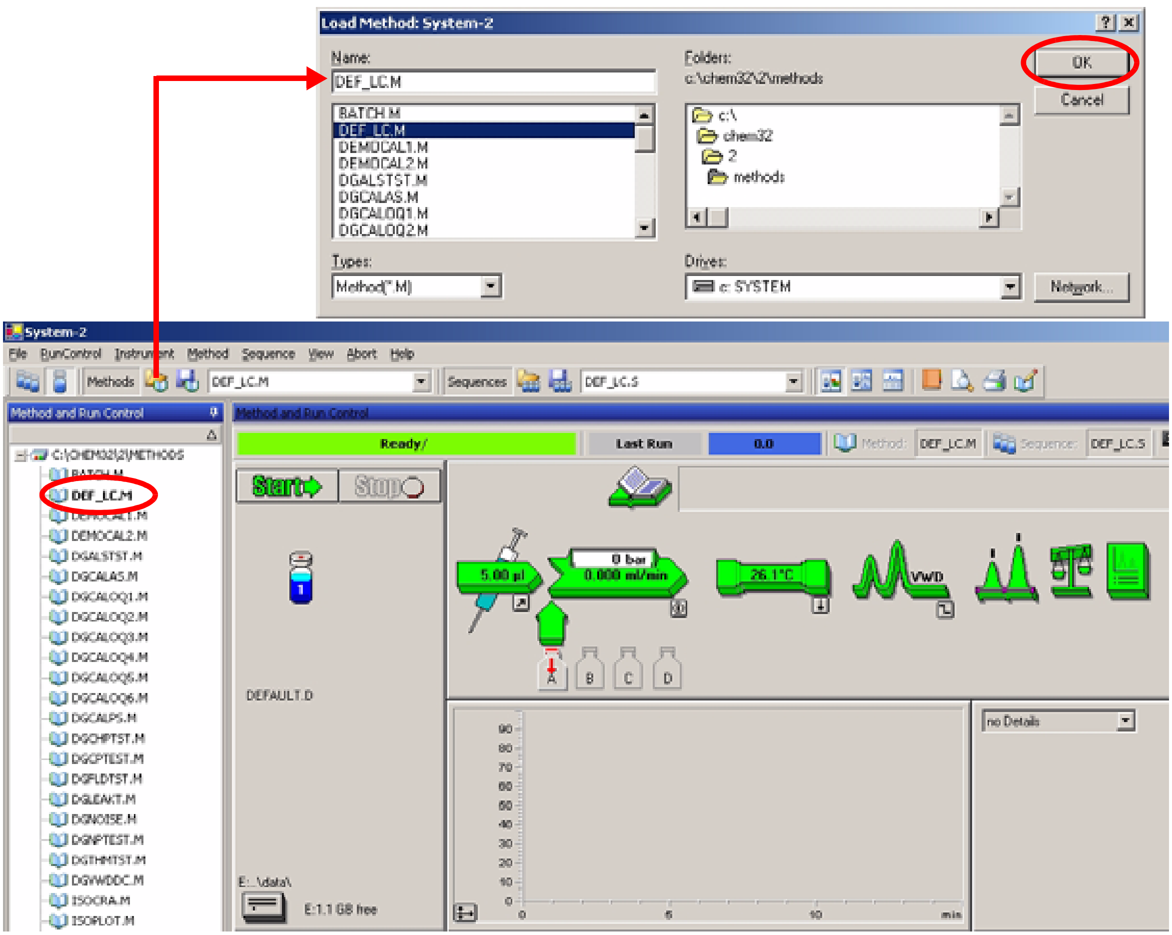


Figure 13 Loading Default LC Method

9 Click on the module icons (Figure 14) and open the *Setup* of these modules. Figure 15 on page 54 shows the detector settings (do not change the detector parameters at this time).

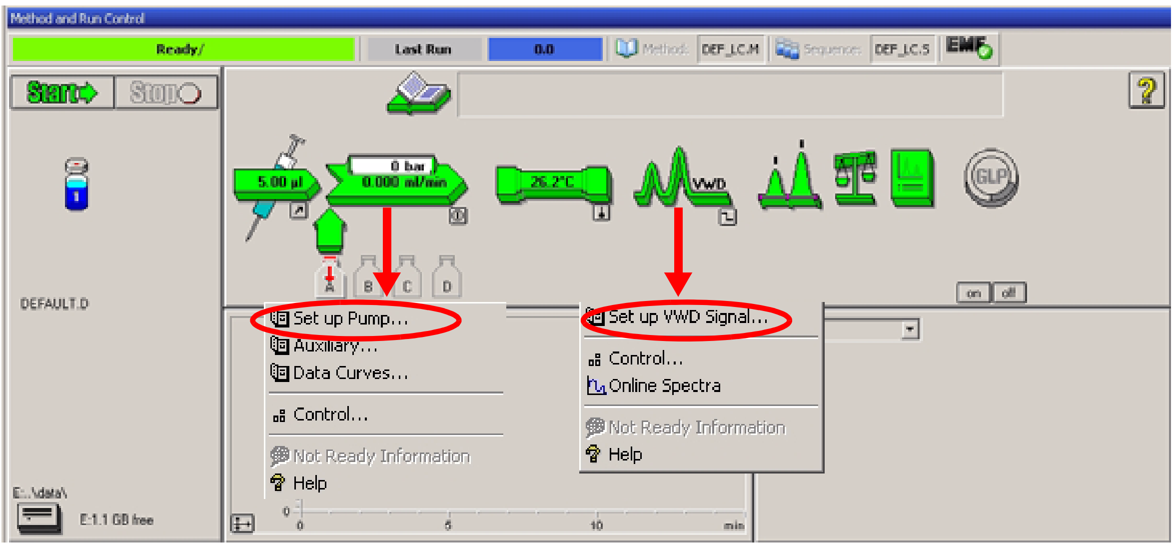
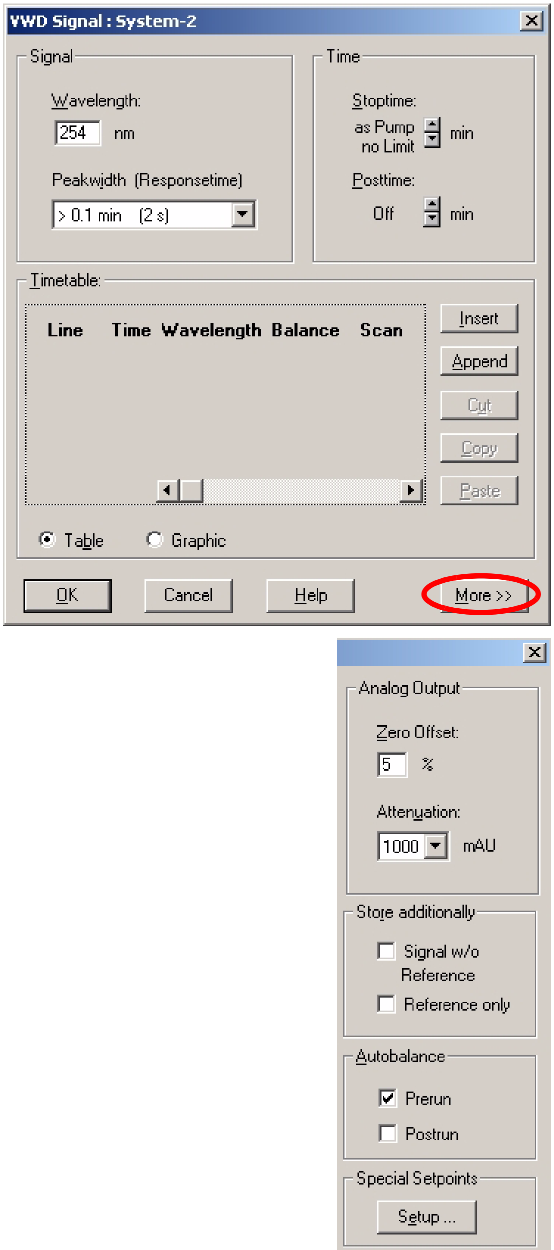


Figure 14 Open the module menu

10 Enter the pump parameters mentioned under "Conditions" on page 47.



- 1 signal with individual wavelength setting
- stop and post time can be set (if required)
- peakwidth depends on the peaks in the chromatogram, see page 65.
- time table for programmable actions during the run
- Zero Offset Limits: 1 to 99% in steps of 1%
- Attenuation Limits: 0.98 to 4000 mAU at discrete values for either 100 mV or 1 V full scale
- additional signals can be stored with the normal signal (for diagnostics)
- autobalance to zero absorbance (on the analog output plus offset) at begin and/or end of run
- see “Special Setpoints” on page 64

Figure 15 Detector Settings (default)

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

12 Click the button and select *Change*... to open the Signal Plot information. Select the *Pump: Pressure* and the *VWD A: Signal 254* as signals. Change the Y-range for the VWD 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.

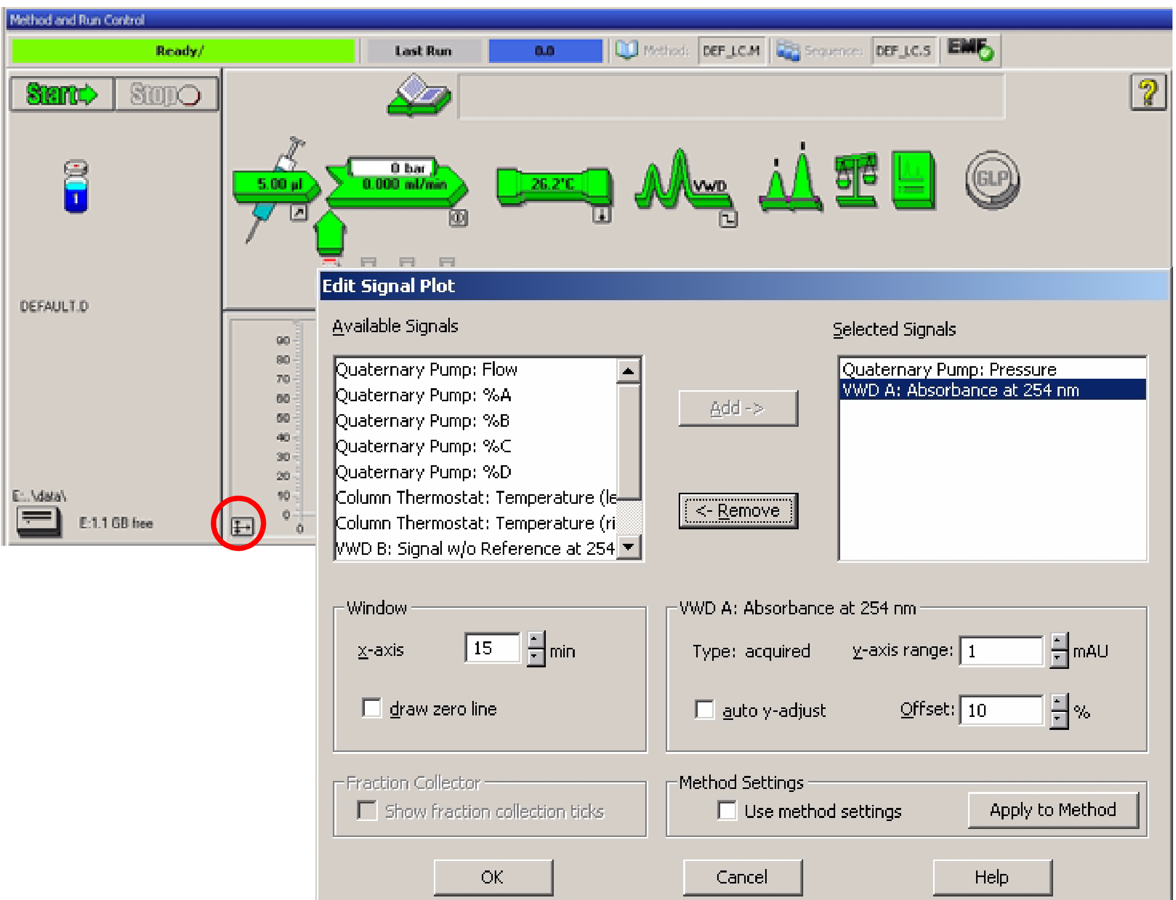


Figure 16 Edit Signal Plot Window

The Online Plot (Figure 17 on page 56) 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.

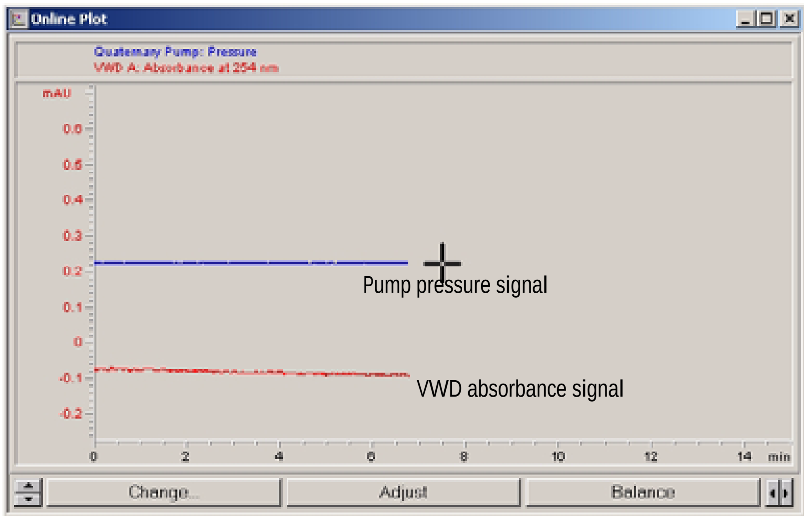


Figure 17 Online Plot Window

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).

14 Select the menu item *RunControl -> Sample Info* and enter information about this application (Figure 18 on page 57). Press *OK* to leave this screen.

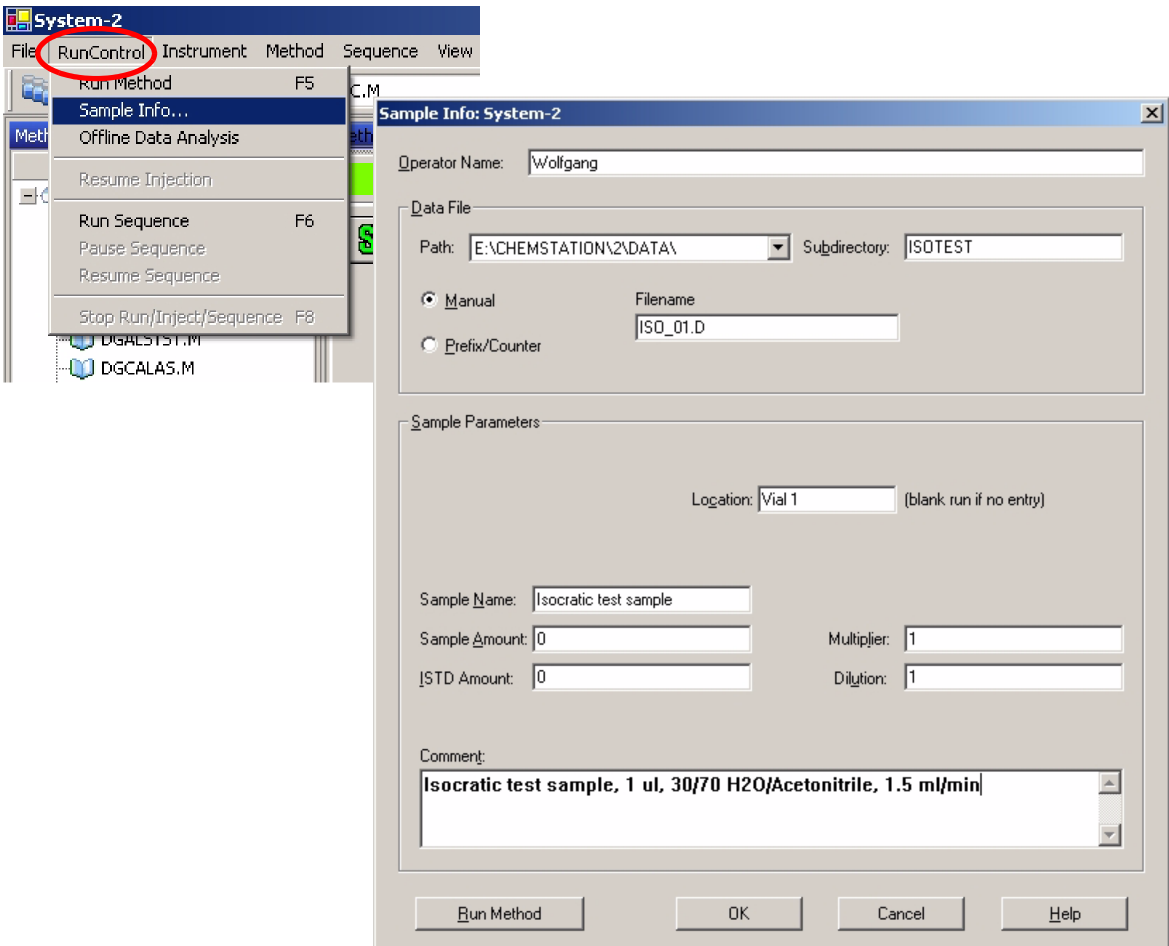


Figure 18 Sample Information

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 1200 modules and the online plot on the Agilent ChemStation will show the resulting chromatogram.

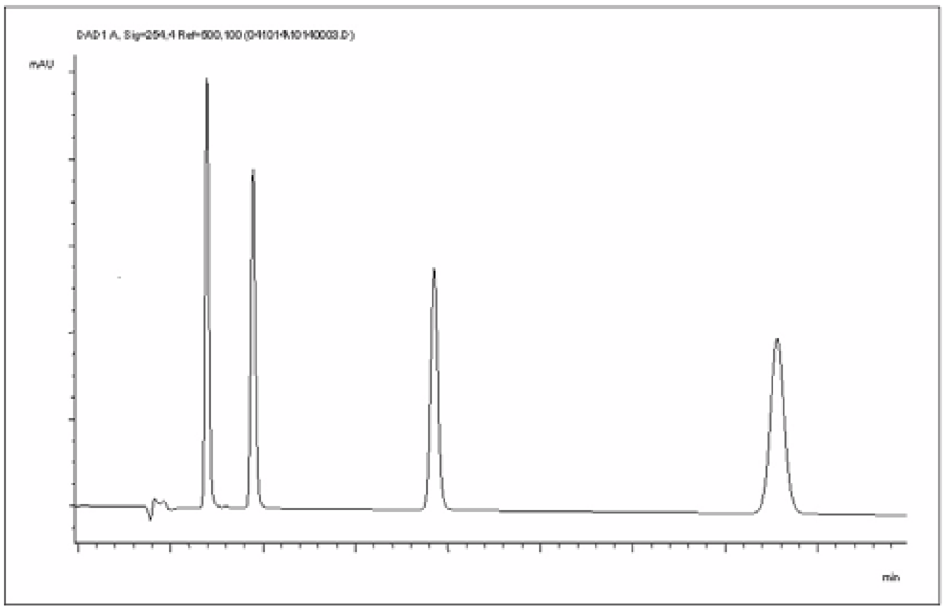


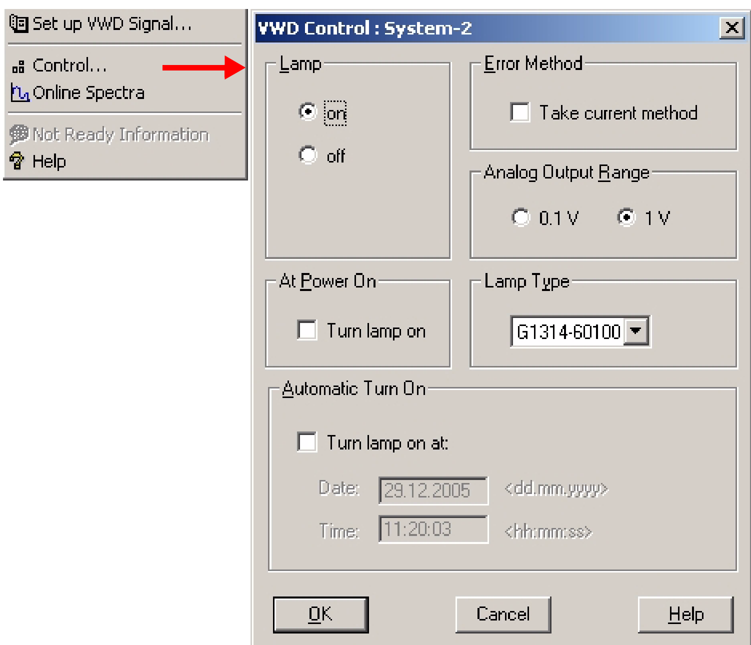
Figure 19 Chromatogram with Isocratic Test Sample

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 G1314B VWD and G1314C VWD-SL are described (based on the Agilent ChemStation B.02.01).

Control Settings



- **Lamp:** turn on and off of UV-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, see also “Analog Output Settings” on page 63.
- **Lamp Type:** can be set to either G1314-60100 (standard VWD lamp) or 2140-0590 (DAD lamps), see also “Exchanging a Lamp” on page 137.
- **Automatic Turn On:** lamps can be programmed (detector must be on for this).
- **Help:** online help.

Figure 20 Detector control settings

Online Spectra

1 To view the online spectra select *Online Spectra*.

NOTE

This online spectrum is taken during a stop-flow condition only while the peak is kept in the flow cell, see “Scanning with the VWD" on page 61.

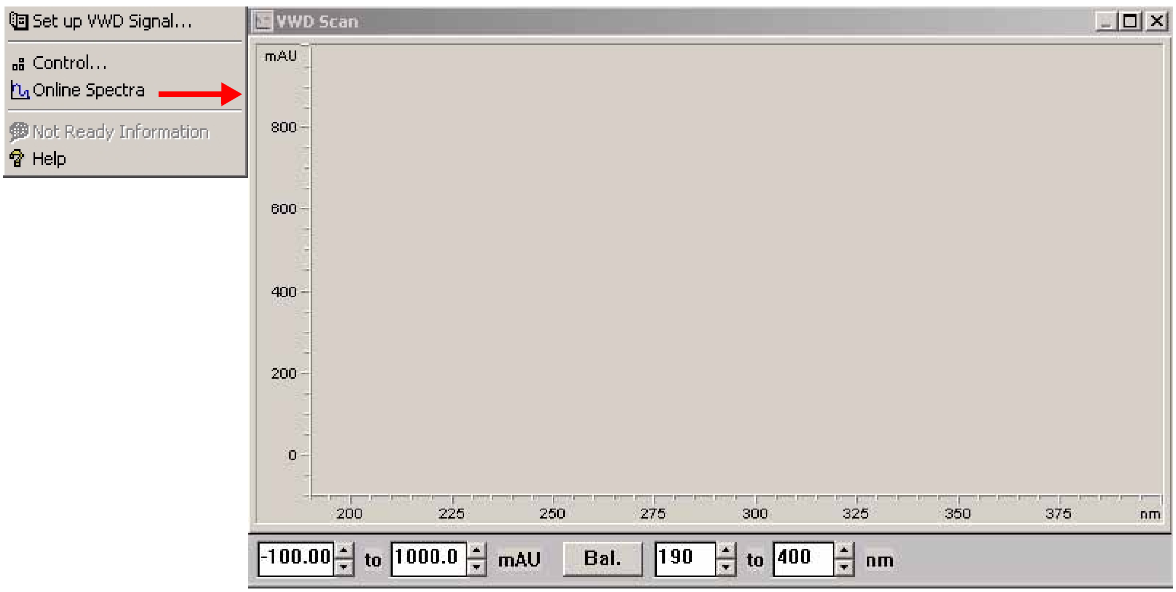


Figure 21 Online Spectra Window

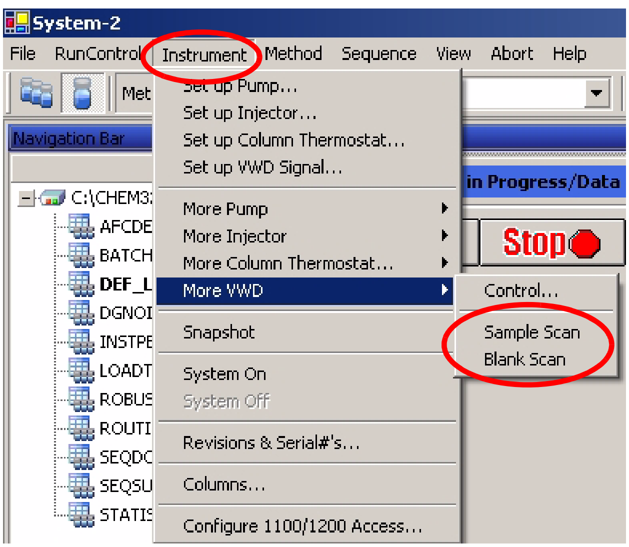
2 Change the absorbance and wavelength range according your needs.

Scanning with the VWD

NOTE Access to the scan feature is only possible during run.

1 Set up a run.
2 Start a run.
3 While running on the baseline, select from the menu *Instrument* - *More VWD* - *Blank Scan*, see Figure 22 on page 61.

   A background scan is stored in the memory.



- **Step 1: Blank Scan:** scan of the background (solvent) is stored in the memory.
- **Step 2: Sample Scan:** scan of the peak of interest is taken while the peak stays in the flow cell (stop-flow condition).
- **Online Spectrum:** Sample Scan minus Blank Scan.

Figure 22 Taking Online Spectra

4 When the peak of interest enters the flow cell, stop the flow (set flow rate to zero or open the purge valve) and wait a few moments to stabilize the concentration.

NOTE Turning off the pump would stop the run and no access to the sample scan is possible.

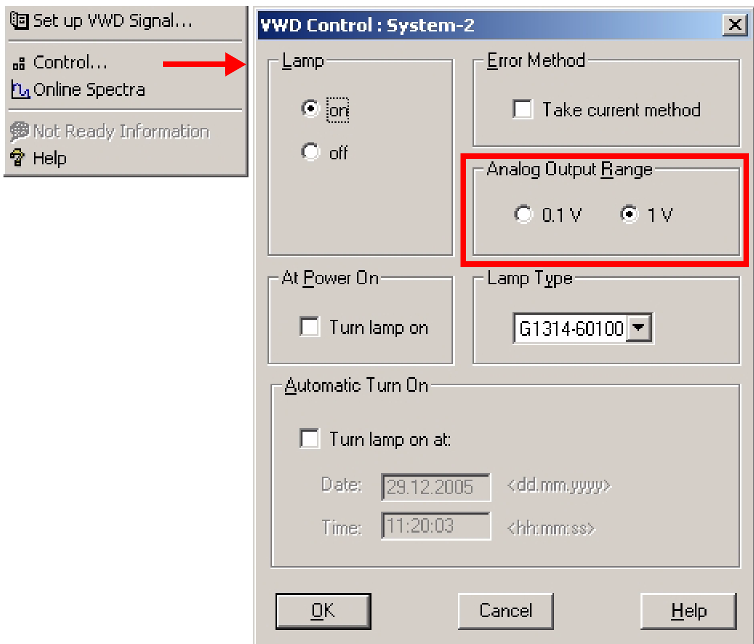
5 Select from the menu
Instrument - *More VWD* - *Sample Scan*.

A sample scan is taken in the range defined under “Special Setpoints" on page 64 and the Online Spectra window (see “Online Spectra" on page 60) displays the result (Sample Scan minus Blank Scan).

Analog Output Settings

1 To change the Output Range of the analog outputs select *VWD Control*.

2 To change the offset and the attenuation select *VWD Signal - More*.



- **Analog Output Range:** can be set to either 100 mV or 1 V full scale.
- **Zero Offset:** can be set to either 100 mV or 1 V full scale.
- **Attenuation Limits:** 0.98 to 4000 mAU at discrete values for either 100 mV or 1 V full scale.

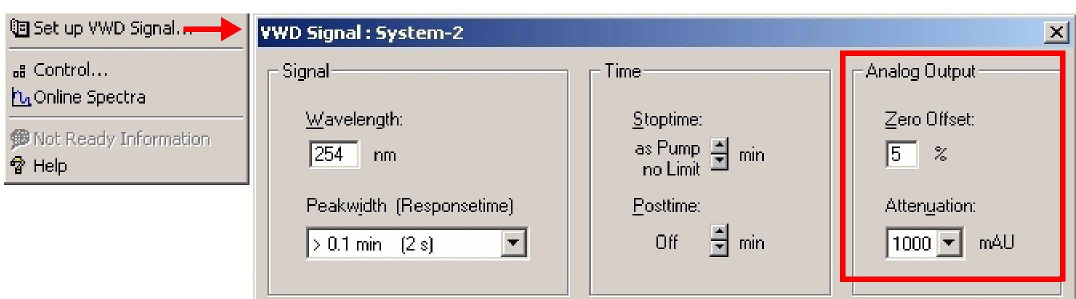
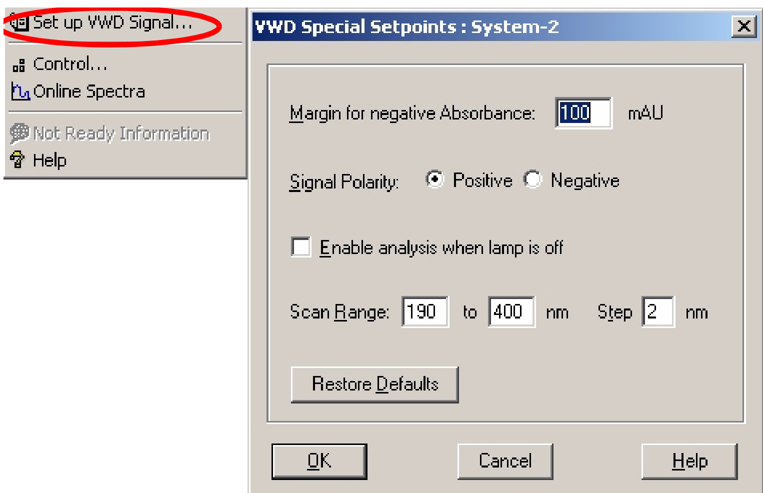


Figure 23 Analog Output Settings

3 Change the values if required.

Special Setpoints

1 To change the offset and the attenuation select *VWD Signal - More - Special Setpoints*.



Margin for negative Absorbance: 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.

Signal Polarity: can be switched to negative (if required).

Enable analysis when lamp is off: if the VWD is not used in a dual detector setup (lamp off), the not-ready condition is not stopping the analysis.

Scan Range / Step: Used for stop-flow scanning, see "Scanning with the VWD" on page 61.

Figure 24 Spectra Window

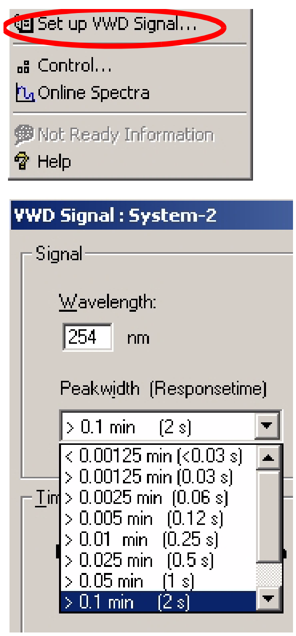
NOTE

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

Peakwidth Settings

NOTE Do not use peak width shorter than necessary, see also "Set the Detector Parameters" on page 73.

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, see Table 9 on page 66.

Limits: When you set the peak width (in minutes), the corresponding response time is set automatically and the appropriate data rate for signal acquisition is selected as shown in Table 9 on page 66.

Figure 25 Peakwidth Setting

Table 9 Peak Width — Response Time — Data Rate (G1314B VWD)

Peak Width (min)	Response Time (sec)	Data Rate (Hz)
<0.005	0.12	13.74
>0.005	0.12	13.74
>0.01	0.25	13.74
>0.025	0.5	13.74
>0.05	1.0	6.87
>0.10	2.0	3.43
>0.20	4.0	1.72
>0.40	8.0	0.86

Table 10 Peak Width — Response Time — Data Rate (G1314C VWD SL)

Peak Width (min)	Response Time (sec)	Data Rate (Hz)
<0.00125	<0.031	55
>0.00125	0.031	27.5
>0.0025	0.062	13.74
>0.005	0.12	13.74
>0.01	0.25	13.74
>0.025	0.5	13.74
>0.05	1.0	6.87
>0.10	2.0	3.43
>0.20	4.0	1.72
>0.40	8.0	0.86

Optimizing the Detector

Additional theoretical information can be found in chapter "How to optimize the detector" on page 69.

5
How to optimize the detector

This chapter gives hints on how to select the detector parameters and the flow cell.

Optimizing the Detector Performance

The detector has a variety of parameters that can be used to optimize 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 a rule-of-thumb for optimizing the detector parameters.

Match the Flow Cell to the Column

Figure 26 recommends the flow cell that matches the column used. If more than one selection is appropriate, use the larger flow cell to get the best detection limit. Use the smaller flow cell for best peak resolution.

Column length	Typical peak width	Recommended flow cell			
<= 5 cm	0.025 min	Micro flow cell			
10 cm	0.05 min		Semi-micro flow cell		
20 cm	0.1 min			Standard flow cell	
>= 40 cm	0.2 min				
	Typical flow rate	0.05 – 0.2 ml / min	0.2 – 0.4 ml / min	0.4 – 0.8 ml / min	1 – 2 ml / min
Internal column diameter		1.0 mm	2.1 mm	3.0 mm	4.6 mm

Figure 26 Choosing a Flow Cell

Flow Cell Path Length

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

$$Absorbance = -\log T = \log\frac{I_0}{I} = \varepsilon \cdot C \cdot d$$

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, I_0,

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 is the concentration of the absorbing species (usually in g/l or mg/l), and

d 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 27 on page 72 the noise increased by less than 10 % but a 70 % increase in signal intensity was achieved by increasing the path length from 6 mm to 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 27 on page 72 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).

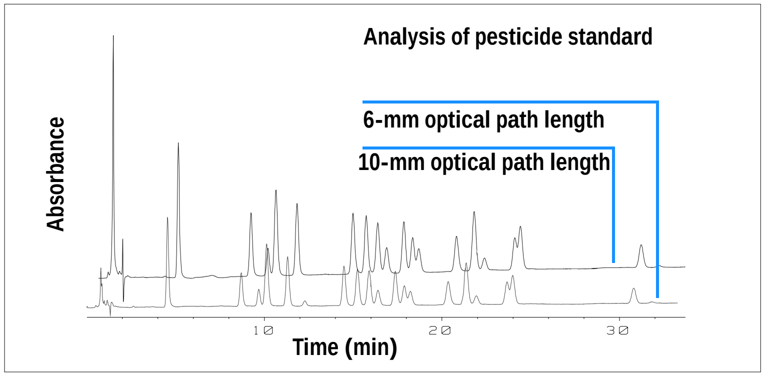


Figure 27 Influence of Cell Path Length on Signal Height

Traditionally LC analysis with UV detectors is based on comparing measurements with internal or external standards. To check photometric accuracy of the Agilent 1200 Series VWD it is necessary to have more precise information on path lengths of the VWD flow cells.

The correct response is:

`expected response * correction factor`

Please find below the details of the Agilent 1200 Series VWD flow cells:

Table 11 Correction factors for Agilent 1200 Series VWD flow cells

Flow cell type	Cell volume	Part number	Path length (nominal)	Path length (actual)	Correction factor
Standard flow cell	14 µl	G1314-60086	10 mm	10.15 ± 0.19 mm	10/10.15
Semi-micro flow cell	5 µl	G1314-60083	6 mm	6.10 ± 0.19 mm	6/6.10
Micro flow cell	1 µl	G1314-60081	5 mm	4.80 ± 0.19 mm	5/4.8
High Pressure flow cell	14 µl	G1314-60082	10 mm	10.00 ± 0.19 mm	6/5.75

NOTE However you have to be aware that there are additional tolerance of gasket thickness and its compression ratio which is supposed to be very small in comparison with the machining tolerance.

Set the Detector Parameters

1 Set peakwidth as close as possible to the width (at half height) of a narrow peak of interest.

Table 12 Peakwidth Settings

Peakwidth at half height	Rise time [10.. 90%]	Data rate	Module
< 0.00125 minutes	< 0.031 seconds	54.96 Hz	G1314C
0.00125 minutes	0.031 seconds	27.48 Hz	G1314C
0.0025 minutes	0.062 seconds	13.74 Hz	G1314C
0.005 minutes	0.125 seconds	13.74 Hz	G1314B / G1314C
0.01 minutes	0.25 seconds	13.74 Hz	G1314B / G1314C
0.025 minutes	0.50 seconds	13.74 Hz	G1314B / G1314C
0.05 minutes	1 second	6.87 Hz	G1314B / G1314C
0.1 minutes	2 seconds	3.43 Hz	G1314B / G1314C
0.2 minutes	4 seconds	1.72 Hz	G1314B / G1314C
0.4 minutes	8 seconds	0.86 Hz	G1314B / G1314C

2 Choose the sample wavelength.

- at a longer wavelength than the cut-off wavelength of the mobile phase,
- at a wavelength where the analytes have strong absorptivity if you want to get the lowest possible detection limit,
- at a wavelength with moderate absorptivity if you work with high concentrations, and
- preferably where the spectrum is flat for better linearity.

3 Consider to use time-programming to further optimization.

NOTE The G1314C VWD-SL can be operated with a G1323B just in standard mode as G1314B - no higher data rate selection is available.

6
Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

Overview of the Detector's Indicators and Test Functions

Status Indicators

The detector is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the detector. The status indicators provide a quick visual check of the operation of the detector (see page 51).

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the detector 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 81.).

Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components (see "Test Functions" on page 103).

Wavelength Verification / Recalibration

Wavelength recalibration is recommended after repair of internal components, and on a regular basis to ensure correct operation of the detector. The detector uses the deuterium alpha and beta emission lines for wavelength calibration (see "Wavelength Verification/Calibration" on page 105).

Diagnostic Signals

The detector has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing baseline problems (see "Diagnosis Signals" on page 121).

Status Indicators

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

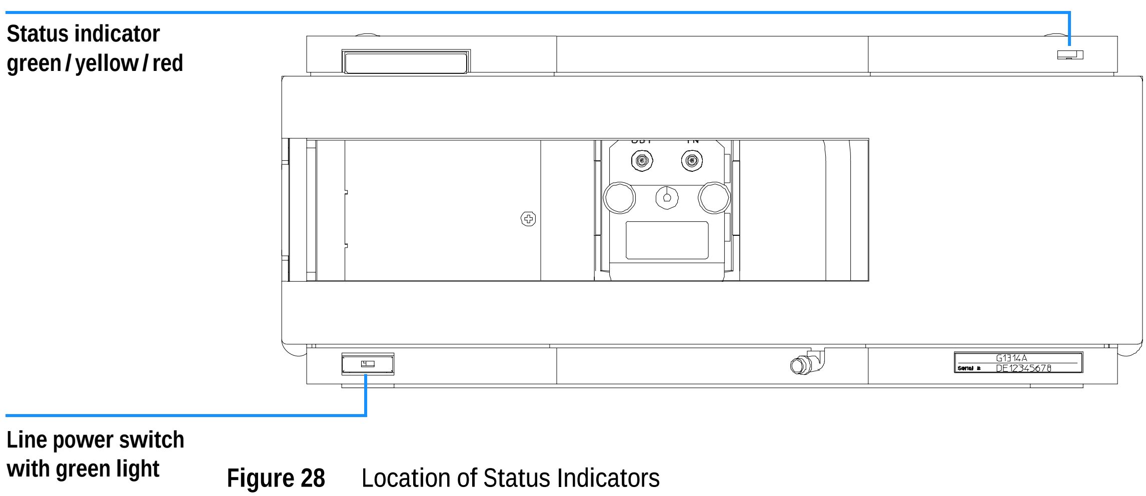


Figure 28 Location of Status Indicators

Power Supply Indicator

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

Detector Status Indicator

The detector status indicator indicates one of four possible detector conditions:

- When the status indicator is OFF (and power switch light is on), the detector is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the detector is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The detector 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 detector has detected an internal problem which affects correct operation of the detector. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.
- A *red-blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).

User Interfaces

Depending on the user interface the available tests vary. All test descriptions are based on the Agilent ChemStation as user interface. Some descriptions are only available in the Service Manual.

Table 13 Test Functions available vs. User Interface

Test	ChemStation	Instant Pilot G4208A	Control Module G1323B
Selftest	Yes	No	No
Filter	Yes	No	No
Slit	Yes	No	Yes
D/A Converter	Yes	No	No
Test Chromatogram	Yes (C)	No	Yes
Wavelength Calibration	Yes	Yes (M)	Yes
Lamp Intensity	Yes	Yes (D)	Yes
Holmium	Yes	Yes (D)	Yes
Cell	Yes	Yes (D)	No
Dark Current	Yes	Yes (D)	No

C via command

M section Maintenance

D section Diagnose

NOTE The Agilent Control Module (G1323B) does not do any calculations. So there will be no reports generated with passed/failed information.

Agilent LC Diagnostic Software

The Agilent LC diagnostic software is an application independent tool that provides troubleshooting capabilities for the Agilent 1200 Series modules. It provides for all 1200 Series LC the possibility of a first guided diagnostic for typical HPLC symptoms and a status report stored as Adobe Acrobat pdf or as a printable file to assist users evaluating the instrument state.

At the introduction, following modules will be fully supported by the software, including module tests and calibrations as well as injector steps and maintenance positions.

- Agilent 1200 Series binary pump SL (G1312B)
- Agilent 1200 Series high performance autosampler SL (G1367B)
- Agilent 1200 Series thermostatted column compartment SL (G1316B)
- Agilent 1200 Series diode array detector SL (G1315C)

With further releases of the diagnostic software all Agilent 1200 Series HPLC modules will be fully supported.

This diagnostic software provides tests and diagnostic features that may differ from the descriptions in this manual. For details refer to the help files provided with the diagnostic software.

7
Error Information

This chapter describes the meaning of detector 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 instrument logbook.

General Error Messages

General error messages are generic to all Agilent 1200 Series HPLC modules.

Timeout

The timeout threshold was exceeded.

Probable Causes

- The analysis was completed successfully, and the time0ut function switched off the pump as requested.
- 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.

Shutdown

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

The detector 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 Causes

- Leak detected in an external instrument with a remote connection to the system.
- Shut-down in an external instrument with a remote connection to the system.
- The degasser failed to generate sufficient vacuum for solvent degassing.

Suggested Actions

✔ Fix the leak in the external instrument before restarting the pump.

✔ Check external instruments for a shut-down condition.

✔ Check the degasser module for an error condition. Refer to the *Reference Manual* for the Agilent 1200 Series vacuum degasser.

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 Causes

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

Suggested Actions

✔ Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.

✔ Exchange the remote cable.

✔ Check the instrument for defects (refer to the instrument's reference 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 Causes

- CAN cable disconnected.
- Defective CAN cable.
- Defective main board in another module.

Suggested Actions

✔ Ensure all the CAN cables are connected correctly.

✔ Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

✔ Ensure all CAN cables are installed correctly.

Leak

A leak was detected in the detector.

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 VWM board.

Probable Causes

- Loose fittings.
- Broken capillary.
- Leaking flow cell.

Suggested Actions

✔ Ensure all fittings are tight.

✔ Exchange defective capillaries.

✔ Exchange flow cell components.

Leak Sensor Open

The leak sensor in the detector 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 Causes

- Leak sensor not connected to the VWM board.
- Defective leak sensor.

Suggested Actions

✔ Ensure the leak sensor is connected correctly.

✔ Exchange the leak sensor.

Leak Sensor Short

The leak sensor in the detector 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 Causes

- Defective leak sensor.

Suggested Actions

✔ Exchange the leak sensor.

Compensation Sensor Open

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

The resistance across the temperature compensation sensor (NTC) on the VWM 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 Causes

- Defective VWM board.

Suggested Actions

✔ Exchange the VWM board.

Compensation Sensor Short

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

The resistance across the temperature compensation sensor (NTC) on the VWM 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 Causes

- Defective VWM board.

Suggested Actions

✔ Exchange the VWM board.

Fan Failed

The cooling fan in the detector has failed.

The hall sensor on the fan shaft is used by the VWM board to monitor the fan speed. If the fan speed falls below two revolutions/second for more than five seconds, the error message is generated.

Probable Causes

- Fan cable disconnected.
- Defective fan.
- Defective VWM board.

Suggested Actions

✔ Ensure the fan is connected correctly.

✔ Exchange fan.

✔ Exchange the VWM board.

Open Cover

The top foam has been removed.

The sensor on the VWM board detects when the top foam is in place. If the foam is removed during operation, the lamp and grating drive power is switched off, and the error message is generated.

Probable Causes

- Top foam removed.

Suggested Actions

✔ Replace the foam.

Detector Error Messages

These errors are detector specific.

Lamp Current Missing

The lamp anode 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 Causes

- Lamp disconnected.
- Top foam removed while lamp is on.
- Defective lamp or non-Agilent lamp.
- Defective VWM board.
- Defective power supply.

Suggested Actions

✔ Ensure the lamp connector is seated firmly.

✔ Replace the top foam, and turn ON the lamp.

✔ Exchange the lamp.

✔ Exchange the VWM board.

✔ Exchange the power supply.

Lamp Voltage Missing

The 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 Causes

- Defective or non-Agilent lamp.
- Defective VWM board.
- Defective power supply.

Suggested Actions

✔ Exchange the lamp.

✔ Exchange the VWM board.

✔ Exchange the power supply.

Lamp Ignition Failed

The lamp failed to ignite.

The processor monitors the 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 Causes

- Lamp not connected.
- Defective or non-Agilent lamp.
- Defective VWM board.
- Defective power supply.

Suggested Actions

✔ Ensure the lamp is connected.

✔ Exchange the lamp.

✔ Exchange the VWM board.

✔ Exchange the power supply.

Heater Current Missing

The lamp heater current in the detector is missing.

During 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 Causes

- Lamp not connected.
- Ignition started without the top foam in place.
- Defective or non-Agilent lamp.
- Defective VWM board.
- Defective power supply.

Suggested Actions

✔ Ensure the lamp is connected.

✔ Replace the top foam, and turn on the lamp.

✔ Exchange the lamp.

✔ Exchange the VWM board.

✔ Exchange the power supply.

Calibration Failed

The intensity maximum was not found during wavelength calibration.

Calibration 0 Failed: Zero-order calibration failed.

Calibration 1 Failed: 656 nm calibration failed.

During zero-order and 656 nm calibration, the detector searches for the intensity maximum. If the maximum is not detected within the scan range, the error message is generated.

Probable Causes

- Lamp is OFF.
- Incorrect flow cell installation.
- Flow cell contamination or air bubbles.
- Intensity too low.
- Current step value too far from maximum.
- Misalignment of the grating assembly.
- Defective grating assembly.
- Defective VWM board.

Suggested Actions

✔ Switch on the lamp.

✔ Ensure the flow cell are installed correctly.

✔ Clean/replace flow cell windows or remove air bubbles.

✔ Replace lamp.

✔ Enter a different calibration step value (different scan range). Repeat the calibration.

✔ Realign the grating.

✔ Run the grating-motor test to determine if the grating assembly is defective. Exchange the grating assembly if required.

✔ Exchange the VWM board.

Holmium Oxide Test Failed

The holmium oxide test in the detector has failed.

During the holmium test, the detector moves the holmium filter into the light path, and compares the measured absorbance maxima of the holmium oxide filter with expected maxima. If the measured maxima are outside the limits, the error message is generated.

Probable Causes

- Defective or dirty flow cell.
- Defective filter motor assembly.
- Defective grating motor assembly.

Suggested Actions

✔ Ensure the flow cell is inserted correctly, and is free from contamination (cell windows, buffers, and so on).

✔ Run the filter-motor test to determine if the grating motor assembly is defective. Exchange the filter motor assembly.

✔ Run the grating-motor test to determine if the grating assembly is defective. Exchange the grating motor assembly if required.

Grating / Filter Motor Test Failed

The motor test has failed.

Test 0 Failed: Filter motor.

Test 1 Failed: Grating motor

During the motor tests, the detector moves the motor to the end position while monitoring the end-position sensor. If the end position is not found, the error message is generated.

Probable Causes

- Defective motor assembly.

Suggested Actions

✔ Run the motor test again to confirm the motor assembly is defective. Exchange the grating motor assembly if required.

Wavelength Check Failed

The automatic wavelength check after lamp ignition has failed.

When the lamp is switched on, the detector waits 1 minute to warm-up the lamp. Then a check of the deuterium emission line (656 nm) via the reference diode is performed. If the emission line is more than 3 nm away from 656 nm, the error message is generated.

Probable Causes

- Calibration incorrect.

Suggested Actions

✔ Recalibrate the detector.

Filter Check Failed

The automatic filter check after lamp ignition has failed.

When the lamp is switched on, the detector moves the cutoff filter into the light path. If the filter is functioning correctly, a decrease in lamp intensity is seen. If the expected intensity decrease is not detected, the error message is generated.

Probable Causes

- Filter motor defective.
- Defective or missing filter.

Suggested Actions

✔ Run the filter motor test to determine if the motor is defective.

✔ Exchange the filter assembly.

8
Test Functions

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

Available Tests versus Interfaces

Depending on the user interface the available tests vary. All test descriptions are based on the Agilent ChemStation as user interface.

Table 14 Available Tests versus Interface

Interface **Test**	**ChemStation**	**Instant Pilot** **G4208A**	**Control Module** **G1323B**
Wavelength Verification/Re-calibration	Tests (*)	Maintenance (*)	Tests
Lamp Intensity	Tests (*)	Diagnosis (*)	Tests
Holmium Test	Tests (*)	Diagnosis (*)	Tests
Cell Test	Tests (*)	n/a	n/a
D/A Converter Test	Tests (*)	n/a	n/a
Dark Current Test	Tests (*)	n/a	n/a
Filter / Grating Motor Test	Tests (*)	n/a	n/a
Test Chromatogram	from command line	n/a	Tests
Spectrum (Blank, Sample, Holmium)	n/a	n/a	Tests
Service Dialog	Tests	n/a	Test [**m** key]

(*) interface provides passed/fail information or a plot.

NOTE

With the introduction of the Agilent 1200 Series of HPLC modules a user-interface independent Diagnostic Software is available, that can be used from any PC via LAN or RS-232.

Wavelength Verification / Calibration

Wavelength calibration of the detector is done using the zero-order position and 656 nm emission line position of the deuterium lamp. The calibration procedure involves two steps. First the grating is calibrated on the zero-order position. The stepper-motor step position where the zero-order maximum is detected is stored in the detector. Next, the grating is calibrated against the deuterium emission-line at 656 nm, and the motor position at which the maximum occurs is stored in the detector.

In addition to the zero-order and 656 nm (alpha-emission line) calibration, the beta-emission line at 486 nm and the three holmium lines are used for the complete wavelength calibration process. These holmium lines are at 360.8 nm, 418.5 nm and 536.4 nm.

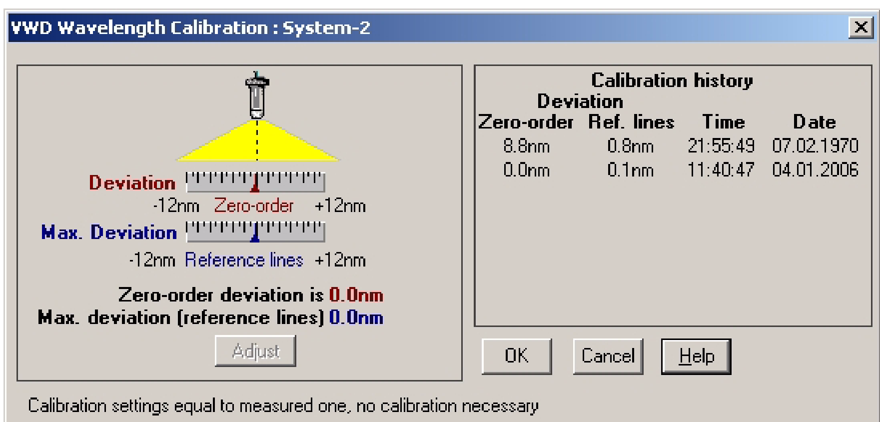


Figure 29 Wavelength Verification / Calibration

NOTE The wavelength verification / calibration takes about 2.5 minutes and is disabled within the first 10 minutes after ignition of the lamp because initial drift may distort the measurement.

When the lamp is turned ON, the 656 nm emission line position of the deuterium lamp is checked automatically, see “Lamp-on Routine" on page 107.

When to Calibrate the Detector

The detector is calibrated at the factory, and under normal operating conditions should not require recalibration. However, it is advisable to recalibrate:

- after maintenance (flow cell or lamp),
- after repair of components in the optical unit,
- after exchange of the optical unit or VWM board,
- at a regular interval, at least once per year (for example, prior to an Operational Qualification/Performance Verification procedure), and
- when chromatographic results indicate the detector may require recalibration.

Zero-Order Calibration

The zero-order calibration function is used for the electrical calibration of the zero-order beam of the monochromator.

The grating is driven by the stepper motor while the detector searches for the intensity maximum occurring at the zero-order position. The zero-order calibration values are stored in the instrument.

The deviation is displayed in nm on the user interface, see Figure 29 on page 105.

656-nm Wavelength Calibration

The wavelength calibration function is used to calibrate the monochrometer against the 656 nm emission line of the deuterium lamp.

The detector searches for maximum light intensity in the region of the 656 nm emission line. The 656 nm calibration values are stored in the instrument.

The deviation is displayed in nm on the user interface, see Figure 29 on page 105.

Lamp-on Routine

When the lamp is turned on the following routine is implemented:

- During the ignition phase the grating position is reinitialize by moving the grating position lever into the sensor position.
- After ignition, a 1-minute warm-up phase should stabilize the lamp.
- Check of wavelength setting at 656 nm emission line (must be within 3 nm). This measurement is taken at the reference side only (to have no influence from flow cell condition). If not correct then a message for recalibration is displayed.
- Intensity check:

  at 250 nm without cutoff filter (= value 1).

  at 250 nm with cutoff filter (= value 2).

  The result should be value 2 < value 1/16.
  If not OK, the cutoff filter does not work correctly.
- Restore the set wavelength position.
- The detector should now be ready condition.

Checking the Photocurrent

To identify problems with the flow cell (contaminated windows, air bubbles and so on) you can use raw data from the sample and reference photodiode (unfiltered and not logarithmic).

NOTE

The screen of the VWD-Tests (Control Module G1323B) on the control module in Figure 30 shows the wavelength and photo current information.

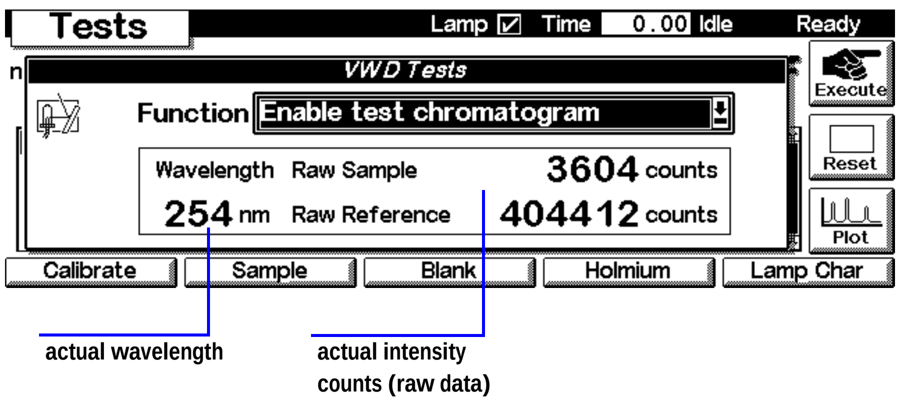


Figure 30 Photocurrent Readings on Control Module

With a clean cell the counts for sample and reference are in the same range. If, like in this example, the sample side shows much less, the flow cell might have a problem due to

- ✔ dirty windows,
- ✔ absorbing solvents/compounds,
- ✔ not correctly mounted flow cell, or
- ✔ air bubbles

Holmium Oxide Test

This test verifies the calibration of the detector against the three wavelength maxima of the built-in holmium oxide filter. The test displays the difference between the expected and measured maxima. Figure 31 shows a holmium test spectrum.

The test uses the following holmium maxima:

- 360.8 nm
- 418.5 nm
- 536.4 nm

NOTE

See also “Declaration of Conformity for HOX2 Filter" on page 313.

When to do the Test

- after recalibration,
- as part of the Operational Qualification/Performance Verification procedure, or
- after flow cell maintenance or repair.

Interpreting the Results

The test is passed successfully when all three wavelengths are within ± 1 nm of the expected value. This indicates the detector is calibrated correctly.

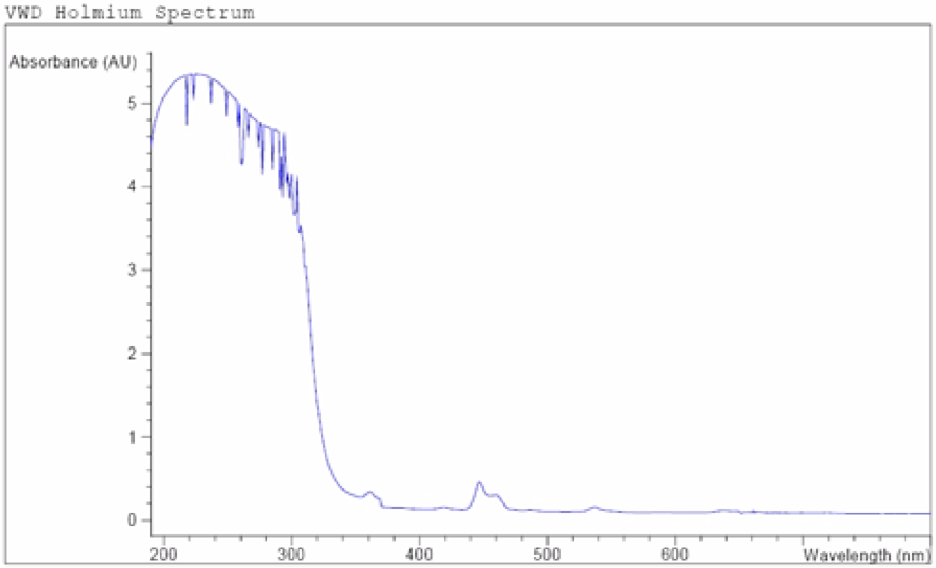
NOTE

The test results are currently available on the Agilent ChemStation only.

ChemStation revisions below B.01.xx show a limit of ± 2 nm. It should read ± 1 nm. If the test shows a value greater than ± 1 nm, perform a recalibration.

```
Instrument:       G1314B
Serial Number:    JP33324886
Operator:         Wolfgang
Date:             03.01.2006
Time:             15:26:41
File:             C:\CHEM32\2\DIAGNOSE\VWD_HOLM.DGR
```

VWD Holmium Spectrum



VWD Holmium Test Results

	Specification	Measured	Result
Deviation from wavelength 1: 360.8 nm	-1..1 nm	0.0 nm	Passed
Deviation from wavelength 2: 418.5 nm	-1..1 nm	0.1 nm	Passed
Deviation from wavelength 3: 536.4 nm	-1..1 nm	0.0 nm	Passed

Figure 31 Holmium Test (Report)

Holmium Oxide Test Failed

Probable Causes

- Detector not calibrated.
- Dirty or defective flow cell.
- Dirty or defective holmium oxide filter.
- Optical misalignment.

Suggested Actions

- ✔ Recalibrate the detector.
- ✔ Repeat the test with the flow cell removed. If the test is OK, exchange the flow cell components.
- ✔ Run the holmium oxide filter test. If the test fails, exchange the filter assembly.
- ✔ Realign the optical components.

Intensity Test

The intensity test measures the intensity of the deuterium lamp over the full VWD wavelength range (190 – 600 nm). The test can be used to determine the performance of the lamp, and to check for dirty or contaminated flow cell windows. When the test is started, 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 characteristics. Therefore, intensity spectra will differ slightly between instruments. Figure 32 shows a typical intensity test spectrum.

Intensity Test Evaluation (Agilent ChemStation only)

The Agilent ChemStation evaluates three values automatically and displays the limits for each value, the average, the minimum and the maximum of all data points and *passed* or *failed* for each value.

Test Failed

Probable Causes

- Absorbing solvent in flow cell.
- Dirty or contaminated flow cell.
- Dirty or contaminated optical components (source lens, mirrors, grating).
- Old or non-Agilent lamp.

Suggested Actions

✔ Ensure the flow cell is filled with water.

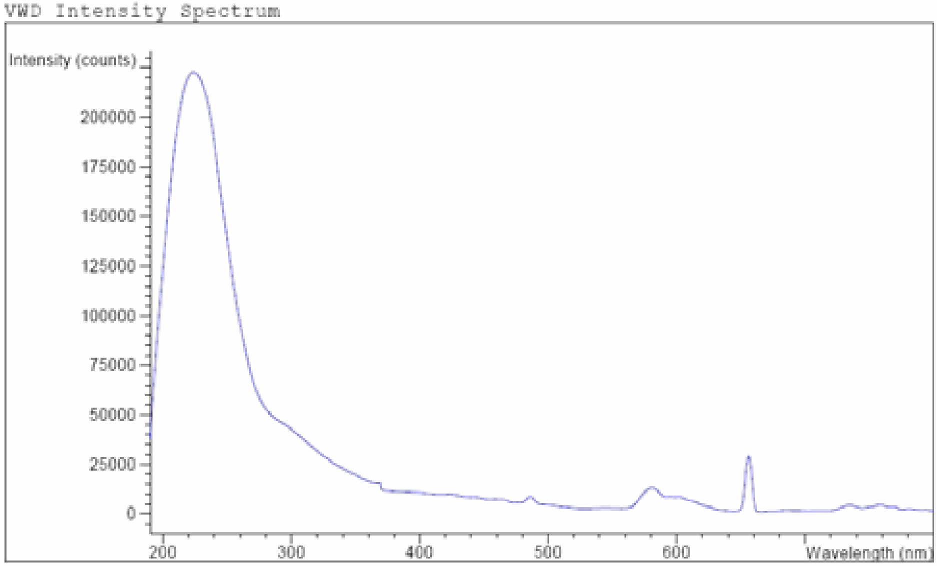
✔ Repeat the test with the flow cell removed. If the test passes, exchange the flow cell windows.

✔ Clean/replace optical components.

✔ Exchange the lamp.

```
Instrument:         G1314B
Serial Number:      JP33324886
Operator:           Wolfgang
Date:               03.01.2006
Time:               15:07:09
File:               C:\CHEM32\2\DIAGNOSE\VWD_INT.DGR
```

VWD Intensity Spectrum



VWD Intensity Test Results

	Specification	Measured	Result
Accumulated lamp on time		94.35 h	
Highest intensity	> 10000 cts	222615 cts	Passed
Average intensity	> 5000 cts	29734 cts	Passed
Lowest intensity	> 200 cts	1137 cts	Passed

Figure 32 Intensity Test (Report)

Dark Current Test

This test determines the dark-current noise contribution of the front-end electronics.

During the test, the lamp is switched OFF. The resulting signal corresponds to the unfiltered dark-current noise contribution of the front-end electronics. When the test is run, the signal is output to the detector analog output.

When to do the Test

- if the detector signal is noisy.

How to do it with the Agilent ChemStation

On the Agilent ChemStation the test is evaluated automatically and checked against the limits.

```
Instrument:        G1314B
Serial Number:     JP33324886
Operator:          Wolfgang
Date:              03.01.2006
Time:              15:41:01
File:              C:\CHEM32\2\DIAGNOSE\VWD_DARK.DGR

                                                      |      Result | Status
-----------------------------------------------------------------------------
VWD Dark Current Test                                 |             |
Date: 03.01.2006;  Time: 15:41:01                     |             |
Expected total time: approx. 3.5 min.                 |             |
                                                      |             |
Test Procedure:                                       |             |
1. Switching the lamp off?                            |             | done
2. Performing dark current noise measurement          |             | done
3. Evaluating sample circuit noise                    |        3790 | done
4. Evaluating reference circuit noise                 |        3731 | done
5. Maximum noise                                      |        3790 | done
6. Switching the lamp on again?                       | Lamp Ignit  | done
```

Figure 33 Dark Current Test (Report)

How to do it with the Control Module (G1323B)

On the Control Module the dark current counts are displayed as follows:

1. Enable the Dark Current Test.
2. Activate the Service Dialog (m-key, Service)
3. Select Signal 1 - Raw Sample.
4. Select Signal 2 - Raw Reference.

5 Observe the count readings for signal 1 and signal 2.

The displayed values should be less than 7900 counts.

The dark current signal can be displayed directly on the screen.

1 Select in VWD - Settings - Analog Output as Raw Sample or Raw Reference.
2 Press **Plot** and select the **Analog signal** in Setup.
3 Return to **Plot** screen by pressing **Done**.

Interpreting the Results

The output signal of the ADC noise corresponds to AD counts with 1 V or 0.1 V full scale setting. The ADC noise must be taken over a time of 10 minutes for the results to be accepted.

Average counts should be less than 7900 counts

Dark Current Test Failed

Probable Causes

- Defective sample or reference diode.
- Defective sample or reference VWA board.
- Defective VWM board.

Suggested Actions

✔ Exchange the reference or sample diode.

✔ Exchange sample or reference VWA board.

✔ Exchange the VWM board.

DAC Test

This test determines correct operation of the digital-analog converter (DAC).

The test applies an AC voltage (10 µV) to the DC output of the DAC. The DAC output is connected to the analog output connector at the rear of the detector.

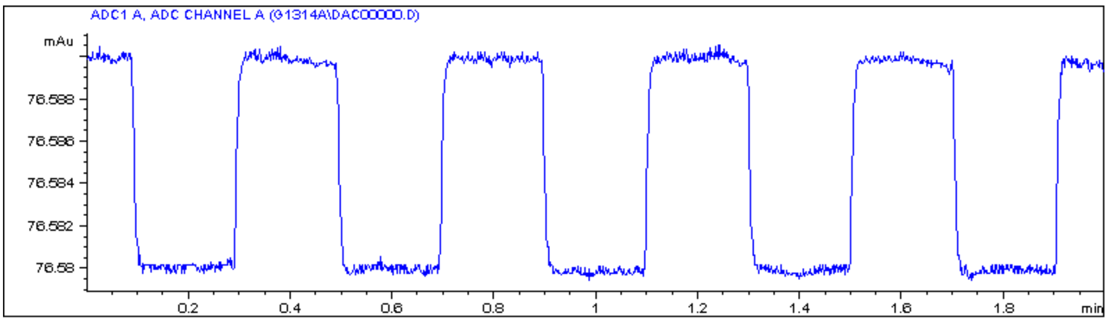


Figure 34 DAC Test

When to do the Test

- if the detector signal is noisy or missing.

Interpreting the Results

The noise on the step should be less than 3 µV.

Probable Causes

- Defective VWM board.

Suggested Actions

✔ Exchange the VWM board.

Grating Motor Test

This test moves the grating motor to the end position, and displays the motor-position step difference. This checks the movement of the grating drive mechanism.

When to do the Test

- if recalibration cannot be done successfully, or
- if the holmium test fails.

Interpreting the Results

Grating Motor Test Failed

Probable Causes

- Defective grating motor.
- Defective grating position sensor
- Defective VWM board.

Suggested Actions

✔ Exchange the grating motor

✔ Exchange the grating position sensor.

✔ Exchange the VWM board.

Filter Motor Test

This control function is used to check the motion of second-order cut-off filter. The cut-off filter returns to original position at the end of this control function.

When to do the Test

- if the holmium test fails.

Grating Motor Test Failed

Probable Causes

- Defective filter motor
- Defective filter position sensor.
- Defective VWM board.

Suggested Actions

✔ Exchange the filter motor

✔ Exchange the filter position sensor.

✔ Exchange the VWM board.

Test Chromatogram

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

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 15 Test Chromatogram Settings

Response time	Set Run Time
0.06 sec	0.8 min
0.12 sec	0.8 min
0.25 sec	0.8 min
0.50 sec	0.8 min
1.00 sec	1.6 min
2.00 sec	3.2 min
4.00 sec	6.4 min
8.00 sec	12.8 min

Control Module G1323B

1 Select the response time and stop time according to Table 15.
2 Select the function Enable test chromatogram in Tests - VWD and press **Execute**.
3 Select **Plot** in the **System** screen and press **Setup**.
4 Select as Source the Signal (VWD), change the Y-range to - 10 to 300 mAU, fit the Time Range to match Table 15 and press **Done**.

5 If required, connect a recording device (for example, Agilent 3396A with settings ATTN=9, CHSP=2, ZERO=10, AR REJ=106).

6 Press **Start** to start the run. On completion of the run, or when the run is stopped, the test chromatogram is deactivated.

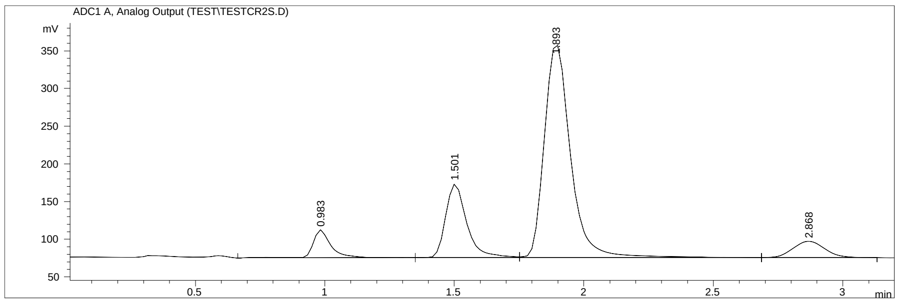


Figure 35 Test Chromatogram on Integrator (response time 2 seconds)

Agilent ChemStation

1 Select the response time and stop time according to Table 15 on page 119.

2 Activate the test chromatogram by typing into the command line (or as pre-run command): PRINT SENDMODULE$(LVWD,“SIMU:DFLT”)

3 Start the run. On completion of the run, or when the run is stopped, the test chromatogram is deactivate.

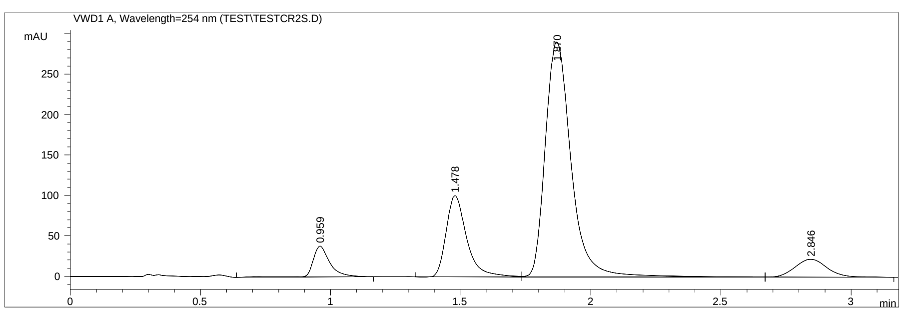


Figure 36 Test Chromatogram on Agilent ChemStation (response time 2 seconds)

9
Diagnosis Signals

This chapter describes the detector's built in diagnostics.

Diagnostic Signal Output

The detector provides an analog signal output for various detector signals for diagnostic purposes.

Selecting and Plotting Signals

Some of the signals are available on the analog output only when running specific tests (see following sections). Only one signal can be plotted at any one time.

NOTE

All values in Table 17 on page 125 refer to the following settings on the user interface:
attenuation 1000 mAU,
zero offset 5%,
analog voltage range 1 V full scale.

The following signals are available on the analog signal output and the control display (select Analog Out VWD as source signal in the Plot-Setup).

NOTE

For signal descriptions see "Signal Descriptions" on page 126.

Table 16 Diagnostic Signals on Analog Output

Signal	Analog Out 1 V is equal to	Display
Constant zero offset	0 mV	
Absorbance	1 AU	AU
Sample signal without reference	1 AU	AU
Reference signal without sample	1 AU	AU
Sample raw data (unfiltered and not logarithmic)	2^{21} counts	Counts
Reference raw data (unfiltered and not logarithmic)	2^{21} counts	Counts

Table 16 Diagnostic Signals on Analog Output (continued)

Signal	**Analog Out 1 V is equal to**	**Display**
Analog output test	zero offset + 10 µV step	Counts
Sample diode current	220 nA / 2^{gain}	nA
Reference diode current	220 nA / 2^{gain}	nA
Board Temperature	102.4 °C (displayed value minus zero offset)	°C

Service Dialog

Available on Agilent ChemStation and G1323B Control Module.

NOTE

This dialog interface displays the values on the screen only. The analog signal will not be affected. Some of the signals can be routed to the analog output selectable in the VWD - Settings - Analog screen.

On the Control Module G1323B it can be accessed from System - Tests - VWD. Then press **m** (menu) and select **Service**.

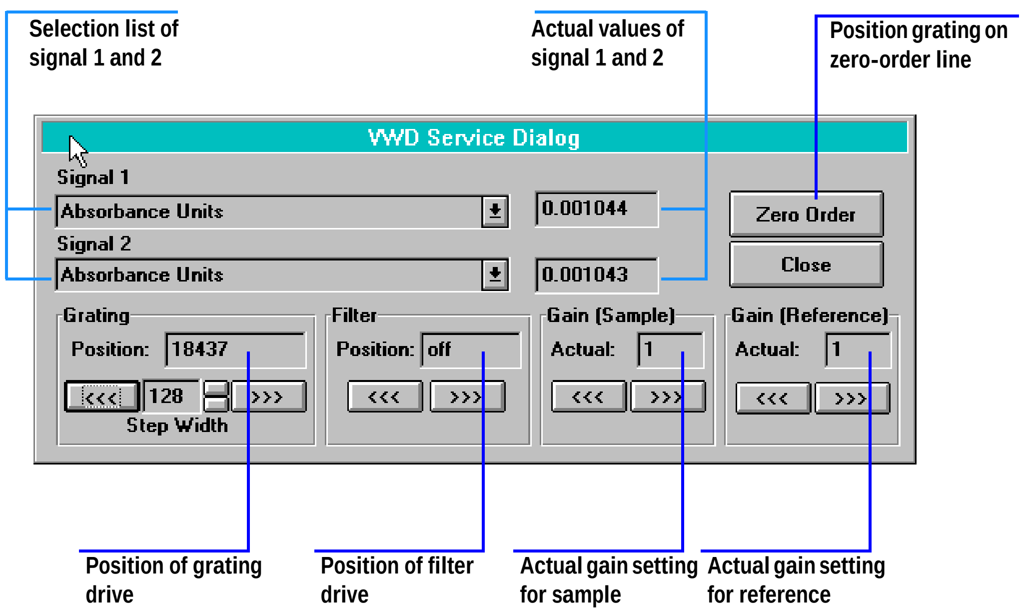


Figure 37 Service Dialog

Table 17 Diagnostic Signals

Signal	Display	Analog Output*
Absorbance	AU	1 AU/V
Sample signal without reference	AU	1 AU/V
Reference signal without sample	AU	1 AU/V
Sample raw data (unfiltered and not logarithmic)	Counts	2^{21} counts/V
Reference raw data (unfiltered and not logarithmic)	Counts	2^{21} counts/V
Analog output test	Counts	zero offset + 10 µV step
Sample diode current	nA	220 nA/2^{gain}
Reference diode current	nA	220 nA/2^{gain}
Sample preamplifier gain	gain 0 ... 5	
Reference preamplifier gain	gain 0 ... 5	
Lamp anode voltage	V	
Lamp anode current	mA	
Lamp heater voltage	V	
Lamp heater current	A	
Grating motor steps	Steps	
Grating position sensor	ON/OFF	
Filter motor position	0 ... 4**	
Filter position sensor	ON/OFF	
Board Temperature	°C	102.4 °C (displayed value minus zero offset
PTC current	mA	
Leak status	-1, 0 ... 5***	
PTC (leak sensor) voltage	mV	
NTC (reference sensor) voltage	V	

* for more information see “Diagnostic Signal Output" on page 122

** 0 = in sensor position; 1 = OFF (<370 nm); 2 = cutoff filter in; 3 = unused; 4 = holmium filter in

***-1 = warm-up; 0 = OK; 1 = leak; 2 = NTC short; 3 = NTC open; 4 = PTC short; 5 = PTC open

Signal Descriptions

Constant Zero Offset

This sets the output signal to zero (0 mV).

Absorbance

This is the normal signal (sample plus reference) defined by user wavelength.

Sample signal without reference

This is the normal signal defined by user wavelength without the reference. No influence from the reference diode.

Reference signal without sample

This is the normal signal defined by user wavelength without the sample. No influence from the sample diode.

Sample or reference raw data

The sample or reference diode’s data is processed without filtering and take the logarithm.

Analog output test

This test adds to the used zero offset setting a DC voltages of 10 µV in cycles of 12 seconds. This 10 µV step is equal to 1×10^{-6} AU and can be used to check the noise on a recording device. See “DAC Test" on page 116.

Sample or reference diode current

Shows the diodes current.

Sample or reference gain

This function shows the current the gain setting.

Lamp anode / heater voltages and currents

Provides the information of actual voltages and currents of the lamp's anode and filament.

Grating or Filter Motor motor steps

Provides the step numbers of grating or filter motor settings.

Grating or Filter position sensor

Checks the movement of grating or filter.

Board Temperature

An on-board temperature sensor on the VWM board provides the actual temperature on the board. This information is running continuously into a buffer from which it can be retrieved as last-12-hours plot.

Agilent ChemStation: Diagnosis - VWD Details view - Temperature

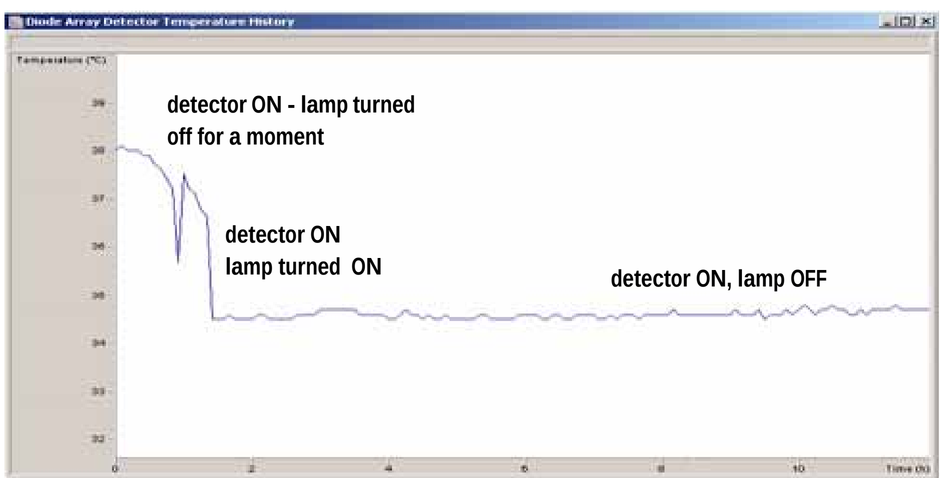


Figure 38 Board Temperature (internal detector buffer)

Leak Status

Provides status of PTC and NTC sensors. See Table 17 on page 125.

PTC or NTC voltage / current

The actual voltage/current of the PTC (leak sensor) or NTC (reference sensor) is provided.

10
Maintenance and Repair

This chapter provides general information on maintenance and repair of the detector.

Introduction to Maintenance and Repair

Simple Repairs - Maintenance

The detector is designed for easy repair. The most frequent repairs such as lamp change and flow cell change can be done from the front of the detector with the detector in place in the system stack. These repairs are described in "Maintenance" on page 135 (*part of the User Manual and Service Manual*).

Exchanging Internal Parts - Repair

Some repairs may require exchange of defective internal parts. Exchange of these parts requires removing the detector from the stack, removing the covers, and disassembling the detector. The security lever at the power input socket prevents that the detector cover is taken off when line power is still connected. These repairs are described in "Repair" on page 159 (*part of the Service Manual*).

Warnings and Cautions

WARNING

To prevent personal injury, the power cable must be removed from the instrument before opening the detector cover. Do not connect the power cable to the detector while the covers are removed.

WARNING

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

WARNING

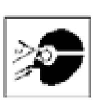
When working with solvents please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD). In order to prevent damage always use an ESD protection (for example, the ESD wrist strap from the accessory kit) when handling electronic boards and components (see “Using the ESD Strap” on page 133).

WARNING

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.



Cleaning the Detector

The detector 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 detector.

WARNING **Do not let liquid drip into the detector. It could cause shock hazard and it could damage the detector.**

Using the ESD Strap

Electronic boards are sensitive to electrostatic discharge (ESD). In order to prevent damage, always use an ESD strap when handling electronic boards and components.

1 Unwrap the first two folds of the band and wrap the exposed adhesive side firmly around your wrist.
2 Unroll the rest of the band and peel the liner from the copper foil at the opposite end.
3 Attach the copper foil to a convenient and exposed electrical ground.

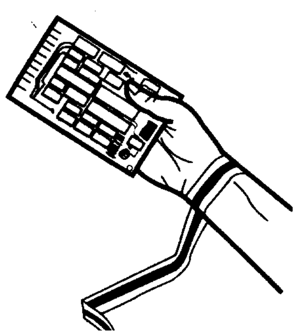


Figure 39 Using the ESD Strap

11
Maintenance

This chapter describes the maintenance of the detector.

Overview of Maintenance

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

Table 18 Simple Repairs

Procedures	Typical Frequency	Notes
Deuterium lamp exchange	If noise and/or drift exceeds your application limits or lamp does not ignite.	A VWD test should be performed after replacement.
Flow cell exchange	If application requires a different flow cell type.	A VWD test should be performed after replacement.
Cleaning 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.
Leak sensor drying	If leak has occurred.	Check for leaks.
Leak handling system replacement	If broken or corroded.	Check for leaks.

Exchanging a Lamp

When required	If noise or drift exceeds application limits or lamp does not ignite.
Tools required	Screwdriver POZI 1 PT3
Parts required	Deuterium lamp G1314-60100

NOTE

If you want to use the Agilent DAD lamp instead of the VWD lamp, you have to change the lamp settings in the *VWD Configuration* to lamp type *2140-0590*. This ensures that the DAD lamp's filament heating is operated like in the DAD. The instrument specifications are based on the VWD lamp.

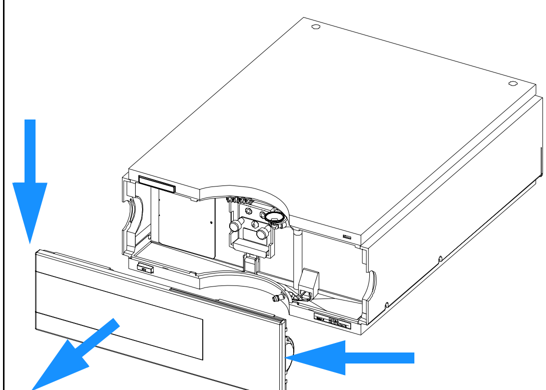
WARNING

If the detector has been in use, the lamp may be hot. If so, wait five minutes for lamp to cool down.

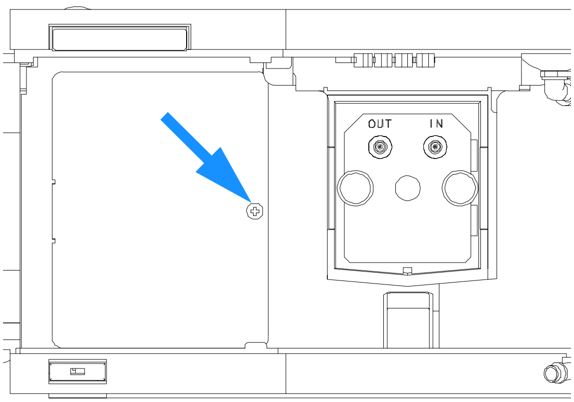
Preparations for this procedure:

- Turn the lamp OFF.

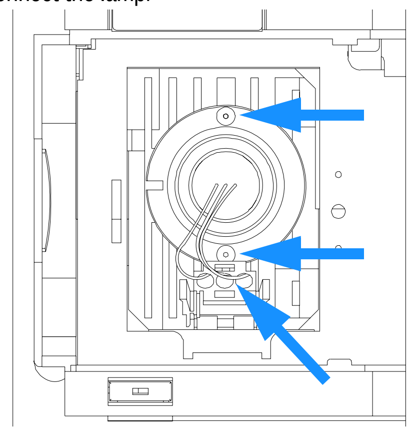
1 Press the release buttons and remove the front cover to have access to the lamp area.



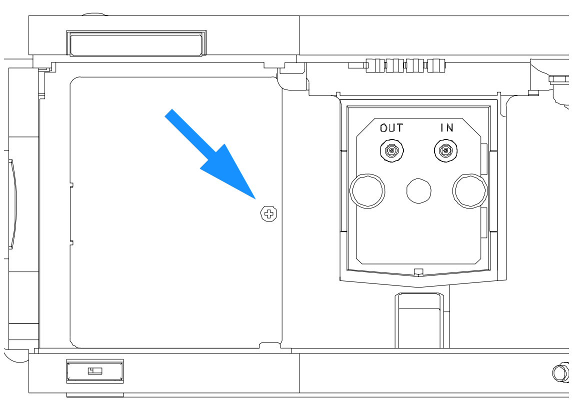
4 Unscrew the lamp cover and remove it.



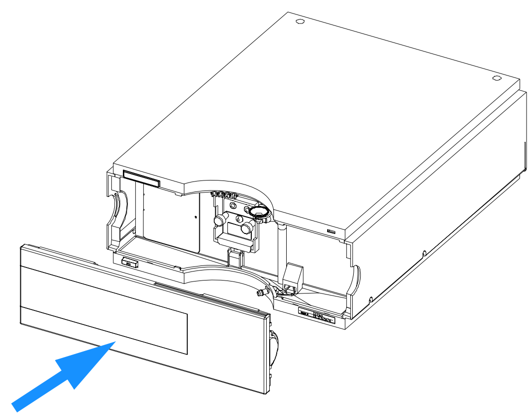
5 Unscrew, disconnect and replace the lamp. Insert, fix and reconnect the lamp.



6 Replace the lamp cover.



7 Replace the front cover.



Next steps:

- Reset the lamp counter as described in the User Interface documentation.
- Turn the lamp ON.
- Give the lamp more than 10 minutes to warm-up.
- Perform "Wavelength Verification/Calibration" on page 155 to check the correct positioning of the lamp.

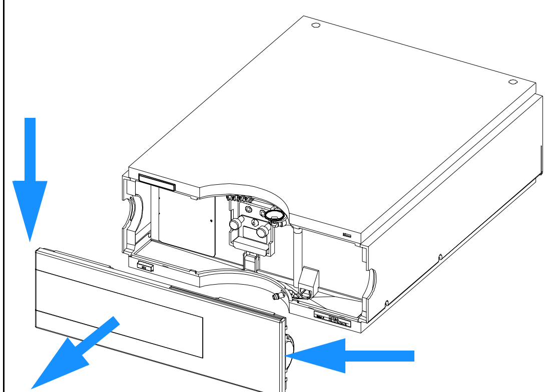
Exchanging a Flow Cell

When required	If 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	G1314-60086 10 mm, 14 µl, 40 bar, Micro flow cell, 5 mm, 1 µl, 40 bar, G1314-60081 Semimicro flow cell, 6 mm, 5 µl, 40 bar, G1314-60083 High pressure flow cell, 10 mm, 14 µl, 400 bar, G1314-60082

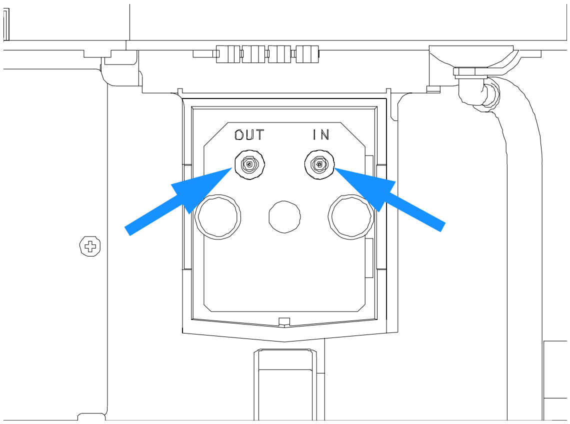
Preparations for this procedure:

- Turn the lamp OFF.

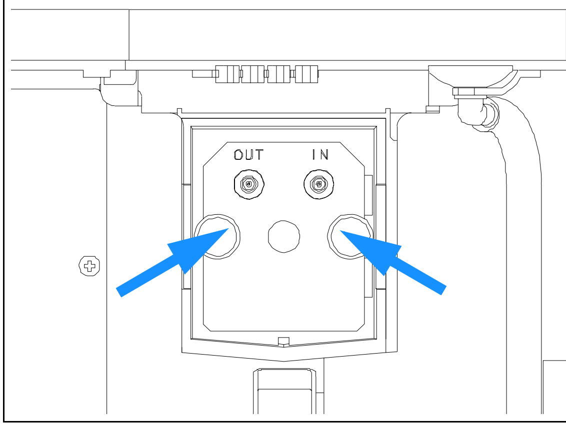
1 Press the release buttons and remove the front cover to have access to the flow cell area.



2 Disconnect the inlet and outlet capillaries.



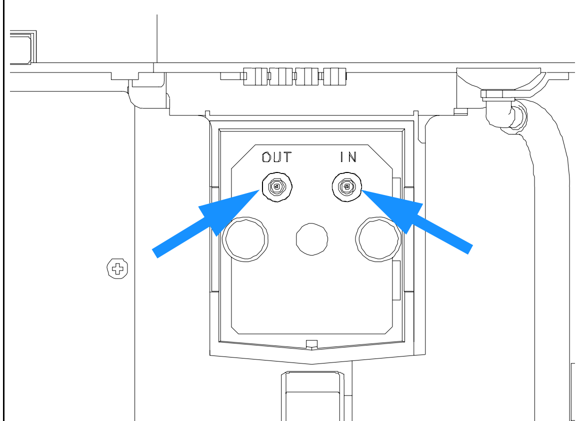
3 Unscrew the thumb screws parallel and remove the flow cell.



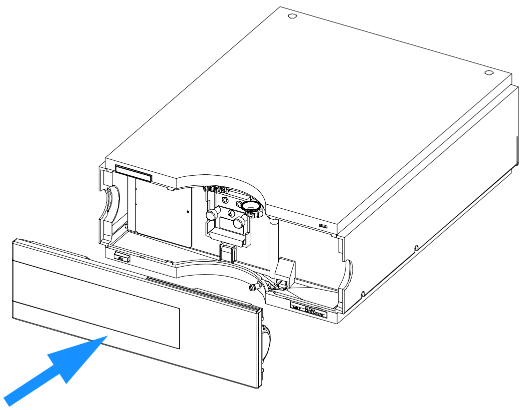
Note:

If you want to maintain flow cell parts, see "Repairing the Flow Cells" on page 142 or the information provided with your flow cell.

4 Replace the flow cell and fix the thumb screws.
Reconnect the inlet and outlet capillaries to the flow cell.



5 Replace the front cover.



Next steps:

- To check for leaks, establish a flow and observe the flow cell (outside of the cell compartment) and all capillary connections.
- Insert the flow cell.
- Perform “Wavelength Verification/Calibration" on page 155 to check the correct positioning of the flow cell.
- Replace the front cover.

Repairing the Flow Cells

When required	If the flow cell needs repair due to leaks or contaminations.
Tools required	Wrench 1/4 inch for capillary connections Hexagonal wrench 4 mm Tooth picks
Parts required	See "Standard Flow Cell" on page 231. See "Micro Flow Cell" on page 232. See "Semi-micro Flow Cell" on page 233. See "High Pressure Flow Cell" on page 235.
Preparations	Turn off the flow. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 139.

NOTE The shown cell parts will differ depending upon the flow cell type. For detailed parts schematics, refer to above mentioned pages.

1 - Cell Screw
2 - Conical Springs
3 - Ring #1 PEEK
4 - Gasket #1 (small hole)
5 - Window Quartz
6 - Gasket #2 (large hole)
7 - Cell cover assembly
8 - Ring #2 PEEK

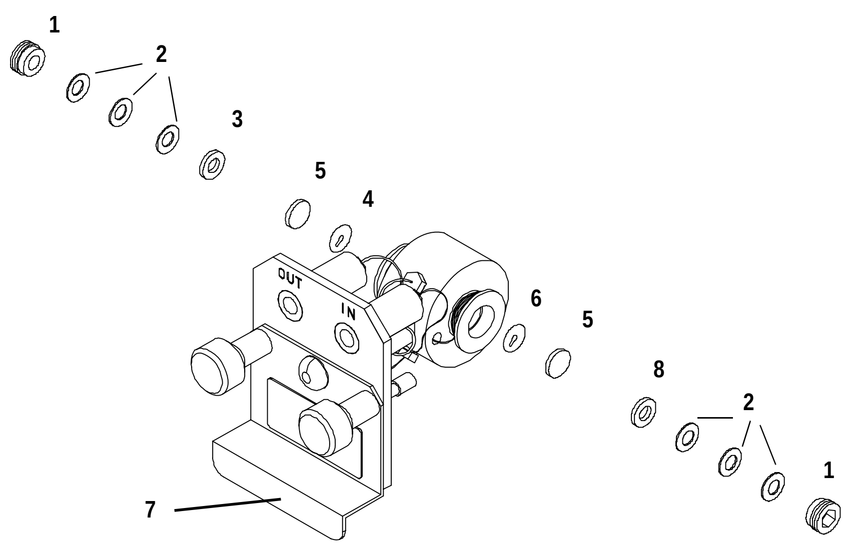


Figure 40 Standard Flow Cell

Disassembling the Flow Cell

1 Unscrew the cell screw using a 4-mm hexagonal wrench.

2 Remove the SST rings using a pair of tweezers.

3 Use adhesive tape to remove the peek ring, the window and the gasket.

CAUTION

Do not use tweezers to remove windows as the surfaces can easily be scratched.

4 Repeat step 1 through step 3 for the other window (keep the parts separate - otherwise they could be mixed!).

Cleaning the Flow Cell Parts

5 Pour isopropanol into the cell hole and wipe clean with a piece of lint-free cloth.

6 Clean the windows with ethanol or methanol. Dry it with a piece of lint-free cloth.

NOTE

Always use new gaskets.

Reassembling the Flow Cell

7 Hold the flow cell cassette horizontally and place gasket in position. Ensure both cell holes can be seen through the holes of gasket.

NOTE

The semi-micro #1 and #2 gaskets (items 6 and 7, "Semi-micro Flow Cell" on page 234) look very similar. Do not mix them up.

8 Place the window on gasket.

9 Place the peek ring on the window.

10 Insert the conical springs. Make sure the conical springs point towards the window. Otherwise tightening the cell screw might break the window.

11 Screw the cell screw into the flow cell and tighten the screw.

12 Repeat the procedure for the other cell side.

Next steps

- Reconnect the capillaries, see "Exchanging a Flow Cell" on page 139.
- Perform a leak test. If OK, insert the flow cell.
- Perform "Wavelength Verification/Calibration" on page 155 to check the correct positioning of the flow cell.
- Replace the front cover.

Using the Cuvette Holder

When required:	If your own standard should be used to checkout the instrument.
Tools required:	None
Parts required:	Cuvette Holder G1314-60200 Cuvette with the “standard”, e.g. NIST certified holmium oxide sample

This cuvette holder can be placed instead of a flow cell in the variable wavelength detector. Standard cuvettes with standards in it, for example, National Institute of Standards & Technology (NIST) holmium oxide solution standard, can be fixed in it.

This can be used for wavelength verifications.

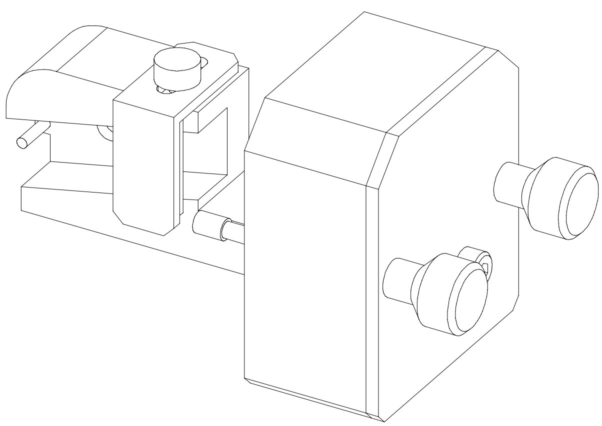
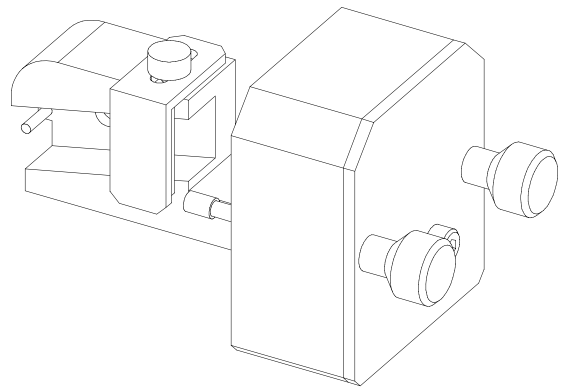


Figure 41 Cuvette Holder

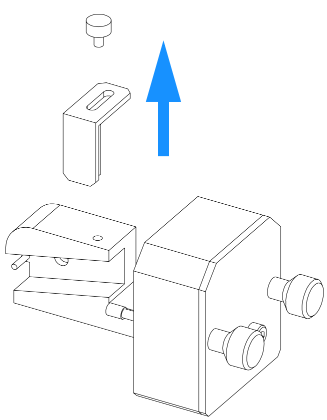
Preparation for this procedure are:

- Remove the normal flow cell.
- Have cuvette with standard available.

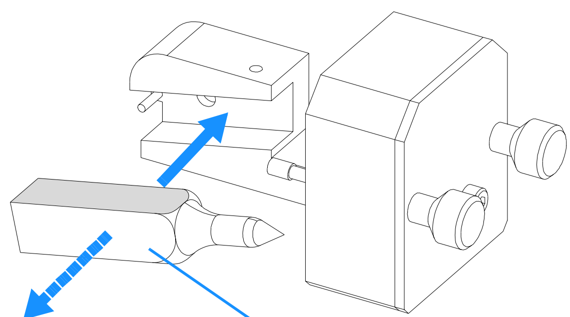
1 Locate the cuvette holder on the desk.



2 Unscrew the bracket.

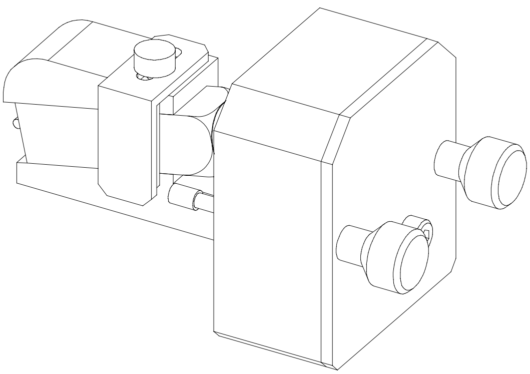


3 Insert the cuvette with the sample into the holder. The clear side of the cuvette must be visible.



Next steps:

- Reset the lamp counter as described in the User Interface documentation.
- Turn the lamp ON.
- Give the lamp more than 10 minutes to warm-up.
- Perform "Wavelength Verification/Calibration" on page 155 to check the correct positioning of the lamp.

4 Replace the bracket and fix the cuvette. 	**5** Install the cuvette holder in the instrument.

Next steps:

- Perform your verification.

Correcting Leaks

When required	If a leakage has occurred in the flow cell area or at the capillary connections.
Tools required	Tissue Two 1/4 inch wrenches for capillary connections
Parts required	None

1 Remove the front cover.

2 Use tissue to dry the leak sensor area.

3 Observe the capillary connections and the flow cell area for leaks and correct, if required.

4 Replace the front cover.

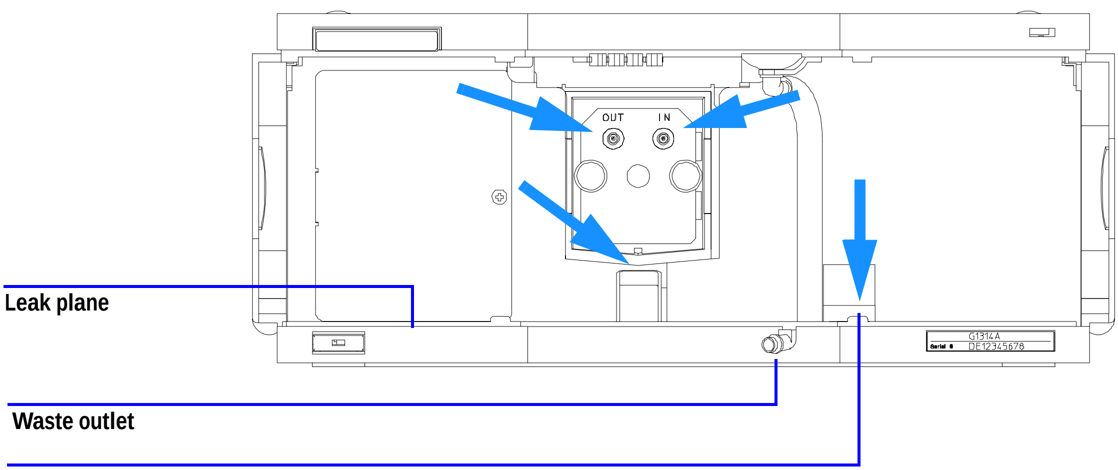


Figure 42 Drying the Leak Sensor

Replacing Leak Handling System Parts

When required	If the parts are corroded or broken.
Tools required	None
Parts required	Leak funnel 5061-3356 Leak funnel holder 5041-8389 Leak tubing (120 mm) 0890-1711

1 Remove the front cover to have access to the leak handling system.

2 Pull the leak funnel out of the leak funnel holder.

3 Pull the leak funnel with the tubing out of its location.

4 Replace the leak funnel and/or the tubing.

5 Insert the leak funnel with the tubing in its position.

6 Insert the leak funnel into the leak funnel holder.

7 Replace the front cover.

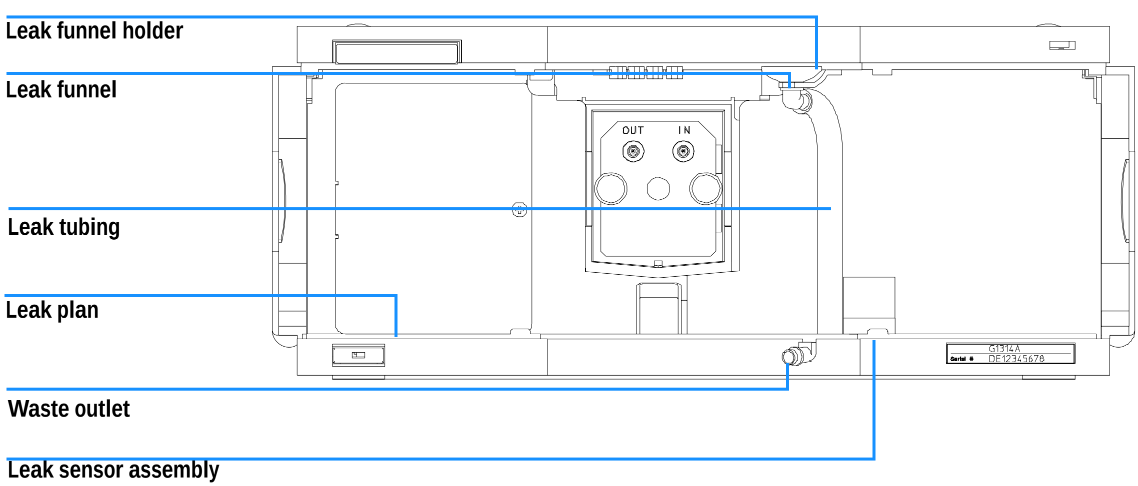
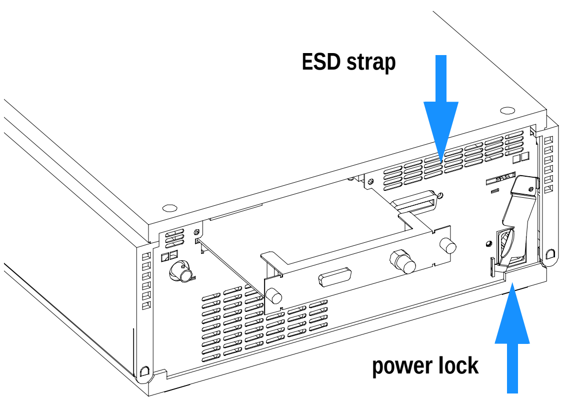


Figure 43 Replacing Waste Handling System Parts

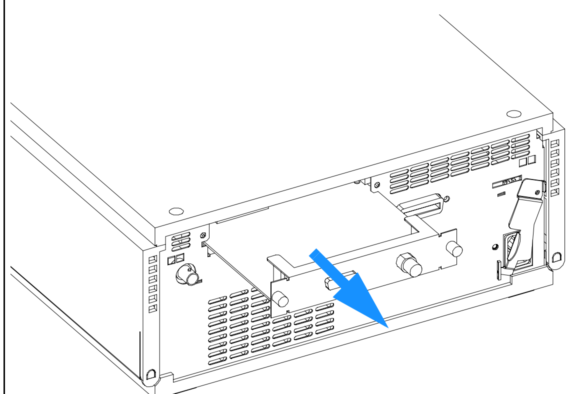
Replacing the Interface Board

When required	When defective or for installation of the board or for all repairs inside the detector.
Part required	Interface board (BCD) G1351-68701 with external contacts and BCD outputs, see "BCD Board" on page 287. LAN Communication Interface board G1369A or G1369-60001, see "LAN Communication Interface Board" on page 289.
Tools required	None

1 Install the ESD strap. Move the power lock across the power inlet.



2 If required, unscrew and remove the interface board. Place the board on the ESD kit.



3 If required, insert the interface board and fix the screws.

Next steps:

- Remove the ESD strap.
- Reinstall the module into the stack.

Replacing the Detector's Firmware

When required	If new version solves problems of currently installed version or after exchange of the detector main board (VWM) the version on board is older than previous installed one.
Tools required	LAN/RS-232 Firmware Update Tool, or Instant Pilot G4208A or Control Module G1323B
Parts required	Firmware, tools and documentation from Agilent web site
Preparations	Read update documentation provided with the Firmware Update Tool.

The installation of *older* firmware might be necessary:

- to keep all systems on the same (validated) revision, or
- if third part control software requires a special version.

To upgrade/downgrade the detector's firmware the following steps have to be performed:

1. Download the module's firmware, the LAN/RS-232 FW Update Tool Version 2.00 or above and the documentation from the Agilent web

   http://www.chem.agilent.com/scripts/cag_firmware.asp.
2. Load the firmware into the detector as described in the documentation.

NOTE The G1314C VWD-SL requires firmware revision A.06.02 or above (main and resident).

Tests & Calibrations

The following tests are required after maintenance of lamps and flow cells:

- “Intensity Test" on page 153.
- “Wavelength Verification/Calibration" on page 155.
- “Holmium Oxide Test" on page 156.

Intensity Test

The intensity test measures the intensity of the deuterium lamp over the full VWD wavelength range (190 – 600 nm). The test can be used to determine the performance of the lamp, and to check for dirty or contaminated flow cell windows. When the test is started, 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 characteristics. Therefore, intensity spectra will differ slightly between instruments. Figure 44 shows a typical intensity test spectrum.

Intensity Test Evaluation (Agilent ChemStation only)

The Agilent ChemStation evaluates three values automatically and displays the limits for each value, the average, the minimum and the maximum of all data points and *passed* or *failed* for each value.

Test Failed

Probable Causes

- Absorbing solvent in flow cell.
- Dirty or contaminated flow cell.
- Dirty or contaminated optical components (source lens, mirrors, grating).
- Old or non-Agilent lamp.

Suggested Actions

✔ Ensure the flow cell is filled with water.

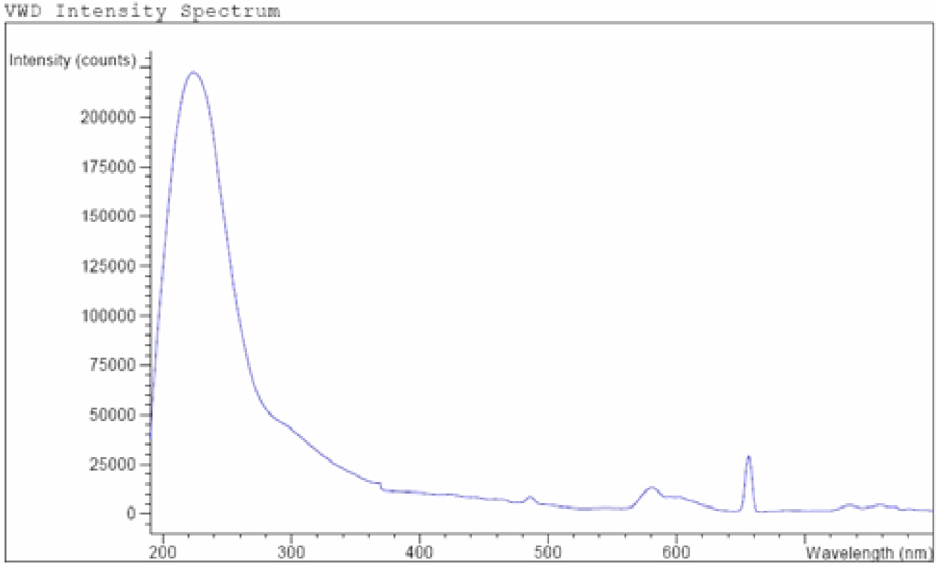
✔ Repeat the test with the flow cell removed. If the test passes, exchange the flow cell windows.

✔ Clean/replace optical components.

✔ Exchange the lamp.

```
Instrument:        G1314B
Serial Number:     JP33324886
Operator:          Wolfgang
Date:              03.01.2006
Time:              15:07:09
File:              C:\CHEM32\2\DIAGNOSE\VWD_INT.DGR
```

VWD Intensity Spectrum



VWD Intensity Test Results

	Specification	Measured	Result
Accumulated lamp on time		94.35 h	
Highest intensity	> 10000 cts	222615 cts	Passed
Average intensity	> 5000 cts	29734 cts	Passed
Lowest intensity	> 200 cts	1137 cts	Passed

Figure 44 Intensity Test (Report)

Wavelength Verification / Calibration

Wavelength calibration of the detector is done using the zero-order position and 656 nm emission line position of the deuterium lamp. The calibration procedure involves two steps. First the grating is calibrated on the zero-order position. The stepper-motor step position where the zero-order maximum is detected is stored in the detector. Next, the grating is calibrated against the deuterium emission-line at 656 nm, and the motor position at which the maximum occurs is stored in the detector.

In addition to the zero-order and 656 nm (alpha-emission line) calibration, the beta-emission line at 486 nm and the three holmium lines are used for the complete wavelength calibration process. These holmium lines are at 360.8 nm, 418.5 nm and 536.4 nm.

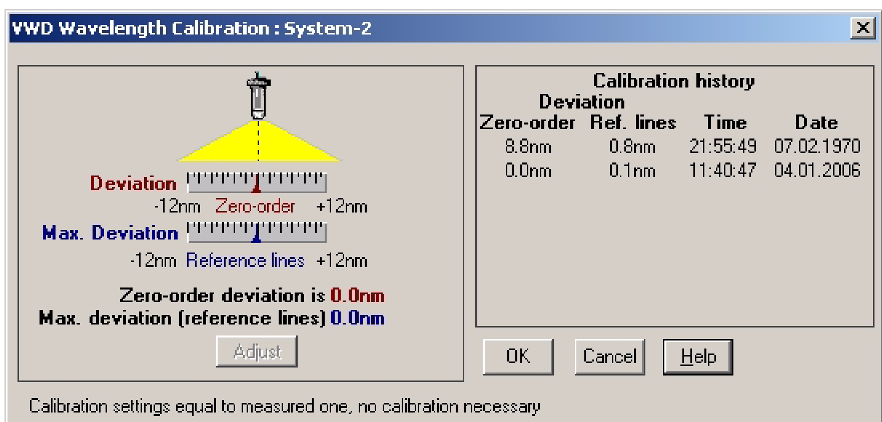


Figure 45 Wavelength Verification / Calibration

NOTE

The wavelength verification / calibration takes about 2.5 minutes and is disabled within the first 10 minutes after ignition of the lamp because initial drift may distort the measurement.

When the lamp is turned ON, the 656 nm emission line position of the deuterium lamp is checked automatically.

Holmium Oxide Test

This test verifies the calibration of the detector against the three wavelength maxima of the built-in holmium oxide filter. The test displays the difference between the expected and measured maxima. Figure 46 shows a holmium test spectrum.

The test uses the following holmium maxima:

- 360.8 nm
- 418.5 nm
- 536.4 nm

NOTE

See also "Declaration of Conformity for HOX2 Filter" on page 313.

When to do the Test

- after recalibration,
- as part of the Operational Qualification/Performance Verification procedure, or
- after flow cell maintenance or repair.

Interpreting the Results

The test is passed successfully when all three wavelengths are within ± 1 nm of the expected value. This indicates the detector is calibrated correctly.

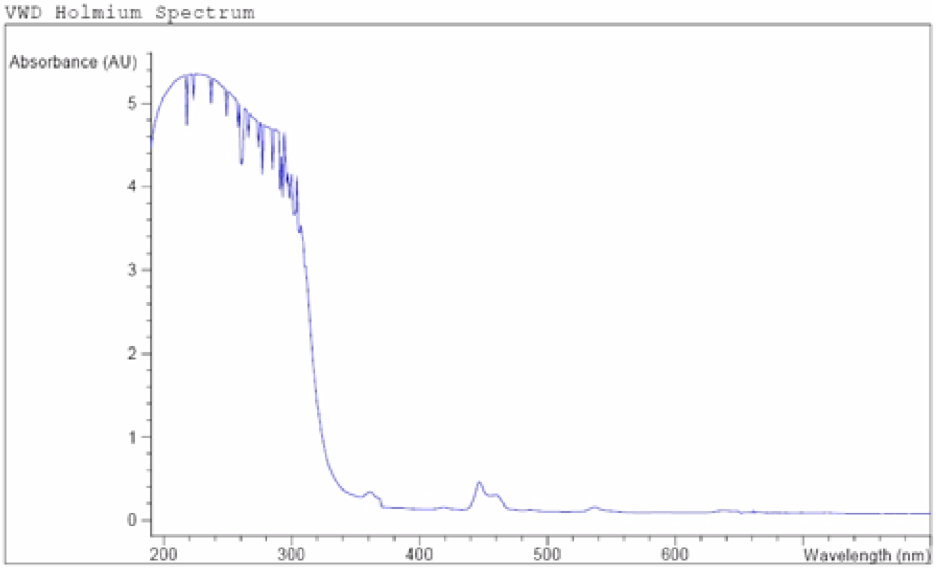
NOTE

The test results are currently available on the Agilent ChemStation only.

ChemStation revisions below B.01.xx show a limit of ± 2 nm. It should read ± 1 nm. If the test shows a value greater than ± 1 nm, perform a recalibration.

```
Instrument:         G1314B
Serial Number:      JP33324886
Operator:           Wolfgang
Date:               03.01.2006
Time:               15:26:41
File:               C:\CHEM32\2\DIAGNOSE\VWD_HOLM.DGR
```

VWD Holmium Spectrum



VWD Holmium Test Results

	Specification	Measured	Result
Deviation from wavelength 1: 360.8 nm	-1..1 nm	0.0 nm	Passed
Deviation from wavelength 2: 418.5 nm	-1..1 nm	0.1 nm	Passed
Deviation from wavelength 3: 536.4 nm	-1..1 nm	0.0 nm	Passed

Figure 46 Holmium Test (Report)

Holmium Oxide Test Failed

Probable Causes

- Detector not calibrated.
- Dirty or defective flow cell.
- Dirty or defective holmium oxide filter.
- Optical misalignment.

Suggested Actions

- ✔ Re-calibrate the detector.
- ✔ Repeat the test with the flow cell removed. If the test is OK, exchange the flow cell components.
- ✔ Run the holmium oxide filter test. If the test fails, exchange the filter assembly.
- ✔ Realign the optical components.

12
Repair

This chapter gives instructions on how to repair the detector.

Cautions and Warnings

WARNING **The following procedures require opening the main cover of the detector. Always ensure the detector is disconnected from the line power when the main cover is removed. The security lever at the power input socket prevents the detector cover from being taken off when line power is still connected.**

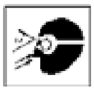
WARNING **To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the switch on the front panel is turned off.**

WARNING **When working with solvents please observe appropriate safety procedures (for example. goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when using toxic or hazardous solvents.**

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

CAUTION Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use an ESD protection (for example, the ESD wrist strap from the accessory kit) when handling electronic boards and components, see “Using the ESD Strap" on page 133

WARNING **Eye damage may result from directly viewing the light produced by the Deuterium lamp used in this product. Always turn off the deuterium lamp before removing it.**



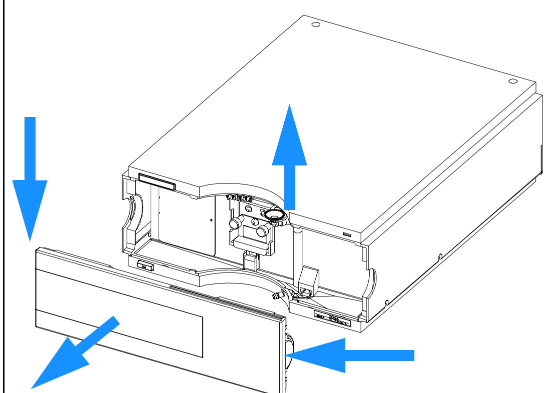
Removing the Top Cover and Top Foams

When required	For all repairs inside the detector.
Tools required	Screwdriver POZI 1 PT3
Parts required	Depends on the work inside and the following procedures.

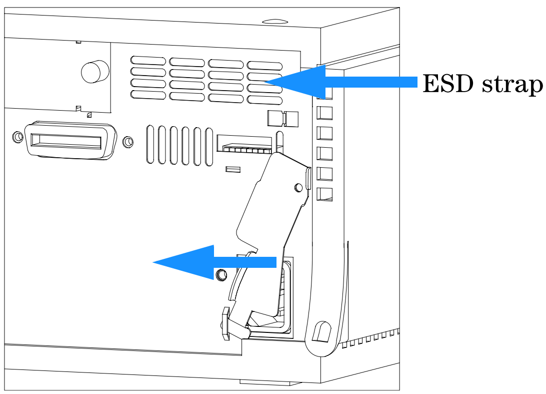
Preparations for this procedure:

- Turn OFF the detector.
- Disconnect the power cable.
- Disconnect capillaries.
- Remove detector from stack and place it on the working bench.

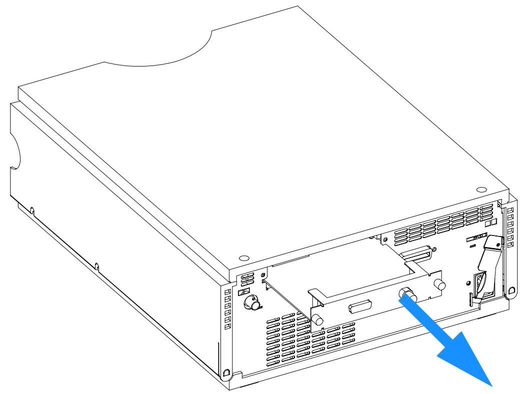
1 Press the release buttons and remove the front cover. Unclip and remove the waste funnel assembly.



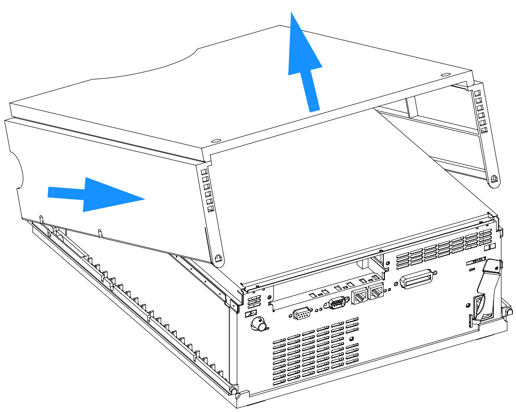
2 Install the ESD strap. Move the power lock across the power inlet.



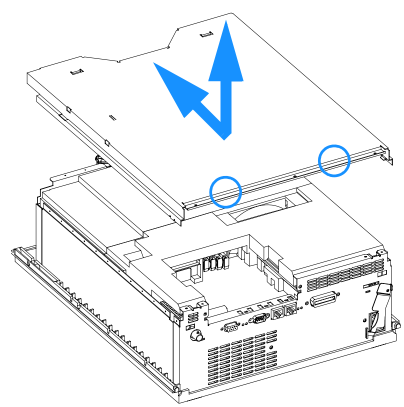
3 If installed, unscrew and remove the interface board. Place the board on the ESD kit.



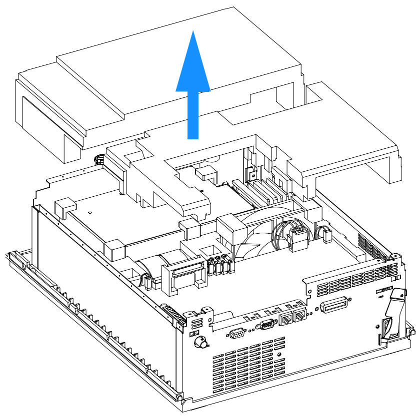
4 Lift the cover and slide it towards the rear.



5 Unscrew the screws at the rear of the top plate, slide the plate towards the front and remove it.



6 Carefully remove the top foams from the detector, first part #1, then part #2.



Note:

Do not connect a power plug to module after removing the top covers.

A safety light switch on the main board will turn off fan (immediately) and electronic (after 30 seconds) to avoid the operation with removed covers. An error will be generated (status lamp lights red) and the logbook will show an error message.

NOTE

The internal components are now accessible. Exchanging specific components are described in the following sections.

Exchanging the Main Board

When required	If the detector main board is defective or for repair on other assemblies
Tools required	Screwdriver POZI 1 PT3 Hexagonal wrenches 5 mm, 7 mm and 15 mm
Parts required	Detector main board VWM (exchange assembly) G1314-69531 (G1314C) Detector main board VWM (exchange assembly) G1314-69525 (G1314B)

NOTE The G1314C VWD-SL no longer has a GPIB connection. Therefore ignore all GPIB information.

1 Turn OFF the lamp.
2 Switch OFF the detector, and disconnect the cables.
3 Remove detector from stack and place it on the working bench.

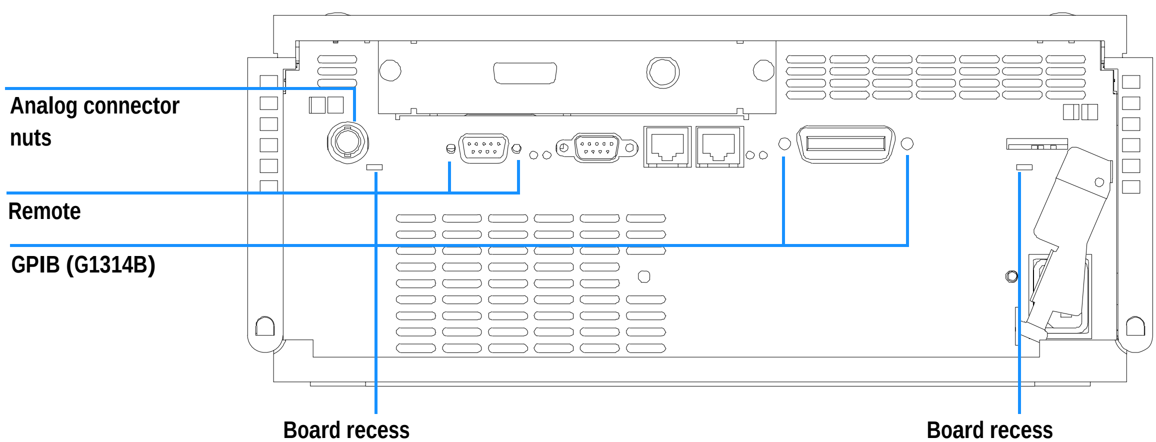


Figure 47 Unscrew Connectors From Board

4 Remove the front cover, top cover and top foam section, see "Removing the Top Cover and Top Foams" on page 163.

5 Use a 5-mm and 7-mm wrench to unscrew the REMOTE and the GPIB connector and a 15-mm wrench to unscrew the analog connector nut.

6 Disconnect all connectors from the processor board.

NOTE When removing connectors, counter-hold with one hand on connector J3.

J1/2 -CAN
J3 -Interface board
J5 - Test connector
J12 - RS-232C
J15 - REMOTE
J17 - GPIB
J150 - Power supply
J201 - Grating motor
203 - Fan assembly
J204 - Leak sensor
J205 - Grating position
J207 - Filter motor
J208 - Analog output
J209 - Filter position
J400 -ADC board Sample
J401 -ADC Board Reference
J502 - Deuterium lamp
S1 - Configuration switch

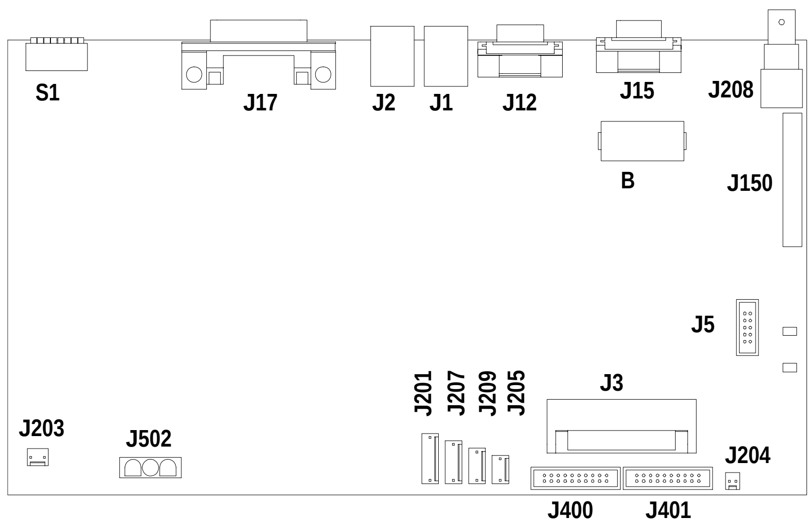


Figure 48 Location of Connectors on VWM Board

7 Remove the processor board. Place the board on the ESD kit.

NOTE If you also have to replace other assemblies, continue with that work first.

8 On the new board check the switch setting of address switch S1, see “Setting the 8-bit Configuration Switch" on page 295.

NOTE An incorrect switch setting (for example, TEST/BOOT) may cause the module to turn in a basic mode (yellow or red flashing status light). In such a case turn off the module, re-set the address switches, and turn on the module again.

9 Install the new processor board and reconnect the connectors. Make sure that the board is fitted correctly in the board recesses in the holes at the rear panel.

10 Refit the screws at the REMOTE and GPIB connectors and the nut of the analog connector.

11 Reinstall the top foam section, top cover and front cover, see “Installing the Foam and the Top Cover" on page 225.

12 Replace detector into the stack and reconnect the cables.

NOTE If a new VWM board was installed, update the serial number information of the detector in the user interface, see procedure below.

13 Check the firmware revision of the module. If the firmware revision is older than the current firmware revision of the module, update the firmware using the standard firmware update procedure, see “Replacing the Detector’s Firmware" on page 151.

14 The detector requires a wavelength recalibration to write down the calibration parameters into the board’s memory, see “Wavelength Verification/Calibration" on page 105.

Changing the Type and Serial Number

When required	If detector main board has been replaced.
Tools required	User interface
Parts required	none
Preparations	• Turn the detector on. • Start the user interface.

When the main board has to be replaced, the new board does not have a serial number. For some modules (e.g. pumps or auto samplers) the type has to be changed (multiple usage boards). Use the information from the serial number plate of your module.

The changes become active after the reboot of the module.

Using the Agilent ChemStation

Module serial numbers are entered by typing specific commands on the command line at the bottom of the main user interface screen.

1 To enter a module serial number, type the following command into the command line:

```
print sendmodule$(lvwd, "ser ‘YYYYYYYYYY’")
```

Where: YYYYYYYYYY is the 10-character serial number of the module in question.

NOTE The first two characters are letters, which should be capitalized.

The reply line will respond with **RA 0000 SER** followed by the module serial number you just entered.

To change the type of the module use the following command:

```
print sendmodule$(lvwd, "TYPE XXXXX")
```

Where: XXXXX is the 5-character product number of the module (e.g. G1314B).

NOTE To configure the detector as G1314C (VWD-SL) requires the correct main board version.

WARNING **If you enter the wrong type, your module will not be accessible anymore. In such a case see** **"Using the Instant Pilot G2408A" on page 170 or "Using the Control Module G1323B" on page 171** **for recovering.**

2 Turn OFF the detector, then ON again. Then, restart the Agilent ChemStation. If the serial number you have just entered is different than the original module serial number, you will be given the opportunity to edit the configure **1200 access** screen during the restart of the Agilent ChemStation.

3 After restart, the serial number/type you have just entered can be seen under the **Instrument** menu of the main user interface screen.

Using the Instant Pilot G2408A

1 Connect the Instant Pilot to the detector. Turn ON the detector.

2 On the Instant Pilot's Welcome screen, press **More**, then select **Maintenance**. Using the **up/down arrows**, select the detector where you have to change the product number or serial number.

3 Press **PN/SN**. This will display a screen where you can enter the product number and/or serial number.

4 Make your changes, using the information from the product label of your detector.

NOTE To configure the detector as G1314C (VWD-SL) requires the correct main board version.

WARNING **If you enter the wrong type, your module might not be accessible anymore with the Agilent ChemStation and the Instant Pilot (unsupported module). In such a case follow the** **"Recover Instructions" on page 171.**

5 Press **OK** to highlight the complete command.

6 Press **Done** to transfer the information into the main board's memory. Press **Cancel** quit the process.

7 Turn the detector OFF then ON again. The Maintenance screen should display the correct serial number for this module.

8 If an Agilent ChemStation is also connected, restart the Agilent ChemStation now as well.

Recover Instructions

1 Turn off the detector.

2 Change the 8-bit Configuration Switch to Resident (see "Stay-Resident Settings" on page 299).

3 Turn the detector on.

4 Re-do steps 2 to 5 of "Using the Instant Pilot G2408A" on page 170 and correct the type information. Enter the product number without "-R"

5 Turn the detector off.

6 Change the 8-bit Configuration Switch back to default settings (see "Setting the 8-bit Configuration Switch" on page 295).

7 Turn the detector ON again. The Maintenance screen should display the correct type for this module.

Using the Control Module G1323B

1 Connect the control module to the detector. Turn ON the detector.

2 On the control module, press **System** (**F5**), then **Records** (**F4**). Using the **up/down arrows**, make sure that the detector is highlighted.

3 Press **FW Update** (**F5**), then **m.** This will display a box which says **Update Enter Serial#**.

4 Press **Enter**. This will display the box labeled **Serial#**.

5 Letters and numbers are created using the up and down arrows. Into the box labeled Serial#, enter the 10-character serial number for the detector. When the 10-character serial number is entered, press **Enter** to highlight the complete serial number. Then, press **Done** (**F6**).

6 Turn the detector OFF then ON again. The Records screen should display the correct serial number for this module.

7 If a Agilent ChemStation is also connected, restart the Agilent ChemStation now as well.

To change the product number go to the **System** screen.

1 Press **Tests (F3)** and select the detector and press **Enter**.

2 While in the Tests screen, press **m.m** (m dot m).

3 From the box now displayed, select the **Command**, and press **Enter**.

4 Into the box labeled **Nester** (instruction), enter the command **TYPE XXXXX**.

   Letters and numbers are created using the up and down arrows. XXXXX is the 5-character product number of the module being changed. There must be a space between the word TYPE and the product number.

   Examples:**TYPE G1314B** to configure as a VWD.

   TYPE G1314C to configure as a VWD-SL

NOTE

To configure the detector as G1314C (VWD-SL) requires the correct main board version.

WARNING

When the command is entered, press **Enter** to highlight the complete command.

If you enter the wrong type, your module might not be accessible anymore with the Agilent ChemStation. In such a case re-enter the TYPE command correctly.

5 Now, press the **Execute** key. Below the box, a reply line should then say:

   Reply RA 0000 TYPE "XXXXX" (XXXXX is what you just entered)

6 Turn the detector off, then on again. Turn on should be normal. In the **Records** screen, the product# column should indicate the module you just entered. If an Agilent ChemStation is also connected, re-boot it now.

Exchanging the Fan

When required	If the fan is defective or noisy
Tools required	Screwdriver POZI 1 PT3
Parts required	Fan G1314-65004 Other parts see "Optical Unit and Fan Assembly" on page 242.

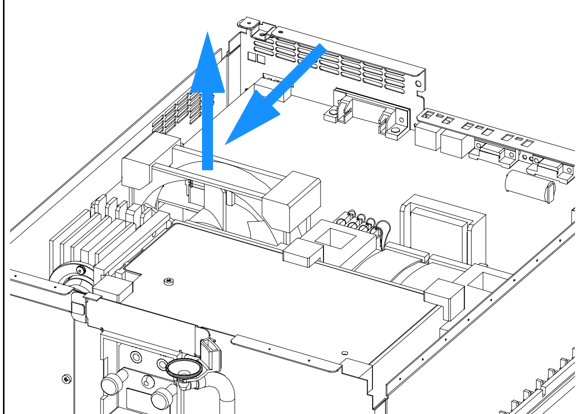
CAUTION The fan must be installed in the correct orientation to ensure optimum cooling and operation of the detector.

NOTE With the introduction of the 1200 Series VWD, the fan protection cover (grille) was changed slightly. For parts see "Optical Unit and Fan Assembly" on page 242. It has to

Preparations for this procedure:

- Turn OFF the lamp.
- Switch OFF the detector, and disconnect the cables.
- Remove detector from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section, see "Removing the Top Cover and Top Foams" on page 163.

1 Disconnect the fan from the main board and remove the fan assembly.



2 Remove the bumper from the fan.

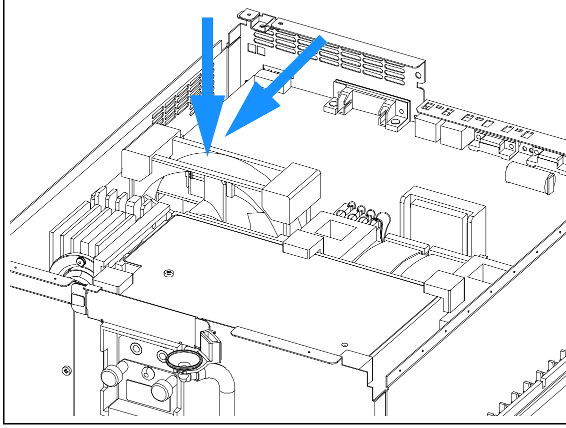
3 Remove the fan protection grille.

4 Exchange the fan.

5 Refit the fan protection grille (newer grilles are just clipped).

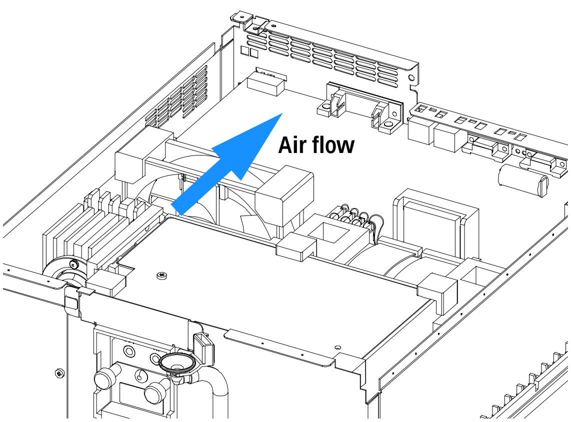
6 Replace the bumpers.

7 Fit the fan assembly into its location. Replace and reconnect the fan assembly to the main board.



Note:

The fan must be installed in the correct orientation to ensure optimum cooling and operation of the detector. The direction of air flow is from the front towards the rear.



Next steps:

- Reinstall the top foam section, top cover and front cover, see "Installing the Foam and the Top Cover" on page 225.
- Replace detector into the stack.
- Reconnect the cables and turn ON the detector.

Repairs in the Optical Unit

Inside the optical unit the following assemblies may be replaced by detector users:

- the source lens assembly, described on page 179, and
- the filter assembly, described on page 182.

All other repairs within the optical unit require special knowledge and training. Therefore these repairs and calibrations must be performed by Agilent Technologies trained service engineers.

NOTE Troubleshooting should be performed with a clean and bubble-free flow cell and with a new deuterium lamp or one in good condition.

In case of the following problem symptoms call your local Agilent Technologies service representative for help:

- low intensity readings after replacement of lamp and/or cleaning of the flow cell and/or source lens assembly,
- calibration failures (zero-order, holmium oxide lines or 656 nm emission lines),
- excessive noise and/or drift,
- grating drive failures,
- filter drive failures, and
- no intensity readings on one or both, the reference and/or sample side.

Special Notes

The following procedures describe the replacements of parts separately.

WARNING

During these procedures the instrument is turned on. Do not touch the processor board nor the lamp cables.

NOTE

It is important that only one assembly (mirror, grating, beam splitter, ...) is changed and calibrated at a time. Otherwise you will lose correct optical assembly alignment during the calibration process.

WARNING

Do not remove the Entrance Slit Holder nor loosen it. Otherwise the optical unit has to be exchanged completely.

NOTE

NOTE

The photo current readings with test slit installed are much lower than with the standard slit.

NOTE

If mirrors or grating show signs of contaminations, read "Contaminated Mirrors and Grating" on page 177 first.

Contaminated Mirrors and Grating

Under some specific environmental conditions it might happen that the efficiency of the mirrors and the grating is decreasing faster than normal. This results in low photo current readings on sample and reference side.

NOTE Contaminated mirrors and the grating should be replaced.

As a temporary solution the following procedure might be performed (for mirrors only), until new mirrors are available.

1 Note the photo current values of reference and sample side.
2 Open the optical unit and observe the mirrors and the grating.
3 If the mirror or grating shows a clouded surface (contaminations), you can try to clean the surface carefully within the instrument.

NOTE Use HPLC grade water, isopropanol or ethanol (might depend on the contaminations) and a lint-free tissue.

4 Do not bring to much stress onto the mirror surface to avoid scratches or misalignment.
5 Take care that the mirror surface has no deposits left from the cleaning process.
6 Close the optical unit and perform zero-order and wavelength calibration.
7 Note the photo current values of reference and sample side and compare with step 1.

Repairs in the Top Section

Following parts can be replaced in the top section:

- Mirror #1 and #2
- Grating Assembly
- Filter Assembly
- Beam Splitter Assembly
- Photo diodes
- Lens Assembly

For replacements in the bottom section of the optical unit see “Repairs in the Bottom Section" on page 201.

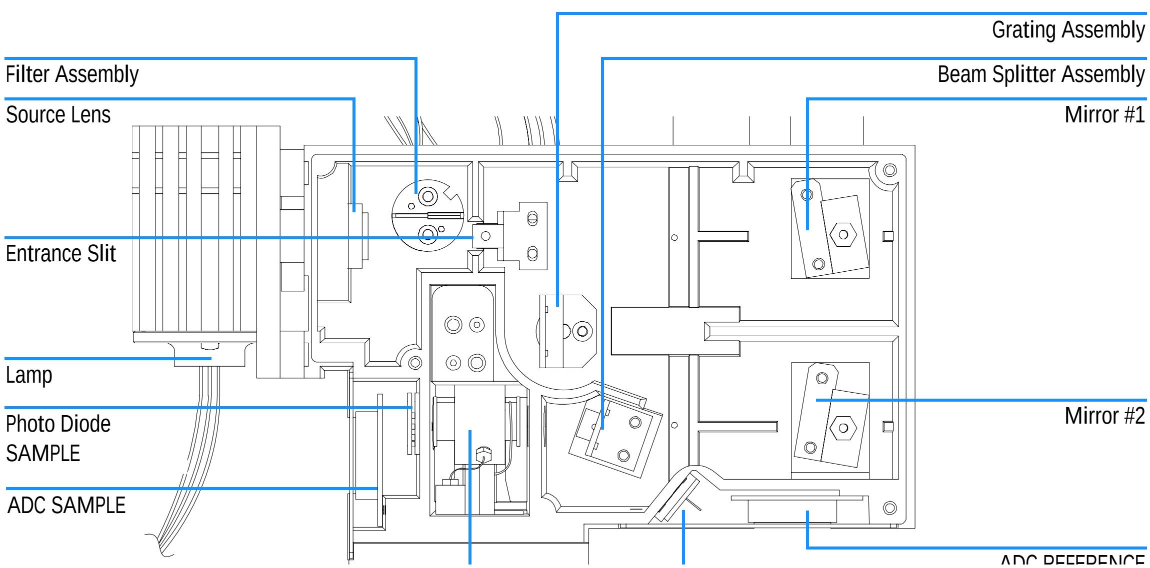


Figure 49 Location of Replaceable Parts in the Optical Unit (Top Section)

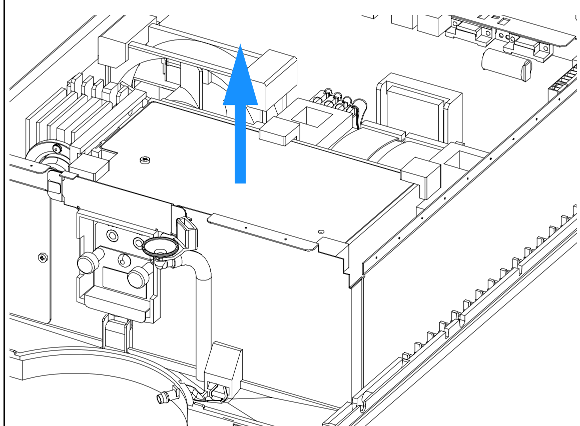
Exchanging the Source Lens Assembly

When required	The lens assembly may be replaced when the transmission of light is reduced and a lamp exchange does not improve the light-throughput
Tools required	Screwdriver POZI 1 PT3 Hexagonal wrench 1.5 mm
Parts required	Source lens assembly G1314-65008

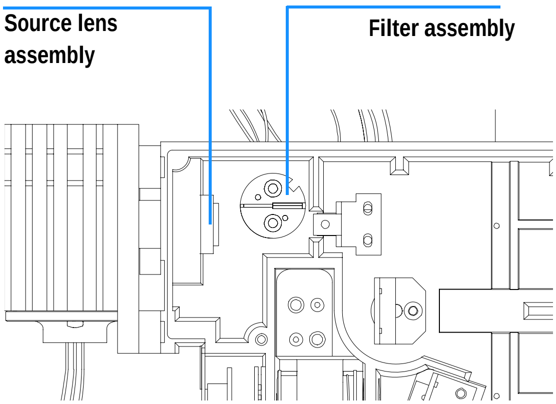
Preparation for this procedure are:

- Turn OFF the lamp.
- Switch OFF the detector, and disconnect the cables.
- Remove the detector from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section, see ""Removing the Top Cover and Top Foams" on page 163.

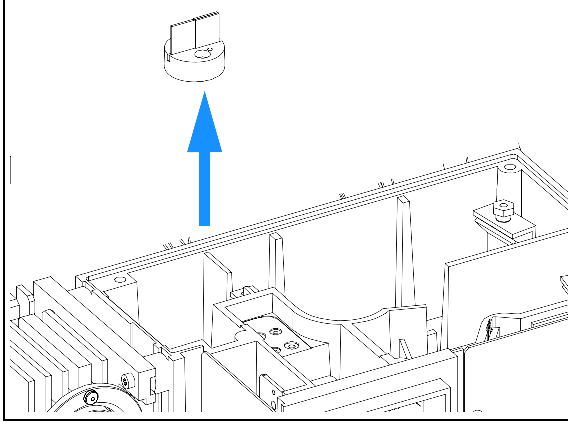
1 Remove the top cover of the optical unit.



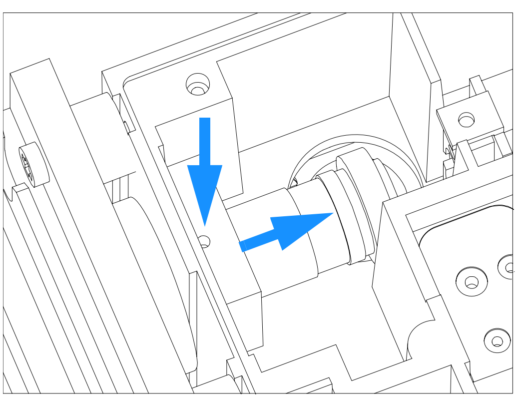
2 Locate the source lens and filter assembly.



3 Using a tweezers, counter-hold the filter assembly. Unscrew and remove the top part of the filter assembly.

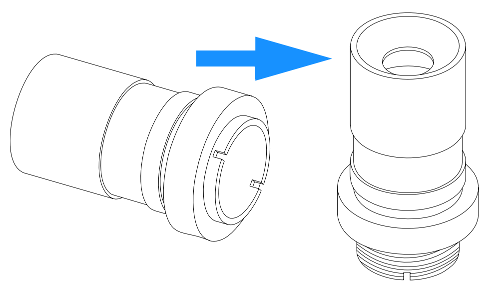


4 Loosen the setscrew and slide the lens assembly out of its holder.

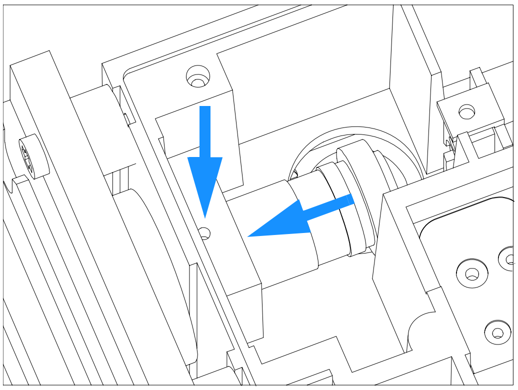


Note:

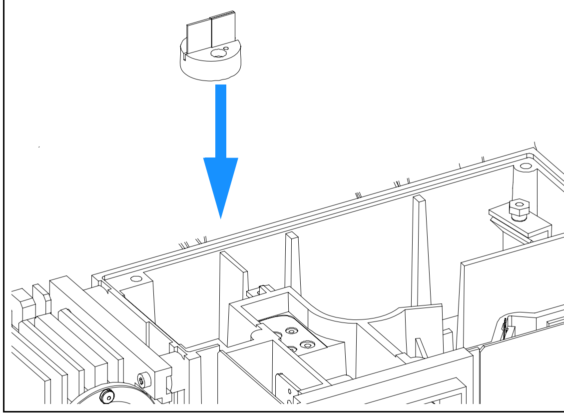
Unscrew the insert and place the assembly as shown. The lens cannot be removed. It is cleanable with alcohol from the outside. Do not scratch the lens nor get contaminations onto it.



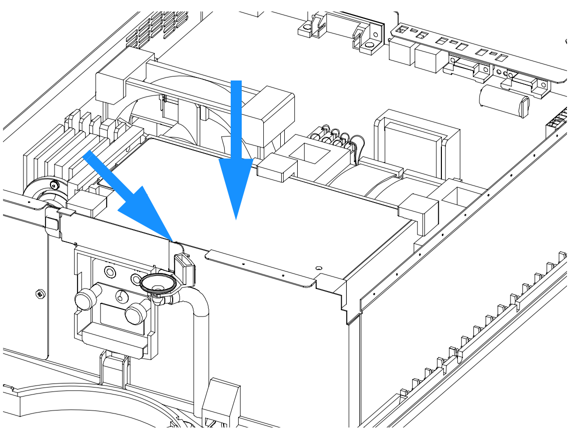
5 Slide the lens assembly into its position. Center the marker on the lens assembly. Fix it the setscrew.



6 Observe the orientation of the filter assembly top part. Install the assembly and fix the screws.



7 Replace the cover of the optical unit.



Next steps:

- Replace the bumpers in the top foam so that they are positioned on the optical unit.
- Reinstall the front cover, top cover and top foam section, see "Installing the Foam and the Top Cover" on page 225.
- Replace the front cover.
- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn ON the detector.

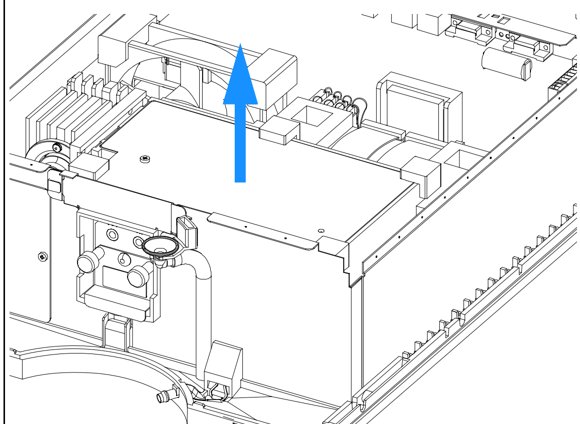
Exchanging the Filter Assembly

When required	The filter assembly may be replaced when the transmission of light is reduced and a lamp or source lens exchange does not improve the light-throughput
Tools required	Screwdriver POZI 1 PT3
Parts required	Filter assembly G1314-65010

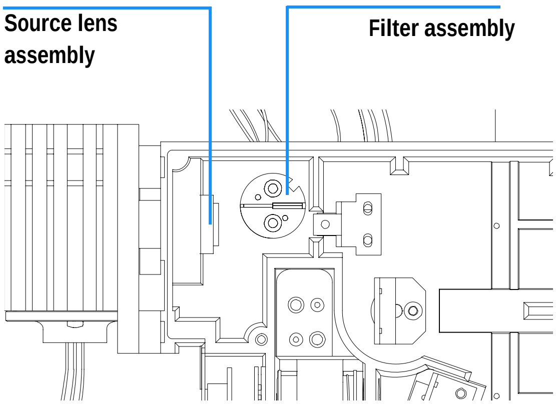
Preparation for this procedure are:

- Turn OFF the lamp.
- Switch OFF the detector, and disconnect the cables.
- Remove the detector from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section, see "“Removing the Top Cover and Top Foams" on page 163.

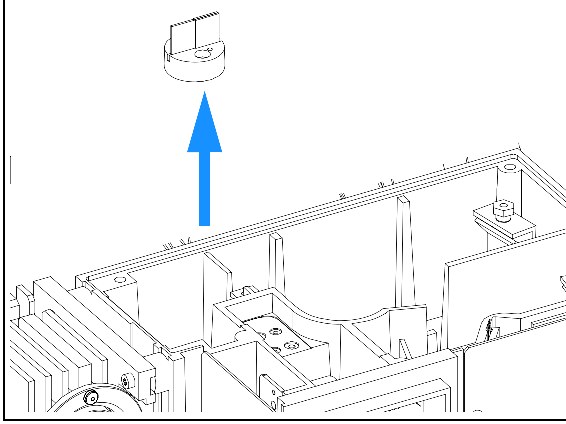
1 Remove the top cover of the optical unit.



2 Locate the source lens and filter assembly.

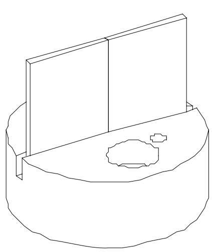


3 Using a tweezers, counter-hold the filter assembly. Unscrew and remove the top part of the filter assembly.

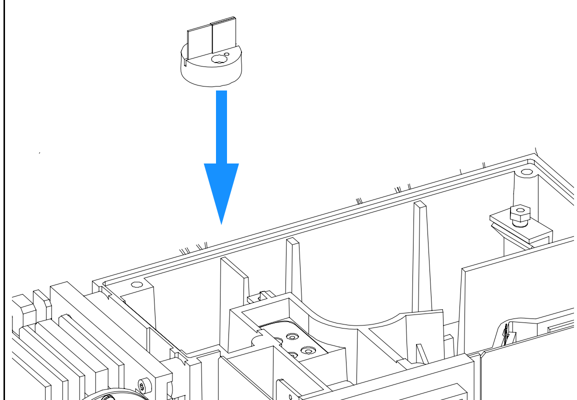


Note:

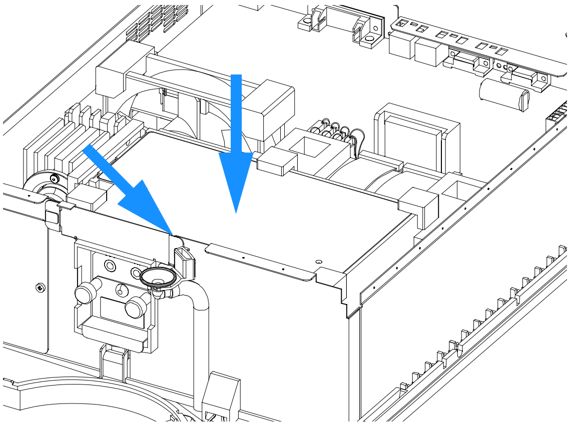
The filter may be cleaned with alcohol. Do not scratch the filter nor get contaminations onto it.



4 Observe the orientation of the filter assembly top part. Install the assembly and fix the screws.



5 Replace the cover of the optical unit.



Next steps:

- Replace the bumpers in the top foam so that they are positioned on the optical unit.
- Reinstall the front cover, top cover and top foam section, see "Installing the Foam and the Top Cover" on page 225.
- Replace the front cover.
- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn ON the detector.

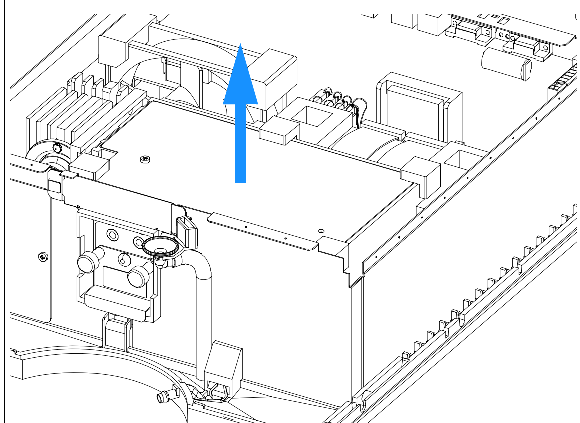
Installing the Test Slit

When required	This procedure has to be carried out at the beginning of all replacement procedures.
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch A pointed pair of pliers
Parts required	Test Slit, part of Slit Kit 79853-68746

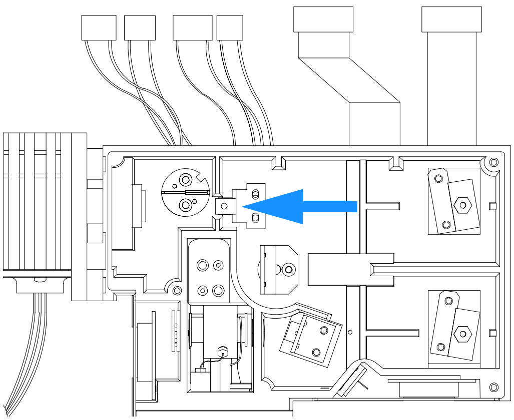
Preparation for this procedure are:

- Turn OFF the module.
- Disconnect the power cable.
- Disconnect capillaries.
- Remove module from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section (front part).

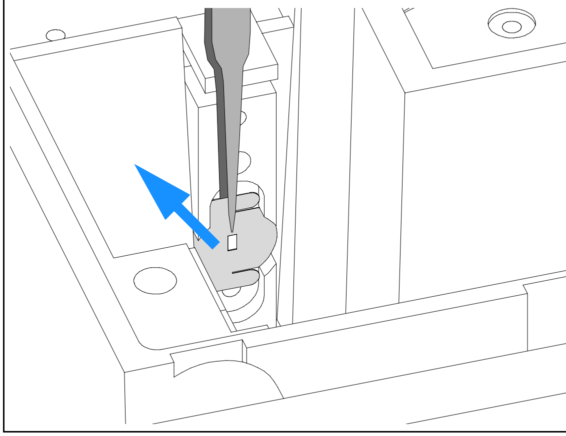
1 Remove the top cover of the optical unit. Take care for the reference aperture handle.



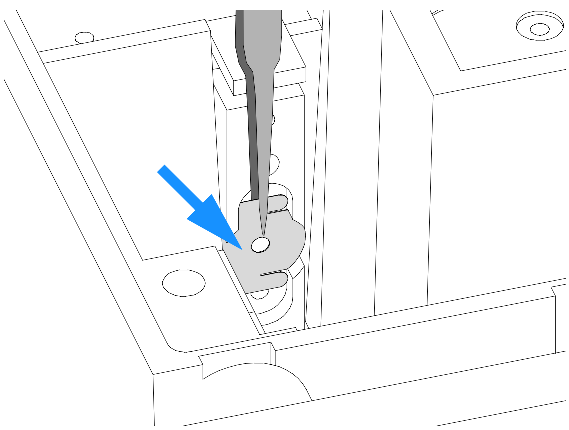
2 Locate the entrance slit holder.



3 Remove the standard slit from the entrance slit holder using a pair of tweezers and place it safe.



4 Carefully insert the test slit (with round hole) into the entrance slit holder starting at the arrow side first. The slit must sit flat on the holder with the white side towards the incoming light.



5 Return to the procedure you are coming from.

Exchanging the Mirror #1 or #2 Assembly

When required	The mirror assemblies might be replaced when the transmission of light is reduced and a lamp exchange or new lamp house lens do not improve the light-throughput.
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch Hexagonal wrench 1.5 mm A pointed pair of pliers
Parts required	Mirror #1 Assembly G1314-65012, Mirror #2 Assembly same as Mirror #1

NOTE

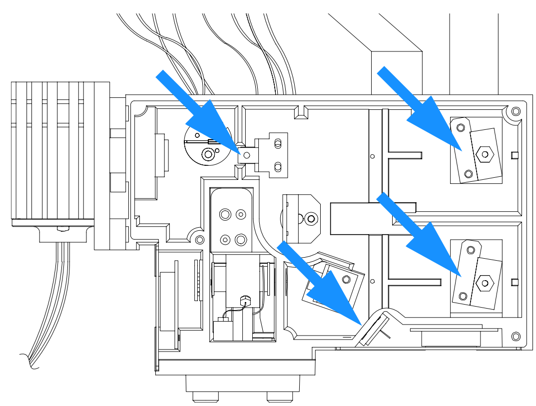
If mirrors show signs of contaminations, read "Contaminated Mirrors and Grating" on page 177 first.

Do exchange only one mirror at a time.

Preparation for this procedure are:

- Turn OFF the lamp.
- Switch OFF the module, and disconnect the cables.
- Remove the module from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section (front part).
- Install the Test Slit, see "Installing the Test Slit" on page 185.
- Turn lamp ON.

1 Locate the mirror #1 or #2, entrance slit holder and reference slit.



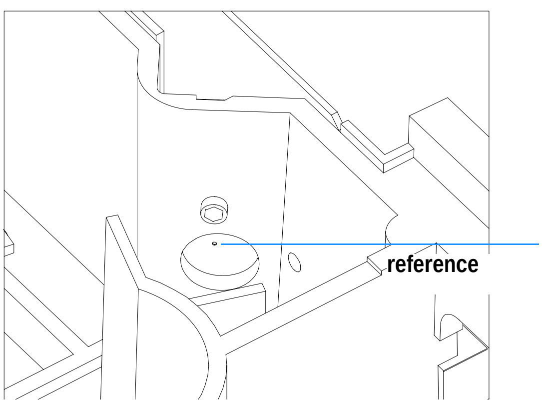
2 Replace mirror #1 or #2 (one at a time). Do not fix the screws yet.

The mirrors must not be cleaned. The surface will be damaged.

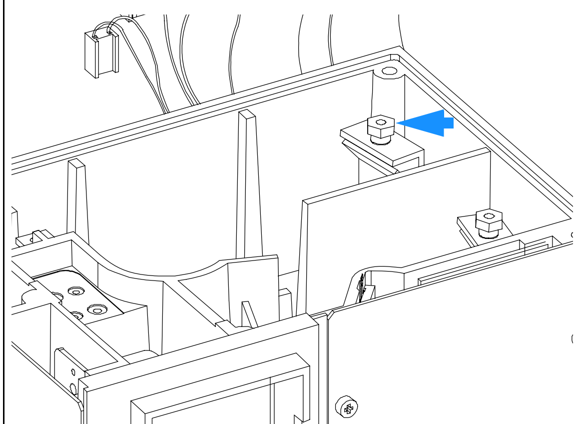
3 Enter the Service Dialog, see “Service Dialog” on page 124, and press **Zero-order**.

The grating is moved into the zero order position.

4 Locate the lamp image onto the reference slit hole.



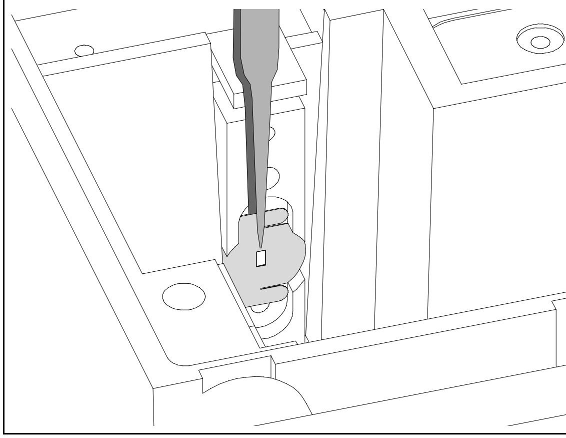
5 Position the lamp image onto the reference slit hole, horizontally by rotating the mirror assembly and vertically using the setscrew on the mirror. Fix the mirror.



6 Perform a wavelength calibration.

7 Do sample and reference optimization, see "Optimizing The Sample Readings" on page 196 and see "Optimizing the Reference Readings" on page 198.

8 Install the Standard Slit, "Installing the Standard Slit" on page 199.



Exchanging the Grating Assembly

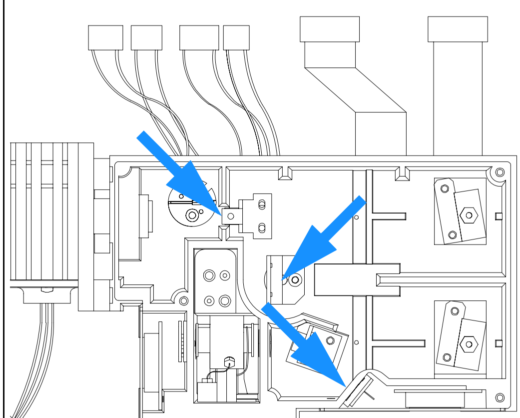
When required	The grating assembly might be replaced when the transmission of light is reduced and a lamp exchange or new lens or new mirrors #1/2 do not improve the light-throughput.
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch Hexagonal wrench 1.5 mm A pointed pair of pliers
Parts required	Grating Assembly G1314-65007 (includes test slit and seals for holes in cover)

NOTE If grating shows signs of contaminations, read "Contaminated Mirrors and Grating" on page 177 first.

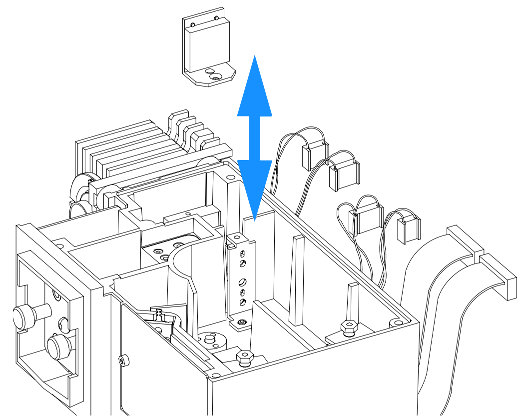
Preparation for this procedure are:

- Turn OFF the lamp.
- Switch OFF the module, and disconnect the cables.
- Remove the module from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section (front part), see Reference Handbook.
- Install the Test Slit, see "Installing the Test Slit" on page 185.
- Turn lamp ON.

1 Remove the cover of the optical unit. Locate the grating assembly, entrance slit holder and reference slit.

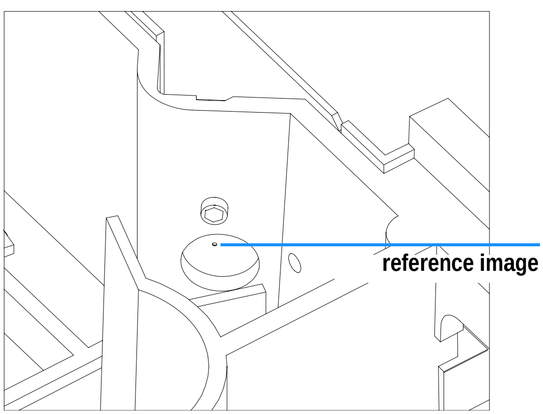


2 Remove the grating and reassemble new grating. Fix the grating on the shaft with the screw.



3 Perform a wavelength calibration.

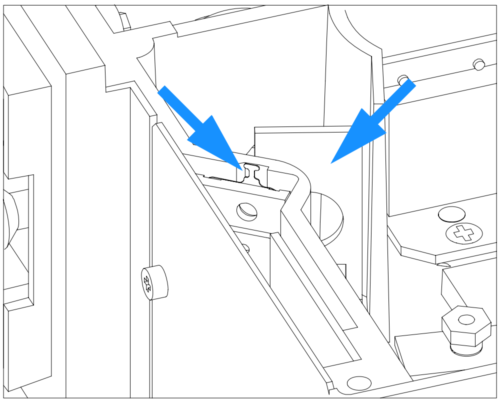
4 Enter the Service Dialog, see "Service Dialog" on page 124, and press **Zero-order**. Check the position of the image on the reference slit.



5 If not correct,

- Optimize the sample readings, using the setscrew of mirror #2 through the hole in the optical unit cover, see "Optimizing The Sample Readings" on page 196.
- adjust image horizontally by rotating the beam splitter.
- If necessary, unlock the reference aperture, see "Unlocking the Reference Aperture" on page 197.

6 Optimize the reference readings with the reference slit, see "Optimizing the Reference Readings" on page 198.



- Install the standard slit and perform electronic calibrations, see "Installing the Standard Slit" on page 199.
- Carefully replace the cover of the optical unit.

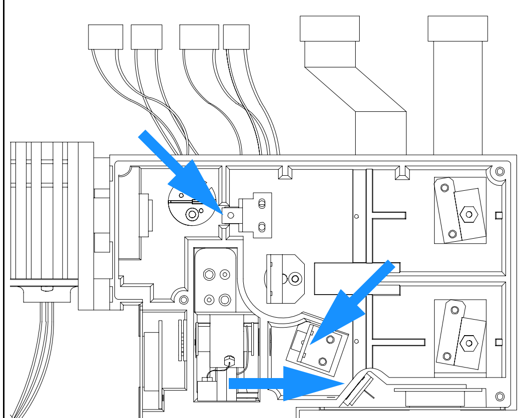
Replacing the Beam Splitter

When required	The beam splitter assembly might be replaced when the transmission of light is reduced and a lamp exchange, a new lamp house lens or mirrors and grating do not improve the light-throughput.
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch Hexagonal wrench 1.5 mm A pointed pair of pliers
Parts required	Beam Splitter Assembly G1314-65013 (includes test slit and seals for holes in cover)

Preparation for this procedure are:

- Turn OFF the lamp.
- Switch OFF the module, and disconnect the cables.
- Remove the module from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section (front part).
- Install the Test Slit, see "Installing the Test Slit" on page 185.
- Turn lamp ON.

1 Remove the cover of the optical unit. Locate the beam splitter assembly, entrance slit holder and reference slit.



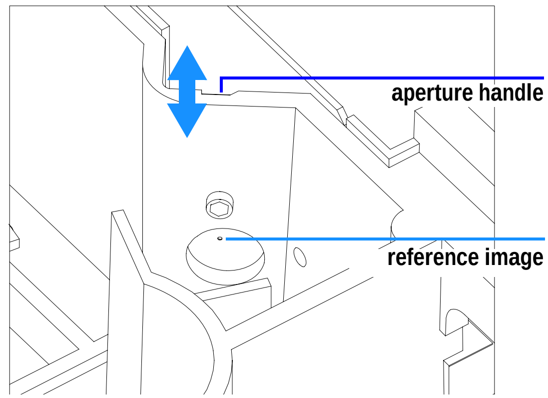
2 Perform a wavelength calibration.

3 Carefully remove the cover of the optical unit. Take care for the reference aperture handle.

4 Enter the Service Dialog, see “Service Dialog” on page 124, and press **Zero-order**.

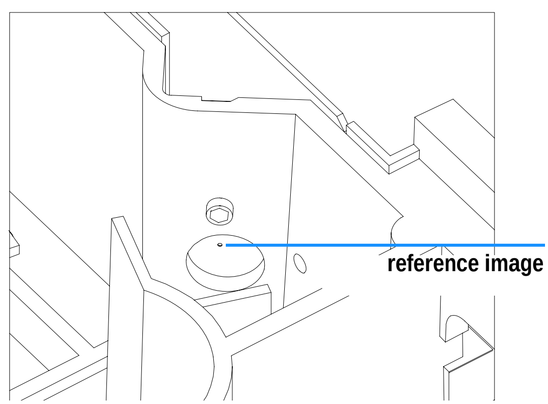
5 Unlock the reference aperture, see “Unlocking the Reference Aperture” on page 26.

6 Center the reference slit on the white image by moving the aperture up or down. The image diameter is nearly equal to the reference slit diameter.

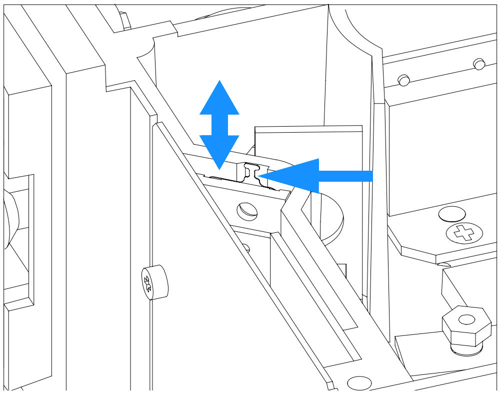


7 Replace the beam splitter assembly.

8 Position horizontally the white image center of the beam splitter onto the reference slit. Fix the beam splitter after precise image fit.



9 Correct new vertical position with reference slit.



- Replace the cover of the optical unit.
- Perform a BALANCE.
- Set l=254 nm.
- Enter the Service Dialog, see "Service Dialog" on page 124.
- Select Raw sample signal for value 1 and Raw reference signal for value 2.
- Press **Zero-order.**
- Optimize the sample readings using the setscrew of mirror #2 through the hole in the optical unit cover, see "Optimizing The Sample Readings" on page 196.
- Optimize the reference readings, see "Optimizing the Reference Readings" on page 198.
- Install the standard slit and perform electronic calibrations, see "Installing the Standard Slit" on page 199.

Optimizing The Sample Readings

1 Install the test slit, see “Installing the Test Slit" on page 185.

2 Set l=254 nm.

3 Enter the Service Dialog, see “Service Dialog" on page 124.

4 Select Raw sample signal for value 1 and Raw reference signal for value 2.

5 Optimize the sample readings using the setscrew of mirror #2 through the hole in the optical unit cover.

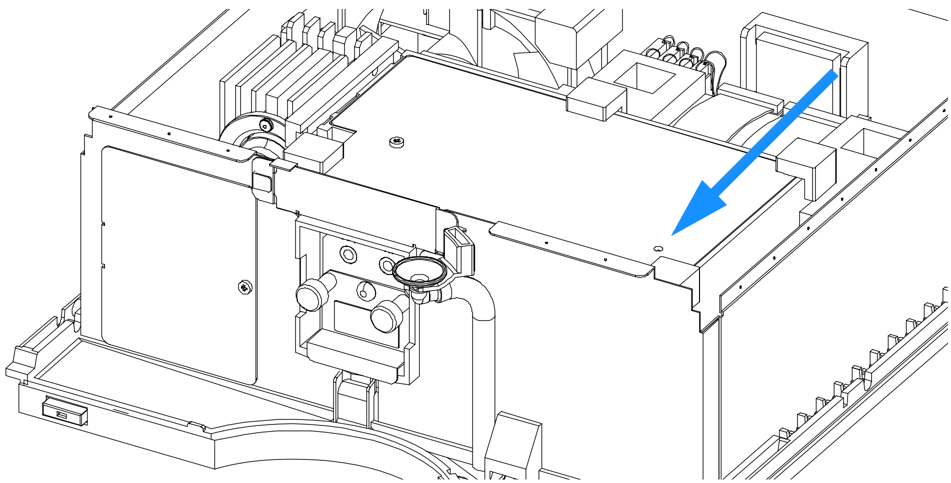


Figure 50 Aligning Mirror 2

6 Optimize the reference readings with the reference aperture, “Optimizing the Reference Readings" on page 198.

7 Install the standard slit and perform electronic calibrations, “Installing the Standard Slit" on page 199.

Unlocking the Reference Aperture

NOTE

Only necessary, if required during a replacement procedure.

For performance reasons, the reference aperture is fixed by one screw only and has to be unlocked prior to any replacement/calibration within the optical unit if appropriate.

1 Use a 2.5-mm hexagonal wrench to loosen the screw.
2 Replace the cover of the optical unit.
3 Turn on the detector and the lamp.
4 Set the wavelength to 254 nm.
5 Return to the replacement procedure.

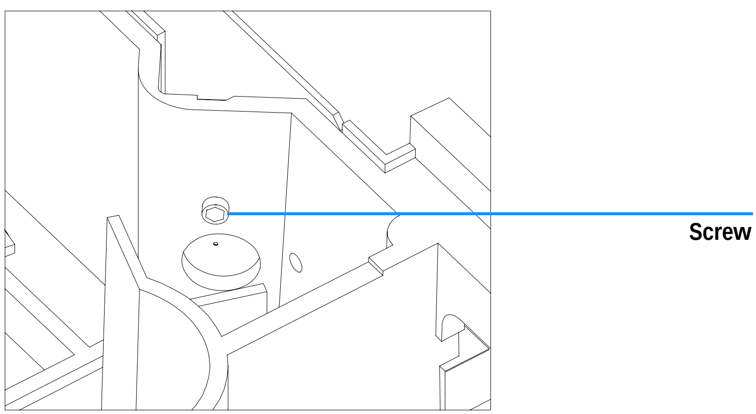


Figure 51 Unlocking the Reference Aperture

Optimizing the Reference Readings

1 Install the test slit, see "Installing the Test Slit" on page 185.

2 Replace the cover of the optical unit.

3 Enter the Service Dialog, see "Service Dialog" on page 124.

4 Select Raw sample signal for value 1 and Raw reference signal for value 2.

5 Press **Zero-order**.

6 Shift reference aperture vertically for maximum reference readings.

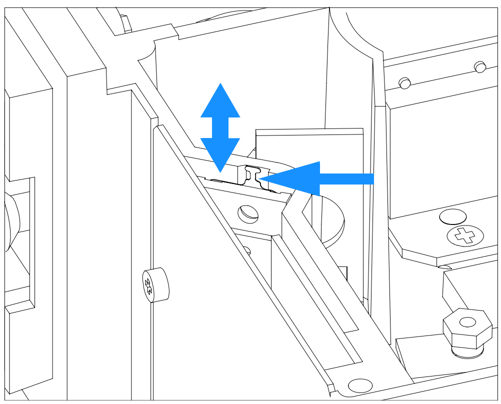


Figure 52 Optimizing the Reference Readings

7 Remove the top cover without touching the reference handle.

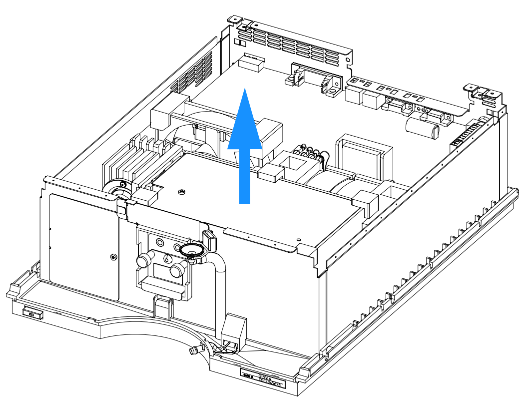
8 Fix the reference slit with the top lock screw of the photo diode assembly, Figure 4.

9 Continue with the next step of the procedure of the assembly you are replacing.

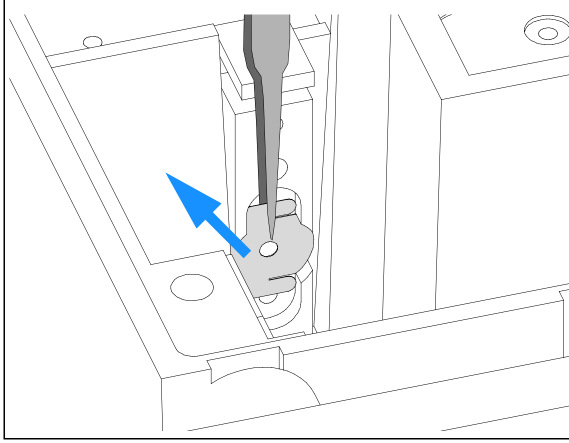
Installing the Standard Slit

When required	This procedure has to be carried out at the beginning of all replacement procedures.
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch A pointed pair of pliers
Parts required	Standard Slit, part of Slit Kit 79853-68746

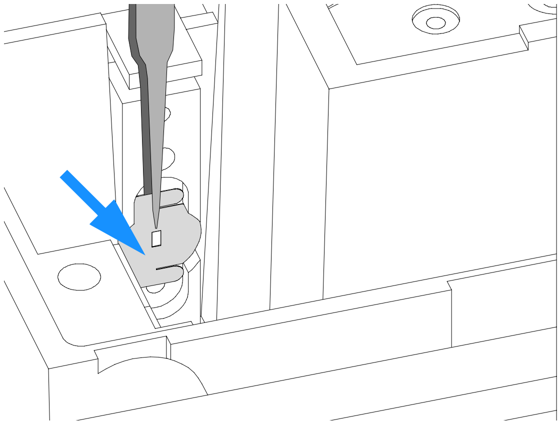
1 Carefully remove the cover of the optical unit. Take care for the reference aperture handle.



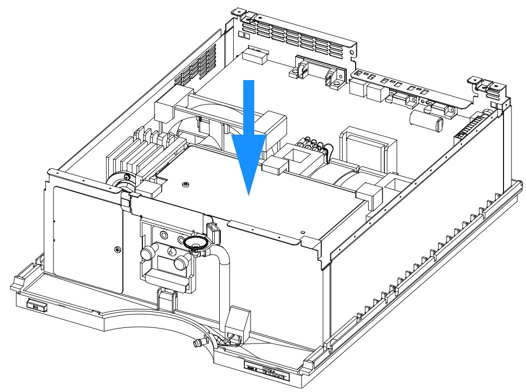
2 Remove the test slit from the entrance slit holder using a pair of tweezers and place it safe.



3 Carefully insert the standard slit into the entrance slit holder starting at the arrow side first. The slit must sit plane on the holder.



4 Replace the cover of the optical unit.



5 Execute Wavelength Calibration to calibrate the grating.

6 Fix the screws of the optical unit's cover.

7 Turn the instrument OFF.

8 Reinstall the front cover, top cover and top foam section.

9 Replace module into the stack.

10 Reconnect the cables and capillaries and turn ON the module.

Repairs in the Bottom Section

Following parts can be replaced within the bottom section of the optical unit:

- Filter Motor Drive parts
- Grating Drive parts
- Pre-amplifier boards

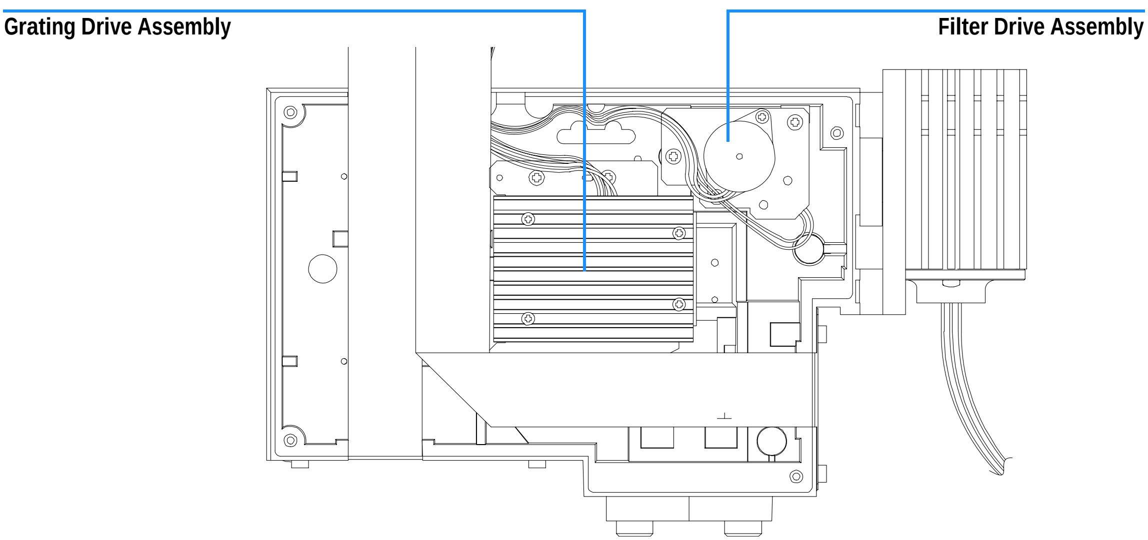


Figure 53 Location of Replaceable Parts in the Optical Unit (Bottom Section)

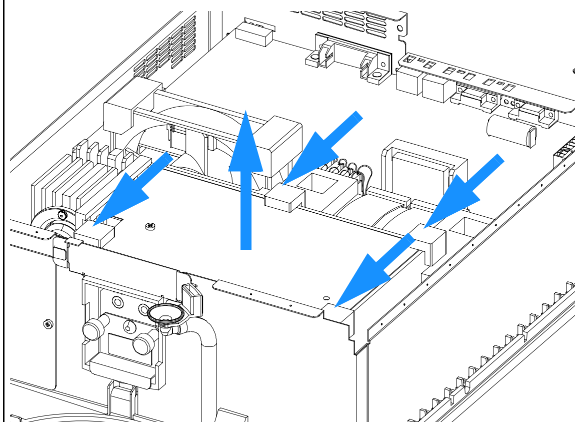
Removing the Optical Unit

When required	When other assemblies have to be removed or when defective
Tools required	Screwdriver POZI 1 PT3
Parts required	Optical unit G1314-69060 (exchange part)

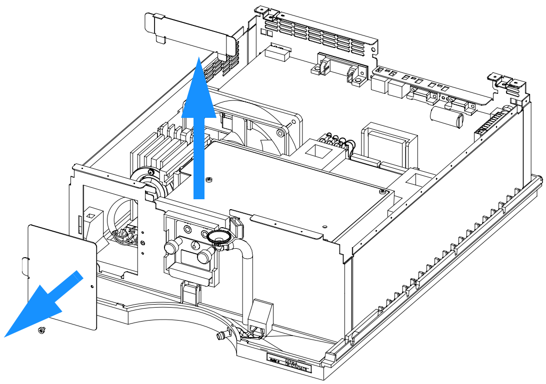
Preparation for this procedure are:

- Turn OFF the detector.
- Disconnect the power cable.
- Disconnect capillaries.
- Remove the detector from stack and place it on the working bench.
- Remove the front cover, top cover and top foam section, see "Removing the Top Cover and Top Foams" on page 163.

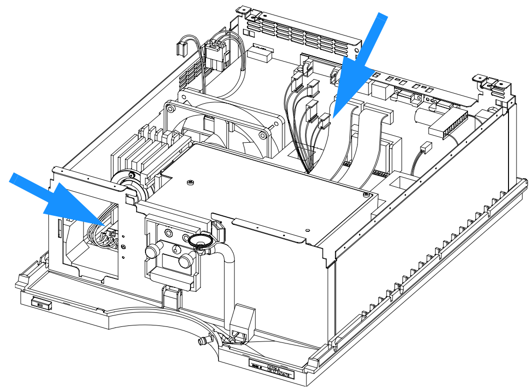
1 Keep the bumpers safe.



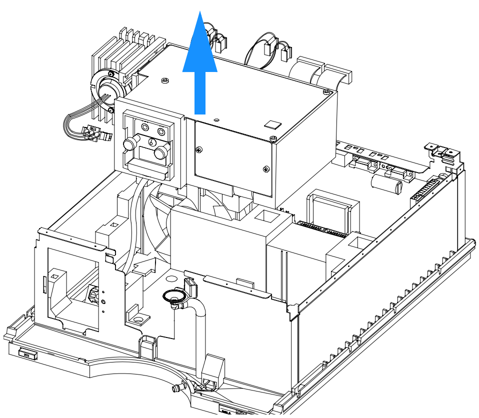
2 Remove the lamp cover and the plate above the flow cell.



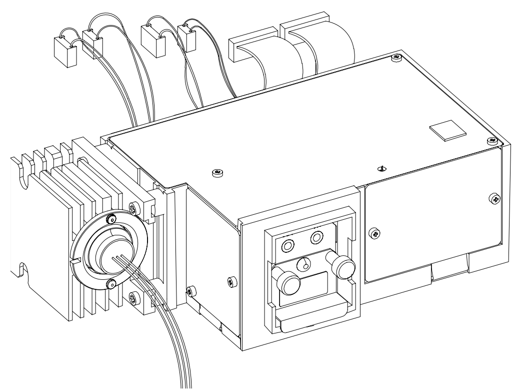
3 Disconnect the deuterium lamp connector and all cables coming from the optical unit to the main board.



4 Lift the optical unit out of the foam.



5 Place the optical unit on a bench.



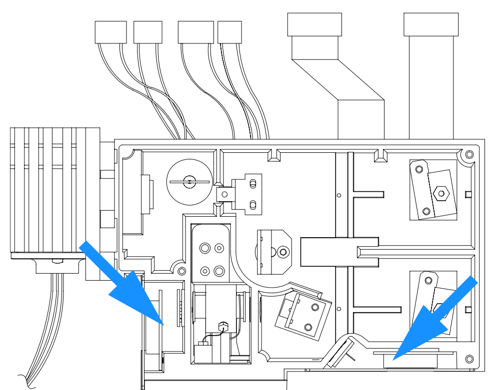
Exchanging a Photo Diode and / or ADC Board Assembly

When required	The sample or reference diode / ADC board assembly might be replaced when excessive drift or noise or no response has been identified.
Tools required	Screwdriver POZI 1 PT3 Wrench 1 / 4 - 1 / 5 inch Hexagonal wrench 1.5 mm A pointed pair of pliers Soldering iron
Parts required	Photodiode Assembly: Sample G1314-65014, Reference G1314-65015. ADC Board Assembly (VWA): Sample G1314-67503, Reference G1314-67504.

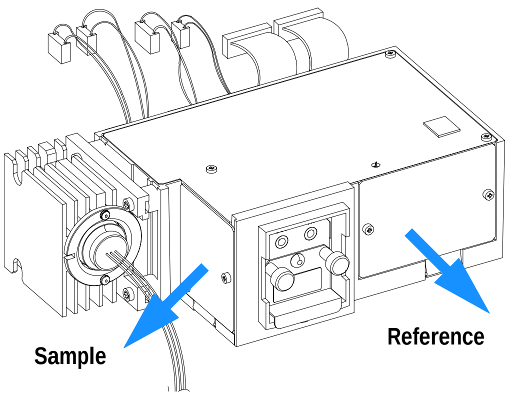
Preparation for this procedure are:

- Install the Test Slit, see "Installing the Test Slit" on page 185.
- Remove the optical unit from the instrument, see "Removing the Optical Unit" on page 202.
- The top cover of the optical unit is removed.
- For replacement of ADC boards (VWA) remove the bottom cover of the optical unit.

1 Locate the sample or the reference diode and ADC boards.

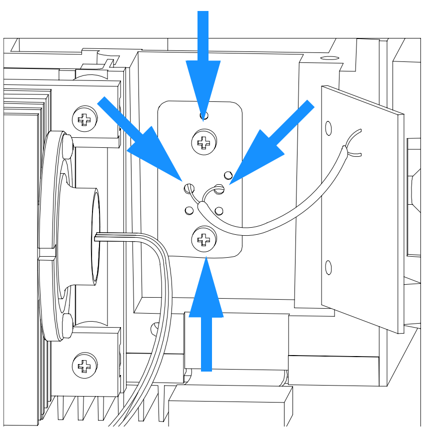


2 Remove the cover of sample or the reference side.



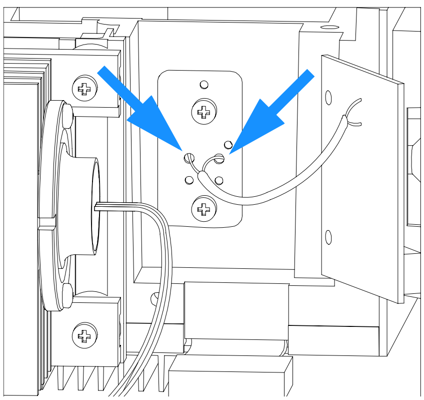
To replace the reference side parts, continue with step 7.

3 To replace the sample diode, unscrew the ADC board and unsolder the wire at the diode. Unscrew the diode.



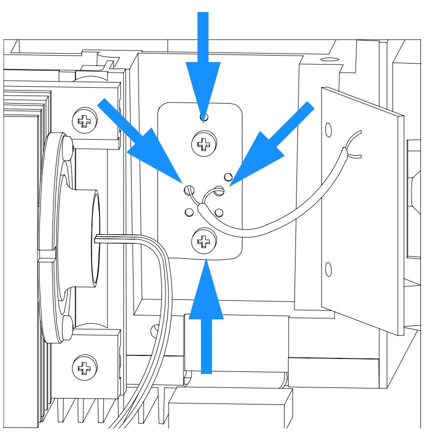
4 Replace the diode and solder it. Left diode pin is GND.

5 To replace the sample ADC board, unsolder it from the diode.



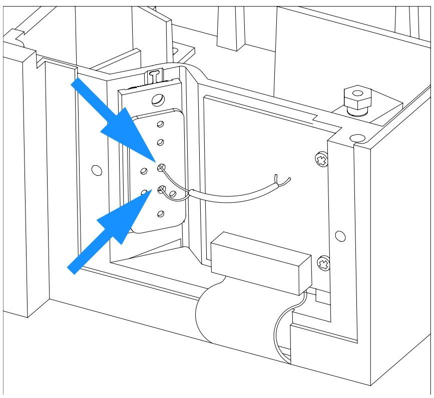
6 Replace the sample ADC board and solder it to the diode. Left pin is GND. Fix the ADC board.

7 To replace the reference diode, unscrew the ADC board and unsolder the wire at the diode and unscrew diode.



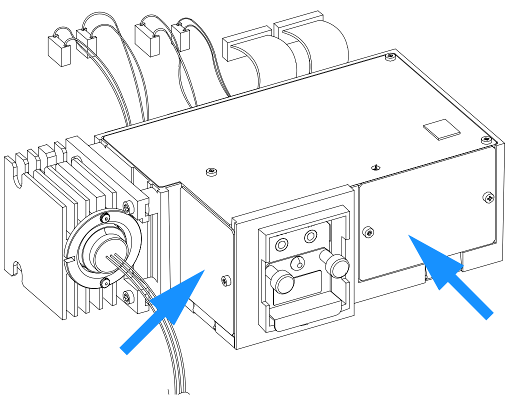
8 Replace the diode and solder it. Upper diode pin is GND.

9 To replace the reference ADC board, unsolder it from the diode.



10 Replace the reference ADC board and solder it to the diode. Upper pin is GND.

11 Replace the cover of sample or the reference side.



12 Replace the optical unit, see “Installing the Optical Unit" on page 223.

13 Re-align the reference slit, see “Optimizing the Reference Readings" on page 198.

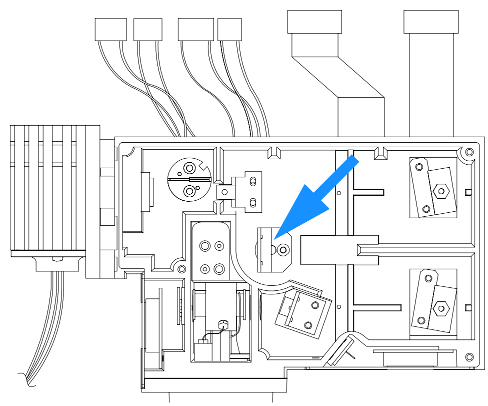
Replacing the Grating Motor or Position Sensor

When required	The grating motor or the position sensor might be replaced when the motor does not turn or the grating position is not sensed correctly
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch Hexagonal wrench 1.5 mm a pointed pair of pliers
Parts required	Grating Motor G1314-65009, includes test slit and seals for holes in cover Grating Position Sensor G1314-65005.

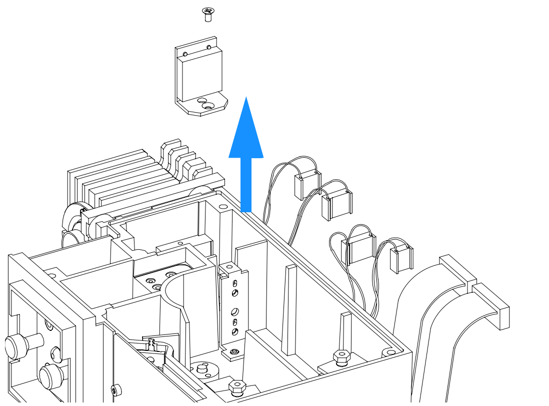
Preparation for this procedure are:

- Install the Test Slit, see "Installing the Test Slit" on page 185.
- Remove the optical unit from the instrument, see "Removing the Optical Unit" on page 202.
- The top cover of the optical unit is removed.

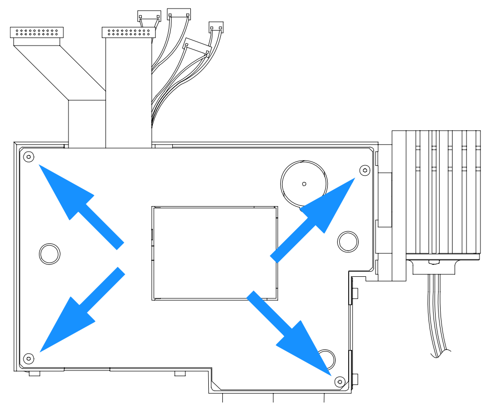
1 Locate the grating, unscrew and remove it. Place it safe.



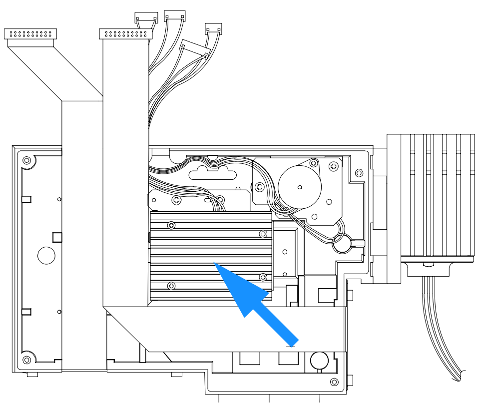
2 Place the optical unit in normal position and remove the grating, see "Exchanging the Grating Assembly" on page 190.



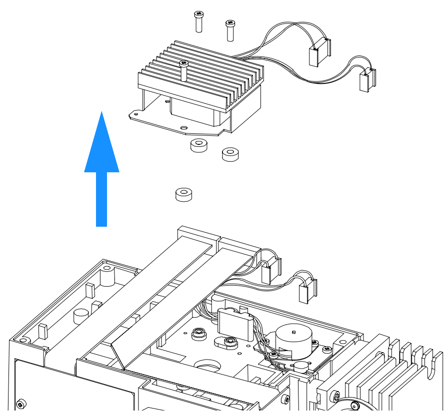
3 Place the optical unit on its top and remove the cover to have access to the bottom parts.



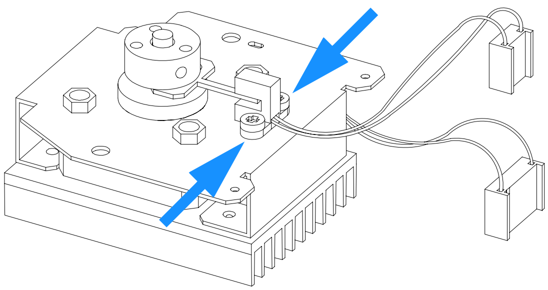
4 The grating motor is underneath the heat exchanger.



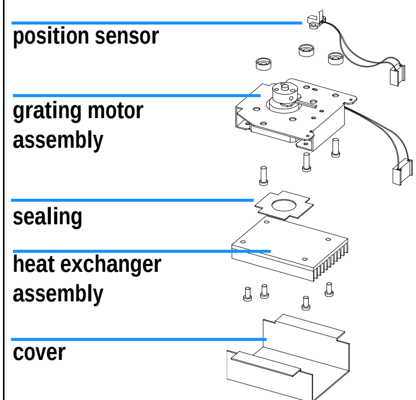
5 Unscrew the motor holder and remove it.



6 To replace the sensor, unscrew it and replace it by the new one.

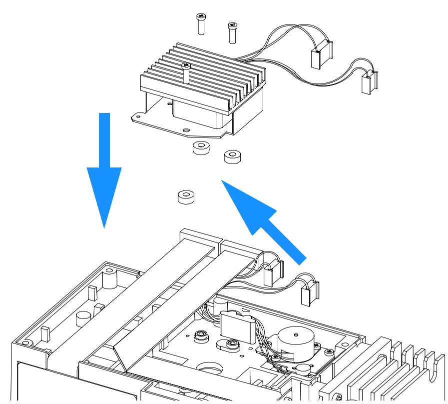


7 To replace the motor, remove the cover and unscrew the heat exchanger.

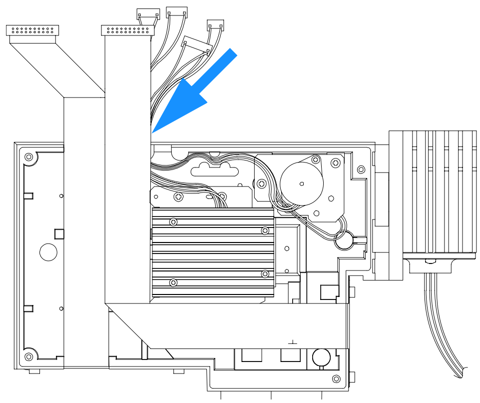


8 Replace the heat exchanger on the new motor assembly. Then replace the cover.

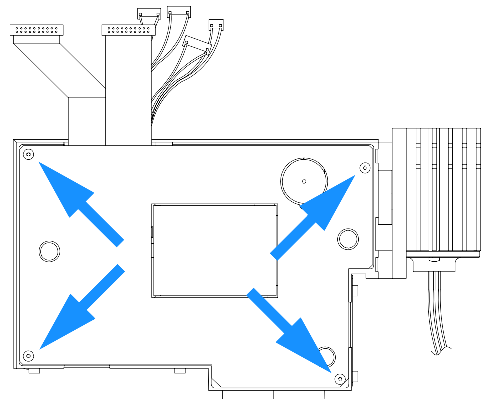
9 Assure that all three spacers are in place and replace the complete motor assembly.



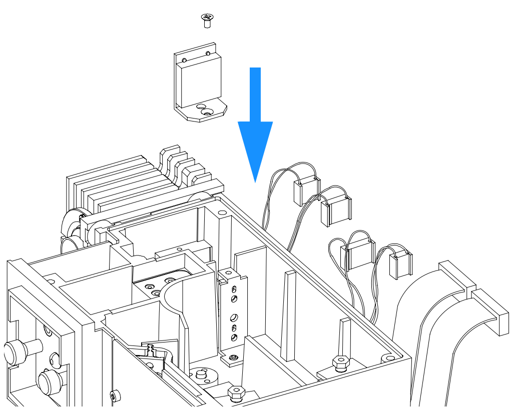
10 Route the cables through the openings.



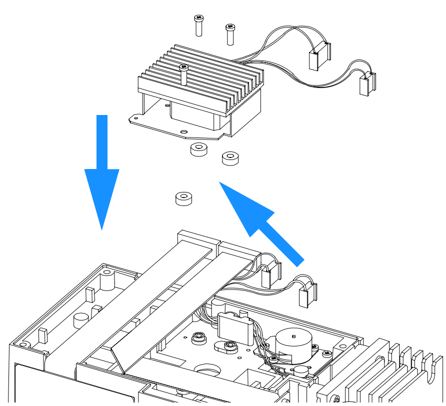
11 Replace the cover.



12 Place the optical unit in normal position and replace the grating.



13 Continue as described in "Exchanging the Grating Assembly" on page 190.



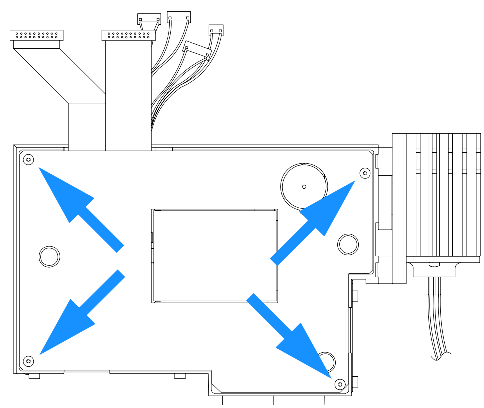
Replacing the Filter Motor or Position Sensor

When required	The filter motor or the position sensor might be replaced when the motor does not turn or the filter position is not sensed correctly.
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 - 1/5 inch Hexagonal wrench 1.5 mm a pointed pair of pliers
Parts required	Filter Motor Assembly G1314-65011, includes plate and filter bottom. Filter Position Sensor G1314-65006.

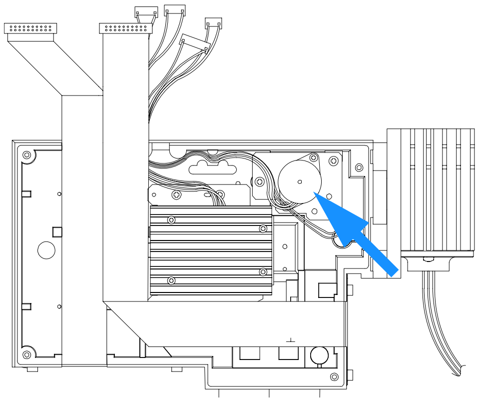
Preparation for this procedure are:

- Install the Test Slit, see "Installing the Test Slit" on page 185.
- Remove the optical unit from the instrument, see "Removing the Optical Unit" on page 202.
- The top cover of the optical unit is removed.

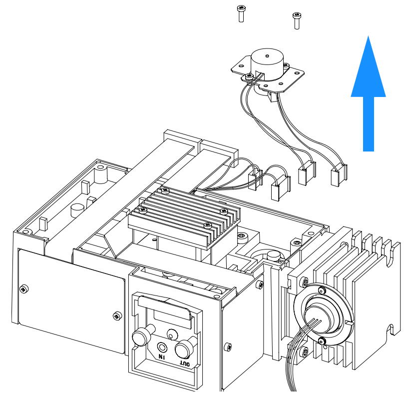
1 Place the optical unit on its top and remove the cover to have access to the bottom parts.



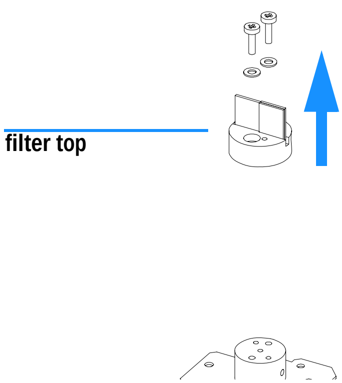
2 Locate the filter motor.



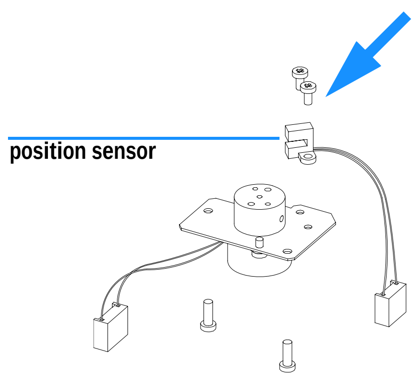
3 Unscrew the filter motor assembly and remove it.



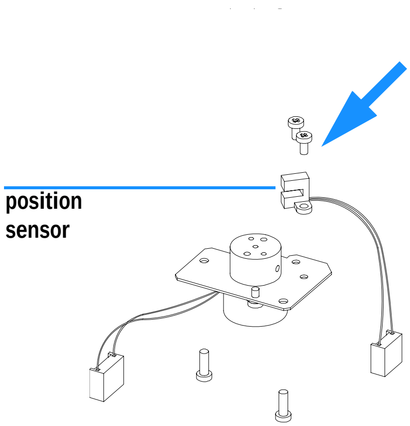
4 Unscrew the filter top part and place it safe.



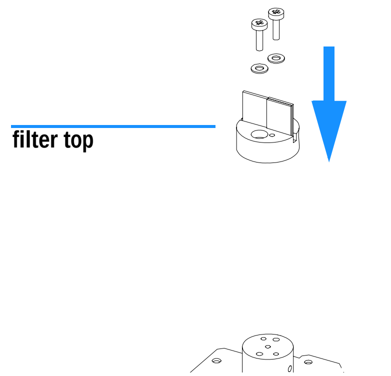
5 To replace the sensor, unscrew it and replace it by the new one.



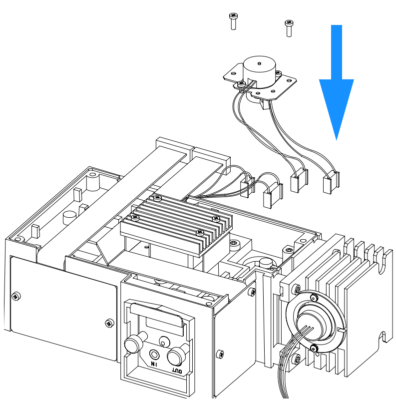
6 To replace the filter motor assembly, unscrew the sensor for reuse on the new filter motor assembly.



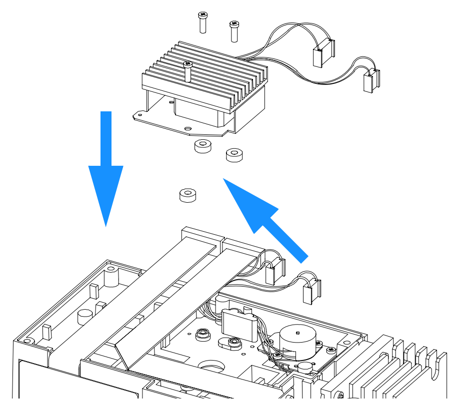
7 Replace the filter top part and place it safe.



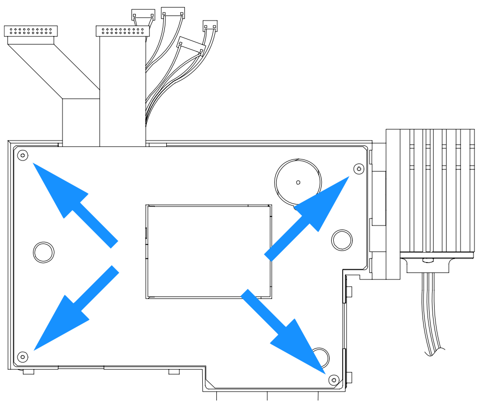
8 Replace the complete filter motor assembly.



9 Route the cables through the openings and replace the cover.



10 Replace the cover.



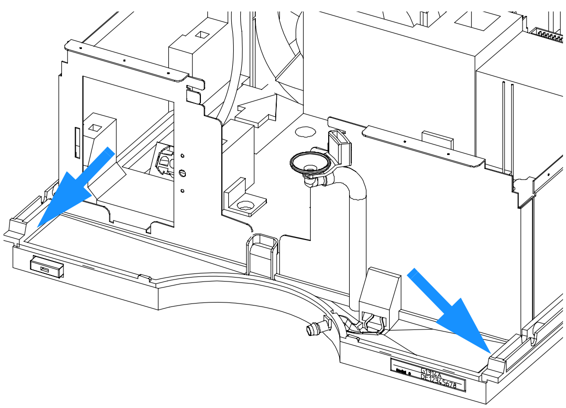
Continue as described in "Exchanging the Filter Assembly" on page 182.

Exchanging the Leak Sensor

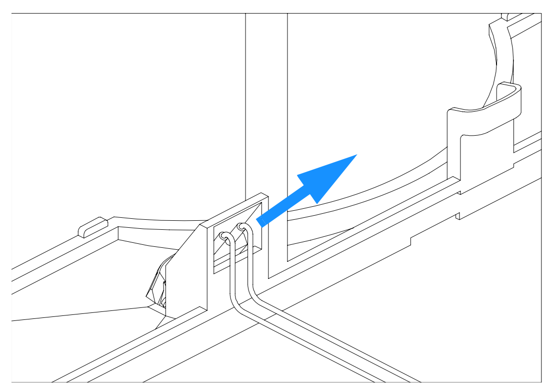
When required	If defective
Tools required	Screwdriver POZI 1 PT3
Parts required	Leak sensor assembly 5061-3356

1 Turn OFF the lamp.
2 Switch OFF the detector, and disconnect the cables and capillaries.
3 Remove the detector from the stack and place it on the working bench.
4 Remove the front cover, top cover and top foam section, see “Removing the Top Cover and Top Foams" on page 163.
5 Remove the optical unit, see “Removing the Optical Unit" on page 202.

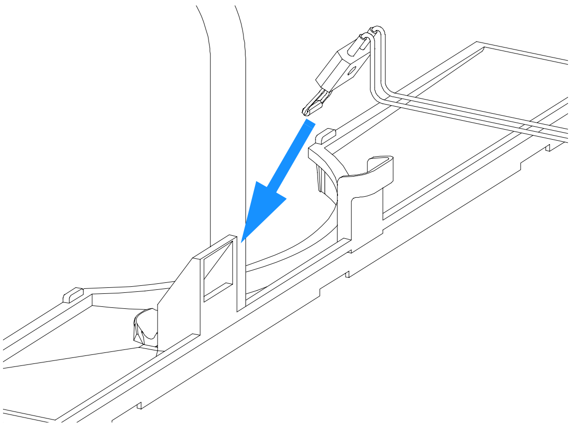
6 Remove the leak base from the cabinet bottom by unlocking it with a flat blade on the right and left side.



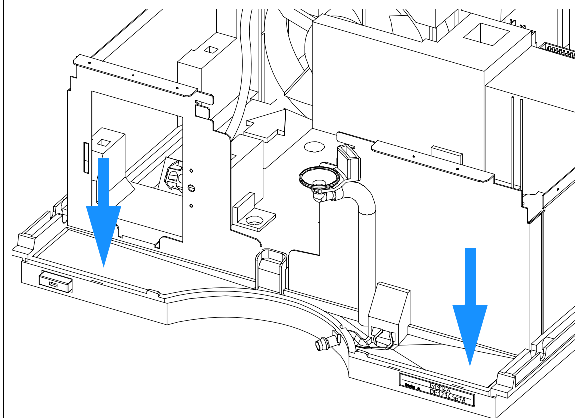
7 Disconnect the leak sensor assembly on the processor board and remove it from the leak panel.



8 Replace the leak sensor assembly into the leak panel and route the cable through the cabinet and foam channel. Reconnect it to the main board.



9 Replace the leak base by pressing it into the bottom of the cabinet.



6 Replace the optical unit, see “Installing the Optical Unit" on page 223.

7 Replace the front cover, top cover and top foam section, see “Installing the Foam and the Top Cover" on page 225.

8 Replace the detector into the stack.

9 Reconnect the cables and capillaries.

10 Turn ON the detector.

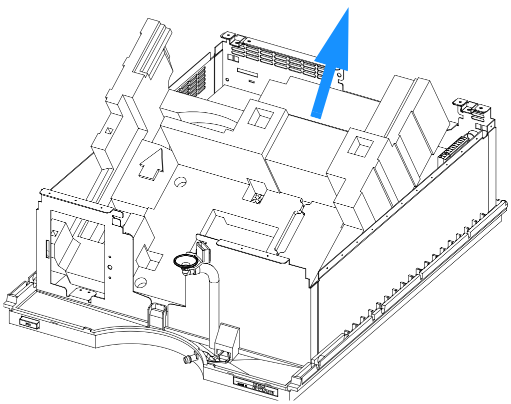
Exchanging the Power Supply

When required	If defective
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 inch Wrench 5 mm, 7 mm and 15 mm
Parts required	Power supply 0950-2528

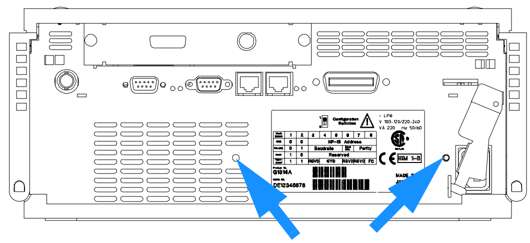
NOTE The repair level of the power supply assembly is exchanging the complete assembly. No serviceable parts are inside.

1 Turn OFF the lamp.
2 Switch OFF the detector, and disconnect the cables.
3 Remove the detector from the stack and place it on the working bench.
4 Remove the front cover, top cover and top foam section, see “Removing the Top Cover and Top Foams" on page 163.
5 Remove the processor board, see “Exchanging the Main Board" on page 166.
6 Remove the fan assembly, see “Exchanging the Fan" on page 173.
7 Remove the optical unit, see “Removing the Optical Unit" on page 202.

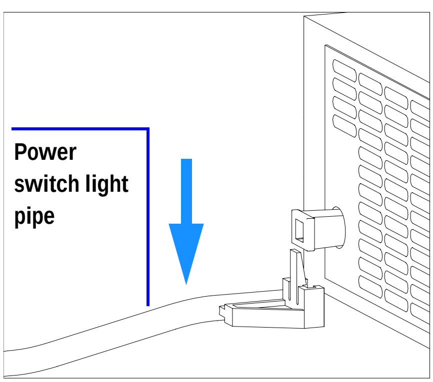
8 Carefully remove the bottom foam part by sliding it out towards the rear.



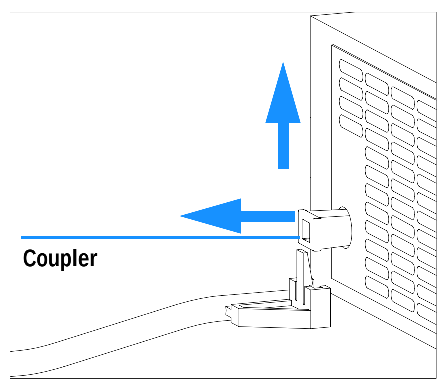
9 Unscrew the power supply at the rear of the detector.



10 Press down the power switch light pipe to remove it from the coupler.

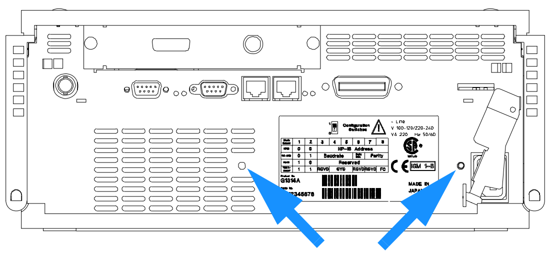


11 Remove the power supply completely. Reuse the coupler on the new power supply.

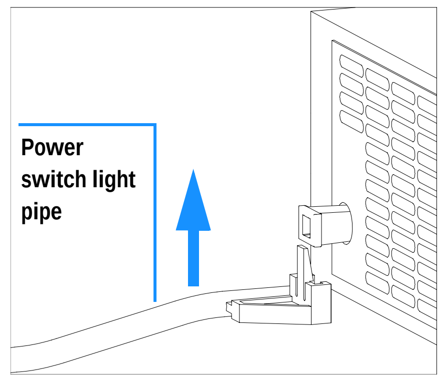


NOTE The repair level of the power supply assembly is exchanging of the complete assembly. No serviceable parts are inside.

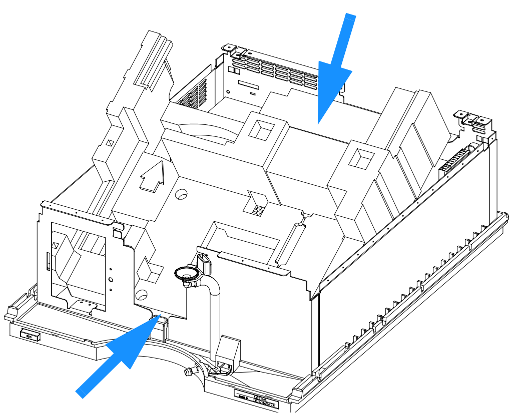
12 Insert the power supply into its location and fix it with the screw at the rear panel.



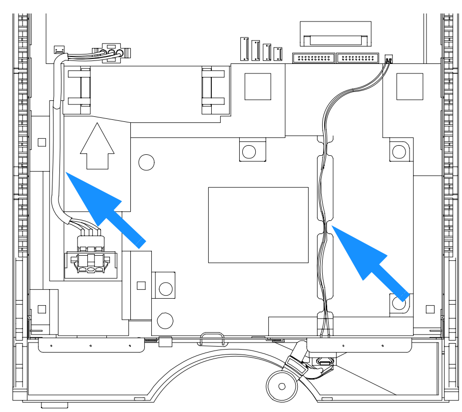
13 Press down and clip in the power switch light pipe into the power supply.



14 Reinstall bottom foam part. Slide it in underneath the leak drain.



15 Route the lamp cable and the leak sensor cable to the main board.



16 Reinstall the processor board, see “Exchanging the Main Board" on page 166.

17 Reinstall the Fan Assembly, see “Exchanging the Fan" on page 173.

18 Reinstall the optical unit, see “Replacing Status Light Pipe" on page 222.

19 Reinstall the front cover, top cover and top foam section, see “Installing the Foam and the Top Cover" on page 225.

20 Replace the detector into the stack.

21 Reconnect the power cable and turn ON the detector.

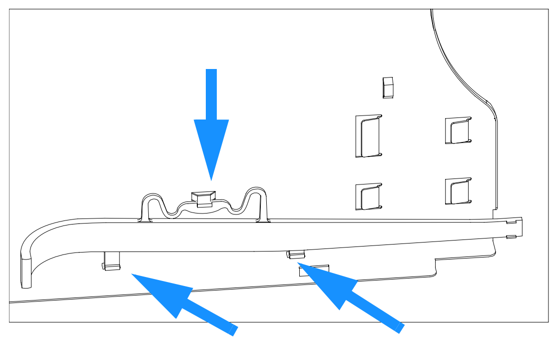
Replacing Status Light Pipe

When required	When part is broken
Tools required	Screwdriver POZI 1 PT3
Parts required	Status light pipe 5041-8384

Preparations for this procedure are:

- Remove the front cover and top cover, ""Removing the Top Cover and Top Foams" on page 163.

1 The status light pipe is clipped into the top cover.



2 Replace the foam section, the top cover and front cover, see "Installing the Foam and the Top Cover" on page 225.

3 Replace the detector into the stack and reconnect the cables and capillaries.

4 Turn ON the detector.

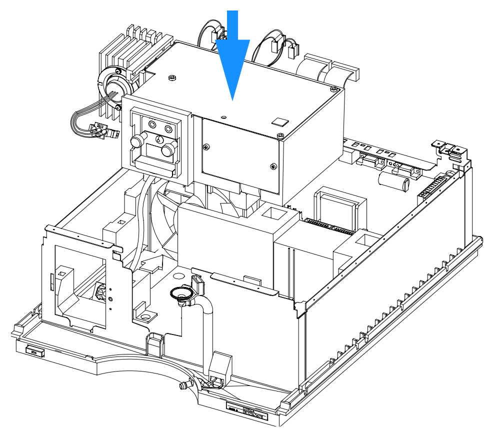
Installing the Optical Unit

When required	To continue the installation
Tools required	Screwdriver POZI 1 PT3 Wrench 1/4 inch
Prerequisites	The optical unit is already removed All other assemblies are already installed

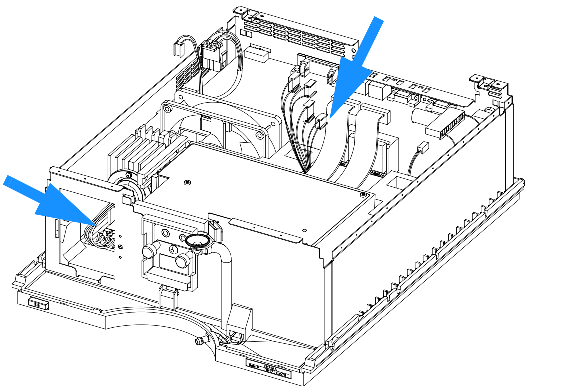
Preparation for this procedure are:

- The power supply, the fan and the processor board are already installed.

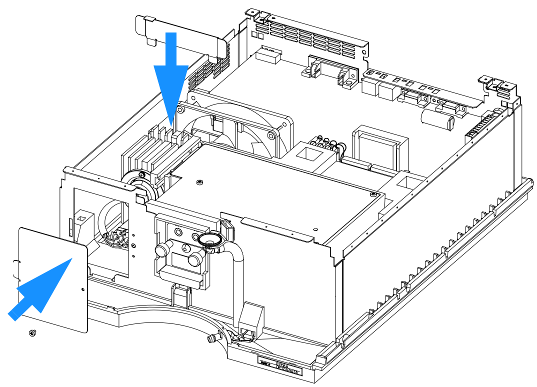
1 Place the optical unit into the bottom foam.



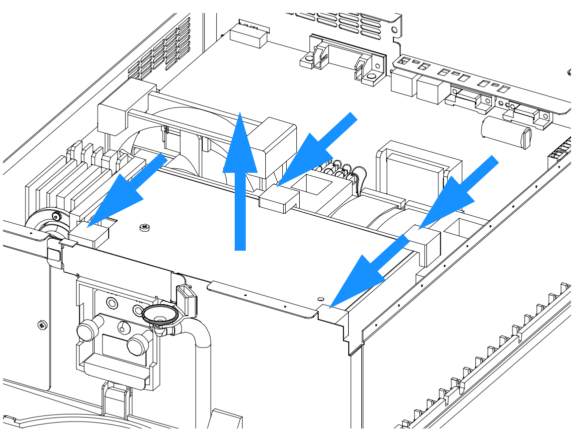
2 Reconnect all cables to the main board and the deuterium lamp connector.



3 Replace the lamp cover and the plate that secures the optical unit.



4 Replace the bumpers in the top foam so that they are positioned on the optical unit as shown.



Next steps:

- Reinstall the front cover, top cover and top foam section, see "Installing the Foam and the Top Cover" on page 225.
- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn ON the detector.

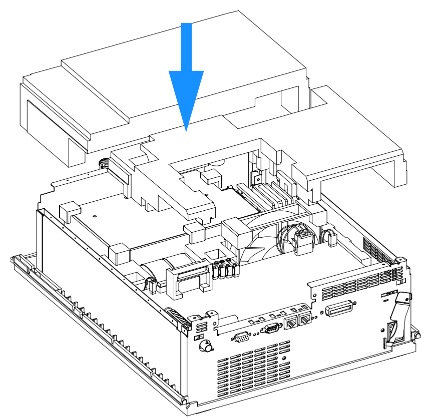
Installing the Foam and the Top Cover

When required	When all repairs have been completed
Tools required	Screwdriver POZI 1 PT3
Prerequisites	The detector is open and other procedures have been carried out

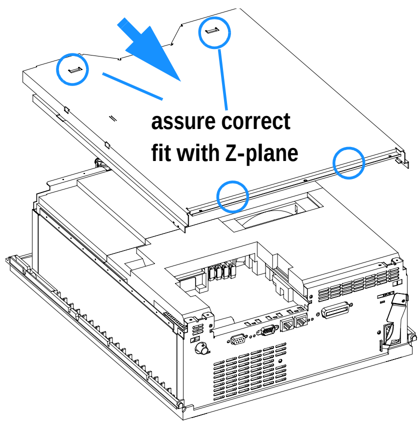
Preparations for this procedure:

- All previous repairs have been completed.

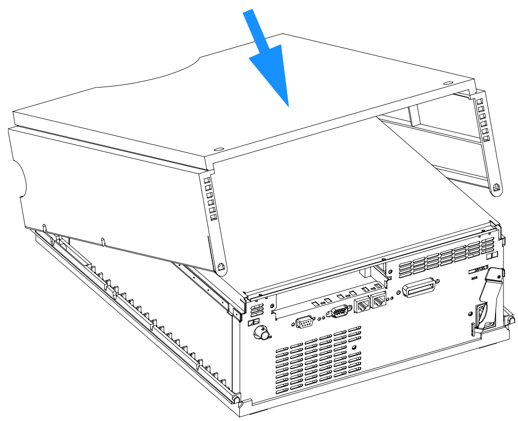
1 Carefully fit the top foams into the detector.



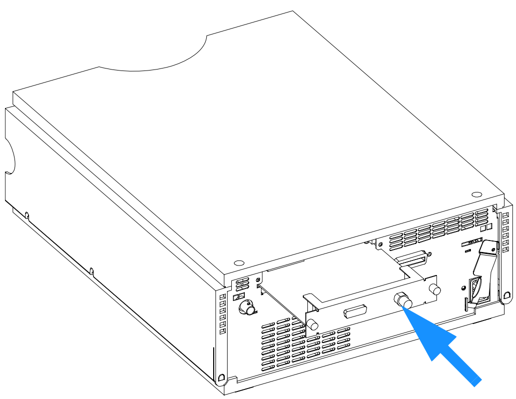
2 Slide the top plate towards the rear and fix the top plate screws.



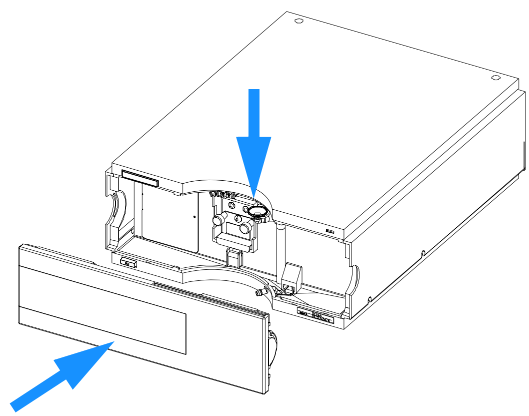
3 Replace the cover.



4 If installed, replace the interface board and fix the screws.



5 Replace the waste funnel and the front panel.



Next steps:

- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn ON the detector.

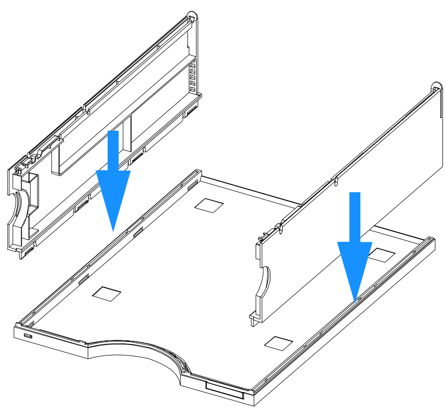
Assembling the Main Cover

When required	If cover is broken
Tools required	None
Parts required	Plastics kit 5065-9982 (includes base, top, left and right sides)

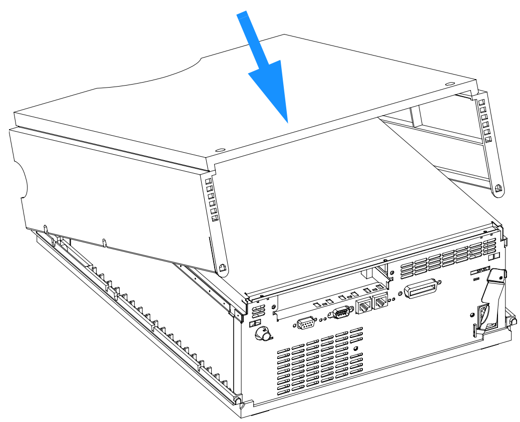
NOTE The plastics kit contains all parts, but it is not assembled.

WARNING **In case you insert the left or right side in the opposite position, you may not be able to remove the side from the top part.**

1 Place the top part on the bench and insert the left and right side into the top part.



2 Replace the cover.



Next steps:

- Replace the detector into the stack and reconnect the cables and capillaries.
- Turn ON the detector.

13
Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

Overview of Maintenance Parts

Table 19 Maintenance Parts

Item	Description	Part Number
	Cable CAN assembly 0.5 m	5181-1516
	Cable CAN assembly 1 m	5181-1519
	Interface board BCD/External Contacts	G1351-68701
	LAN Communication Interface board	G1369A or G1369-60001
	Control Module G1323B (Note: The G1314C VWD-SL can be operated with a G1323B just in standard mode as G1314B - no higher data rate available) or Instant Pilot G4208A	G1323-67001 G4208-67001
	Deuterium lamp	G1314-60100
	Standard flow cell, 10 mm 14 µl, additional flow cell parts, see page 231	G1314-60086
	Micro flow cell, 5 mm 1 µl, additional flow cell parts, see page 232	G1314-60081
	High pressure flow cell, 10 mm 14 µl, additional flow cell parts, see page 235	G1314-60082
	Semi-micro flow cell, 6 mm 5 µl, additional flow cell parts, see page 233	G1314-60083
	Cuvette Holder	G1314-60200
	Front cover	5065-9982
	Leak handling parts	see page 237

Standard Flow Cell

Table 20 Standard Flow Cell Assembly

Item	Description	Part Number
	Standard Flow Cell, 10 mm, 14 µl, 40 bar	G1314-60086
1	Cell screw kit, quantity=2	G1314-65062
2	Conical spring kit, quantity=10	79853-29100
3	Ring #1 PEEK kit, quantity=2	G1314-65065
4	Gasket #1 (small hole), KAPTON, quantity=10	G1314-65063
5	Window quartz kit, quantity=2	79853-68742
6	Gasket #2 (large hole), KAPTON, quantity=10	G1314-65064
7	Ring #2 PEEK kit, quantity=2	G1314-65066

1 - Cell Screw
2 - Conical Springs
3 - Ring #1 PEEK
4 - Gasket #1 (small hole)
5 - Window Quartz
6 - Gasket #2 (large hole)
7 - Ring #2 PEEK

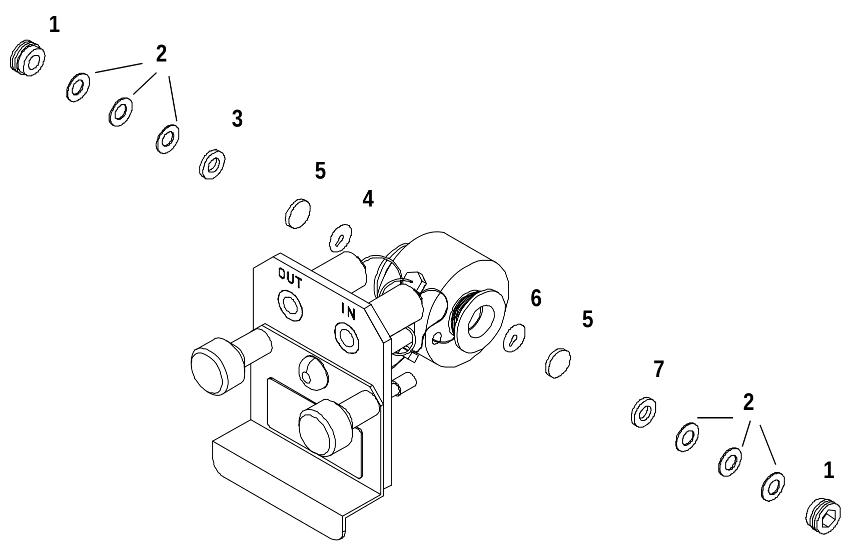


Figure 54 Standard Flow Cell

Micro Flow Cell

Table 21 Micro Flow Cell Assembly

Item	Description	Part Number
	Micro flow cell, 5 mm, 1 µl, 40 bar	G1314-60081
	Capillary column – detector SST 400 mm lg, 0.12 i.d.	5021-1823
1	Cell screw	79853-27200
	Cell kit micro, comprises: two windows, two gaskets #1 and two gaskets #2	G1314-65052
2	Conical spring kit, quantity=10	79853-29100
3	Ring SST kit, quantity=2	79853-22500
4	Window quartz kit, quantity=2	79853-68742
5	Gasket #1, PTFE, quantity=10	79853-68743
6	Gasket #2, PTFE, quantity=10	G1314-65053

1 - Cell Screw

2 - Conical Springs

3 - Ring SST

4 - Gasket #1

5 - Window Quartz

6 - Gasket #2

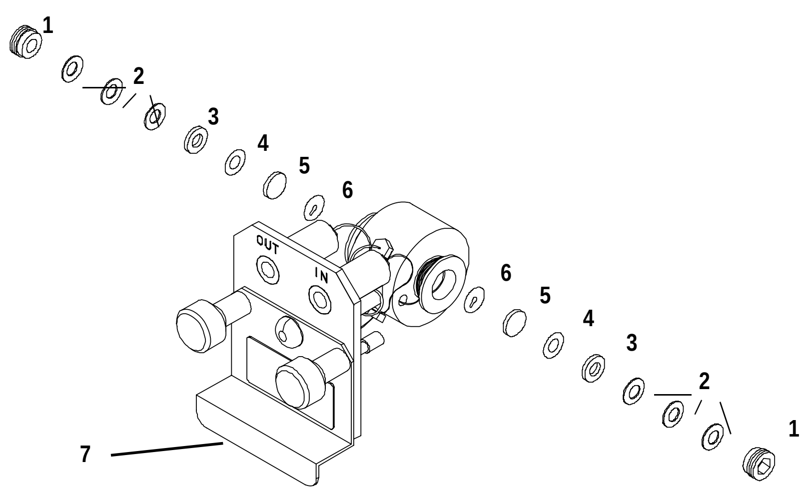


Figure 55 Micro Flow Cell

Semi-micro Flow Cell

Table 22 Semi-micro Flow Cell Assembly

Item	Description	Part Number
	Semi-micro flow cell assembly, 6 mm, 5 µl, 40 bar	G1314-60083
1	Cell screw	79853-27200
	Semi-micro cell kit, consisting of: two windows, two #1 standard gaskets, one #1 semi-micro gasket and one #2 semi-micro gasket.	G1314-65056
2	Conical springs, (pack of 10)	79853-29100
3	Ring SST, (pack of 2)	79853-22500
4	PTFE #1 standard gasket, (pack of 10)	79853-68743
5	Quartz window, (pack of 2)	79853-68742
6	Semi-micro #1 gasket, PTFE, (pack of 10)	G1314-65057
7	Semi-micro #2 gasket, PTFE, (pack of 10)	G1314-65058
	Inlet capillary, 400 mm long, 0.12 mm i.d.	5021-1823

NOTE The semi-micro #1 and #2 gaskets (items 6 and 7) look very similar. Do not mix them up.

1 - Cell screw
2 - Conical springs
3 - Ring SST
4 - Gasket #1
5 - Quartz window
6 - Semi-micro gasket #1
7 - Semi-micro gasket #2

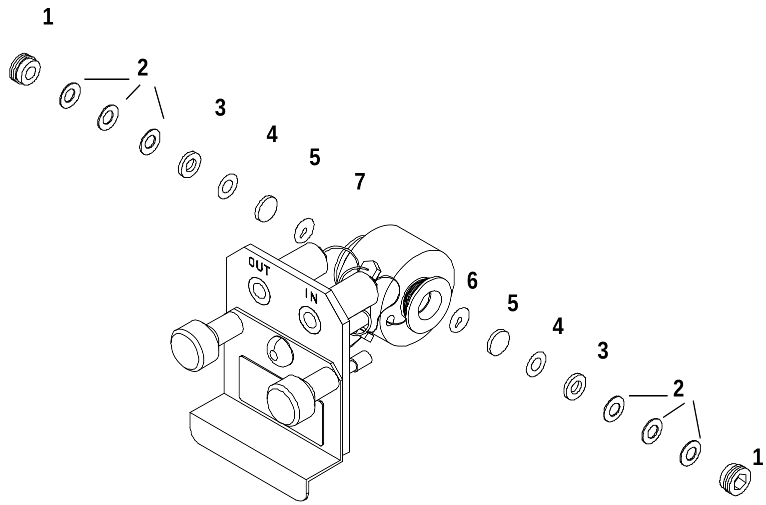


Figure 56 Semi-micro Flow Cell

High Pressure Flow Cell

Table 23 High Pressure Flow Cell Assembly

Item	Description	Part Number
	High pressure flow cell, 10 mm, 14 µl, 400 bar	G1314-60082
	Capillary column–detector SST 380 mm lg, 0.17 i.d. (one side not assembled)	G1315-87311
1	Cell screw	79853-27200
	Cell kit Agilent, comprises: two windows, two KAPTON gaskets and two PEEK rings	G1314-65054
2	Ring PEEK kit, quantity=2	79853-68739
3	Window quartz kit, quantity=2	79853-68734
4	Gasket kit, KAPTON, quantity=10	G1314-65055

1 - Cell screw

2 - Ring PEEK

3 - Window quartz

4 - Gasket KAPTON

5 - Cell Cover

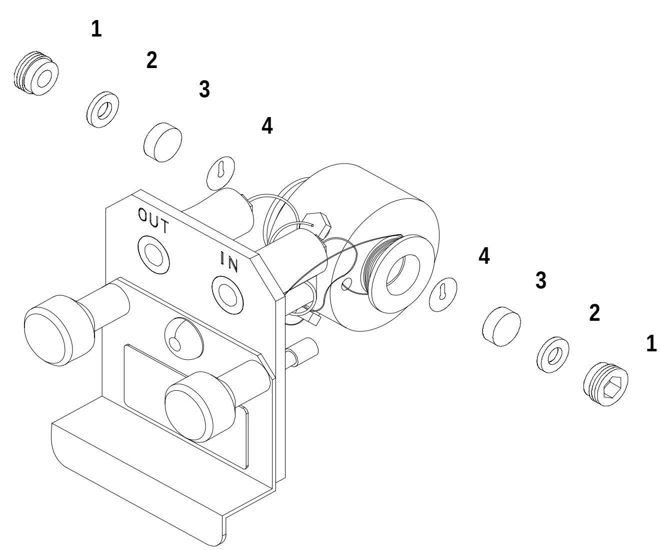


Figure 57 High Pressure Flow Cell

Cuvette Holder

Table 24 Cuvette Holder

Item	Description	Part Number
	Cuvette Holder	G1314-60200

For information the use of the cuvette holder, refer to “Using the Cuvette Holder" on page 145.

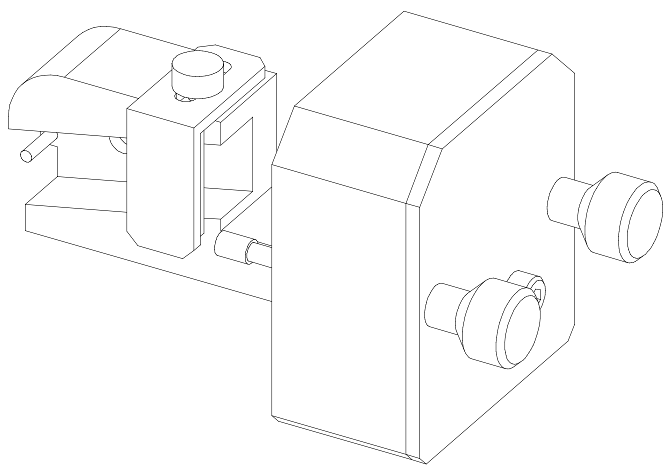


Figure 58 Cuvette Holder

Leak Parts

Table 25 Leak Parts

Item	Description	Part Number
3	Leak funnel	5041-8388
4	Leak funnel holder	5041-8389
5	Clip	5041-8387
6	Corrugated tubing, 120 mm lg, re-order 5 m	5062-2463
7	Corrugated tubing, 1200 mm lg, re-order 5 m	5062-2463

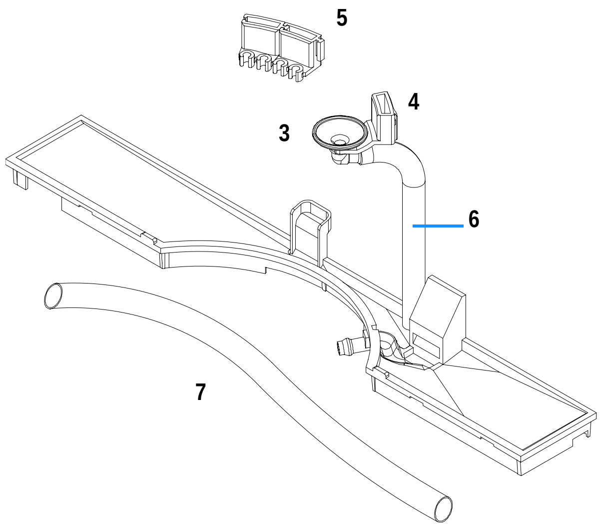


Figure 59 Leak Parts

Accessory Kit

This kit contains some accessories and tools needed for the installation and repair of the detector.

Table 26 Accessory Kit Parts

Description	Part Number
Accessory kit	G1314-68705
Corrugated tubing (to waste), re-order 5 m	5062-2463
Peek outlet capillary kit, i.d. is 0.25 mm (PEEK)	5062-8535
Fitting male PEEK, quantity=1	0100-1516
Hex key 1.5 mm	8710-2393
Hex key 4 mm	8710-2392
Wrench open end 1/4–5/16 inch	8710-0510
Wrench open end 4 mm	8710-1534

14
Parts for Repairs

This chapter provides information on parts for repair.

Overview of Main Assemblies

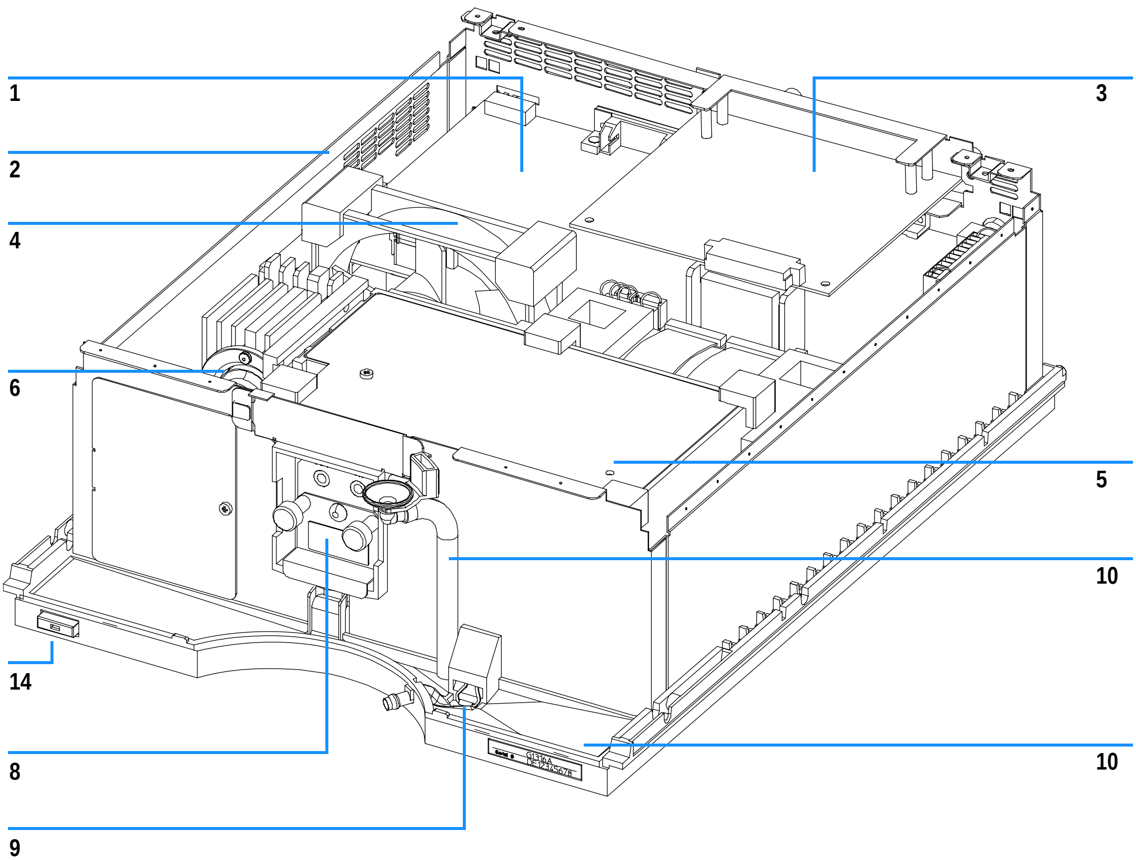


Figure 60 Overview of Main Assemblies

Table 27 Main Assemblies

Item	Description	Part Number
1	Main board VWM for G1314C VWD-SL	G1314-66531
1	Main board VWM for G1314C VWD-SL (exchange part)	G1314-66531
1	Main board VWM for G1314B VWD	G1314-66525
1	Main board VWM for G1314B VWD (exchange part)	G1314-69525
	Cable CAN assembly	5181-1516
	Hexagonal nut for GPIB connector	0380-0643
	Hexagonal nut for RS-232C connector	1251-7788
	Nut for analog connector	2940-0256
	Washer for analog connector	2190-0699
2	Power supply assembly, additional power and status light parts, see page 255	0950-2528
3	Interface board BCD/External Contacts	G1351-68701
	LAN Communication Interface board (G1369A)	G1369A or G1369-60001
4	Fan assembly, additional parts, see page 242	G1314-65004
5	Optical unit (exchange part), additional optical unit parts, see page 242	G1314-69060
6	Deuterium lamp	G1314-60100
8	Standard flow cell, 10 mm 14 µl, additional flow cell parts, see page 231	G1314-60086
	Micro flow cell, 5 mm 1 µl, additional flow cell parts, see page 232	G1314-60081
	High pressure flow cell, 10 mm 14 µl, additional flow cell parts, see page 235	G1314-60082
	Semi-micro flow cell, 6 mm 5 µl, additional flow cell parts, see page 233	G1314-60083
9	Leak sensor assembly	5061-3356
10	Leak handling parts	see page 253
11	Plastic parts (housing)	see page 252
12	Sheet metal parts	see page 251
13	Foam parts	see page 254
14	Power and status light parts	see page 255

Optical Unit and Fan Assembly

NOTE Certain repairs in the optical unit require special knowledge, see "Removing the Optical Unit" on page 202.

Table 28 Optical Unit and Fan Assembly

Item	Description	Part Number
1	Optical unit (exchange part)	G1314-69060
2	Deuterium lamp	G1314-60100
3	Fan assembly (without grille)	G1314-65004
	Fan Grille (not shown)	3160-0397
	Pin (to clip the grille into fan, used instead of screws)	5042-8916
	For lens assembly and filter top assembly, see "Source Lens and Filter Assembly" on page 245	
4	Bumper kit, includes 8 for optical unit plus 4 for fan	G1314-65021

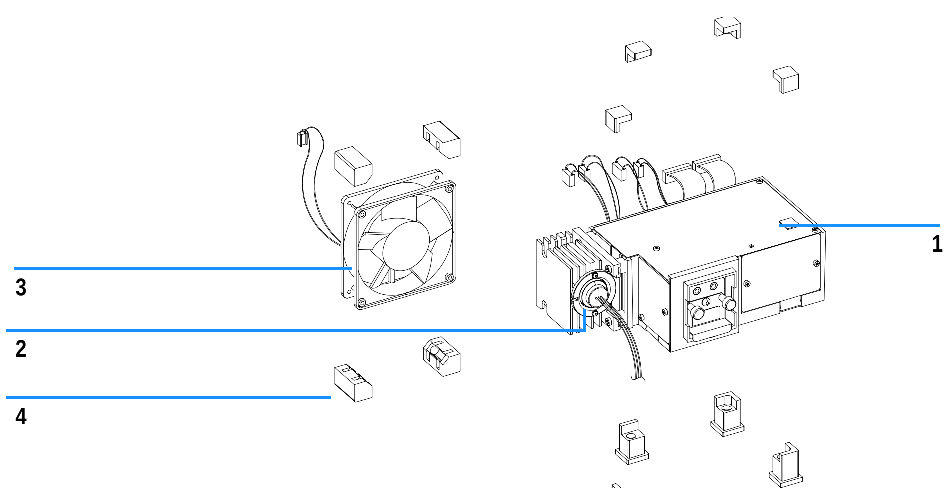


Figure 61 Optical Unit and Fan Assembly

Optical Unit Assembly

Table 29 Optical Unit

Item	Description	Part Number
	Optical Unit (exchange part)	G1314-69060
2	Deuterium Lamp	G1314-60100
3	Lens Assembly for details of Lens Assembly, see page 245	G1314-65008
4	Filter Assembly Top for details of Filter Assembly. see page 245	G1314-65010
5	Slit Kit, includes Test Slit and Standard Slit	79853-68746
6	Grating Assembly, includes Test Slit and Seal for Optical Cover, for details of Grating Assembly, see page 246	G1314-65007
7 (M1) 8 (M2)	Mirror Assembly (same for M1 and M2), includes Test Slit and Seal for Optical Cover	G1314-65012
9	ADC Board Assembly Sample	G1314-67503
10	Photodiode Assembly Sample	G1314-65014
11	Beam Splitter Assembly, includes Test Slit and Seal for Optical Cover	G1314-65013
12	Photodiode Assembly Reference	G1314-65015
13	ADC Board Assembly Reference	G1314-67504

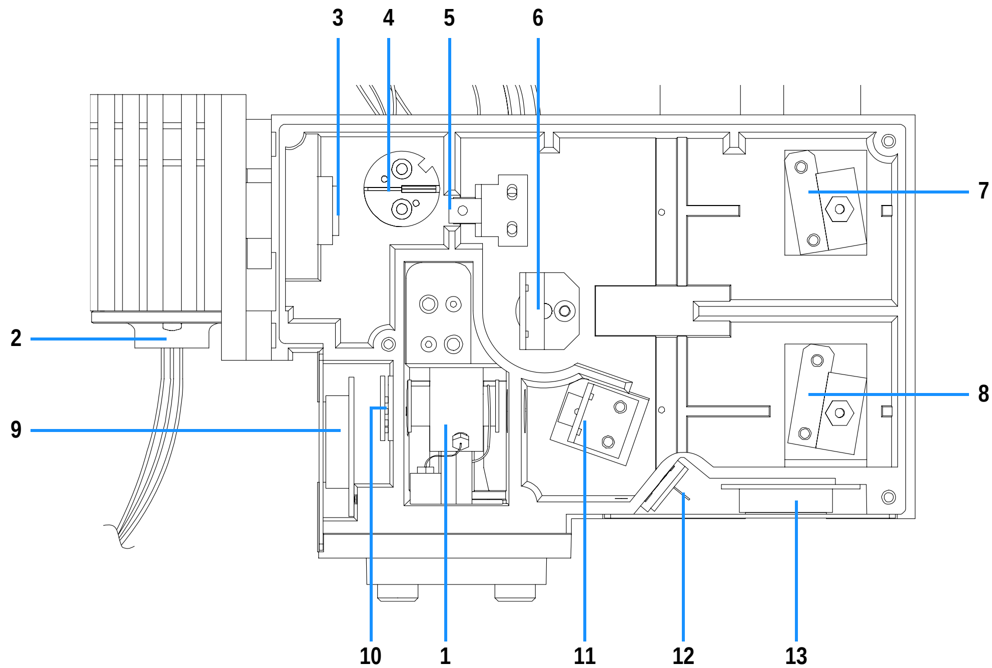


Figure 62 Optical Unit

Source Lens and Filter Assembly

Table 30 Source Lens and Filter Assembly

Item	Description	Part Number
1	Lens assembly complete	G1314-65008
2	Filter assembly top	G1314-65010

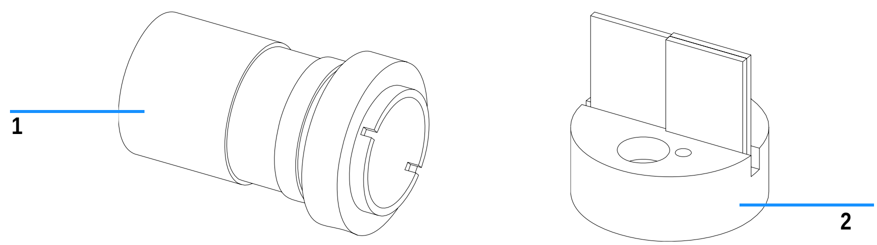


Figure 63 Source Lens and Filter Assembly

Grating Assembly

NOTE

Do not disassemble the Grating Motor Assembly. Its height is factory aligned.

Table 31 Grating Assembly

Item	Description	Part Number
1	Screw Grating M3, 5 mm lg	see (*)
2	Grating Assembly, includes Test Slit and Seal for Optical Cover	G1314-65007
3	Spacer	see (*)
4	Position Sensor, includes Test Slit and Seal for Optical Cover	G1314-65005
5	Screw Sensor M3, 6 mm lg	see (*)
6	Grating Motor Assembly, excluding heat sink parts, includes Test Slit and Seal for Optical Cover	G1314-65009
7	Screws M4, 10 mm lg	see (*)
8	Sealing	G1314-80012
9	Heat Sink	G1314-40002
10	Screws M3, 6 mm lg	see (*)
11	Cover, part of bottom plate of optical unit	no part number
(*)	Miscellaneous Kit (includes screws, washers and spacers used for Grating and Filter Assembly)	G1314-65022

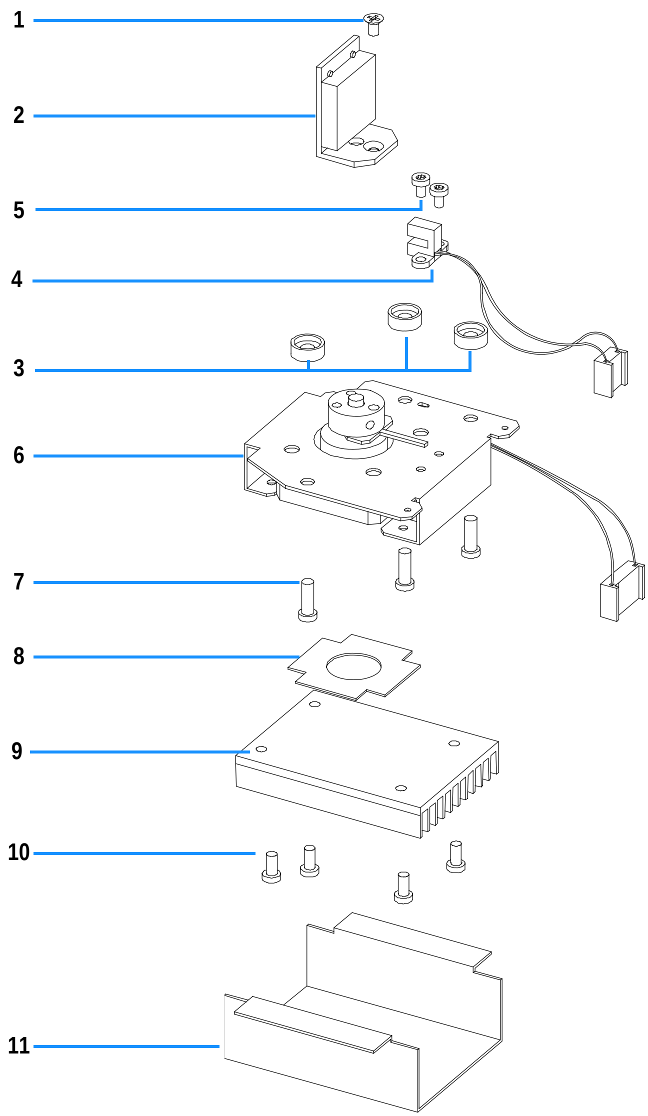


Figure 64 Grating Assembly

Filter Assembly

NOTE Do not disassemble the Filter Assembly. Its height is factory aligned.

Table 32 Filter Assembly

Item	Description	Part Number
1	Filter Assembly Top	G1314-65010
2	Washer	see (*)
3	Screw M3, 12 mm lg	see (*)
4	Filter Motor Assembly, includes items 4, 5 and 6	G1314-65011
5	Filter Bottom	
6	Plate	
(*)	Miscellaneous Kit (includes screws, washers and spacers used for Grating and Filter Assembly)	G1314-65022

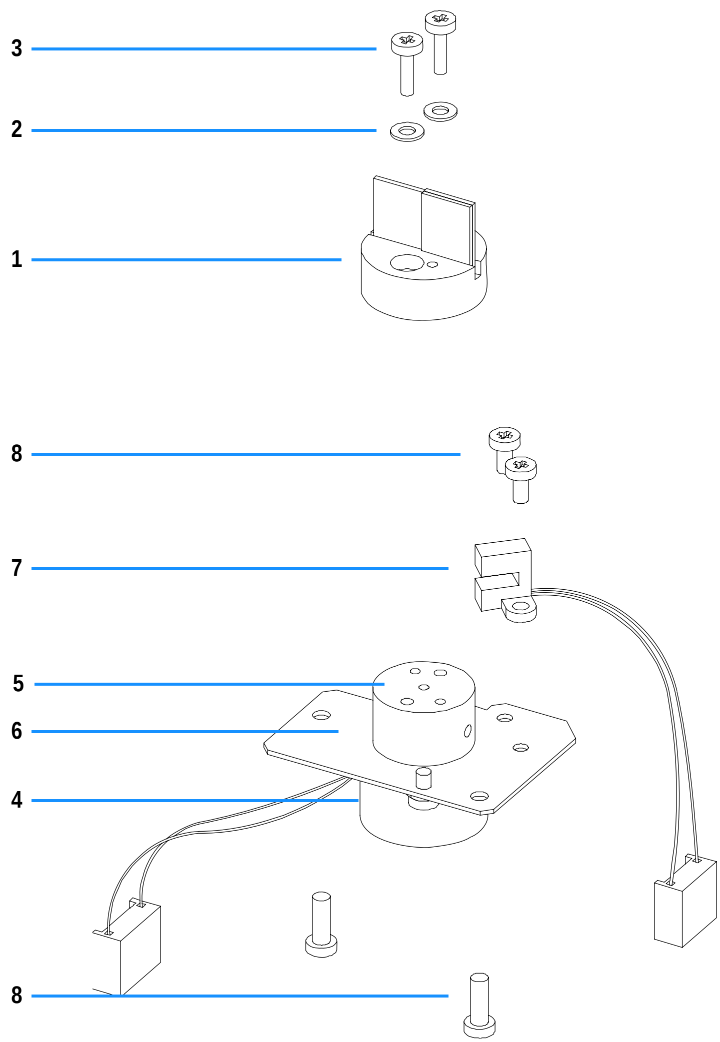


Figure 65 Filter Assembly

Lens Assembly

Table 33 Lens Assembly

Item	Description	Part Number
	Lens Assembly complete	G1314-65008
1	Lens	G1314-65020
2	Lens Screw	
3	Lens Holder	

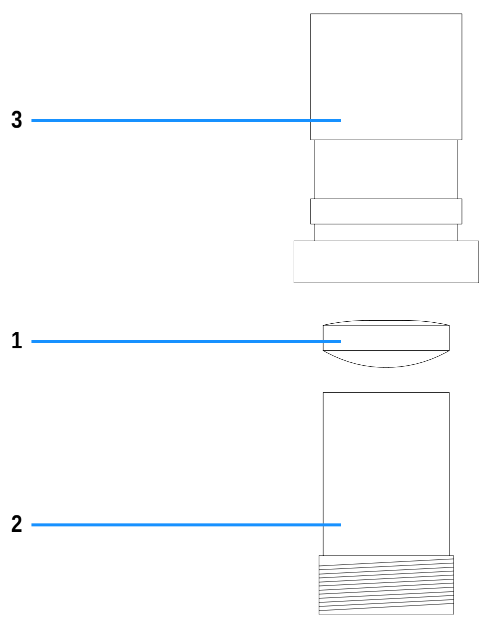


Figure 66 Lens Assembly

Sheet Metal Kit

Table 34 Sheet Metal Kit Parts

Item	Description	Part Number
	Sheet metal kit includes items 1, 2 and 3	G1314-65017
1	Top cover	
2	Case	
3	Plate	
4	Cover for lamp	G1314-65018

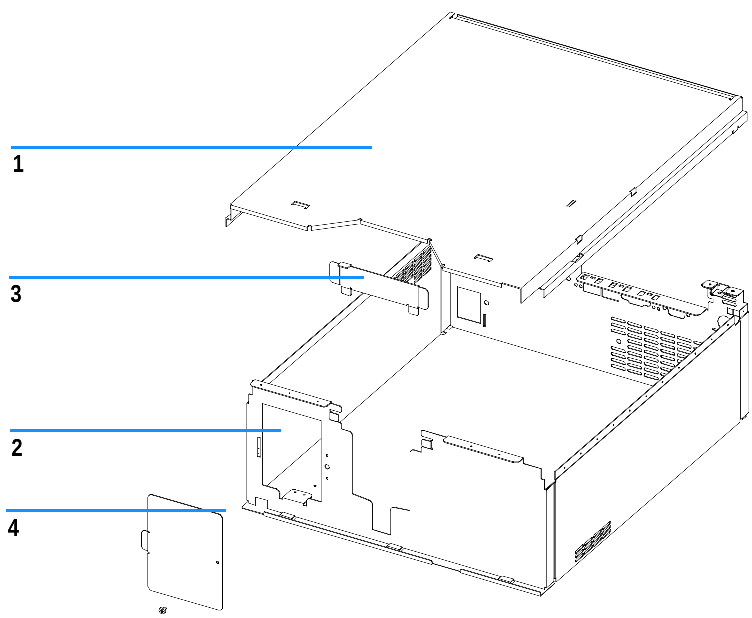


Figure 67 Sheet Metal Kit Parts

Plastic Parts

Table 35 Plastics Parts

Item	Description	Part Number
1	Front cover	5065-9982
2	Plastics, includes base, sides and top	5065-9985
3	Name plate Agilent 1200 Series	5042-8901

NOTE

For correct assembling of the top and sides, see “Assembling the Main Cover" on page 227.

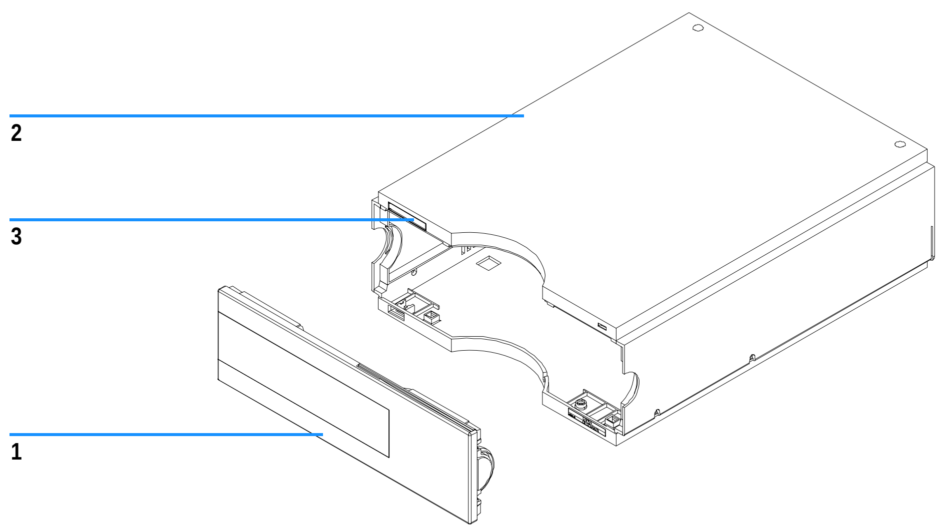


Figure 68 Plastic Parts

Leak Parts

Table 36 Leak Parts

Item	Description	Part Number
1	Leak sensor assembly	5061-3356
2	Leak pan	5042-8908
3	Leak funnel	5041-8388
4	Leak funnel holder	5041-8389
5	Clip	5041-8387
6	Corrugated tubing, 120 mm lg, re-order 5 m	5062-2463
7	Corrugated tubing, 1200 mm lg, re-order 5 m	5062-2463

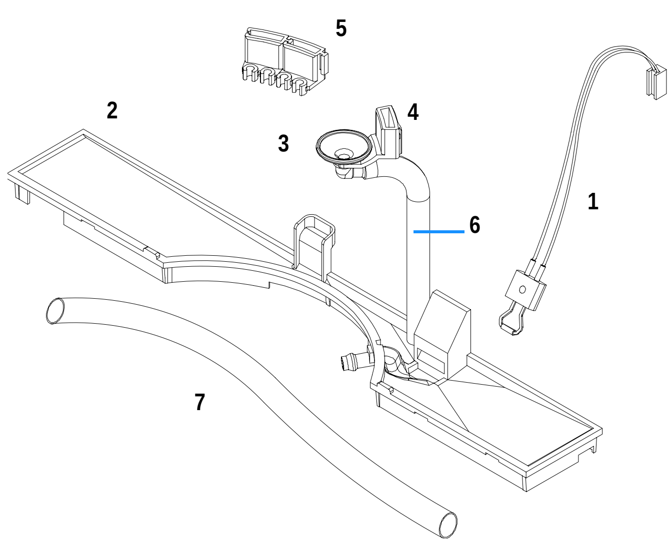


Figure 69 Leak Parts

Foam Parts

Table 37 Foam Parts

Item	Description	Part Number
1, 2	EPP foam kit, includes Base and top (part #1 and #2)	G1314-65019
3	Damper kit (includes bumpers for optical and fan)	G1314-65021
4	Guides for interface board	5041-8395

NOTE

Do not order the individual part numbers mentioned on the foam.

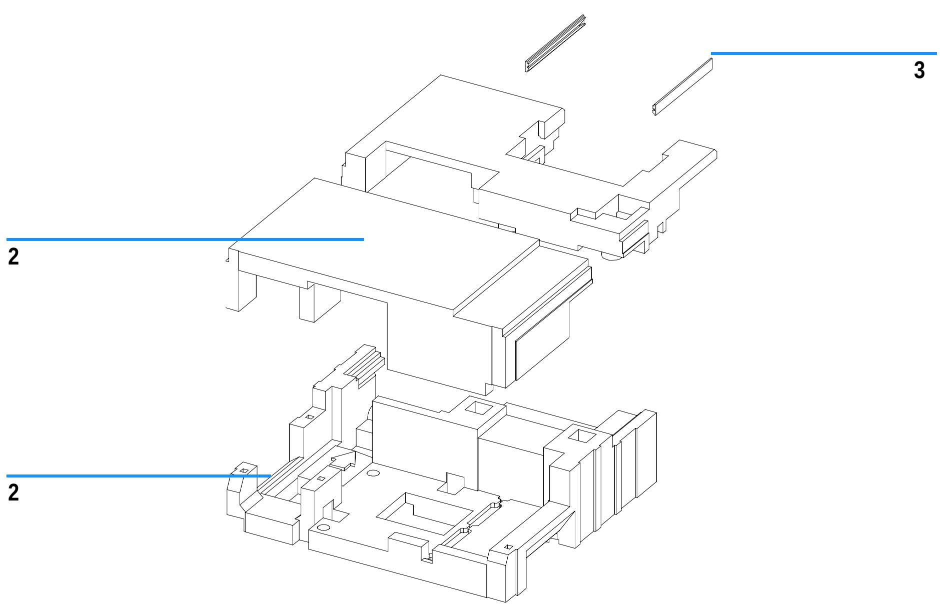


Figure 70 Foam Parts

Power and Status Light Pipes

Table 38 Power and Status Light Pipes

Item	Description	Part Number
	Power supply assembly	0950-2528
	Screw M4 × 0.7, 8 mm lg, to fix power supply at rear panel	0515-0910
	Washer	2190-0409
1	Power light pipe	5041-8382
2	Status light pipe	5041-8384
3	Power switch button	5041-8381
4	Coupler for power supply actuator	5041-8383

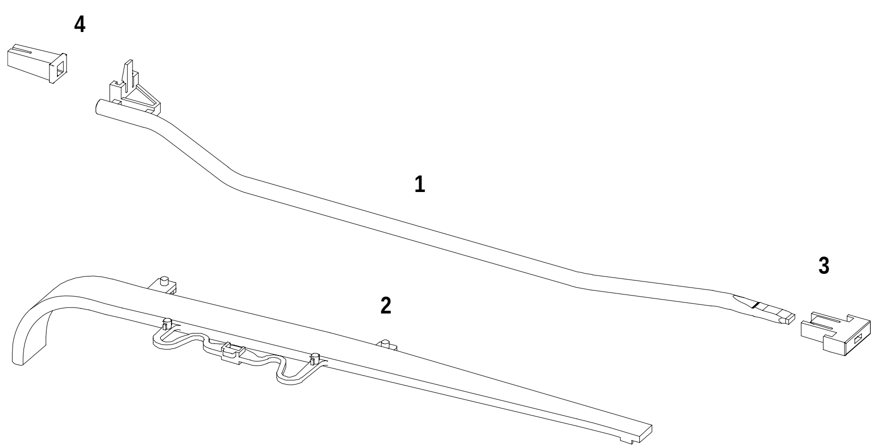


Figure 71 Power and Status Light Pipes

15
Identifying Cables

This chapter provides information on cables used with the 1200 series of HPLC modules.

Cable Overview

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

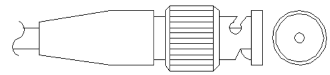
Table 39 Cables Overview

Type	Description	Part Number
Analog cables	3390/2/3 integrators	01040-60101
	3394/6 integrators	35900-60750
	35900A A/D converter	35900-60750
	General purpose (spade lugs)	01046-60105
Remote cables	3390 integrator	01046-60203
	3392/3 integrators	01046-60206
	3394 integrator	01046-60210
	3396A (Series I) integrator	03394-60600
	3396 Series II / 3395A integrator, see page 265	
	3396 Series III / 3395B integrator	03396-61010
	Agilent 1200 / 1050 modules / 1046A FLD	5061-3378
	1046A FLD	5061-3378
	35900A A/D converter	5061-3378
	1090 liquid chromatographs	01046-60202
	Signal distribution module	01046-60202

Table 39 Cables Overview (continued)

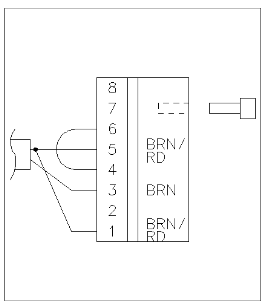
Type	Description	Part Number
BCD cables	3396 integrator	03396-60560
	General purpose (spade Lugs)	G1351-81600
Auxiliary	Agilent 1200 Series vacuum degasser	G1322-61600
CAN cables	Agilent 1200 module to module, 0.5 m	5181-1516
	Agilent 1200 module to module, 1 m	5181-1519
	Agilent 1200 module to control module	G1323-81600
External contacts	Agilent 1200 Series interface board to general purpose	G1103-61611
GPIB cable	Agilent 1200 module to Agilent ChemStation, 1 m	10833A
	Agilent 1200 module to Agilent ChemStation, 2 m	10833B
RS-232 cable	Agilent 1200 module to a computer This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter.	34398A
LAN cable	Cross-over network cable (shielded, 3 m long), (for point to point connection)	5023-0203
	Twisted pair network cable (shielded, 7 m long) (for hub connections)	5023-0202

Analog Cables

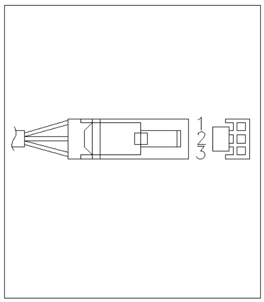


One end of these cables provides a BNC connector to be connected to Agilent 1200 Series modules. The other end depends on the instrument to which connection is being made.

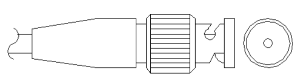
Agilent 1200 to 3390/2/3 Integrators

Connector 01040-60101	Pin 3390/2/3	Pin Agilent 1200	Signal Name
	1	Shield	Ground
	2		Not connected
	3	Center	Signal +
	4		Connected to pin 6
	5	Shield	Analog -
	6		Connected to pin 4
	7		Key
	8		Not connected

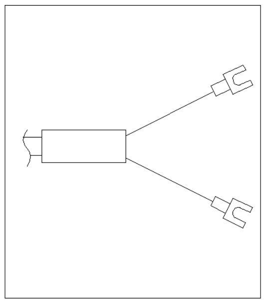
Agilent 1200 to 3394 / 6 Integrators

Connector 35900-60750	Pin 3394 / 6	Pin Agilent 1200	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

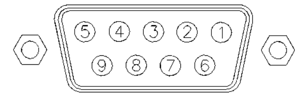
Agilent 1200 to BNC Connector

Connector 8120-1840	Pin BNC	Pin Agilent 1200	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

Agilent 1200 to General Purpose

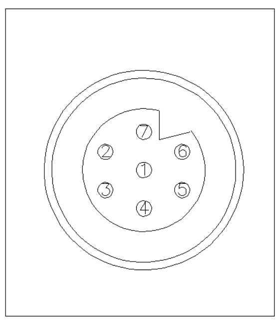
Connector 01046-60105	Pin 3394 / 6	Pin Agilent 1200	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables

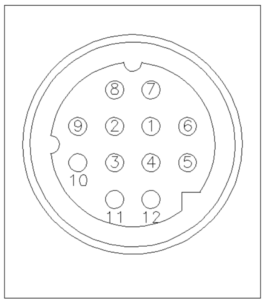


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent 1200 Series modules. The other end depends on the instrument to be connected to.

Agilent 1200 to 3390 Integrators

Connector 01046-60203	Pin 3390	Pin Agilent 1200	Signal Name	Active (TTL)
	2	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	7	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	NC	7 - Red	Ready	High
	NC	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

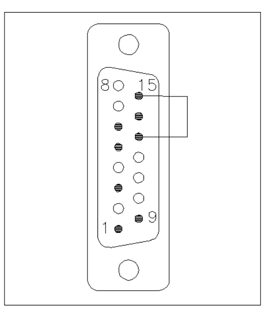
Agilent 1200 to 3392 / 3 Integrators



4 - Key

Connector 01046-60206	Pin 3392 / 3	Pin Agilent 1200	Signal Name	Active (TTL)
	3	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	11	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	9	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

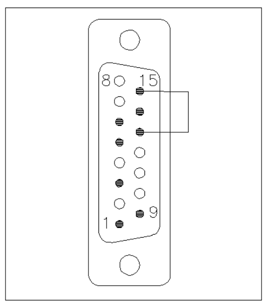
Agilent 1200 to 3394 Integrators



Connector 01046-60210	Pin 3394	Pin Agilent 1200	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
	5,14	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	1	9 - Black	Start request	Low
	13, 15		Not connected	

NOTE START and STOP are connected via diodes to pin 3 of the 3394 connector.

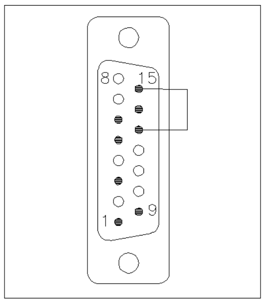
Agilent 1200 to 3396A Integrators

Connector 03394-60600	Pin 3394	Pin Agilent 1200	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
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

Agilent 1200 to 3396 Series II / 3395A Integrators

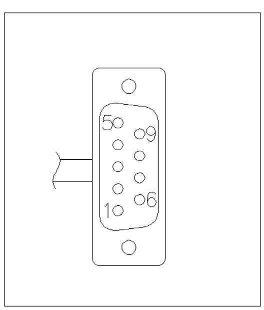
Use the cable 03394-60600 and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

Agilent 1200 to 3396 Series III / 3395B Integrators



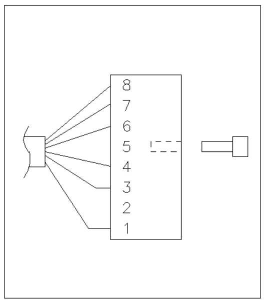
Connector 03396-61010	Pin 33XX	Pin Agilent 1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	14	7 - Red	Ready	High
	4	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

Agilent 1200 to HP 1050, HP 1046A or Agilent 35900 A / D Converters



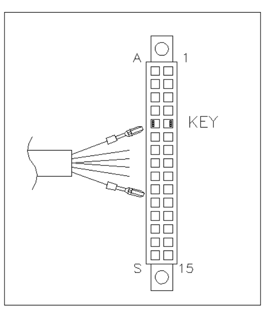
Connector 5061-3378	Pin HP 1050 / ...	Pin Agilent 1200	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent 1200 to HP 1090 LC or Signal Distribution Module



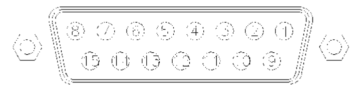
Connector 01046-60202	Pin HP 1090	Pin Agilent 1200	Signal Name	Active (TTL)
	1	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	4	3 - Gray	Start	Low
	7	4 - Blue	Shut down	Low
	8	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	3	7 - Red	Ready	High
5 - Key	6	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1200 to General Purpose



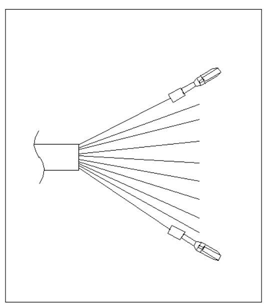
Connector 01046-60201	Pin Universal	Pin Agilent 1200	Signal Name	Active (TTL)
		1 - White	Digital ground	
		2 - Brown	Prepare run	Low
		3 - Gray	Start	Low
		4 - Blue	Shut down	Low
		5 - Pink	Not connected	
		6 - Yellow	Power on	High
		7 - Red	Ready	High
		8 - Green	Stop	Low
		9 - Black	Start request	Low

BCD Cables

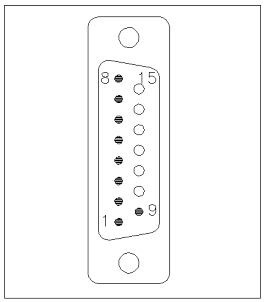


One end of these cables provides a 15-pin BCD connector to be connected to the Agilent 1200 Series modules. The other end depends on the instrument to be connected to

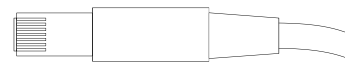
Agilent 1200 to General Purpose

Connector G1351-81600	Wire Color	Pin Agilent 1200	Signal Name	BCD Digit
	Green	1	BCD 5	20
	Violet	2	BCD 7	80
	Blue	3	BCD 6	40
	Yellow	4	BCD 4	10
	Black	5	BCD 0	1
	Orange	6	BCD 3	8
	Red	7	BCD 2	4
	Brown	8	BCD 1	2
	Gray	9	Digital ground	Gray
	Gray/pink	10	BCD 11	800
	Red/blue	11	BCD 10	400
	White/green	12	BCD 9	200
	Brown/green	13	BCD 8	100
	not connected	14		
	not connected	15	+5 V	Low

Agilent 1200 to 3396 Integrators

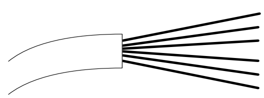
Connector 03396-60560	Pin 3392 / 3	Pin Agilent 1200	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

Auxiliary Cable

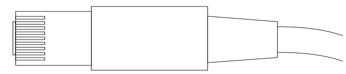


One end of this cable provides a modular plug to be connected to the Agilent 1200 Series vacuum degasser. The other end is for general purpose.

Agilent 1200 Series Degasser to general purposes

Connector G1322-61600	Color	Pin Agilent 1200	Signal Name
	White	1	Ground
	Brown	2	Pressure signal
	Green	3	
	Yellow	4	
	Grey	5	DC + 5 V IN
	Pink	6	Vent

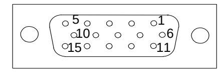
CAN Cable



Both ends of this cable provide a modular plug to be connected to Agilent 1200 Series module's CAN-bus connectors.

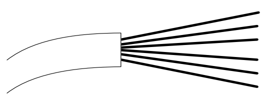
Agilent 1200 module to module, 0.5 m	5181-1516
Agilent 1200 module to module, 1 m	5181-1519
Agilent 1200 module to control module	G1323-81600

External Contact Cable



One end of this cable provides a 15-pin plug to be connected to Agilent 1200 Series module's interface board. The other end is for general purpose.

Agilent 1200 Series Interface Board to general purposes

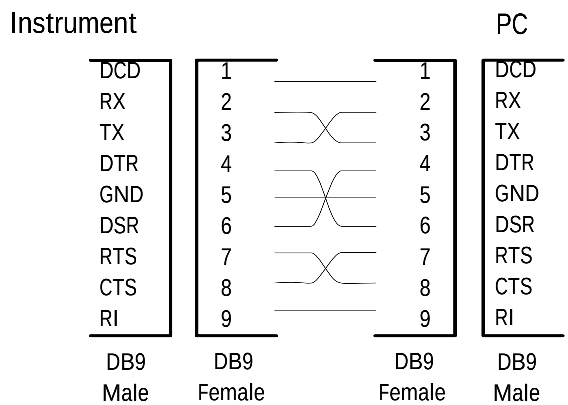
Connector G1103-61611	Color	Pin Agilent 1200	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected
	Brown/green	14	Not connected
	White/yellow	15	Not connected

RS-232 Cable Kit

This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter. Use the cable and adapter to connect Aligent Technologies instruments with 9-pin male RS-232 connectors to most PCs or printers.

Agilent 1200 module to PC

RS-232 Cable Kit 34398As



LAN Cables

Recommended Cables

Table 40

Description	Part number
Cross-over network cable (shielded, 3 m long), (for point to point connection)	5023-0203
Twisted pair network cable (shielded, 7 m long), (for hub connections)	5023-0202

16
Hardware Information

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

Optical System Components

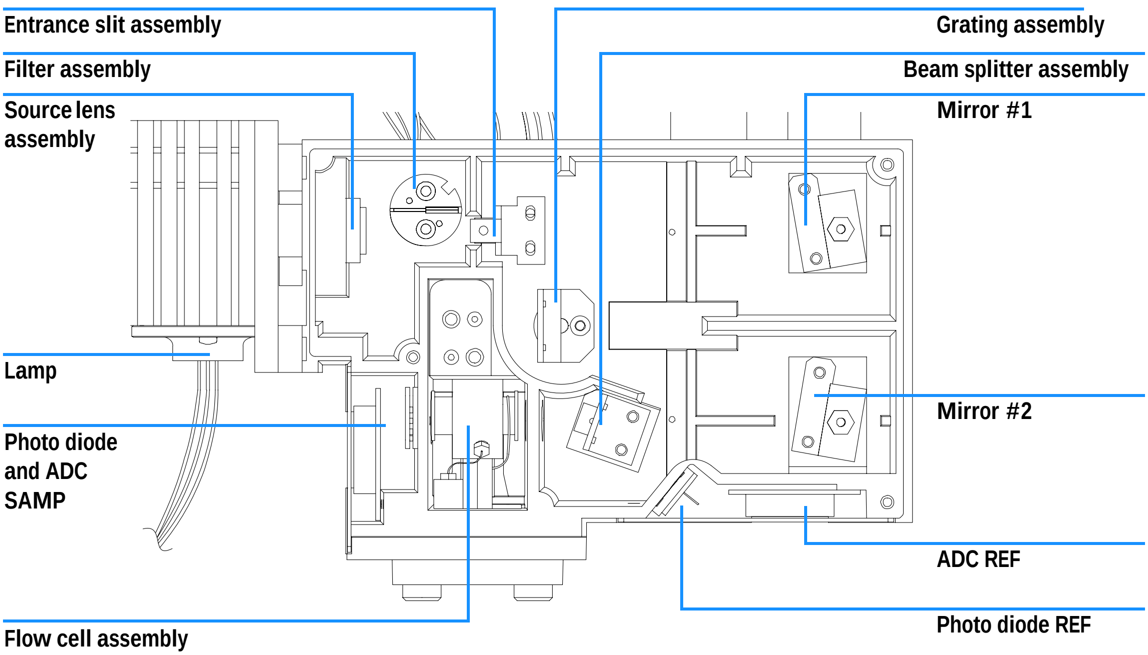


Figure 72 Mechanical Layout of the Optical Unit

Lamp

The light source for the UV wavelength range is a deuterium lamp. As a result of plasma discharge in a low pressure deuterium gas, the lamp emits light over the 190 to 600 nm wavelength range.

Source Lens Assembly

The source lens receives the light from the deuterium lamp and focuses it onto the entrance slit.

Entrance Slit Assembly

The entrance slit assembly has an exchangeable slit. The standard one has a 1-mm slit. For replacement and calibration purposes to optimize the alignment, a slit with a hole is needed.

Filter Assembly

The filter assembly is electromechanically actuated. During wavelength calibrations it moves into the light path.

The filter assembly has two filters installed and is processor-controlled.

OPEN	**nothing in light path**
CUTOFF	**cut off filter in light path at λ > 370 nm**
HOLMIUM	**holmium oxide filter for wavelength check.**

A photo sensor determines the correct position.

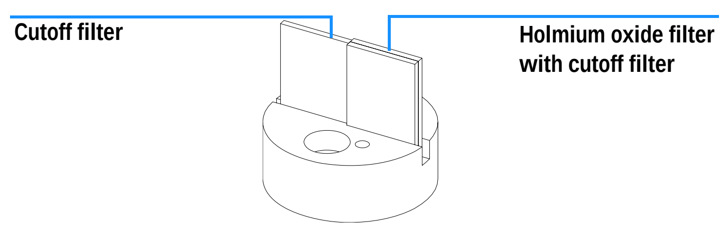


Figure 73 Filter Assembly

Mirror Assemblies M1 and M2

The instrument contains two spherical mirrors (M1 and M2). The beam adjustable is vertically and horizontally. Both mirrors are identical.

NOTE The mirrors are coated with magnesium fluoride. They should not be touched or cleaned. This will destroy the surface and reduce the light reflection.

Grating Assembly

The grating separates the light beam into all its component wavelengths and reflects the light onto mirror #2.

The grating has 1200 lines/mm and is directly rotated by the grating drive stepper motor, depending on the wavelength entry. The whole range (190 to 600 nm) is equal to 1550 steps (15.5 °). The stepper motor is controlled and driven by the detector main board (VWM). The step angle of the stepper motor rotation is electronically reduced by 0.01 ° per step. This system has no mechanical reduction mechanism, accordingly the grating is mounted directly onto the motor shaft.

The stepper motor reference position is determined by a plate fitted onto the motor shaft, interrupting the beam of a photo sensor. The wavelength calibration of the grating is done at the zero order light position and at 656 nm, which is the emission line of the deuterium lamp.

NOTE The grating surface should not be touched or cleaned. This will destroy the surface and reduce the light reflection.

Beam Splitter Assembly

The beam splitter splits the light beam. One part goes directly to the sample diode. The other part of the light beam goes to the reference diode.

Photo Diodes Assemblies

Two photo diode assemblies are installed in the optical unit. The sample diode assembly is located on the left side of the optical unit. The reference diode assembly is located in the front of the optical unit.

Photo Diode ADC (analog-to-digital converter)

The photo diode current is directly converted to 20-bit digital data direct photo current digitalization. The data is transferred to the detector main board (VWM). The photo diode ADC boards (VWAs) are located close to the photo diodes.

Flow Cell Assembly

A variety of flow-cell cartridges can be inserted using the same quick and simple mounting system.

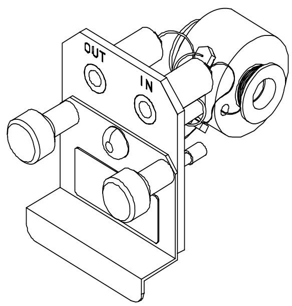


Figure 74 Cartridge Type Flow Cell

Table 41 Flow Cell Data

	STD	Semi-micro	High Pressure	Micro	
Maximum pressure	40 (4)	40 (4)	400 (40)	40 (4)	bar (MPa)
Path length	10 (conical)	6 (conical)	10 (conical)	5	mm
Volume	14	5	14	1	µl
Inlet i.d.	0.17	0.17	0.17	0.1	mm
Inlet length	750	750	750	555	mm
Outlet i.d.	0.25	0.25	0.25	0.25	mm
Outlet length	120	120	120	120	mm
Materials in contact with solvent	SST, quartz, PTFE, PEEK	SST, quartz, PTFE	SST, quartz, Kapton	SST, quartz, PTFE	

Detector Main Board (VWM)

This board controls all information and activities of all assemblies within the detector module. The operator enters parameters, changes modes and controls the module, through interfaces (CAN, GPIB (G1314B only) or RS-232C), connected to the user interfaces.

Depending on the version of the detector there are two main boards available:

G1314B VWD	VWM board G1314-66525	
G1314C VWD-SL	VWM board G1314-66531	high data rates, requires firmware A.06.02 or above

Main features:

- lamp supply for UV-lamp,
- interface slot for LAN or BCD/external contact board,
- CAN for internal 1200 interfacing,
- RS-232 for third part control or service,
- 1 analog output (0 - 1 V or 0 - 100 mV full scale),
- leak sensing (flow cell),
- safety switch turns off high voltages/fan,
- battery for parameter backup.

Firmware

For an outline of the firmware, see “Firmware Description" on page 285.

Leak Converter

This block consists of a PTC (resistor with positive temperature coefficient) for the leak identification and a NTC (resistor with negative temperature coefficient) for the ambient temperature measurement. This assures that temperature changes are not identified as a leak. A leak would cool down the PTC and its change in resistance would produce a leak signal. The signals are converted by the diagnostic A/D converter.

Fan Drive

The operation of the fan is controlled by the main processor and runs with constant revolution. The fan produces a sense signal which is derived from the revolution. This sense signal is used for diagnostics. If the fan does not turn, the deuterium lamp and the grating drive are switched OFF.

Filter Motor Driver

The filter motor driver, controlled by the main processor, drives the filter motor with constant voltage, 2-phase full stepping.

Grating Motor Driver

The grating motor driver, controlled by the main processor, drives the grating motor. The motor driver controls and balances each coil current of the 2-phase stepper motor (corrected micro-step stepper motor driver circuit). The step angle of the stepper motor rotation is reduced electronically into 0.01° per step. The data of current control for detent torque correction is programmed on ROM (Read Only Memory).

On-board Battery

An on-board lithium battery buffers the electronic memories when the module is turned OFF.

For safety information on lithium batteries “Lithium Batteries Information" on page 307.

Interfaces

For detailed information on interfaces, see “Agilent 1200 Series Interfaces" on page 290.

Deuterium Lamp Filament Control

The deuterium lamp filament control circuit provides a constant voltage of 2.5 VDC at approximately 6 A to the filament of the deuterium lamp. The deuterium lamp filament control circuit is enabled by the processor. Depending on the lamp type the heater voltage is turned off or kept lower after lamp ignition.

Deuterium Lamp Current Control

The deuterium lamp current control circuit comprises two parts. One part generates an ignition pulse of 600 VDC for the lamp, resulting in lamp ignition. After ignition this voltage is disabled. The other part is a constant current source of 320 mA at an operating voltage of about 85 VDC for stable operating conditions and light emission of the deuterium lamp.

Igniting the Deuterium Lamp

The deuterium lamp filament is heated for several seconds prior to ignition. The deuterium lamp current control circuit gives an ignition pulse to the lamp, resulting in lamp ignition. The filament control circuit disables or lowers the filament voltage (depending on the lamp type) if the lamp was ignited successfully.

If the deuterium lamp failed to ignite, the whole sequence is repeated after a wait sequence for cooling down. If the deuterium lamp still does not ignite, an error message occurs.

Diagnostic A/D Converter

The diagnostic A/D converter senses currents and voltages of the deuterium and tungsten lamps and converts the analog signals into digital values. The digital values are transferred via the control bus on the VWM board. When values are outside of the normal range, an appropriate error message is generated.

Safety Switch

If the rear EPP foam is removed while the instrument is still on, the safety light switches are activated and the deuterium lamp, the grating drive and the fan are switched OFF.

Board Layout and Connectors

J1 / 2 -CAN
J3 -Interface board
J5 - Test connector
J12 - RS-232C
J15 - REMOTE
J17 - GPIB
J150 - Power supply
J201 - Grating motor
203 - Fan assembly
J204 - Leak sensor
J205 - Grating position
J207 - Filter motor
J208 - Analog output
J209 - Filter position
J400 -ADC board Sample
J401 -ADC Board Reference
J502 - Deuterium lamp
S1 - Configuration switch
B - Battery

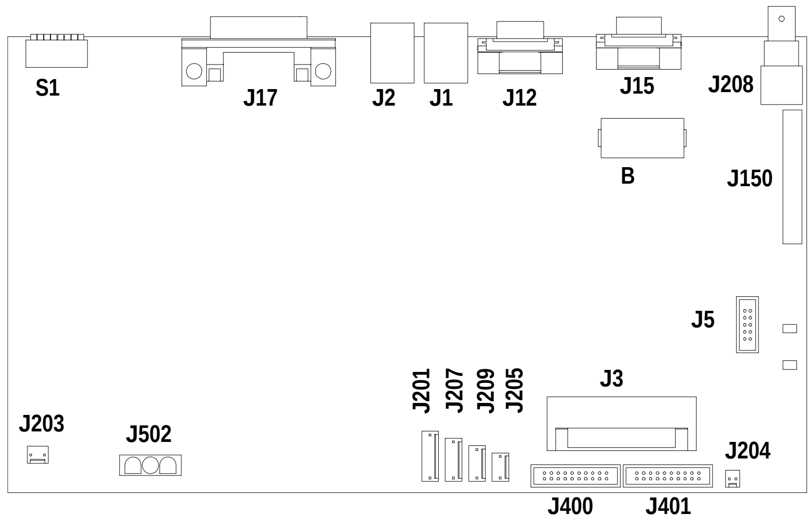


Figure 75 Board Layout and Connectors on VWM Board

Firmware Description

The firmware of the instrument consists of two independent sections:

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

Resident System

This resident section of the firmware is identical in all Agilent 1200 Series modules. Its properties are:

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

Main System

Its properties are:

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

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

- run synchronization through APG remote
- error handling,
- diagnostic functions and so on,

or module specific functions like

- internal events such as lamp control, grating and filter movements,
- raw data collection and conversion to absorbance, and so on.

Firmware Updates

Firmware updates can be done using your user interface:

- instant pilot G4208A with files from a USB-memory stick, or
- handheld control module G1323 with files from a PC-card, or
- a PC Firmware Update Tool with files from hard disk or CD-ROM.

The file naming conventions are:

1314B_A602_zz.dlb, where

xxxxx is the product number, e.g. 1314B for the G1314B VWD), and
vvvv is the revision number, for example A602 is revision A.06.02, and
zz is the build number of the firmware.

For instructions refer to the documentation provided with the Firmware Upgrade Tools provided on the Agilent web.

NOTE

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

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

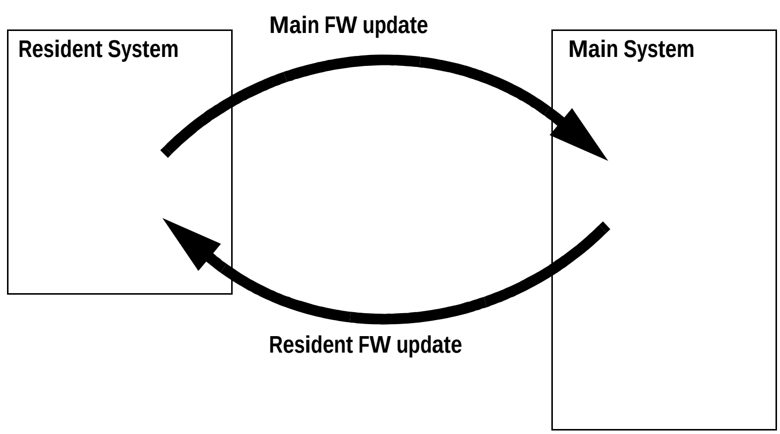


Figure 76 Firmware Update Mechanism

Optional Interface Boards

The Agilent 1200 Series modules have one optional board slot that allows to add an interface board to the modules.

Table 42 Optional Interface Boards

Description	Part Number
BCD Board	G1351-68701
Fuse 250 mA (four are on the board)	2110-0004
LAN Communication Interface Board	G1369A or G1369-60001

BCD Board

The BCD board provides a BCD output for the bottle number of the Agilent 1200 Series autosampler and four external contacts. The external contact closure contacts are relay contacts. The maximum settings are: 30 V (AC/DC); 250 mA (fused).

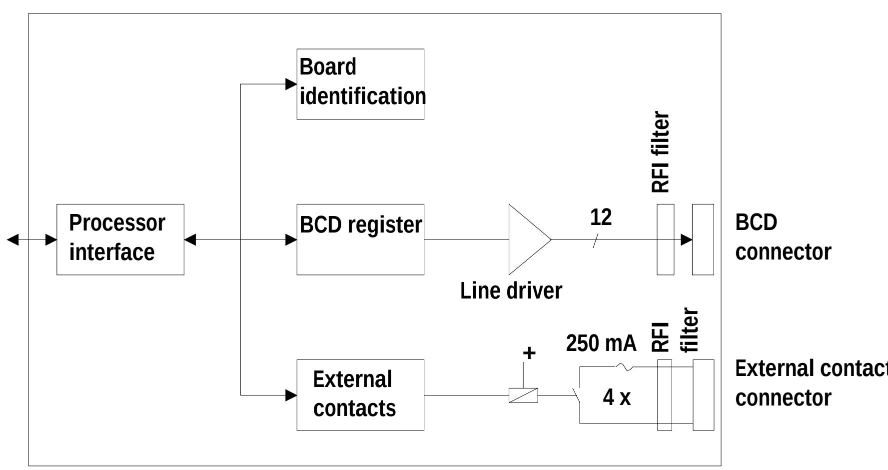


Figure 77 Block Diagram BCD Board

There are general purpose cables available to connect the BCD output, see "BCD Cables" on page 268 and the external outputs, see "External Contact Cable" on page 272 to external devices.

Table 43 Detailed connector layout (1200)

Pin	Signal name	BCD digit
1	BCD 5	20
2	BCD 7	80
3	BCD 6	40
4	BCD 4	10
5	BCD 0	1
6	BCD 3	8
7	BCD 2	4
8	BCD 1	2
9	Digital ground	
10	BCD 11	800
11	BCD 10	400
12	BCD 9	200
13	BCD 8	100
15	+5V	Low

LAN Communication Interface Board

NOTE One board is required per Agilent 1200 stack. It is recommended to add the LAN board to the detector with highest data rate.

The following cards can be used with the Agilent 1200 Series modules.

Table 44 LAN Boards

Type	Vendor	Supported networks
G1369A G1369-60001	Agilent Technologies	Fast Ethernet, Ethernet/802.3, RJ-45 (10/100Base-TX) **recommended for re-ordering**
J4106A (*)	Hewlett Packard	Ethernet/802.3, RJ-45 (10Base-T(
J4105A (*)	Hewlett Packard	Token Ring/802.5, DB9, RJ-45 (10Base-T)
J4100A (*)	Hewlett Packard	Fast Ethernet, Ethernet/802.3, RJ-45 (10/100Base-TX) + BNC (10Base2)

NOTE These cards (*) may be no longer orderable. Minimum firmware of these Hewlett Packard JetDirect cards is A.05.05.

Recommended Cables

Cross-over network cable (shielded, 3 m long), (for point to point connection)	5023-0203
Twisted pair network cable (shielded, 7 m long) (for hub connections)	5023-0202

Agilent 1200 Series Interfaces

The Agilent 1200 Series modules provide the following interfaces:

Table 45 Agilent 1200 Series Interfaces

Interface Type	Pumps	Autosampler	DA Detector MW Detector FL Detector	DA Detector MW Detector (G1315C / G1365C)	VW Detector RI Detector	Thermostatted Column Compartment	Vacuum Degasser
CAN	Yes	Yes	Yes	Yes	Yes	Yes	No
LAN (on-board)	No	No	No	Yes	No	No	No
GPIB	Yes	Yes	Yes	No	Yes	No	No
RS-232C	Yes	Yes	Yes	Yes	Yes	Yes	No
Remote	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Analog	Yes	No	2 ×	2 ×	1 ×	No	Yes*
Interface board (LAN / BCD / Ext)	Yes	Yes	Yes	No	Yes	No	No

* The vacuum degasser will have a special connector for specific use. For details see description of main board.

- CAN connectors as interface to other Agilent 1200 Series modules,
- GPIB connector as interface to the Agilent ChemStation,
- RS-232C as interface to a computer,
- REMOTE connector as interface to other Agilent products,
- analog output connector(s) for signal output, and
- interface slot for specific interfacing (external contacts, BCD, LAN and so on).

For identification and location of the connectors, see Figure 8 on page 38.

WARNING **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations, see “" on page 238.**

Analog Signal Output

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

GPIB Interface

The GPIB connector is used to connect the module with a computer. The address and control switches next to the GPIB connector determine the GPIB address of your module. The switches are preset to a default address and recognized by the operating software from Agilent Technologies.

Table 46 Default Addresses

Autosampler	28	Autosampler	28
Pump	22	RID	29
FLD	23		
VWD	24	Autosampler (HP 1050)	18
Agilent 8453A	25	Pump (HP 1050)	16
DAD/MWD	26	VWD (HP 1050)	10
Column Compartment	27	DAD (HP 1050)	17

CAN Interface

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

Remote Interface

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 level are defined as:

- standard TTL levels (0 V is logic true, + 5 V is false)
- fan-out is 10,
- input load is 2.2 kOhm against + 5 V, and
- output are open collector type, inputs/outputs (wired-or technique).

Table 47 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 preanalysis 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.

Table 47 Remote Signal Distribution (continued)

Pin	Signal	Description
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.

RS-232C

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 next to the GPIB connector.

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 48 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

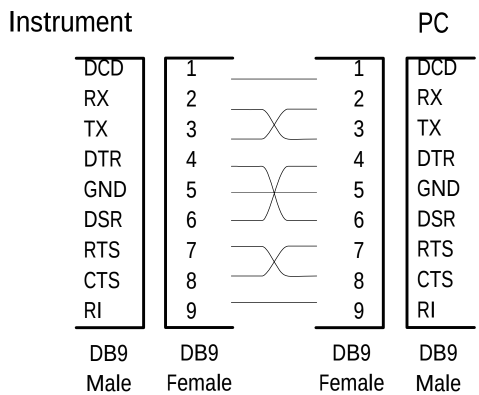


Figure 78 RS-232 Cable

Setting the 8-bit Configuration Switch

The 8-bit configuration switch is located next to the GPIB connector. Switch settings provide configuration parameters for GPIB address, serial communication protocol and instrument specific initialization procedures.

Factory setting is shown for the variable wavelength detector

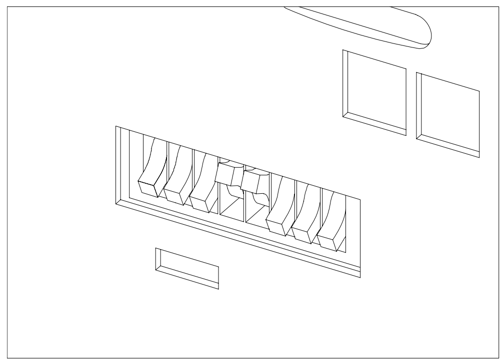


Figure 79 8-bit Configuration Switch

Table 49 8-bit Configuration Switch

Mode Select	1	2	3	4	5	6	7	8
GPIB	0	0		GPIB address				
RS-232C	0	1	Baud rate			Data bits	Parity	
Reserved	1	0	Reserved					
TEST / BOOT	1	1	RSVD	SYS		RSVD	RSVD	FC

Switches 1 and 2 define which set of parameters (for example, for GPIB, RS-232C, and so on) will be changed. Once the change has been completed, the instrument must be powered up again in order to store the values in the non-volatile memory.

In the non-volatile memory, the parameters are kept, regardless of whether you turn the instrument OFF and ON again. They will be kept until the same set of parameters is changed and the power is reset. All other previously stored configuration settings will still remain in the non-volatile memory.

In this way, you can store more than one set of parameters using the same 8-bit configuration switch twice, for example, for both GPIB and RS-232C.

GPIB Default Addresses

If you just want to change the GPIB address and need a detailed procedure, refer to the *Installing Your Agilent ChemStation System* handbook.

Default GPIB address is set to the following addresses:

Table 50 Default Addresses for Agilent Series 1200 Modules

Module	Address	Binary Address
Pump	22	0 0 0 1 0 1 1 0
FLD	23	0 0 0 1 0 1 1 1
VWD	24	0 0 0 1 1 0 0 0
Agilent 8453A	25	0 0 0 1 1 1 0 1
DAD/MWD	26	0 0 0 1 1 0 1 0
Column compartment	27	0 0 0 1 1 0 1 1
Autosampler	28	0 0 0 1 1 1 0 0
RID	29	0 0 0 1 1 1 0 1

where 0 means that the switch is down and 1 means that the switch is up.

Communication Settings for RS-232C Communication

The communication protocol used in this instrument supports only hardware handshake (CTS/RTS).

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 instrument must be powered up again in order to store the values in the non-volatile memory.

Table 51 Communication Settings for RS-232C Communication

Mode Select	1	2	3	4	5	6	7	8
RS-232C	0	1	Baud rate			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 52 Baud Rate Settings

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 53 Data Bit Settings

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

Table 54 Parity Settings

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.

Forced Cold Start Settings

Switches 1 and 2 do not force storage of this set of parameters in non-volatile memory. Returning switches 1 and 2 to other positions (other than being both up) will allow for normal operation.

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

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

Table 55 Forced Cold Start Settings

Mode Select	1	2	3	4	5	6	7	8
TEST/BOOT	1	1	0	0	0	0	0	1

To return to normal operation, set switches back to your GPIB or RS 232 configuration settings.

Stay-Resident Settings

Firmware update procedures may require this mode in case of firmware loading errors.

Switches 1 and 2 do not force storage of this set of parameters in non-volatile memory. Returning switches 1 and 2 to other positions (other than being both up) will allow for normal operation.

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident part, that is, it is not operable as a detector. It only uses basic functions of the operating system for example, for communication.

Table 56 Stay Resident Settings

Mode Select	1	2	3	4	5	6	7	8
TEST/BOOT	1	1	0	0	1	0	0	0

To return to normal operation, set switches back to your GPIB or RS-232C configuration settings.

Main Power Supply Assembly

The main power supply comprises a closed assembly (no on-site repair possibility).

The power supply provides all DC voltages used in the module except for the voltages supplied by the lamp power supply to the deuterium and tungsten lamps in the detectors. The line voltage can vary in a range from 100 – 240 volts AC ± 10% and needs no manual setting.

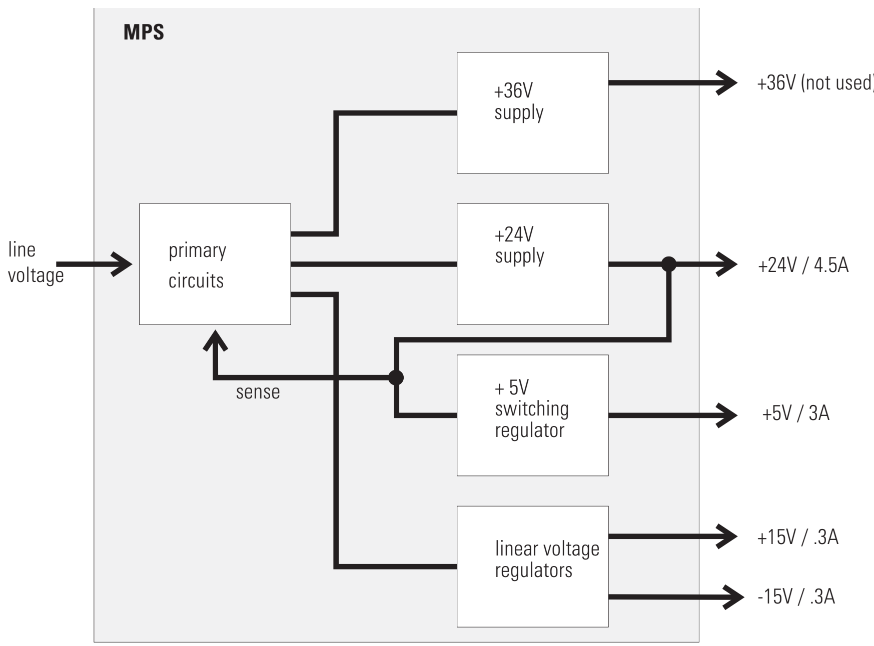


Figure 80 Main Power Supply (MPS) Blockdiagram

WARNING **To disconnect the instrument from line, unplug the power cord. The power supply still uses some power, even if the power switch on the front panel is turned OFF.**

No accessible hardware fuse is needed because the main power supply is safe against any short circuits or overload conditions on the output lines. When overload conditions occur, the power supply turns off all output voltages. Turning the line power off and on again resets the power supply to normal operation if the cause of the overload condition has been removed.

An over-temperature sensor in the main power supply is used to turn OFF output voltages if the temperature exceeds the acceptable limit (for example, if the cooling fan of the instrument fails). To reset the main power supply to normal operating conditions, turn the instrument OFF, wait until it is approximately at ambient temperature and turn the instrument on again.

The following table gives the specifications of the main power supply.

Table 57 Main Power Supply Specifications

Maximum power	130 W	Continuous output
Line input	100 – 240 volts AC ± 10%, line frequency of 50 / 60 Hz	Wide ranging
Output 1	+ 24 V / 4.5 A (maximum)	Total power consumption of + 24 V and + 36 V must not exceed 107 W.
Output 2	+ 36 V / 2.5 A (maximum)	
Output 3	+ 5 V / 3 A	
Output 4	+ 15 V / 0.3 A	
Output 5	- 15 V / 0.3 A	

A
Appendix

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.

General

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

This instrument is designed and certified as a general purpose laboratory instrument for research and routine application only. It is not certified for in-vitro or medical applications.

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.

CAUTION The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

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 as much as possible. When inevitable, this should 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.

Safety Symbols

Table 58 shows safety symbols used on the instrument and in the manuals.

Table 58 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order 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.

WARNING **A warning alerts you to situations that could cause physical injury or damage to the equipment. 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 a possible loss of data. Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Lithium Batteries Information

WARNING

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Lithium batteries may not be disposed-off into the domestic waste.

Transportation of discharged Lithium batteries through carriers regulated by IATA / ICAO, ADR, RID, IMDG is not allowed. Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

WARNING

Lithium batteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Lever det brugte batteri tilbage til leverandøren.

WARNING

Lithiumbatteri - Eksplosionsfare. Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres appararleverandoren.

NOTE

Bij dit apparaat zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.

Radio Interference

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

Test and Measurement

If test and measurement equipment is operated with equipment unscreened 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 Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

UV-Radiation

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 59 UV-Radiation Limits

Exposure / day	Effective Irradiance
8 hours	0.1 µW / cm^2
10 minutes	5.0 µW / cm^2

Typically the radiation values are much smaller than these limits:

Table 60 UV-Radiation Typical Values

Position	Effective Irradiance
Lamp installed, 50-cm distance	average 0.016 µW / cm^2
Lamp installed, 50-cm distance	maximum 0.14 µW / cm^2

Solvent Information

Observe the following recommendations on the use of solvents.

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.

Prevent any crystallization of buffer solutions. This will lead into a blockage/damage of the flow cell.

If the flow cell is transported while temperatures are below 5 degree C, it must be assured that the cell is filled with alcohol.

Aqueous solvents in the flow cell can built up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add small % of organic solvents (e.g. Acetonitrile or Methanol ~5%).

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. 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 nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

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

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

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Declaration of Conformity for HOX2 Filter

Declaration of Conformity

We herewith inform you that the

Holmium Oxide Glass Filter (Type Hoya HY-1)
(Part No. 79880-22711)

meets the following specification of absorbance maxima positions:

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	1100	536.7 nm		
G1315B/C	1100 / 1200			
G1600				
79853C	1050	360.8nm 418.5nm 536.4nm	+/- 2 nm	6 nm
G1314A/B/C	1100 / 1200	360.8nm 418.5nm 536.4nm	+/- 1 nm	6 nm

*) The variation in Measured Wavelength depends on the different Optical Bandwidth.

Agilent Technologies guarantees the traceability of the specified absorbance maxima to a National Institute of Standards & Technology (NIST) Holmium Oxide Solution Standard with a lot-to-lot tolerance of ± 0.3 nm.

The wavelength calibration filter built into the Agilent Technologies UV-VIS detectors is made of this material and meets these specifications. It is, therefore, suitable for wavelength calibration of these detectors within the specified wavelength accuracy of the respective detector over its wavelength range.

January 13, 2006
(Date)

Thomas Jöris
(Engineering Manager)

G. Gölke
(Quality Manager)

P/N 89550-90501

Revision: E
Effective by: Jan 13, 2006

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Select "**Products**" - "**Chemical Analysis**"

It will provide also the latest firmware of the Agilent 1200 Series modules for download.

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www.agilent.com

In This Book

This manual contains the technical reference information about the Agilent 1200 Series variable wavelength detector.

The manual describes the following:

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

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