Agilent 1200 Series
Vacuum Degasser

User Manual

Agilent Technologies

Notices

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A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents

1 Introduction

Introduction to the Vacuum Degasser

The Agilent 1200 Series vacuum degasser, model G1322A, comprises a 4-channel vacuum container, including 4 tubular plastic membranes, and a vacuum pump. When the vacuum degasser is switched on, the control circuit turns on the vacuum pump which generates a partial vacuum in the vacuum container The pressure is meassured by a pressure sensor. The vacuum degasser maintains the partial vacuum by turning on and off the vacuum pump depending on the signal from the pressure sensor.

The LC pump draws the solvents from their bottles through the special tubular plastic membranes of the vacuum container. As the solvents pass through the vacuum tubes any dissolved gas in the solvents permeates through the membranes into the vacuum container. The solvents will be almost completely degassed when leaving the outlets of the vacuum degasser.

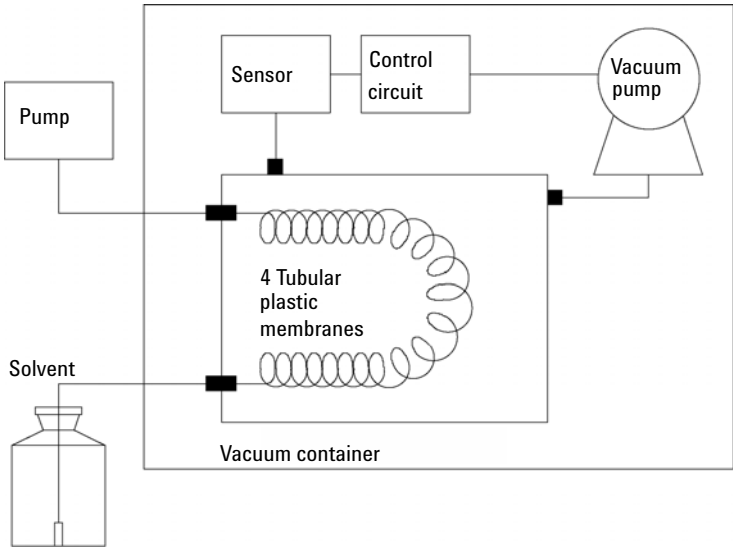

Figure 1 Overview (only one of the four solvent channels is shown)

How the Electronics Work

The vacuum degasser has two different normal operation modes and a continuous 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 becomes 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.

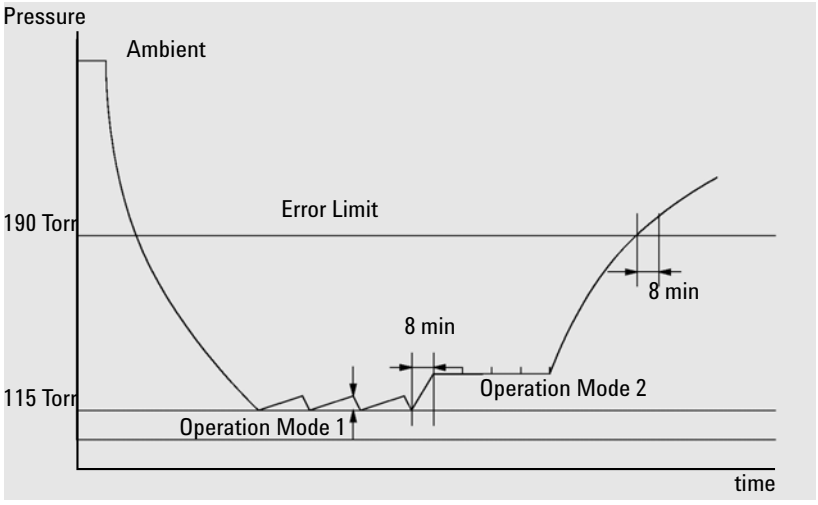

Figure 2 Operation Modes of the Vacuum Degasser

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 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 chamber is not within working range (above error limit of 190 Torr), the amplifier and comparator circuit sends a signal to the vacuum pump driver and the timers of the vacuum pump (timer 1) and the solenoid valve (timer 2).

The vacuum pump is turned on immediately while the solenoid valve closing 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 turns yellow when the pump is activated. The status lamp is turned off as soon as the vacuum is below the error limit.

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 that the limit of the operation mode 1 has been exceeded (e.g. when dissolved gas from the solvent diffused 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 monitor 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 with in 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. Timers 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 either of its two operation modes within 8 minutes (error timer limit) the error driver is activated. The error driver will deactivate the vacuum pump and solenoid valve. The status lamp turns 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 continuous mode overwrites all other operation modes of the degasser. When activated (switch SW1 on the electronic board or via the auxiliary cable) the vacuum pump is forced into continuous mode and is turned on as long as the degasser is switched ON.

2
Site Requirements and Specifications

Site Requirements

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

Power Considerations

The vacuum degasser power supply has wide-ranging capability (see Table 1 on page 15). It accepts any line voltage in the range mentioned below. Consequently there is no voltage selector in the rear of the vacuum degasser. There are two externally accessible fuses, that protect the power supply.

WARNING

Incorrect line voltage at the instrument

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

➔ Connect your vacuum degasser to the specified line voltage.

CAUTION

Provide access to the power plug

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

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

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

Power Cords

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

WARNING

Electric Shock

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

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

WARNING

Use of unsupplied cables

The use of cables which haven't been supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

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

CAUTION

Unaccessable power plug.

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

- ➔ Make sure the power connector of the instrument can be easily reached and unplugged.
- ➔ Provide sufficient space behind the power socket of the instrument to unplug the cable.

Bench Space

The vacuum degasser dimensions and weight (see Table 1 on page 15) 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 Agilent 1200 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 on page 15.

CAUTION

Condensation within the vacuum degasser

Condensation will damage the system electronics.

➔ Do not store, ship or use your vacuum degasser under conditions where temperature fluctuations could cause condensation within the vacuum degasser.

➔ 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.

Physical Specifications

Table 1 Physical Specifications

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, ± 10 %	Wide-ranging capability
Line Frequency	50 or 60 Hz, ± 5 %	
Power consumption	30 W	Maximum
Ambient Operating Temperature	0 – 55 °C (32 – 131 °F)[1]	
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	

[1] This temperature range represents the technical specifications for this instrument. The mentioned temperatures may not be suitable for all applications and all types of solvents.

WARNING

Unspecified Conditions

Operating the instrumentation under conditions other than their intended use might result in a potential safety hazard or might damage the instrumentation.

➔ Never operate your instrumentation under conditions other than specified by the vendor.

NOTE

The Agilent 1200 Series vacuum degasser has been tested for evaporation of solvents into the atmosphere by an independent institute with approved methods. The tests were performed with Methanol (BIA Nr. 7810) and Acetonitrile (NIOSH, Nr. 1606). Evaporation of these solvents into the atmosphere when operating the degasser was below the limits of detection.

Performance Specifications

Table 2 Performance Specifications Agilent 1200 Series Vacuum Degasser

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 (AUX)	For pressure monitoring, range 0 – 3 V

NOTE The G1322 Vacuum Degasser has been tested for evaporation of solvents into the atmosphere by an independent institute with approved methods. The tests were performed with Methanol (BIA Nr. 7810) and Acetonitrile (NIOSH, Nr. 1606). Evaporation of these solvents into the atmosphere when operating the degasser was below the limits of detection.

3
Installing the Vacuum Degasser

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.

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 "Parts and Materials for Maintenance" on page 61. Please report missing or damaged parts to your local Agilent Technologies Sales and Service Office.

Table 3 Vacuum Degasser Delivery Checklist

Description	Quantity
Vacuum Degasser	1
Power Cable	1
Remote Cable	1
Auxiliary Cable	As ordered
Service Manual	1
Accessory Kit (Table 4 on page 21)	1

Accessory Kit Contents

Table 4 Accessory Kit Contents G1322-68705

Description	Part Number	Quantity
Syringe[1]	5062-8534	1
Syringe Adapter	9301-1337	1
Mounting Tool	0100-1710	1
Waste Tube[2]	5062-2463	1
Connecting Tubes labeled A to D	G1322-67300	4

[1] Reorder Number (pack of 10)

[2] Reorder Number (5 m)

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. This 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).

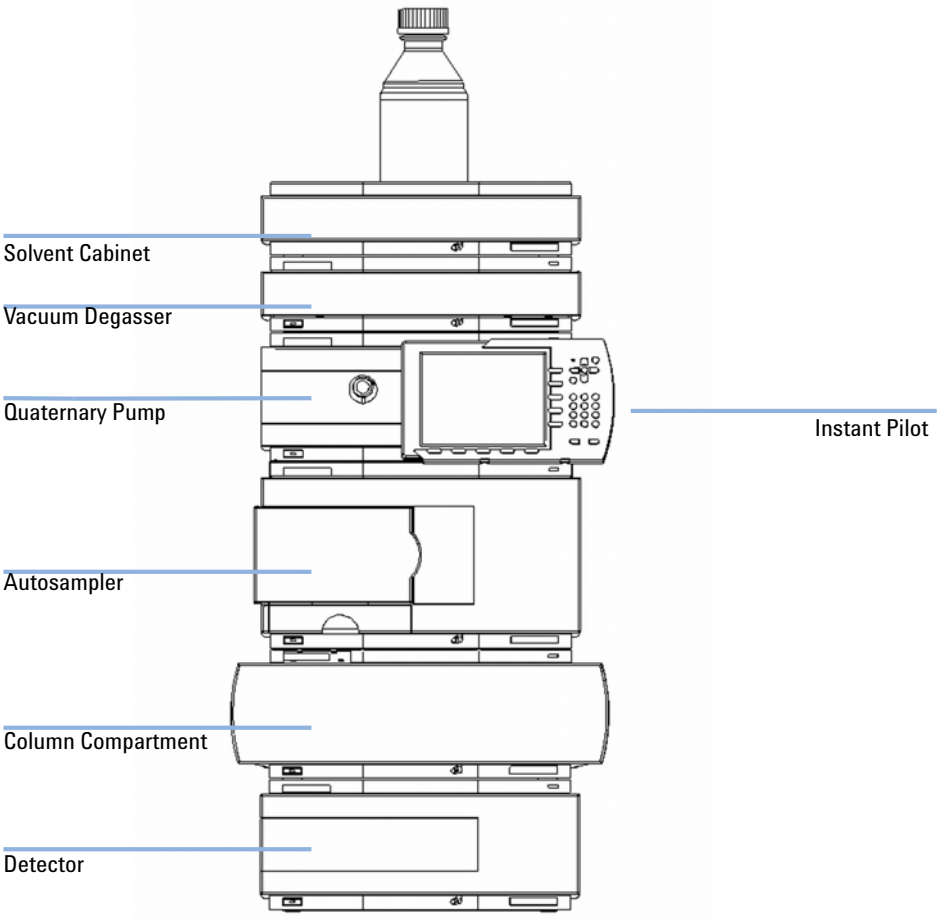

Figure 3 Recommended Stack Configuration (Front View)

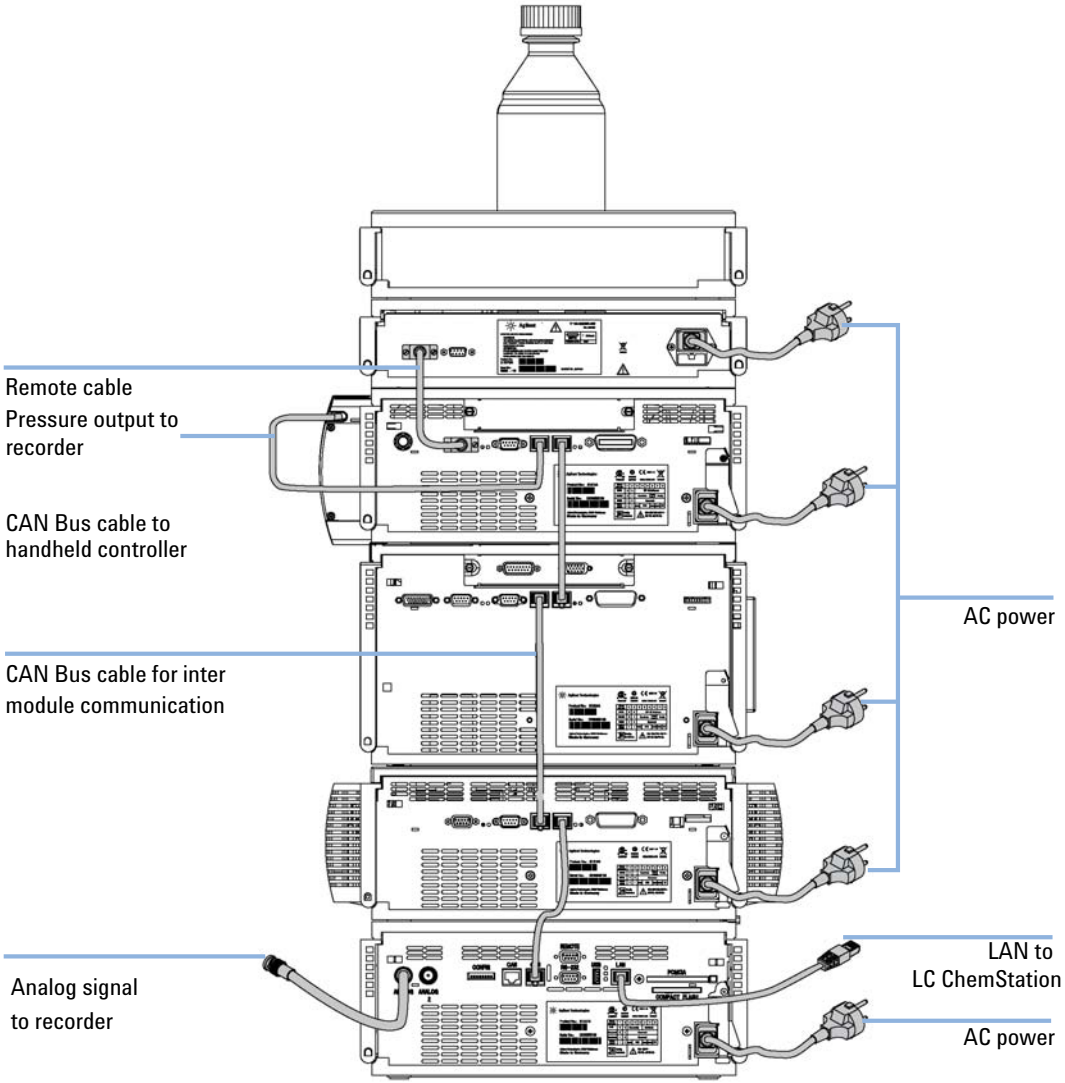

Figure 4 Recommended Stack Configuration (Rear View)

Installing the Vacuum Degasser

Parts required

#	Description
1	Vacuum degasser
1	Power cable
1	Interface cable as ordered, see "Cable Overview" on page 66

Preparations

- Locate bench space
- Provide power connections
- Unpack the vacuum degasser module

CAUTION

"Defective on arrival" problems

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

➔ Notify your Agilent sales and service office about the damage.

➔ An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.

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 interface cable to the vacuum degasser. The interface cable (remote cable) is a one way connection to send a not-ready signal from the degasser to the other modules to shut down the whole system after an error condition of the degasser.

NOTE

In an Agilent 1200 Series system, the individual modules are connected through a CAN cable. The Agilent 1200 Series vacuum degasser is an exception. 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 chamber. An Agilent 1200 Series control module can be connected to the CAN bus at any of the modules in the system except for the degasser. The Agilent ChemStation can be connected to the system through one GPIB or LAN cable at any of the modules (except for the degasser), preferably at the detector. For more information about connecting the control module or Agilent ChemStation refer to the respective user manual.

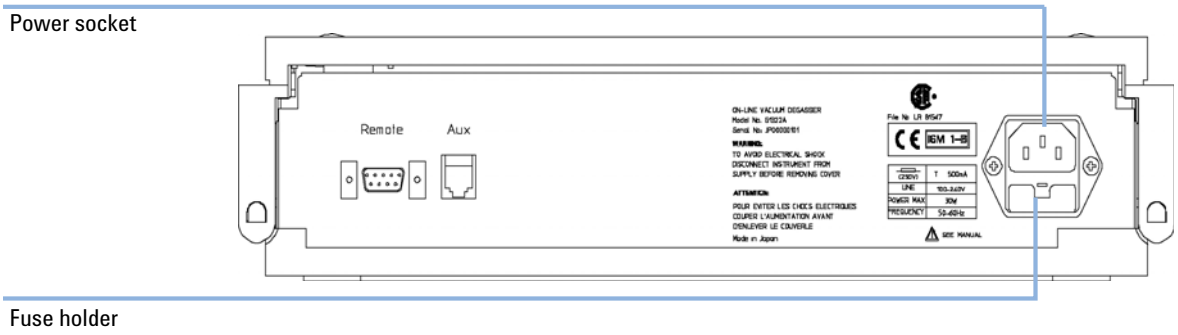

Figure 5 Rear of the Vacuum Degasser

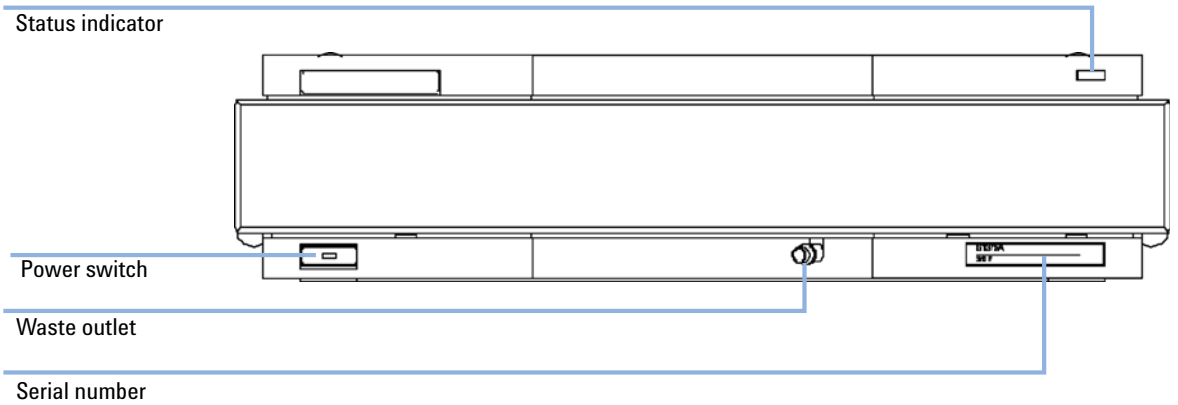

Figure 6 Front of the Vacuum Degasser

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 OF, the vacuum degasser is turned OFF.

Flow Connections to the Vacuum Degasser

Parts required

#	Description
1	Solvent cabinet including solvent bottles (filled with solvent) and bottle head assemblies
1	Vacuum degasser
1	Solvent outlet tubes
1	Syringe with adapter

Preparations

- Install the vacuum degasser

WARNING

Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

➔ 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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1 Place solvent cabinet with the bottle(s) on top of the vacuum degasser.

2 Remove the front cover by pressing the snap fasteners on both sides.

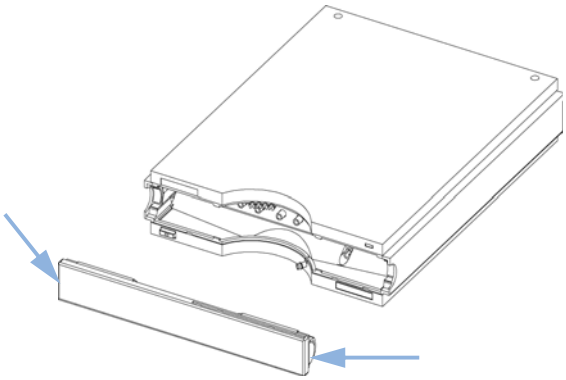


Figure 7 Removing the Front Cover

3 If the vacuum degasser is not used with an Agilent 1200 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 bottles 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. Use the mounting tool shown in Figure 8 on page 28 to fix the tube screw. Fix the tubes in the clips of the vacuum degasser.

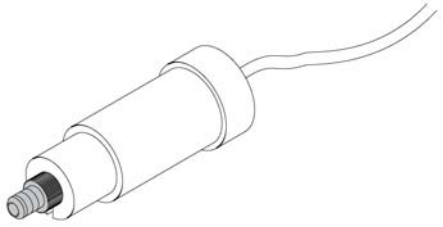


Figure 8 Mounting Tool

6 Connect the outlet tubes to the output ports (typically right connection of the channel) of the vacuum degasser.

7 Prime the degasser before first use (see "Priming the Degasser" on page 31).

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.

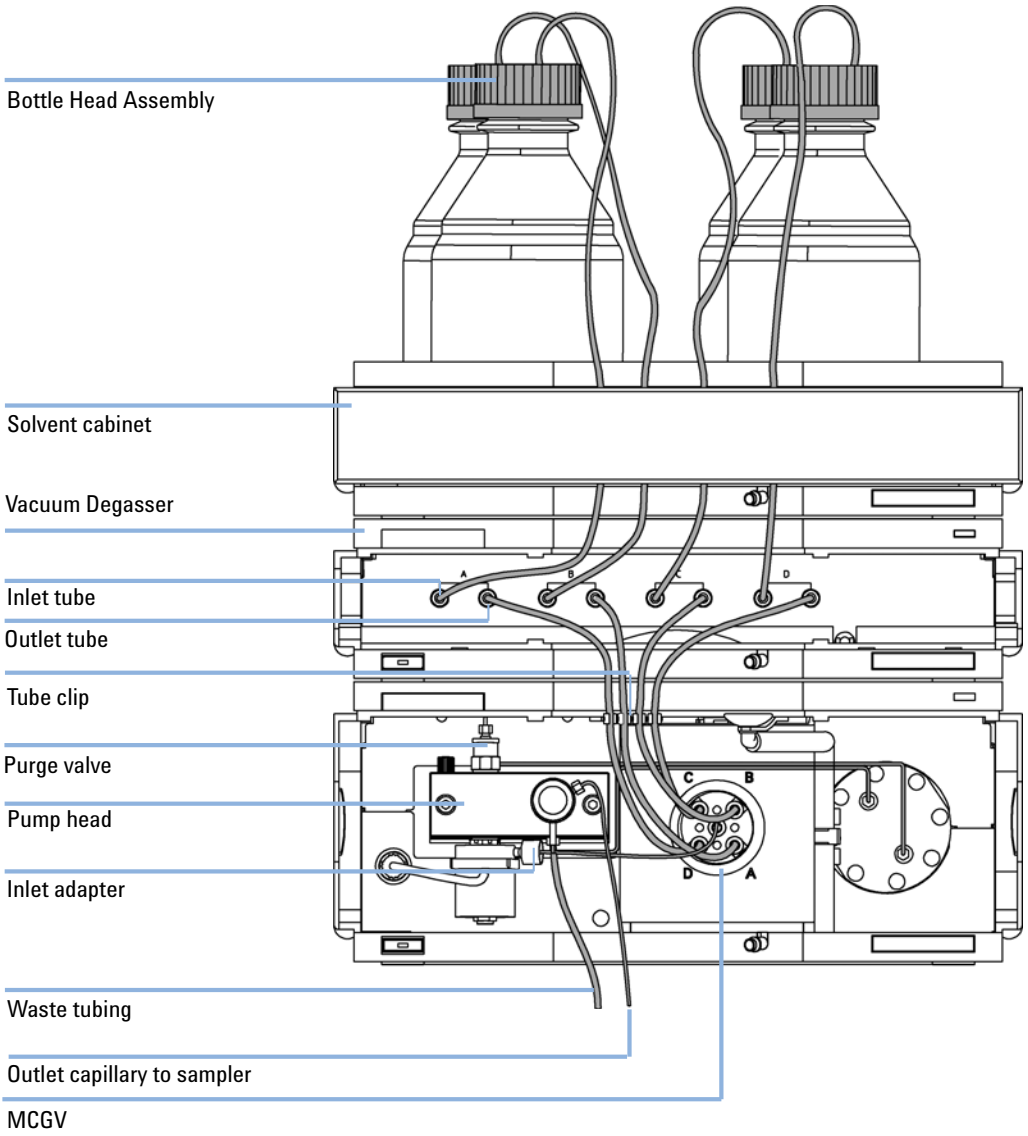


Figure 9 Flow Connections to the Vacuum Degasser (with Quarternary Pump)

Operational Hints for the Vacuum Degasser

Priming the Degasser

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, overnight) and if volatile solvent mixtures are used, or
- if solvents have been changed.

Priming with a Syringe

Before using a new degasser or new tubings for the first time:

WARNING

Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

➔ 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.

1 Prime all tubings with at least 30 ml of iso-propanol no matter whether the channels will be used with organic mobile phase or with water.

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

2 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.

3 Disconnect solvent outlet tube of the channel that is supposed to be primed from your pump.

4 Connect syringe adapter to solvent outlet tube.

5 Push syringe adapter onto syringe.

6 Pull syringe plunger to draw at least 30 ml of solvent through degasser and tubing.

7 Replace the priming solvent with the new solvent of your choice.

8 Pull syringe plunger to draw at least 30 ml of solvent through degasser and tubing.

9 Disconnect syringe adapter from solvent tube.

10 Connect solvent tube to your pump.

11 Repeat step 3 on page 32 to step 10 on page 32 for the other solvent channels.

NOTE When priming the vacuum degasser with a syringe the solvent is drawn through the degasser tubes very quickly. The solvent at the degasser outlet will therefore not be 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.

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

Priming with the Pump

When the pumping system has been turned off for a certain time (for example, overnight) oxygen will rediffuse into the solvent channels 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 an 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.
5. Repeat step 1 on page 33 through step 4 on page 33 with other channels, where needed.

Transporting the Vacuum Degasser

WARNING

Solvents leaking out

Solvents remaining in the solvent channels may leak out during transport. This can possibly cause personal damage.

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

1 Disconnect the solvent tubes from solvent inlets from front panel.
2 Disconnect one of the solvent tubes from your pump.
3 Connect syringe adapter to solvent tube of this 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 the solvent channel is completely empty.
6 Repeat step 2 on page 34 through step 5 on page 34 for the remaining solvent channels.

4
Using the Vacuum Degasser

When to Use a Vacuum Degasser?

WARNING

Unspecified Conditions

Operating the instrumentation under conditions other than their intended use might result in a potential safety hazard or might damage the instrumentation.

➔ Never operate your instrumentation under conditions other than specified by the vendor.

Pumps that mix the solvent on the low pressure side like the Agilent 1200 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. However for the following conditions the vacuum degasser is also recommended for an 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 optimum injection precision, or
- if your application requires highest retention time reproducibility (mandatory at flow rates below 0.5 ml/min),
- if your sample or detection is sensitive to dissolved oxygen in the mobile phase (degradation).

Generally a degasser should be used when negative effects due to dissolved gas in the mobile phase exceed the limits that are acceptable for the user. Negative effects that can be caused by dissolved gas are:

- Unstable flow due to unstable pumping conditions. This may result in a high ripple (unstable pressure at constant flow and with constant mobile phase composition) or high standard deviations of peak retention times and peak areas especially at low flow rates.
- Baseline noise on detectors that are sensitive to changes in the refractive index (e.g. RI detector or UV detector in the low UV range, both at maximum sensitivity).
- Sample degradation.

- Fluorescence Quenching due to dissolved oxygen.
- Baseline drift in electrochemical detectors due to dissolved oxygen especially in reduction mode.

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:

  $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether). Such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Mixtures of carbon tetrachloride with 2-propanol or THF dissolve stainless steel.

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, if possible amber 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 on the low-pressure side of the pumping system. A blocked filter therefore does not affect the pressure readings of the pump. The pressure readings cannot be used to indetify blocked filters. If the solvent cabinet is placed on top of the vacuum degasser the filter condition can be checked in the following way:

Remove the tubing 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 (due to 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 and place it in a beaker with concentrated nitric acid (35%) for one hour.
- Thoroughly flush the filter with bidistilled water (remove all nitric acid).
- Replace the filter.

NOTE Never use the system without solvent filter installed.

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.
- In operation mode 2 the vacuum degasser works in the range between 115 to 190 Torr.
- The continuous 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.

(1 Torr = 1.33×10^{-3} bar)

Table 5 Operation Modes of the Vacuum Degasser

	Operation Mode 1	Operation Mode 2	Continuous Mode	Error Mode
Pressure Range [Torr]	115	115 -190	Below 115	Above 190
DC Voltage Readings [mV] (rough values)	Lower Limit: 590 - 600 Upper Limit: 600 - 610	600 - 800	Below 600	Above 800
Operation mode	Pump switched on and off at upper and lower limit during operation	Pump switched on every 2 minutes for 30 seconds	Pump permantly running	8 Minutes of continuous pumping before shutdown
Status Indicator	OFF - below 800 mV YELLOW - above 800 mV	OFF - below 800 mV YELLOW - above 800 mV	OFF - below 800 mV YELLOW - above 800 mV	YELLOW
Failure Actions	Switch to Operation Mode 2	Switch to Error Mode	Switch to Error Mode	Shut down module, switch status indicator to RED

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

NOTE See service manual (troubleshooting and diagnostics) for setting up test meter connections to the degasser for reading the pressure sensor output.

Normal Operation Mode 1

When the degasser is turned ON, the vacuum pump runs and is connected to ambient through the solenoid valve. The solenoid valve activates about 15 seconds after turning ON the degasser (you can hear it click). The vacuum pump then begins to pull a vacuum on the vacuum chamber. The voltage measurements begin to decrease rapidly. The yellow status LED turns off when the vacuum level reaches 190 Torr (DC voltage readings around 800mV). The normal operation mode vacuum level (115 Torr) is achieved when the DC voltage measures approximately 590 to 600 mV. After achieving the normal operation mode vacuum level, the solenoid valve turns off. The vacuum pump continues to run for a few seconds, then it turns OFF. When the DC voltage measurement rises back to approximately 600 to 610 mV, the turn on process begins again. If the vacuum level of normal operation mode one cannot be achieved within 8 minutes the instrument turns into normal operation mode 2.

Normal Operation Mode 2 (Timing Mode)

Under certain operational conditions (large amount of dissolved gas in mobile phase, high flow rates) the 115 Torr trigger level for operation mode 1 cannot be reached. The vacuum degasser automatically turns into operation mode 2. Normal operation mode 2 is a fixed timing mode. Every 2 minutes the degasser is turned ON for 30 seconds. This assures a pressure level in the range from 115 to 190 Torr. The pressure signal measured with the auxiliary cable is in the range between 600 to 800 mV. If the vacuum level of normal operation mode two cannot be achieved within 8 minutes the instrument turns into error mode.

Continuous Mode

The continuous mode is activated either by switching SW1 on the main board to 1 (removal of cover is required, see "Removing and Refitting the Top Cover" on page 54, for identifying SW1, see Service Manual, Repairs, Overview of Internal Parts), 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 1. If the vacuum level of normal operation mode 2 cannot be achieved within 8 minutes the instrument turns into error mode.

NOTE When set to continuous mode the life time of the vacuum pump will be significantly reduced.

When to use Continuous Mode

In continuous 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).

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.

5
Troubleshooting and Diagnostics

Overview of the Degasser's Indicators

Status Indicators

The vacuum degasser is provided with two status indicators which indicate the operational state (ready, busy, and error states) of the vacuum degasser. The status indicators provide a quick visual check of the operation of the vacuum degasser (see "Overview of the Degasser's Indicators" on page 46).

Hardware Symptoms

A red status lamp at the vacuum degasser indicates a problem with the vacuum system or with the electronic control. The vacuum degasser generates an error output on the remote lines.

Status Indicators

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

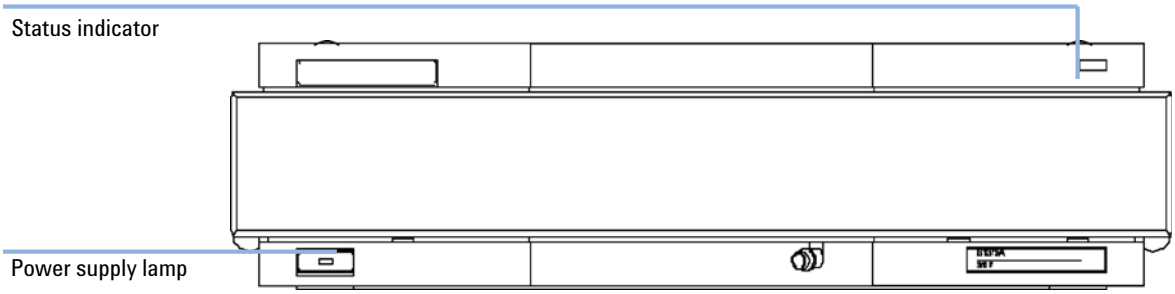


Figure 10 Location of Status Lamps

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 three 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 maintain vacuum in the chambers. This is the case when the vacuum degasser is turned ON for the first time or the pressure rises above 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 built up in a certain time frame (approximately 8 minutes).

CAUTION

Internal Leak or Electronic Failure

If the error LED is on, there is either an internal leak in the vacuum system or an electronic failure. In case of an internal leak it is possible that solvent may 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.

6
Maintenance

Introduction to Maintenance and Repair

Simple Repairs - Maintenance

The vacuum degasser is designed for easy repair. The most frequent repairs such as exchanging power fuses and status light pipes can be performed by the user, but require opening the main cover of the vacuum degasser. These repairs are described in this chapter.

Warnings and Cautions

WARNING

Open main cover

The following procedures require opening the main cover of the vacuum degasser.

➔ To prevent personal injury, remove the power cable from the vacuum degasser before opening the cover.

➔ Do not connect the power cable to the vacuum degasser while the covers are removed.

WARNING

Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

➔ 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.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ In order to prevent damage always use ESD protection when handling electronic boards and components.

CAUTION

The sheet metal plates of the degasser are very thin.

Although they have been deburred, they are still quite sharp. You may cut your hands or fingers.

➔ Never slide your fingers along the edges of the enclosure.

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 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.

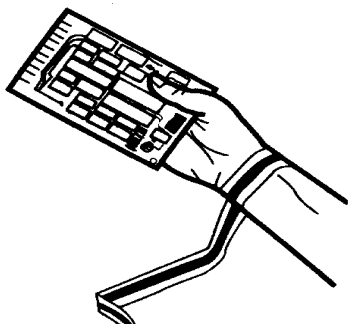


Figure 11 Using the ESD Strap

Cleaning the Instrument

WARNING

Liquid dripping into the electronic compartment of your module.

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

➔ Do not use an exessively damp cloth during cleaning.

➔ Drain all solvent lines before opening any fittings.

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.

Removing and Refitting the Top Cover

Tools required

- Screwdriver Pozidriv #1

Preparations

- Switch OFF the vacuum degasser at the main power switch
- Disconnect the power cable and remote 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.

WARNING

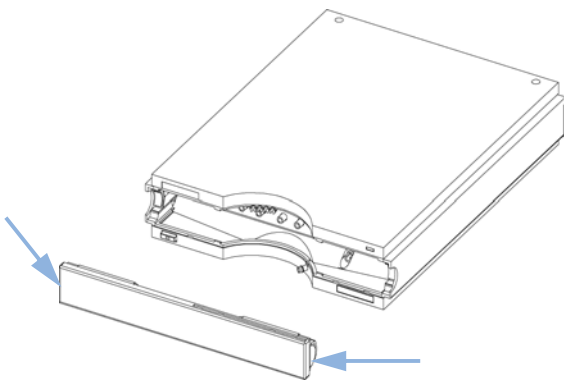
Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

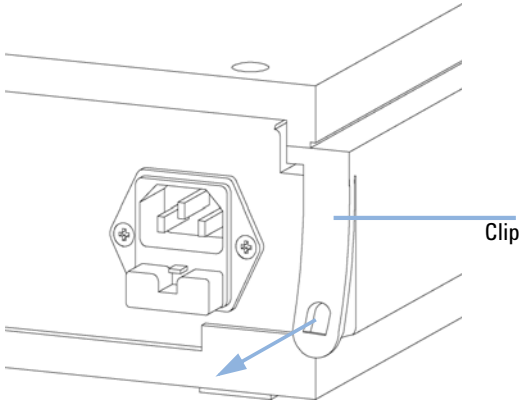
➔ When opening capillary or tube fittings solvents may leak out.

➔ 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.

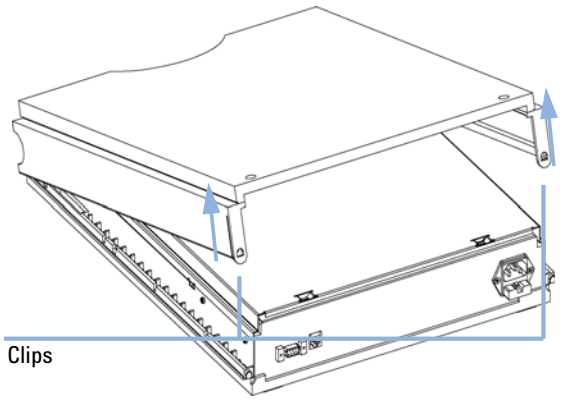
1 Remove the front panel.



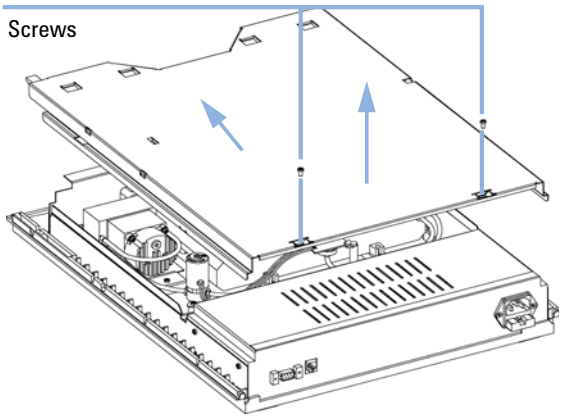
2 Unclip the clips on the top cover .



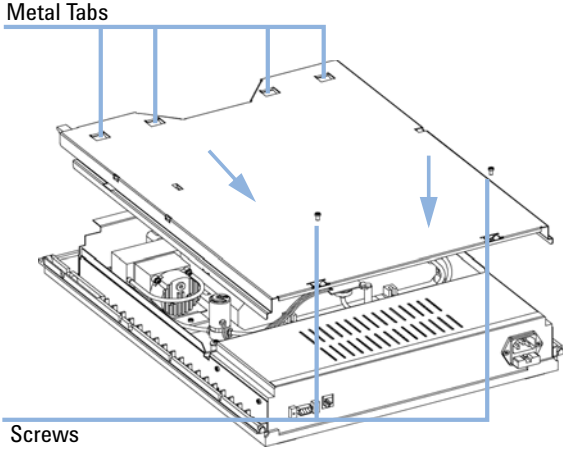
3 Lift the cover away.



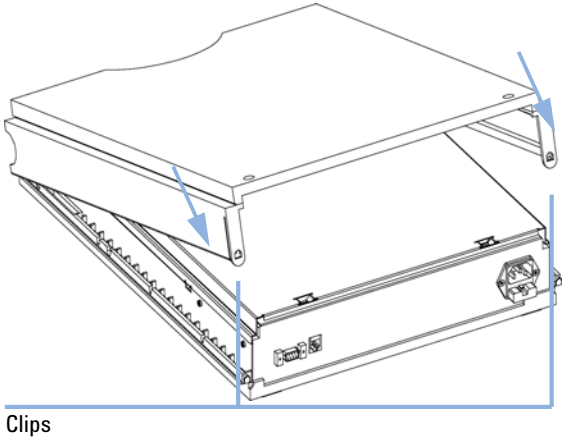
4 Unscrew the screws on the top plate and remove the plate by lifting its back and then sliding the plate to the front.

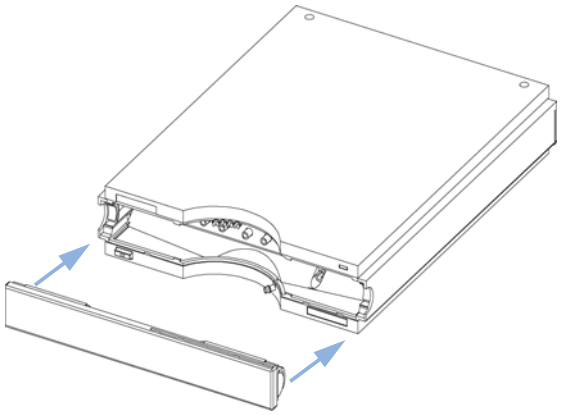


5 Place the metal cover onto the housing. Lower the front of the plate first, then slide panel to the back. Assure the four metal tabs of the panel slide underneath the Z-plane. Fix the two holding screws.



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



7 Reinstall the front cover. 	**8** Reinstall the vacuum degasser in your system stack and connect the cables and capillaries and turn on the vacuum degasser.

Assembling the Main Cover

When

- If cover is broken.

Parts required

#	Part number	Description
1	5065-9989	Cover kit (includes base, top, left and right)

CAUTION

Wrong assembly

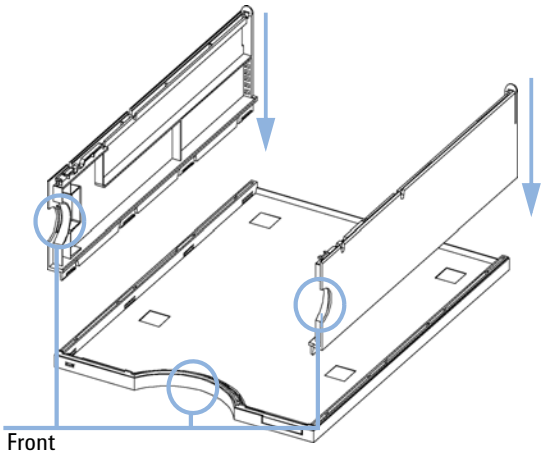
In case you insert the left or right side in the opposite position, you may not be able to remove the side from the top part.

➔ Take care not to mix up left and right side.

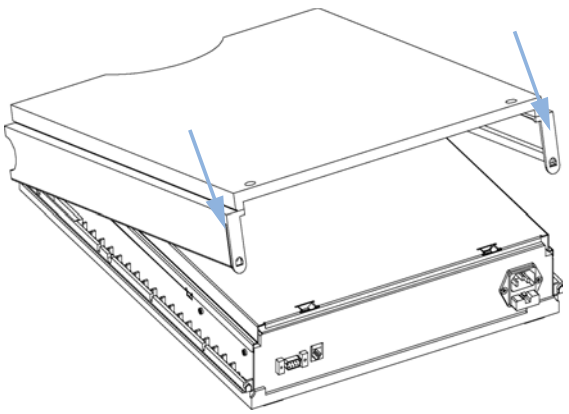
NOTE

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

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:

3 Replace the vacuum degasser in the stack and reconnect the cables and capillaries.

4 Turn ON the vacuum degasser.

Checking and Changing the Power Fuses

When
- If the vacuum degasser appears dead

Tools required
- Test meter (if available)

Parts required

#	Part number	Description
1	2110-0458	Fuse 500 mA

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.

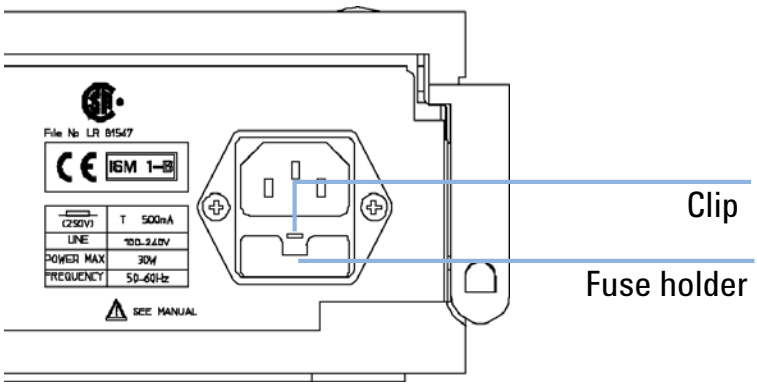


Figure 12 Fuse Holder and Clip

4 Remove the fuses from the fuse holders.

5 Ensure the fuse wires inside the fuses are not broken. If a test meter is 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.

Exchanging the Status Light Pipe

When
- If part is broken

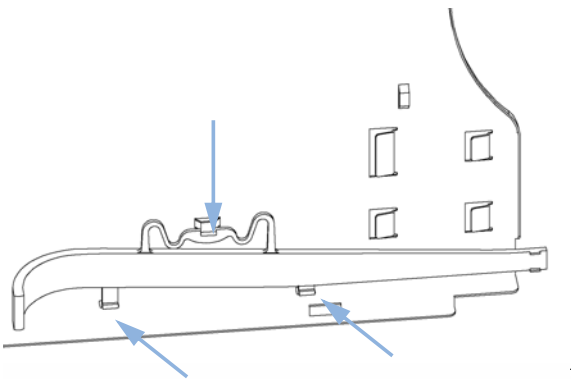
Tools required
- Screwdriver Pozidriv#1

Parts required

#	Part number	Description
1	5041-8384	Status light pipe

Preparations
- Remove the front cover and top cover, see "Removing and Refitting the Top Cover" on page 54.

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 54.

7
Parts and Materials for Maintenance

Cover Parts

Table 6 Cover Parts

Item	Description	Part Number
1	Set of all plastic covers, top-side-base	5065-9989
2	Front cover	5065-9990
3	Logo plate, Agilent 1200	5042-8901
4	Tube clip	5041-8387

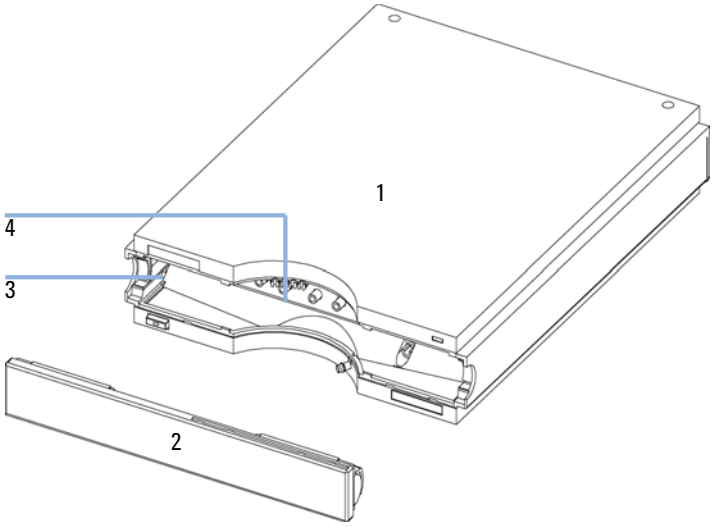


Figure 13 Cover Parts

Power and Status Light Pipes

Table 7 Power and Status Light Pipes

Item	Description	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

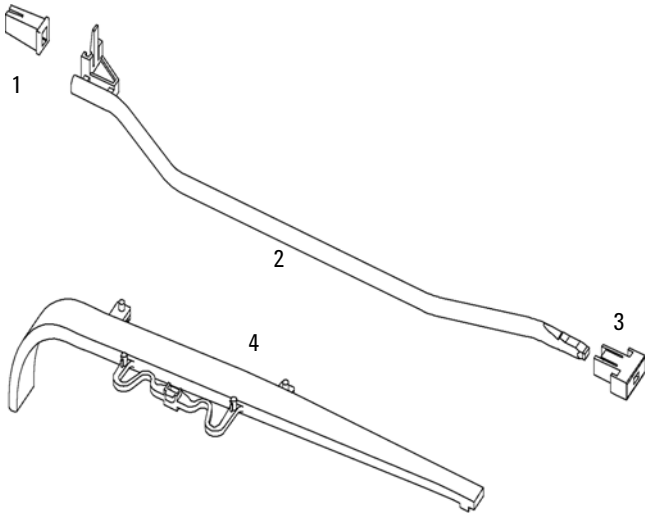


Figure 14 Power and Status Light Pipes

Accessory Kit

Table 8 Accessory Kit G1322-68705

Item	Description	Part Number
1	Syringe[1]	5062-8534
2	Syringe adapter	9301-1337
3	Mounting Tool	0100-1710
4	Solvent tubing kit (4 tubes degasser to pump)	G1322-67300
5	Waste tube**	5062-2463

[1] Reorder number (pack of 10)**Reorder number (5m)

8
Identifying Cables

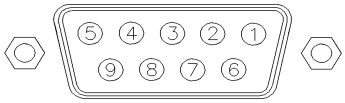
Cable Overview

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

Type	Description	Part Number
Analog cables	3390/2/3 integrators	**01040-60101**
	3394/6 integrators	**35900-60750**
	Agilent **35900A** A/D converter	**35900-60750**
	General purpose (spade lugs)	**01046-60105**
Remote cables	3390 integrator	**01046-60203**
	3392/3 integrators	**01046-60206**
	3394 integrator	**01046-60210**
	3396A (Series I) integrator	**03394-60600**
	3396 Series II / 3395A integrator, see details in section "Remote Cables" on page 68	
	3396 Series III / 3395B integrator	**03396-61010**
	HP 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**
BCD cables	3396 integrator	**03396-60560**
	General purpose (spade Lugs)	**G1351-81600**
Auxiliary	Agilent 1100 Series vacuum degasser	**G1322-61600**

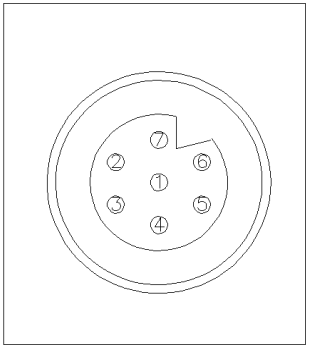
Type	Description	Part Number
CAN cables	Agilent 1100/1200 module to module,0.5m lg Agilent 1100/1200 module to module, 1m lg	**5181-1516** **5181-1519**
External contacts	Agilent 1100/1200 Series interface board to general purpose	**G1103-61611**
GPIB cable	Agilent 1100/1200 module to ChemStation, 1 m Agilent 1100/1200 module to ChemStation, 2 m	**10833A** **10833B**
RS-232 cable	Agilent 1100/1200 module to a computer This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter.	**34398A**
LAN cable	Twisted pair cross over LAN cable, (shielded 3m long) (for point to point connection)	**5023-0203**
	Twisted pair cross over LAN cable, (shielded 7m long) (for point to point connection)	**5023-0202**

Remote Cables

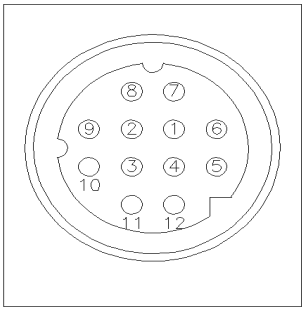


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent 1100/1200 Series modules. The other end depends on the instrument to be connected to.

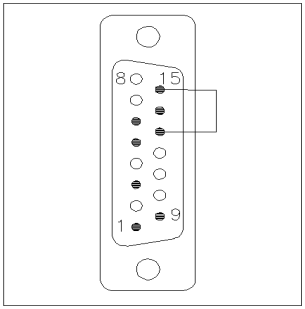
Agilent 1100/1200 to 3390 Integrators

Connector 01046-60203	Pin 3390	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	2	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	7	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	NC	7 - Red	Ready	High
	NC	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1100/1200 to 3392/3 Integrators

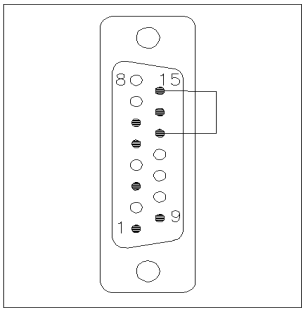
Connector01046-60206	Pin 3392/3	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	3	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	11	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	9	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1100/1200 to 3394 Integrators

Connector01046-60210	Pin 3394	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	1	9 - Black	Start request	Low
	13, 15		Not connected	

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

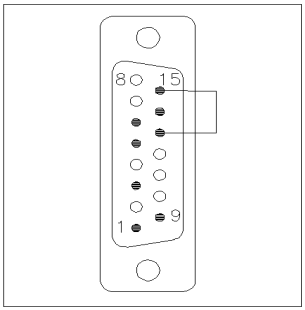
Agilent 1100/1200 to 3396A Integrators

Connector03394-60600	Pin 3394	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

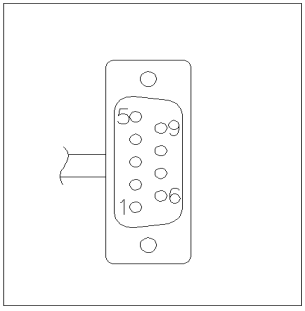
Agilent 1100/1200 to 3396 Series II / 3395A Integrators

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

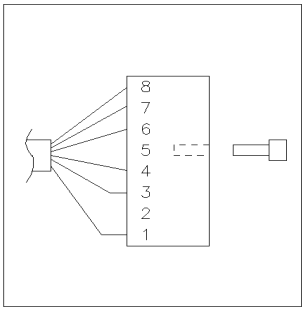
Agilent 1100/1200 to 3396 Series III / 3395B Integrators

Connector03396-61010	Pin 33XX	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	14	7 - Red	Ready	High
	4	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

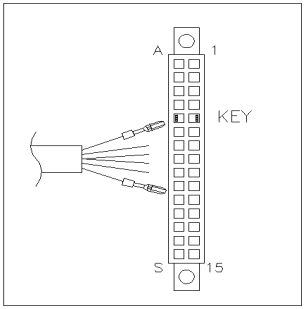
Agilent 1100/1200 to HP 1050, HP 1046A or Agilent 35900 A/D Converters

Connector5061-3378	Pin HP 1050/....	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent 1100/1200 to HP 1090 LC or Signal Distribution Module

Connector01046-60202	Pin HP 1090	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	1	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	4	3 - Gray	Start	Low
	7	4 - Blue	Shut down	Low
	8	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	3	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

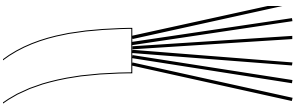
Agilent 1100/1200 to General Purpose

Connector01046-60201	Pin Universal	Pin Agilent 1100/1200	Signal Name	Active (TTL)
		1 - White	Digital ground	
		2 - Brown	Prepare run	Low
		3 - Gray	Start	Low
		4 - Blue	Shut down	Low
		5 - Pink	Not connected	
		6 - Yellow	Power on	High
		7 - Red	Ready	High
		8 - Green	Stop	Low
		9 - Black	Start request	Low

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

Connector G1322-81600	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

9 Appendix

General Safety Information

General Safety Information

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

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

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

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 fuse holders must be avoided.

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

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

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

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

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

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

Safety Symbols

Table 9 Safety Symbols

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

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

➔ Do not proceed beyond a warning until you have fully understood and met the indicated conditions.

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

➔ Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

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

Abstract

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

NOTE

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

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

Do not dispose off in domestic household waste

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

Radio Interference

Cables supplied by Agilent Technoligies are screened to provide opitimized protection against radio interference. All cables are in compliance with safety or EMC regulations.

Test and Measurement

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

Sound Emission

Manufacturer's Declaration

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

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

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

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 1200 Series modules for download.

Index

www.agilent.com

In This Book

This manual contains user information about the Agilent 1200 Series vacuum degasser. The manual describes the following:

- introduction,
- site requirements and specifications,
- installing the vacuum degasser,
- using the vacuum degasser,
- troubleshooting and diagnostics,
- maintenance,
- parts and materials for maintenance,
- identifying cables,
- appendix.

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