



# Agilent 1100 Series Variable Wavelength Detector



## Reference Manual



Agilent Technologies

## Notices

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### Software Revision

This guide is valid for A.01.xx revisions of the Agilent 1100 Series Variable Wavelength Detector software, where xx refers to minor revisions of the software that do not affect the technical accuracy of this guide.

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## In This Guide...

### **1 Installing the Variable Wavelength Detector**

How to install the variable wavelength detector

### **2 How to optimize the detector**

How to select the detector parameters and flow cell

### **3 Troubleshooting and Test Functions**

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

### **4 Repairing the Variable Wavelength Detector**

Instructions on how to repair the variable wavelength detector

### **5 Identifying Parts and Materials**

Detailed illustrations and listings for parts and materials identification for the variable wavelength detector

### **6 Introduction to the Variable Wavelength Detector**

An introduction to the detector, instrument overview, theory of operation, external communication and internal connectors

### **7 Control Module Screens for the Agilent 1100 Variable Wavelength Detector**

This chapter is intended to introduce an operator to the screens available for operation of the Agilent 1100 variable wavelength detector (VWD) with the Agilent 1100 control module.

Please use the manual of control module for further detailed reference.

### **8 Specifications**

Performance specifications of the variable wavelength detector



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## **8 Specifications**

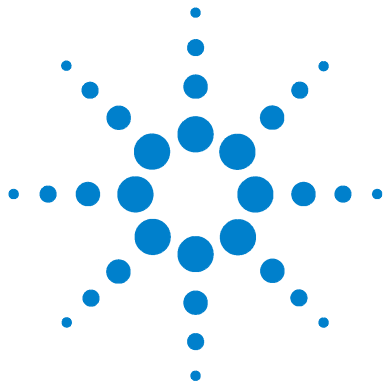
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### Site Requirements

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

#### Power Consideration

The detector power supply has wide ranging capabilities (see [Table 1](#) on page 14). 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.**

---

#### 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.**

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#### **WARNING**

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

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## Bench Space

The detector dimensions and weight (see [Table 1](#) on page 14) 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 1100 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 1](#) on page 14.

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 242) 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 1** 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	100–120 or 220–240 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	



## 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 2** Variable Wavelength Detector Checklist

Description	Quantity
Variable wavelength detector	1
Power cable	1
CAN cable (Part number 5181-1516)	1
Flow cell	As ordered
<i>Reference Manual</i>	1
Accessory kit (see <a href="#">Table 3</a> on page 16)	1

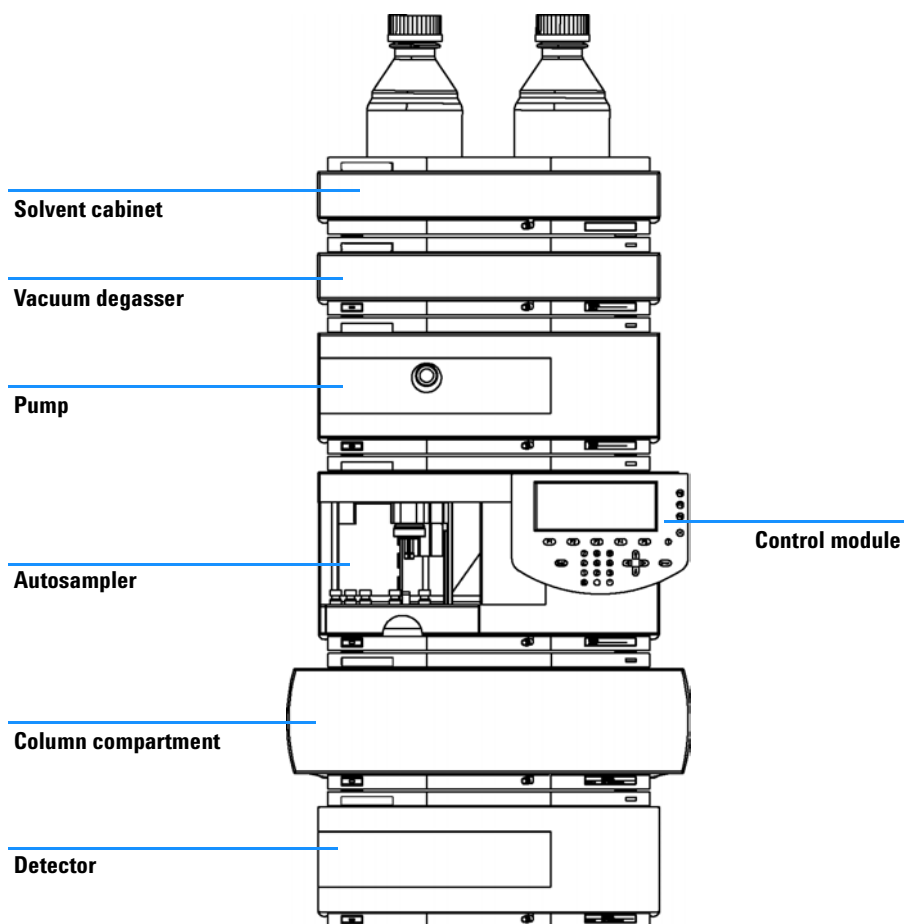
## 1 Installing the Variable Wavelength Detector

**Table 3** Accessory Kit Contents

<b>Description</b>	<b>Part Number</b>	<b>Quantity</b>
Accessory kit	G1314-68705	
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
ESD wrist strap	9300-1408	1

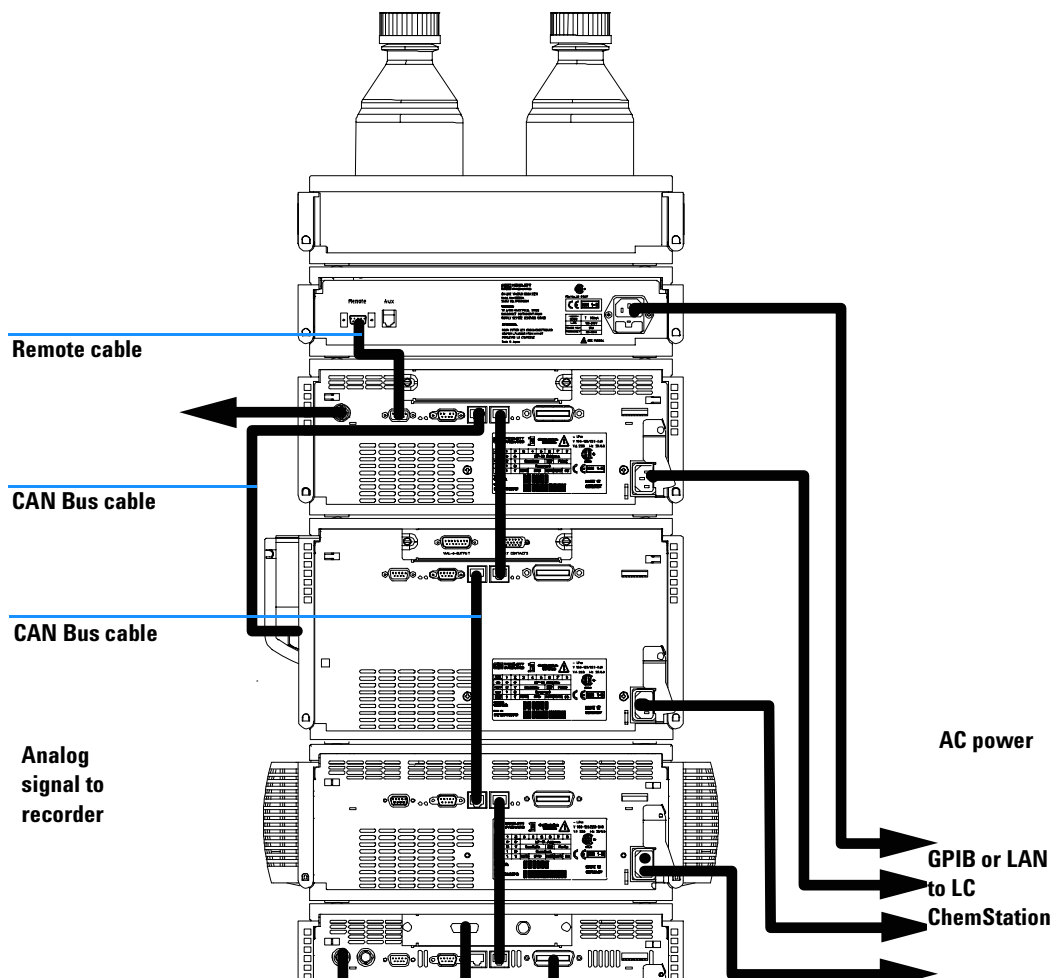
## Optimizing the Stack Configuration

If your detector is part of a complete Agilent 1100 Series system, you can ensure optimum performance by installing the following configuration. This configuration optimizes the system flow path, ensuring minimum delay volume.



**Figure 1** Recommended Stack Configuration (Front View)

## 1 Installing the Variable Wavelength Detector



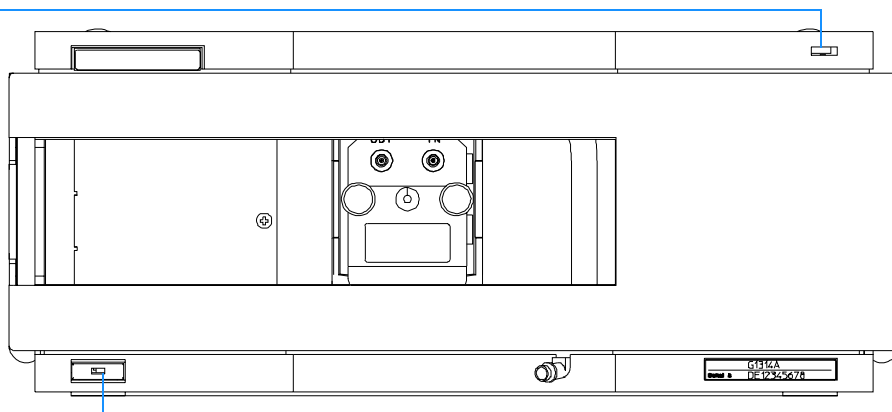
**Figure 2** Recommended Stack Configuration (Rear View)

## Installing the Detector

<b>Preparations</b>	Locate bench space. Provide power connections. Unpack the detector.
<b>Parts required</b>	Detector Power cord, for other cables see text below and <a href="#">“Cable Overview”</a> on page 160 ChemStation and/or Control Module G1323A/B

- 1 Install the LAN interface board in the detector (if required), see [“Replacing the Interface Board”](#) on page 134.
- 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.

Status indicator  
green/yellow/red



Line power switch  
with green light

**Figure 3** 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 22.



**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 208

---

## Flow Connections to the Detector

**Preparations**  
**Parts required**

Detector is installed in the LC system.  
Other modules

Parts from accessory kit, see ["Accessory Kit Contents"](#) on page 16  
Two wrenches 1/4–5/16 inch for capillary connections

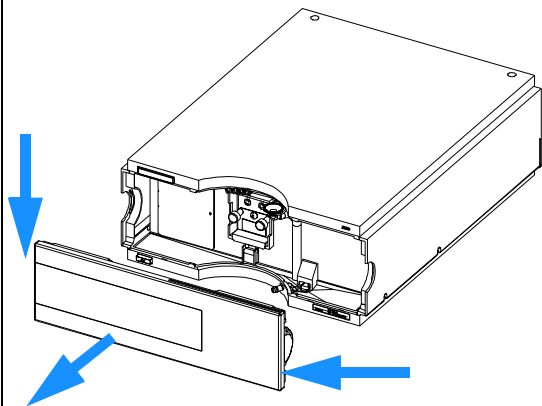
**WARNING**

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.

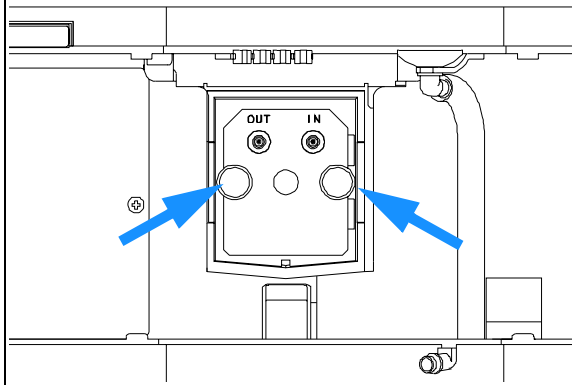
**NOTE**

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.



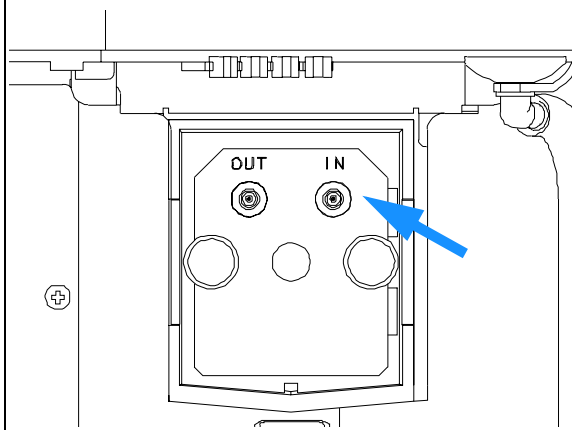
- 2 Remove the metal cover and install the flow cell. Tighten the cell screws.





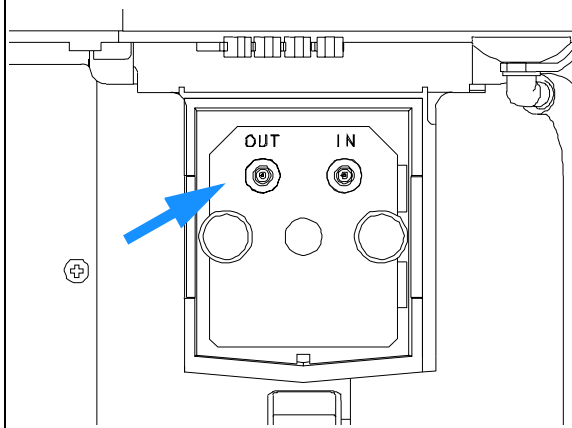
**3** Assemble the column-detector capillary.  
Depending on the flow cell type it may be a PEEK or SST capillary.

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



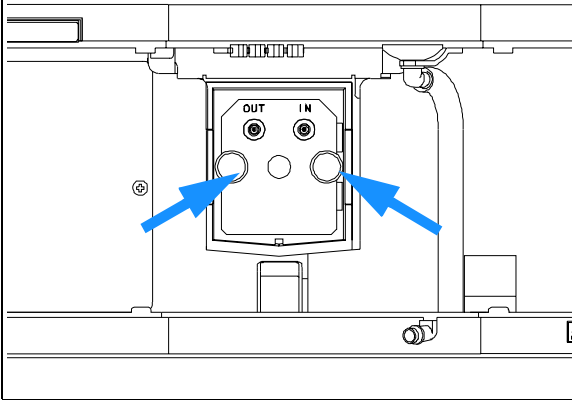
**5** Connect the other end of the capillary to the column.

**6** Connect the PEEK waste capillary to the outlet connector.

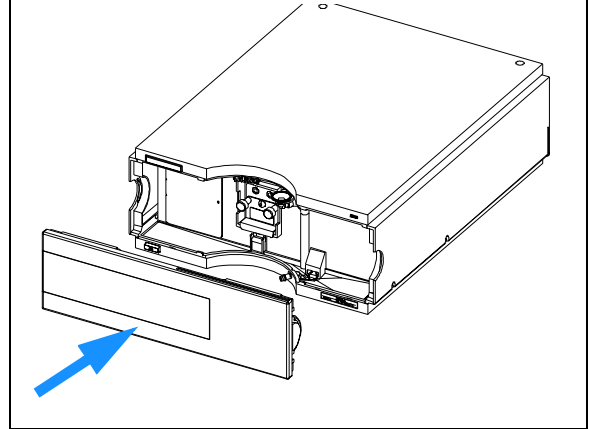


## 1 Installing the Variable Wavelength Detector

**7** Establish a flow and observe for leakage.



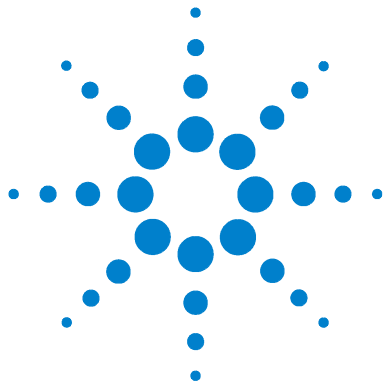
**8** Replace the front cover.



**The installation of the detector is now complete.**



## **1 Installing the Variable Wavelength Detector**



## 2 How to optimize the detector

Optimizing the Detector Performance 28



## 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 5 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		Semimicro 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 5 Choosing a Flow Cell

### Flow Cell Path Length

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

$$\text{absorbance} = -\log T = \log \frac{I_0}{I} = \epsilon \cdot C \cdot d$$

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,  $I_0$ ,

$\epsilon$  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

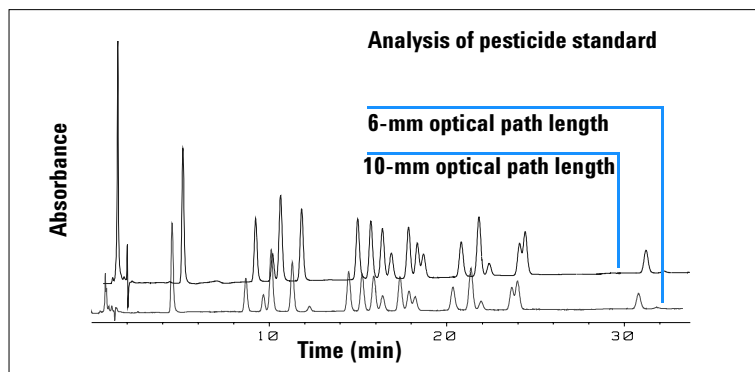
$d$  is the path length of the cell used for the measurement.

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 6](#) on page 30 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  $\mu$ l. Typically, this causes more peak dispersion. As [Figure 6](#) on page 30 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).

## 2 How to optimize the detector



**Figure 6** 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 1100 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 1100 VWD flow cells:

**Table 4** Correction factors for Agilent 1100 VWD flow cells

Flow cell type	Cell volume	Part number	Path length (nominal)	Path length (actual)	Correction factor
Standard flow cell	14 $\mu$ l	G1314-60080	10 mm	10.15 $\pm$ 0.19 mm	10/10.15
Semimicro flow cell	5 $\mu$ l	G1314-60083	6 mm	6.10 $\pm$ 0.19 mm	6/6.19
Micro flow cell kit	1 $\mu$ l	G1314-60081	5 mm	4.80 $\pm$ 0.19 mm	5/4.8
High Pressure flow cell	14 $\mu$ l	G1314-60082	10 mm	10.00 $\pm$ 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.
- 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.

## **2 How to optimize the detector**



## 3 Troubleshooting and Test Functions

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## 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 35](#)).

### 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 Messages"](#) on [page 37](#)).

### Wavelength 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 zero-order maximum and the deuterium alpha-emission line for wavelength calibration (see ["Wavelength Calibration"](#) on [page 58](#)).

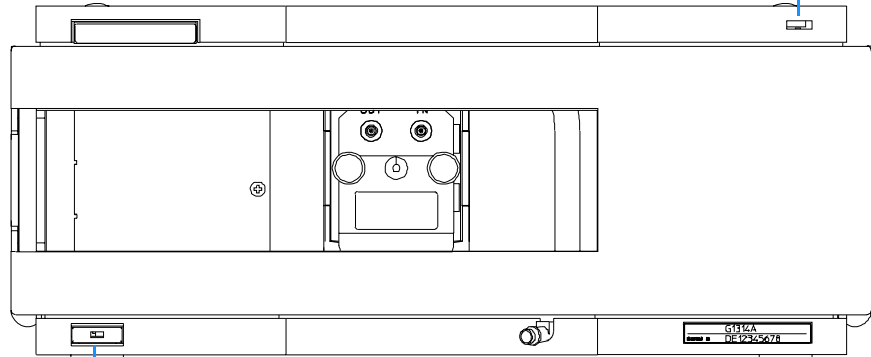
### Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components (see ["Test Functions"](#) on [page 62](#)).

## 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.

Status indicator  
green/yellow/red



Line power switch  
with green light

Figure 7 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 instrument conditions:

- When the status indicator is *OFF* (and power switch light is on), the instrument is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the instrument is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The instrument 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 setpoint), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the instrument has detected an internal problem which affects correct operation of the instrument. Usually, an error condition requires attention (for example, leak, defective internal components). An error condition always interrupts the analysis.

## 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.

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

### Timeout

The timeout threshold was exceeded.

#### Probable Causes

- The analysis was completed successfully, and the timeOut 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 1100 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 foam (#2) has been removed.

The sensor on the VWM board detects when the top foam (#2) 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

- Foam #2 removed.

#### Suggested Actions

- ✓ Replace the foam.

## 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.
- 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 VWM board.
- Defective power supply.

#### Suggested Actions

- ✓ 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 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 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.



## 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.

## Wavelength 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.

#### NOTE

The wavelength calibration takes about 3.5 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 63.

## 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.

### NOTE

The wavelength calibration takes about 3.5 minutes and is disabled within the first 10 minutes after ignition of the lamp.

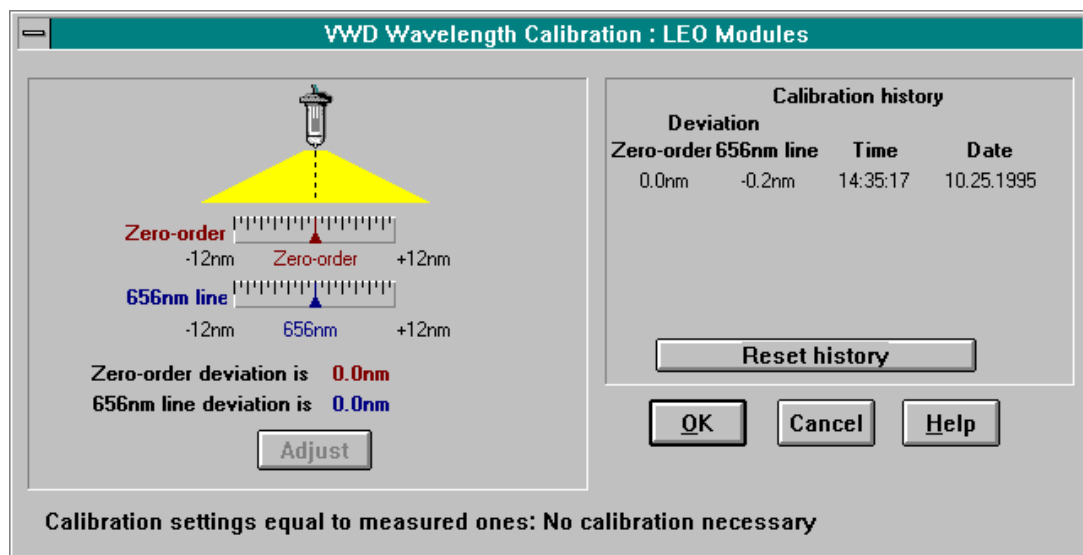


Figure 8 Wavelength Calibration

## 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 8](#) on page 59.

### Calibration Procedure

- 1 Install the flow cell.
- 2 Flush the flow cell with LC-grade water at 1 ml/min.
- 3 Run the zero-order calibration test.

## 656-nm Wavelength Calibration

The wavelength calibration function is used to calibrate the monochromator 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 8](#) on page 59.

### Calibration Procedure

- 1 Install the flow cell.
- 2 Flush the flow cell with LC-grade water at 1 ml/min.
- 3 Run the 656-nm calibration test.

## Test Functions

The instrument provides the following test functions:

- holmium oxide test,
- lamp intensity test (lamp characteristics),
- ADC test,
- dark current test,
- DAC test,
- grating motor test, and
- filter motor test.



## Lamp-on Routine

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

- During the ignition phase the grating position is reinitialized 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  $\text{value 2} < \text{value 1}/16$ .  
If not OK, the cutoff filter does not work correctly.
- Restore the set wavelength position.
- The detector should now be ready condition.

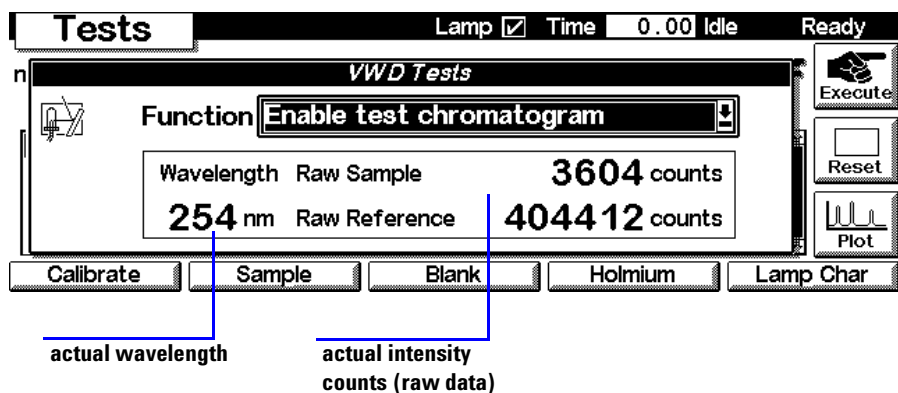
## Checking the Photocurrent

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 on the control module in [Figure 9](#) shows the wavelength and photo current information. This feature is not available on control module firmware revisions A.1.04 and below.

For all control module firmware revisions A.1.04 and below, use the "Service Dialog" on page 78.



**Figure 9** 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.

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 254.

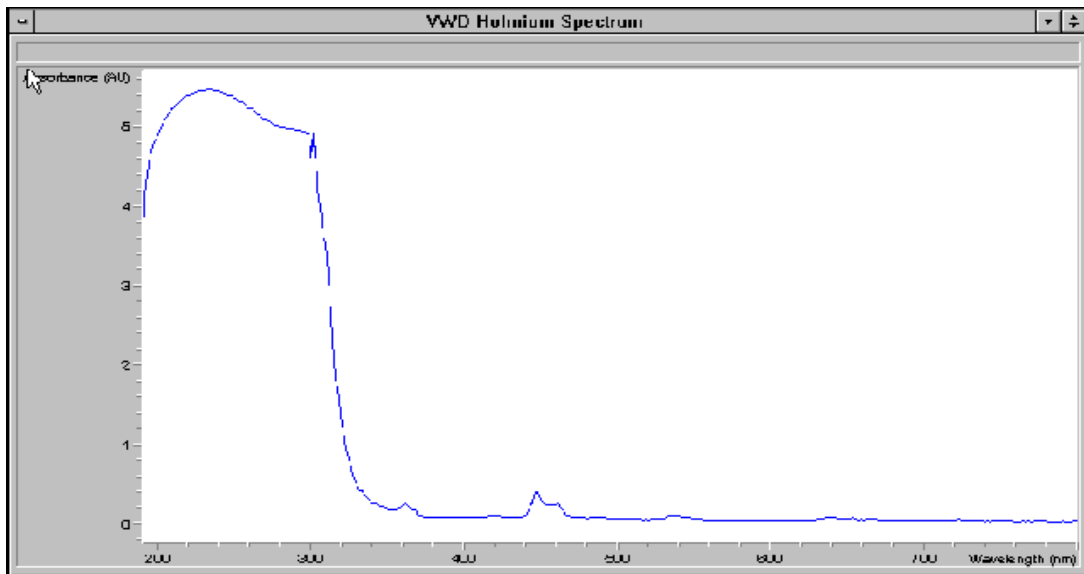


Figure 10 Holmium Test

#### 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  $\pm 1$  nm of the expected value. This indicates the detector is calibrated correctly.

#### NOTE

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

#### Holmium Oxide Test Failed

##### Probable Causes

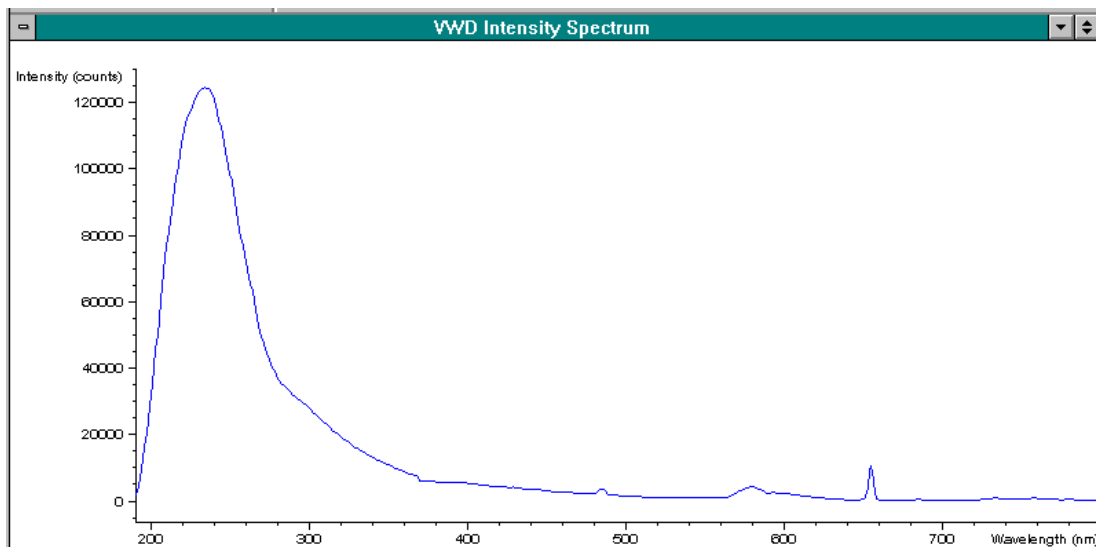
- Detector not calibrated.
- Dirty or defective flow cell.
- Dirty or defective holmium oxide filter.
- Optical misalignment.

##### 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 11](#) shows a typical intensity test spectrum.



**Figure 11** Intensity Test

### 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.

**Table 5** Intensity Limits

Range	Limit (counts)
High intensity	> 10000
Average intensity	> 5000
Lowest intensity	> 200

#### Test Failed

##### Probable Causes

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

##### 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.

## 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.

### 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

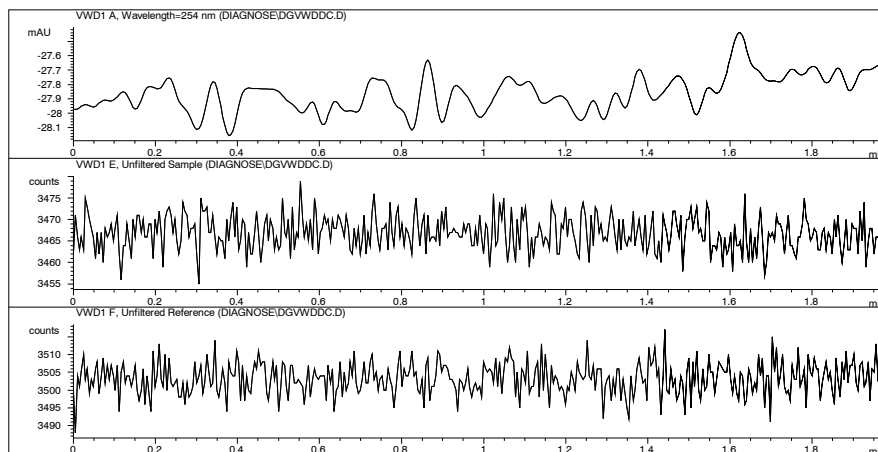
- Defective sample or reference diode.
- Defective sample or reference VWA board.
- Defective VWM board.

#### Suggested Actions

- ✓ Exchange the reference or sample diode.
- ✓ Exchange sample or reference VWA board.
- ✓ Exchange the VWM board.

#### How to do it with the Agilent ChemStation

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



**Figure 12** Dark Current Noise

#### How to do it with the Control Module

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.

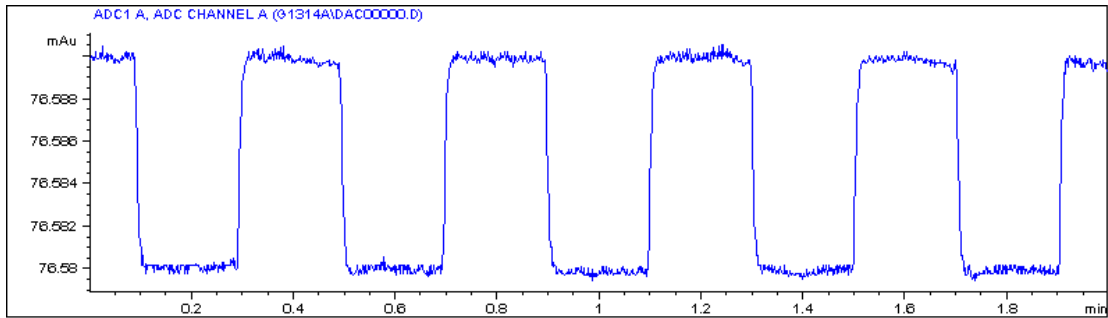
- 1 Select in VWD - Settings - Analog Output as Raw Sample or Raw Reference.
- 2 Press the Plot button and select the Analog signal in Setup.
- 3 Return to the Plot screen by pressing Done.



## DAC Test

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

The test applies an AC voltage (10  $\mu\text{V}$ ) to the DC output of the DAC. The DAC output is connected to the analog output connector at the rear of the detector.



**Figure 13** 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  $\mu\text{V}$ .

### 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.

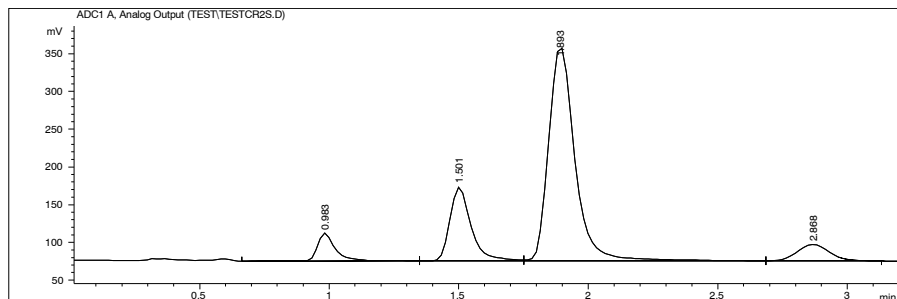
**Table 6** Test Chromatogram Settings

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

- 1 Select the response time and stop time according to [Table 6](#).
- 2 Select the function Enable test chromatogram in Tests - VWD and press Execute.
- 3 Select the Plot button in the System screen and press the Setup button.
- 4 Select as Source the Signal (VWD), change the Y-range to - 10 to 300 mAU, fit the Time Range to match [Table 6](#) and press Done.

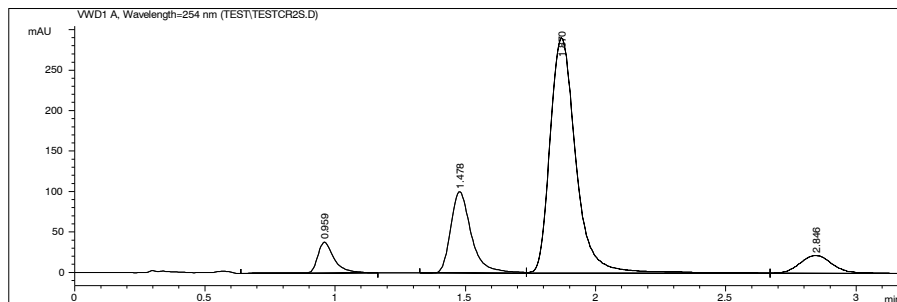
- 5 If required, connect a recording device (for example, Agilent 3396A with settings ATTN=9, CHSP=2, ZERO=10, AR REJ=106).
- 6 Press the Start button to start the run. On completion of the run, or when the run is stopped, the test chromatogram is deactivated.



**Figure 14** Test Chromatogram on Integrator (response time 2 seconds)

### Agilent ChemStation

- 1 Select the response time and stop time according to [Table 6](#) on page 74.
- 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 15** Test Chromatogram on Agilent ChemStation (response time 2 seconds)

## 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 8](#) on page 79 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 80.

**Table 7** 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 <sup>21</sup> counts	Counts
Reference raw data (unfiltered and not logarithmic)	2 <sup>21</sup> counts	Counts
Analog output test	zero offset + 10 $\mu$ V step	Counts
Sample diode current	220 nA/2 <sup>gain</sup>	nA

**Table 7** Diagnostic Signals on Analog Output (continued)

<b>Signal</b>	<b>Analog Out 1 V is equal to</b>	<b>Display</b>
Reference diode current	220 nA/2 <sup>gain</sup>	nA
Board Temperature	102.4 °C (displayed value minus zero offset)	°C

## Service Dialog

Available on both user interfaces.

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

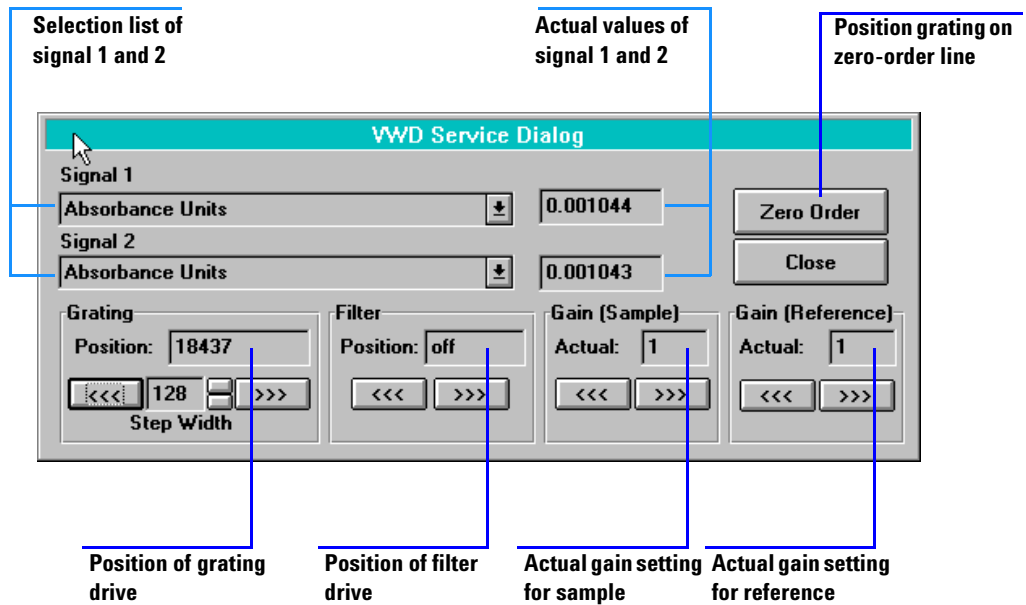


Figure 16 Service Dialog



**Table 8** 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 $\mu$ V step
Sample diode current	nA	220 nA/ $2^{\text{gain}}$
Reference diode current	nA	220 nA/ $2^{\text{gain}}$
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	$^{\circ}$ C	102.4 $^{\circ}$ 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 76

\*\* 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 logarithming.

#### **Analog output test**

This test adds to the used zero offset setting a DC voltages of 10  $\mu$ V in cycles of 12 seconds. This 10  $\mu$ V step is equal to  $1 \times 10^{-6}$  AU and can be used to check the noise on a recording device. See "DAC Test" on page 71.

#### **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.

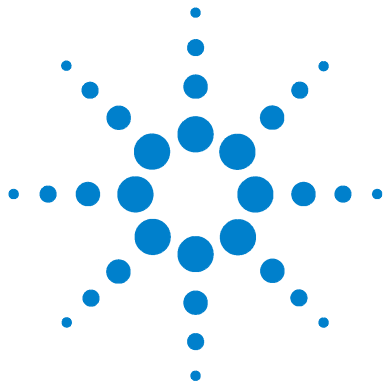
**Leak Status**

Provides status of PTC and NTC sensors. See [Table 8](#) on page 79.

**PTC or NTC voltage/current**

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

### **3 Troubleshooting and Test Functions**



## 4 Repairing the Variable Wavelength Detector

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# Introduction into Repairing the Variable Wavelength Detector

### Simple Repairs

The detector is designed for easy repair. The most frequent repairs such as changing the lamp and changing the flow cell can be done from the front of the detector with the detector in place in the system stack. These repairs are described in “[Simple Repairs](#)” on page 88.

### Exchanging Internal Parts

Some repairs may require exchanging 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 the detector cover from being taken off when line power is still connected. These repairs are described in “[Exchanging Internal Parts](#)” on page 102.

#### WARNING

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

#### WARNING

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

#### 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 86).

**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 a mild detergent. Do not use an excessively damp cloth allowing liquid to drip into the spectrometer.

**WARNING**

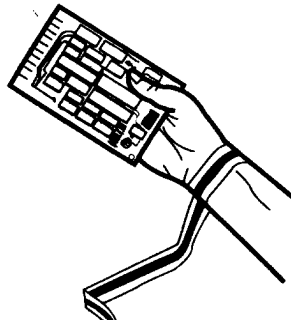
Do not let liquid drip into the detector. It could cause shock hazard and it could damage the detector.

## 4 Repairing the Variable Wavelength Detector

### Using the ESD Strap

Electronic boards are sensitive to electronic discharge (ESD). In order to prevent damage, always use an ESD strap supplied in the standard accessory kit (see “[Accessory Kit](#)” on page 159) 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.

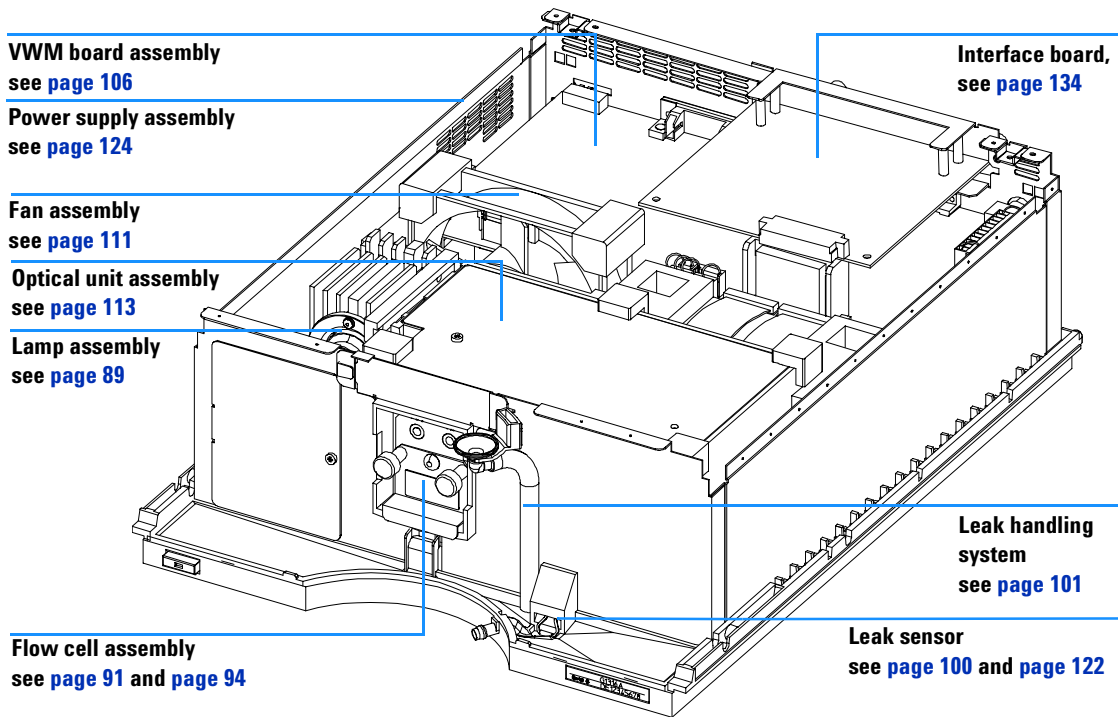


**Figure 17** Using the ESD Strap



## Overview of the Repairing of the Variable Wavelength Detector

Figure 18 below shows the main assemblies and their locations.



**Figure 18** Main Assemblies

### Simple Repairs

On the following pages repairs are described that can be done without opening the main cover.

**Table 9** Simple Repairs

<b>Procedures</b>	<b>Typical Frequency</b>	<b>Notes</b>
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

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

### NOTE

If you want to use the Agilent 1100 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.

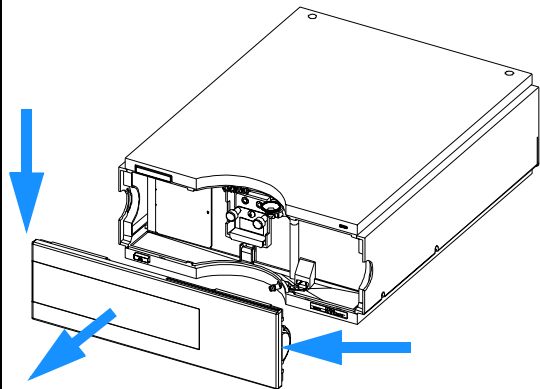
### WARNING

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:

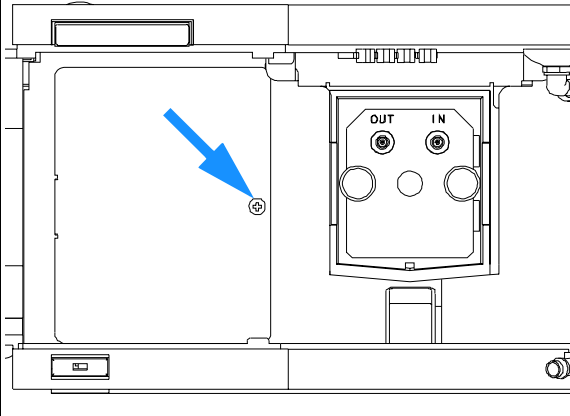
- Turn the lamp off.

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

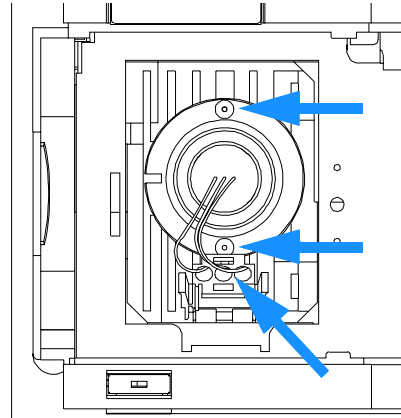


## 4 Repairing the Variable Wavelength Detector

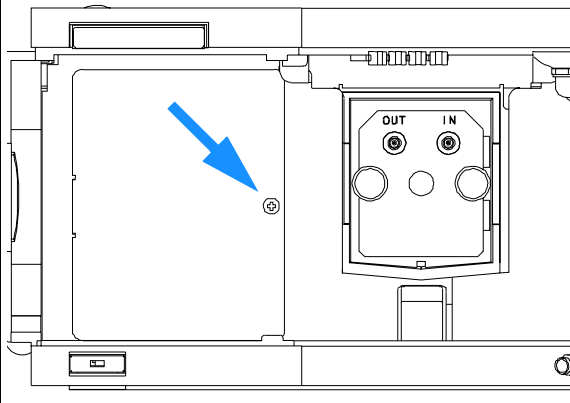
**2** Unscrew the lamp cover and remove it.



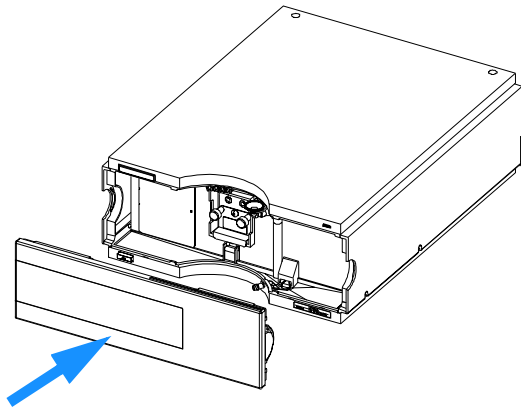
**3** Unscrew, disconnect and replace the lamp. Insert, fix and reconnect the lamp.



**4** Replace the lamp cover.



**5** 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 "[Zero-Order Calibration](#)" on page 60 and "[656-nm Wavelength Calibration](#)" on page 61 to check the correct positioning of the lamp.

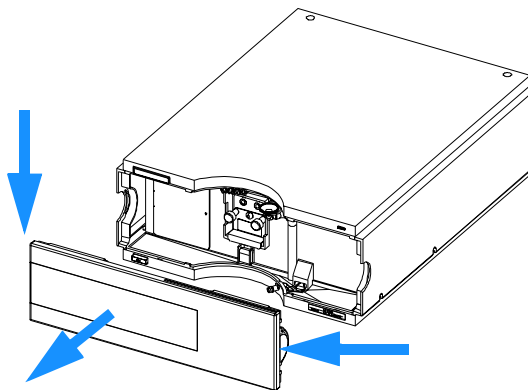
## Exchanging a Flow Cell

<b>When required</b>	If application needs a different type of flow cell or the flow cell needs repair.
<b>Tools required</b>	Two 1/4 inch wrenches for capillary connections
<b>Parts required</b>	Standard Flow Cell G1314-60086 10 mm, 14 $\mu$ l, 40 bar, (former Standard Flow Cell G1314-60080 is obsolete) Micro flow cell, 5 mm, 1 $\mu$ l, 40 bar, G1314-60081 Semimicro flow cell, 6 mm, 5 $\mu$ l, 40 bar, G1314-60083 High pressure flow cell, 10 mm, 14 $\mu$ l, 400 bar, G1314-60082

### Preparations for this procedure:

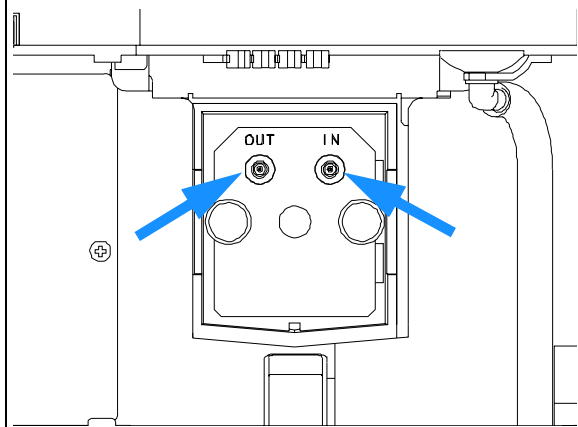
- Turn the lamp off.

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

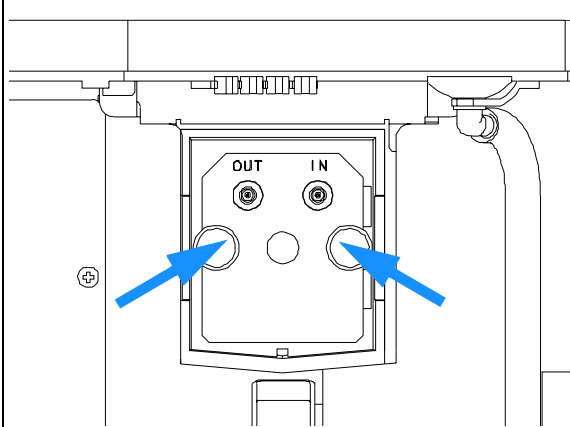


## 4 Repairing the Variable Wavelength Detector

**2** Disconnect the inlet and outlet capillaries.



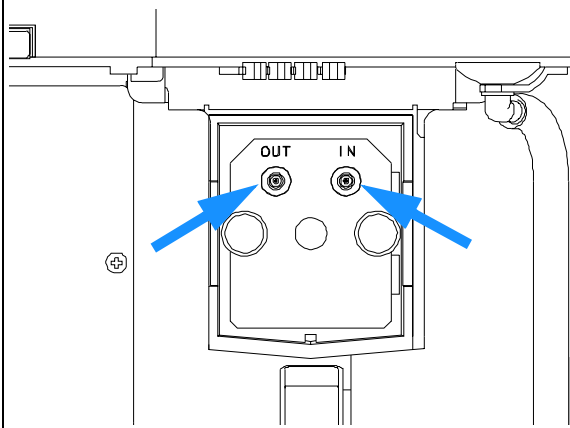
**3** Unscrew the thumb screws parallel and remove the flow cell.



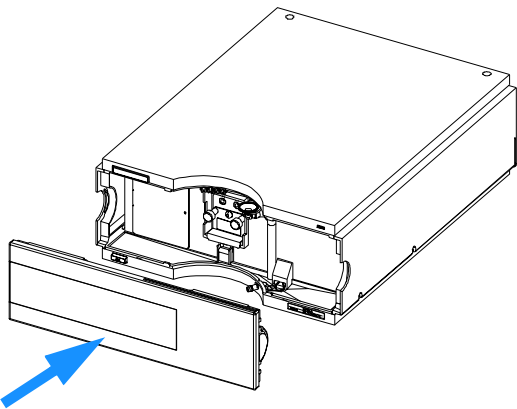
**Note:**

If you want to maintain flow cell parts, see ["Repairing the Flow Cells"](#) on page 94 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 "[Zero-Order Calibration](#)" on page 60 and "[656-nm Wavelength Calibration](#)" on page 61 to check the correct positioning of the flow cell.
- Replace the front cover.

## 4 Repairing the Variable Wavelength Detector

### Repairing the Flow Cells

<b>When required</b>	If the flow cell needs repair due to leaks or contaminations.
<b>Tools required</b>	Wrench 1/4 inch for capillary connections Hexagonal wrench 4 mm Tooth picks
<b>Parts required</b>	See "Standard Flow Cell (G1314-60086)" on page 142. See "Standard Flow Cell (G1314-60080)" on page 144 See "Micro Flow Cell" on page 146. See "Semimicro Flow Cell" on page 148. See "High Pressure Flow Cell" on page 150.
<b>Preparations</b>	Turn off the flow. Remove the front cover. Remove the flow cell, see "Exchanging a Flow Cell" on page 91.

#### 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
- 5 - Window Quartz
- 6 - Gasket #2
- 7 - Cell cover assembly
- 8 - Ring #2 PEEK

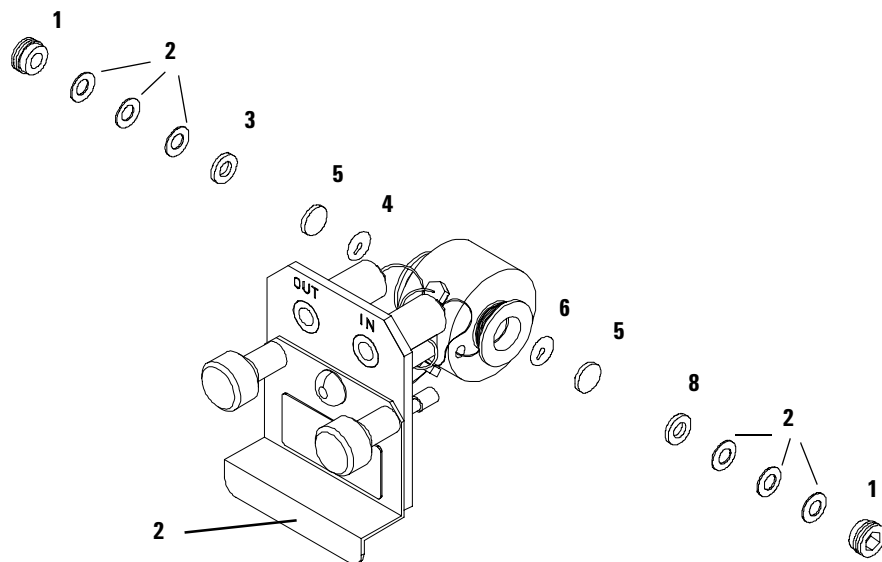


Figure 19 Standard Flow Cell



**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 semimicro #1 and #2 gaskets (items 6 and 7, "[Semimicro Flow Cell](#)" on page 149) 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.

## 4 Repairing the Variable Wavelength Detector

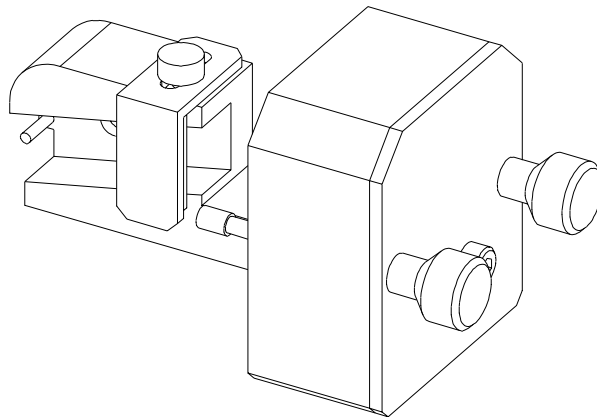
- Next steps**
- Reconnect the capillaries, see [“Exchanging a Flow Cell”](#) on page 91.
  - Perform a leak test. If OK, insert the flow cell.
  - Perform [“Zero-Order Calibration”](#) on page 60 and [“656-nm Wavelength Calibration”](#) on page 61 to check the correct positioning of the flow cell.
  - Replace the front cover.

## Using the Cuvette Holder

<b>When required:</b>	If your own standard should be used to checkout the instrument.
<b>Tools required:</b>	None
<b>Parts required:</b>	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.



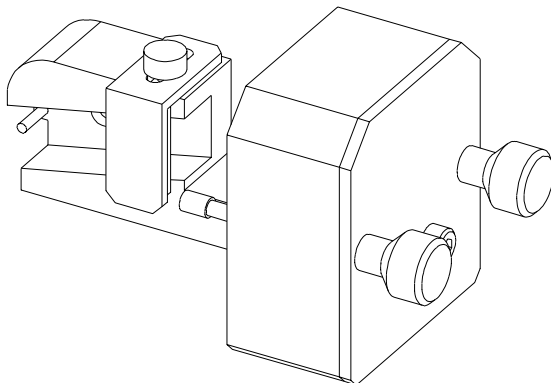
**Figure 20** Cuvette Holder

## 4 Repairing the Variable Wavelength Detector

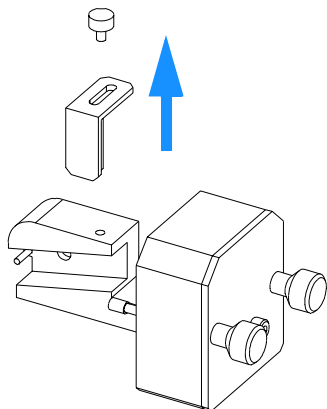
### Preparation for this procedure are:

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

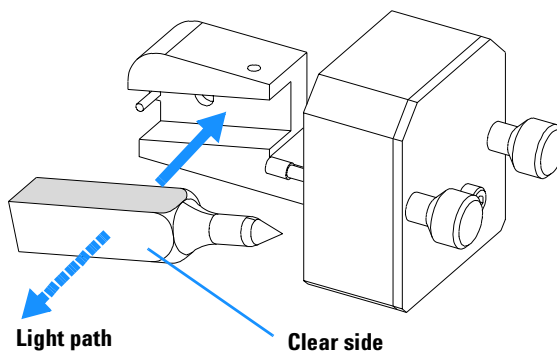
### 1 Locate the cuvette holder on the desk.



### 2 Unscrew the bracket.



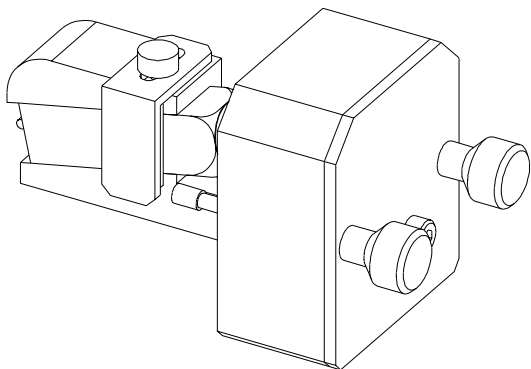
### 3 Insert the cuvette with the sample into the holder. The clear side of the cuvette must be visible.



### 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 "[Zero-Order Calibration](#)" on page 60 and "[656-nm Wavelength Calibration](#)" on page 61 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:**

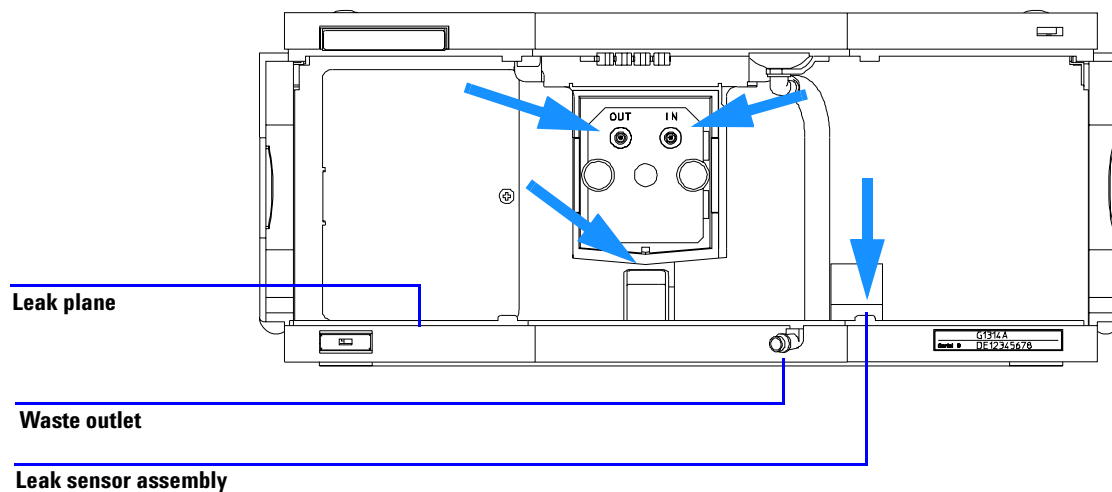
- Perform your verification.

## 4 Repairing the Variable Wavelength Detector

### Correcting Leaks

<b>When required</b>	If a leakage has occurred in the flow cell area or at the capillary connections.
<b>Tools required</b>	Tissue Two 1/4 inch wrenches for capillary connections
<b>Parts required</b>	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.

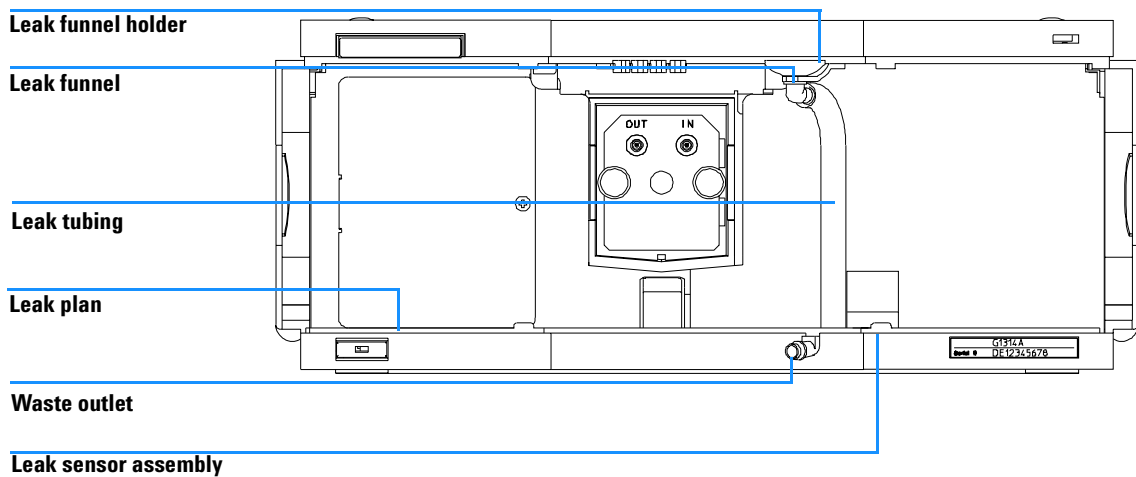


**Figure 21** Drying the Leak Sensor

## Replacing Leak Handling System Parts

<b>When required</b>	If the parts are corroded or broken.
<b>Tools required</b>	None
<b>Parts required</b>	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 22** Replacing Waste Handling System Parts

### Exchanging Internal Parts

#### 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 86

#### 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.





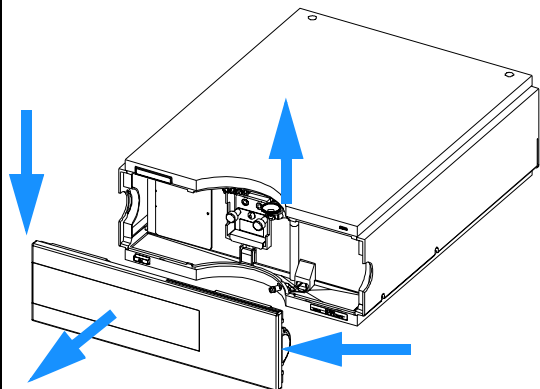
## Removing the Top Cover and Top Foams

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

### Preparations for this procedure:

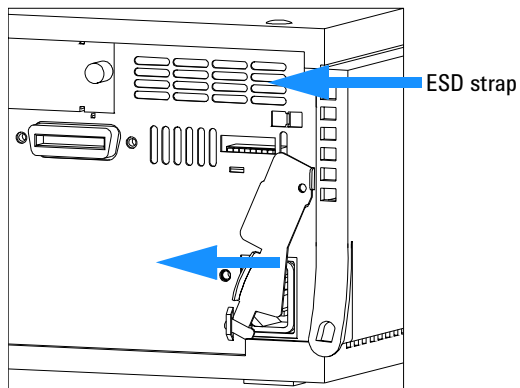
- Turn off the detector.
- Disconnect the power cable.
- Disconnect capillaries.
- Remove detector from stack and place it on the working bench.

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

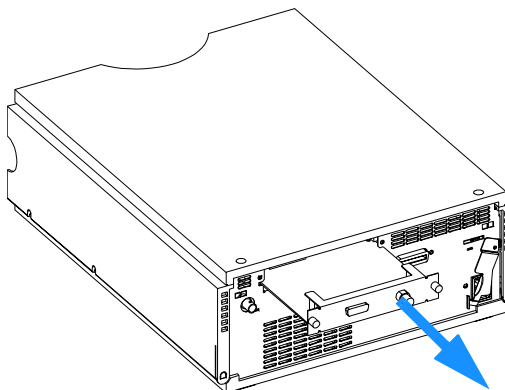


## 4 Repairing the Variable Wavelength Detector

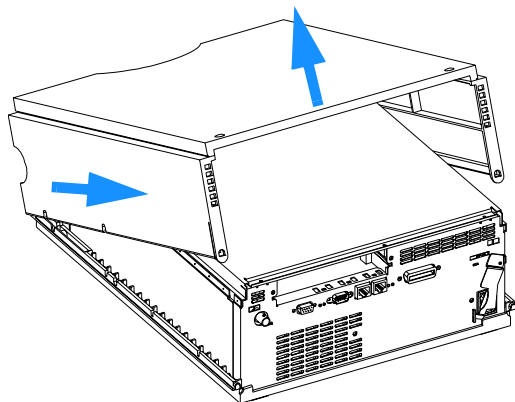
**2** Install the ESD strap. Move the power lock across the power inlet.



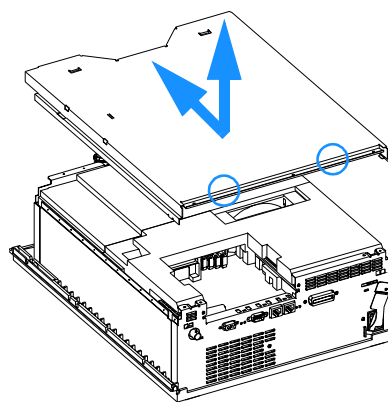
**3** If installed, unscrew and remove the interface board. Place the board on the ESD kit.



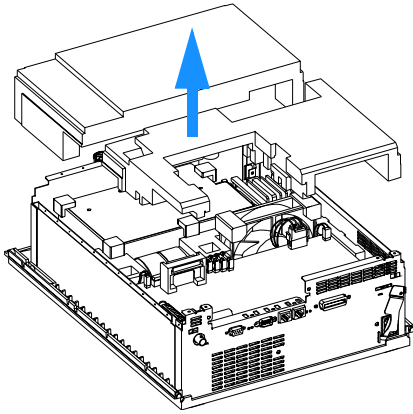
**4** Lift the cover and slide it towards the rear.



**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.**

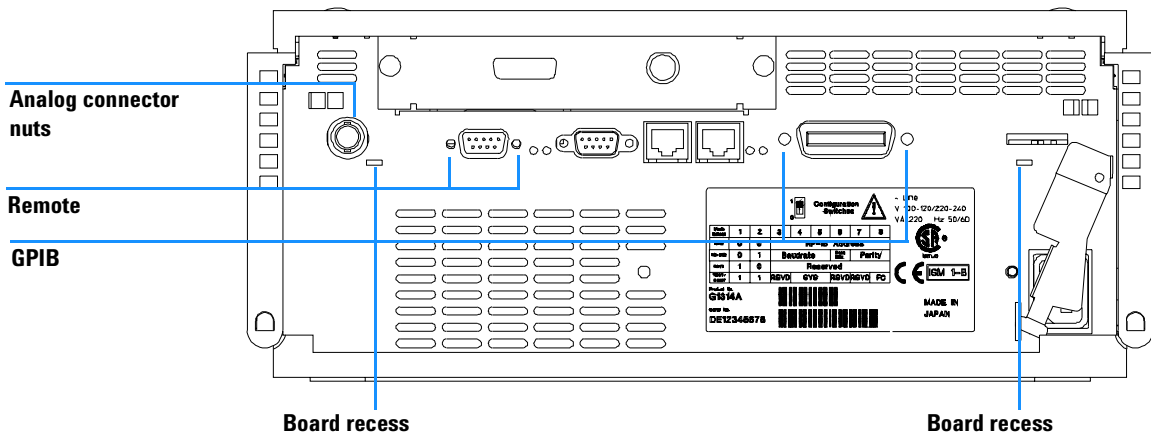
**NOTE**

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

### Exchanging the Processor Board

<b>When required</b>	If the detector main board is defective or for repair on other assemblies
<b>Tools required</b>	Screwdriver POZI 1 PT3 Hexagonal wrenches 5 mm, 7 mm and 15 mm
<b>Parts required</b>	Detector main board VWM (exchange assembly) G1314-69521

- 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.



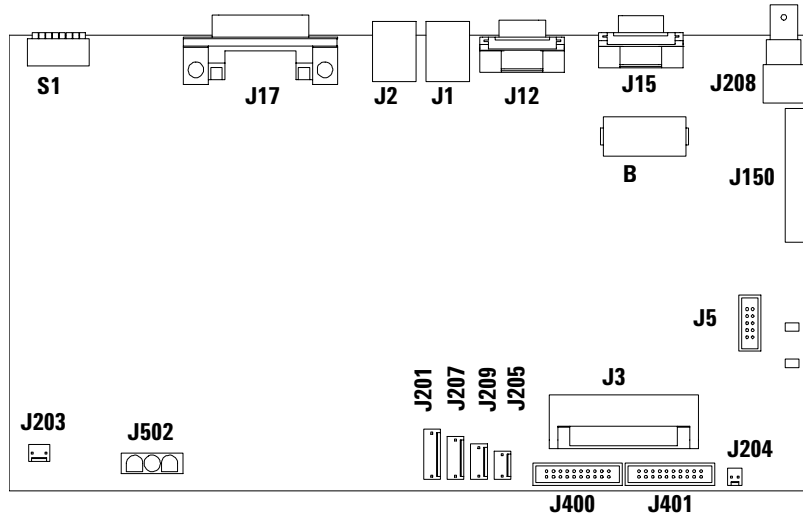
**Figure 23** Unscrew Connectors From Board

- 4 Remove the front cover, top cover and top foam section, see “[Removing the Top Cover and Top Foams](#)” on page 103.
- 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, counterhold 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**  
**B - Battery**



**Figure 24** 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 208.

**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.

## 4 Repairing the Variable Wavelength Detector

- 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 131.
- 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 135.

## Entering the Serial Number using the Control Module

- 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). Now, press the m key. 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).

### NOTE

For firmware revisions below A.02.00 it is very important never to press Done if the Serial# box is blank. In this case, the module can no longer be recognized by either the control module or the Agilent ChemStation. The main board must then be replaced.

- 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.

### Entering the Serial Number 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.

- 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 1100 access screen during the restart of the Agilent ChemStation.
- 3 After restart, the serial number you have just entered can be seen under the Instrument menu of the main user interface screen. The serial number of the detector can also be seen by typing the following command into the command line:

```
print sendmodule$ (lvwd, "ser?")
```

The reply line will give the module serial number.



## Exchanging the Fan

<b>When required</b>	If the fan is defective or noisy
<b>Tools required</b>	Screwdriver POZI 1 PT3
<b>Parts required</b>	Fan G1314-65004

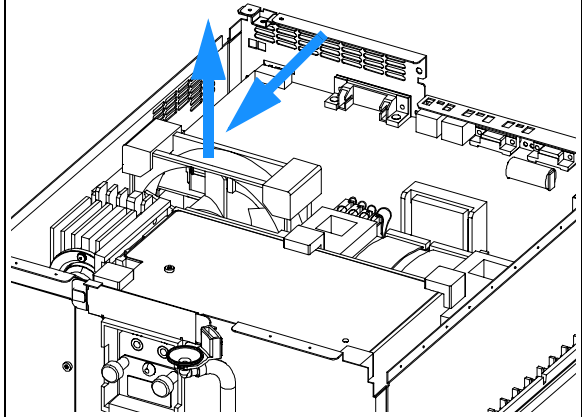
### CAUTION

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

#### 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 103.

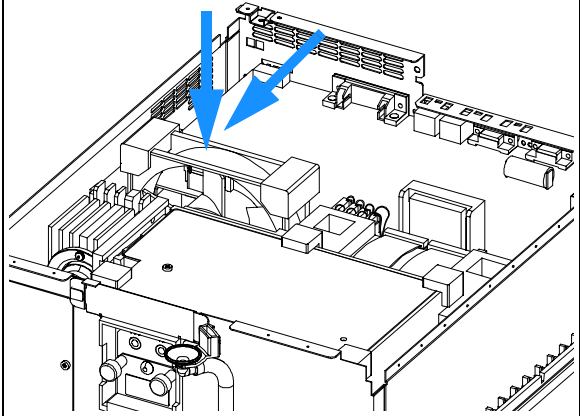
- 1 Disconnect the fan from the main board and remove the fan assembly.



## 4 Repairing the Variable Wavelength Detector

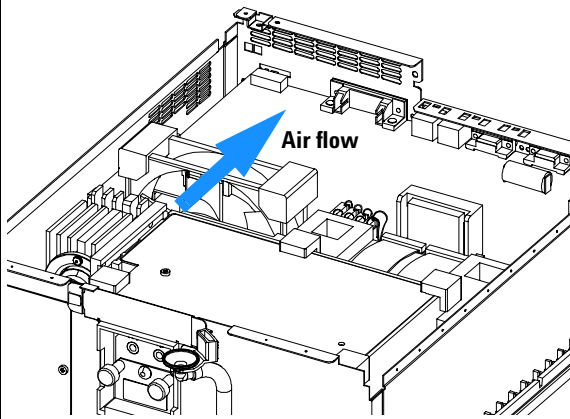
- 2 Remove the bumper from the fan.
- 3 Unscrew the fan protection grill.
- 4 Exchange the fan.
- 5 Refit the fan protection grill and tighten the screws using a screwdriver and 7 mm wrench.
- 6 Replace the bumpers.

- 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 131.
- 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 114](#), and
- the filter assembly, described on [page 117](#).

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.

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

### NOTE

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

- 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.

## 4 Repairing the Variable Wavelength Detector

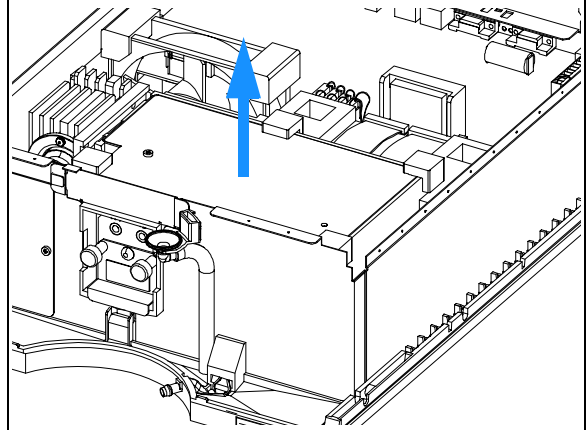
### Exchanging the Source Lens Assembly

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

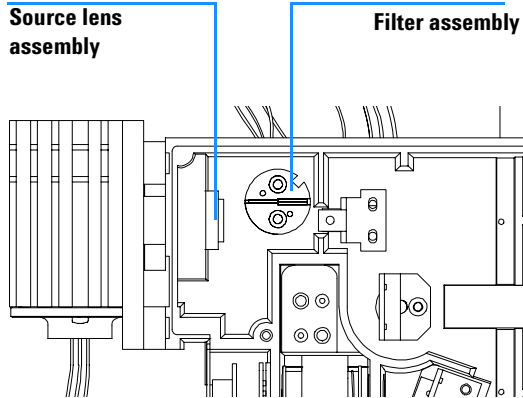
#### Preparation for this procedure are:

- 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 103.

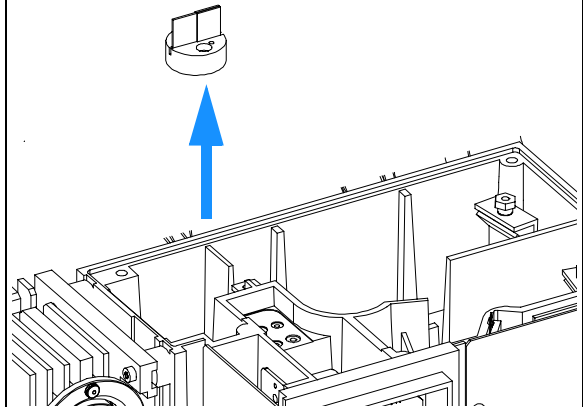
#### 1 Remove the top cover of the optical unit.



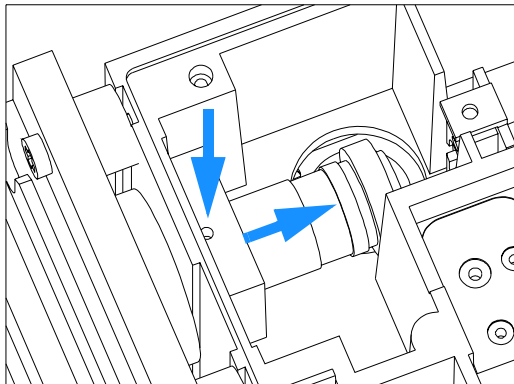
**2** Locate the source lens and filter assembly.



**3** Using a tweezers, counterhold the filter assembly. Unscrew and remove the top part of the filter assembly.

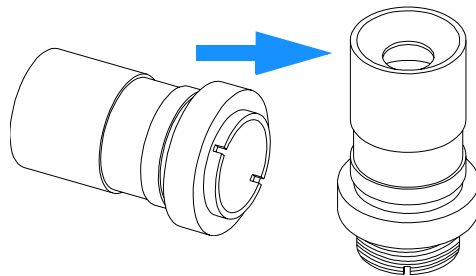


**4** Loosen the setscrew and slide the lens assembly out of its holder.



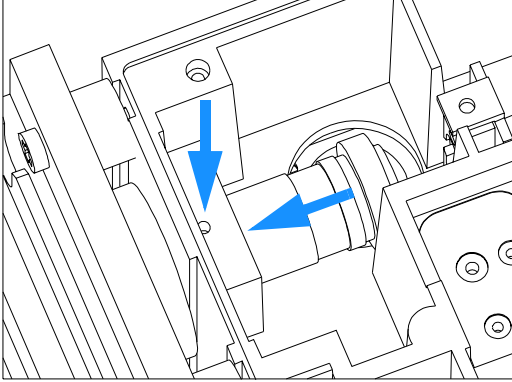
**Note:**

**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.**

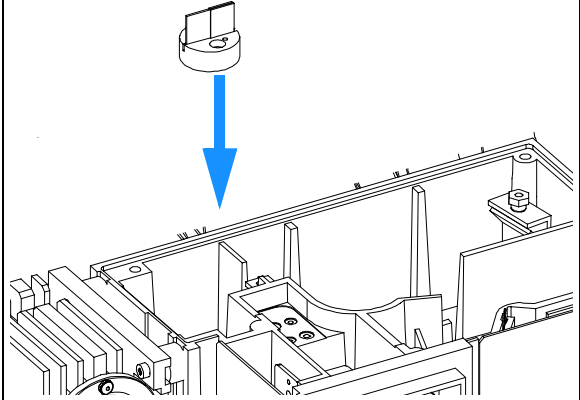


## 4 Repairing the Variable Wavelength Detector

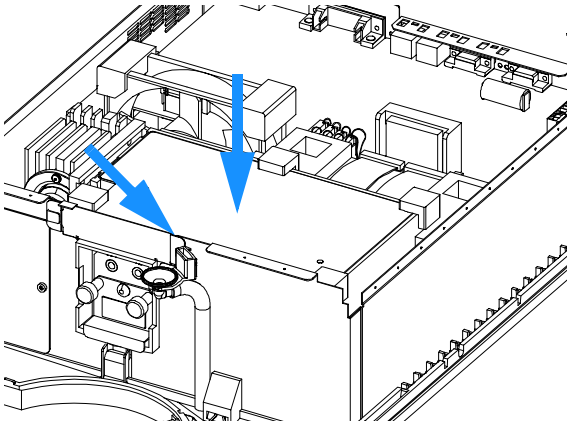
**5** Slide the lens assembly into its position. Center the marker on the lens assembly. Fix it the setscrew.



**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 131.
- Replace the front cover.
- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn on the detector.

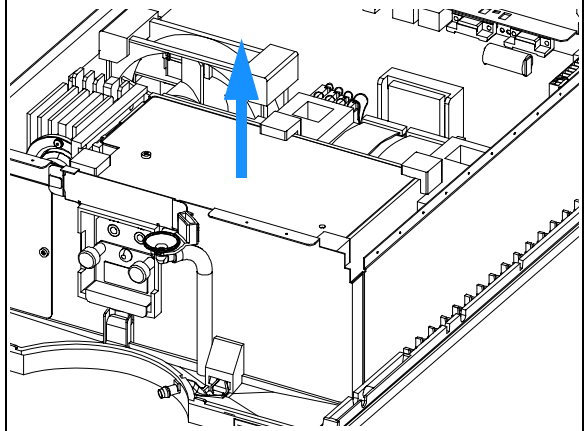
## Exchanging the Filter Assembly

<b>When required</b>	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
<b>Tools required</b>	Screwdriver POZI 1 PT3
<b>Parts required</b>	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 103.

### 1 Remove the top cover of the optical unit.

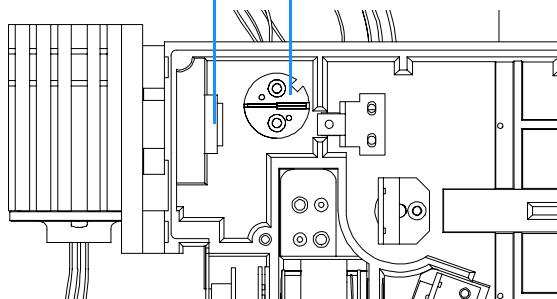


## 4 Repairing the Variable Wavelength Detector

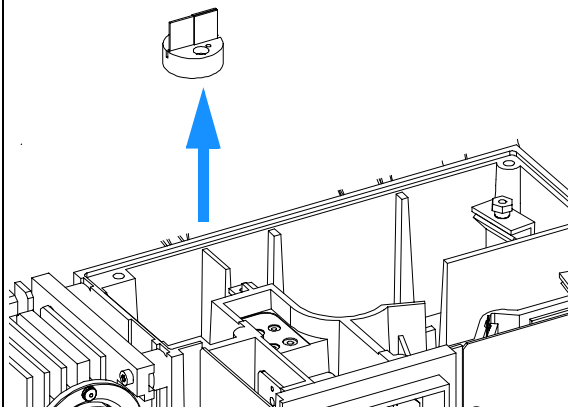
**2** Locate the source lens and filter assembly.

**Source lens assembly**

**Filter assembly**

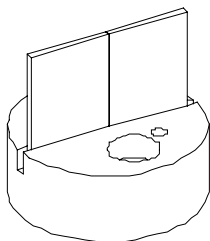


**3** Using a tweezers, counterhold the filter assembly. Unscrew and remove the top part of the filter assembly.

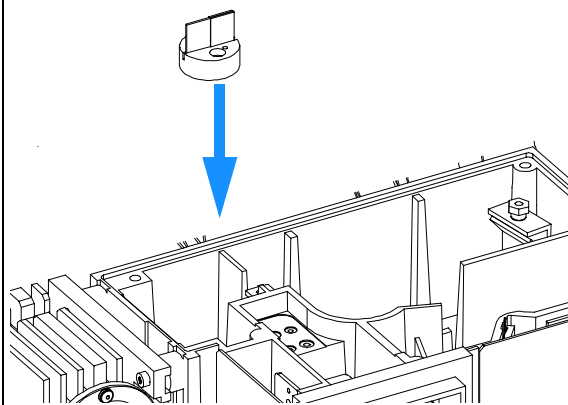


**Note:**

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

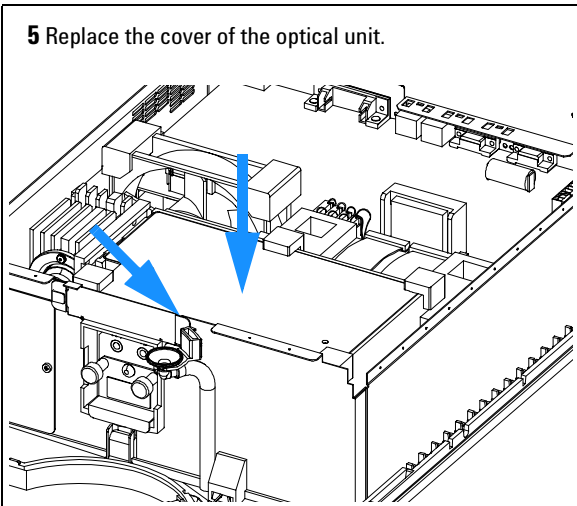


**4** Observe the orientation of the filter assembly top part. Install the assembly and fix the screws.





**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 131.
- Replace the front cover.
- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn on the detector.

## 4 Repairing the Variable Wavelength Detector

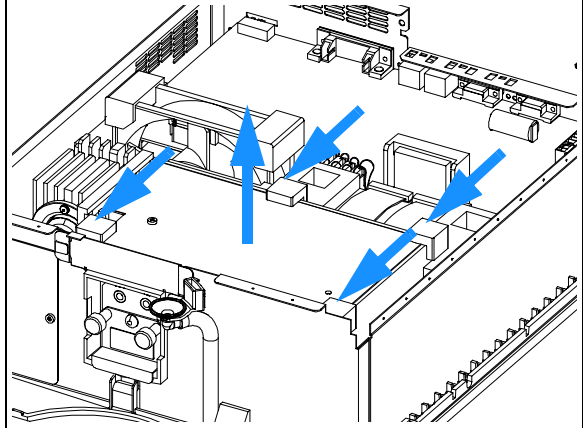
### Removing the Optical Unit

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

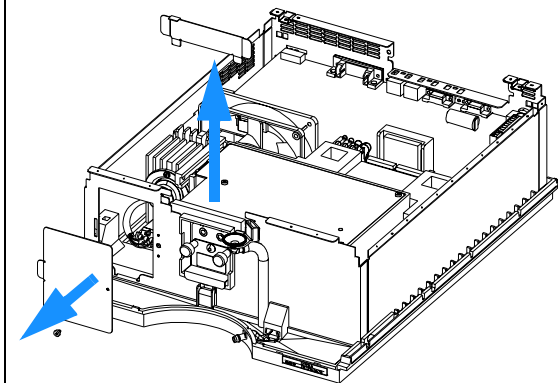
#### Preparation for this procedure are:

- 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 103.

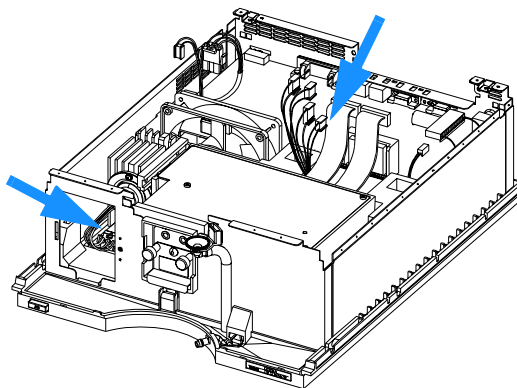
#### 1 Keep the bumpers safe.



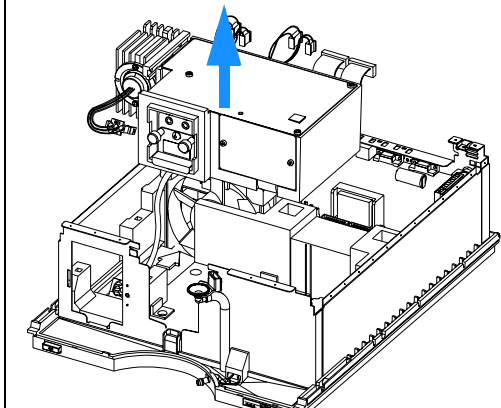
2 Remove the lamp cover and the plate above the flow cell.



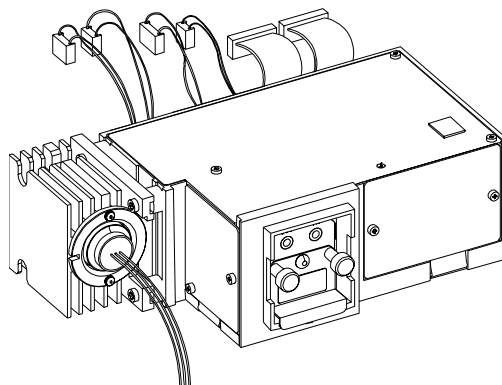
3 Disconnect the deuterium lamp connector and all cables coming from the optical unit to the main board.



4 Lift the optical unit out of the foam.



5 Place the optical unit on a bench.



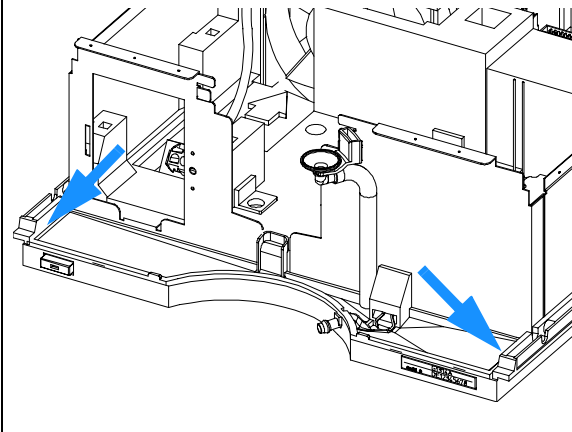
## 4 Repairing the Variable Wavelength Detector

### Exchanging the Leak Sensor

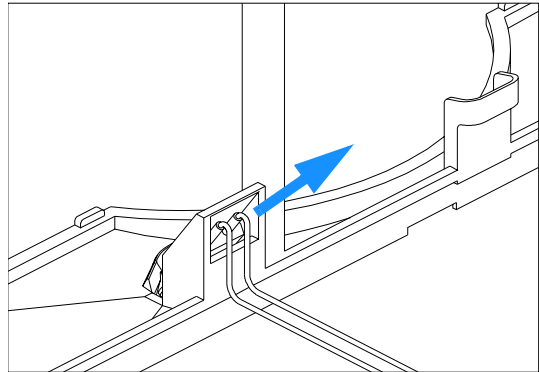
<b>When required</b>	If defective
<b>Tools required</b>	Screwdriver POZI 1 PT3
<b>Parts required</b>	Leak sensor assembly 5061-3356

- 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 103.
- 5 Remove the optical unit, see [“Removing the Optical Unit”](#) on page 120.

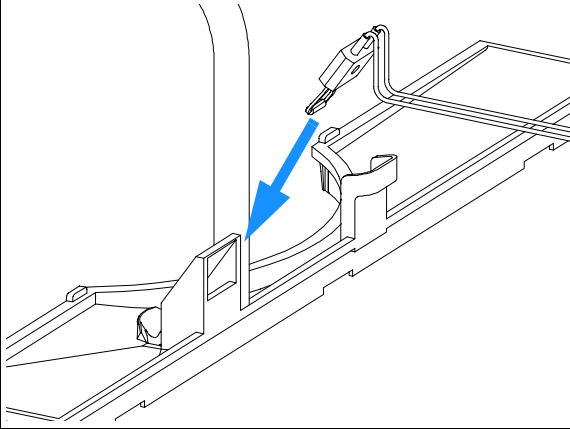
**6** Remove the leak base from the cabinet bottom by unlocking it with a flat blade on the right and left side.



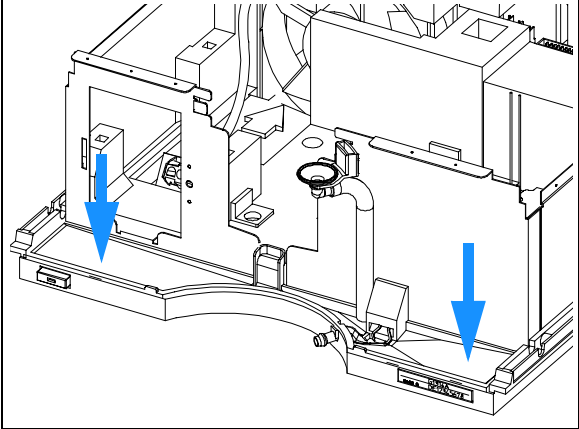
**7** Disconnect the leak sensor assembly on the processor board and remove it from the leak panel.



**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.



**10** Replace the optical unit, see [“Installing the Optical Unit”](#) on page 129.

**11** Replace the front cover, top cover and top foam section, see [“Installing the Foam and the Top Cover”](#) on page 131.

**12** Replace the detector into the stack.

**13** Reconnect the cables and capillaries.

**14** Turn on the detector.

### Exchanging the Power Supply

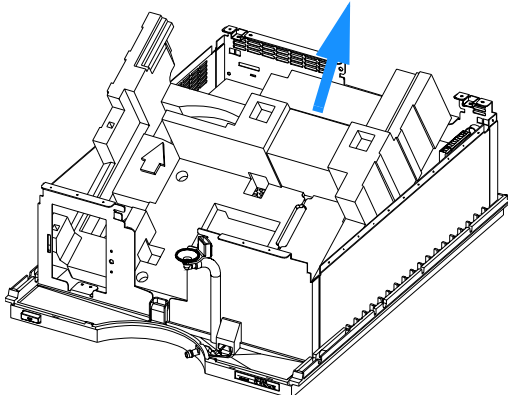
<b>When required</b>	If defective
<b>Tools required</b>	Screwdriver POZI 1 PT3 Wrench 1/4 inch Wrench 5 mm, 7 mm and 15 mm
<b>Parts required</b>	Power supply 0950-2528

#### NOTE

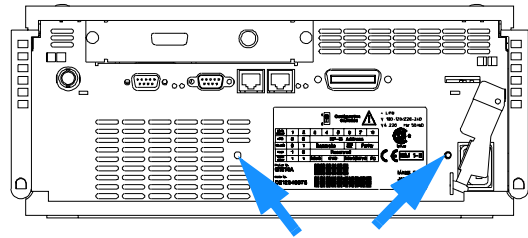
The repair level of the power supply assembly is exchanging the complete assembly. No serviceable parts are inside.

- 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 103.
- 5 Remove the processor board, see [“Exchanging the Processor Board”](#) on page 106.
- 6 Remove the fan assembly, see [“Exchanging the Fan”](#) on page 111.
- 7 Remove the optical unit, see [“Removing the Optical Unit”](#) on page 120.

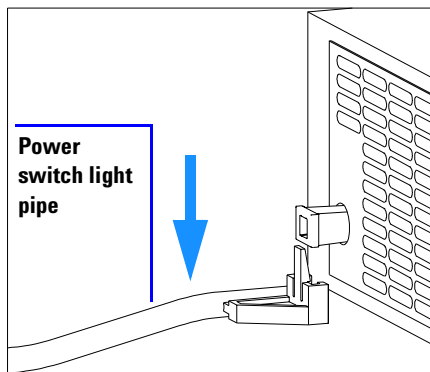
**8** Carefully remove the bottom foam part by sliding it out towards the rear.



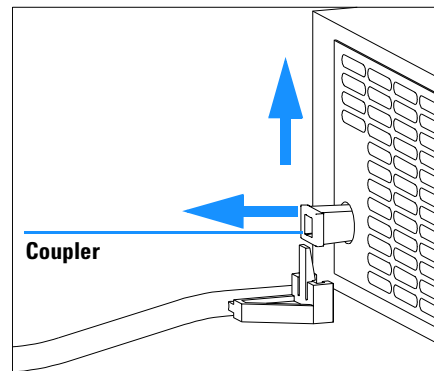
**9** Unscrew the power supply at the rear of the detector.



**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.

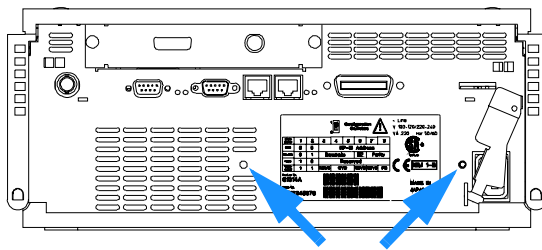


**NOTE**

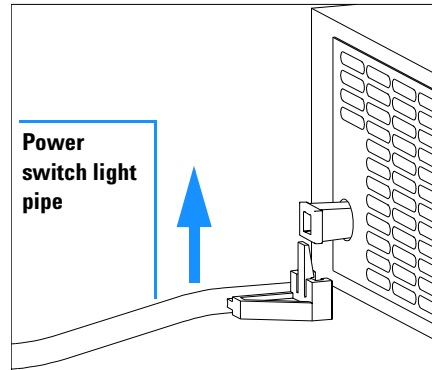
The repair level of the power supply assembly is exchanging of the complete assembly. No serviceable parts are inside.

## 4 Repairing the Variable Wavelength Detector

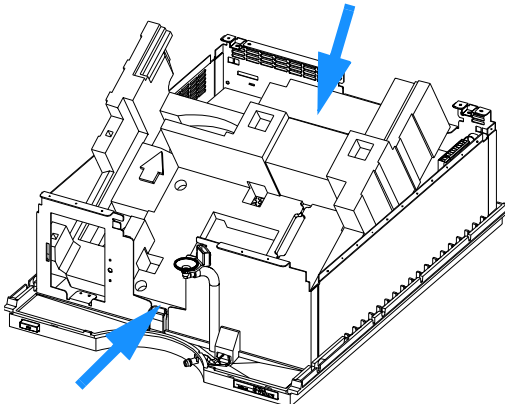
**12** Insert the power supply into its location and fix it with the screw at the rear panel.



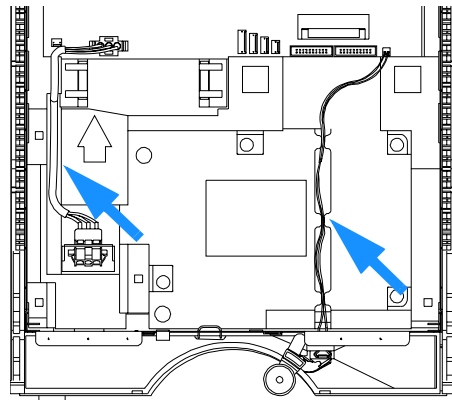
**13** Press down and clip in the power switch light pipe into the power supply.



**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 Processor Board" on page 106.

**17** Reinstall the Fan Assembly, see "Exchanging the Fan" on page 111.



- 18 Reinstall the optical unit, see [“Replacing Status Light Pipe”](#) on page 128.
- 19 Reinstall the front cover, top cover and top foam section, see [“Installing the Foam and the Top Cover”](#) on page 131.
- 20 Replace the detector into the stack.
- 21 Reconnect the power cable and turn on the detector.

## 4 Repairing the Variable Wavelength Detector

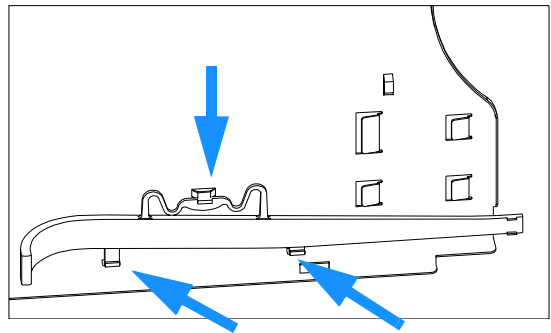
### Replacing Status Light Pipe

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

#### Preparations for this procedure are:

- Remove the front cover and top cover, see ["Removing the Top Cover and Top Foams"](#) on page 103.

**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 131.

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

**4** Turn on the detector.

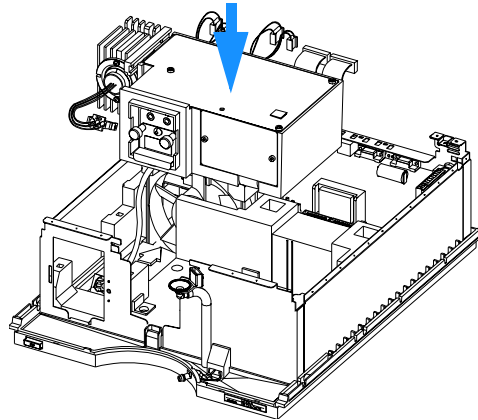
## Installing the Optical Unit

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

### Preparation for this procedure are:

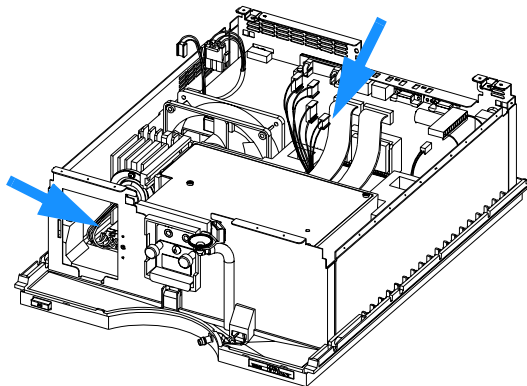
- The power supply, the fan and the processor board are already installed.

1 Place the optical unit into the bottom foam.

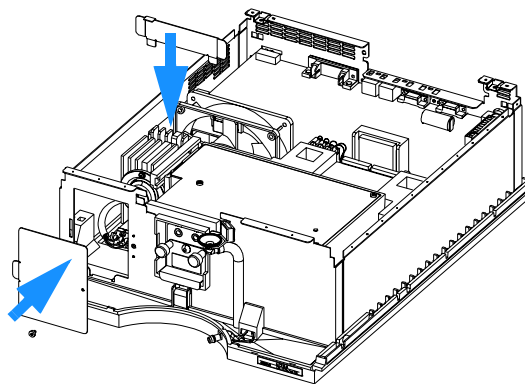


## 4 Repairing the Variable Wavelength Detector

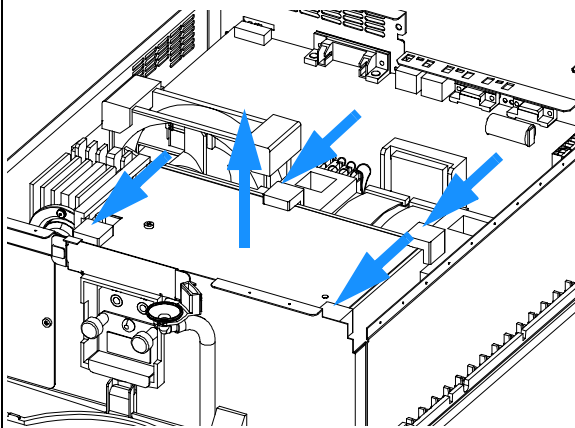
**2** Reconnect all cables to the main board and the deuterium lamp connector.



**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 131.
- Replace the detector into the stack.
- Reconnect the cables and capillaries and turn on the detector.

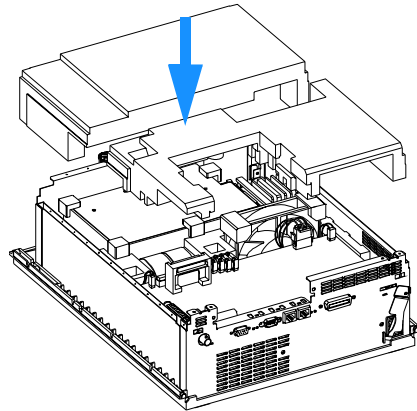
## Installing the Foam and the Top Cover

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

### Preparations for this procedure:

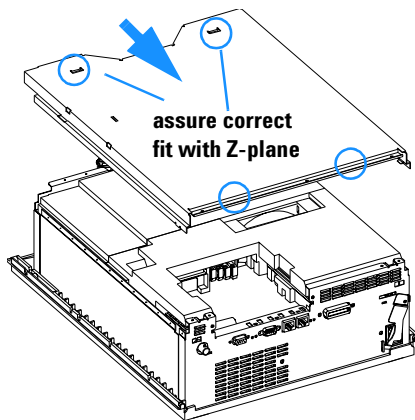
- All previous repairs have been completed.

**1** Carefully fit the top foams into the detector.

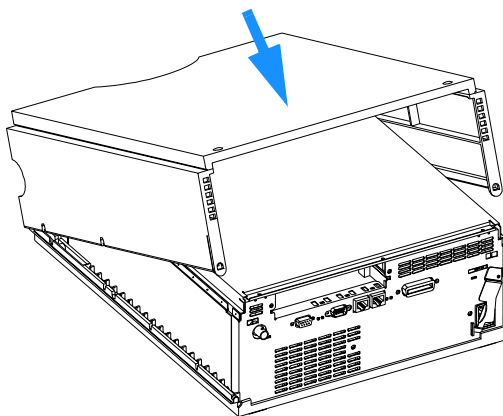


## 4 Repairing the Variable Wavelength Detector

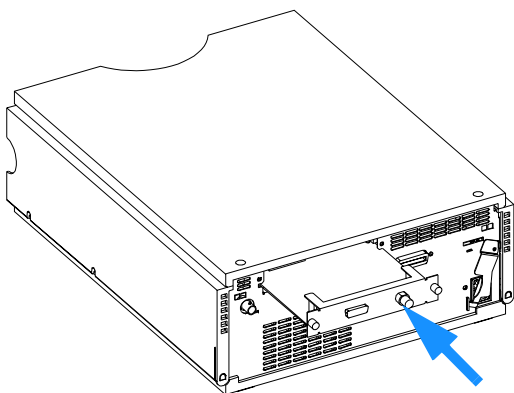
**2** Slide the top plate towards the rear and fix the top plate screws.



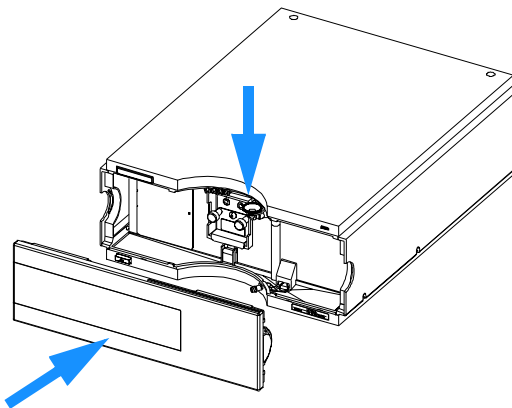
**3** Replace the cover.



**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

<b>When required</b>	If cover is broken
<b>Tools required</b>	None
<b>Parts required</b>	Plastics kit 5062-8582 (includes base, top, left and right sides)

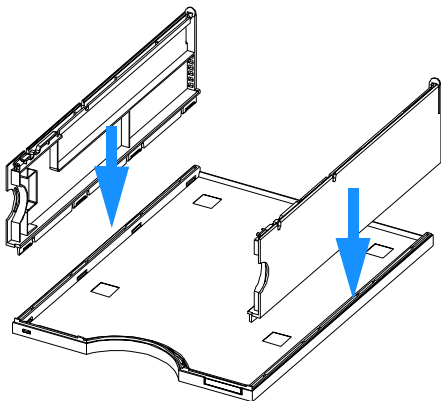
### NOTE

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

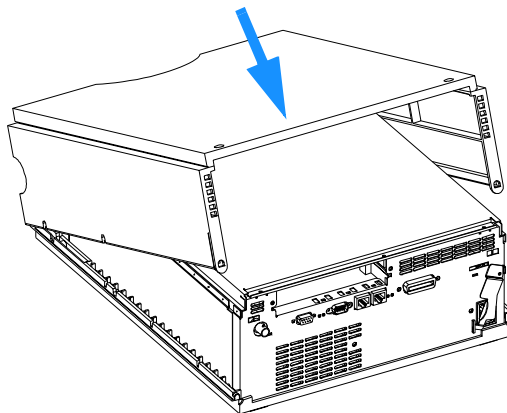
### WARNING

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:

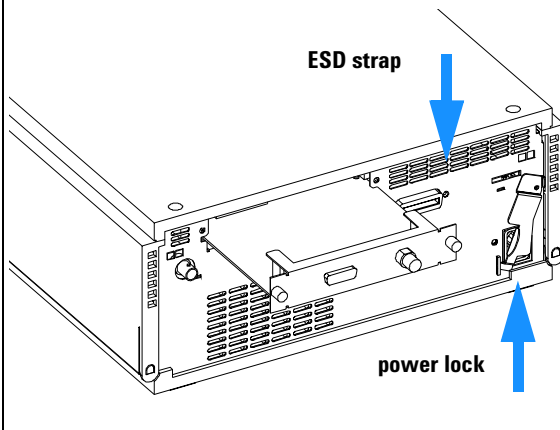
- Replace the detector into the stack and reconnect the cables and capillaries.
- Turn on the detector.

## 4 Repairing the Variable Wavelength Detector

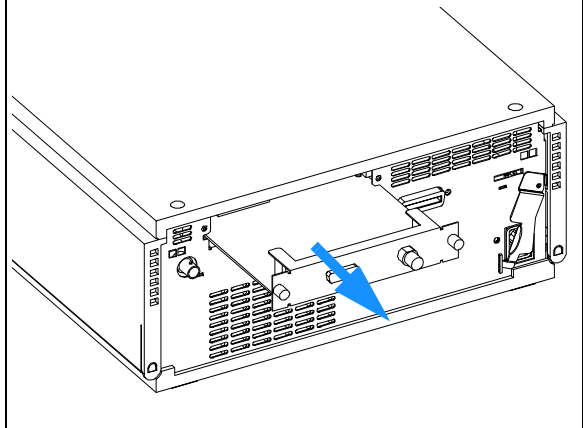
### Replacing the Interface Board

<b>When required</b>	For all repairs inside the detector or for installation of the board
<b>Part required</b>	Interface board (BCD) G1351-68701 with external contacts and BCD outputs Interface board (LAN), see <a href="#">"Optional Interface Boards"</a> on page 200.
<b>Tools required</b>	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

The installation of new firmware is required:

- if new version solves problems of currently installed version, or
- if after exchange of the processor board (VWM) the version on board is older than previous installed one.

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

- 1** Load the firmware into the detector, see the help system of your user interface.

### NOTE

Update of operation firmware can be done in the resident mode only.

Update of the resident firmware can be done in the normal mode only.

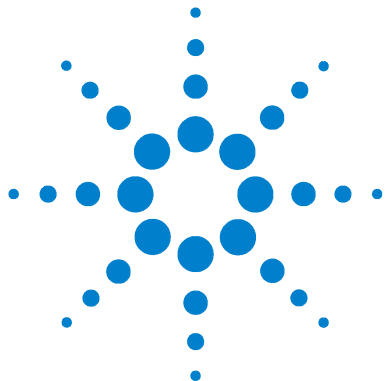
- 2** Perform a zero-order and a 656-nm calibration to add the calibration parameters into the board's memory, see "[Wavelength Calibration](#)" on page 58.

### NOTE

The zero-order and a 656-nm calibration should be performed after at least 10 minutes of warm-up time of the lamp.

- 3** Enter the serial number information of the detector through the user interface, see "[Entering the Serial Number using the Control Module](#)" on page 109 or "[Entering the Serial Number using the Agilent ChemStation](#)" on page 110.

## **4 Repairing the Variable Wavelength Detector**



## 5 Identifying Parts and Materials

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## Overview of Main Assemblies

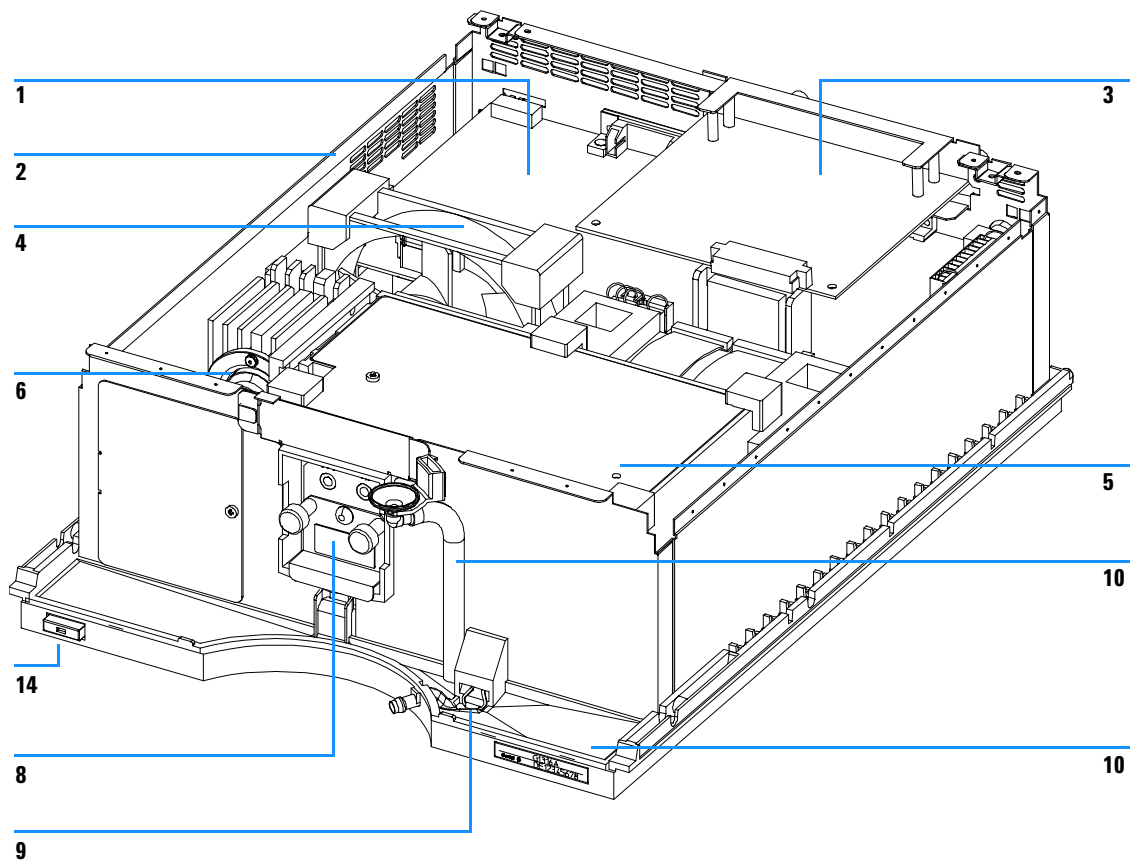


Figure 25 Overview of Main Assemblies

**Table 10** Main Assemblies

Item	Description	Part Number
1	VWD main board VWM (exchange part)	G1314-69521
	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 <a href="#">page 157</a>	0950-2528
3	Interface board BCD/External Contacts	G1351-68701
4	Fan assembly, additional parts, see <a href="#">page 140</a>	G1314-65004
5	Optical unit (exchange part), additional optical unit parts, see <a href="#">page 140</a>	G1314-69060
6	Deuterium lamp	G1314-60100
8	Standard flow cell, 10 mm 14 $\mu$ l, additional flow cell parts, see <a href="#">page 144</a>	G1314-60080
	Micro flow cell, 5 mm 1 $\mu$ l, additional flow cell parts, see <a href="#">page 146</a>	G1314-60081
	High pressure flow cell, 10 mm 14 $\mu$ l, additional flow cell parts, see <a href="#">page 150</a>	G1314-60082
	Semimicro flow cell, 6 mm 5 $\mu$ l, additional flow cell parts, see <a href="#">page 148</a>	G1314-60083
9	Leak sensor assembly	5061-3356
10	Leak handling parts	see <a href="#">page 158</a>
11	Plastic parts (housing)	see <a href="#">page 155</a>
12	Sheet metal parts	see <a href="#">page 154</a>
13	Foam parts	see <a href="#">page 156</a>
14	Power and status light parts	see <a href="#">page 157</a>

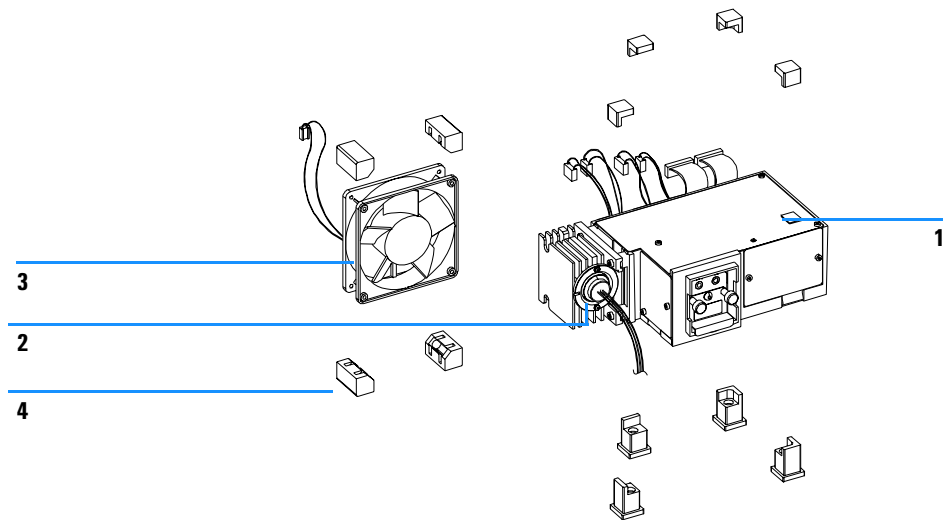
## Optical Unit and Fan Assembly

**NOTE**

Certain repairs in the optical unit require special knowledge, see [“Removing the Optical Unit”](#) on page 120.

**Table 11** Optical Unit and Fan Assembly

Item	Description	Part Number
1	Optical unit (exchange part)	G1314-69060
2	Deuterium lamp	G1314-60100
3	Fan assembly	G1314-65004
	For lens assembly and filter top assembly, see <a href="#">“Source Lens and Filter Assembly”</a> on page 141	
4	Bumper kit, includes 8 for optical unit plus 4 for fan	G1314-65021

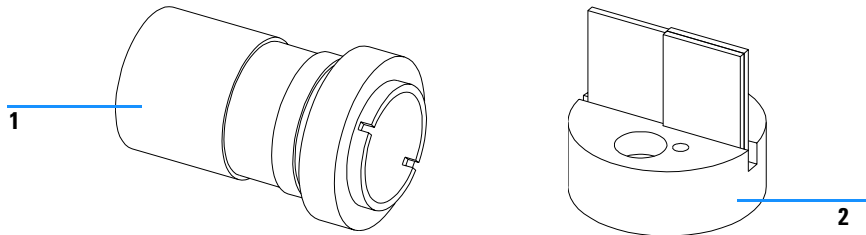


**Figure 26** Optical Unit and Fan Assembly

## Source Lens and Filter Assembly

**Table 12** Source Lens and Filter Assembly

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



**Figure 27** Source Lens and Filter Assembly

## Standard Flow Cell (G1314-60086)

**NOTE**

This flow cell replaced flow cell G1314-60080, see “[Standard Flow Cell \(G1314-60080\)](#)” on page 144. The new standard flow cell has been improved on refractive index response.

**Table 13** Standard Flow Cell G1314-60086

Item	Description	Part Number
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, KAPTON, quantity=10	G1314-65063
5	Window quartz kit, quantity=2	79853-68742
6	Gasket #2, KAPTON, quantity=10	G1314-65064
7	Cell cover assembly	G1314-65023
8	Ring #2 PEEK kit, quantity=2	G1314-65066



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

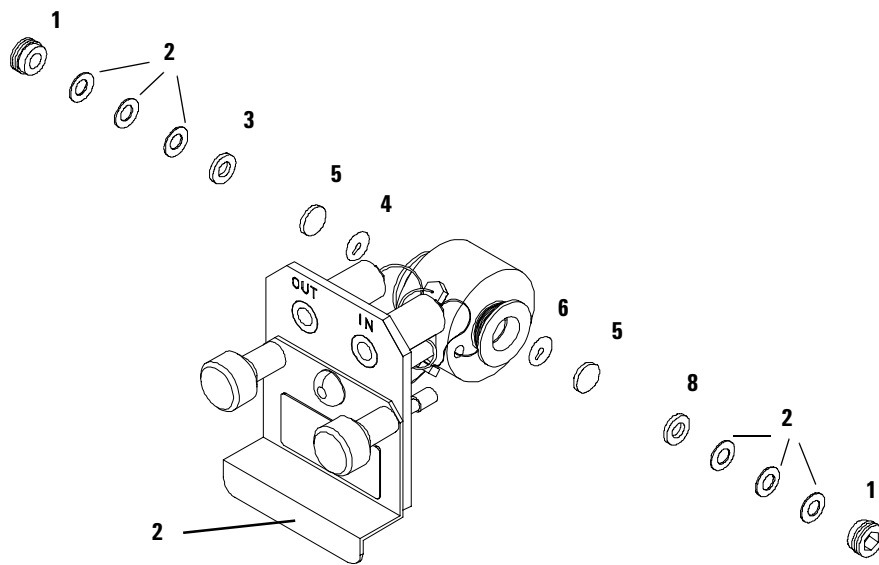


Figure 28 Standard Flow Cell (G1314-60086)

## Standard Flow Cell (G1314-60080)

### NOTE

The flow cell G1314-60080 is obsolete since May 2001. The repair parts (repair kit, windows, gaskets, etc.) will continue to be available. The cell was replaced by G1314-60086

**Table 14** Standard Flow Cell G1314-60080

Item	Description	Part Number
	Standard flow cell assembly, 10 mm, 14 $\mu$ l, 40 bar	G1314-60080 (no longer orderable)
	Capillary column – detector PEEK 600 mm lg, 0.17 i.d.	5062-8522
1	Cell screw	79853-27200
	Cell kit STD, consists of: two windows, two gaskets #1 and two gaskets #2.	G1314-65050
2	Conical spring kit, quantity=10	79853-29100
3	Ring SST kit, quantity=2	79853-22500
4	Gasket #1, PTFE, quantity=10	79853-68743
5	Window quartz kit, quantity=2	79853-68742
6	Gasket #2, PTFE, quantity=10	G1314-65051
7	Cell cover assembly	G1314-65023 see note below

### NOTE

Early flow cells did not have a cell cover. In case of stray light problems, order cell cover assembly which includes cell plate, one each of standard, micro and high pressure cell label and modification procedure.

Figure 30 on page 145 shows the way of adding the cell cover assembly to the flow cells.

- 1 - Cell Screw
- 2 - Conical Springs
- 3 - Ring SST
- 4 - Gasket #1
- 5 - Window Quartz
- 6 - Gasket #2
- 7 - Cell cover assembly

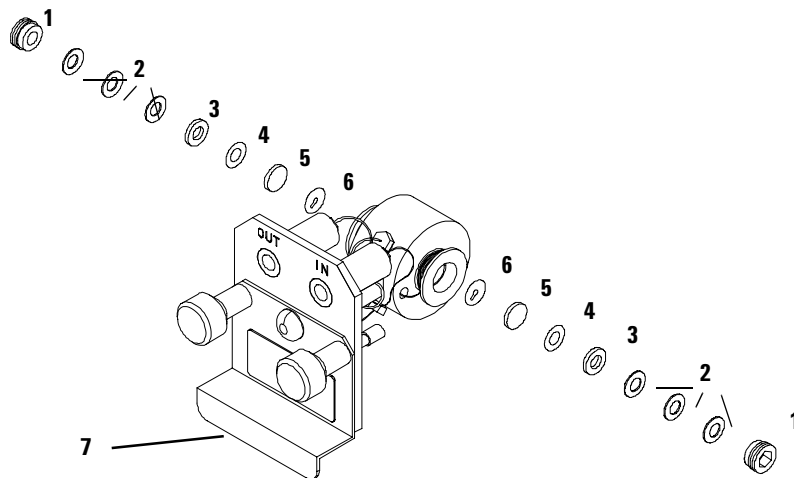


Figure 29 Standard Flow Cell

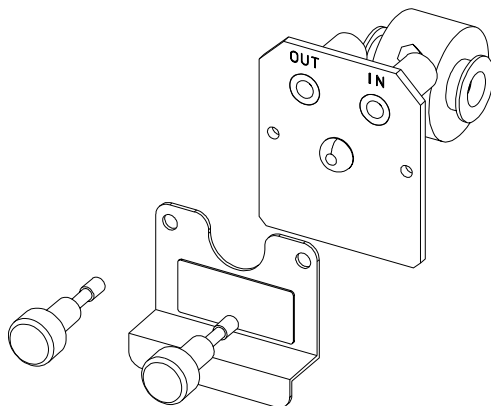


Figure 30 Modification of Flow Cells with Cell Cover Assembly

## Micro Flow Cell

**Table 15** Repair Parts: Micro Flow Cell Assembly

Item	Description	Part Number
	Micro flow cell, 5 mm, 1 $\mu$ l, 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
7	Cell cover assembly	G1314-65023 see note below

### NOTE

Early flow cells did not have a cell cover. In case of stray light problems, order cell cover assembly which includes cell plate, one each of standard, micro and high pressure cell label and modification procedure.

Figure 30 on page 145 shows the way of adding the cell cover assembly to the flow cells.

- 1 - Cell Screw
- 2 - Conical Springs
- 3 - Ring SST
- 4 - Gasket #1
- 5 - Window Quartz
- 6 - Gasket #2
- 7 - Cell cover assembly

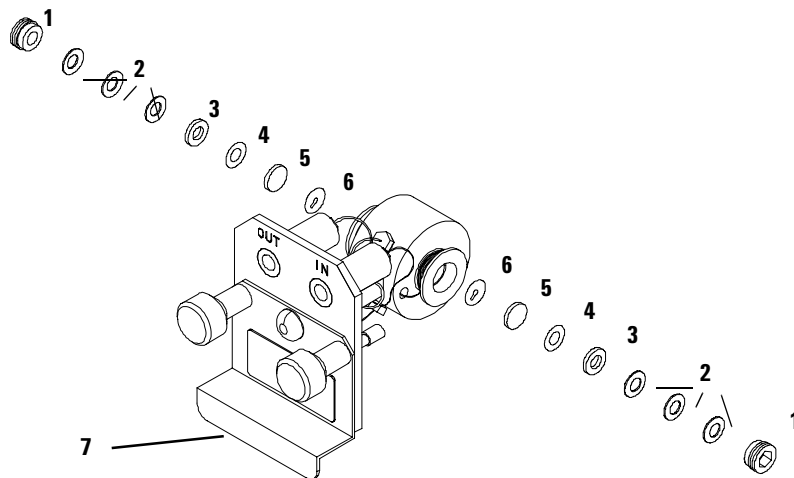


Figure 31 Micro Flow Cell

## Semimicro Flow Cell

Most part numbers are the same as for the standard flow cell G1314-60080 described on [page 144](#). The new numbers are marked with an asterisk (\*).

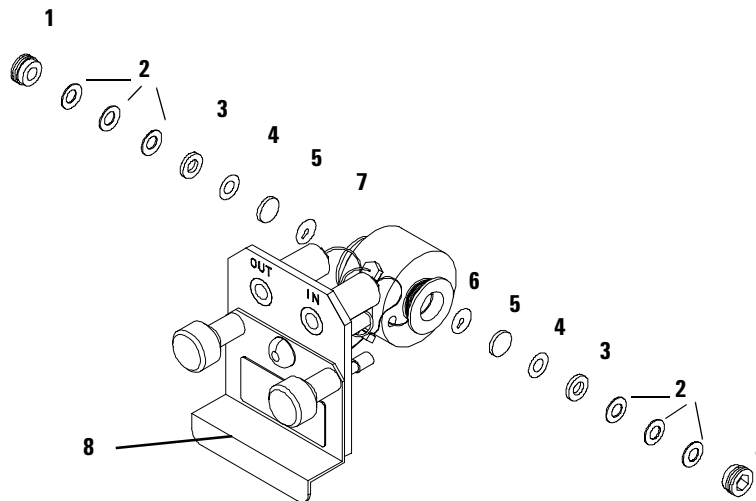
**Table 16** Repair Parts: Semimicro Flow Cell Assembly

Item	Description	Part Number
	Semimicro flow cell assembly, 6 mm, 5 µl, 40 bar	G1314-60083
1	Cell screw	79853-27200
	Semimicro cell kit, consisting of: two windows, two #1 standard gaskets, one #1 semimicro gasket and one #2 semimicro 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	Semimicro #1 gasket, PTFE, (pack of 10)	G1314-65057
7	Semimicro #2 gasket, PTFE, (pack of 10)	G1314-65058
8	Cell cover assembly	G1314-65023
	Inlet capillary, 400 mm long, 0.12 mm i.d.	5021-1823

### NOTE

The semimicro #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 - Semimicro gasket #1
- 7 - Semimicro gasket #2
- 8 - Cell cover assembly



**Figure 32** Semimicro Flow Cell

## High Pressure Flow Cell

**Table 17** Repair Parts: High Pressure Flow Cell Assembly

Item	Description	Part Number
	High pressure flow cell, 10 mm, 14 $\mu$ l, 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
5	Cell cover assembly	G1314-65023 see note below

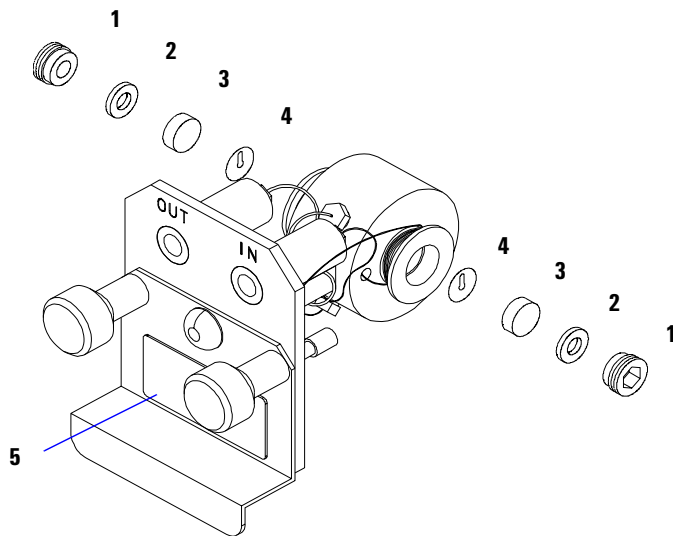
### NOTE

Early flow cells did not have a cell cover. In case of stray light problems, order Cell Cover Assembly which includes cell plate, one each of standard, Micro and High Pressure Cell label and modification procedure.

Figure 30 on page 145 shows the way of adding the cell cover assembly to the flow cells.



- 1 - Cell screw
- 2 - Ring PEEK
- 3 - Window quartz
- 4 - Gasket KAPTON
- 5 - Cell Cover



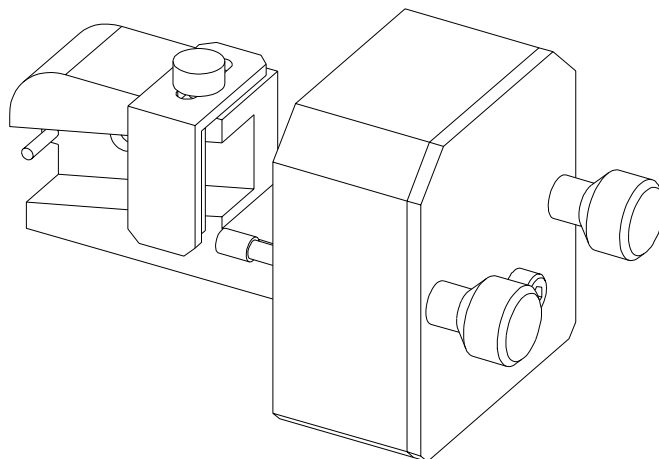
**Figure 33** High Pressure Flow Cell

## Cuvette Holder

**Table 18** Control Module Parts

Item	Description	Part Number
	Cuvette Holder	G1314-60200

For information on the use of the cuvette holder, refer to [“Using the Cuvette Holder”](#) on page 97.

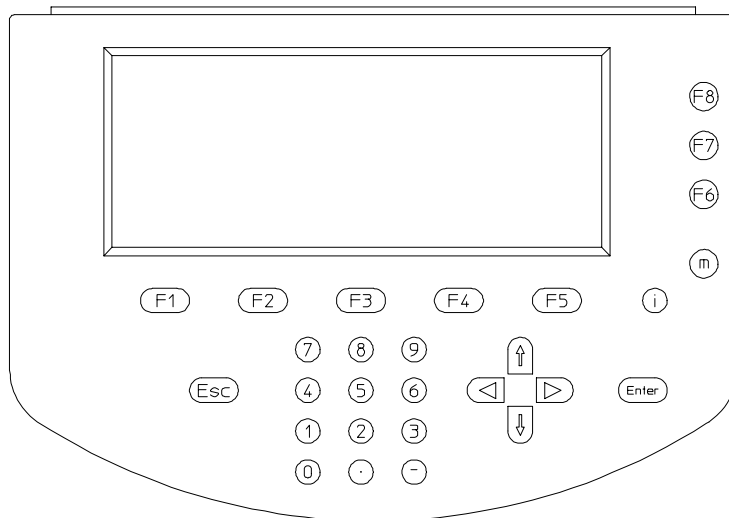


**Figure 34** Cuvette Holder

# Control Module

**Table 19** Control Module Parts

Item	Description	Part Number
	Control Module, replacement part including cable	G1323-67001
	Plastic Housing Kit, includes front, back and a clamp	5062-8583
	CAN cable Agilent 1100 module to control module	G1323-81600

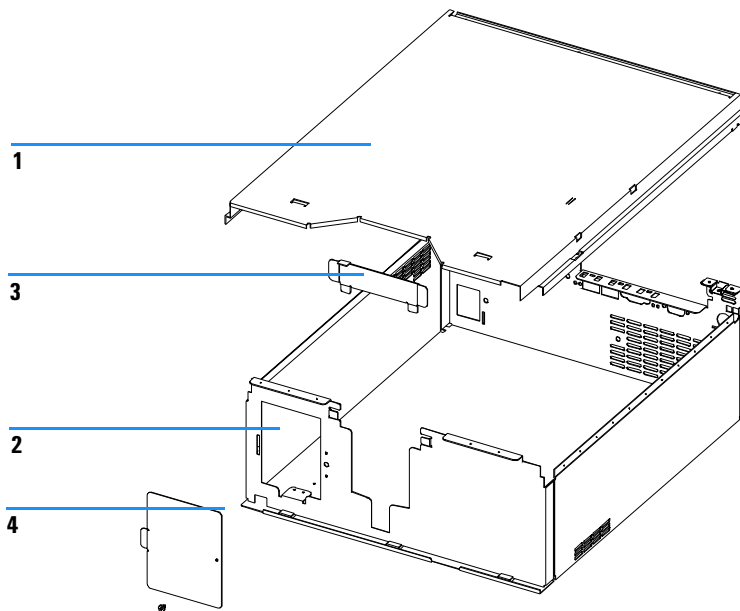


**Figure 35** Control Module

## Sheet Metal Kit

**Table 20** 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 36** Sheet Metal Kit Parts

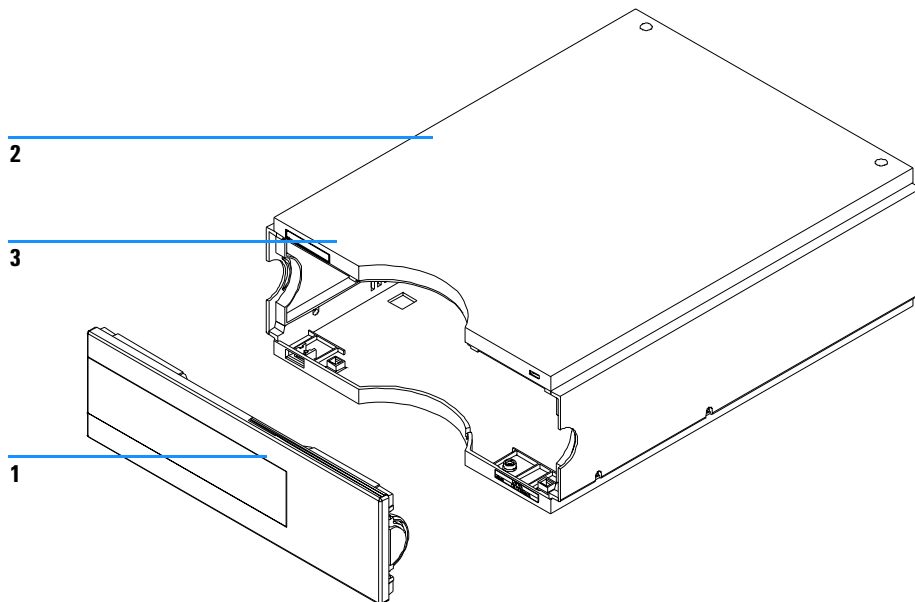
## Plastic Parts

**Table 21** Plastics Parts

Item	Description	Part Number
1	Front cover	5062-8582
2	Plastics, includes base, sides and top	5062-8565
3	Name plate Agilent 1100 Series	5042-1381

### NOTE

For correct assembling of the top and sides, see [“Assembling the Main Cover”](#) on page 133.



**Figure 37** Plastic Parts

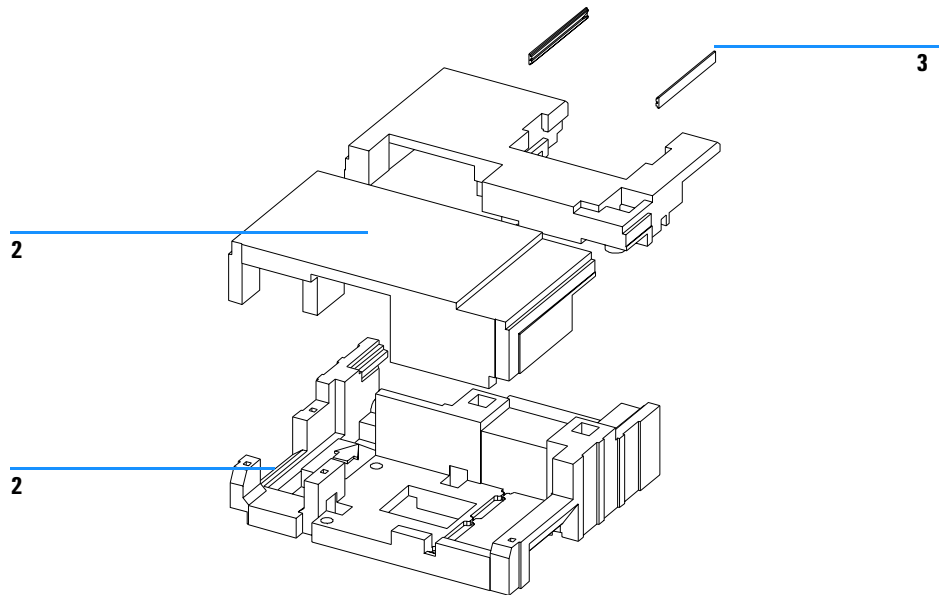
## Foam Parts

**Table 22** 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.

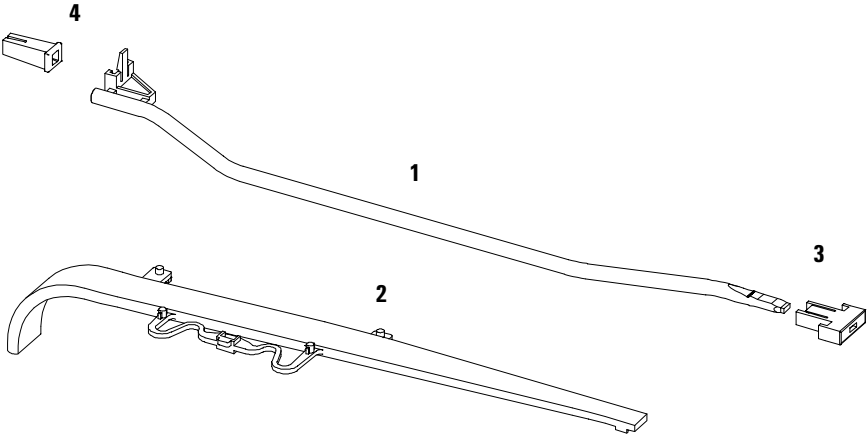


**Figure 38** Foam Parts

# Power and Status Light Pipes

**Table 23** 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

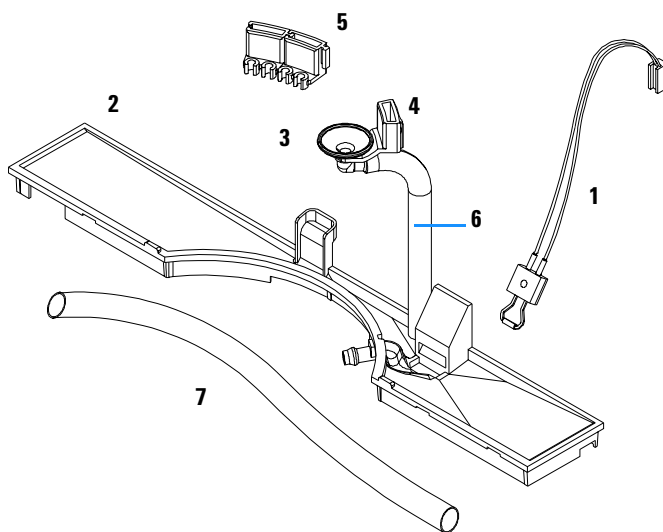


**Figure 39** Power and Status Light Pipes

## Leak Parts

**Table 24** Leak Parts

Item	Description	Part Number
1	Leak sensor assembly	5061-3356
2	Leak pan	5042-1308
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 40** Leak Parts



## Accessory Kit

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

**Table 25** 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
ESD wrist strap	9300-1408

## 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.

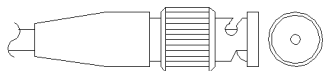
**Table 26** Cables Overview

Type	Description	Part Number
<b>Analog cables</b>	3390/2/3 integrators	01040-60101
	3394/6 integrators	35900-60750
	Agilent 35900A A/D converter	35900-60750
	General purpose (spade lugs)	01046-60105
	3390/2/3 integrators	01040-60101
<b>Remote cables</b>	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 <a href="#">page 167</a>	
	3396 Series III / 3395B integrator	03396-61010
	Agilent 1100 / 1050 modules / HP 1046A FLD	5061-3378
	HP 1046A FLD	5061-3378
	Agilent 35900A A/D converter	5061-3378
	HP 1040 diode-array detector	01046-60202
	HP 1090 liquid chromatographs	01046-60202
	Signal distribution module	01046-60202

**Table 26** Cables Overview (continued)

<b>Type</b>	<b>Description</b>	<b>Part Number</b>
<b>BCD cables</b>	3392/3 integrators	18594-60510
	3396 integrator	03396-60560
	General purpose (spade lugs)	18594-60520
<b>Auxiliary</b>	Agilent 1100 Series vacuum degasser	G1322-61600
<b>CAN cables</b>	Agilent 1100 module to module, 0.5 m	5181-1516
	Agilent 1100 module to module, 1 m	5181-1519
	Agilent 1100 module to control module	G1323-81600
<b>External contacts</b>	Agilent 1100 Series interface board to general purpose	G1103-61611
<b>GPIB cable</b>	Agilent 1100 module to Agilent ChemStation, 1 m	10833A
	Agilent 1100 module to Agilent ChemStation, 2 m	10833B
<b>RS-232 cable</b>	Agilent 1100 module to a computer This kit contains a 9-pin female to 9-pin female null modem (printer) cable and one adapter.	34398A
<b>LAN cable</b>	Twisted pair cross over LAN cable, 10 feet long (for point to point connection)	5183-4649
	Category 5 UTP cable, 8 m long (for hub connections)	G1530-61480

## Analog Cables



One end of these cables provides a BNC connector to be connected to Agilent 1100 Series modules. The other end depends on the instrument to which connection is being made.

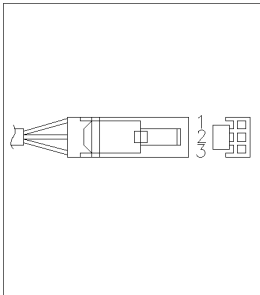
### Agilent 1100 to 3390/2/3 Integrators

Table 27

Connector 01040-60101	Pin 3390/2/3	Pin Agilent 1100	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

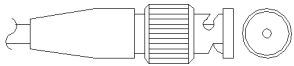
**Agilent 1100 to 3394/6 Integrators**

**Table 28**

Connector 35900-60750	Pin 3394/6	Pin Agilent 1100	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

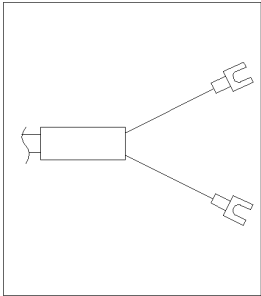
**Agilent 1100 to BNC Connector**

**Table 29**

Connector 8120-1840	Pin BNC	Pin Agilent 1100	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

**Agilent 1100 to General Purpose**

**Table 30**

Connector 01046-60105	Pin 3394/6	Pin Agilent 1100	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 1100 Series modules. The other end depends on the instrument to be connected to.

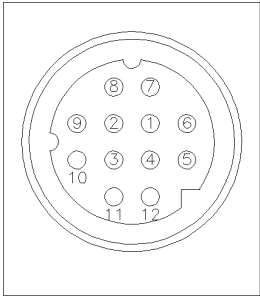
### Agilent 1100 to 3390 Integrators

**Table 31**

Connector 01046-60203	Pin 3390	Pin Agilent 1100	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 1100 to 3392/3 Integrators**

**Table 32**

Connector 01046-60206	Pin 3392/3	Pin Agilent 1100	Signal Name	Active (TTL)
 <p>4 - Key</p>	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 1100 to 3394 Integrators**

**Table 33**

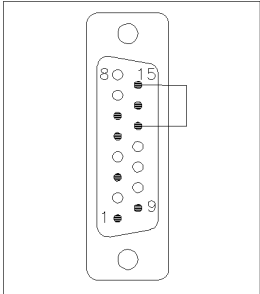
Connector 01046-60210	Pin 3394	Pin Agilent 1100	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	1	9 - Black	Start request	Low



Table 33

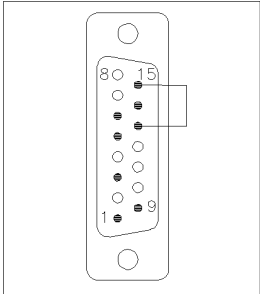
Connector 01046-60210	Pin 3394	Pin Agilent 1100	Signal Name	Active (TTL)
	13, 15		Not connected	

**NOTE**

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

**Agilent 1100 to 3396A Integrators**

Table 34

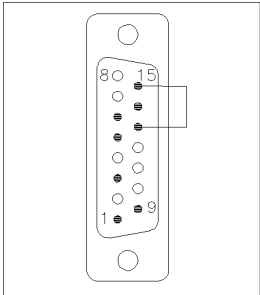
Connector 03394-60600	Pin 3394	Pin Agilent 1100	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

**Agilent 1100 to 3396 Series II / 3395A Integrators**

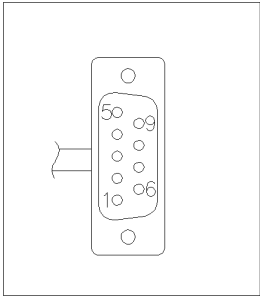
Use the cable 03394-60600 and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

**Agilent 1100 to 3396 Series III / 3395B Integrators**

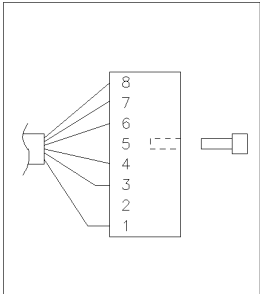
**Table 35**

Connector 03396-61010	Pin 33XX	Pin Agilent 1100	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 1100 to HP 1050, HP 1046A or Agilent 35900 A/D Converters**
**Table 36**

Connector 5061-3378	Pin HP 1050 / ...	Pin Agilent 1100	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 1100 to HP 1090 LC, HP 1040 DAD or Signal Distribution Module**
**Table 37**

Connector 01046-60202	Pin HP 1090	Pin Agilent 1100	Signal Name	Active (TTL)
 <p>5 - Key</p>	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
	6	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1100 to General Purpose

Table 38

Connector 01046-60201	Pin Universal	Pin Agilent 1100	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

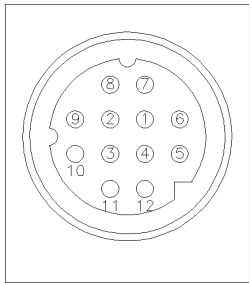
## BCD Cables



One end of these cables provides a 15-pin BCD connector to be connected to the Agilent 1100 Series modules. The other end depends on the instrument to be connected to.

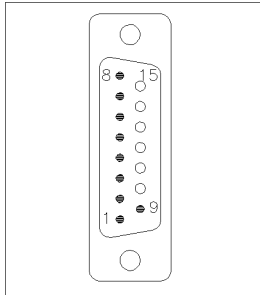
### Agilent 1100 to 3392/3 Integrators

Table 39

Connector 18584-60510	Pin 3392/3	Pin Agilent 1100	Signal Name	BCD Digit
 <p>6 - Key</p>	10	1	BCD 5	20
	11	2	BCD 7	80
	3	3	BCD 6	40
	9	4	BCD 4	10
	7	5	BCD 0	1
	5	6	BCD 3	8
	12	7	BCD 2	4
	4	8	BCD 1	2
	1	9	Digital ground	
	2	15	+ 5 V	Low

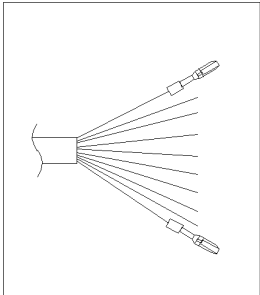
**Agilent 1100 to 3396 Integrators**

**Table 40**

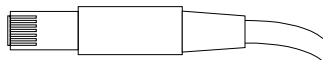
<b>Connector 03396-60560</b>	<b>Pin 3392/3</b>	<b>Pin Agilent 1100</b>	<b>Signal Name</b>	<b>BCD Digit</b>
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD 0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

**Agilent 1100 to General Purpose**

**Table 41**

Connector 18594-60520	Wire Color	Pin Agilent 1100	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	
	White	15	+5 Vt	Low

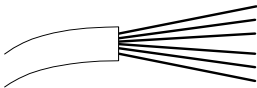
## Auxiliary Cable



One end of this cable provides a modular plug to be connected to the Agilent 1100 Series vacuum degasser. The other end is for general purpose.

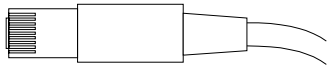
### Agilent 1100 Series Degasser to general purposes

Table 42

Connector G1322-61600	Color	Pin Agilent 1100	Signal Name
	White	1	Ground
	Brown	2	Pressure signal
	Green	3	
	Yellow	4	
	Grey	5	DC + 5 V IN
	Pink	6	Vent



## CAN Cable

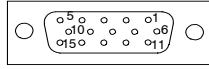


Both ends of this cable provide a modular plug to be connected to Agilent 1100 Series module's CAN-bus connectors.

**Table 43**

Agilent 1100 module to module, 0.5 m	5181-1516
Agilent 1100 module to module, 1 m	5181-1519
Agilent 1100 module to control module	G1323-81600

## External Contact Cable

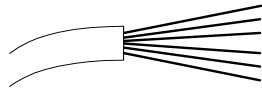


One end of this cable provides a 15-pin plug to be connected to Agilent 1100 Series module's interface board. The other end is for general purpose.

### Agilent 1100 Series interface cable to general purposes

Table 44

Connector G1103-61611	Color	Pin Agilent 1100	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

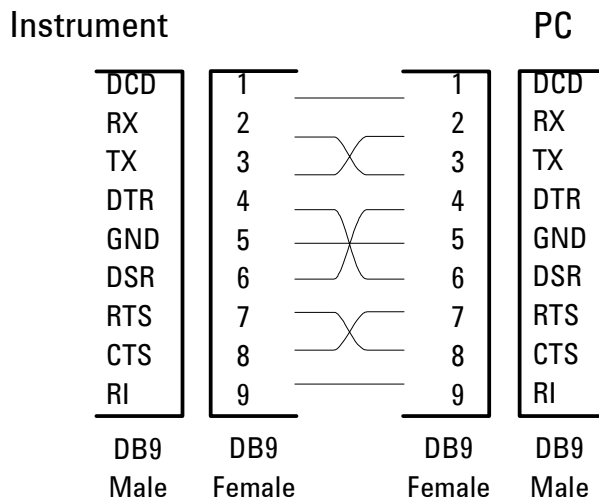


## RS-232 Cable Kit

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 Agilent Technologies instruments with 9-pin male RS-232 connectors to most PCs or printers.

### Agilent 1100 module to PC

#### RS-232 Cable Kit 34398A

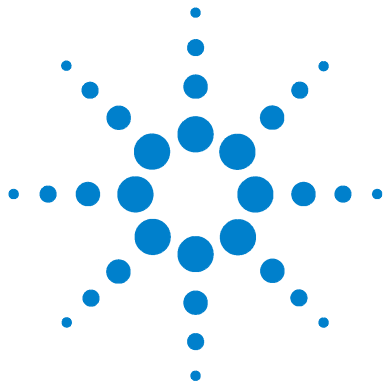


## **LAN Cables**

### **Recommended Cables**

For point to point connection (not using a network hub) use a twisted pair cross over LAN cable (P/N 5183-4649, 10 feet long).

For standard network connections using a hub use category 5 UTP cables, (P/N G1530-61480, 8 m long).



## 6 Introduction to the Variable Wavelength Detector

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The Main Power Supply Assembly	213



### Introduction to the Detector

The Agilent 1100 Series variable wavelength detector is designed for highest optical performance, GLP compliance and easy maintenance with:

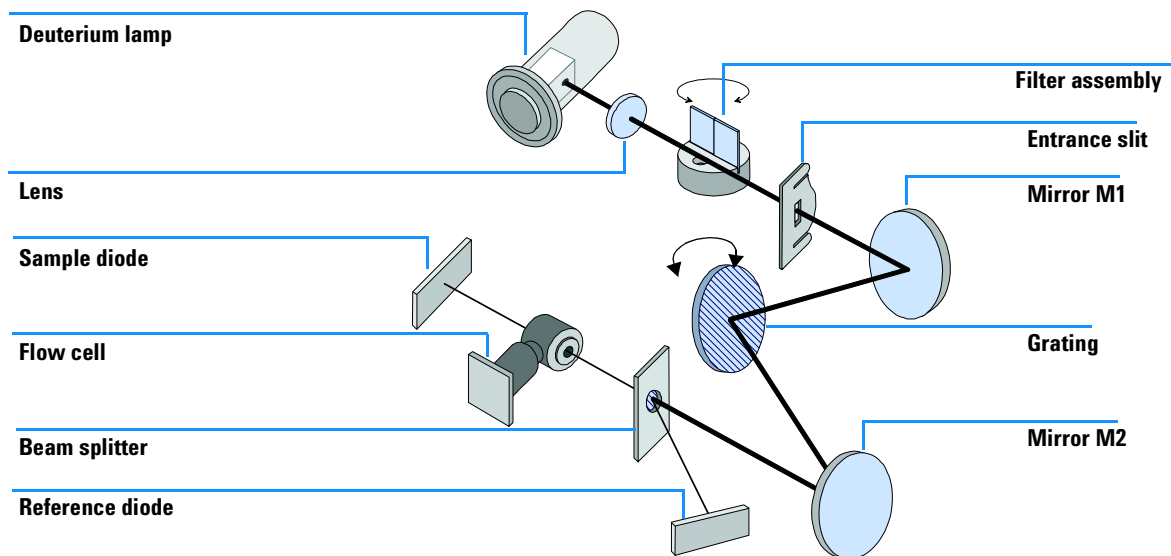
- deuterium lamp for highest intensity and lowest detection limit over a wavelength range of 190 to 600 nm,
- optional flow-cell cartridges (standard 10 mm 14  $\mu$ l, high pressure 10 mm 14  $\mu$ l, micro 5 mm 1  $\mu$ l, semimicro 6 mm 5  $\mu$ l) are available and can be used depending on the application 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 242.

## Optical System Overview

### Optical System

The optical system of the detector is shown in [Figure 41](#). Its radiation source is a deuterium-arc discharge lamp for the ultraviolet (UV) wavelength range. 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 41** Optical Path of the Variable Wavelength Detector

### The Optical Components

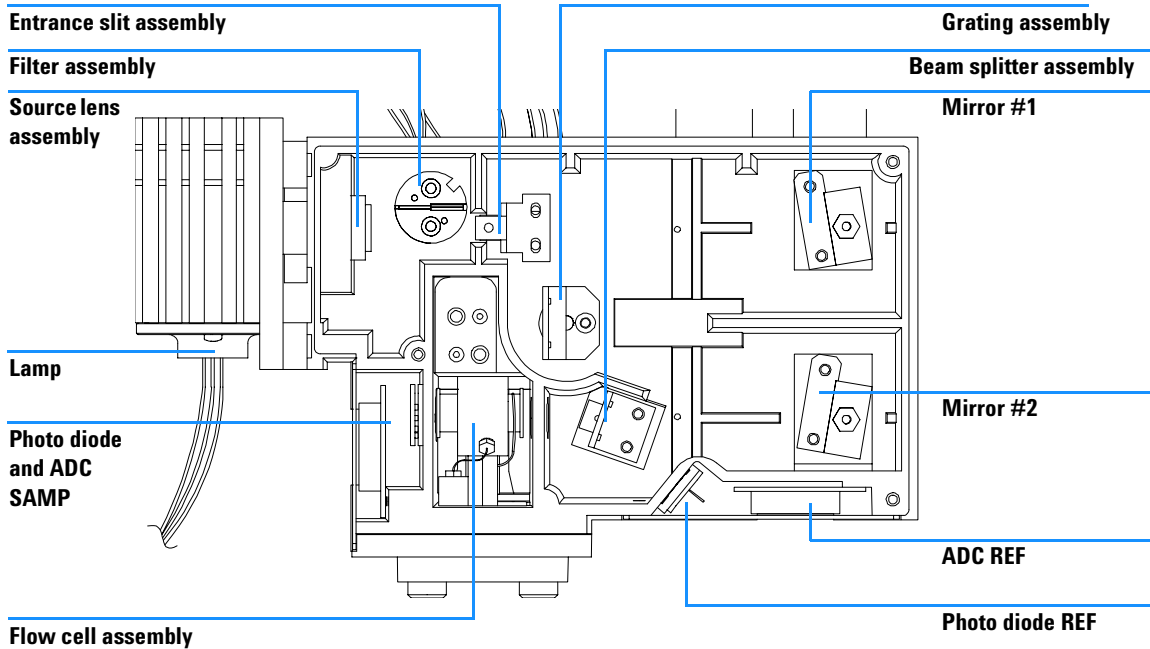


Figure 42 Mechanical Layout of the Optical Unit

**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 lightpath.

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

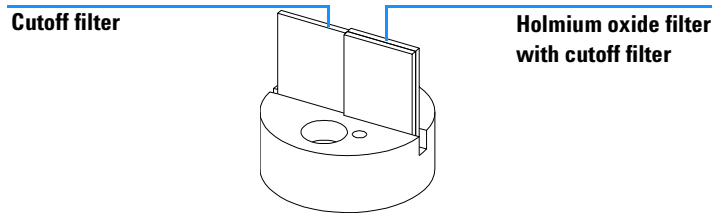
OPENnothing in lightpath



CUTOFFcut off filter in lightpath at  $\lambda > 370$  nm

HOLMIUMholmium oxide filter for wavelength check.

A photo sensor determines the correct position.



**Figure 43** 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

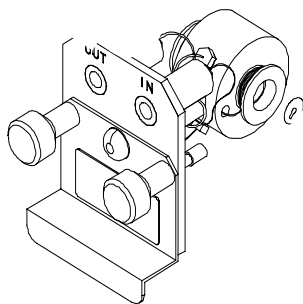
Two photodiode assemblies are installed in the optical unit. The sample diode assembly is located on the left side of the optical unit. The reference diode assembly is located in the front of the optical unit.

### Photo Diode ADC (analog-to-digital converter)

The photo diode current is directly converted to 20-bit digital data direct photocurrent digitization. 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 44** Cartridge Type Flow Cell

**Table 45** Flow Cell Data

	<b>STD</b>	<b>Semimicro</b>	<b>Agilent</b>	<b>Micro</b>	
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	

## Electrical Connections

- The GPIB connector is used to connect the detector to the 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 49](#) on page 204 or [Table 53](#) on page 209) 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 1100 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 next to the GPIB connector (see "[Communication Settings for RS-232C Communication](#)" on page 210). See your software documentation for further information.
- The power input socket accepts a line voltage of 100–120 or 220–240 volts AC  $\pm$  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.**

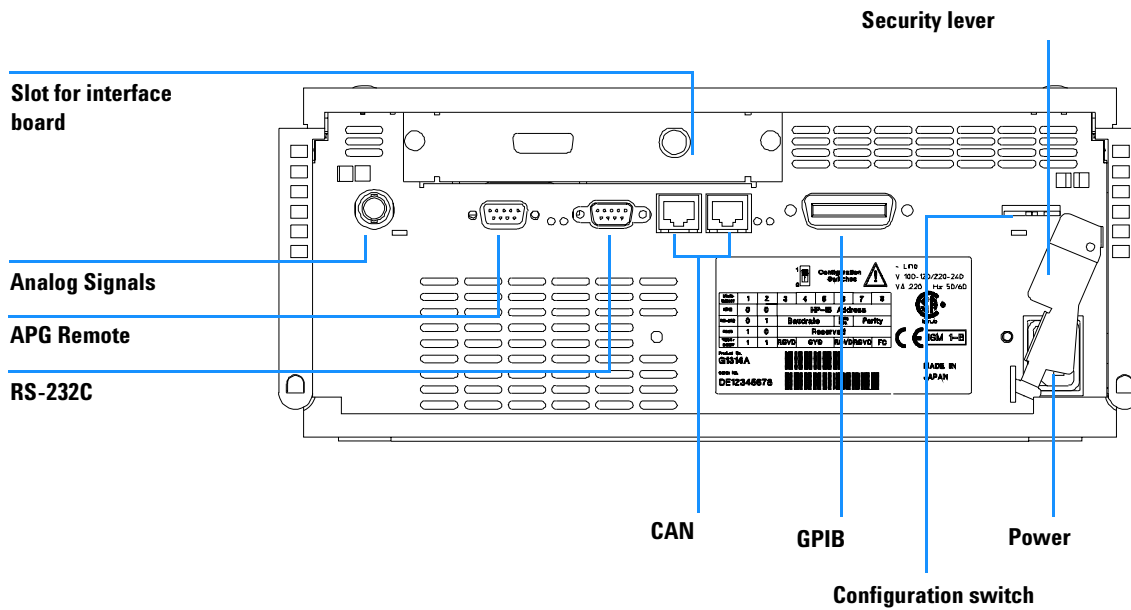


Figure 45 Electrical Connections

### 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)

## **6 Introduction to the Variable Wavelength Detector**

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.



## The Electronics

The electronics are comprised of four main components:

- **detector main board** (VWM), see [page 192](#).
- **power supply**, see [page 213](#).

Optional:

- **interface board** (BCD/external contacts), see [page 200](#).
- **interface board** (LAN), see [page 202](#).

## 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 or RS-232C), connected to the user interfaces

### ASIC — Application Specific Integrated Circuit

The 304-pin application-specific integrated circuit (ASIC) provides interfacing to external devices through drivers, including GPIB, CAN, APG remote, and RS-232C. It is directly connected to the four control LEDs located near the connectors on this board and the 8-bit configuration switch which is used to configure the address for the GPIB communication, Baud rate for RS-232C transfer and so on. For switch settings, [Table 53](#) on page 209.

In addition, it controls the cooling fan through the PWM (pulse width modulation) driver. Movement of the cooling fan is sensed by the hardware and the microprocessor.

### Mainprocessor

The Motorola MC 68332 microprocessor acts as mainprocessor with a clock frequency of 16 MHz and exchanges data with the ASIC through the core bus as well as with the PSRAM (pseudo-static random access memory) of  $2 \times 512$  KB, flash EEPROM (electrically erasable programmable read only memory) of 1 MB and  $1 \times 32$  KB battery-backed NV-RAM (non-valuable). Battery life is laid out to last for more than 25 years under normal operating conditions.

### FPGA (Field Programmable Gate Array)

Almost all control and communication of the ADC boards (VWA) and digital section of grating motor driver is programmed in FPGA.

### Firmware

For an outline of the firmware, see "[Firmware Description](#)" on page 197.

### 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 249.

### Interfaces

For detailed information on interfaces, see "[Agilent 1100 Series Interfaces](#)" on page 203.

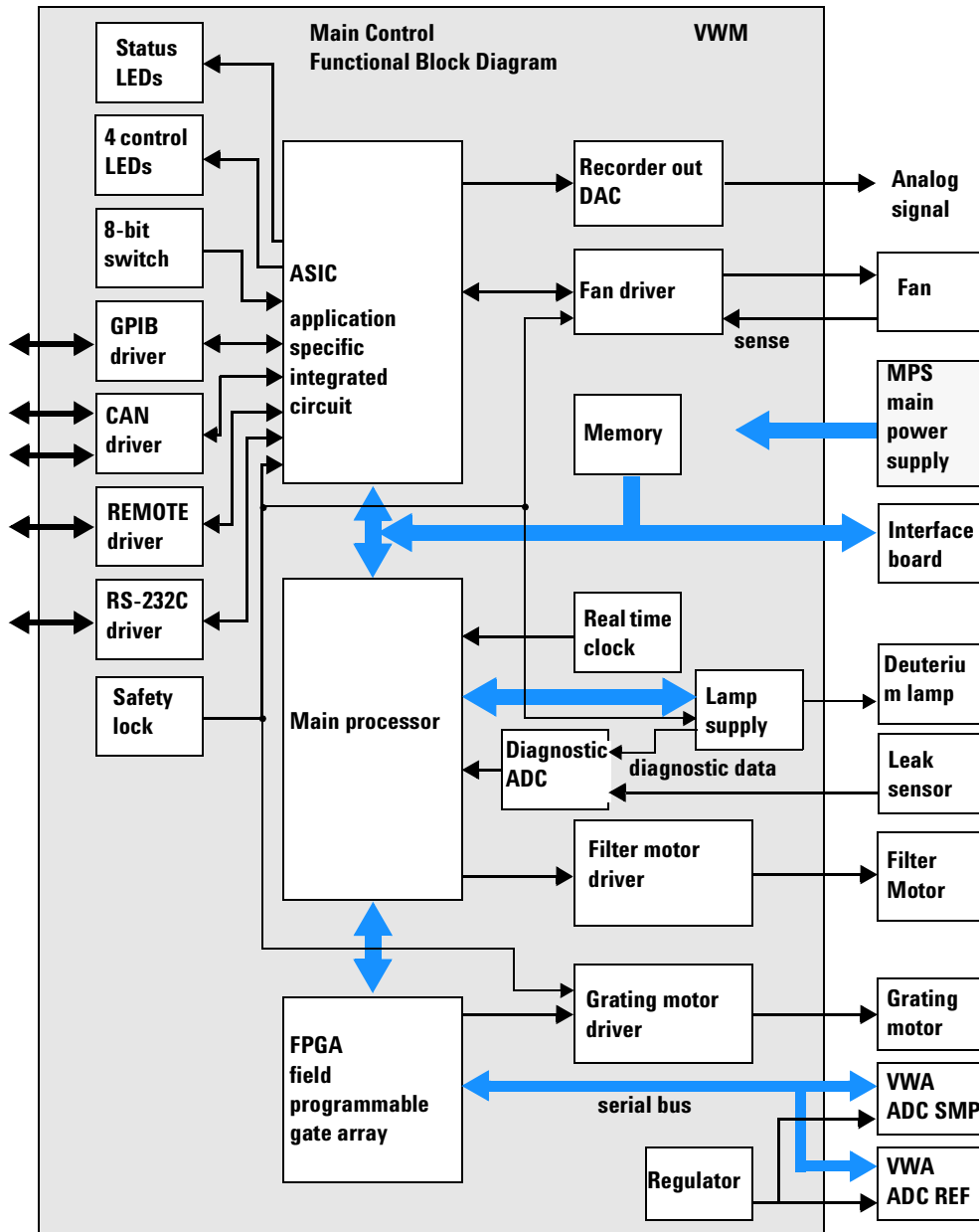


Figure 46 Block Diagram VWD Main Controller Functionality

### **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 Switches**

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.

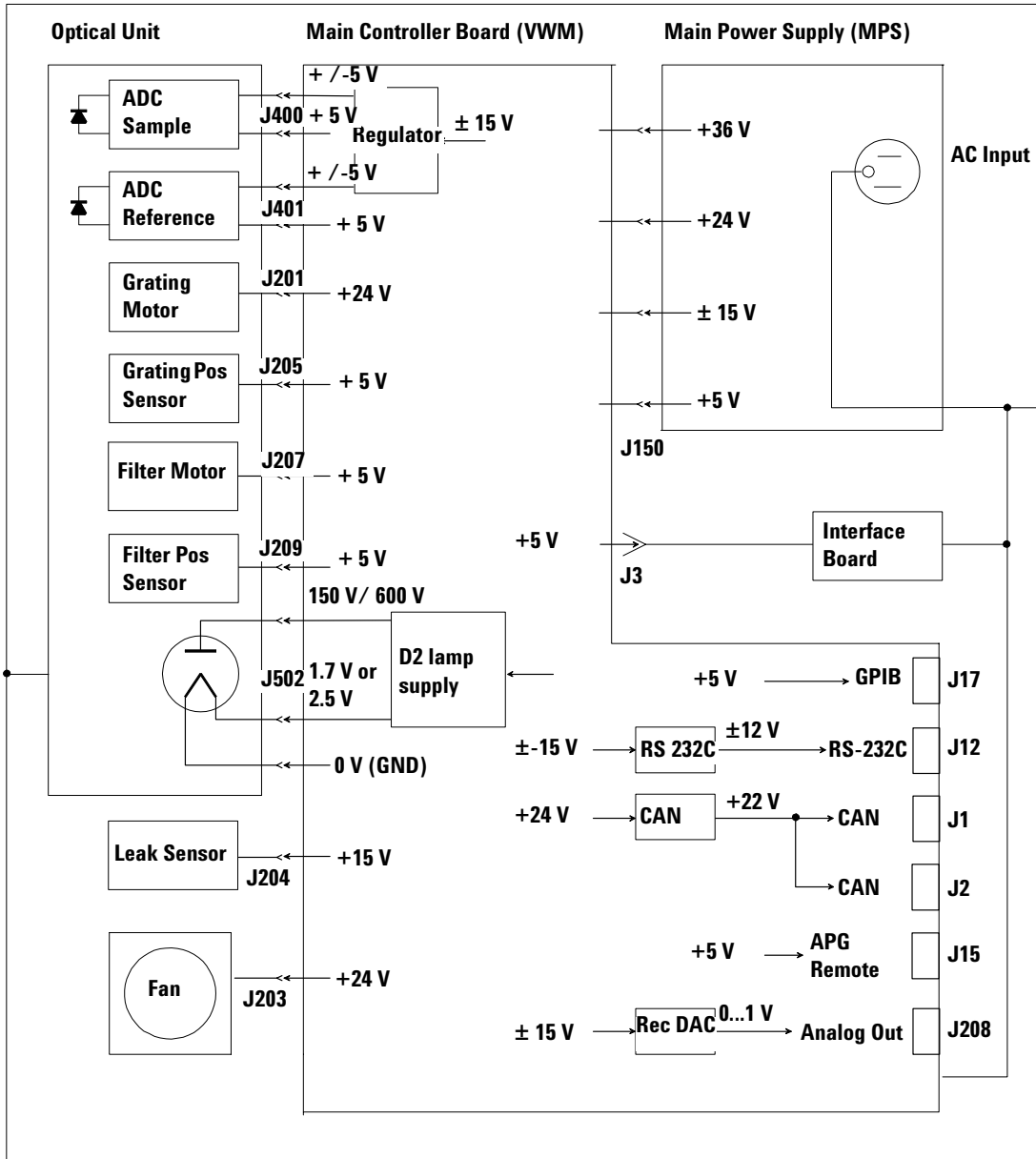


Figure 47 Power Interconnection Diagram of the Detector

## 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 1100 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 synchronisation 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 (see [“Raw Data Conversion to Absorbance”](#) on page 199, and so on.

## Firmware Updates

Firmware updates can be done using your user interface:

- handheld control module with files from a PC-card, or
- Agilent ChemStation with files from floppy disk.

The file naming conventions are:

xxxx-vvv.DLB, where

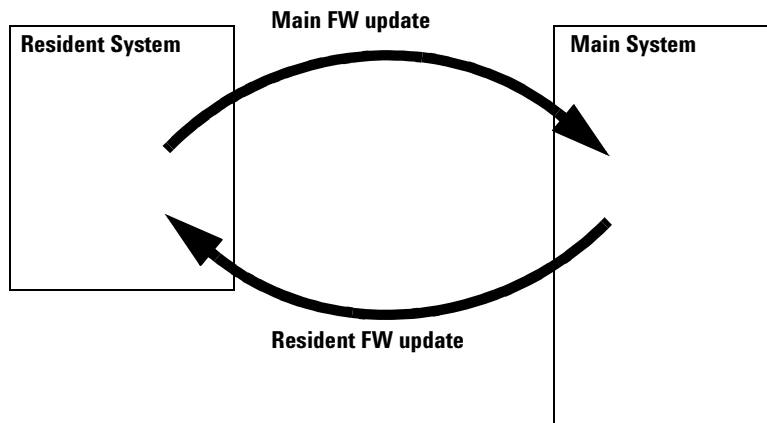
xxxx is the product number, e.g. 1314 for the G1314A VWD), and vvv is the revision number, for example 108 is revision 1.08

For instructions refer to your user interface.

### 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.

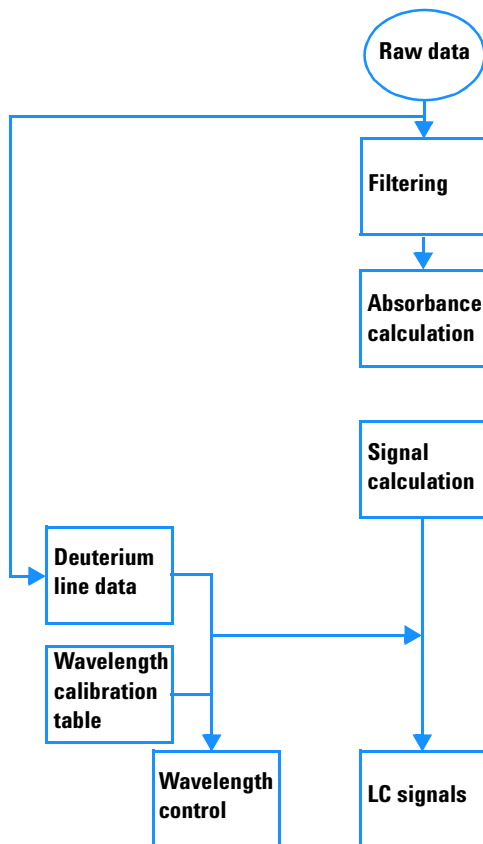


**Figure 48** Firmware Update Mechanism



## Raw Data Conversion to Absorbance

The raw data flow (from the photovisible wavelength) and conversion to absorbance spectra with variance for each data point is a multiple step process. This process is outlined in [Figure 49](#).



**Figure 49** Firmware Flow Diagram

## Optional Interface Boards

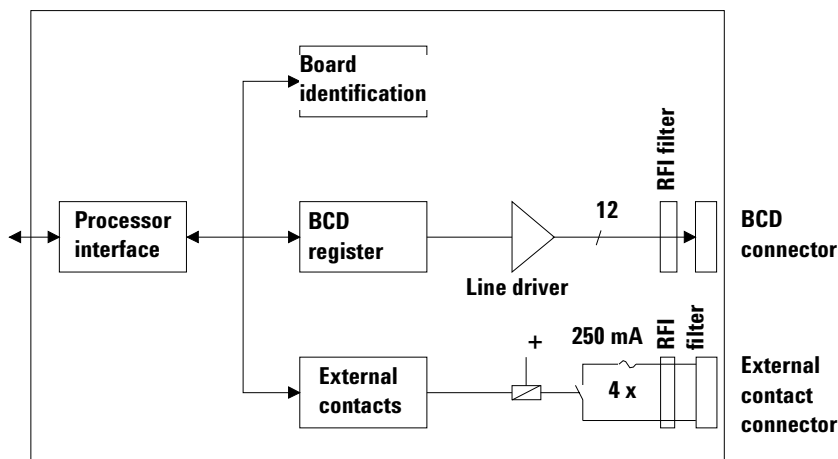
The Agilent 1100 Series modules have one optional board slot that allows to add an interface board to the modules.

**Table 46** Optional Interface Boards

Description	Part Number
BCD Board	G1351-68701
Fuse 250 mA (four are on the board)	2110-0004
LAN Board (see next page for details)	

## BCD Board

The BCD board provides a BCD output for the bottle number of the Agilent 1100 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). There are general purpose cables available to connect the BCD output, see “[BCD Cables](#)” on page 171 and the external outputs, see “[External Contact Cable](#)” on page 176 to external devices.



**Figure 50** Block Diagram BCD Board

## LAN Board

The HP JetDirect cards are network interface cards used in HP printers.

**NOTE**

One board is required per Agilent 1100 stack. It is recommended to add the LAN board to the detector with highest data rate.

**NOTE**

The LAN board can only be used together with:

a main board version G13XX-66520 (DAD/MWD/VWD/Pump/ALS) or G13XX-66500 (FLD/RID) and above.

a DOS-ChemStation software revision A.06.01 or above.

The following cards can be used with the Agilent 1100 modules.

**Table 47** LAN Boards

Agilent Order Number	Supported networks
J4106A	Ethernet/802.3, RJ-45 (10Base-T)
J4105A	Token Ring/802.5, DB9, RJ-45 (10Base-T)
J4100A	Fast Ethernet, Ethernet/802.3, RJ-45 (10/100Base-TX) + BNC (10Base2)

**NOTE**

Minimum firmware of the JetDirect cards is A.05.05.

### Recommended Cables

For point to point connection (not using a network hub) use a twisted pair cross over LAN cable (P/N 5183-4649, 10 feet long).

For standard network connections using a hub use category 5 UTP cables, (P/N G1530-61480, 8 m long).

## Agilent 1100 Series Interfaces

The Agilent 1100 Series modules provide the following interfaces:

**Table 48** Agilent 1100 Series Interfaces

Interface Type	Pumps	Autosampler	DA Detector MW Detector FL Detector	VW Detector RI Detector	Thermostatted Column Compartment	Vacuum Degasser
CAN	Yes	Yes	Yes	Yes	Yes	No
GPIB	Yes	Yes	Yes	Yes	Yes	No
RS-232C	Yes	Yes	Yes	Yes	Yes	No
Remote	Yes	Yes	Yes	Yes	Yes	Yes
Analog	Yes	No	2 ×	1 ×	No	Yes*
Interface board	Yes	Yes	Yes	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 1100 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 4](#) on page 20.

### WARNING

**Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations, see “[Cable Overview](#)” on page 160.**

## 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 49** 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 50** 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

**Table 50** Remote Signal Distribution (continued)

Pin	Signal	Description
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

## 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:

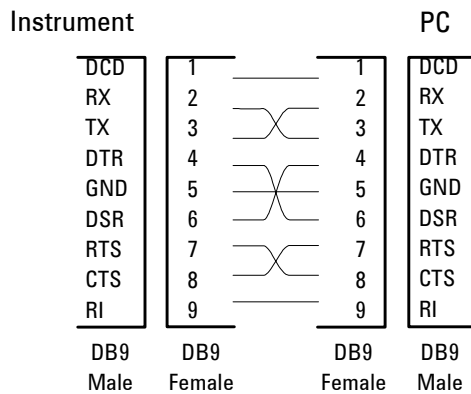
**Table 51** RS-232C Connection Table

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



**Table 51** RS-232C Connection Table (continued)

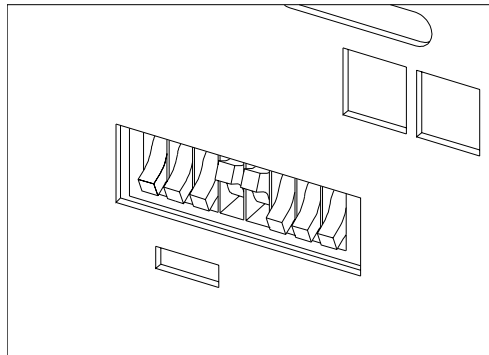
Pin	Direction	Function
9	In	RI

**Figure 51** 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 52** 8-bit Configuration Switch

**Table 52** 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 53** Default Addresses for Agilent Series 1100 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 54** 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 55** 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 56** Data Bit Settings

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

**Table 57** 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 58** 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 59** Stay Resident Settings

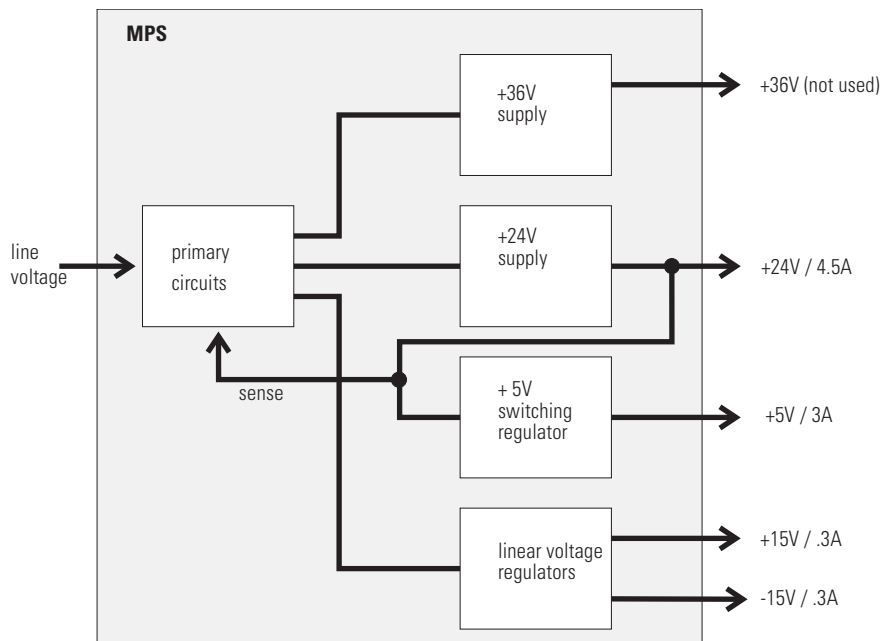
Mode Select	1	2	3	4	5	6	7	8
TEST/BOOT	1	1	0	0	1	0	0	0

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

## The 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 100–120 or 220–240 volts AC  $\pm$  10% and needs no manual setting.



**Figure 53** 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.

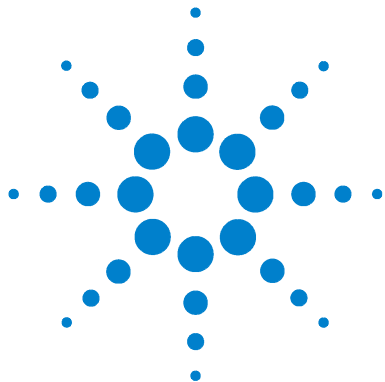
An over-temperature sensor in the main power supply is used to turn off output voltages if the temperature exceeds the acceptable limit (for example, if the cooling fan of the instrument fails). To reset the main power supply to normal operating conditions, turn the instrument off, wait until it is approximately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

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

**Table 60** Main Power Supply Specifications

Maximum power	130 W	Continuous output
Line input	100–120 or 220–240 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	





## 7

# Control Module Screens for the Agilent 1100 Variable Wavelength Detector

Major keys on the Agilent 1100 Control Module [216](#)

Screens available from the Analysis screen [217](#)

Screens available from the System screen [227](#)

Screens available from the Records screen [229](#)

Diagnostics and Tests [235](#)



## Major keys on the Agilent 1100 Control Module

**Table 61**

ESC	Return to previous screen and scroll through top layer views (Analysis, Settings)
m	Open context sensitive menus
i	Information/help
Enter	Store changed parameters or execute the choice from a pull-down menu
On/Off	Switch on lamp(s)
Start	Start a run
Plot	View the chromatogram
Views	Change between view of analysis - status - system screens

**NOTE**

The screens shown on the next pages are based on the following firmware revisions:  
Control Module firmware revision B.01.01 (G1323B).  
LC Module firmware revision 3.8x

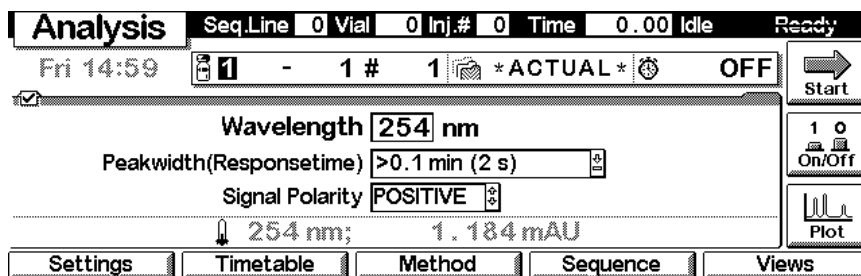
**NOTE**

In case the control module's display seems to be frozen (hang-up due to a communication problem on the CAN bus, unplug the control module from the LC module and reconnect.

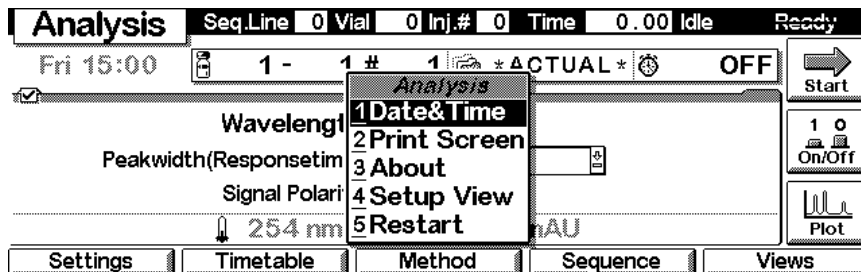
## Screens available from the Analysis screen

### The Analysis screen

This is the wake-up screen, if the Agilent 1100 variable wavelength detector is the only configured Agilent 1100 module. It is used to enter the most common VWD method parameters.

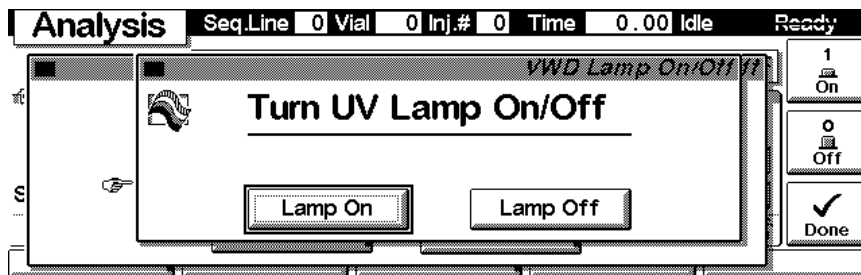
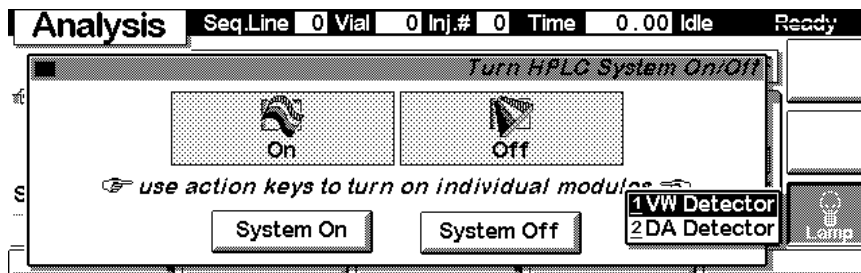


The **m**-key allows access to the context sensitive menu. **Setup view** leads you to add sections for additional Agilent 1100 modules. **Restart** re-boots the control module.



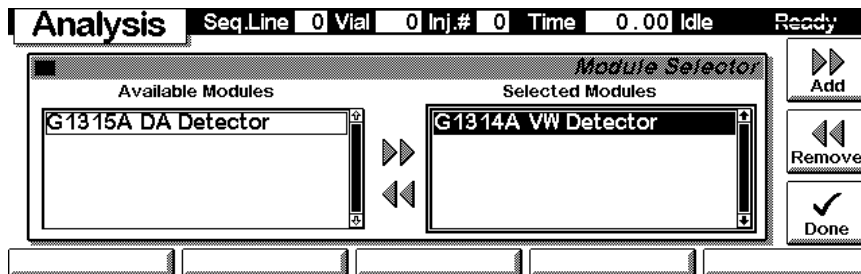
### Lamp ON/OFF

Use the F8 key (**On/Off**) to turn on the lamp(s). If more than one module is available, select the VWD from the pop-up menu.



### Setup View

In the Setup view, e.g. another module can be added to the view.



Here, e.g. the diode array detector parameters are shown on the display as well. The number of parameters on the display are restricted as additional modules are added. Maximum 4 modules are shown automatically. If more modules are in the system, you have to choose in Setup view.

The screenshot shows the 'Analysis' screen with the following parameters:

Analysis		Seq.Line	0	Vial	0	Inj.#	0	Time	0.00	Idle	Ready
Fri 14:27											
1 - 1 # 1 *ACTUAL* OFF											
λ 254 nm		A		λ		BW		B		λ BW	
Peakwidth >0.1 min (2 s)		Sample		250		100		254		16	
Sig. Polarity POSITIVE		Ref		360		100		360		100	
254 nm; 0.918 mAU		-41.657		-32.341							
Settings		Timetable		Method		Sequence		Views			

With the **Settings** key you open a pull-down menu where you can select the VWD modules.

The screenshot shows the 'Analysis' screen with the 'Settings' menu open, displaying the following parameters:

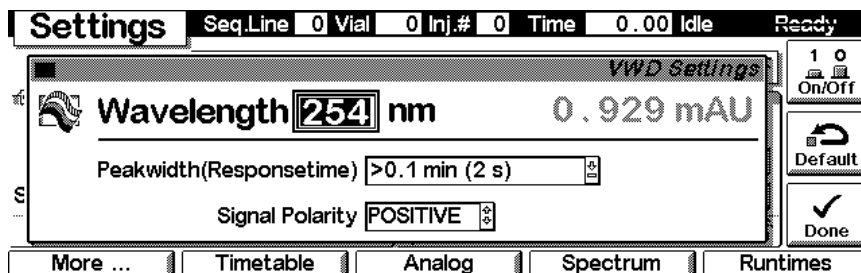
Analysis		Seq.Line	0	Vial	0	Inj.#	0	Time	0.00	Idle	Ready
Tue 13:15											
1 - 1 # 1 *ACTUAL* OFF											
Wavelength 254 nm											
Peakwidth(Responsetime) >0.1 min (2 s)											
Signal Polarity POSITIVE											
254 nm; -0.333 mAU											
Settings		Timetable		Method		Sequence		Views			

The 'Settings' menu is expanded to show the following options:

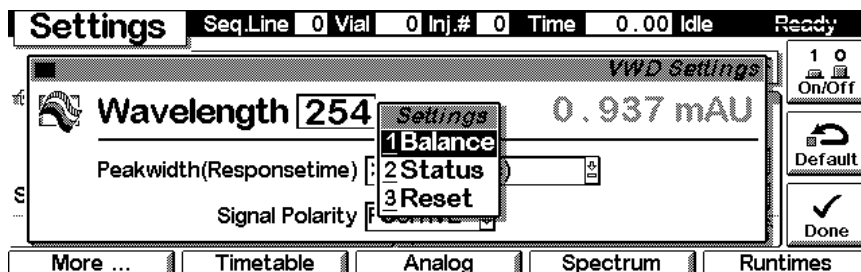
- 1 HPLC System
- 2 VW Detector
- 3 DA Detector

### Settings

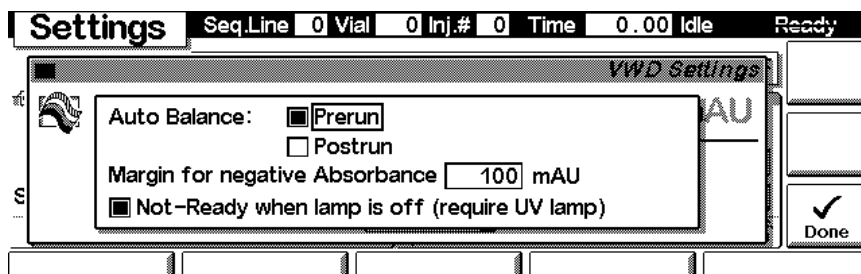
Within the **Settings** you can change the VWD parameters and with a different set of parameters available through the F1-5 keys. F7 key resets the VWD to default values. F8 opens a window to turn on the lamp.



Use the **m**-key for the context sensitive menu. The **Status** command pulls up a monitor screen displaying signals and spectra as programmed. **Reset** will load the VWD default parameters. **Balance** brings the baseline back to set offset.



Use F1-key (**More**). You can enter special VWD setpoints.



## Settings - Timetable

With the F2 key (**Timetable**) you can list the timetable for the VWD. Press F7 key (**Insert**) to add entries or F6 key (**Delete**) to remove entries.

Timetable				Seq.Line	0	Vial	0	Inj.#	0	Time	0.00	Idle	Ready
Time	Module	Setting	Value										
2.00	VW Detector	Wavelength	220 nm										
4.00	VW Detector	Balance											
*** end of module timetable ***													

Press the F7 key (**Insert**) to add a timetable events. Use the F6 key (**Done**) to view the entered lines of the timetable.

Timetable				Seq.Line	0	Vial	0	Inj.#	0	Time	0.00	Idle	Ready *
<i>Timetable Insert</i>													
Time [min]	Module	Setting											
0.00	VW Detector	Wavelength											
Wavelength 254 nm													
<i>fields change with setting selected</i>													

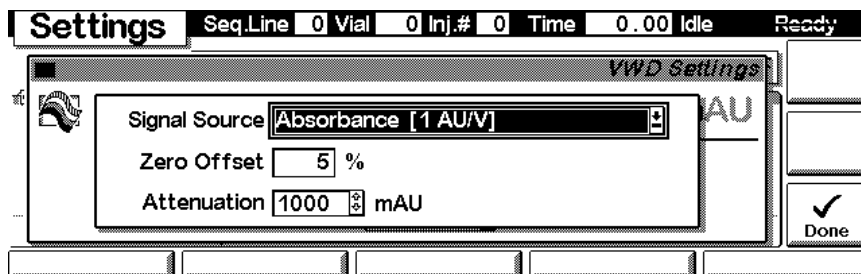
Enter
   
 Done

Use the **m**-key for the context sensitive menu. It gives you additional tools for the timetable.

Timetable				Seq.Line	0	Vial	0	Inj.#	0	Time	0.00	Idle	Ready *
Time	Module	Setting	Value										
2.00	VW Detector	Wavelength											
4.00	VW Detector	Balance											
*** end of module timetable ***													

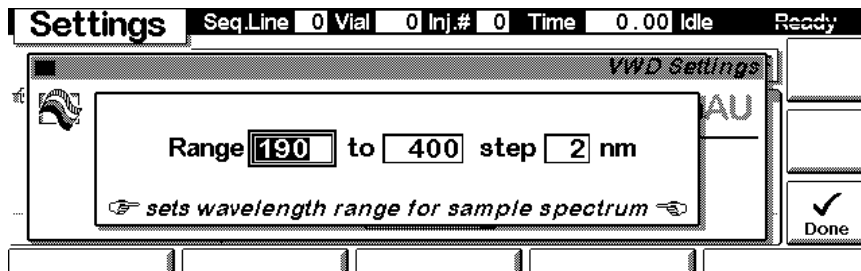
### Settings - Analog

With the F3 key (**Analog**) you can change the settings for the analog outputs.



### Settings - Spectrum Range

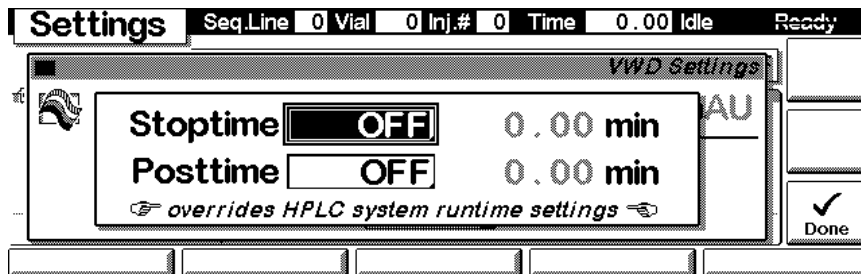
With the F4 key (**Spectrum**) you can change the settings for the spectrum acquisition, see "[Sample, Blank and Holmium Spectrum](#)" on page 237.



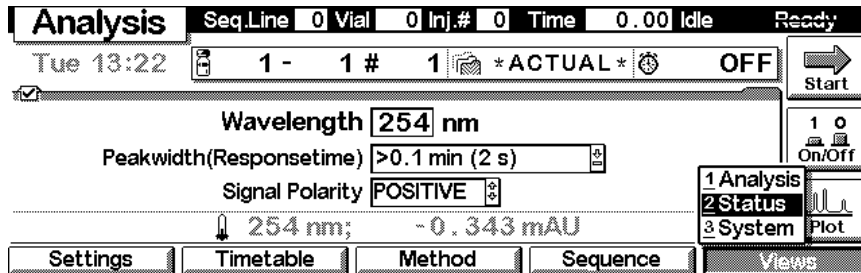


### Settings - Run times

With the F5 key (**Runtimes**) you can change the stop time and the post-run time.

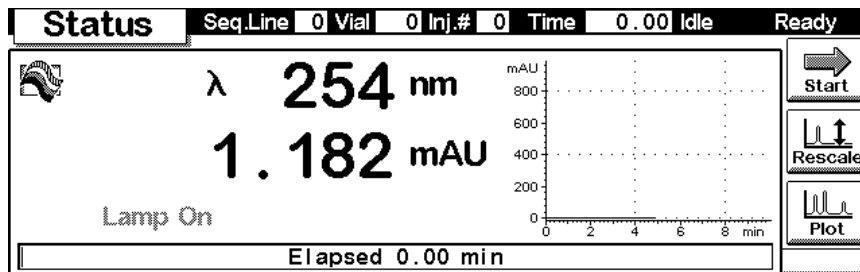


Press F5 key (**Views**) and select **Status**.



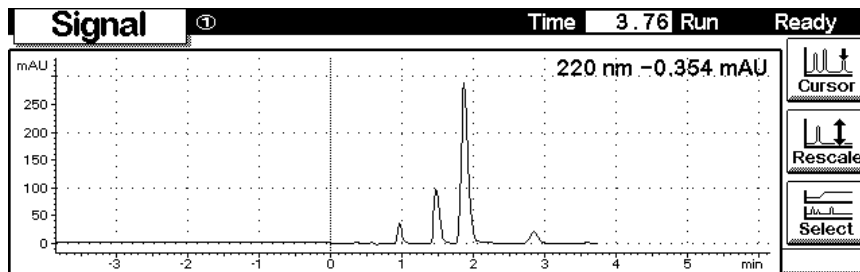
### Status

This is an example if an Agilent 1100 VWD is configured standalone. Information on the actual wavelength setting, absorbance value, elapsed run time, messages and the signal plot are shown. Press key F8 (**Start**) to start a run, key F7 (**Rescale**) to maximize the signal.

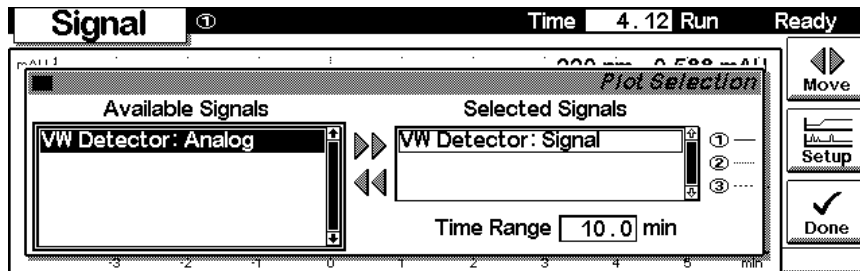


### Signal plot

Press F6 key (**Plot**) to enter the plot screen (available also from the **Analysis** and **System** screen). Here you can observe the online signal(s). To add additional online signals (maximum 3), press F6 key (**Select**). If more than one signal is configured (see next), use the 1-2-3 number key to switch between the signals.

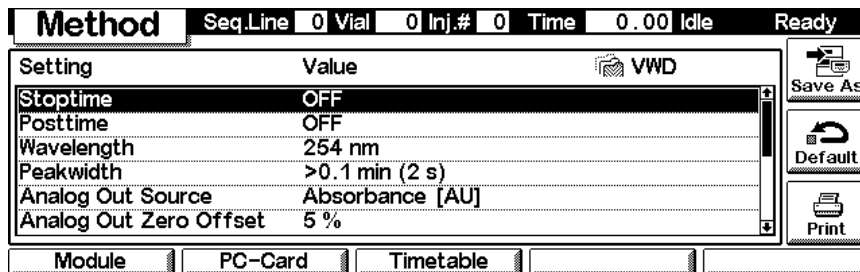


Press F6 key (**Select**). Here you can add additional online signals (maximum are 3), press F6 key (**Select**). Additional signals could be also pressure or temperature signals from other modules. Use the Right/Left arrows to switch between Available and Selected Signals. Use the F8 key (**Move**) to enter available signals into the box for selected signals or vice versa.



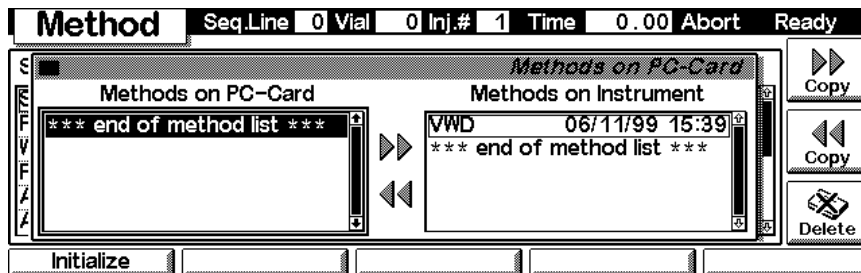
### Method screens

On the **Analysis** screen use the F3 key (**Method**) to view the parameters in a method and F8 key (**Save As**) to save the method in the module(s). The PC-Card key is only active when a PCMCIA card is inserted in the control module.



## 7 Control Module Screens for the Agilent 1100 Variable Wavelength Detector

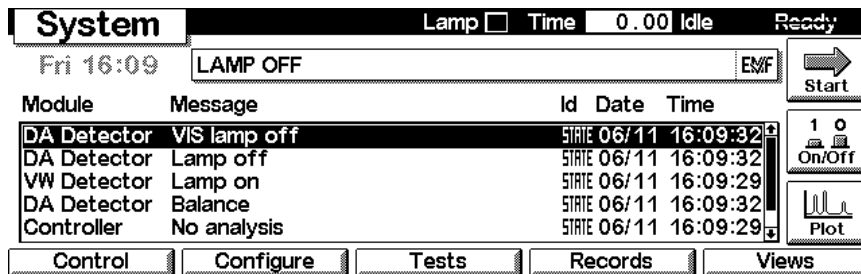
Use F2 key (**PC-Card**) to save a method on a PCMCIA card. Use the Right/Left arrows to switch between PC-Card and Instrument window. Use the UP/Down arrows to select the method. Use the F7/F8 keys (**Copy**) to enter available signals into the box for selected signals or vice versa.



## Screens available from the System screen

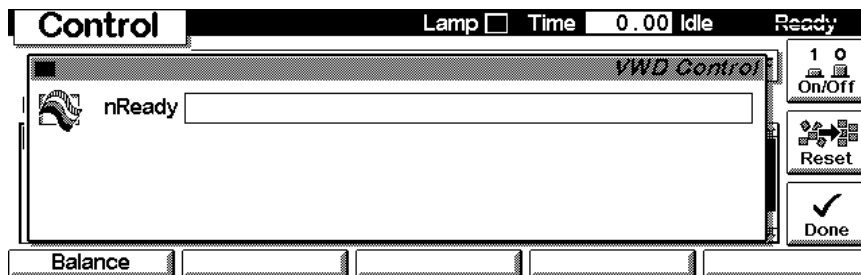
### System screen

Use the Esc key to receive **Views** on the F5 key. Choose **System** from the pull-down menu. This screen shows the last activities in the system.



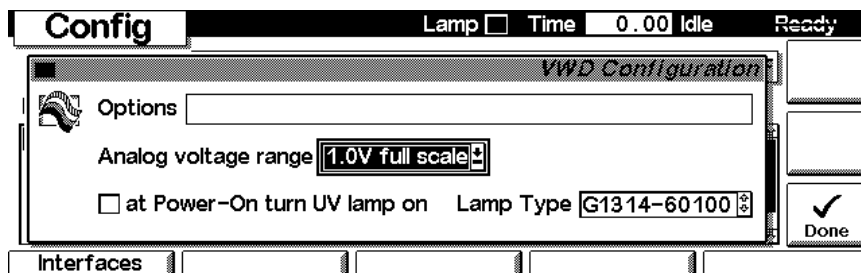
### System - Control

Use the F1 key (**Control**) to select the VW-Detector. Here you receive information about the not-ready conditions if needed. F2 key (**Reset**) does a re-initialization of the VWD.

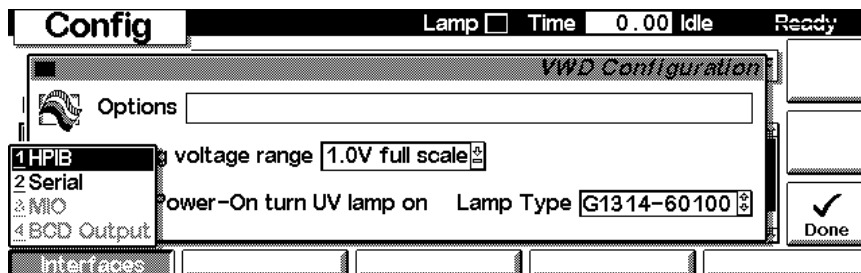


### System - Configuration

On the **System** screen use the F2 key (**Configure**) to select the VWD. Here you define further special setpoints for the VWD operation. Lamp type can be either G1314-60100 (VWD) as the default lamp or 2140-0590 (DAD).



Use the F1 key (**Interfaces**) to access the interface settings (if required).



## Screens available from the Records screen

### Records screen

Use the Esc key to receive **Views** on the F5 key. Choose **System** from the pull-down menu. Use the F4 key (**Records**) to select the VWD. Errors are reported either into the **System Log** (F2) or **Error Log** (F3).

Records						Lamp <input type="checkbox"/>	Time	0.00	Idle	Ready
Module	Product#	Serial#	Version	On-Time	EMF					
Controller	G1323B*	DE53300105	B.01.01	0d 00:32h						
VW Detector	G1314A*	JP73705650	A.03.80	0d 01:11h						
DA Detector	G1315A	DE53500102	A.03.80	0d 00:32h						

Buttons: EMF, System Log, Error Log, Maint Log, FW Update

Icons: Identify, Print

### System / Error Log

Use the F2 key (**System Log**) or F3 key (**Error Log**) to look for errors.

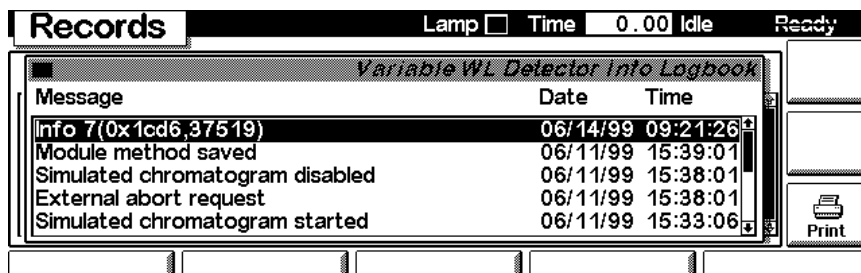
Records						Lamp <input type="checkbox"/>	Time	0.00	Idle	Ready
Variable WL Detector Error Logbook										
Message	Date	Time								
Synchronization lost	06/11/99	14:02:04								
*** end of logbook ***										

Buttons: (Empty)

Icon: Print

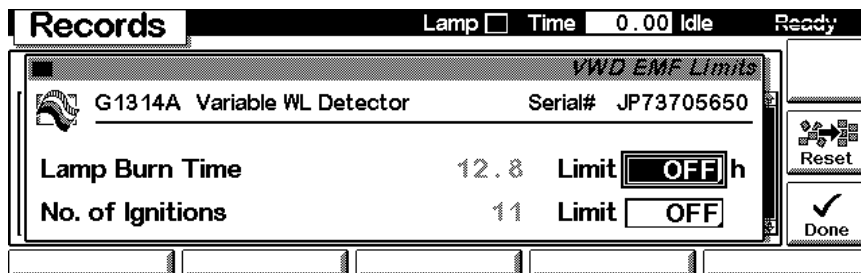
### Info Log

Use the **m**-key to receive a pop-up menu, Select **Info Log**. A list of the last events are listed. For troubleshooting reasons they can be printed or saved to a file on the PCMCIA card (using the **m**-key for the context sensitive menu).



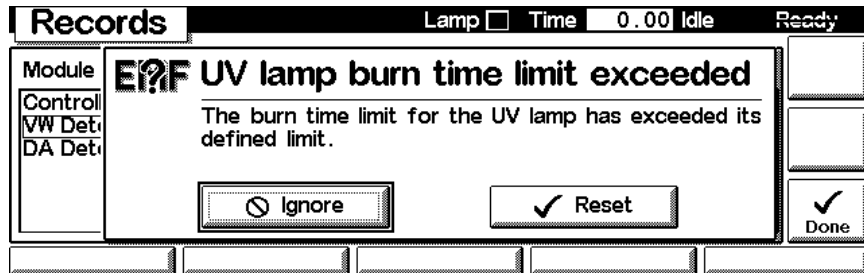
### EMF (Early Maintenance Feedback)

Use the F1 key (**EMF**) to set EMF parameters. Choose menu item 1 (**Setup limits**) to select lamp-on level for the UV lamp at which you want to receive a warning.



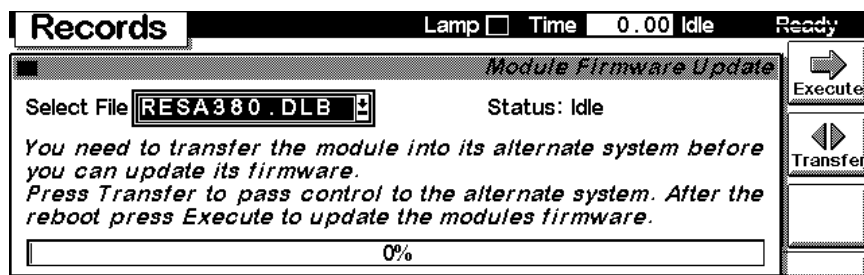


If a set limit has been exceeded, a message box will pop up. This will not stop a sequence or run (information only to plan maintenance activities). If you press **Reset**, the limits will be removed. **Ignore** will continue to keep the EMF flag set.



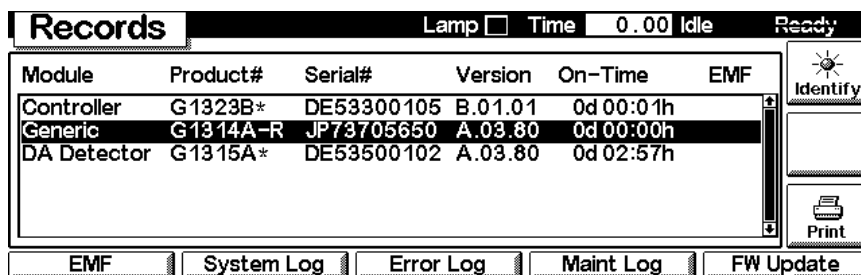
### Firmware Update

Use the Esc key to receive **Views** on the F5 key. Choose **System** from the pull-down menu. Use the F3 key (**Records**) to select the VWD. Use the F5 key (**FW Update**) to enter the Update section. If you want to update the resident firmware (together with specific main firmware revisions), select the a file from the PCMCIA card (RESnnnn.DLB) and press execute. If you want to update the main firmware, press F7 key (**Transfer**) to turn the module into the resident mode (LED on module should blink yellow).



## 7 Control Module Screens for the Agilent 1100 Variable Wavelength Detector

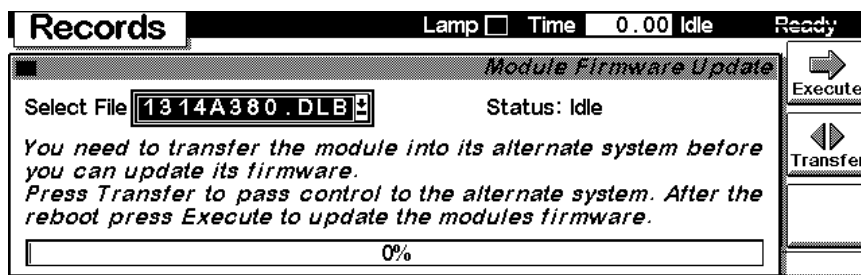
Use the **Esc** key to receive **Views** on the F5 key. Choose **System** from the pull-down menu. Use the F3 key (**Records**) to select the **Generic** module. In this screen the resident firmware revision is shown.



The 'Records' screen displays a table of module information. The status bar at the top shows 'Lamp' (unchecked), 'Time' 0.00, 'Idle', and 'Ready'. The table has columns for Module, Product#, Serial#, Version, On-Time, and EMF. The 'Generic' module is highlighted. To the right are 'Identify' and 'Print' buttons. At the bottom are buttons for 'EMF', 'System Log', 'Error Log', 'Maint Log', and 'FW Update'.

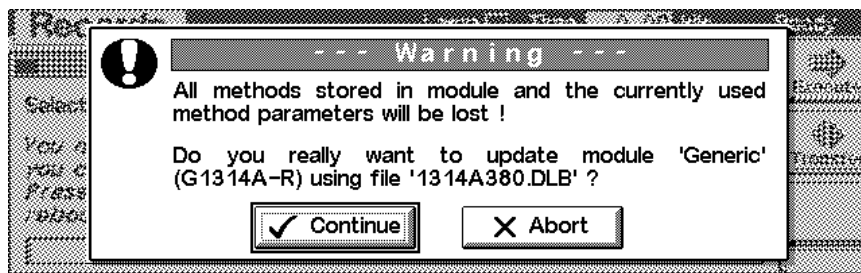
Module	Product#	Serial#	Version	On-Time	EMF
Controller	G1323B*	DE53300105	B.01.01	0d 00:01h	
Generic	G1314A-R	JP73705650	A.03.80	0d 00:00h	
DA Detector	G1315A*	DE53500102	A.03.80	0d 02:57h	

Use the F5 key (**FW Update**) to enter the Update section. Select the a file from the PCMCIA card (1314nnnn.DLB) and press execute. When the update has finished, press F7 key (**Transfer**) to return the module into the normal mode (LED on module should stay yellow).



The 'Module Firmware Update' screen shows 'Select File' with '1314A380.DLB' entered. The status is 'Idle'. A progress bar at the bottom shows '0%'. Instructions on the screen advise transferring the module to an alternate system before updating. Navigation buttons 'Execute' and 'Transfer' are on the right.

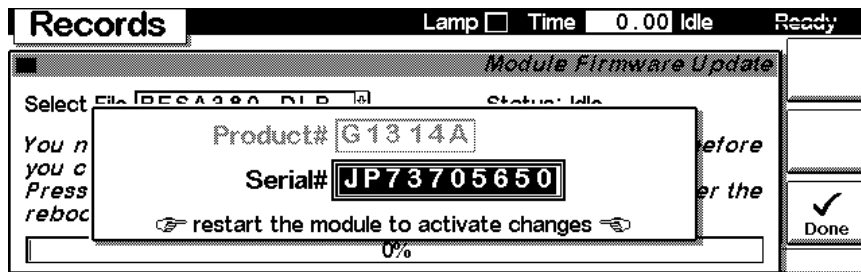
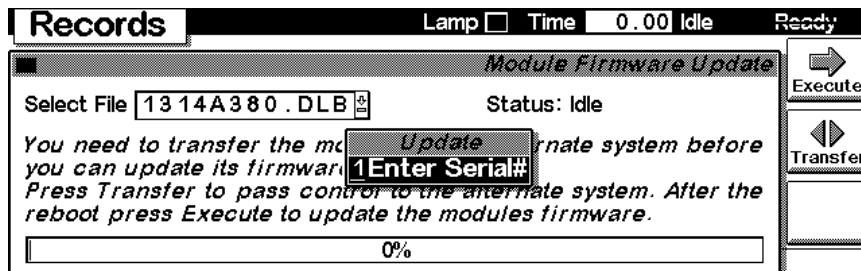
If you have not saved your methods, please do it before continuing. Otherwise they will be overwritten during the update process.



A warning dialog box with a title bar '--- Warning ---'. It contains a warning icon and text: 'All methods stored in module and the currently used method parameters will be lost ! Do you really want to update module 'Generic' (G1314A-R) using file '1314A380.DLB' ?'. There are 'Continue' and 'Abort' buttons at the bottom.

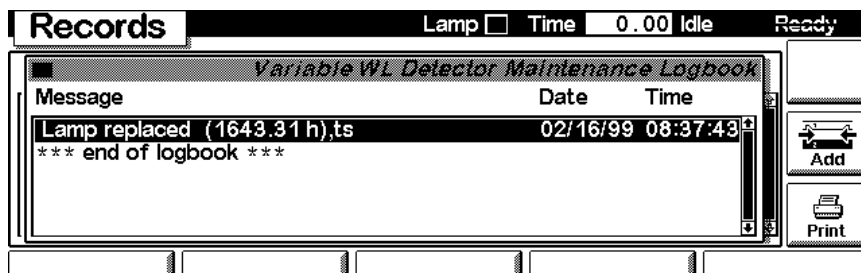
### Changing the serial number

In case the serial number of the module has to be added, use the **m**-key to open the menu **Enter Serial#**. The serial number becomes active after restart of the module.



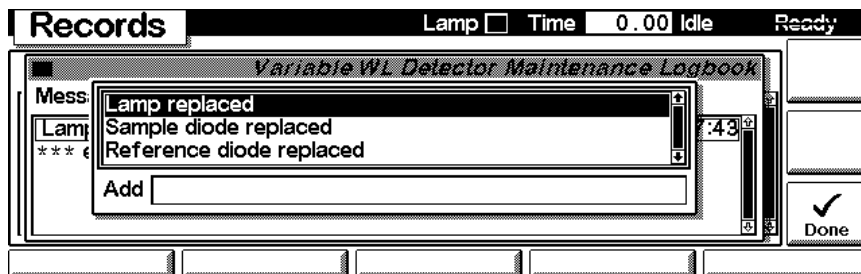
### Maintenance activities

On the Records screen use the F4 key (**Maint log**) to view and edit the maintenance logbook.



## 7 Control Module Screens for the Agilent 1100 Variable Wavelength Detector

Use the F7 key (**Add**) to add new maintenance activities. If an activity is not listed, you can type the activity into the line “Add” using the control modules key pad.

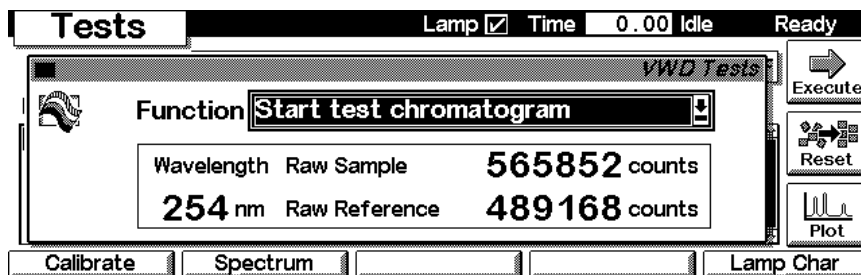


## Diagnostics and Tests

### Tests screen

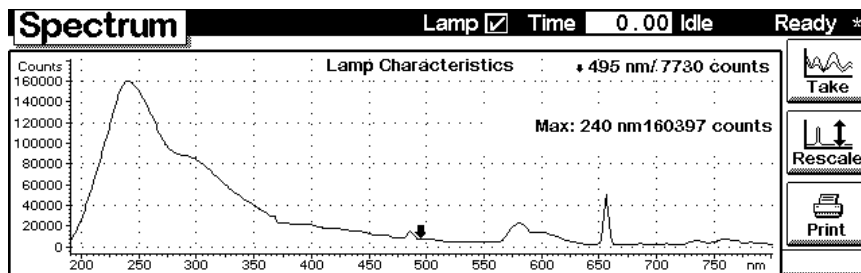
Use the Esc key to receive **Views** on the F5 key. Choose **System** from the pull-down menu. Use the F3 key (**Tests**) to select the VWD. Several tests are available to test the Agilent 1100 VWD. Additional test are listed in the function box. Refer to “**Test Functions**” on page 62 for more information on the tests.

This screen shows in addition to functions the actual readings of the sample and reference diodes that are useful to diagnose the flow cell condition.



### Intensity Test

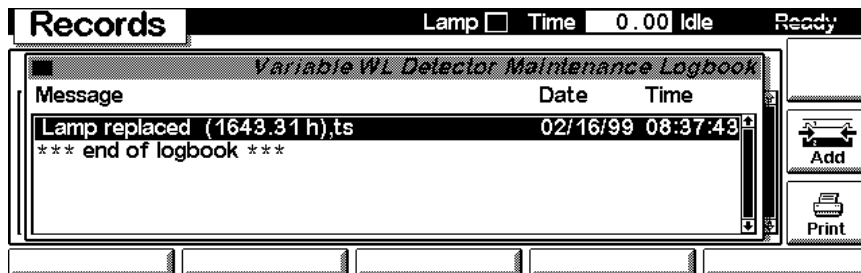
Use the F5 key (**Intensity**) to get the instrument profile (lamp on). Use the Left/Right arrow to move the cursor within the spectrum to find the wavelength of interest.



## 7 Control Module Screens for the Agilent 1100 Variable Wavelength Detector

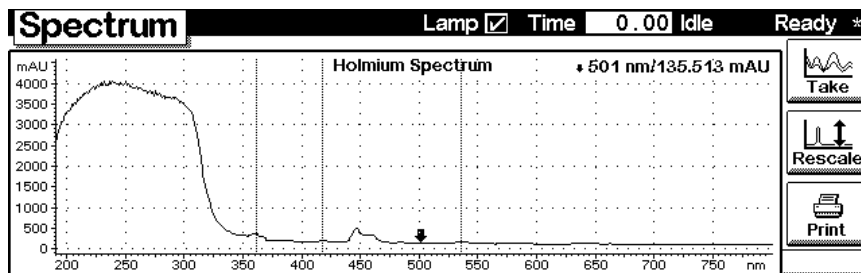
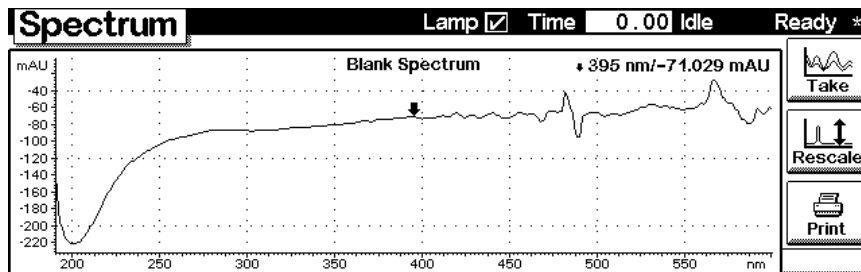
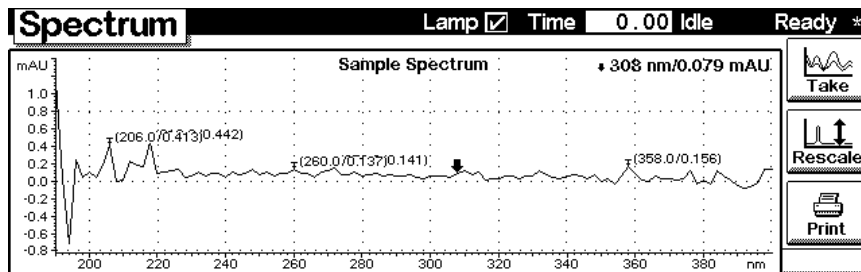
### Wavelength Calibration

Use the F1 key (**Calibrate**) and then F8 key (**Execute**) to start the VWD wavelength calibration (with water in the flow cell). If a deviation is found, press **Adjust**.



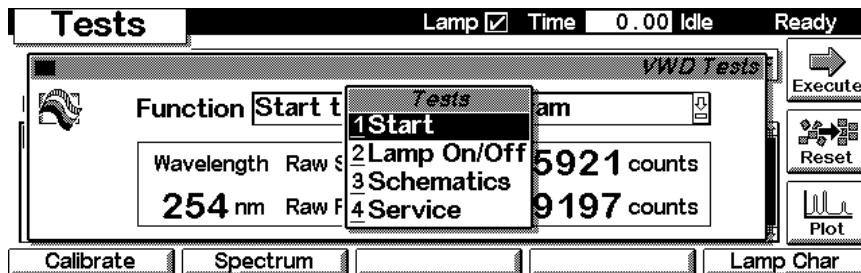
### Sample, Blank and Holmium Spectrum

Use the F2 key (**Spectrum**) to take a spectrum (sample, blank or holmium). Use the Left/Right arrow to move the cursor within the spectrum to find the wavelength of interest. To change the range refer to "Settings - Spectrum Range" on page 222.

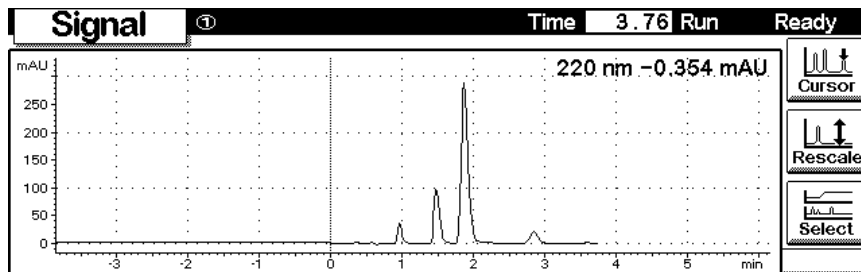


### Built-in Test Chromatogram (Simulation)

To start the built-in test chromatogram, use the F8 key (**Execute**) to enable the simulation. Then press the **m**-key to open the pop-up menu. Select **Start** to start a run (all modules in the Agilent 1100 system must be in ready state).



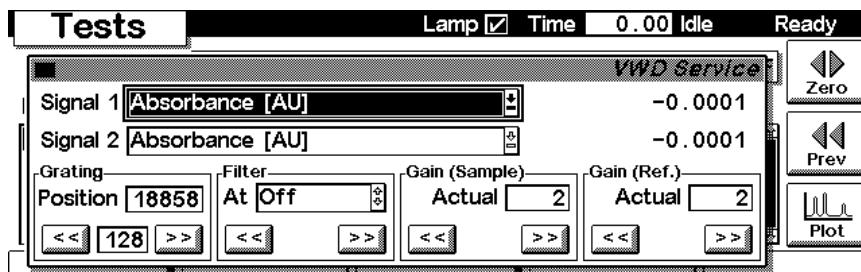
Use the F6 key (**Plot**) to view the signal. A simulated chromatogram (4 peaks) will repeat until the run is stopped. The signal is also available on the analog output. A change of the peakwidth will change the retention times.



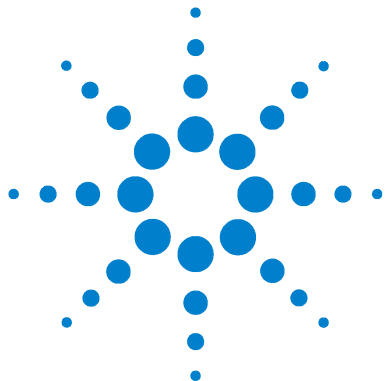


## Service Functions

On the System screen use the F3 key (**Tests**) to select the VWD. Use the **m**-key for the context sensitive menu and select **Service**. The service screen allows certain checks for diagnosing the VWD described in “Service Dialog” on page 78.



## **7 Control Module Screens for the Agilent 1100 Variable Wavelength Detector**



## 8 Specifications

Performance Specifications [242](#)



## Performance Specifications

**Table 62** Performance Specifications Agilent 1100 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)	$\pm 0.75 \times 10^{-5}$ AU at 254 nm	See NOTE on <a href="#">page 243</a> .
Drift	$3 \times 10^{-4}$ AU/hr at 254 nm	See NOTE on <a href="#">page 243</a>
Linearity	> 2 AU (5%) upper limit	See NOTE on <a href="#">page 243</a>
Wavelength accuracy	$\pm 1$ nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Band width	6.5 nm typical	
Flow cells	Standard: 14- $\mu$ l volume, 10-mm cell path length and 40 bar (588 psi) pressure maximum High pressure: 14- $\mu$ l volume, 10-mm cell path length and 400 bar (5880 psi) pressure maximum Micro: 1- $\mu$ l volume, 5-mm cell path length and 40 bar (588 psi) pressure maximum Semimicro: 5- $\mu$ l 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 62** Performance Specifications Agilent 1100 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	
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.	

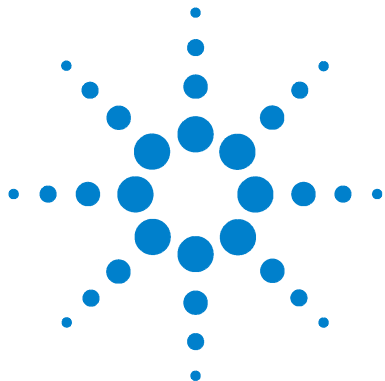
**NOTE**

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.





## A Safety Information

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# 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.

### 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 fuseholders must be avoided.

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

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided 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 63 shows safety symbols used on the instrument and in the manuals.

**Table 63** 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.
	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 opening the metal lamp door on the side of the instrument.

### **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**

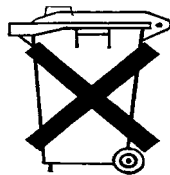
Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Lever det brugte batteri tilbage til leverandoren.

**WARNING**

Lithiumbatteri - Eksplosionsfare. Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandoren.

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

## Sound Emission

### Manufacturer's Declaration

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

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

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

## UV-Radiation

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 64** UV-Radiation Limits

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

Typically the radiation values are much smaller than these limits:

**Table 65** UV-Radiation Typical Values

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

## Solvent Information

Observe the following recommendations on the use of solvents.

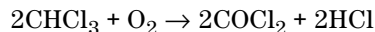
### Flow Cell

Avoid the use of alkaline solutions (pH > 11) which can attack quartz and thus impair the optical properties of the flow cell.

### Solvents

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:



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

We herewith inform you that the

*holmium oxide glass filter (type Hoya HY-1)*

meets the following specification of absorbance maxima positions:

360.8 nm – 418.5 nm – 536.4 nm (spectral bandwidth: 1 nm).

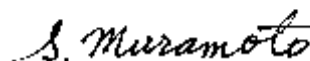
Agilent Technologies guarantees the traceability of the specified absorbance maxima to a National Institute of Standards & Technology (NIST) holmium oxide solution standard with a lot-to-lot tolerance of  $\pm 0.3$  nm.

The wavelength calibration filter built into the Agilent Technologies UV-visible detectors

**Table 66**

		<b>Wavelength Accuracy</b>	
Product number	79853C	HP 1050 Series	$\pm 2$ nm
	G1314A	Agilent 1100 Series	$\pm 1$ nm

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.



November 1, 1995

DateQuality Manager



## Agilent Technologies on Internet

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

<http://www.agilent.com>

Select “Products” - “Chemical Analysis”

It will provide also the latest firmware of the Agilent 1100 series modules for download.

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## **In This Book**

This manual contains technical reference information about the Agilent 1100 Series variable wavelength detector. The manual describes the following:

- installing the detector,
- the detector optimization,
- diagnostics and troubleshooting,
- repairing the detector,
- parts and materials, and
- theory of operation and introduction to the detector
- screens of local control module.

