

HP 1100 Series  
Vacuum  
Degasser

## Reference Guide

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## WARNING

For details of safety, see Safety Information on page 90.

### Warning Symbols Used In This Book



The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect the apparatus against damage.

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Reference Guide

This manual contains technical reference information about the HP 1100 Series vacuum degasser. The manual describes the following:

- installation,
- optimizing performance,
- troubleshooting,
- repairing,
- parts and materials,
- theory of operation, and
- specifications.

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## **Installing the Vacuum Degasser**

How to install the vacuum degasser

## Site Requirements

A suitable environment is important to ensure optimum performance of the vacuum degasser.

### Power Considerations

The vacuum degasser power supply has wide-ranging capability (see Table 1). It accepts any line voltage in the above mentioned range. Consequently there is no voltage selector in the rear of the vacuum degasser. There are two externally accessible fuses, that protect the power supply.

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**WARNING**

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**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 vacuum degasser. The female end of each of the power cords is identical. It plugs into the power-input socket at the rear of the vacuum degasser. The male end of each of the power cords is different and designed to match the wall socket of a particular country or region.

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**WARNING**

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

### Bench Space

The vacuum degasser dimensions and weight (see Table 1) allow to place the vacuum degasser on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space at either side and approximately 8 cm (3.1 inches) at the rear for the circulation of air and electric connections.

If the bench should carry a complete HP 1100 Series system, make sure that the bench is designed to carry the weight of all the modules.

## Environment

Your vacuum degasser will work within specifications at ambient temperatures and relative humidity as described in Table 1.

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### CAUTION

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

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**Table 1**
**Physical Specifications**


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Type	Specification	Comments
Weight	7 kg (15.4 lbs)	
Dimensions (width × depth × height)	345 × 435 × 80 mm (13.5 × 17 × 3.1 inches)	
Line Voltage	100 – 120 or 220 – 240 VAC, $\pm$ 10 %	Wide-ranging capability
Line Frequency	50 or 60 Hz, $\pm$ 5 %	
Power consumption	30 W	Maximum
Ambient Operating Temperature	0 – 55 °C (32 – 131 °F)	see CAUTION on page 11
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	Installation Category II, Pollution Degree 2	

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## Unpacking the Vacuum Degasser

### Damaged Packaging

Upon receipt of your vacuum degasser, inspect the shipping containers for any signs of damage. If the containers or cushioning material are damaged, save them until the contents have been checked for completeness and the vacuum degasser has been mechanically and electrically checked. If the shipping container or cushioning material is damaged, notify the carrier and save the shipping material for the carriers inspection.

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**CAUTION**

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If there are signs of damage, please do not attempt to install the vacuum degasser.

### Delivery Checklist

Ensure all parts and materials have been delivered with the vacuum degasser. The delivery checklist is shown below. To aid in parts identification, please see Chapter 5 “Parts and Materials”. Please report missing or damaged parts to your local Hewlett-Packard Sales and Service Office.

Table 2

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**Vacuum Degasser Checklist**

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Description	Quantity
Vacuum Degasser	1
Power Cable	1
Remote Cable	1
Auxiliary Cable	As ordered
Reference Manual	1
Accessory Kit (Table 3)	1

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### Accessory Kit Contents

Table 3

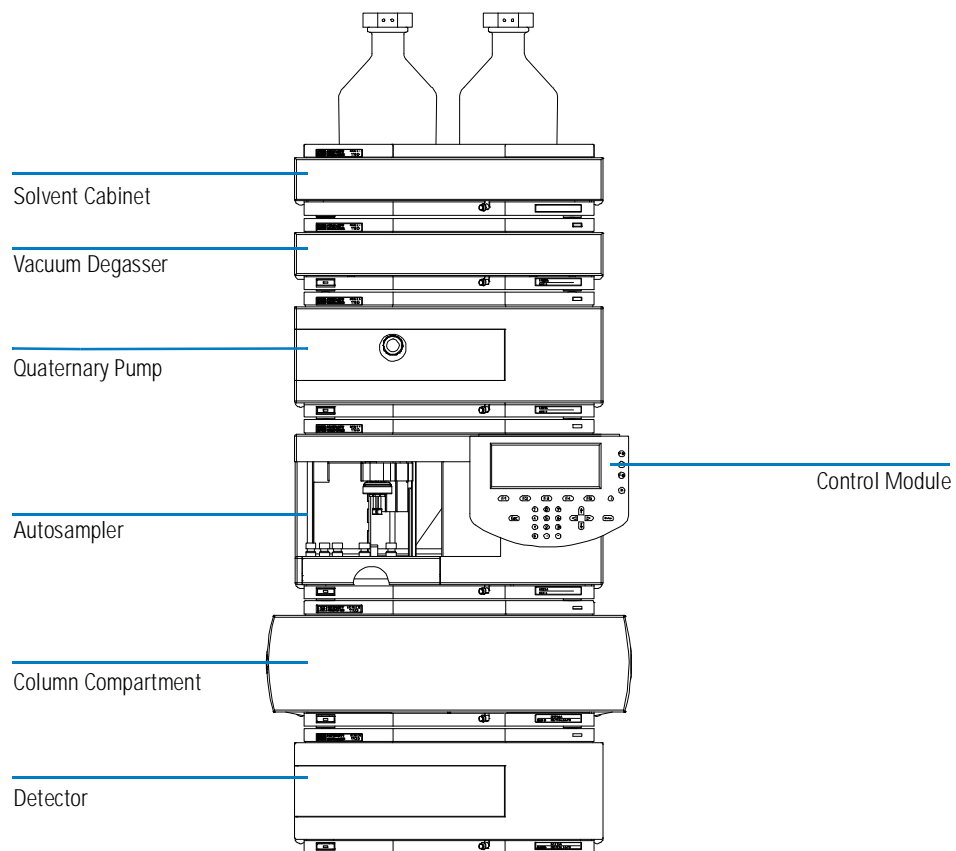
Accessory Kit Contents G1322-68705

Description	Quantity
Syringe	1
Syringe Adapter	1
Waste Tube	1
Connecting Tubes labeled A to D	4

## Optimizing the Stack Configuration

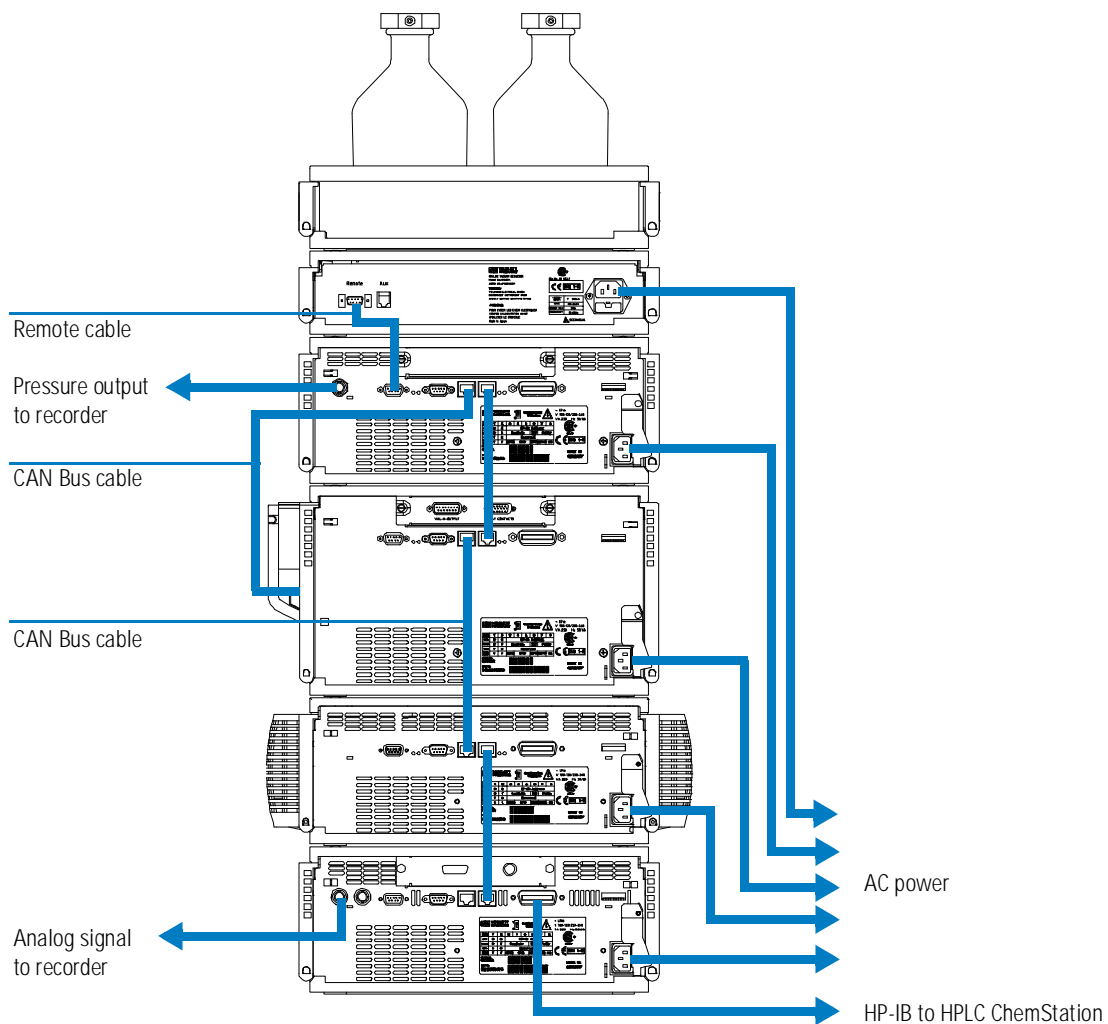
If your vacuum degasser is part of a system, you can ensure optimum performance by limiting the configuration of the system stack to the following configuration. These configuration optimizes the system flow path, ensuring minimum delay volume (from point of solvent mixing to head of column) and dead volume (from point of injection to detector outlet).

Figure 1 Recommended Stack Configuration (Front View)



Installing the Vacuum Degasser  
Optimizing the Stack Configuration

Figure 2 Recommended Stack Configuration (Rear View)



## Installing the Vacuum Degasser

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<b>Parts required</b>	Vacuum degasser Power cable Interface cable as ordered, see “Cable Overview” on page 74
<b>Preparation</b>	Locate bench space Provide power connections Unpack the vacuum degasser module

---

- 1** Place the vacuum degasser on the bench.
- 2** Ensure the power switch on the front of the vacuum degasser is OFF (switch stands out).
- 3** Connect the power cable to the power connector at the rear of the vacuum degasser.
- 4** Connect the ordered interface cable to the vacuum degasser.

---

### NOTE

In an HP 1100 Series system, the individual modules are connected through a CAN cable. Only exception is the HP 1100 Series vacuum degasser. The vacuum degasser can be connected via the APG remote connector to the other modules of the stack. The AUX output allows to monitor the vacuum pressure in the degasser chambers. The HP 1100 Series control module can be connected to the CAN bus at any of the modules in the system. The HP ChemStation can be connected to the system through one HP-IB cable at any of the modules, preferable at the detector. For more information about connecting the control module or HP ChemStation refer to the respective user manual.

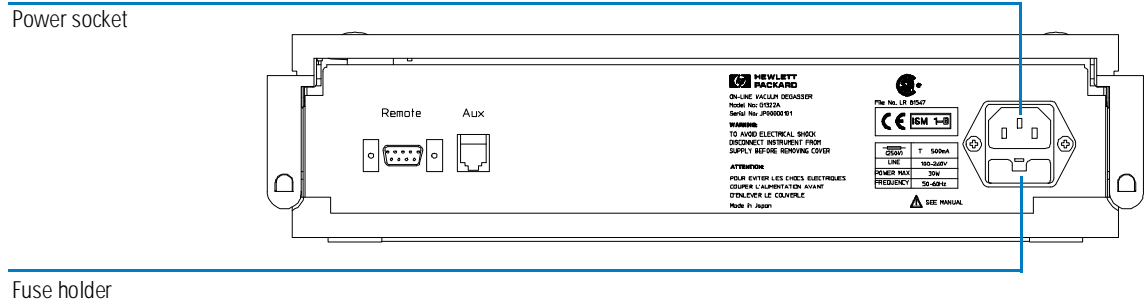
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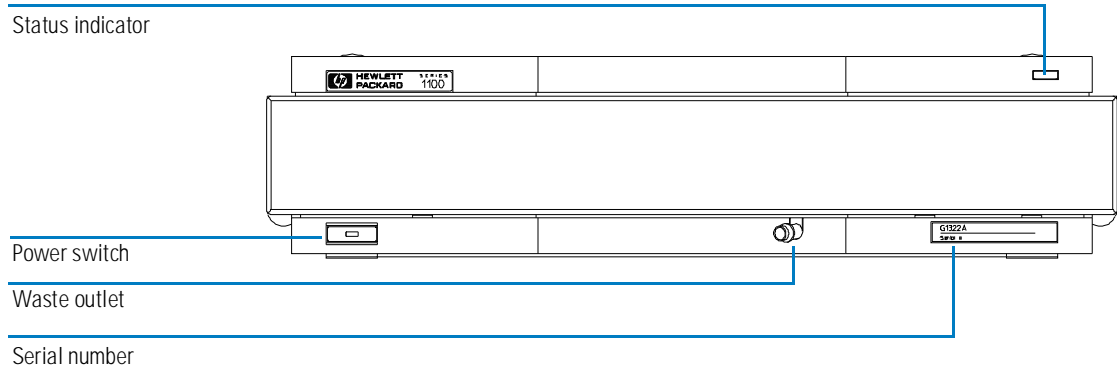
## Installing the Vacuum Degasser

### Installing the Vacuum Degasser

**Figure 3** Rear of the Vacuum Degasser



**Figure 4** Front of the Vacuum Degasser



- 5 Press in the power switch to turn on the vacuum degasser.

#### NOTE

The power switch stays pressed in and a green indicator lamp in the power switch is on when the vacuum degasser is turned on. When the line power switch stands out and the green light is off, the vacuum degasser is turned off.

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## Flow Connections to the Vacuum Degasser

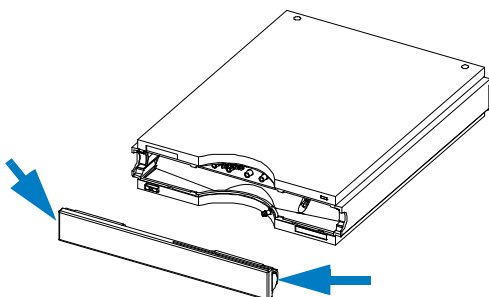
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<b>Parts required</b>	Solvent cabinet including solvent bottles (filled with solvent) and bottle head assemblies Vacuum degasser Solvent outlet tubes Syringe with adapter
<b>Preparation</b>	Install the vacuum degasser

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- 1 Place solvent cabinet with the bottle on top of the vacuum degasser.
- 2 Remove the front cover by pressing the snap fasteners on both sides.

**Figure 5** Removing the Front Cover



- 3 If the vacuum degasser is not used with an HP 1100 Series pump, connect the waste tube from the accessory kit to the waste outlet and place into your waste system.
- 4 Put the bottle head assemblies into solvent reservoirs containing your mobile phase.
- 5 Connect the solvent tubes from the bottle head assemblies to the inlet connectors A to D (typically the left connection of the channel) of the vacuum degasser. Fix the tubes in the clips of the vacuum degasser.
- 6 Connect the outlet tubes to the output ports (typically right connection of the channel) of the vacuum degasser.

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**NOTE**

Atmospheric gases can diffuse through the tubing and dissolve in the mobile phase solvents. For best chromatographic results, keep the length of tubing between the vacuum degasser and your pump as short as possible.

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- 7 Connect syringe adapter to solvent tube of first solvent channel.

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**WARNING**

**When opening capillary or tube fittings solvents may leak out. Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.**

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- 8 Pull syringe plunger to draw solvent through vacuum degasser and tubing. Continue to draw solvent through tubing until no gas bubbles are visible.
- 9 Disconnect syringe adapter from solvent tube.
- 10 Connect the open end of the outlet tubing to the inlet of your pump module.
- 11 Repeat step 5 through step 8 for the remaining three channels.
- 12 Switch on your pump with your normal operation flow rate. Wait for at least 10 minutes before starting your analysis.

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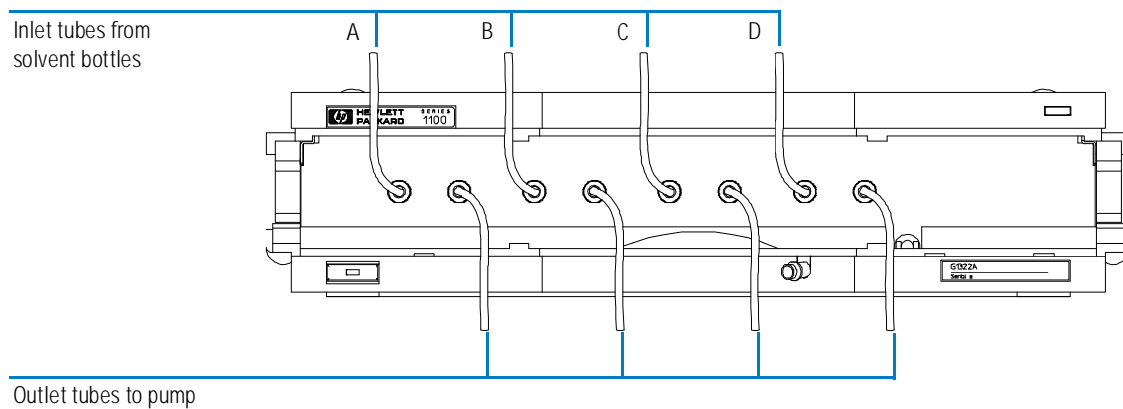
**NOTE**

When priming the vacuum degasser with a syringe the solvent is very fast drawn through the degasser tubes. The solvent at the degasser outlet is therefore not fully degassed. Pump for at least 10 minutes with your selected flow rate before starting any application. For highest degassing efficiency it is necessary to flush the degasser with approximately 30 ml before starting any application. This will allow the vacuum degasser to properly degas the solvent in the degasser tubes. The solvent reaching the pump inlet will be sufficiently degassed after that time frame, see “Operational Hints for the Vacuum Degasser” on page 27.

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Installing the Vacuum Degasser  
**Flow Connections to the Vacuum Degasser**

**Figure 6** Flow Connections of the Vacuum Degasser



## Transporting the Vacuum Degasser

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**WARNING**

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**Drain any remaining solvents from the degassing channels before transporting the vacuum degasser.**

- 1 Disconnect the solvent tubes from solvent inlets from front panel.
- 2 Disconnect solvent tubes from your pump.
- 3 Connect syringe adapter to solvent tube of first solvent channel.
- 4 Push syringe adapter onto syringe.
- 5 Pull syringe plunger to draw solvent out of vacuum degasser and tubing.  
Continue to draw solvent into syringe until there is no solvent in the tubing.
- 6 Repeat step 3 through step 5 for other solvent channels.

Installing the Vacuum Degasser  
**Transporting the Vacuum Degasser**

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## **Optimizing the Vacuum Degasser Performance**

How to optimize the vacuum degasser to achieve  
best chromatographic results

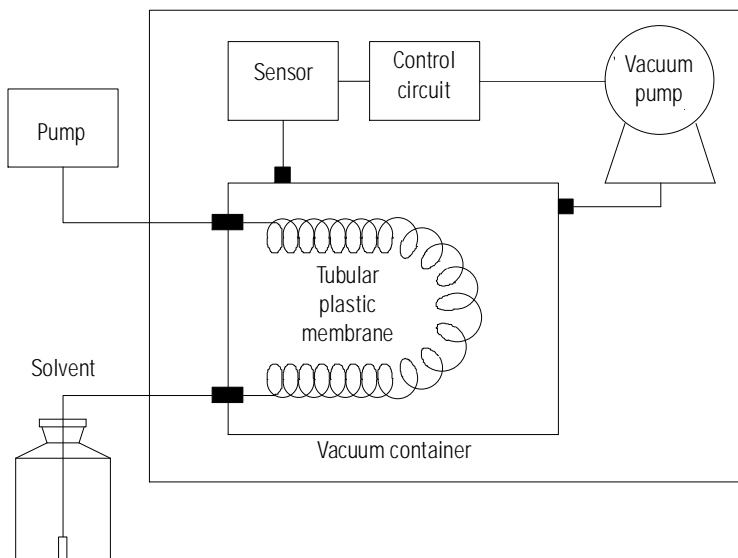
## Introduction to the Vacuum Degasser

The vacuum degasser comprises a 4-channel vacuum container, including a tubular plastic membrane, and a vacuum pump. When the vacuum degasser is switched on the control circuit turns on the vacuum pump which generates a slight vacuum in the four chambers of the vacuum container. The vacuum is measured by a pressure sensor. The vacuum degasser maintains the vacuum by turning on and off the vacuum pump depending on the signal from the pressure sensor.

The HPLC pump draws the solvent from its reservoir through the special tubular plastic membrane of the vacuum container. As the solvent passes through the vacuum tubes any dissolved gas in the solvent permeates through the membrane into the vacuum. The solvent will be almost completely degassed and free of dissolved gas when leaving the outlet of the vacuum degasser.

Figure 7

### Principle of Operation



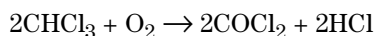


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## Solvent Information

Always filter solvents through 0.4 µm filters, 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 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 may attack steel.
- Mixtures of carbon tetrachloride with 2-propanol or THF dissolve stainless steel.

## **When to use a Vacuum Degasser?**

Pumps that mix the solvent on the low pressure side like the HP 1100 Series quaternary pump do need degassing and must be equipped with a vacuum degasser or alternative degassing systems (for example, helium). Isocratic pumps and high-pressure mixing pumps do not always require degassing. But for the following conditions the vacuum degasser is also recommended for a isocratic or a high pressure mixing pump:

- if your detector is used with maximum sensitivity in the low UV wavelength range,
- if your application requires highest injection precision, or
- if your application requires highest retention time reproducibility (mandatory at flow rates below 0.5 ml/min).

## **When to use Continues Mode**

For highest performance the degasser has an continues mode. This can be selected by connecting pin 1 and 3 of the auxiliary cable to each other, see “Cable Overview” on page 74.

In continues mode the vacuum pump runs continuously thus generating the highest degassing efficiency of the degasser. This mode is only recommended for very sensitive applications (e.g. RI detection).

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**NOTE**

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When set to continues mode the life time of the vacuum pump will be reduced.

## **Operational Hints for the Vacuum Degasser**

If you are using the vacuum degasser for the first time, if the vacuum degasser was switched off for any length of time (for example, overnight), or if the vacuum degasser lines are empty, you should prime the vacuum degasser before running an analysis.

The vacuum degasser can be primed either by drawing solvent through the degasser with a syringe or by pumping with the connected pump.

Priming the vacuum degasser with a syringe is recommended, when:

- vacuum degasser is used for the first time, or vacuum tubes are empty, or
- changing to solvents that are immiscible with the solvent currently in the vacuum tubes.

Priming the vacuum degasser by using the pump at high flow rate (3–5 ml/min) is recommended, when:

- pumping system was turned off for a length of time (for example, during night) and volatile solvent mixtures are used, or
- solvents have been changed.

## Priming the Vacuum Degasser with a Syringe

- 1 Disconnect solvent outlet tube of that channel from your pump.
- 2 Connect syringe adapter to solvent outlet tube.
- 3 Push syringe adapter onto syringe.
- 4 Pull syringe plunger to draw solvent through degasser and tubing. Continue to draw solvent through tubing until no gas bubbles are visible.
- 5 Disconnect syringe adapter from solvent tube.
- 6 Connect solvent tube to your pump.
- 7 Repeat step 1 through step 6 for other solvent channels.
- 8 Switch on your pump with your normal operation flow rate. Wait for at least 10 minutes before starting your analysis.

---

### NOTE

When priming the vacuum degasser with a syringe the solvent is very fast drawn through the degasser tubes. The solvent at the degasser outlet is therefore not fully degassed. Pump for approximately 10 minutes with your selected flow rate before starting any application. This will allow the vacuum degasser to properly degas the solvent in the degasser tubes. The solvent reaching the pump inlet will be sufficiently degassed after that time frame.

---

## Changing Solvents

If you are changing to a solvent that is immiscible with the solvent currently in the tubing:

- 1 Replace the current solvent with iso-propanol, if current solvent is organic or with water, if current solvent is an inorganic buffer or contains salt.
- 2 Flush the vacuum degasser and all tubing thoroughly with at least 30 ml of solvent.
- 3 Replace the iso-propanol or water with the new solvent. Draw at least 30 ml of solvent through each solvent channel. Make sure that no more gas bubbles are visible.

---

### NOTE

When priming the vacuum degasser with a syringe the solvent is very fast drawn through the degasser tubes. The solvent at the degasser outlet is therefore not fully degassed. Pump for approximately 10 minutes with your selected flow rate before starting any application. This will allow the vacuum

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degasser to properly degas the solvent in the degasser tubes. The solvent reaching the pump inlet will be sufficiently degassed after that time frame.

---

### **Priming the Vacuum Degasser with a Pumping System**

When the pumping system was turned off for a certain time (for example, during night) oxygen will rediffuse into the solvent lines between the vacuum degasser and the pump. Solvents containing volatile ingredients will slightly lose these, if left in the degasser without flow for a prolonged period of time. Therefore priming of the vacuum degasser and the pumping system is required before starting the application.

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

## Prevent Blocking of Solvent Filters

Contaminated solvents or algae growth in the solvent bottle will reduce the lifetime of the solvent filter and will influence the performance of the pump. This is especially true for aqueous solvents or phosphate buffers (pH 4 to 7). The following suggestions will prolong lifetime of the solvent filter and will maintain the performance of the pump.

- Use sterile solvent bottles to slow down algae growth.
- Filter solvents through filters or membranes that remove algae.
- Exchange solvents every two days or refilter.
- If the application permits add 0.0001–0.001 M sodium azide to the solvent.
- Place a layer of argon on top of your solvent.
- Avoid exposure of the solvent bottles to direct sunlight.

## Checking the Solvent Filters

The solvent filters are located on the low-pressure side of the pumping system. Therefore the system pressure measured in the pump cannot be used to check whether the filter is blocked or not.

Assuming that the solvent cabinet is placed on top of the vacuum degasser the filter condition can be checked in the following way.

Loosen the solvent inlet tube from the bottle-head assembly at the inlet port of the vacuum degasser. If the filter is in good condition the solvent will freely drip out of the solvent tube (approximately 30 cm hydrostatic pressure). If the solvent filter is partly blocked no solvent or only very little solvent will drip out of the solvent tube.

## Cleaning the Solvent Filters

- Remove the blocked solvent filter from the bottle-head assembly.
- Place the blocked solvent filter in a beaker with concentrated nitric acid for one hour.
- Thoroughly flush the filter with bidistilled water.
- Replace the filter.

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**NOTE**

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Never use the system without solvent filter installed.

Optimizing the Vacuum Degasser Performance  
**Prevent Blocking of Solvent Filters**



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## Troubleshooting

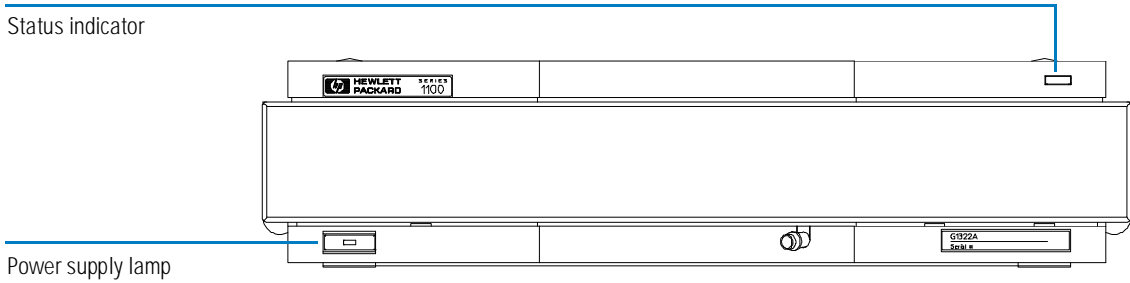
Error messages, their probable cause, and the action required to correct them—and, other chromatographic and hardware indicators of problems

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## Status Indicator

Two status lamps are located on the front of the vacuum degasser. The first lamp indicates the power supply status, the second lamp indicates the vacuum degasser status.

**Figure 8**      **Location of Status Lamps**



## Power Supply Lamp

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

---

## Instrument Status Indicator

The instrument status indicator indicates one of four possible instrument conditions.

- When the lamp is OFF, the vacuum degasser is in *ready* condition (only if the power supply lamp is ON, otherwise, the instrument is switched off, or there is a defect in the power supply). A ready condition exists when there is sufficient vacuum in the vacuum degasser.
- A *busy* condition is indicated when the lamp is yellow. A busy condition exists when the vacuum pump of the vacuum degasser is working to generate or maintaining vacuum in the chambers. This is the case when the vacuum degasser is turned on for the first time or the vacuum drops under its limit during normal operation.
- An *error* condition is indicated when the lamp is red. An error condition exists when the vacuum degasser detects an internal defect that does not allow the vacuum to be build up in a certain time frame (approximately 8 minutes).

---

### CAUTION

If the error LED is on, there is either an internal leak in the vacuum system or a electronic failure. If the remote cable is connected between pump and vacuum degasser, the error of the vacuum degasser will shut down the pump system. In case of an internal leak it is possible that solvent may be able to enter the vacuum chamber and solvent may leak into the waste drain. To prevent any damage of the vacuum degasser, switch off the vacuum degasser and remove the solvent bottles from the solvent cabinet to stop any gravity-caused flow of solvent into the vacuum chamber.

---

## Hardware Symptoms

In case of a problem with the vacuum system or the electronic control the vacuum degasser status lamp will be red. The vacuum degasser will generate an error output on the remote lines. This will allow to shut down other system modules when connected via the remote cable, “Installing the Vacuum Degasser” on page 16. The vacuum degasser itself will not be able to generate any error messages in the system logbook of the HP 1100 Series. The following pages describe hardware symptoms which help you to isolate the cause of a hardware failure.

---

## Operation Modes of the Vacuum Degasser

The vacuum degasser allows various operation modes. Operation mode 1 and 2 are the normal operation modes of the degasser. In operation mode 1 the vacuum degasser works at 115 Torr and in operation mode 2 the vacuum degasser works in the range between 115 to 190 Torr. The continues mode can be selected for highest degassing efficiency of the degasser. In this mode the vacuum level is below 115 Torr. The error mode is activated in case the degasser cannot achieve a vacuum level of 190 Torr. In this case the status indicator shows a red light and the vacuum pump is turned off.

---

### NOTE

The voltage readings given for the various modes are rough values. In the factory all values are set according to the vacuum level. Depending on the vacuum sensor batch variations this will result in different voltage readings. Regardless of the reading of the various stages no adjustment should be performed on the degasser electronics.

---

### Normal Operation Mode 1

Connect the auxiliary cable to the AUX output at the back at the vacuum degasser. When the vacuum chamber is at ambient, a DC voltage measurement across the white and brown wires will give between 1.8 and 2.7 Volts (for pin connections see, "Auxiliary Cable" on page 76).

When the degasser is turned on, the vacuum pump runs and is connected to ambient through the solenoid. The solenoid activates about 15 seconds after turning on the degasser (you can hear it click), and the vacuum pump begins pulling a vacuum on the vacuum chamber.

The voltage measurement begins rapidly decreasing. The yellow status led turns off when the vacuum level reaches 190 Torr (voltage reading around 800mV). The normal operation mode vacuum level (115 Torr) is achieved when the voltage measures approximately 590 to 600 mV.

The solenoid turns off. The vacuum pump continues to run for a few seconds, then it turns off.

When the voltage measurement rises back to approximately 600 to 610 mV, the turn on process begins again.

## Normal Operation Mode 2 (Timing Mode)

Under certain operation conditions the 115 Torr trigger level for operation mode 1 cannot be reached. The vacuum degasser automatically turns into operation mode 2.

The degasser first tries to reach the trigger level of operation mode 1 (115 Torr / 600 mV). If this degassing level cannot be achieved within 8 minutes the instrument turns into a fixed timing mode. Every 2 minutes the degasser is turned on for 30 seconds. This assures a vacuum level in the range of 115 to 190 Torr. The pressure signal measured with the auxiliary cable is in the range between 600 to 800 mV.

## Error Mode

The error level for the vacuum degasser is 190 Torr (approximately 800 mV). This level cannot be achieved when there is a failure in the degasser (for example, leaks, etc.). When the error level is exceeded the yellow status indicator lamp is turned on and the vacuum pump runs continuously. If the degasser cannot reach one of the normal operation modes within 8 minutes the status indicator turns red and the vacuum pump is turned off.

## Continues Mode

The continues mode is activated either by switching S1 to 1 on the main board (removal of cover is required), or by connecting pin 1 (white cable) and pin 3 (green cable) of the auxiliary cable to each other. When turning on the vacuum degasser the vacuum pump will run continuously. This will establish a vacuum level that is below the trigger level (600 mV / 115 Torr) of the normal operation mode. When measuring the pressure signal with the auxiliary cable the reading will be between 400 and 600 mV.

---

**NOTE**

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When set to continues mode the life time of the vacuum pump will be reduced.

## All Lamps are Off and the Vacuum Degasser Appears Dead

If all other modules in the system appear to be on (power switch lamp is green), and are recognized by the connected user interface (module parameters can be set, module-specific screens appear, and so on), then do the following to determine the problem with the vacuum degasser.

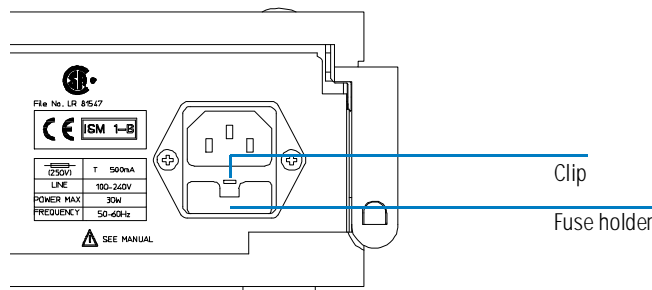
- Ensure the power cable is connected to the pump, and the power cable is connected to line power.
- Ensure the power switch on the front of the module is ON.
- Ensure the power fuses are OK.

The fuse holders are located on the rear panel of the vacuum degasser and are part of the power socket. Check the fuses, and change if necessary:

- 1 Switch off the power switch at the front of the instrument.
- 2 Remove the power cable from the power connector at the rear of the instrument.
- 3 Press down the clip of the fuse holder and pull out of the power socket.

Figure 9

### Fuse Holder and Clip



- 4 Remove the fuses from the fuse holders.
- 5 Ensure the fuse wire inside the fuses are not broken. If a test meter is

**All Lamps are Off and the Vacuum Degasser Appears Dead**

available, check the resistance of each fuse. A good fuse shows a low resistance (approximately 0 Ohm).

- 6** If a fuse is defective (wire broken or high resistance), insert a new fuse.
  - 7** Reinsert the fuse holders and the power cable.
  - 8** Switch on the power switch.
- Change the control assembly.



## **If the Status Indicator is Red**

Sufficient vacuum is normally built up during the initial start-up and is maintained by turning on the vacuum pump whenever triggered by the vacuum sensor.

If the vacuum cannot be reached, or is lost faster than expected during operation, the vacuum degasser will be forced into an error state. Approximately 8 to 16 minutes after turning on the vacuum pump without reaching its normal operation modes the error LED is turned on and the vacuum pump and the solenoid will be disabled.

The error condition can be reset by turning the vacuum degasser off and on again. If the error condition persists the error will occur again after another 8 to 16 minutes.

The following described failure conditions will appear before the error LED is turned on.

## If the Status Indicator is Yellow and the Vacuum Pump is not Running

- ❑ When the vacuum degasser is switched on (no vacuum build up in the vacuum chamber), the power lamp is green and the status indicator is yellow. The vacuum pump starts immediately. The status indicator will be turned off when the vacuum level is below the error level. Depending on the operation mode that can be reached, the vacuum pump will be turned off after about two minutes (operation mode 1), or the vacuum pump will run 8 minutes before turning into the timer control mode (operation mode 2). In the timer control mode the pump is turned on every 2 minutes and runs for 30 seconds.
- ❑ Check the operation of the vacuum pump. Disconnect the vacuum tube from the vacuum chamber. Switch the vacuum degasser off and on again. The vacuum pump should start immediately.

---

**NOTE**

As long as there is sufficient vacuum in the chamber the pump will not be turned on until triggered by the vacuum sensor.

---

- ❑ Check for + 24 V on the connector CN2 of the control assembly (between pin 1 and 2) for the vacuum pump (for access to the control assembly, see Chapter 4 “Repairing the Vacuum Degasser”).
- ❑ Check the resistance of the motor winding. If the winding is broken or shortened replace the vacuum pump, see “Overview of Internal Parts” on page 56.

**Table 4**

---

**Resistance of Motor Windings**

---

Color	Resistance
Red – Blue	85 kOhm
Blue – Black	5.7 kOhm
Black – Red	21 kOhm

---

---

## If the Status Lamp is Yellow and the Vacuum Pump Runs Continuously

When the vacuum degasser is working correctly, the vacuum pump should work in one of the described operation modes, see “Operation Modes of the Vacuum Degasser” on page 37. The status light will be turned off when below the error limit (190 Torr / 800 mV).

When the status light is yellow, the vacuum level has exceeded the error level (190 Torr / 800 mV). If the vacuum cannot be built up to reach the normal operation modes within 8 minutes the status indicator will turn red, indicating an error condition. The operation of the vacuum degasser will be disabled.

Before starting the following troubleshooting procedures check that all tubes on the vacuum container, the pressure sensor, the vacuum pump and the solenoid valve are tight.

### **Check that the vacuum pump generates vacuum and is functioning correctly.**

#### *Troubleshooting*

- 1 Remove the tube going from the sensor assembly to the vacuum chamber at the vacuum chamber.
- 2 For convenience, temporarily remove the vacuum pump and place it on top of the vacuum chamber. Disconnect the tube which is connected to the vacuum pump outlet fitting.
- 3 Switch degasser into continues mode by turning S1 to 1.
- 4 Turn the degasser on, wait approximately 15 seconds, then connect the sensor assembly directly to the output of the vacuum pump.

#### *Results*

A pressure reading below 500 mV indicates a good functioning vacuum pump.

A pressure reading in the range 600 to 800 mV indicates that one of the pump chambers is contaminated or defective. In this case, disconnect the sensor tube and let the pump run without load for 5 minutes. Reconnect the sensor tube and repeat the measurement. If the correct vacuum is obtained the contamination has been flushed away and the vacuum pump is functioning correctly.

If the pressure reading is still in the range 600 to 800 mV or higher, the vacuum pump should be replaced.

### If the Status Lamp is Yellow and the Vacuum Pump Runs Continuously

- 5 Switch the degasser back to normal operation modes by turning S1 back to 0.

#### **Eliminate vacuum pump and solenoid valve as source of the problem.**

*Troubleshooting*

- 1 Disconnect the outlet tubing from the solenoid valve (NC).
- 2 Remove the tube going from the sensor assembly to the vacuum chamber at the vacuum chamber.
- 3 Connect the sensor assembly directly to the output (NC) of the solenoid valve.
- 4 Switch degasser into continues mode by turning S1 to 1.
- 5 Turn on the degasser.

*Results*

If the obtained pressure reading is similar to the result from the previous measurement (below 500 mV), the vacuum pump and solenoid valve are functioning correctly.

If the obtained pressure reading is different (above 500 mV), the solenoid valve is defective and needs replacing.

- 6 Switch the degasser back to normal operation modes by turning S1 back to 0.

#### **Check that the vacuum chamber is functioning correctly.**

*Troubleshooting*

- 1 Disconnect the outlet tube from the solenoid valve (NC). For convenience, temporarily remove the vacuum pump and place it on top of the vacuum chamber.
- 2 Disconnect the tube which is connected to the vacuum pump outlet fitting.
- 3 Switch the degasser back to normal operation modes by turning S1 back to 0.
- 4 To duplicate the normal operation of the degasser, turn on the degasser, wait approximately 15 seconds, then connect the tube from the vacuum chamber directly to the outlet of the vacuum pump.
- 5 Connect this tube directly to the solenoid output (NC) fitting. This is made easier by momentarily disconnecting the sensor assembly from the vacuum chamber.

*Results*

A pressure reading below 500 mV indicates a good working vacuum chamber and vacuum pump.

A pressure reading below 800 mV indicates a normal working vacuum chamber (may have slight condensation inside due to environment

**If the Status Lamp is Yellow and the Vacuum Pump Runs Continuously**

conditions).

A pressure reading above the error limit (approximately 800 mV) indicates a leak in the vacuum chamber.

- 5 Switch the degasser back to normal operation modes by turning S1 back to 0.  
If the above described troubleshooting steps do not lead to an identification of the problem, replace the electronic control module with the pressure sensor assembly.

Troubleshooting

**If the Status Lamp is Yellow and the Vacuum Pump Runs Continuously**

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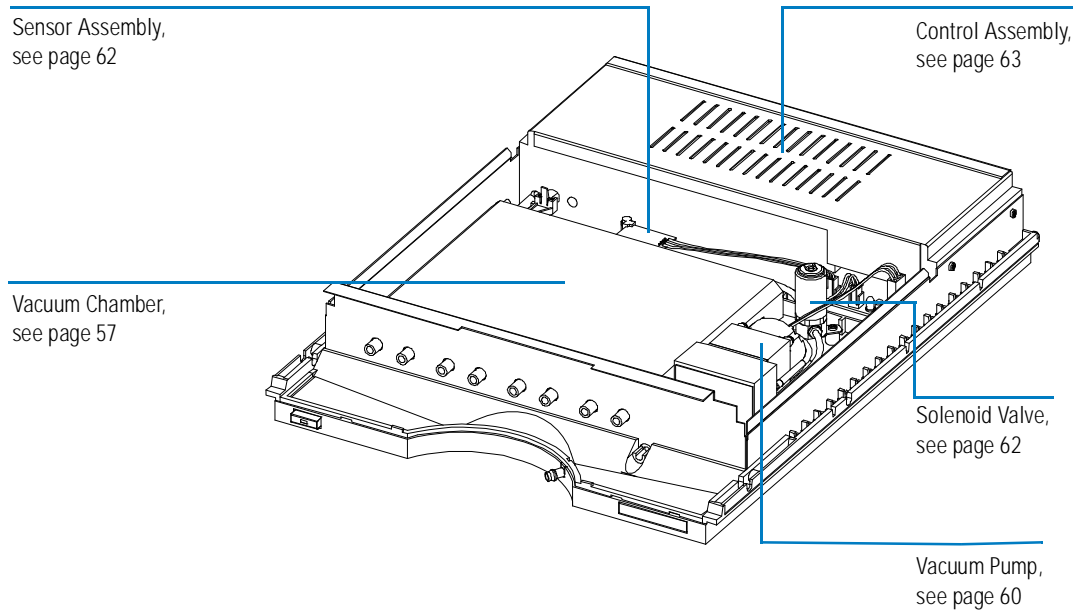
## **Repairing the Vacuum Degasser**

Instructions on how to repair the vacuum  
degasser

---

# Repairing the Vacuum Degasser

**Figure 10** Overview of Repair Procedures



---

## WARNING

**The following procedures require opening the main cover of the vacuum degasser. To prevent personal injury, the power cable must be removed from the vacuum degasser before opening the cover. Do not connect the power cable to the vacuum degasser while the covers are removed.**

---



---

**WARNING**

---

**When opening capillary or tube fittings solvents may leak out. 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 toxic or hazardous solvents are used.**

---

**CAUTION**

---

Electronic boards and components are sensitive to electrostatic discharge (ESD). In order to prevent damage always use an ESD protection (for example, the ESD wrist strap from the start up kit) when handling electronic boards and components.

---

**CAUTION**

---

The plates of the sheet metal of the degasser are very thin. Although they have been deburred, they are still quite sharp, and it is possible that you may cut your hands or fingers if you slide them along the edges of the sheet metal of the enclosure.  
Therefore never support your hand or slide with your fingers along the edges of the enclosure.

The procedures in this section describe how to exchange internal parts. You must remove the vacuum degasser from the stack in order to open the main cover.

---

## Cleaning the Instrument

The vacuum degasser 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 that liquid can drip into the vacuum degasser.

---

### WARNING

---

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

---

## Using the ESD Strap

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

### Using the ESD Strap

- 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 11

Using the ESD Strap



## Removing and Refitting the Top Cover

### WARNING

When opening capillary or tube fittings solvents may leak out. 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 toxic or hazardous solvents are used.

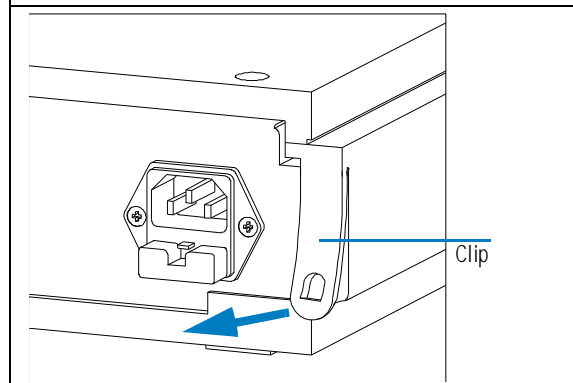
#### Tools required:

- ❑ Screwdriver Pozidriv #1

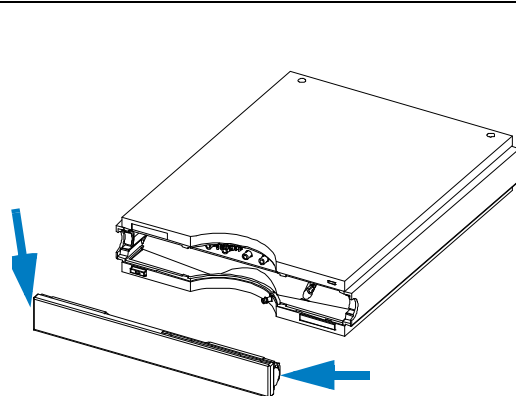
#### Preparations for this procedure:

- ❑ Switch off the vacuum degasser at the main power switch
- ❑ Disconnect the power cable
- ❑ Disconnect all solvent tubes from the ports of the vacuum degasser
- ❑ Remove solvent cabinet from the vacuum degasser
- ❑ Remove vacuum degasser from the stack.

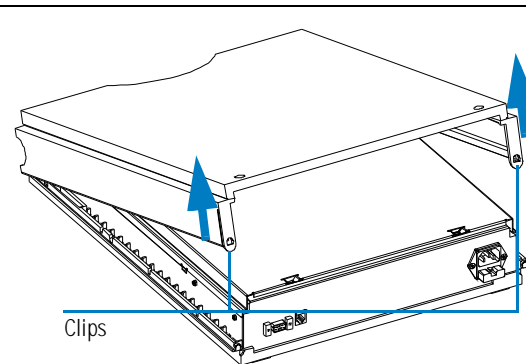
2 Unclip the clips on the top cover and lift the cover away.



1 Remove the front panel.

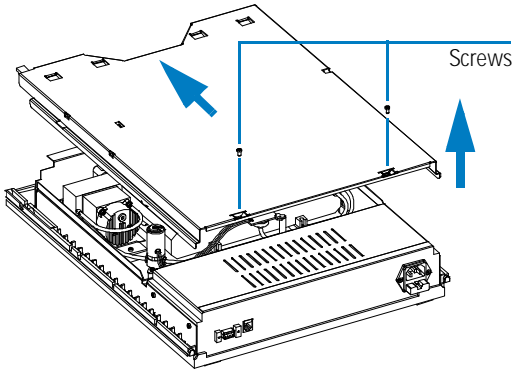


3 Unclip the clips on the top cover and lift the cover away.

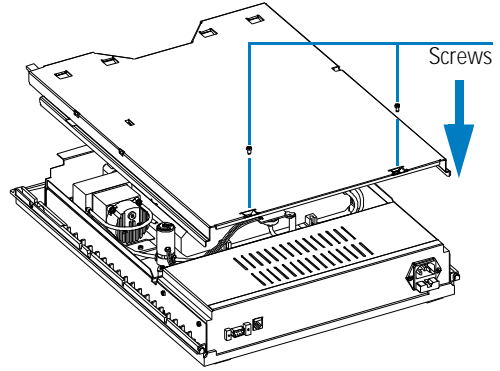


Repairing the Vacuum Degasser  
Removing and Refitting the Top Cover

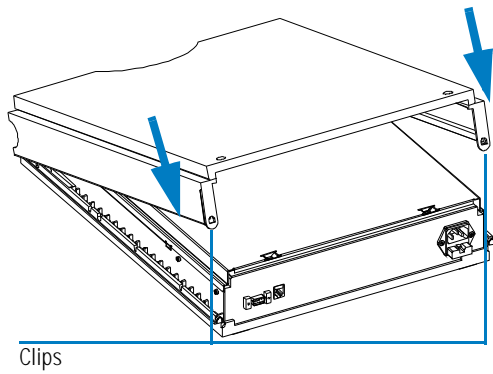
**4** Unscrew the screws on the top plate and remove the plate.



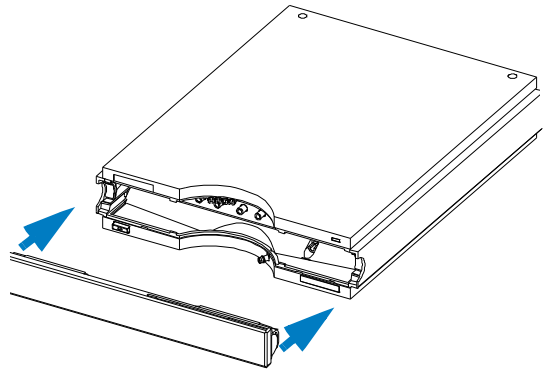
**5** Place the metal cover onto the housing and fix the two holding screws.



**6** Replace the top cover. Ensure the clips are seated correctly.



**7** Reinstall the front cover, reconnect the power cable and turn on the vacuum degasser.



**8** Reinstall the vacuum degasser in your system stack.

---

## Assembling the Main Cover

---

<b>When required</b>	If cover is broken.
<b>Tools required</b>	None
<b>Parts required</b>	Cover kit 5062-8579 (includes base, top, left and right)

---

---

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

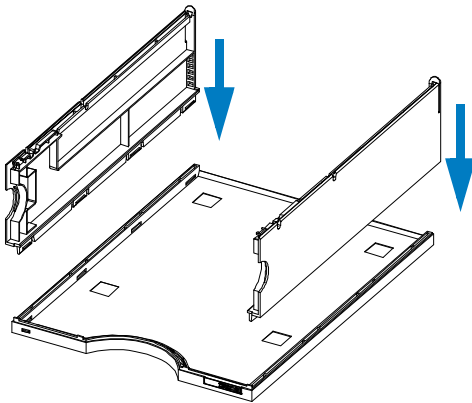
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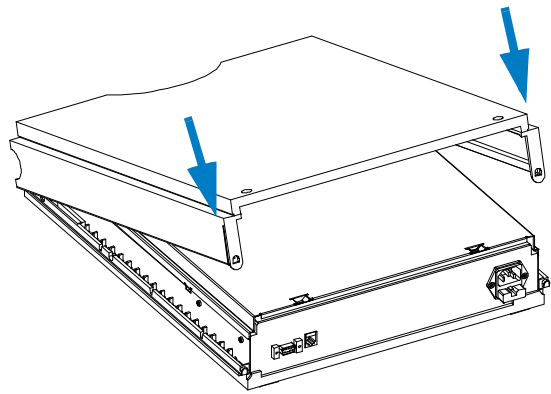
**WARNING** In case you insert the left or right side in the opposite position, you may not be able to remove the side from the top part.

---

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



**2** Replace the cover.



- 3** Replace the vacuum degasser in the stack and reconnect the cables and capillaries.
- 4** Turn on the vacuum degasser.

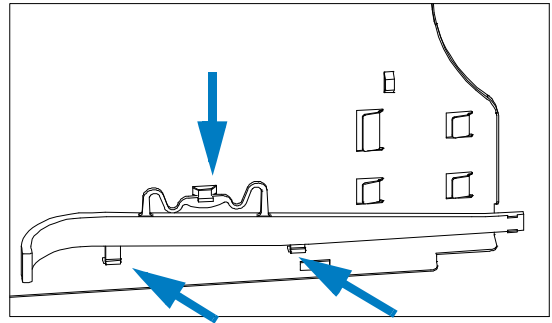
## Exchanging the Status Light Pipe

<b>When required</b>	If part is broken
<b>Tools required</b>	Screwdriver Pozidriv#1
<b>Part required</b>	Status light pipe 5041-8384

Preparation for this procedure:

- ❑ Remove the front cover and top cover, “Removing and Refitting the Top Cover” on page 52.

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



- 2** Replace the top cover, see “Removing and Refitting the Top Cover” on page 52.
- 3** Replace the vacuum degasser in the stack and reconnect the cables and capillaries.
- 4** Turn on the vacuum degasser.

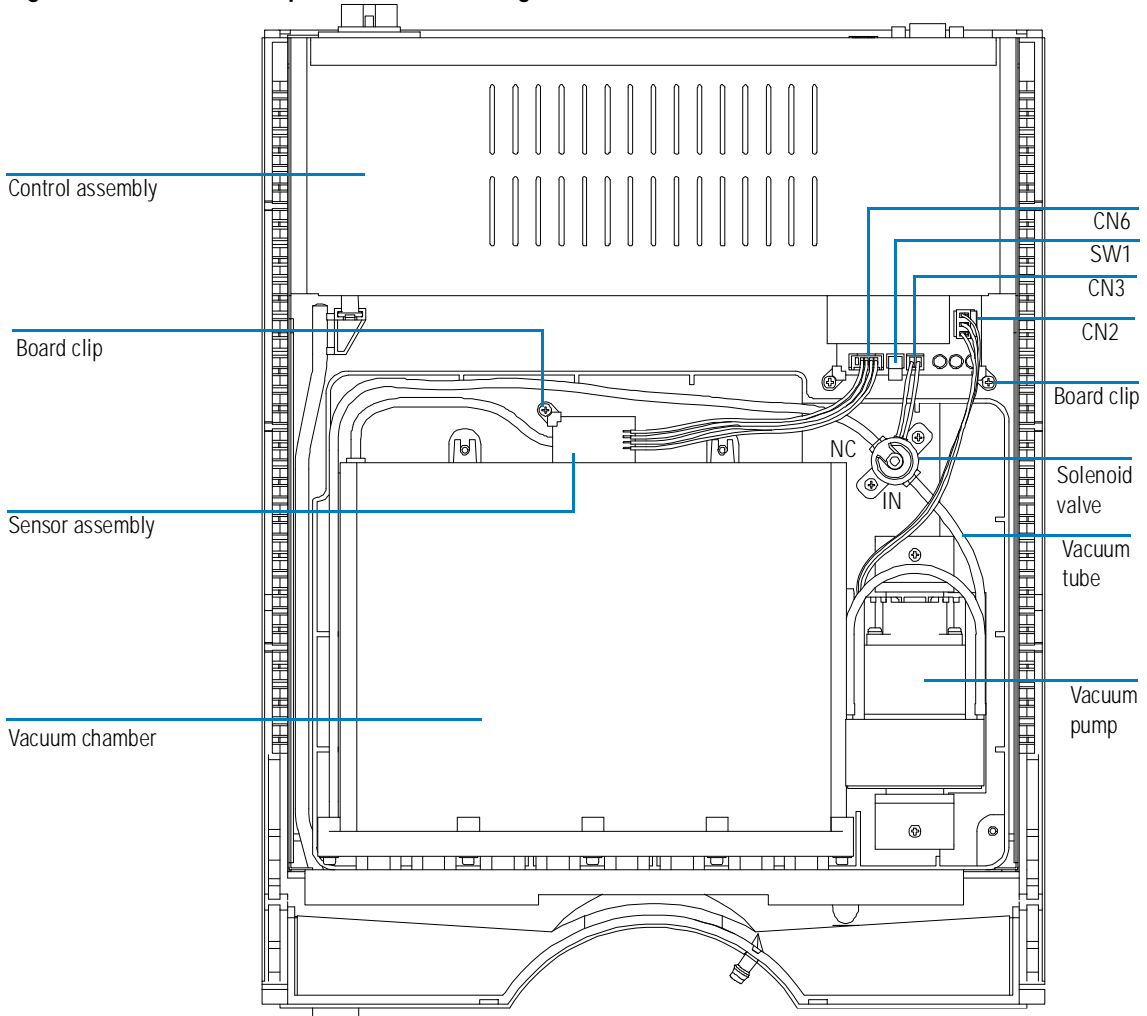
---

## Overview of Internal Parts

Figure 12 shows a top view of the vacuum degasser. It shows the connections of the vacuum tubes as well as the electrical connections at the control assembly.

Figure 12

Top View of Vacuum Degasser





---

## Exchanging the Vacuum Chamber

---

<b>When required</b>	If internal membrane defective or vacuum chamber damaged
<b>Tools required</b>	Screwdriver Pozidriv #1
<b>Material</b>	Vacuum chamber, G1322-60001
<b>Preparation</b>	Disconnect the solvent inlet tubes at the degasser inlet ports Remove the solvent cabinet from the vacuum degasser

---

---

**WARNING** **Drain any remaining solvents from the degassing channels before removing the vacuum chamber from the vacuum degasser.**

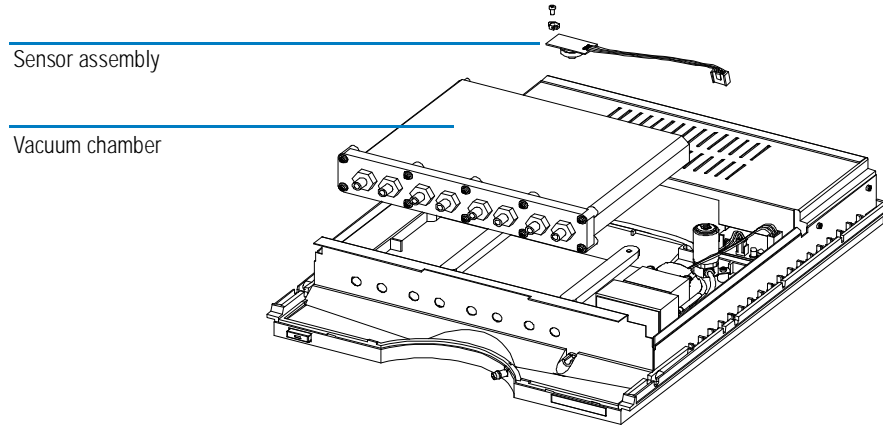
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Repairing the Vacuum Degasser  
**Exchanging the Vacuum Chamber**

- 1** Disconnect the solvent tubes from your pump.
- 2** Connect syringe adapter to solvent tube of first solvent channel.
- 3** Push syringe adapter onto syringe.
- 4** Pull syringe plunger to draw solvent out of degasser and tubing. Continue to draw solvent into syringe until there is no solvent in the tubing.
- 5** Repeat step 3 and step 4 for other solvent channels.
- 6** Disconnect outlet tubes from the vacuum degasser.
- 7** Remove top cover, see “Removing and Refitting the Top Cover” on page 52.
- 8** Loosen the clip of the sensor board and remove it from its slot in the vacuum chamber.
- 9** Remove the two holding screws of the vacuum chamber.
- 10** Slide the vacuum chamber out of the front plate.
- 11** Disconnect the vacuum tubes from the vacuum chamber.
- 12** Reconnect the two vacuum tubes to the new vacuum chamber.
- 13** Slide the vacuum chamber back into the front plate and fix it with the two holding screws.
- 14** Slide the sensor board back into the slots of the vacuum chamber and fix the clip.
- 15** Reconnect all inlet and outlet tubes to the vacuum chamber, see Figure 12.
- 16** Refit the cover, see “Removing and Refitting the Top Cover” on page 52.

Repairing the Vacuum Degasser  
Exchanging the Vacuum Chamber

Figure 13 Exchanging the Vacuum Chamber



## **Exchanging the Vacuum Pump**

---

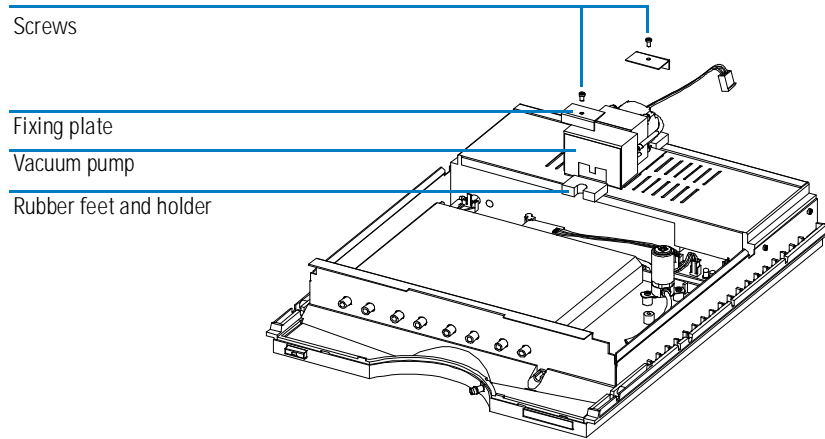
<b>When required</b>	If not generating sufficient vacuum or electrically defective
<b>Tools required</b>	Screwdriver Pozidriv #1
<b>Part required</b>	Vacuum pump, G1322-60000

---

- 1** Remove Top Cover, see “Removing and Refitting the Top Cover” on page 52.
- 2** Disconnect vacuum pump cable from connector CN2 at the control assembly.
- 3** Using a Pozidriv screwdriver #1 loosen and remove the two holding screws of the vacuum pump.
- 4** Remove the fixing plates.
- 5** Lift the vacuum pump, disconnect the inlet tube (connected to the switching valve) and take the pump out of the unit.
- 6** Connect the tubing from the switching valve to the exchange vacuum pump inlet.
- 7** Place the vacuum pump in its position.
- 8** Place the fixing plates onto the rubber feet of the pump.
- 9** Insert the holding screws and fix them.
- 10** Reconnect the vacuum pump cable to the control assembly (CN2).
- 11** Refit the cover, see “Removing and Refitting the Top Cover” on page 52.

Repairing the Vacuum Degasser  
**Exchanging the Vacuum Pump**

**Figure 14**                      **Exchanging the Vacuum Pump**



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## Exchanging the Solenoid Valve

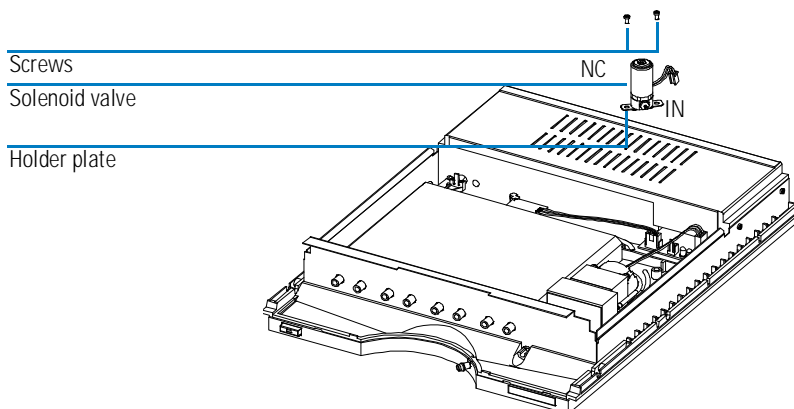
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<b>When required</b>	Valve not switching correctly or leaking
<b>Tools required</b>	Screwdriver Pozidriv #1
<b>Part required</b>	Solenoid valve G1322-60003

---

- 1 Remove Top Cover, see “Removing and Refitting the Top Cover” on page 52.
- 2 Disconnect the solenoid connector from the control board.
- 3 Loosen and remove the holding screws of the solenoid valve.
- 4 Disconnect inlet and outlet tubes from the solenoid valve.
- 5 Loosen and remove the two screws of the holding plate at the solenoid.
- 6 Fix the holding plate to the new solenoid valve.
- 7 Connect the two vacuum tubes to the solenoid valve. The inlet of the solenoid is labeled IN and is connected to the vacuum pump.
- 8 Fix the solenoid valve with the two screws to its holder.
- 9 Connect the solenoid cable to the control board.
- 10 Refit the cover, see “Removing and Refitting the Top Cover” on page 52.

**Figure 15** Exchanging the Solenoid Valve



---

## Exchanging the Degasser Control Assembly and the Sensor Assembly

---

<b>When required</b>	No power available, vacuum pump or switching valve not activated
<b>Tools required</b>	Screwdriver Pozidriv #1
<b>Part required</b>	Degasser control assembly (includes the sensor assembly) G1322-66500

---

---

**WARNING**      **The degasser control assembly does not include any serviceable parts and should not be opened.**

---

---

**NOTE**      Sensor assembly and degasser control assembly are a matched pair and have to be exchanged together.

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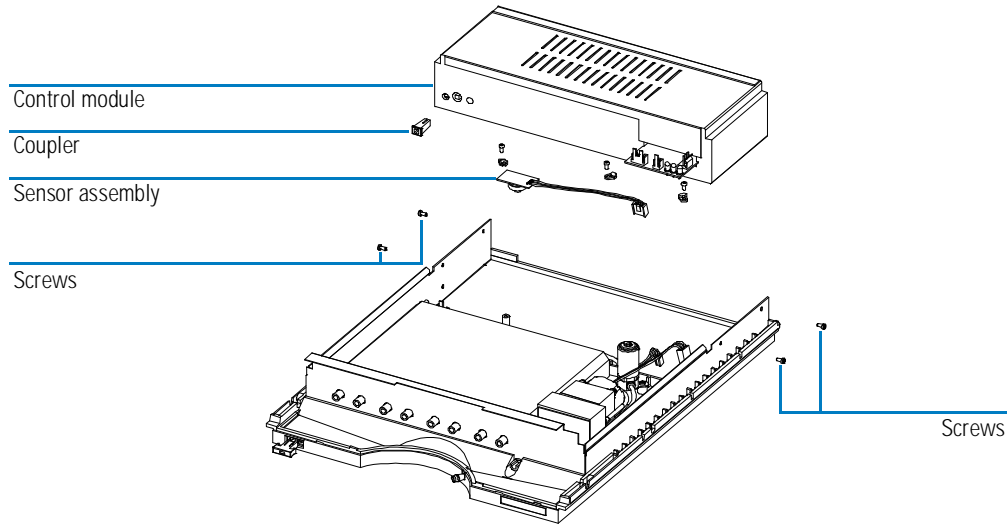
**Exchanging the Degasser Control Assembly and the Sensor Assembly**

- 1** Remove Top Cover, see “Removing and Refitting the Top Cover” on page 52.
- 2** Disconnect all connectors at the control assembly board.
- 3** Loosen and remove the two holding clips at the control board of the control assembly.
- 4** Unclip the power switch light pipe at the degasser control assembly power switch.
- 5** Remove the four holding screws at the side panel — two at the left side, two on the right side of the vacuum degasser.
- 6** Lift the degasser control assembly out of the unit.
- 7** Remove the coupler from the control assembly and place it onto the power switch in the exchange control assembly.
- 8** Loosen the clip of the sensor board and remove it from its slot in the vacuum chamber.
- 9** Slide the new sensor board into the slots of the vacuum chamber and then fix the clip.
- 10** Place a new degasser control assembly into the unit and fix with the four holding screws to the side panels.
- 11** Clip the power switch light pipe to the degasser control assembly power switch.
- 12** Replace the two holding clips and fix the holding screws.
- 13** Connect all the cables to the control board.
- 14** Refit the cover, see “Removing and Refitting the Top Cover” on page 52.



Repairing the Vacuum Degasser  
Exchanging the Degasser Control Assembly and the Sensor Assembly

Figure 16 Exchanging the Degasser Control Assembly



Repairing the Vacuum Degasser

**Exchanging the Degasser Control Assembly and the Sensor Assembly**

---

## **Parts and Materials**

Detailed illustrations and listings for parts and materials identification

# Vacuum Degasser Parts

Figure 17 Vacuum Degasser Parts

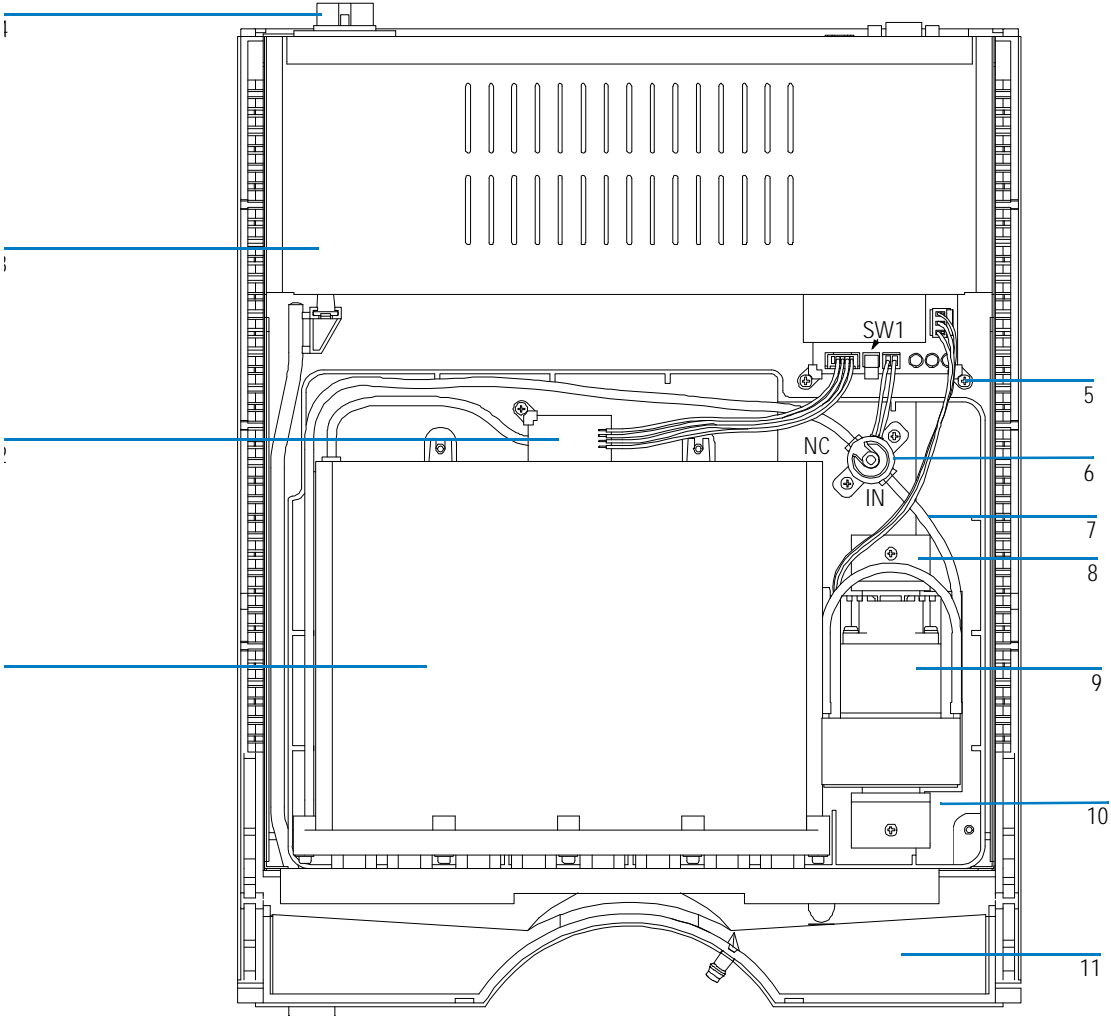


Table 5

---

**Repair Parts: Vacuum Degasser**

---

<b>Item</b>	<b>Description</b>	<b>HP Part Number</b>
1	Vacuum chamber	G1322-60001
2	Sensor assembly (included in the control assembly)	no PN
3	Vacuum degasser control assembly	G1322-66500
4	Fuse 500 mA	2110-0458
5	Board clip	G1322-43100
6	Solenoid valve	G1322-60003
7	Vacuum tubes	G1322-60002
8	Fixing plate	no PN
9	Vacuum pump	G1322-60000
10	Leak tray	G1322-44100
11	Leak pan, degasser	5042-1307

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## Cover Parts

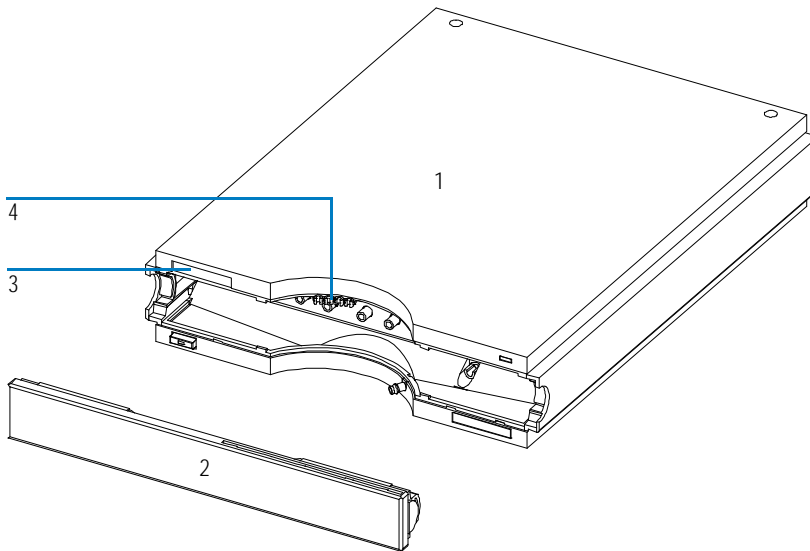
Table 6

Cover Parts

Item	Description	HP Part Number
1	Set of all plastic covers, top-side-base	5062-8579
2	Front cover	5062-8580
3	Logo plate, HP 1100	5042-1312
4	Tube clip	5041-8387

Figure 18

Cover Parts



---

## Sheet Metal Kit

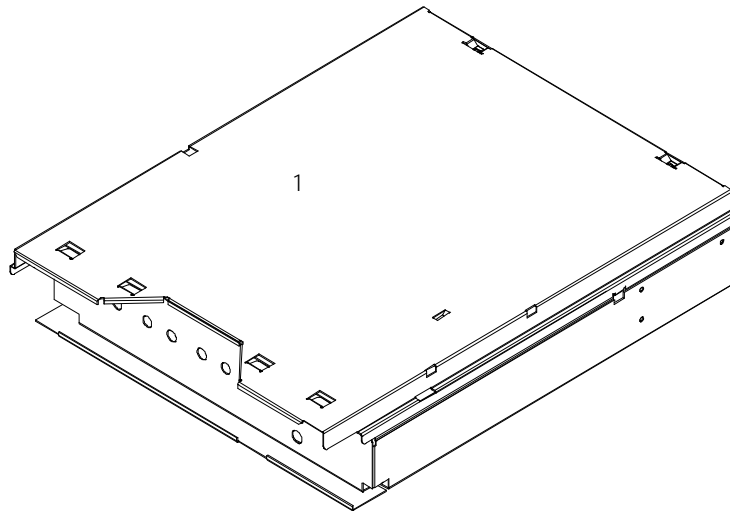
Table 7

Sheet Metal Kit

Item	Description	HP Part Number
1	Sheet metal kit, includes base and top plate	G1322-68701

Figure 19

Sheet Metal Kit



---

## Power and Status Light Pipes

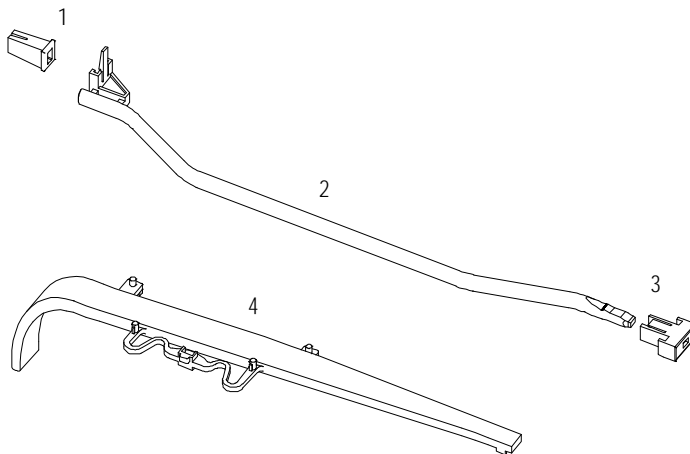
Table 8

Power and Status Light Pipes

Item	Description	HP Part Number
1	Power switch coupler	5041-8383
2	Light pipe – power switch	5041-8382
3	Power switch button	5041-8381
4	Light pipe – status lamp	5041-8384

Figure 20

Power and Status Light Pipes





---

## Accessory Kit

Table 9

---

### Accessory Kit G1322-68705

---

Item	Description	HP Part Number
1	Syringe *	5062-8534
2	Syringe adapter	9301-1337
3	Solvent tubing kit (4 tubes degasser to pump)	G1322-67300
4	Waste tube**	5062-2463

---

\* Reorder number (pack of 10)

\*\*Reorder number (5m)

---

## Cable Overview

---

**WARNING**

---

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

**Table 10**

---

**Cable Overview**

---

Type	Description	HP Part Number
Remote cables	HP 1100 modules	5061-3378
	HP 1050 modules	
	HP 1046A FLD	
	General purpose	01046-60201
Auxiliary	HP 1100 Series vacuum degasser	G1322-61600

---

## Remote Cables



One end of these cables provides a Hewlett-Packard APG (Analytical Products Group) remote connector to be connected to HP 1100 Series modules. The other end depends on the instrument to be connected to.

### HP 1100 to HP 1050, HP 1046A or HP 35900 A/D Converters

Connector 5061-3378	Pin HP 3394	Pin HP 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

### HP 1100 to General Purpose

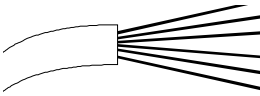
Connector 01046-60201	Universal	Pin HP 1100	Signal Name	Active (TTL)
		1 - White	Digital ground	
		2 - Brown	Prepare run	Low
		3 - Gray	Start	Low
		4 - Blue	Shut down	Low
		5 - Pink	not connected	
		6 - Yellow	Power on	High
		7 - Red	Ready	High
		8 - Green	Stop	Low
		9 - Black	Start request	Low

## Auxiliary Cable



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

### HP 1100 Series Vacuum Degasser to General Purpose

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

---

## **Theory of Operation**

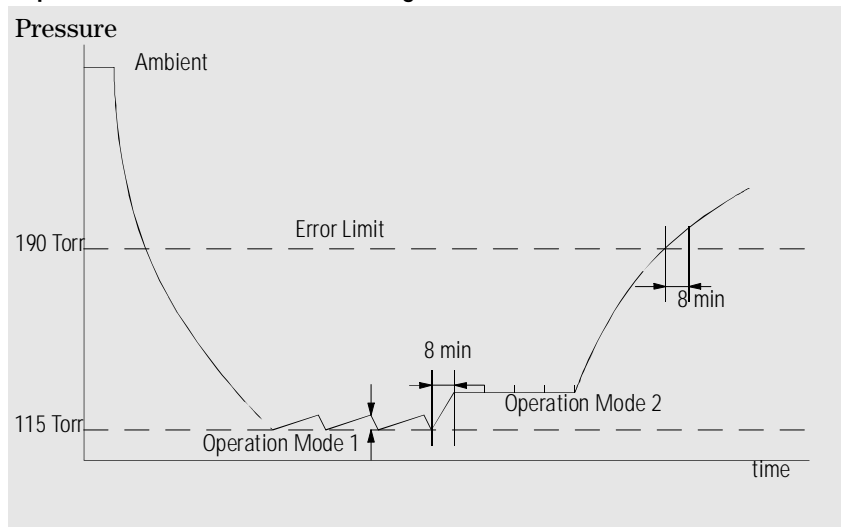
The vacuum degasser's operation, mechanical hardware and electronics

## How Do the Electronics Work?

The vacuum degasser has two different normal operation modes and a continues mode. In operation mode 1 the vacuum degasser works around a defined set point (115 Torr). Due to environmental conditions it is possible that the vacuum degasser cannot reach the pre-defined set point. Under this condition the operation mode 2 is active and the vacuum pump is activated in defined time intervals (vacuum level 115 to 190 Torr). In case of a malfunction of the vacuum degasser (vacuum level above 190 Torr) the instrument is turned into the error mode.

Figure 21

Operation Modes of the Vacuum Degasser



## The Vacuum Degasser Control Assembly

The main function of the vacuum degasser control assembly is to control the vacuum pump and to check the vacuum in the vacuum container.

The power section of the control assembly comprises a switching power supply that generates + 24 V from line voltage. The + 24 V is used to drive the vacuum pump and the solenoid valve. The electronic control circuit uses + 12 V which is generated from the + 24 V.

The pressure sensor is connected to the four chambers of the vacuum chamber and checks for the correct vacuum in the system.

The amplifier and comparator circuit determines the working range of the vacuum that has to be built up. When the vacuum degasser is turned on and the vacuum in the chambers is not within working range (above error limit 190 Torr), the amplifier and comparator circuit sends a signal to the vacuum pump driver and the timers of the vacuum pump and the solenoid valve.

The vacuum pump is turned on immediately while the solenoid valve opening is delayed by 15 seconds. This time delay allows the vacuum pump to start without load before it is connected to the vacuum chamber. The status indicator is yellow when the pump is activated. The status lamp is turned off when the vacuum is below the error limit as determined by the error monitor (approximately 190 Torr).

When the vacuum in the chamber reaches its operation mode 1 (approximately 115 Torr) the amplifier and comparator circuit turns off the solenoid valve and the vacuum pump is turned off by a timer with a delay of 15 seconds.

As soon as the pressure sensor detects the lower limit of the operation mode 1 (when oxygen from the solvent diffuses into the vacuum chamber) the vacuum pump is started again as described before.

The pressure signal is available at the auxiliary output. It allows to control the vacuum system. The upper limit of operation mode 1 is 600 mV. Values below 600 mV on the pressure output indicate sufficient vacuum in the chamber. If the 600 mV are exceeded the vacuum pump will be started to keep the vacuum within its working limit.

The amplifier and comparator circuit also activates the timer 3 when the vacuum in the vacuum chambers is below operation mode 1. The timer 3 is reset when operation mode 1 is reached within a maximum of 8 minutes. If operation mode 1 is not reached and the time (8 minutes) of timer 3 elapsed, the timer mode (operation mode 2) is activated. In this mode the vacuum pump is automatically turned on every 2 minutes for a time frame of 30 seconds. Timer 1 and 2 are activated as described earlier.

The error monitor continuously checks the error limit of the degasser (190 Torr). If the error limit is exceeded (for example, leak in chamber), the error timer is activated and the yellow status indicator lamp is turned on. The vacuum pump is turned on continuously. If the vacuum pump cannot reach its two operation modes (for example, leak in chamber) within 8 minutes (error timer limit) the error driver is activated. The error driver will

## How Do the Electronics Work?

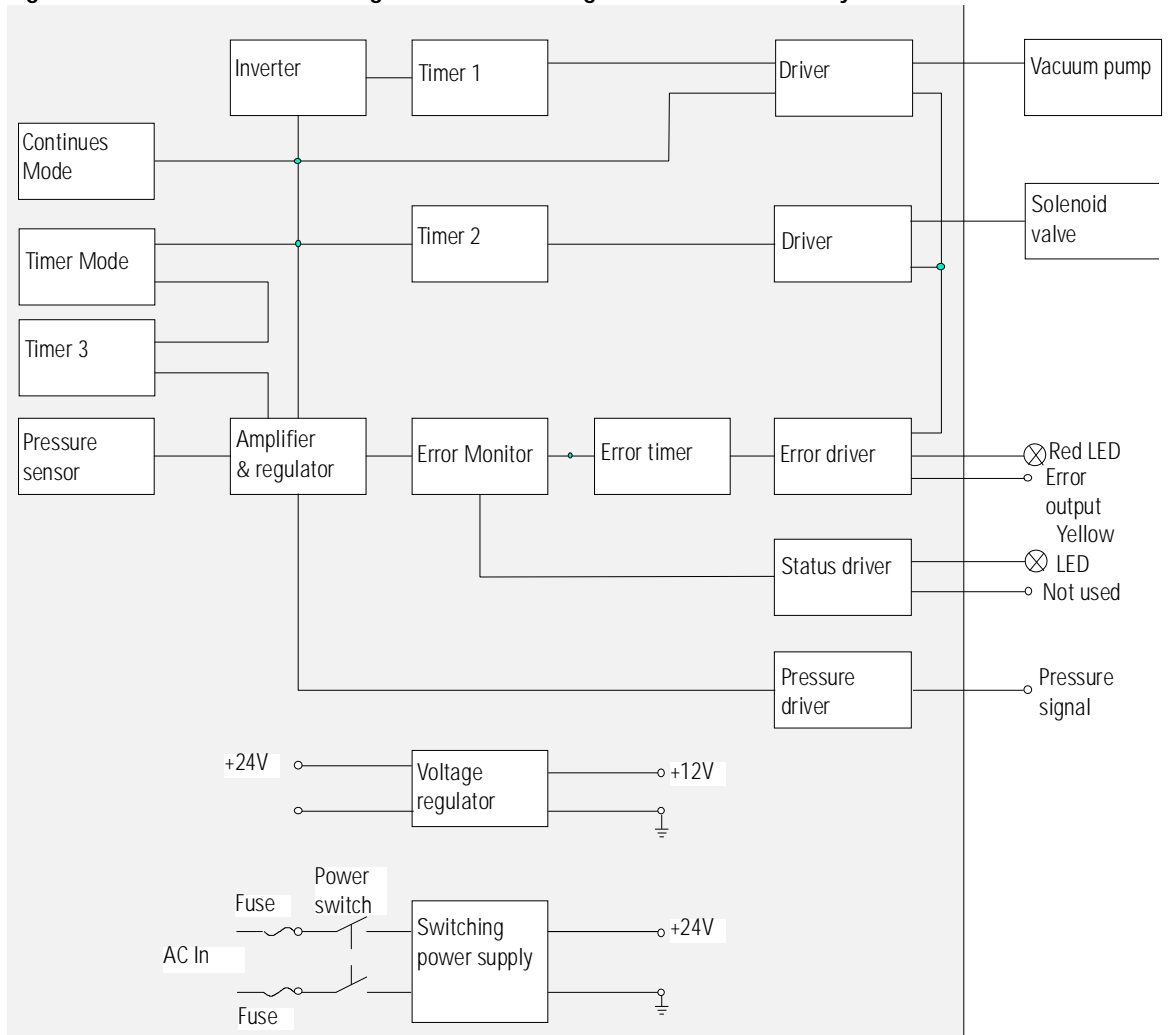
deactivate the vacuum pump and solenoid valve. The status lamp is red and the error output on the remote connector will be activated.

The error output at the remote connector provides a *contact closure* (potential free open collector maximum load 35 V DC/50 mA) as long as the error condition is active. The error condition is set (closed) when the status light shows the error condition (red).

The continues mode overwrites all other operation modes of the degasser. When activated (switch S1 on the electronic board or via the auxiliary cable) the vacuum pump is forced into continues mode and is turned on as long as the degasser is switched to on.



**Figure 22**      **Block Diagram — Vacuum Degasser Control Assembly**



Theory of Operation  
**How Do the Electronics Work?**

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## **Specifications**

Performance specifications of the vacuum degasser

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## Performance Specifications

Table 11

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Performance Specifications HP 1100 Vacuum Degasser

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Type	Specification
Maximum flow rate	10 ml/min per channel
Number of channels	4
Internal volume per channel	Typically 12 ml per channel
Materials in contact with solvent	PTFE, PEEK
pH range	1 – 14
Analog output	For pressure monitoring, range 0 – 1 V

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- 
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### All Chemical Analysis Products

Hewlett-Packard (HP) warrants its chemical analysis products against defects in materials and workmanship. For details of the warranty period in your country, call HP. During the warranty period, HP will, at its option, repair or replace products which prove to be defective. Products that are installed by HP are warranted from the installation date, all others from the ship date.

If buyer schedules or delays installation more than 30 days after delivery, then warranty period starts on 31<sup>st</sup> day from date of shipment (60 and 61 days, respectively for products shipped internationally).

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- 2 buyer-supplied software, hardware, interfacing or consumables,
- 3 unauthorized modification or misuse,

## Warranty Statement

- 4 operation outside of the environmental and electrical specifications for the product,
- 5 improper site preparation and maintenance, or
- 6 customer induced contamination or leaks.

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The customer shall provide:

- 1 access to the products during the specified periods of coverage to perform maintenance,
- 2 adequate working space around the products for servicing by HP personnel,
- 3 access to and use of all information and facilities determined necessary by HP to service and/or maintain the products (insofar as these items may contain proprietary or classified information, the customer shall assume full responsibility for safeguarding and protection from wrongful use),
- 4 routine operator maintenance and cleaning as specified in the HP operating and service manuals, and
- 5 consumables such as paper, disks, magnetic tapes, ribbons, inks, pens, gases, solvents, columns, syringes, lamps, septa, needles, filters, frits, fuses, seals, detector flow cell windows, and so on.



## Responsibilities of Hewlett-Packard

Hewlett-Packard will provide warranty services as described in Table 12.

Table 12

Warranty Services		
Services During Warranty *	Warranty Period**	Type
HP 1100 Series of Modules	1 Year	Onsite
GC, LC, UV-Visible, and LAS supplies and accessories	90 Days	Onsite
Columns and Consumables ***	90 Days	Return to HP
Gas Discharge and Tungsten Lamps	30 Days	Return to HP
Repairs performed on-site by HP ****	90 Days	Onsite

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\*\*\*\* HP repair warranty is limited to only the item repaired or replaced.

### **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. Hewlett-Packard 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

## Safety Information

rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

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

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




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

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

## Safety Symbols

Table 13 shows safety symbols used on the instrument and in the manuals.

Table 13

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.

## Safety Information

---

**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.

## Radio Interference

### Manufacturer's Declaration

This is to certify that this equipment is in accordance with the Radio Interference Requirements of Directive FTZ 1046/1984. The German Bundespost was notified that this equipment was put into circulation, the right to check the series for compliance with the requirements was granted.

### Test and Measurement

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

---

## Sound Emission

### Manufacturer's Declaration

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

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

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

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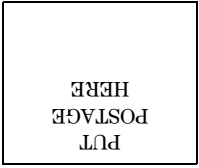
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## **About This Edition**

Third edition, 06/97

## **In This Book**

This manual contains technical reference information about the HP 1100 Series vacuum degasser. The manual describes the following:

- installation,
- optimizing performance,
- troubleshooting,
- repairing,
- parts and materials,
- theory of operation, and
- specifications.

