Agilent 1200 Series Standard and Preparative Autosamplers

Reference Manual

Agilent Technologies

Notices

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About this document

This document covers three Agilent 1200 Series autosampler modules:

G1329A: The Agilent 1200 Series Standard Autosampler, which is used for injecting samples from vials on the analytical scale

G1329B The Agilent 1200 Series Autosampler SL, which is the high pressure variant of the standardautosampler. It can be operated at up to 600 bar and is ideal for the use with other 1200 series SL products.

G2260A: The Agilent 1200 Series Preparative Autosampler, which is used to work with samples on a preparative scale. Sample volumes of up to 5000 µl can be injected using this module and the multiple draw hardware extension.

For detailed specifications please refer to Chapter 8, “Performance Specifications.

As many hardware components of these modules are identical, many procedures can be discussed in common. Where applicable, module specific information is available in this manual.

In This Guide...

1 Installing the Autosampler

Site requirements and installation of the autosampler

2 Optimizing Performance

Autosamplers are more and more used in HPLC to improve the productivity in the laboratories and the consistency and accuracy of analytical results

This chapter shows how to optimize the autosamplers to achieve best results

3 Troubleshooting and Test Functions

The modules built-in troubleshooting and test functions

4 Repairing the Autosampler

Instructions on simple, routine repair procedures as well as more extensive repairs requiring exchange of internal parts

5 Parts and Materials

Detailed illustrations and lists for identification of parts and materials

6 Introduction to the Autosampler

An introduction to the standard and preparative autosamplers

Theory of Operation

Theory of operation of mechanical hardware, electronics, and instrument interfaces

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Introduction to the screens available for operation of the Agilent 1200 Series autosamplers with the control module

9 Specifications

Performance specifications of the Agilent 1200 Series Standard and Preparative Autosamplers

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Installing the Autosampler

Site Requirements

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

Power Consideration

The autosampler power supply has wide-ranging capability. Consequently there is no voltage selector in the rear of the autosampler. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

The thermostatted autosampler comprises two modules, the standard or preparative autosampler and the thermostat (G1330B). Both modules have a separate power supply and a power plug for the line connections. The two modules are connected by a control cable and both are turned on by the autosampler module.

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

WARNING **To disconnect the thermostatted autosampler from line power, unplug the power cord from the autosampler and the ALS thermostat. The power supplies still use some power, even if the power switch on the front panel is turned off. Please make sure that it is always possible to access the power plug.**

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

Power Cords

Your autosampler is delivered with a power cord which matches the wall socket of your particular country or region. The plug on the power cord which connects to the rear of the instrument is identical for all types of power cord.

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

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

Bench Space

The autosampler dimensions and weight (see Table 1 on page 16) allow the instrument to be placed on almost any laboratory bench. The instrument requires an additional 2.5 cm (1.0 inch) of space on either side, and approximately 8 cm (3.1 inches) at the rear for the circulation of air, and room for electrical connections. Ensure the autosampler is installed in a horizontal position.

The thermostatted autosampler dimensions and weight allow the instrument to be placed on almost any laboratory bench. The instrument requires an additional 25 cm (10 inches) of space on either side for the circulation of air, and approximately 8 cm (3.1 inches) at the rear for electrical connections. Ensure the autosampler is installed in a level position.

If a complete Agilent 1200 Series system is to be installed on the bench, make sure that the bench is designed to carry the weight of all the modules. For a complete system including the thermostatted autosampler it is recommended to position the modules in two stacks, see "Optimizing the Stack Configuration" on page 21. Make sure that in this configuration there is 25 cm (10 inches) space on either side of the thermostatted autosampler for the circulation of air.

Environment

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

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

Table 1 Physical Specifications - Autosampler (G1329A /G1329B/G2260A)

Type	Specification	Comments
Weight	14.2 kg (31.3 lbs)	
Dimensions (height × width × depth)	200 × 345 × 435 mm (8 × 13.5 × 17 inches)	
Line voltage	100 – 120 or 220 – 240 VAC, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption (apparent power) Power consumption (active power)	300 W 200 W	Maximum Maximum
Ambient operating temperature	4 – 55 °C (41 – 131 °F)	see on page 17
Ambient non-operating temperature	-40 to 70 °C (-4 to 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 autosampler
Safety standards: IEC, CSA, UL	Installation Category II, Pollution Degree 2 For indoor use only	
IVD Statement	Research Use Only. Not for use in Diagnostic Procedures.	

WARNING **Using the autosampler at environmental temperatures higher than 50 °C (122 °F) may cause the rear panel to become hot.**

Unpacking the Autosampler

CAUTION If you need to ship the autosampler at a later date, always park the transport assembly before shipment (see "Transporting the Autosampler" on page 42).

Damaged Packaging

Upon receipt of your autosampler, 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 autosampler has been checked mechanically and electrically. If the shipping container or cushioning material is damaged, notify the carrier and save the shipping material for the carriers inspection.

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

Delivery Checklist

Ensure all parts and materials have been delivered with the autosampler. The instrument box contains the instrument and an Accessory kit. A separate box contains the reference manual and the power cable.

In Table 2 on page 19 and Table 3 on page 20 are listed the content of each accessory kit.

Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 2 G1329A/G1329B - Standard Autosampler Accessory Kit Contents G1329-68725

Description	Part Number
Tubing assembly	5063-6527
Filter promo kit	5064-8240
CAN cable, 1 m long	5181-1519
Screw cap vials, clear 100/pk	5182-0714
Blue screw caps 100/pk	5182-0717
Label halftray	5989-3890
Vial instruction sheet	no PN
Wrenches 1/4 - 5/16 inch	8710-0510
Rheotool socket wrench 1/4 inch	8710-2391
Hex key 4 mm, 15 cm long, T-handle	8710-2392
Hex key 9/64 inch, 15 cm long, T- handle	8710-2394
Hex key 2.5 mm, 15 cm long, straight handle	8710-2412
Finger caps (x3)*	5063-6506
Front door cooled autosampler	G1329-40301
Air channel adapter	G1329-43200
Cover insulation	no PN
Capillary 0.17 mm, 900 mm	G1329-87300
Capillary heat exchanger	01090-87306
Note for Agilent 1200 Series Autosampler door upgrade	no PN

* Reorder gives pack of 15

Table 3 G2260A - Preparative Autosampler Accessory Kit Contents G2260-68705

Description	Part Number
Tubing assembly	5063-6527
Filter promo kit	5064-8240
CAN cable, 1 m long	5181-1519
Screw cap vials, clear 100/pk	5182-0714
Blue screw caps 100/pk	5182-0717
Label halftray	5989-3890
Wrenches 1/4 - 5/16 inch	8710-0510
Rheotool socket wrench 1/4 inch	8710-2391
Hex key 4 mm, 15 cm long, T-handle	8710-2392
Hex key 9/64 inch, 15 cm long, T- handle	8710-2394
Hex key 2.5 mm, 15 cm long, straight handle	8710-2412
Finger caps x3 (reorder gives pack of 15)	5063-6506
Front door cooled autosampler	G1329-40301
Air channel adapter	G1329-43200
Tray for 15 x 6 ml vials (x2)	G1313-44513
Union, loop extension	5022-2133
Seat extension capillary (500 µl)	G1313-87307
Seat extension capillary (1500 µl)	G1313-87308
Sampler - Column capillary	G2260-87300

Optimizing the Stack Configuration

If your autosampler is part of a system, you can ensure optimum performance by installing the autosampler in the stack in the position shown in Figure 1 on page 22 and Figure 2 on page 23. Figure 3 on page 24 and Figure 4 on page 25 show the configuration recommended for a thermostatted autosampler. These configurations optimize the system flow path, ensuring minimum delay volume.

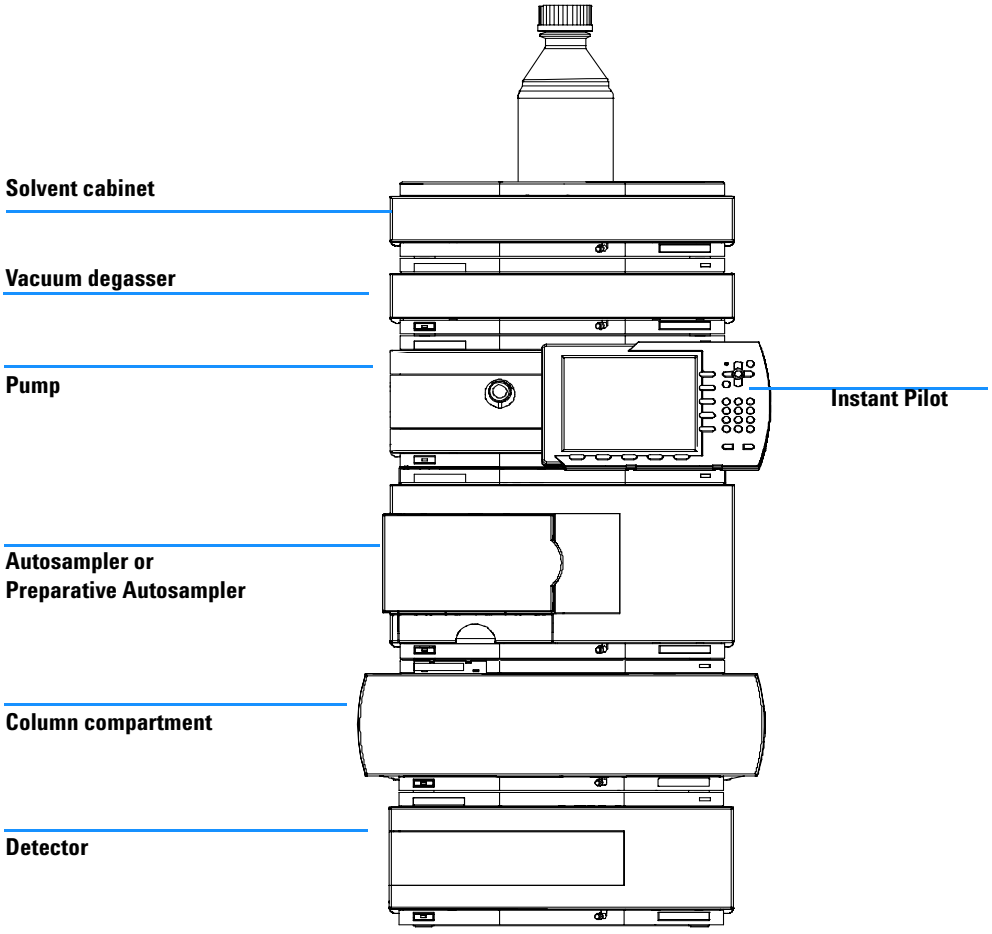


Figure 1 Recommended Stack Configuration for an Autosampler (Front View)

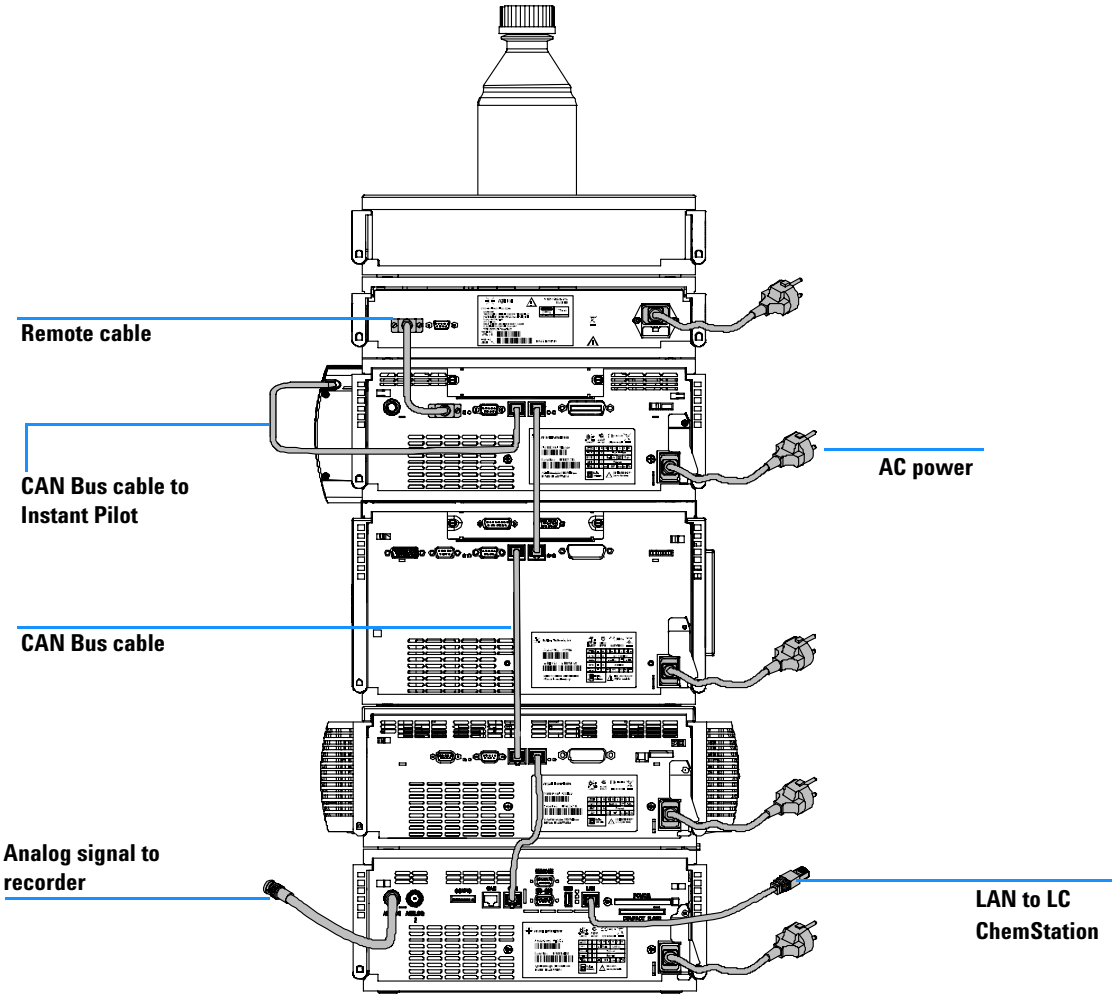


Figure 2 Recommended Stack Configuration for an Autosampler (Rear View)

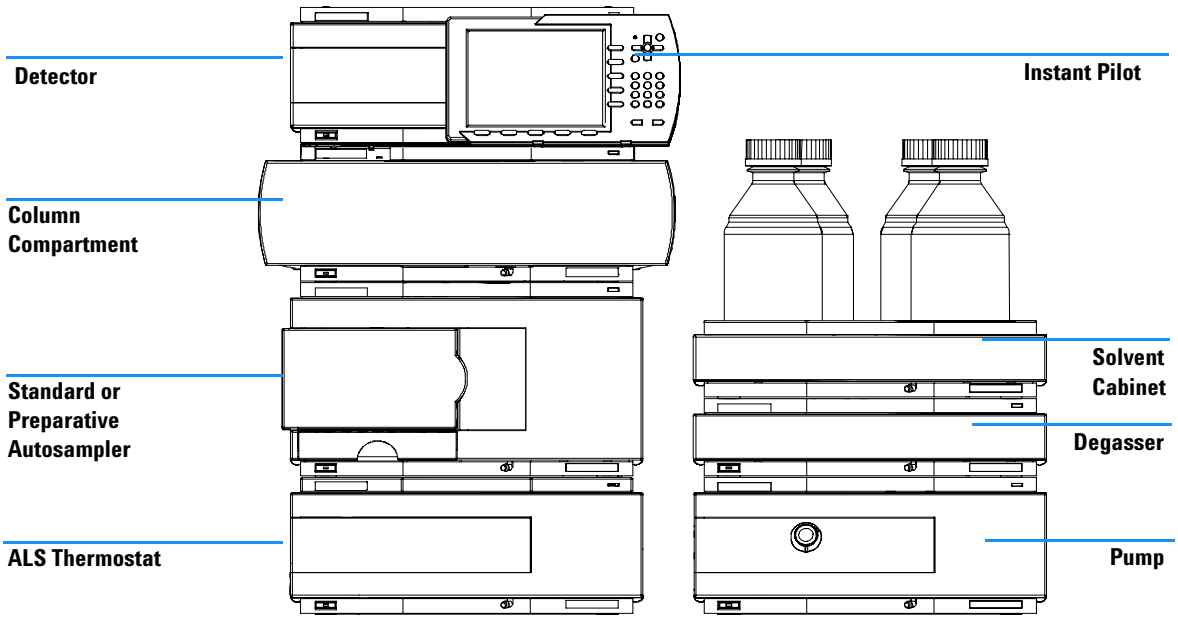


Figure 3 Recommended Stack Configuration for a thermostatted ALS (Front View)

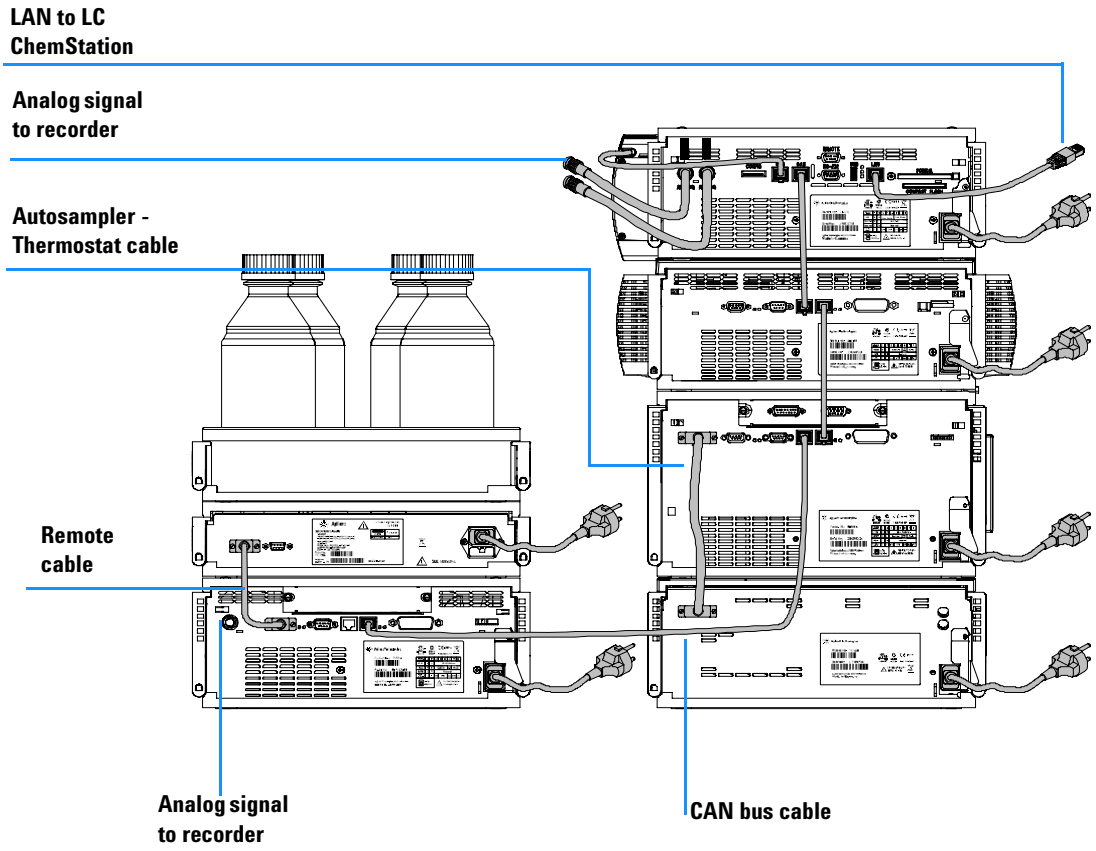


Figure 4 Recommended Stack Configuration for a thermostatted ALS (Rear View)

Installing the Autosampler

Preparation	Locate bench space Provide power connection Unpack the Sampler
Parts required	Sampler Power cord, for the other cables see below and "Cable Overview" on page 148 Chemstation and/or Control Module G1323B.

WARNING **To avoid personal injury, keep fingers away from the needle area during autosampler operation. Do not bend the safety flap away from its position, or attempt to remove the safety cover (see Figure 5). Do not attempt to insert or remove a vial from the gripper when the gripper is positioned below the needle.**

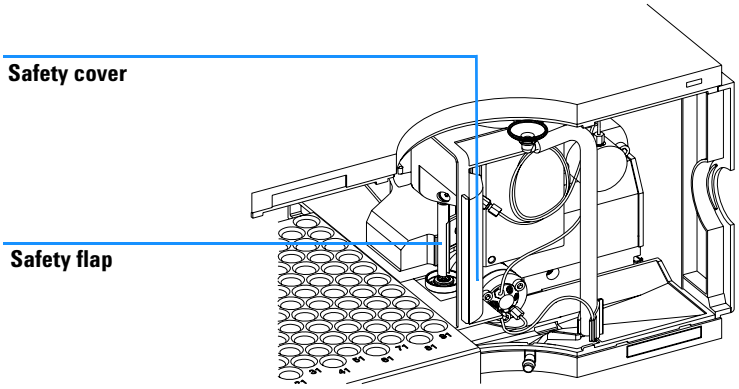


Figure 5 Safety Flap

1 Install the LAN interface board in the sampler (if required), see "LAN Communication Interface Board" on page 193.

2 Remove the adhesive tape which covers the front door.

3 Remove the front door and remove the transport protection foam.

4 Place the Autosampler on the bench or in the stack as recommended in "Recommended Stack Configuration for an Autosampler (Front View)" on page 22.

5 Ensure the power switch at the front of the Autosampler is OFF.

6 Connect the power cable to the power connector at the rear of the sampler.

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

8 If an Agilent Chemstation is the controller, connect either

- The GPIB cable to the detector
- The LAN connector to the LAN interface

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

10 Turn ON power by pushing the button at the lower left hand side of the sampler.

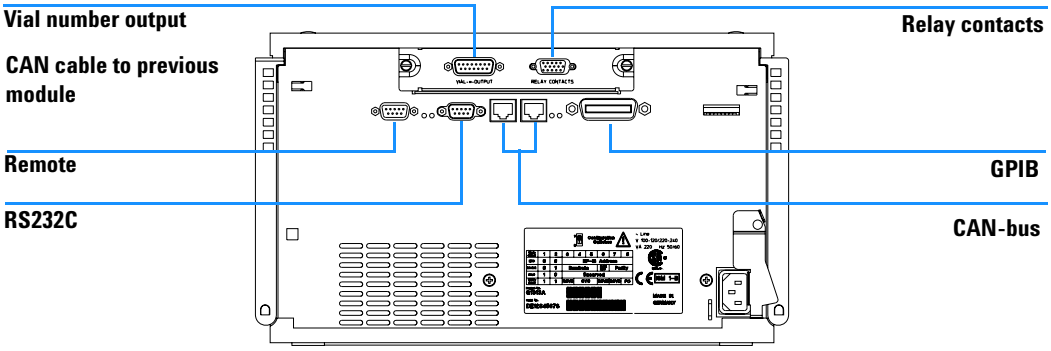


Figure 6 Cable Connections

NOTE If the front cover is not installed the autosampler is in a not ready condition and operation is inhibited.

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

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

Installing the Thermostatted Autosampler

Preparation	Locate bench space Provide power connection Unpack the Sampler and the Thermostat
Parts required	Sampler and Thermostat Power cord, for the other cables see below and "Cable Overview" on page 148 Chemstation and/or Control Module G1323B.

1 Place the Thermostat on the bench.

2 Remove the front cover and route the condensation drain tube to the waste.

WARNING **Make sure that the condensation tube is always above the liquid level in the vessel. If the tube is located in liquid the condensed water cannot flow out of the tube and the outlet is blocked. Any further condensation will then remain in the instrument. This may damage the instruments electronics.**

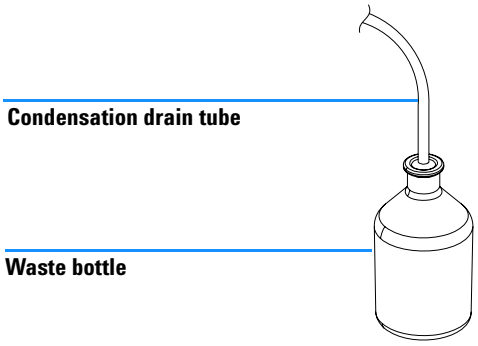


Figure 7 Condensation Leak outlet

3 Install the LAN interface board in the sampler (if required), see "LAN Communication Interface Board" on page 193.

4 Remove the adhesive tape which covers the front door.

5 Remove the front door and remove the transport protection foam.

6 Place the Autosampler on top of the Thermostat. Make sure that the Autosampler is correctly engaged in the Thermostat locks.

7 Place the air channel adapter into the autosampler tray base. Make sure the adapter is fully pressed down. This assures that the cold airstream from the Thermostat is correctly guided to the tray area of the Autosampler.

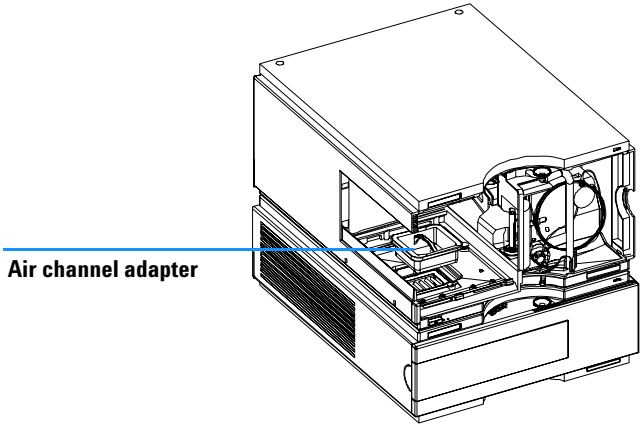


Figure 8 Air channel adapter

8 Re-install the tray

9 Ensure the power switch on the front of the Autosampler is OFF and the power cables are disconnected.

10 Connect the cable between the Autosampler and the Thermostat, see Figure 9 on page 33.

WARNING **Do not disconnect or reconnect the autosampler to ALS thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.**

11 Connect the power cables to the power connectors.

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

13 If an Agilent ChemStation is the controller, connect either
- The GPIB cable to the detector
- The LAN connector to the LAN interface

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

15 Turn ON power by pushing the button at the lower left hand side of the sampler.

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

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

WARNING **To avoid personal injury, keep fingers away from the needle area during Autosampler operation. Do not attempt to insert or remove a vial or a plate when the needle is positioned.**

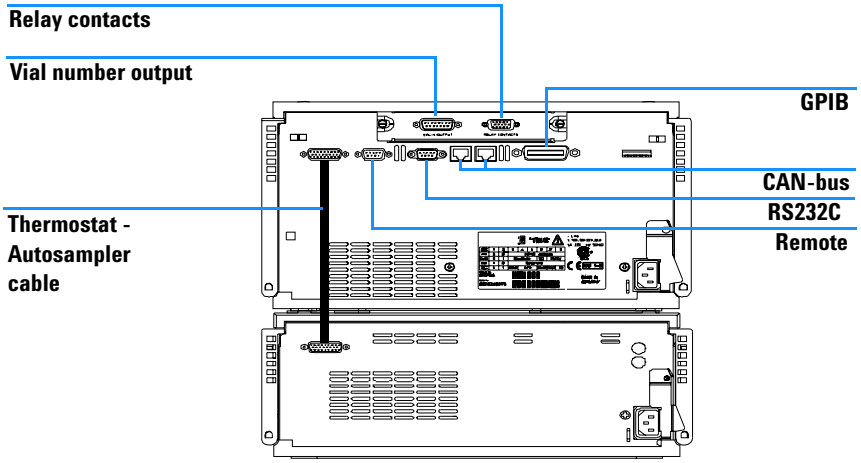


Figure 9 Cable Connections

Flow Connections

Preparation	Sampler is installed in the LC system
Parts required	Parts from the Accessory kit

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.**

1. Connect the pump outlet capillary to port 1 of the injection valve.
2. Connect column-compartment inlet capillary to port 6 of the injection valve.
3. Connect the corrugated waste tube to the solvent waste from the leak plane.
4. Ensure that the waste tube is positioned inside the leak channel.

NOTE Do not extend the waste capillary of the autosampler. The siphoning effect might empty the complete seat capillary introducing air into the system.

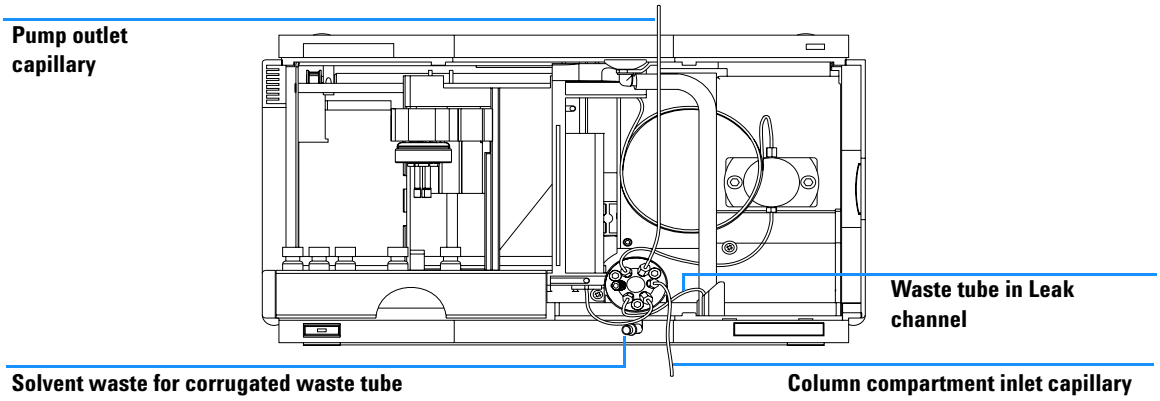


Figure 10 Hydraulic Connections

Sample Trays

Installing the Sample Tray

1 Open the front door.

2 Load the sample tray with sample vials as required.

3 Slide the sample tray into the autosampler so that the rear of the sample tray is seated firmly against the rear of the sample-tray area.

4 Press the front of the sample tray down to secure the tray in the autosampler.

NOTE If the thermostatted autosampler tray pops out of position the air channel adapter is not inserted correctly.

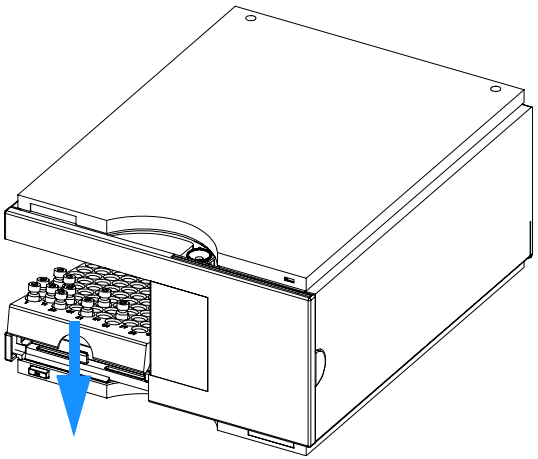


Figure 11 Installing the Sample Tray

Supported trays for the different Autosampler

Table 4 Supported trays for the Autosampler (G1329A/ G2260A)

Description	Part Number
Tray for 100 x 2 ml vials	G1313-44510
Halftray for 15 x 6 ml vials	G1313-44513
Halftray for 40 x 2 ml vials	G1313-44512
Thermostattable Tray for 100 x 2 ml vials	G1329-60011
Halftray for 15 x 6 ml vials (for G2260A only*)	G1313-44513

* This tray is not recommended when using a thermostat

Half-Tray Combinations

Half-trays can be installed in any combination enabling both 2 ml-and 6 ml-vials to be used simultaneously.

Numbering of Vial Positions

The standard 100-vial tray has vial positions 1 to 100. However, when using two half-trays, the numbering convention is slightly different. The vial positions of the right-hand half tray begin at position 101 as follows:

Left-hand 40-position tray: 1 - 40

Left-hand 15-position tray: 1–15

Right-hand 40-position tray: 101–140

Right-hand 15-position tray: 101–115

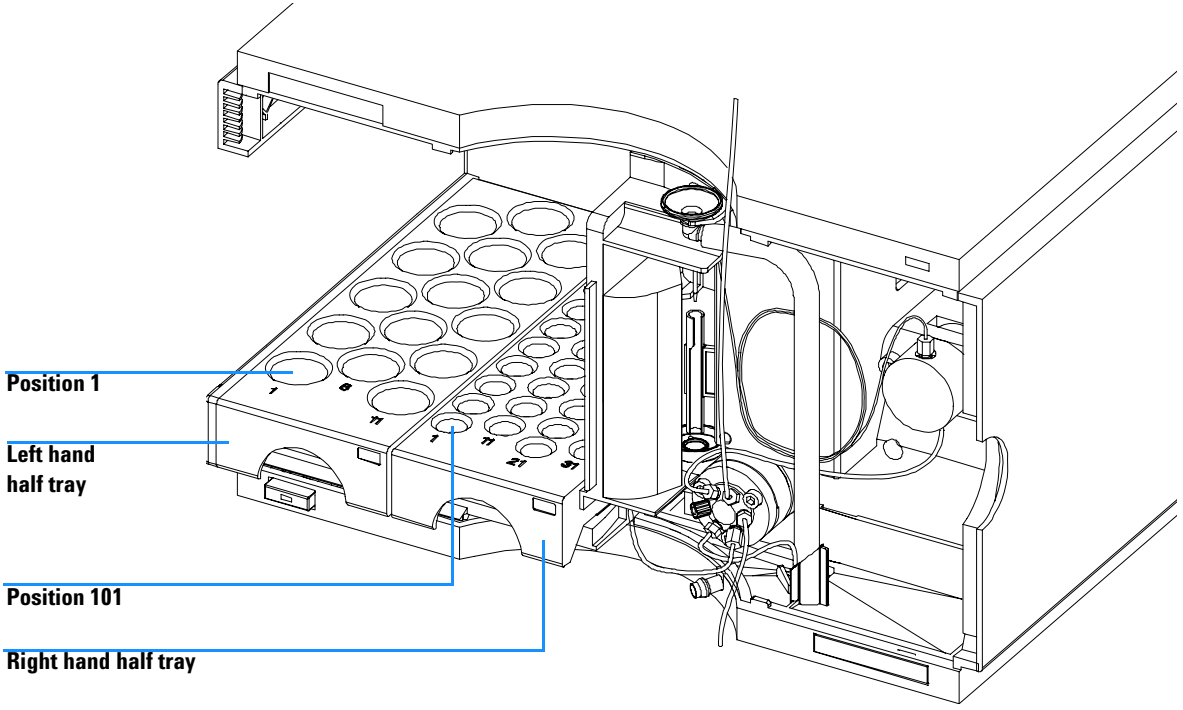


Figure 12 Numbering of Tray Positions

Choice of Vials and Caps

List of Compatible Vials and Caps

For reliable operation vials used with the Agilent 1200 Series autosampler must not have tapered shoulders or caps that are wider than the body of the vial. The vials in Table 5 on page 39, Table 6 on page 39 and Table 7 on page 40 and caps in Table 8 on page 40, Table 9 on page 41 and Table 10 on page 41 (shown with their Part numbers) have been successfully tested using a minimum of 15,000 injections with the Agilent 1200 Series autosampler.

Table 5 Crimp Top Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5181-3375	5183-4491	
Clear glass, write-on spot	2	5182-0543	5183-4492	5183-4494
Amber glass, write-on spot	2	5182-3376	5183-4493	5183-4495
Polypropylene, wide opening	1	5182-0567		5183-4496
Polypropylene, wide opening	0.3		9301-0978	

Table 6 Snap Top Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0544	5183-4504	5183-4507

Table 6 Snap Top Vials (continued)

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass, write-on spot	2	5182-0546	5183-4505	5183-4508
Amber glass, write-on spot	2	5182-0545	5183-4506	5183-4509

Table 7 Screw Top Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0714	5183-2067	5183-2070
Clear glass, write-on spot	2	5182-0715	5183-2068	5183-2071
Amber glass, write-on spot	2	5182-0716	5183-2069	5183-2072

Table 8 Crimp Caps

Description	Septa	100/Pack
Silver aluminum	Clear PTFE/red rubber	5181-1210
Silver aluminum	Clear PTFE/red rubber	5183-4498 (1000/Pack)
Blue aluminum	Clear PTFE/red rubber	5181-1215
Green aluminum	Clear PTFE/red rubber	5181-1216
Red aluminum	Clear PTFE/red rubber	5181-1217

Table 9 Snap Caps

Description	Septa	100/Pack
Clear polypropylene	Clear PTFE/red rubber	5182-0550
Blue polypropylene	Clear PTFE/red rubber	5182-3458
Green polypropylene	Clear PTFE/red rubber	5182-3457
Red polypropylene	Clear PTFE/red rubber	5182-3459

Table 10 Screw Caps

Description	Septa	100/Pack
Blue polypropylene	Clear PTFE/red rubber	5182-0717
Green polypropylene	Clear PTFE/red rubber	5182-0718
Red polypropylene	Clear PTFE/red rubber	5182-0719
Blue polypropylene	Clear PTFE/silicone	5182-0720
Green polypropylene	Clear PTFE/silicone	5182-0721
Red polypropylene	Clear PTFE/silicone	5182-0722

Transporting the Autosampler

When moving the autosampler around the laboratory, no special precautions are needed. However, if the autosampler needs to be shipped to another location via carrier, ensure:

- The transport assembly is parked (see "Park Arm (Park Gripper)" on page 259);
- The vial tray is secured.

If the autosampler is to be shipped to another location, the transport assembly must be moved to the park position to prevent mechanical damage should the shipping container be subjected to excessive shock. Also, ensure the vial tray is secured in place with suitable packaging, otherwise the tray may become loose and damage internal components.

2
Optimizing Performance

Optimization for Lowest Carry-over

Several parts of an injection system can contribute to carry-over:

- needle outside
- needle inside
- needle seat
- sample loop
- seat capillary
- injection valve

The autosampler continuous flow-through design ensures that sample loop, needle inside, seat capillary, and the mainpass of the injection valve is always in the flow line. These parts are continuously flushed during an isocratic and also during a gradient analysis. The residual amount of sample remaining on the outside of the needle after injection may contribute to carry-over in some instances. When using small injection volumes or when injecting samples of low concentration immediately after samples of high concentration, carry-over may become noticeable. Using the automated needle wash enables the carry-over to be minimized and prevents also contamination of the needle seat.

Using the Automated Needle Wash

The automated needle wash can be programmed either as “injection with needle wash” or the needle wash can be included into the injector program. When the automated needle wash is used, the needle is moved into a wash vial after the sample is drawn. By washing the needle after drawing a sample, the sample is removed from the surface of the needle immediately.

Uncapped Wash Vial

For best results, the wash vial should contain solvent in which the sample components are soluble, and the vial should *not* be capped. If the wash vial is capped, small amounts of sample remain on the surface of the septum, which may be carried on the needle to the next sample.

Injector Program with Needle Wash

The injector program includes the command NEEDLE WASH. When this command is included in the injector program, the needle is lowered once into the specified wash vial before injection.

For example:

1 DRAW 5 µl

2 NEEDLE WASH vial 7

3 INJECT

Line 1 draws 5 µl from the current sample vial. Line 2 moves the needle to vial 7. Line 3 injects the sample (valve switches to main pass).

Using an Injector Program

The process is based on a program that switches the bypass grove of the injection valve into the flow line for cleaning. This switching event is performed at the end of the equilibration time to ensure that the bypass grove is filled with the start concentration of the mobile phase. Otherwise the separation could be influenced, especially if microbore columns are used.

For example:

Outside wash of needle in vial 7 before injection

Injector program:

Draw x.x (y) µl from sample

NEEDLE WASH vial 7

Inject

Wait (equilibration time - see text above)

Valve bypass

Wait 0.2 min

Valve mainpass

Valve bypass

Valve mainpass

NOTE Overlapped injection together with additional injection valve switching is not possible.

General Recommendation to Lowest Carry-over

- For samples where needle outside cannot be cleaned sufficiently with water or alcohol use wash vials with an appropriate solvent. Using an injector program and several wash vials can be used for cleaning.

In case the needle seat has got contaminated and carry-over is significantly higher than expected, the following procedure can be used to clean the needle seat:

- Go to MORE INJECTOR and set needle to home position.
- Pipette an appropriate solvent on to the needle seat. The solvent should be able to dissolve the contamination. If this is not known use 2 or 3 solvents of different polarity. Use several milliliters to clean the seat.
- Clean the needle seat with a tissue and remove all liquid from it.
- RESET the injector.

Fast Injection Cycle and Low Delay Volume

Short injection cycle times for high sample througput is one of the most important requirements in analytical laboratories. In order to shorten cycle times, you can:

- shorten the column length
- use high flow rates
- apply a steep gradient

Having optimized these parameters, further reduction of cycle times can be obtained using the overlapped injection mode.

Overlapped Injection Mode

In this process, as soon as the sample has reached the column, the injection valve is switched back to bypass and the next injection cycle starts but waits with switching to mainpass until the actual run is finished. You gain the sample preparation time when using this process.

Switching the valve into the bypass position reduces the system delay volume, the mobile phase is directed to the column without passing sample loop, needle and needle seat capillary. This can help to have faster cycle times especially if low flow rates have to be used like it is mandatory in narrow bore and micro bore HPLC.

NOTE Having the valve in bypass position can increase the carry-over in the system.

The injection cycle times also depend on the injection volume. In identically standard condition, injecting 100 µl instead of 1 µl, increase the injection time by approximately 8 sec. In this case and if the viscosity of the sample allows it, the draw and eject speed of the injection system has to be increased.

NOTE

For the last injection of the sequence with overlapped injections it has to be considered that for this run the injection valve is not switched as for the previous runs and consequently the injector delay volume is not bypassed. This means the retention times are prolonged for the last run. Especially at low flow rates this can lead to retention time changes which are too big for the actual calibration table. To overcome this it is recommended to add an additional “blank” injection as last injection to the sequence.

General Recommendations for Fast Injection Cycle Times

As described in this section, the first step to provide short cycle times are optimizing the chromatographic conditions. If this is done the autosampler parameter should be set to:

- Overlapped injection mode
- Increase of draw and eject speed for large injection volumes
- Add at last run a blank, if overlapped injection is used

To reduce the injection time, the detector balance has to be set to OFF.

Precise Injection Volume

Injection Volumes Less Than 2 µl

When the injection valve switches to the BYPASS position, the mobile phase in the sample loop is depressurized. When the syringe begins drawing sample, the pressureof the mobile phase is decreased further. If the mobile phase is not degassed adequately, small gas bubbles may form in the sample loop during the injection sequence. When using injection volumes < 2 µl, these gas bubbles may affect the injection-volume precision. For best injection-volume precision with injection volumes < 2 µl, use of the Agilent 1200 Series degasser is recommended to ensure the mobile phase is adequately degassed. Also, using the automated needle wash (see "Optimization for Lowest Carry-over" on page 44) between injections reduces carry-over to a minimum, further improving the injection volume precision.

Draw and Eject Speed

Draw Speed

The speed at which the metering unit draws sample out of the vial may have an influence on the injection volume precision when using viscous samples. If the draw speed is too high, air bubbles may form in the sample plug, affecting precision. The default draw speed is 200 µl/min for the autosampler and 1000 µl/min for the preparative autosampler. This speed is suitable for the majority of applications, however, when using viscous samples, set the draw speed to lower speed for optimum results. A "DRAW" statement in an injector program also uses the draw speed setting which is configured for the autosampler.

Eject Speed

The default eject speed setting is 200 µl/min for the standard autosampler and 1000 µl/min for the preparative autosampler. When using large injection volumes, setting the eject speed to a higher value speeds up the injection cycle by shortening the time the metering unit requires to eject solvent at the beginning of the injection cycle (when the plunger returns to the home position).

An “EJECT” statement in an injector program also uses the eject speed setting which is configured for the autosampler. A faster eject speed shortens the time required to run the injector program. When using viscous samples, a high eject speed should be avoided.

Choice of Rotor Seal

Vespel™ Seal (for standard valves only)

The standard seal has sealing material made of Vespel. Vespel is suitable for applications using mobile phases within the pH range of 2.3 to 9.5, which is suitable for the majority of applications. However, for applications using mobile phases with pH below 2.3 or above 9.5, the Vespel seal may degrade faster, leading to reduced seal lifetime.

Tefzel™ Seal (for standard valve only)

For mobile phases with pH below 2.3 or above 9.5, or for conditions where the lifetime of the Vespel seal is drastically reduced, a seal made of Tefzel is available (see "Injection-Valve Assembly" on page 130). Tefzel is more resistant than Vespel to extremes of pH, however, is a slightly *softer* material. Under normal conditions, the expected lifetime of the Tefzel seal is shorter than the Vespel seal, however, Tefzel may have the longer lifetime under more extreme mobile phase conditions.

PEEK Seal (for preparative injection valve only)

The preparative injection valve has a sealing material made of PEEK. This material has high chemical resistance and versatility. It is suitable for application using mobile phases within a pH between 1 and 14.

This seal is also used for the G1329B module.

NOTE Strong oxidizing acids such as concentrated nitric and sulfuric acids are not compatible with PEEK.

3
Repairing the Autosampler

Introduction into Repairing the Autosampler

Simple Repairs

The autosampler is designed for easy repair. The most frequent repairs such as change and needle assembly change can be done from the front of the instrument with the instrument in place in the system stack. These repairs are described in "Simple Repairs" on page 54.

Exchanging Internal Parts

Some repairs may require exchange of defective internal parts. Exchange of these parts requires removing the autosampler from the stack, removing the covers, and disassembling the autosampler.

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

Safety Flap, Flex Board

It is strongly recommended that the exchange of the safety flap, and flex board is done by Agilent-trained service personnel.

Transport Assembly Parts

The adjustment of the motors, and the tension on the drive belts are important for correct operation of the transport assembly (see "Transport Assembly" on page 85). It is strongly recommended that exchange of drive belts, and the gripper assembly is done by Agilent-trained service personnel. There are no other field-replaceable parts in the transport assembly. If any other component is defective (flex board, spindles, plastic parts) the complete unit must be exchanged.

Updating the Firmware

The Agilent 1200 Series LC modules are fitted with FLASH EPROMS. These EPROMS enable you to update the instrument firmware from the ChemStation, PCMCIA card, or through the RS232 interface. The firmware update procedure is described in the on-line user information.

Cleaning the Autosampler

The autosampler covers 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 autosampler.

WARNING **Do not let liquid drip into the autosampler. It could cause a shock hazard or damage to the autosampler.**

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.

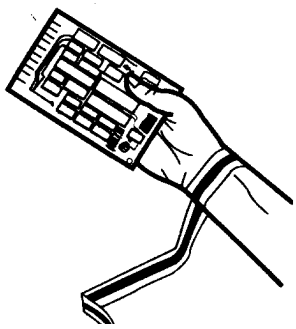


Figure 13 Using the ESD Strap

Overview of Main Repair Procedures

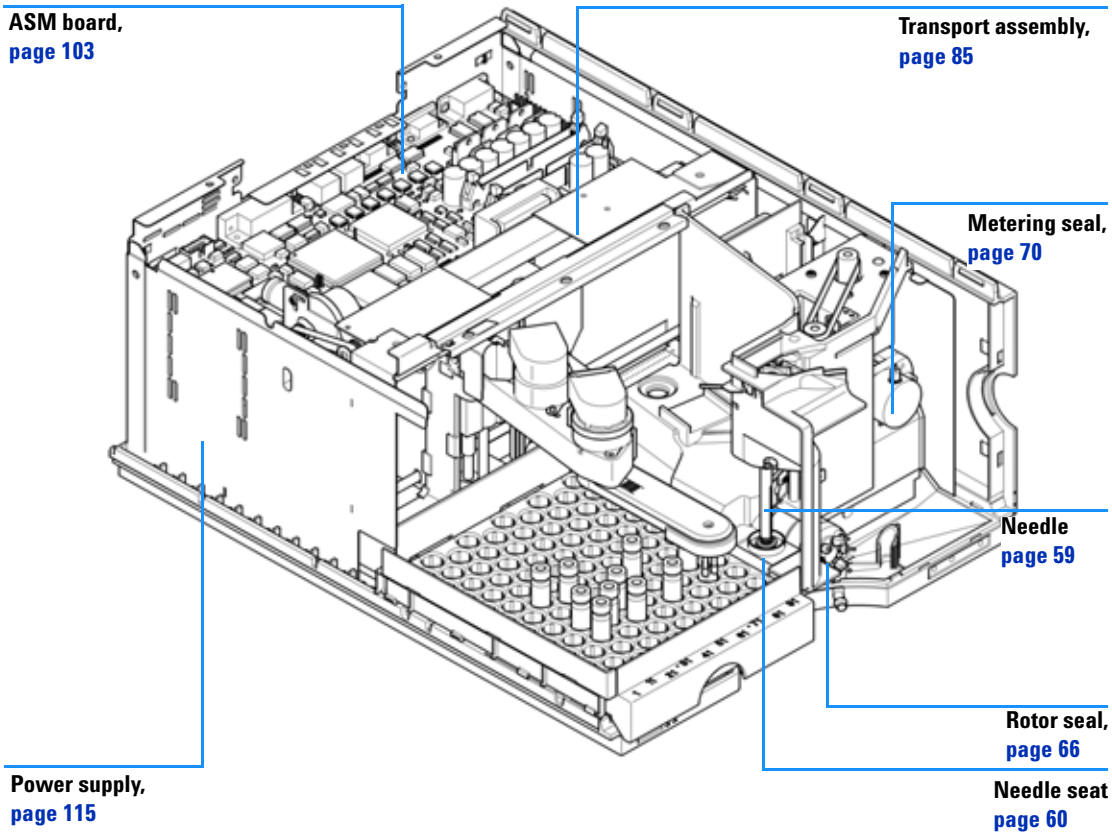


Figure 14 Main Assemblies

Simple Repairs

The procedures described in this section can be done with the autosampler in place in the stack. You will do some of these procedures on a more frequent basis.

Table 11 Simple Repair Procedures

Procedure	Typical Frequency	Time Required	Notes
Exchanging the needle assembly	When needle shows indication of damage or blockage	15 minutes	See "Needle Assembly" on page 59
Exchanging the seat assembly	When the seat shows indication of damage or blockage	10 minutes	See "Needle-Seat Assembly" on page 60
Exchanging the rotor seal	After approximately 30000 to 40000 injections, or when the valve performance shows indication of leakage or wear	30 minutes	See "Rotor Seal" on page 66
Exchanging the metering seal	When autosampler reproducibility indicates seal wear	30 minutes	See"Metering Seal and Plunger" on page 70
Exchanging the gripper arm	When the gripper arm is defective	10 minutes	See"Gripper Arm" on page 74

Needle Assembly

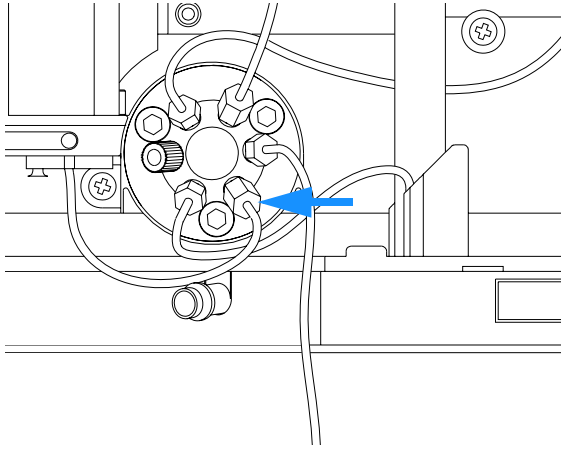
Frequency	When the needle is visibly damaged When the needle is blocked
Tools required	¼ inch wrench (supplied in accessory kit) 2.5 mm Hex key (supplied in accessory kit) A pair of pliers
Parts required	Needle assembly (G1313-87201) *for G1313-87101 or G1313-87103 needle-seat* Needle assembly (G1329-80001) *for G1329-87101 or G1329-87103 needle seat* Needle assembly (900 µl loop cap) (G1313-87202) *for G1313-87101 needle seat* Needle assembly (900 µl loop cap) (G2260-87201) *for G2260-87101 needle-seat*
Preparations for this procedure	Select "Start" in the maintenance function "Change Needle" (see "Change Needle" on page 256). When the needle is positioned approx.15 mm above the needle seat, remove the front cover.

WARNING **To avoid personal injury, keep fingers away from the needle area during autosampler operation. Do not bend the safety flap away from its position, or attempt to insert or remove a vial from the gripper when the gripper is positioned below the needle.**

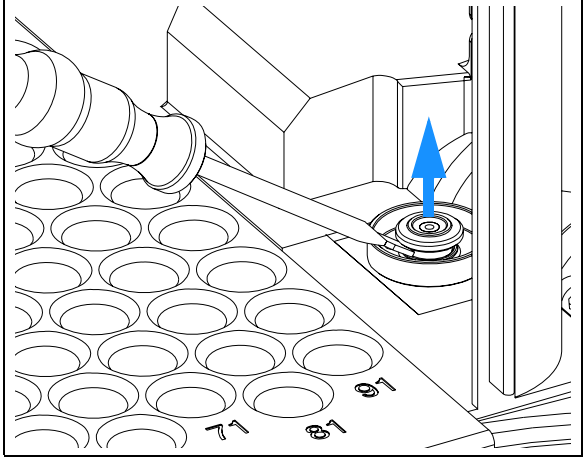
Needle-Seat Assembly

Frequency	When the seat is visibly damaged When the seat capillary is blocked
Tools required	1/4 inch wrench (supplied in accessory kit). Flat-head screwdriver.
Parts required	Needle-seat assy (0.17 mm i.d 2.3 µl) G1313-87101 *for G1329A/B* Needle-seat assy (0.12 mm i.d 1.2 µl) G1313-87103 *for G1329A/B* Needle-seat assy (0.50 mm i.d 20 µl) G2260-87101 *for G2260A*
Preparations for this procedure	Select "Start" in the maintenance function "Change Needle" (see "Change Needle" on page 256). Remove the front cover. Use the "Needle Up" command in the "Change Needle" function to lift the needle an addition 1 cm.

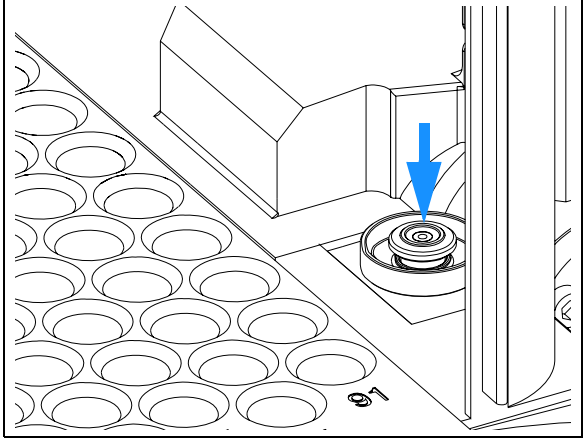
1 Disconnect the seat-capillary fitting from the injection valve (port 5).



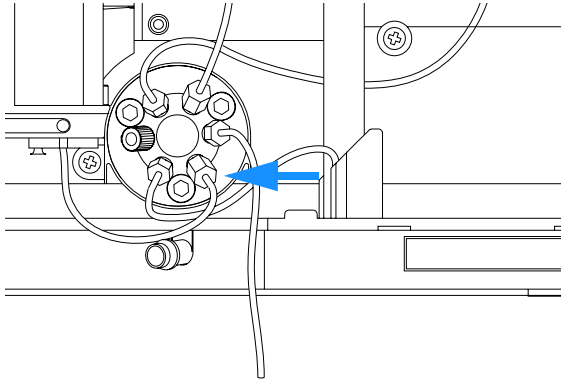
2 Use a small flat-head screwdriver to ease out the needle seat.



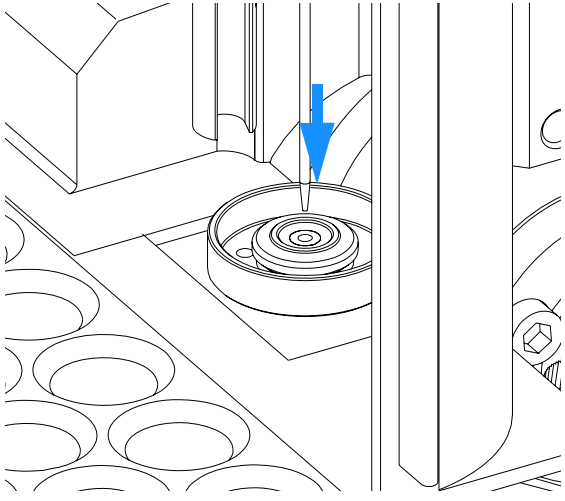
3 Insert the new needle-seat assembly. Press the seat firmly into position.



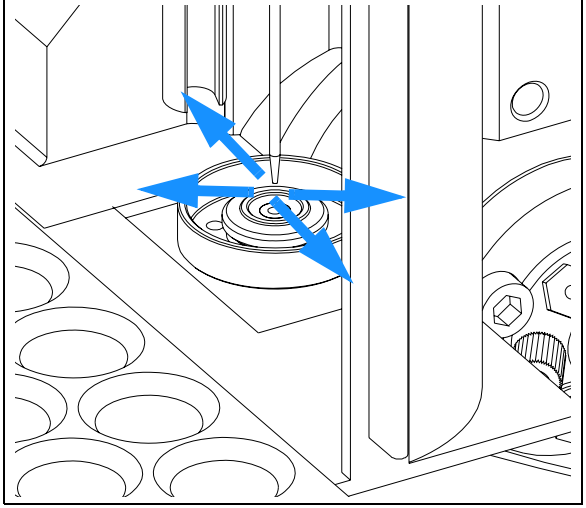
4 Connect the seat-capillary fitting to port 5 of the injection valve.



5 Use "**Down**" to position the needle approximately 2 mm above the seat



6 Ensure the needle is aligned with the seat. If required, bend the needle slightly until the needle is aligned correctly.



On completion of this procedure:

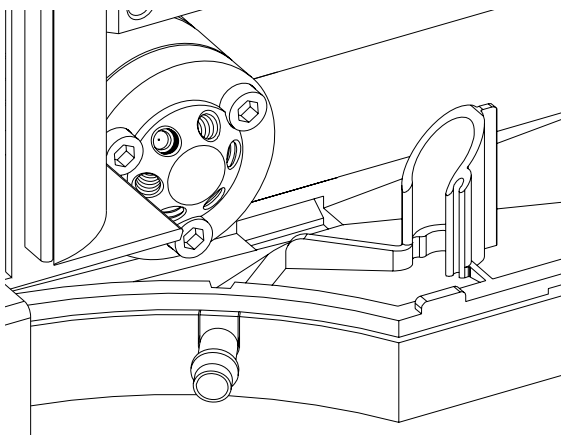
- Install the front cover.
- Select "**End**" in the maintenance function "**Change Needle**" (see "Change Needle" on page 256).

Stator Face

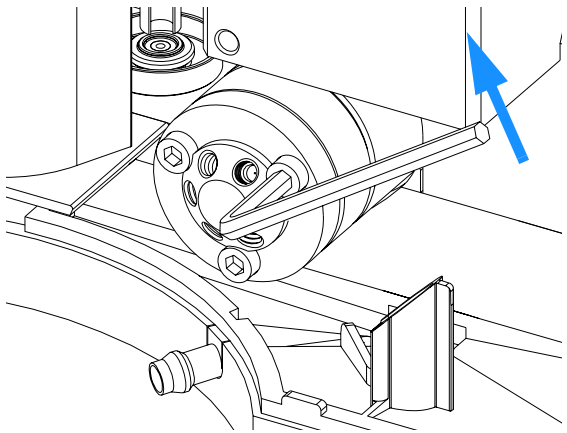
Frequency	Poor injection-volume reproducibility Leaking injection valve
Tools required	1/4 inch wrench (supplied in accessory kit) Hex key, 9/64 inch (supplied in accessory kit)
Parts required	Stator face 0100-1851 *for G1329A* No stator face for G1329B (functionality part of stator head). Stator face 0101-1268 *for G2260A*
Preparation	Remove the front cover. Remove the leak tubings (if necessary).

CAUTION The stator face is held in place by the stator head. When removing the stator head, ensure the stator face does not fall out of the valve.

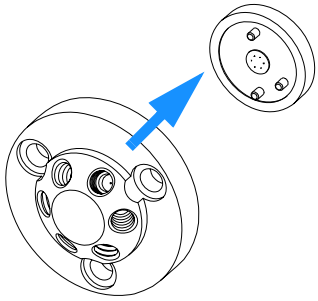
1 Remove all capillary fittings from the injection-valve ports.



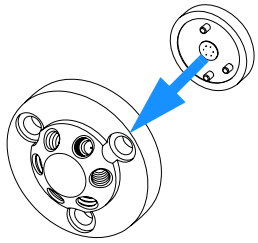
2 Loosen each fixing bolt two turns at a time. Remove the bolts from the head.



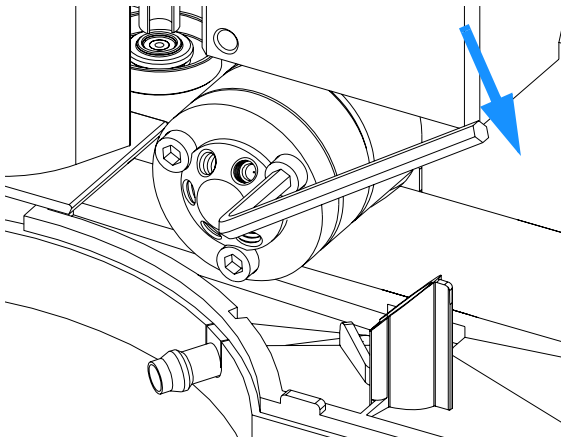
3 Remove the stator head and stator face.



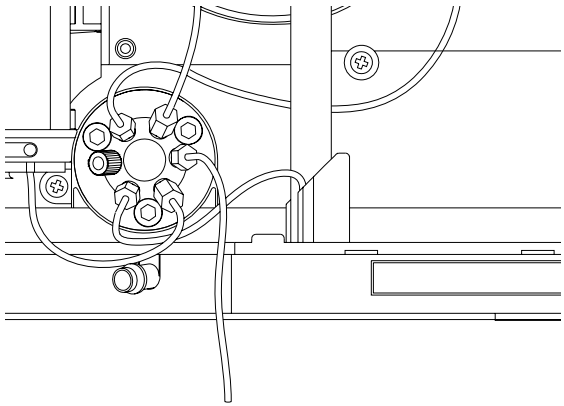
4 Place the stator face in place on the stator head. Ensure the pins on the stator engage in the holes in the stator head.



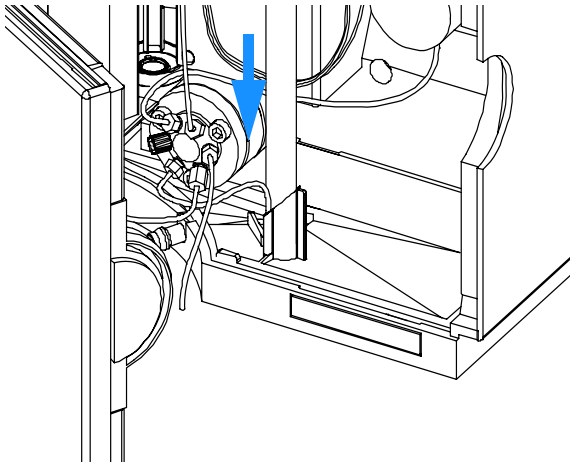
5 Install stator head and stator face. Tighten the bolts alternately two turns at a time until the stator head is secure.



6 Reconnect the pump capillaries to the valve ports (see "Hydraulic Connections" on page 35).



7 Slide the waste tube into the waste holder in the leak tray.



On completion of this procedure:

- Install the front cover.

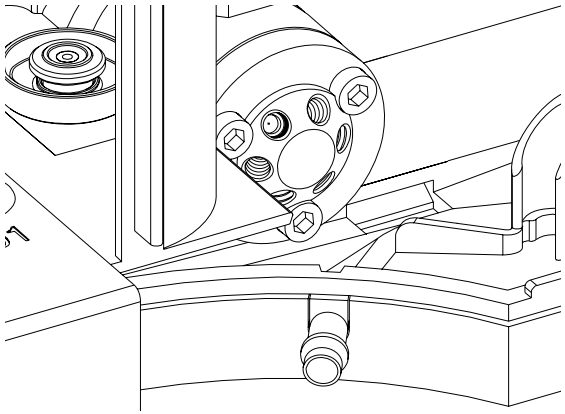
Rotor Seal

Frequency	Poor injection-volume reproducibility Leaking injection valve
Tools required	1/4 inch wrench (supplied in accessory kit). Hex key, 9/64 inch (supplied in accessory kit).
Parts required	Rotor seal 0100-1853 (Vespel) *for G1329A* Rotor seal 0100-1849 (Tefzel) *for G1329A* Rotor seal 0101-1416 (PEEK) *for G1329B* Rotor seal 0101-1268 (PEEK) *for G2260A*
Preparations for this procedure	Remove front cover. Remove the leak tubing (if necessary).

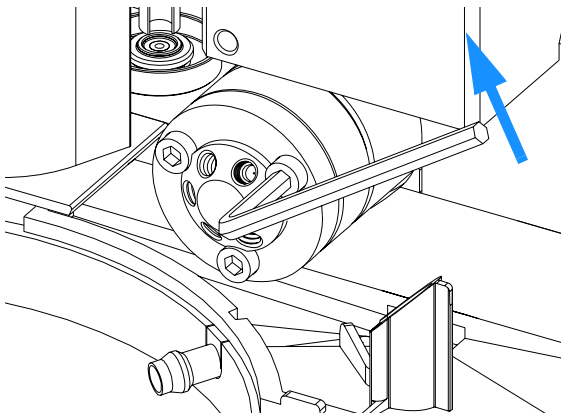
CAUTION The stator face is held in place by the stator head. When removing the stator head, ensure the stator face does not fall out of the valve.

NOTE There is no stator face for G1329B

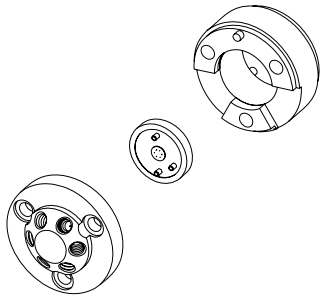
1 Remove all capillary fittings from the injection-valve ports.



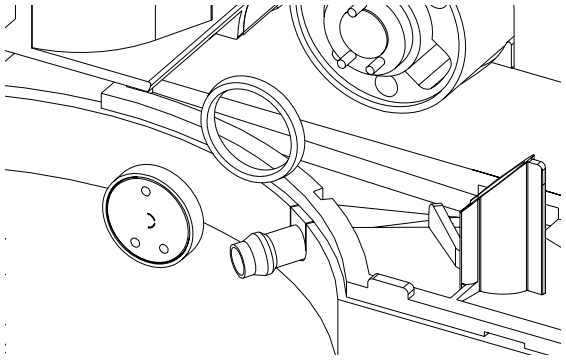
2 Loosen each fixing bolt two turns at a time. Remove the bolts from the head.



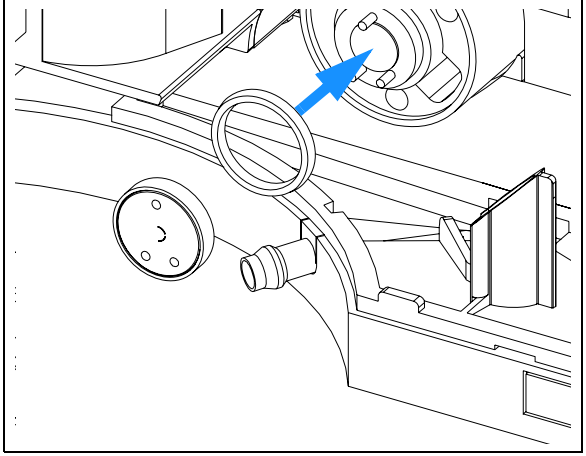
3 Remove the stator head, stator face and stator ring.



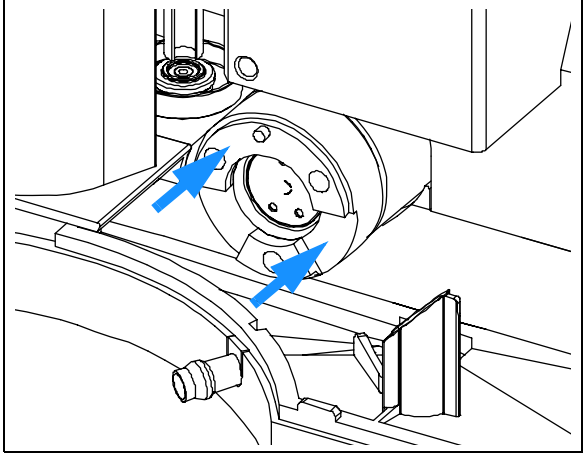
4 Remove the rotor seal and isolation seal.



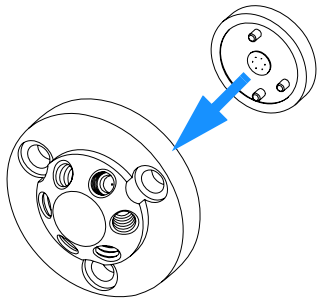
5 Install the new rotor seal and isolation seal. Ensure the metal spring inside the isolation seal faces towards the valve body.



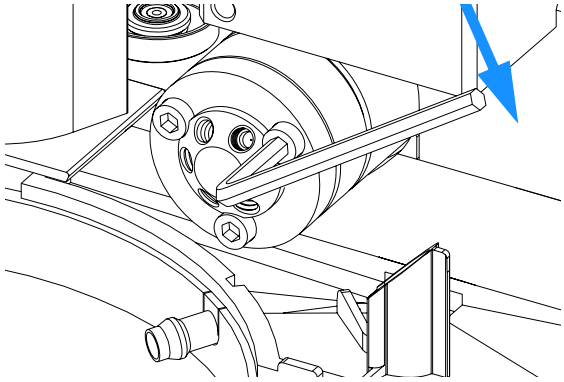
6 Install the stator ring with the short of the two pins facing towards you at the 12 O'Clock position. Ensure the ring sits flat on the valve body.



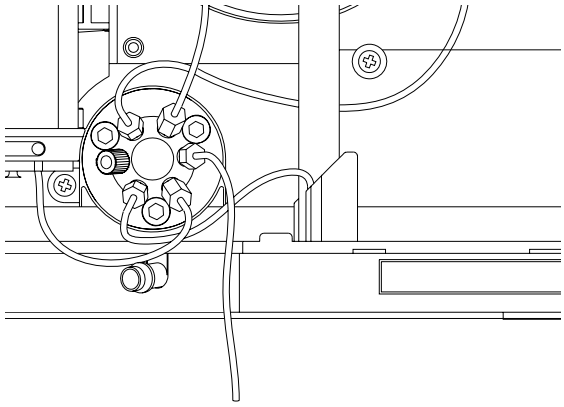
7 Place the stator face in place on the stator head.



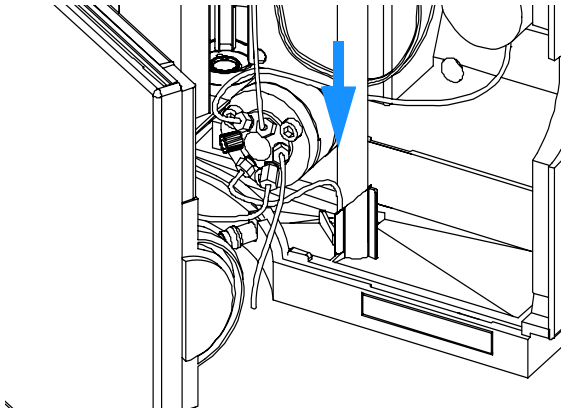
8 Install stator head and stator face. Tighten the bolts alternately two turns at a time until the stator head is secure.



9 Reconnect the pump capillaries to the valve ports (see "Hydraulic Connections" on page 35).



Slide the waste tube into the waste holder in the leak tray.



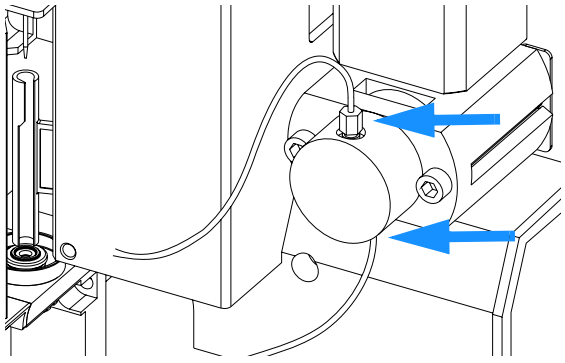
On completion of this procedure:

- Install the front cover.

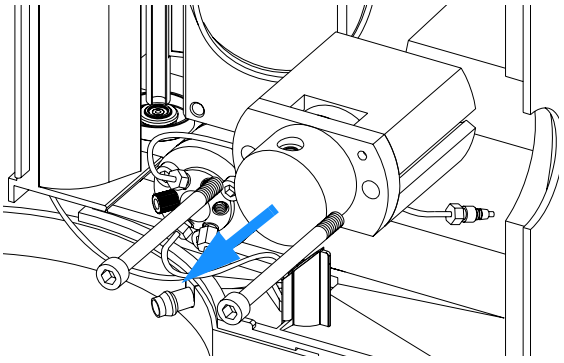
Metering Seal and Plunger

Frequency	Poor injection-volume reproducibility Leaking metering device
Tools required	1/4 inch wrench (supplied in accessory kit). 4 mm hex key (supplied in accessory kit). 3 mm hex key (supplied in accessory kit).
Parts required	Metering seal 5063-6589 (pack of 2) *for 100 µl analytical head* Metering seal 0905-1294 (pack of 1) *for 900 µl analytical head* Metering plunger 5063-6586 *for 100 µl analytical head* Metering plunger 5062-8587 *for 900 µl analytical head* (only if scratched or contaminated)
Preparations for this Procedure	Select "Start" in the maintenance function "Change piston" (see "Change Piston" on page 258). Remove the front cover.

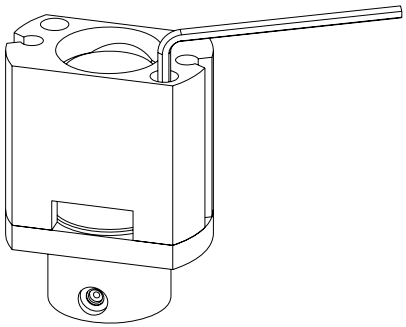
1 Remove the two capillaries from the metering-head assembly.



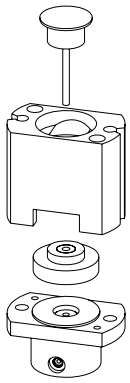
2 Remove the two fixing bolts, and pull the head assembly away from the sampler. Notice that the closed side of the metering head faces upwards.



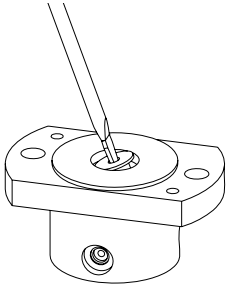
3 Remove the two fixing bolts from the base of the metering head assembly.



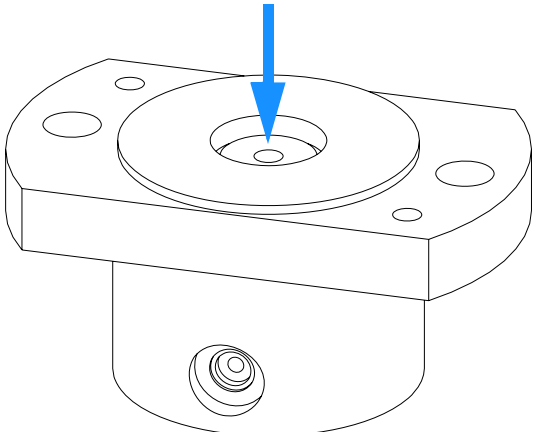
4 Disassemble the metering head assembly.



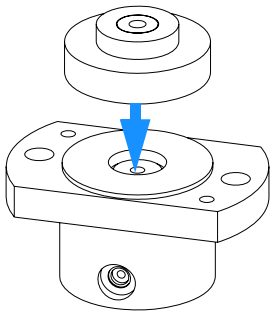
5 Use a small screwdriver to carefully remove the seal. Clean the chamber with lint-free cloth. Ensure all particular matter is removed.



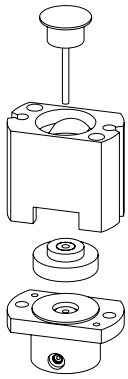
6 Install the new seal. Press the seal firmly into position.



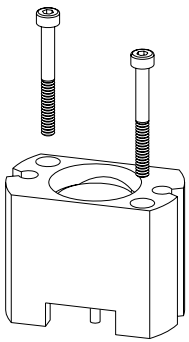
7 Place the piston guide on top of the seal.



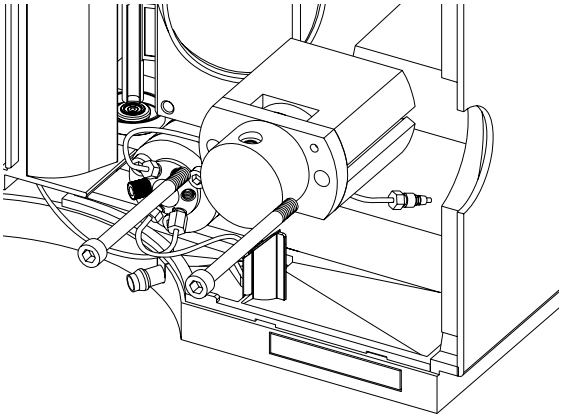
8 Reassemble the metering head assembly. Carefully insert the plunger into the base. The closed side of the metering head must be on the same side as the lower one of the two capillary drillings.



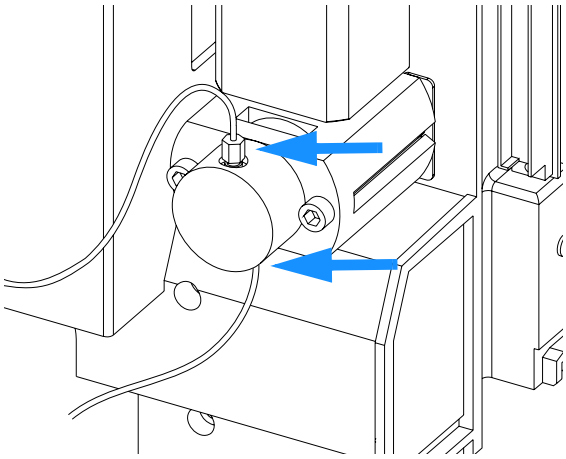
9 Install the fixing bolts. Tighten the bolts securely.



10 Install the metering head assembly in the autosampler. Ensure the large hole in the metering head is facing downwards.



11 Reinstall the capillaries.



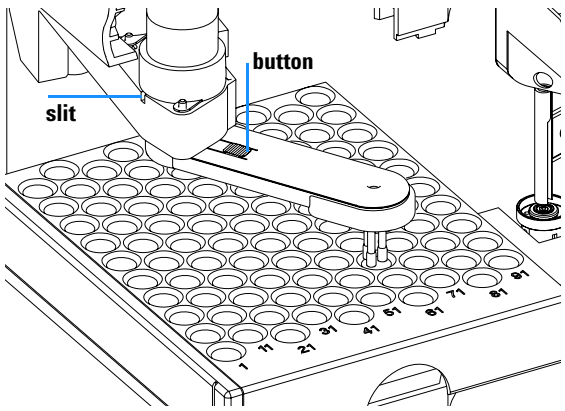
On completion of this procedure:

- Install the front cover.
- Select "**End**" in the maintenance function "**Change piston**" (see "Change Piston" on page 258).

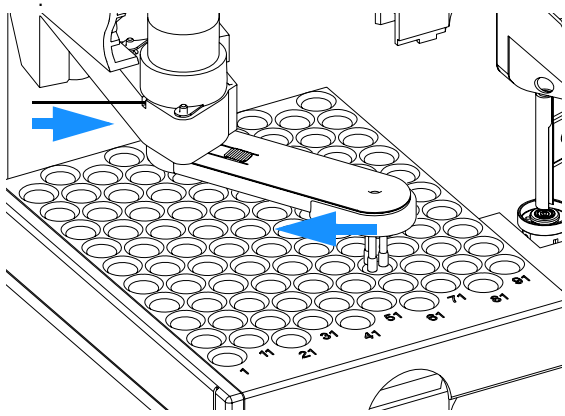
Gripper Arm

Frequency	Defective gripper arm
Tools required	Straightened paper clip.
Parts required	Gripper assembly, G1313-60010.
Preparations for this procedure	Select "Start" in the maintenance function "ChangeGripper" (see "Change Gripper (Change Arm)" on page 260). Turn off the power to the autosampler. Remove the front cover.

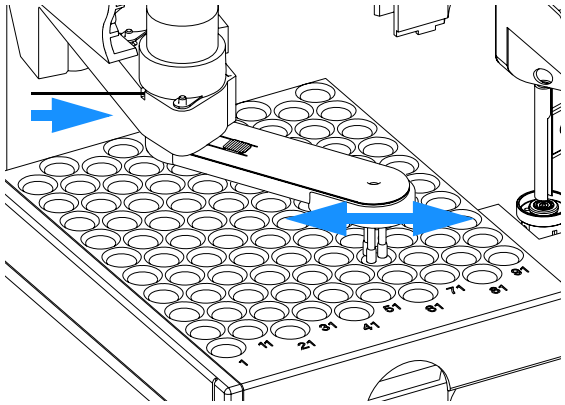
1 Identify the slit below the gripper motor and the gripper arm release button.



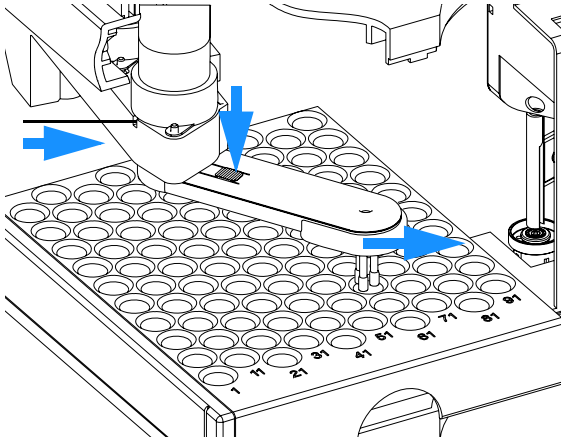
2 Rotate the arm approximately 2.5cm (1 inch) to the left and insert the straightened paper clip into the slit.



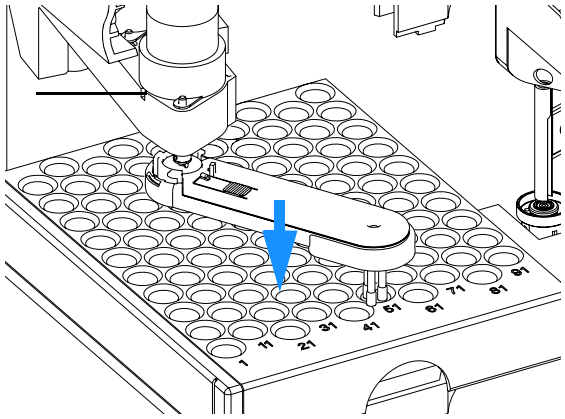
3 Rotate the gripper arm slowly from left to right and apply a gentle pressure to the paper clip. The clip will engage on an internal catch and the rotation of the arm will be blocked.



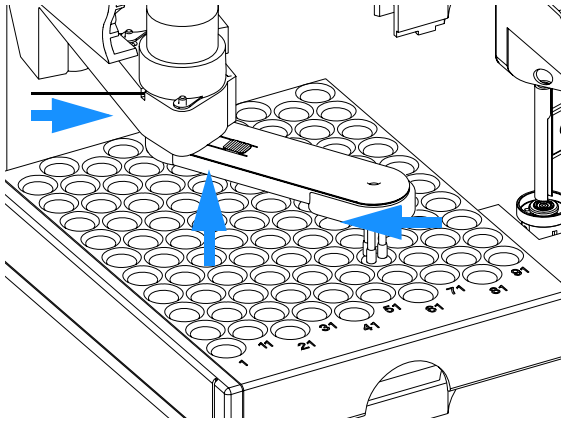
4 Hold the paper clip in place, press the gripper release button and rotate the gripper arm to the right.



5 The gripper arm will come off.



6 Replace the gripper arm by holding the paper clip in place, pushing the gripper arm into the holder and rotating the gripper arm to the left.



On completion of this procedure:

- Install the front cover.
- Turn the power to the autosampler ON.

Interface Board

Frequency	At installation or when defective.
Tools required	Flat-head screwdriver.
Parts required	Interface board, see "Optional Interface Boards" on page 191.

CAUTION The interface board is sensitive to electrostatic discharge. Always use the ESD strap when handling electronic boards.

1 Switch OFF the autosampler at the main power switch.
2 Disconnect cables from the interface board connectors.
3 Loosen the screws. Slide out the interface board from the autosampler.
4 Install the interface board. Secure the screws.
5 Reconnect the cables to the board connectors

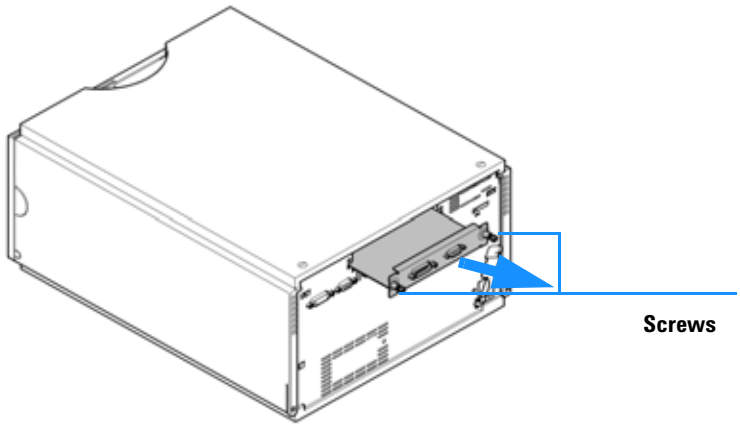


Figure 15 Exchanging the Interface Board

Exchanging Internal Parts

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

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

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.**

NOTE The electronics of the autosampler will not allow operation when the top cover and the top foam are removed. A safety light switch on the main board will inhibit the operation of the autosampler. Always operate the autosampler with the top foam and top covers in place.

CAUTION Internal components may be sensitive to electrostatic discharge (ESD). Always use an ESD strap when handling internal components (see "Using the ESD Strap" on page 55).

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

Assembling the Main Cover

Tools required None

Parts required G1329-68713 Cover kit *for G1329A - G2260A*
5042-8901 Name plate

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

CAUTION Observe the assembly instructions carefully. The main cover cannot be disassembled once assembled incorrectly.

1 Insert the “Agilent Technologies 1200 Series” nameplate into the recess in the top cover

2 Place the top cover on the bench.

3 Press the side panels into the slots in the top cover

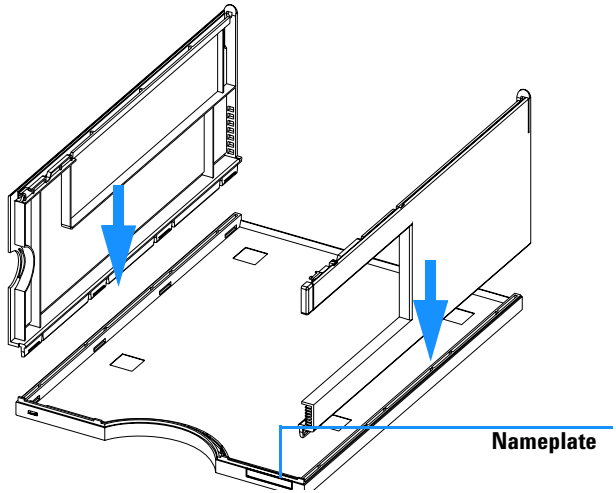


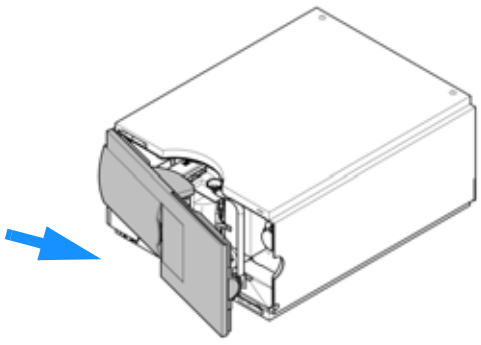
Figure 16 Assembling the Main Cover

Top Cover and Foam

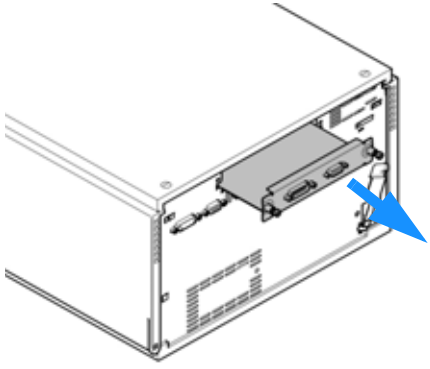
Frequency	When accessing internal parts.
Tools required	If interface board installed: Flat-head screwdriver.
Parts required	Foam kit G1313-68702

CAUTION This procedure requires removal of the MIO-interface board. The board is sensitive to electrostatic discharge. Always use the ESD strap when handling electronic boards.

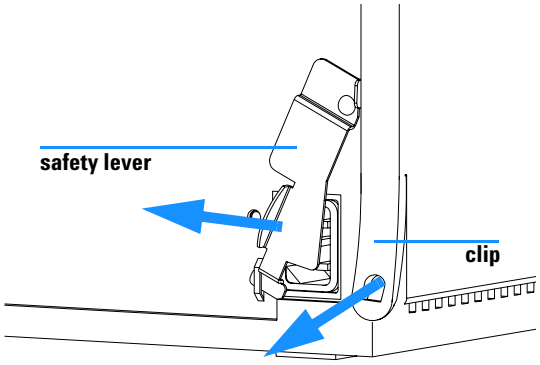
1 Switch OFF the autosampler at the main power switch. Remove the power cable.



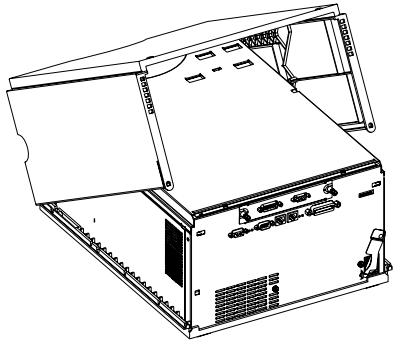
2 If installed, remove the ECB board.



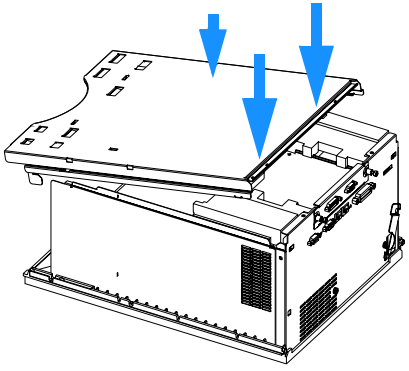
3 Move the safety lever to the left.Lift the clips on the top cover.



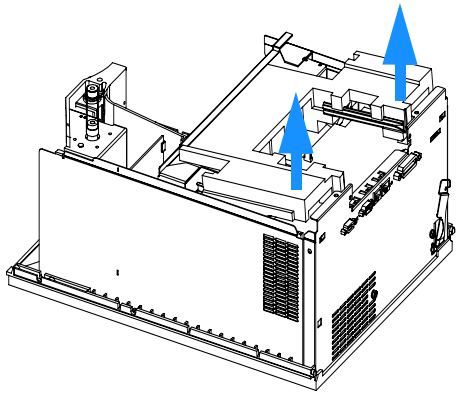
4 Lift the cover away.



5 Unscrew the three screws on the top plate. Remove the top plate.



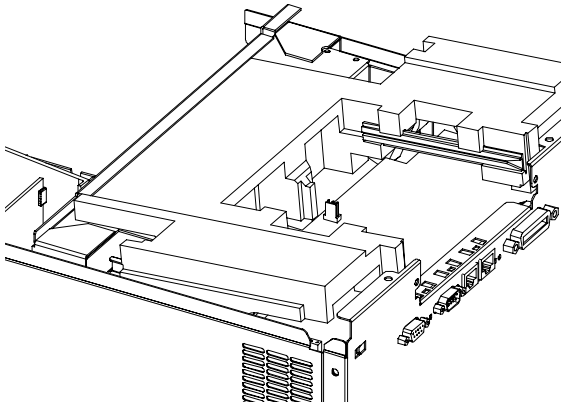
6 Carefully remove the top foam.



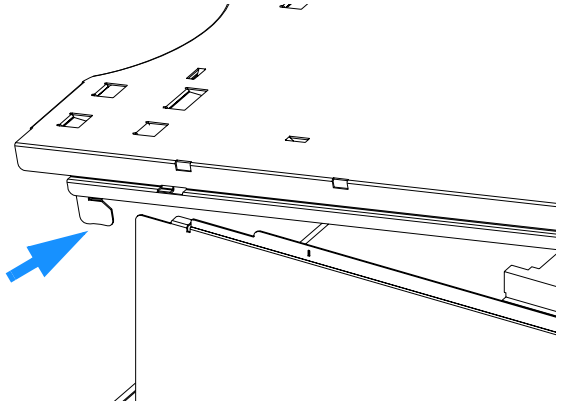
Installing the Top Cover and Foam

Frequency	When accessing internal parts.
Tools required	If interface board installed: Flat-head screwdriver.
Parts required	None.

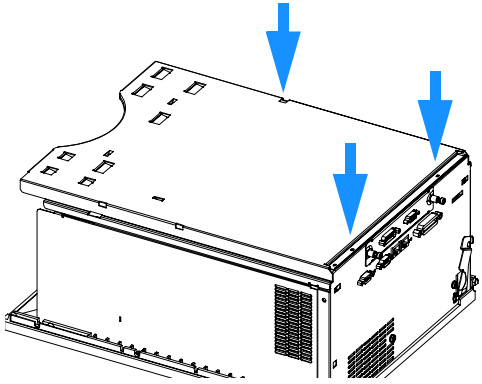
1 Install the top foam. Press the foam firmly into place.



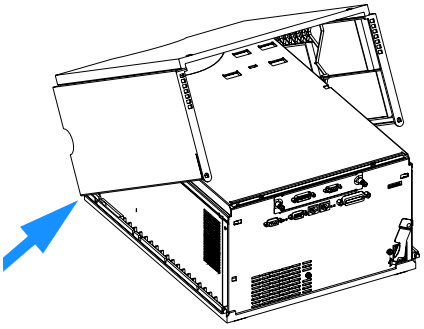
2 Engage the slot on the top plate onto the side plate.



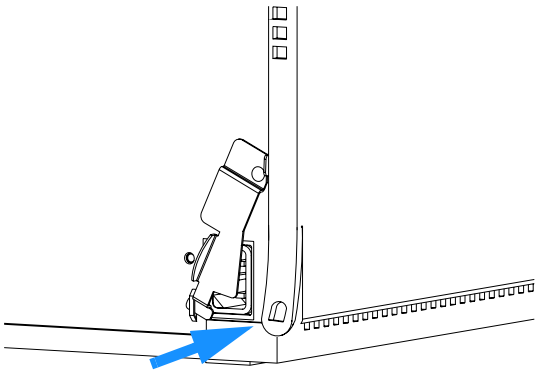
3 Fix the top plate in place with the three screws.



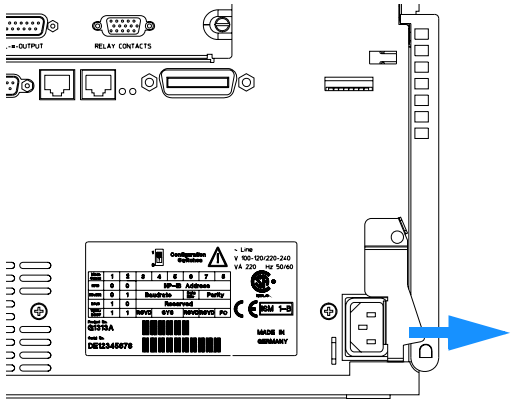
4 Engage the top cover into the bottom cover.



5 Lower the cover into place. Ensure the clips close firmly.



6 Slide the power lock to the right, and install the power cable.



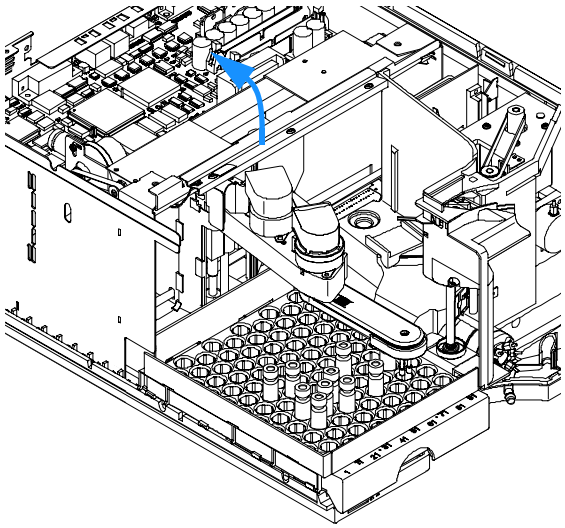
Illumination Assembly

Frequency	Defective LEDs Defective internal parts (before removing the transport assembly)
Tools required	None
Parts required	Illumination assembly G1367-60040

1 Remove the top cover, top plate, and foam (see "Top Cover and Foam" on page 80).

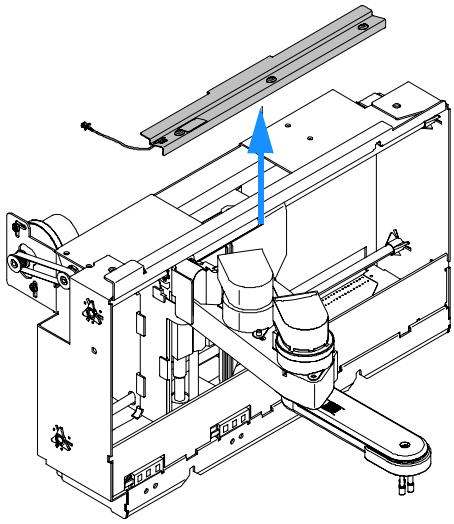
2 Disconnect the cable of the illumination assembly at the autosampler mainboard.

1 The illumination assembly is located at the top rail of transport assembly. After disconnecting the cable from the autosampler mainboard, the illumination assembly can be removed by turning the rail approximately 60 degrees.



2 Then lift the complete assembly.

To install a new illumination assembly, position it at the top rail of the transport assembly. There are no screws, the foam will keep the assembly in place.



Transport Assembly

Frequency	Sticking or jammed transport assembly. Defective flex board or sensors.
Tools required	If interface board installed: Flat-head screwdriver.
Parts required	Transport assembly G1329-60009 *for G1329A - G2260A*

1 Remove the top cover, top plate, and foam (see "Top Cover and Foam" on page 80).

2 Remove the Illumination assembly as described on page 84

3 Lift out the transport assembly. This may require a flat head screwdriver to separate the transport assembly from the sampling unit

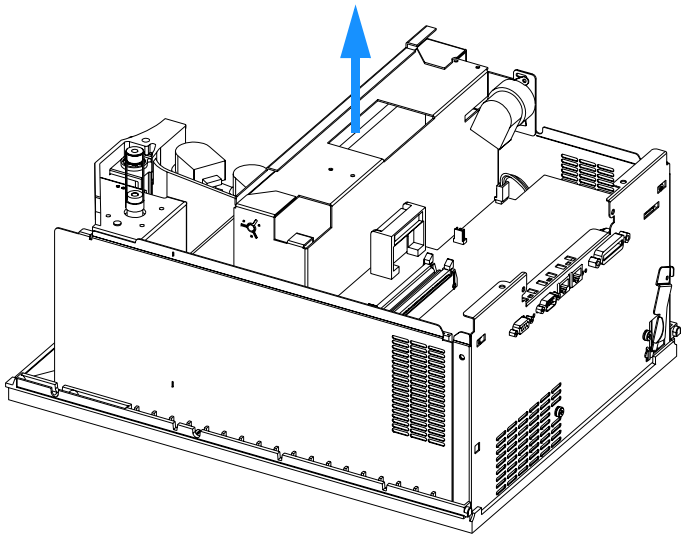
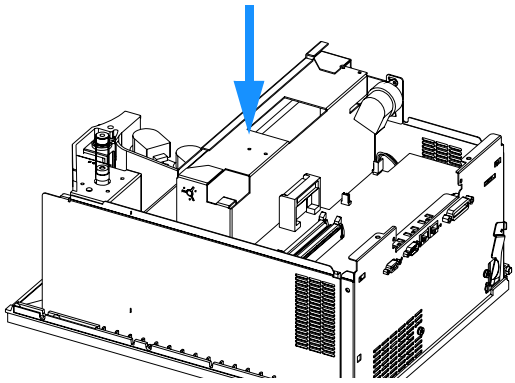


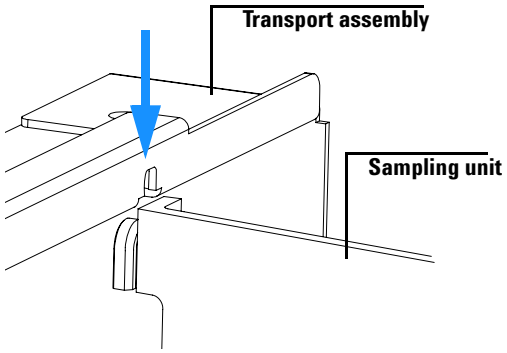
Figure 17 Removing the Transport Assembly

Installing the Transport Assembly

1 Slide the transport assembly into the autosampler.



2 Ensure the slot on the top of the transport assembly engages with the stud on the sampling unit.



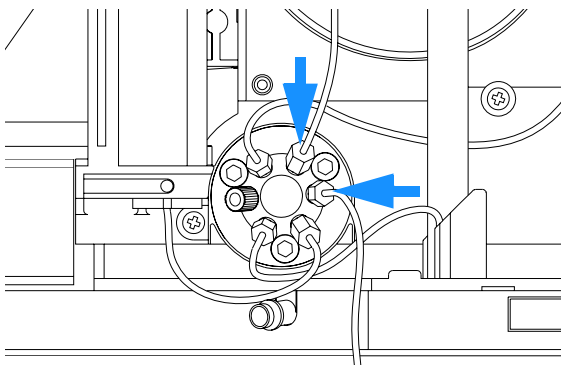
On completion of this procedure:

- Ensure the transport assembly is seated firmly.
- Install the top cover and foam (page 80).
- Verify the transport assembly alignment (page 272).

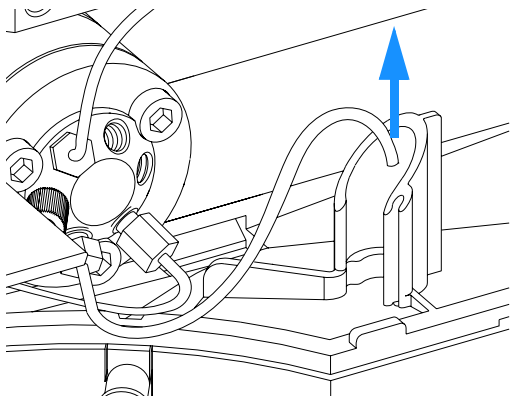
Sampling Unit

Frequency	When accessing internal parts, or when defective.
Tools required	1/4 inch wrench (supplied in accessory kit). Flat-head screwdriver.
Parts required	Sampling unit G1329-60008 *for G1329A/G1329B* Sampling unit G2260-60008 *for G2260A* The sampling units come without injection valve and analytical head assembly (see "Sampling Unit Assembly" on page 124).
Preparations for this procedure	Remove the front cover. Remove the vial tray. Remove the top cover (page 80). Remove the Illumination assembly (page 84) Remove the transport assembly (page 85).

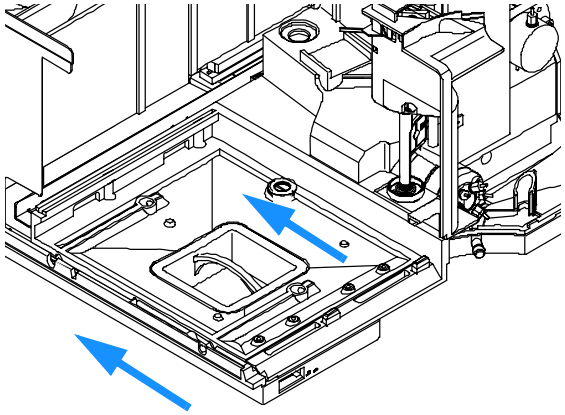
1 Remove the pump and column thermostat capillaries (ports 1 and 6) from the injection valve.



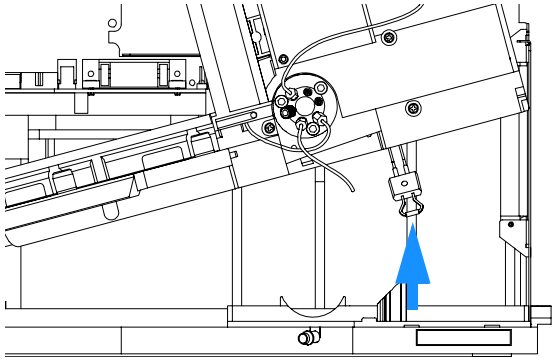
2 Pull out the waste tube from the holder in the leak tray.



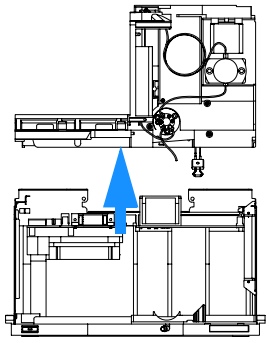
3 Slide the sampling unit and tray base back to disengage the sampling-unit connector.



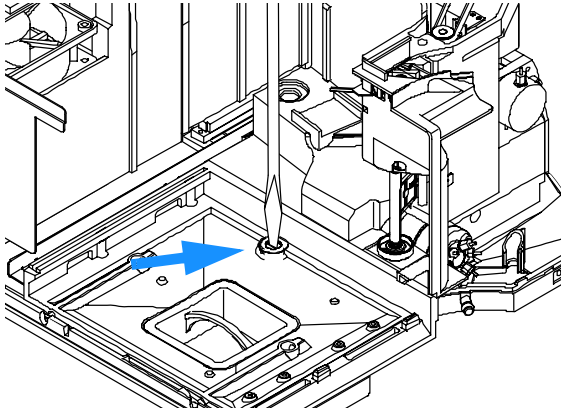
4 Lift the sampling unit and tray base approximately 10 cm. Slide the leak sensor out of the leak plane.



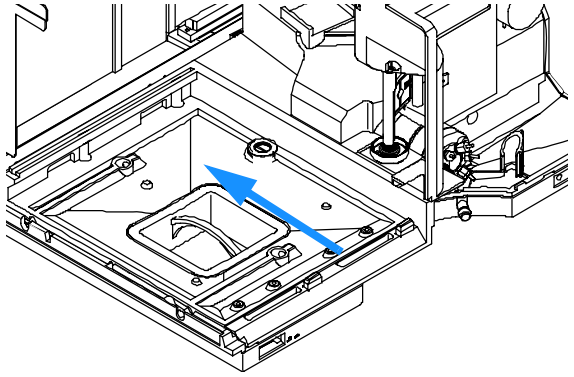
5 Lift the sampling unit and tray base out of the autosampler.



6 Turn the tray-base locking screw ¼-turn anti-clockwise.



7 Slide the tray base back to disengage the tray base from the sampling unit.

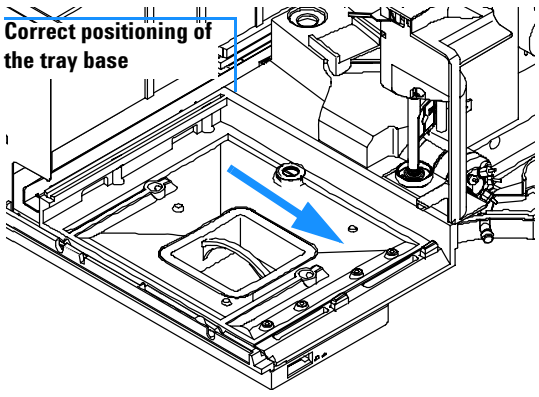


Installing the Sampling Unit

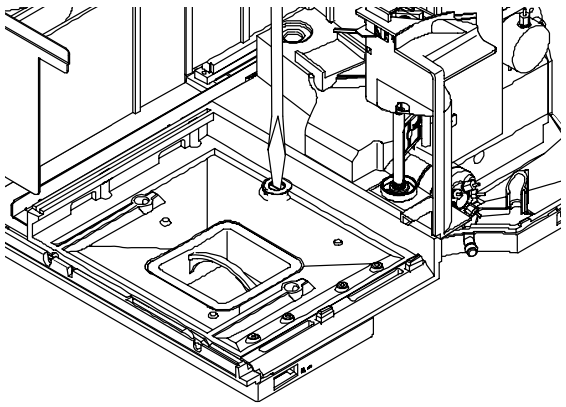
NOTE

The replacement sampling unit is supplied without injection valve and metering head assembly. If you are exchanging the complete sampling unit, remove the injection valve and metering head from the defective sampling unit. Install the valve and metering head in the new sampling unit. See "Injection-Valve Assembly" on page 93 and "Gripper Arm" on page 74.

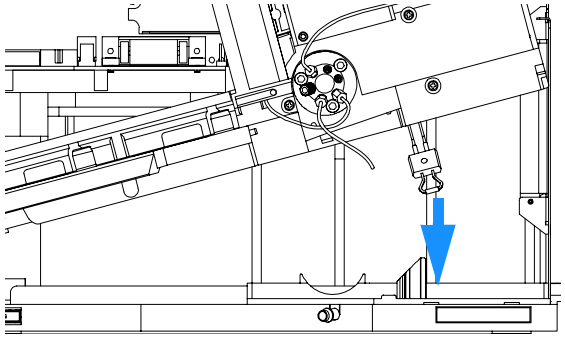
1 Mount the tray base onto the sampling unit. Ensure the tray base is positioned flush against the sampling unit.



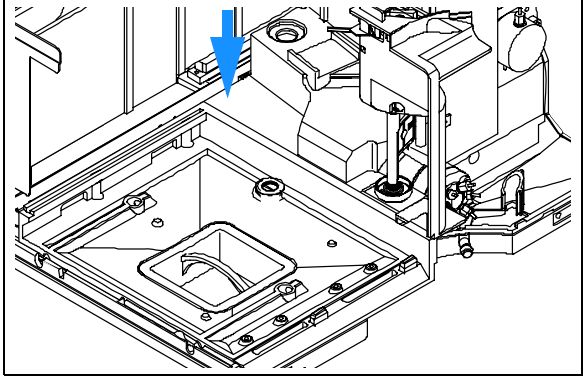
2 Tighten the locking screw ¼-turn clockwise.



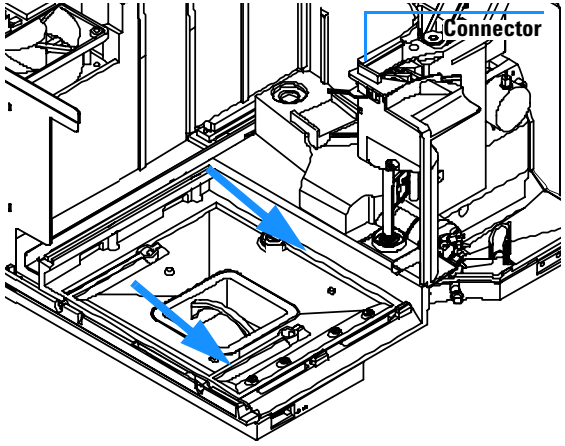
3 While holding the sampling unit and tray base, slide the leak sensor into the holder in the leak plane.



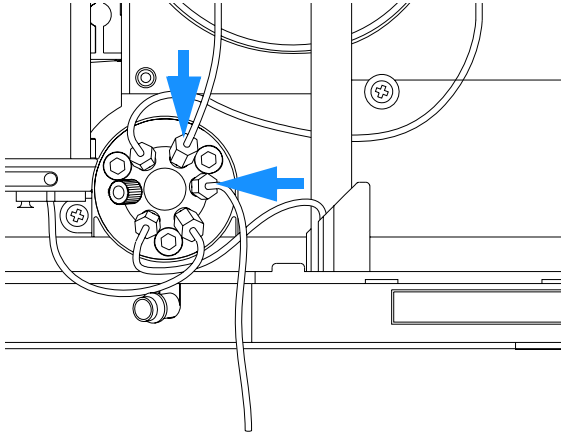
4 Place the sampling unit and tray base into the autosampler.



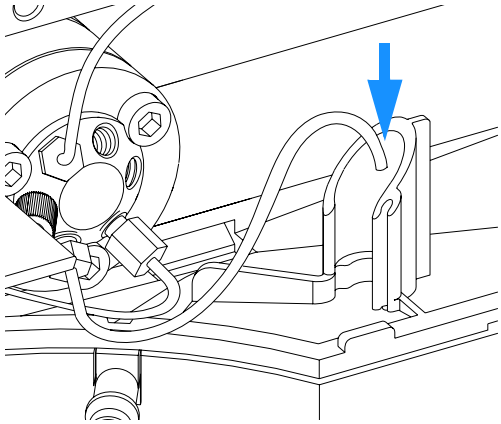
5 Slide the sampling unit and tray base forwards. Ensure the sampling unit connector is seated correctly.



6 Install the pump and column thermostat capillaries (ports 1 and 6) in the injection valve.



7 Install the waste tube in the holder in the leak tray.



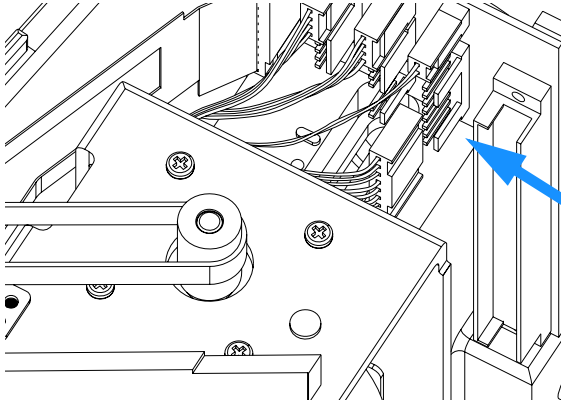
On completion of this procedure:

- Install the transport assembly (page 85).
- Install the top cover (page 80).
- Install the vial tray.
- Verify the transport assembly alignment (page 272).

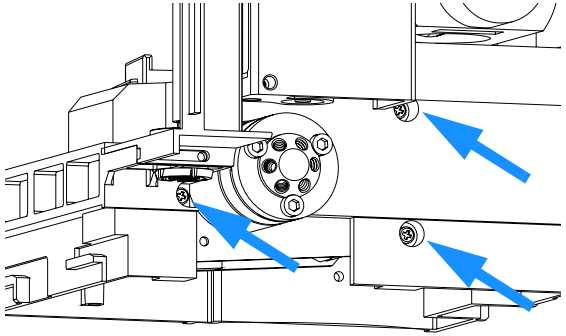
Injection-Valve Assembly

Frequency	When defective
Tools required	Pozidrive No. 1 screwdriver 1/4 inch wrench
Parts required	Injection valve 0101-0921 *for G1329A* Injection valve 0101-1422 *for G1329B* Injection valve 0101-1267 *for G2260A*
Preparations for this procedure	Remove all capillaries from the injection valve (page 35). Remove the top cover (page 80). Remove the transport assembly (page 85). Remove the sampling unit (page 87).

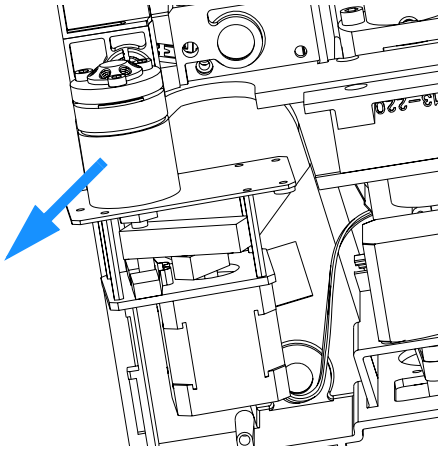
1 Disconnect the valve-cable connector from the SUD board (labelled "Valve Assy").



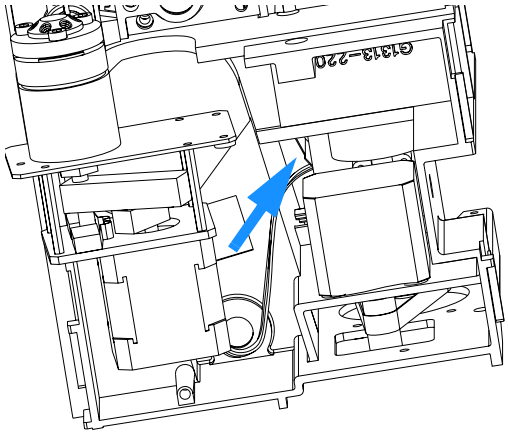
2 Remove the three fixing screws.



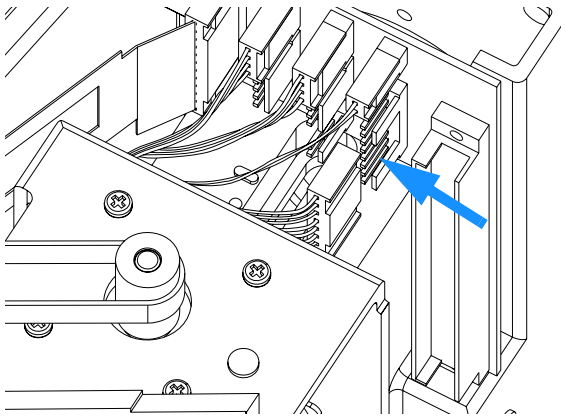
3 Remove the injection-valve assembly.



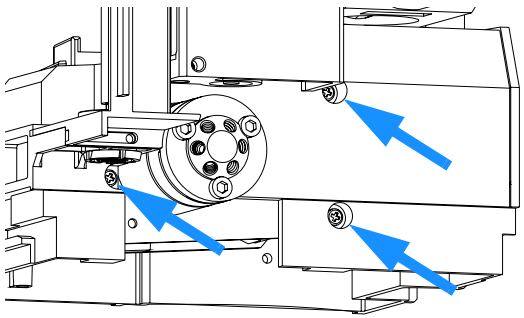
4 Feed the cable of the new valve through to the SUD board).



5 Connect the valve cable to the connector (labelled “Valve Assy”).



6 Fix the valve assembly in place securely with the three screws.



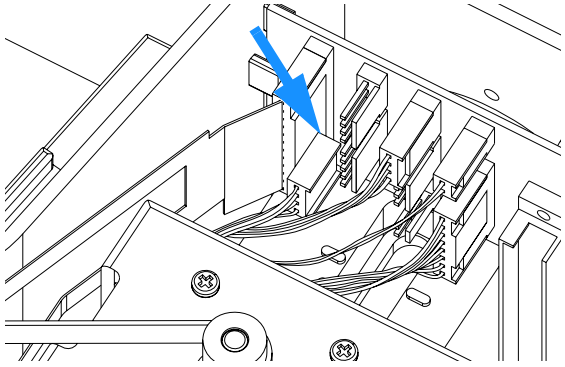
On completion of this procedure:

- Install the sampling unit (page 87).
- Install the transport assembly (page 85).
- Install the top cover (page 80).
- Replace the injection-valve capillaries (page 35).
- Verify the transport assembly alignment (page 272).

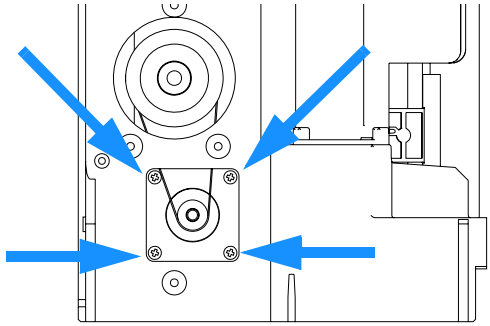
Metering-Drive Motor and Belt

Frequency	When belt or motor defective
Tools required	Pozidrive No. 1 screwdriver
Parts required	Metering-drive motor 5062-8590 Belt 1500-0697
Preparations for this procedure	Remove the top cover (page 80). Remove the transport assembly (page 85). Remove the sampling unit (page 87).

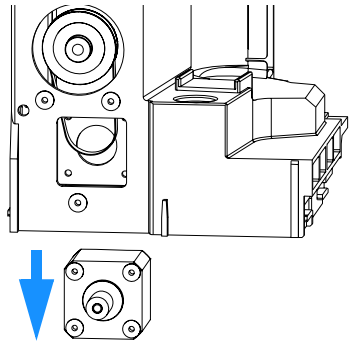
1 Disconnect the motor connector from the SUD board (labelled "Metering M").



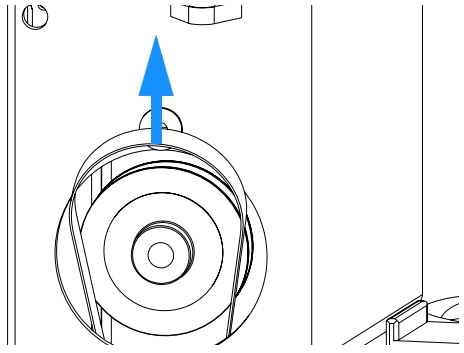
2 Remove the four fixing screws.



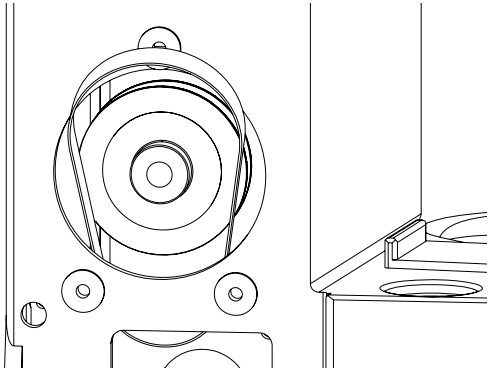
3 Remove the motor.



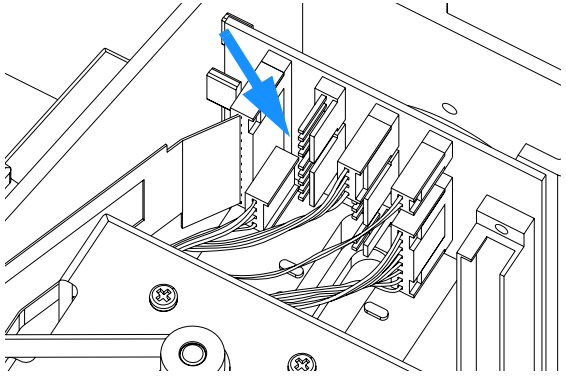
4 Remove the belt.



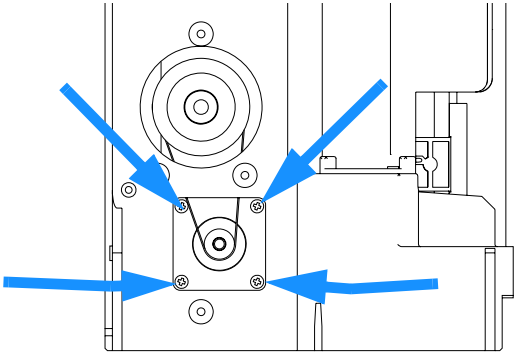
5 Place the belt over the shaft.



6 Feed the motor cable through to the SUD board. Connect the cable to (labelled “Metering M”).



7 Install the motor with the four fixing screws. Ensure the belt is seated correctly over the gear and motor shaft.



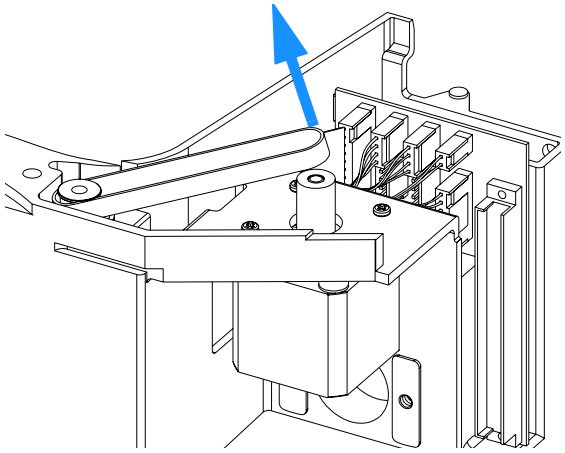
On completion of this procedure:

- Install the sampling unit (page 87).
- Install the transport assembly (page 85).
- Install the top cover (page 80).
- Verify the transport assembly alignment (page 272).

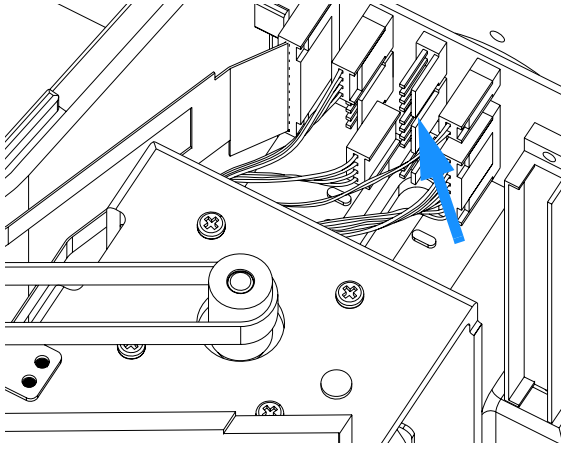
Needle-Drive Motor and Belt

Frequency	When defective
Tools required	Pozidrive No. 1 screwdriver
Parts required	Needle-drive motor 5062-8590 Belt 1500-0697
Preparations for this procedure	Remove the top cover (page 80).

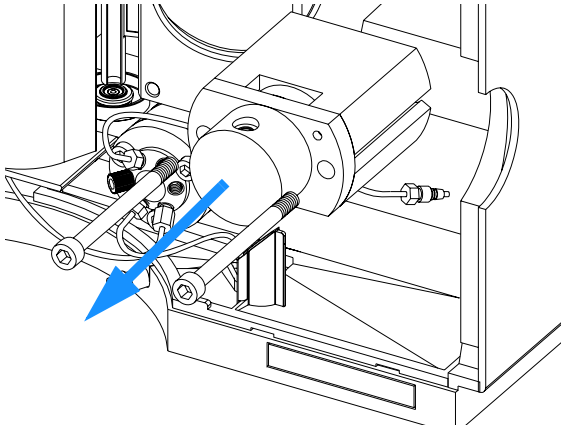
1 Lift away the drive belt.



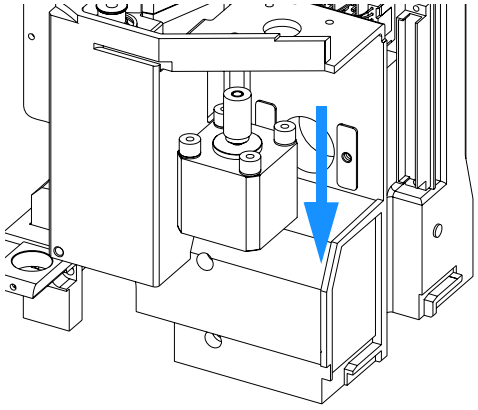
2 Disconnect the motor connector from the SUD board (labelled “Needle M”).



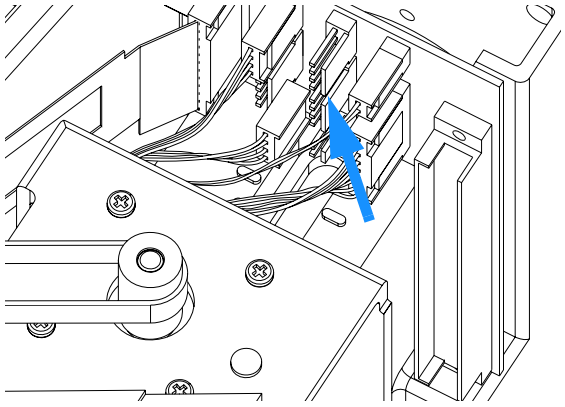
3 Remove the metering head assembly (see "Gripper Arm" on page 74).



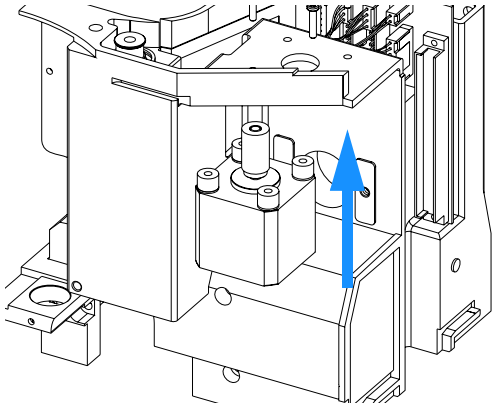
4 Remove the four fixing screws, and remove the motor.



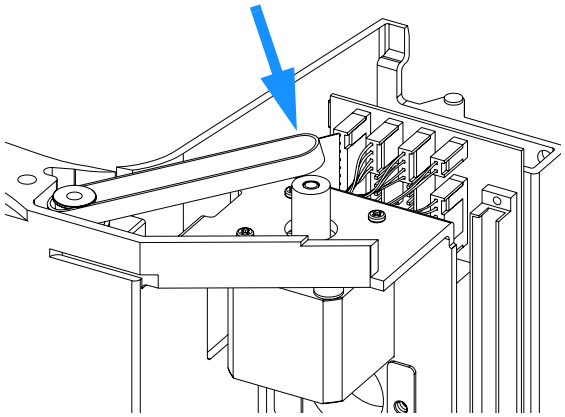
5 .Feed the motor cable through to the SUD board. Connect the cable to the connector, labelled "Needle M".



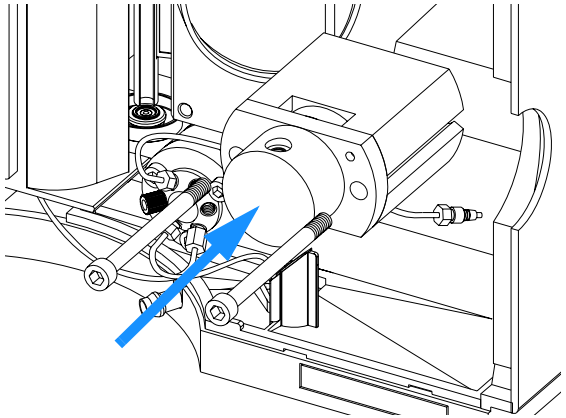
6 Secure the motor in place with the four fixing screws.



7 Install the belt.



8 Install the metering-head assembly (see "Gripper Arm" on page 74).



On completion of this procedure:

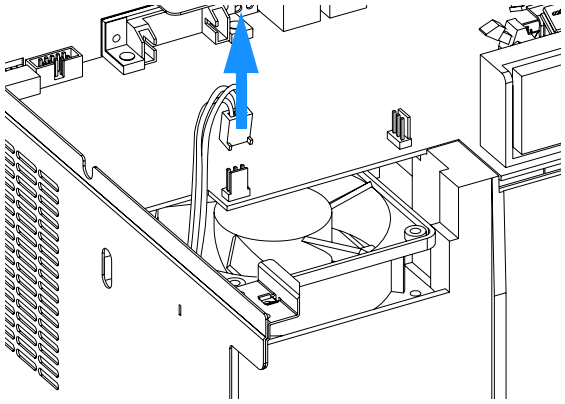
- Install the top cover (page 80).
- Verify the transport assembly alignment (page 272).

Fan

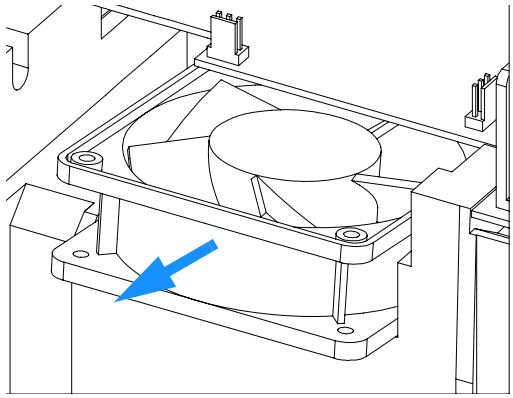
Frequency	When defective.
Tools required	None.
Parts required	Fan 3160-1017
Preparations for this procedure	Remove the top cover and foam (page 80). Remove the transport assembly (page 85).

CAUTION The ASM board is sensitive to electrostatic discharge. Always use the ESD strap (see "Using the ESD Strap" on page 55) when handling electronic boards.

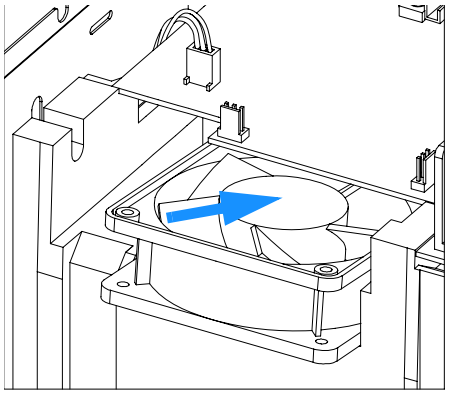
1 Disconnect the fan connector from the ASM board.



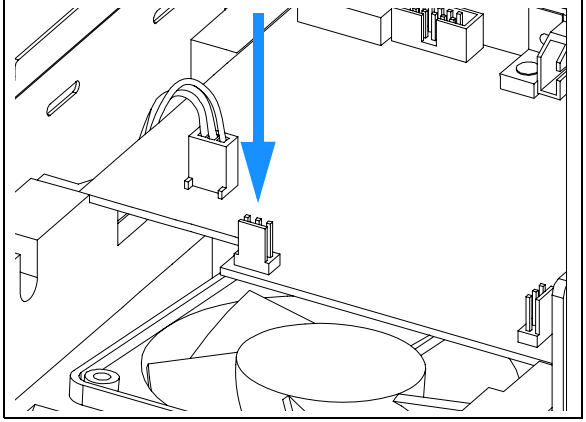
2 Lift the fan, and carefully pull the fan out of the foam.



3 Install the new fan. Ensure the cable is installed as shown.



4 Connect the fan connector to the ASM board.



On completion of this procedure:

- Install the transport assembly (page 85).
- Install the top cover and foam (page 80).
- Verify the transport assembly alignment (page 272).

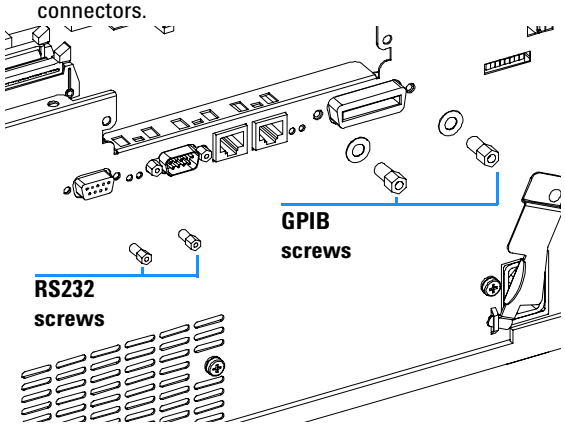
ASM Board

Frequency	When defective
Tools required	5 mm wrench (for remote-connector screws). 7 mm wrench (for GPIB connector screws).
Parts required	ASM board G1329-69530 *for G1329A - G2260A* ASM board G1329-69540 *for G1329B*
Preparations for this procedure	Remove the top cover and foam (page 80). Remove the transport assembly (page 85).

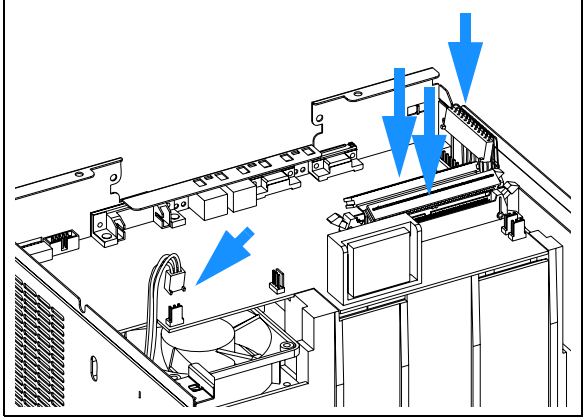
CAUTION The ASM board is sensitive to electrostatic discharge. Always use the ESD strap (see "Using the ESD Strap" on page 55) when handling electronic boards.

NOTE This procedure requires reloading the autosampler firmware, reprogramming of the instrument serial number, and realignment of the gripper.

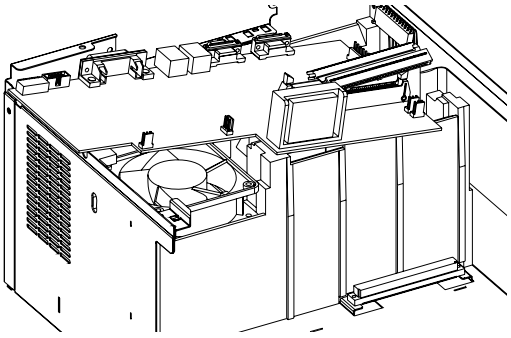
1 Remove the connector screws from the GPIB and RS232 connectors.



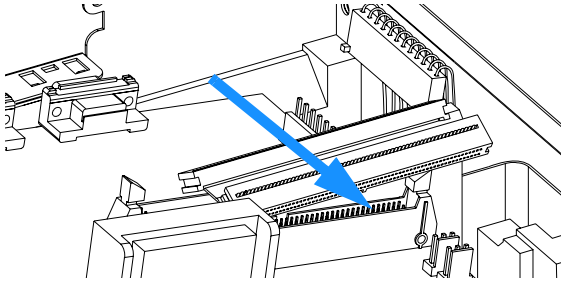
2 Disconnect all connectors on ASM board.



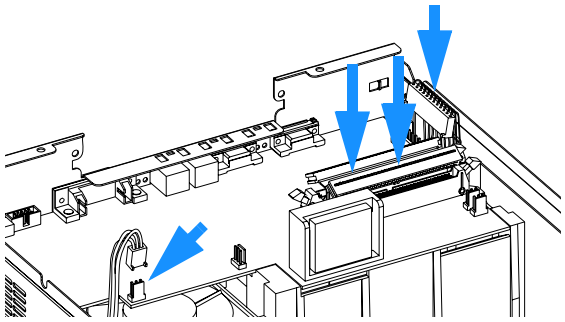
3 Slide ASM board out of the autosampler.



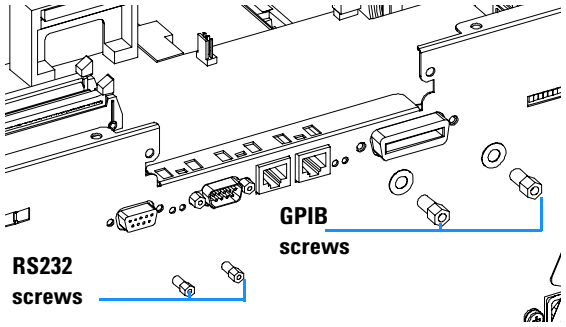
4 Install new board. Ensure ribbon cables are positioned in the slot in the board.



5 Reconnect the connectors to the board.



6 Replace GPIB and RS232 connector screws.



On completion of this procedure:

On the new board check the switch setting of address switch S1, see Table 47 on page 200, or Table 48 on page 201.

Note:

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

4 Install the transport assembly (page 85).

5 Install the top cover and foam (page 80).

6 Turn ON the autosampler.

7 Enter the 10-character autosampler serial number. The serial number can be entered using either the control module or the ChemStation, see "Entering the Serial Number using the Control Module" on page 109 or see"Entering the Serial Number using the ChemStation" on page 111.

8 Check the firmware revision of the autosampler. If the firmware revision is older than the current firmware revision of the autosampler, update the firmware, see "Replacing the Autosampler Firmware" on page 112

Changing the Product Number or Serial Number

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

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

The changes become active after the reboot of the module.

Using the Agilent ChemStation

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

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

```
print sendmodule$(lals, "ser 'YYYYYYYYYY'")
```

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

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

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

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

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

Where: XXXXX is the 5-character product number of the module (e.g. G1314A).

WARNING **If you enter the wrong type, your module will not be accessible anymore. In such a case see "Using the Instant Pilot G4208A" on page 107 or "Using the Control Module G1323B" on page 108 for recovering.**

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

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

Using the Instant Pilot G4208A

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

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

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

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

WARNING **If you enter the wrong type, your module might not be accessible anymore with the Agilent ChemStation and the Instant Pilot (unsupported module). In such a case follow the "Recover Instructions" on page 108.**

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

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

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

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

Recover Instructions

1 Turn off the module.

2 Change the 8-bit Configuration Switch to Resident (see "Stay-Resident Settings" on page 204).

3 Turn the module on.

4 Re-do steps 2 to 5 of "Using the Instant Pilot G4208A" on page 107 and correct the type information. Enter the product number without "-R"

5 Turn the module off.

6 Change the 8-bit Configuration Switch back to default settings (see "Setting the 8-bit Configuration Switch" on page 200).

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

Using the Control Module G1323B

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

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

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

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

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

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

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

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

1 Press **Tests (F3)** and select the module being changed and press **Enter**.

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

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

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

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

Examples: **TYPE G1329A** to configure as a standard autosampler.

TYPE G2260A to configure as a preparative autosampler.

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

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

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

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

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

Entering the Serial Number using the Control Module

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

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

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

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

5 Letters and numbers are created using the up and down arrows. Into the box labeled **Serial#,** enter the 10-character serial number for the

autosampler. When the 10-character serial number is entered, press **Enter** to highlight the complete serial number. Then, press **Done** (**F6**).

NOTE For firmware revisions below A02.00 it is very important never to press **Done** if the Serial# box is blank. In this case, the module can no longer be recognized by either the control module or the ChemStation. The main board must then be replaced.

6 Turn the autosampler off, then on again. The **Records** screen should display the correct serial number for this module.

7 If a ChemStation is also connected, re-boot the ChemStation now as well.

Entering the Serial Number using the ChemStation

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

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

```
print sendmodule$(lals, "ser YYYYYYYYYY")
```

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

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

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

2 Turn OFF the autosampler, then on again. Then, re-boot the ChemStation. If the serial number you have just entered is different than the original module serial number, you will be given the opportunity to edit the configure Agilent 1200 Series access screen during the re-boot of the ChemStation.

3 After boot-up, the serial number you have just entered can be seen under the **Instrument menu** of the main user interface screen. The serial number of the autosampler can also be seen by typing the following command into the command line:

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

The reply line will give the module serial number.

Replacing the Autosampler Firmware

The installation of new firmware is required

- if new version solves problems of currently installed version.
- if after exchange of the mainboard (ASM) the version on board is older than previous installed one.

To upgrade the autosampler firmware the following steps have to be performed:

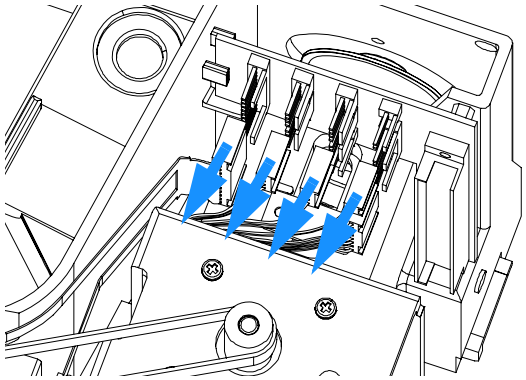
- Load the firmware into the autosampler, see the help system of your user interface.

SUD Board

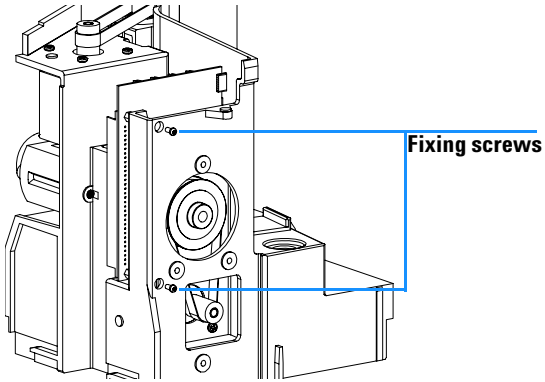
Frequency	When defective.
Tools required	Pozidrive No. 1 screwdriver.
Parts required	SUD board G1313-66503.
Preparations for this procedure	Remove the top cover (page 80). Remove the transport assembly (page 85). Remove the sampling unit (page 87).

CAUTION Take care not to damage the flex board when removing the SUD board.

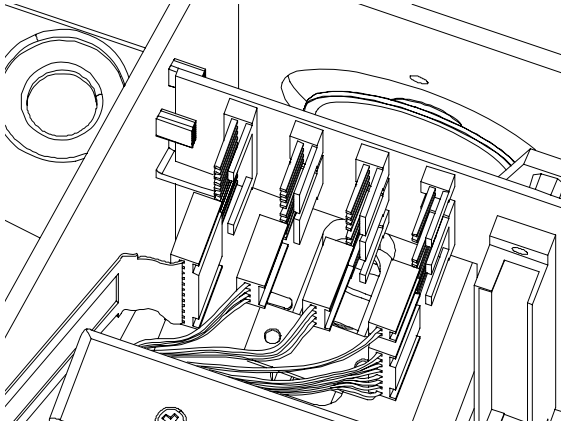
1 Disconnect all connectors from the SUD board.



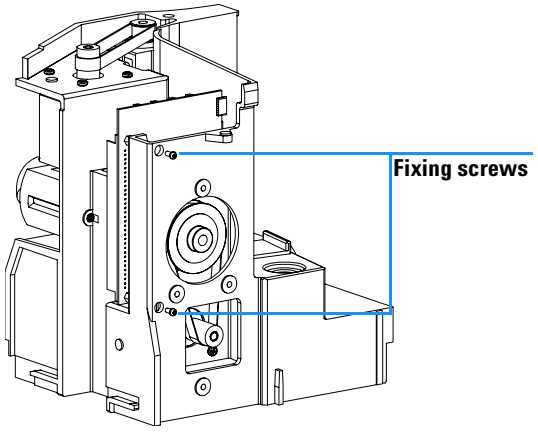
2 Remove the two fixing screws, and lift out the board.



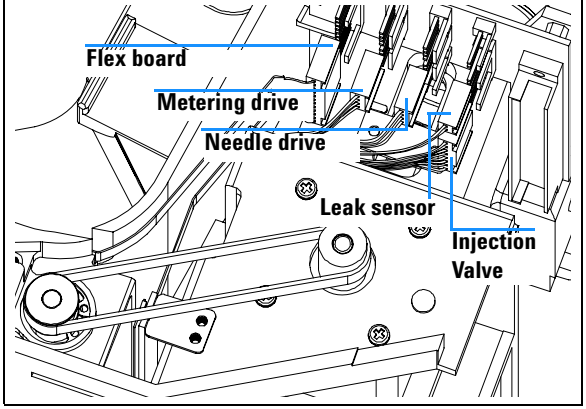
3 Install the new board. Ensure the board is positioned between the board guide.



4 Secure the board in place with the two screws.



5 Reconnect all the connectors to the new board.



On completion of this procedure:

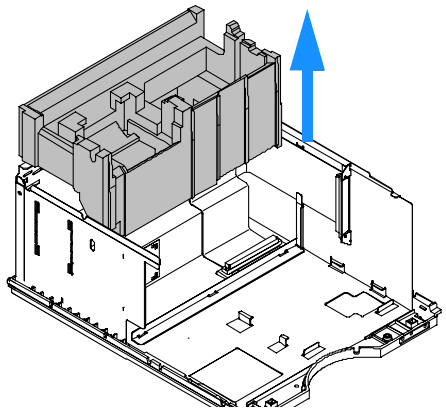
- Install the sampling unit (page 87).
- Install the transport assembly (page 85).
- Install the top cover (page 80).Verify the transport assembly alignment (page 272).

Power Supply

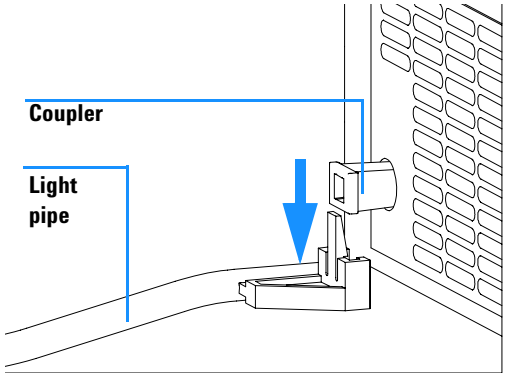
Frequency	When defective
Tools required	Pozidrive No. 1 screwdriver
Parts required	Power supply 0950-2528.
Preparations for this procedure	Remove the top cover (page 80). Remove the transport assembly (page 85). Remove the sampling unit (page 87). Remove the ASM board (page 103). Remove the fan (page 101).

CAUTION The ASM board is sensitive to electrostatic discharge. Always use the ESD strap (see "Using the ESD Strap" on page 55) when handling electronic boards.

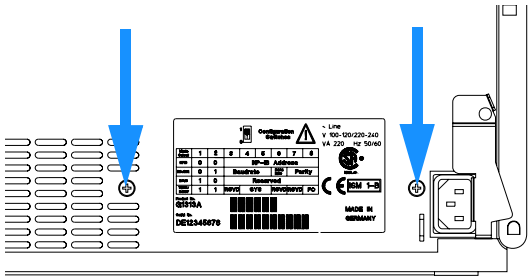
1 Remove the bottom foam.



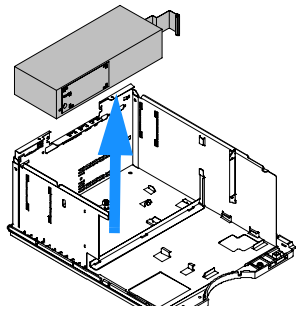
2 Remove the power switch light pipe from the coupler.



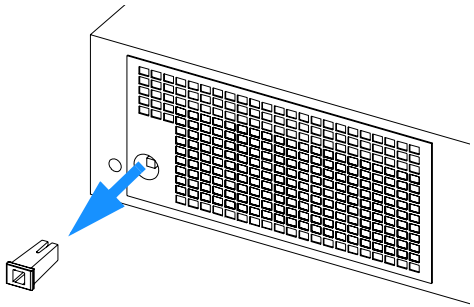
3 Remove the two screws from the rear panel.



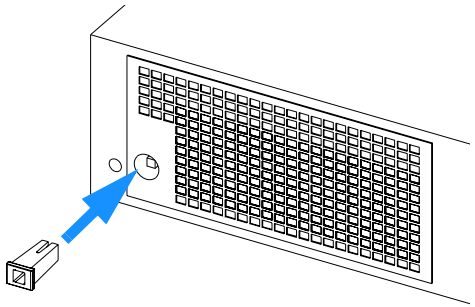
4 Lift the power supply out of the module.



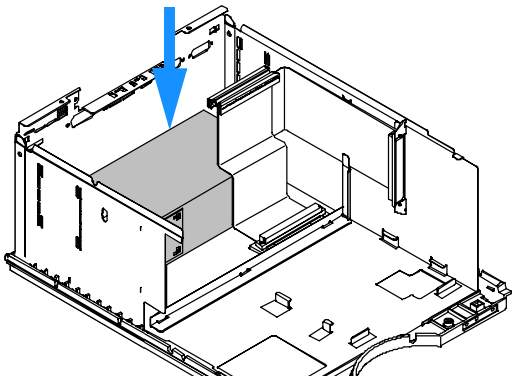
5 Remove the coupler from the of the power supply.



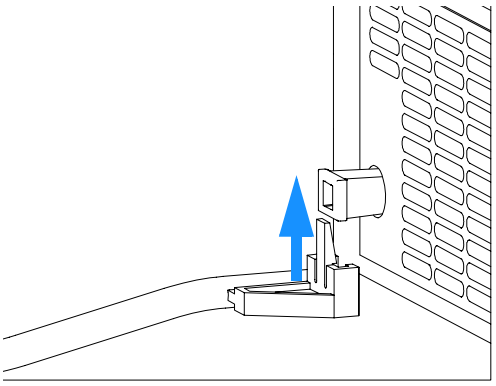
6 Insert the coupler onto the switch of the new power supply.



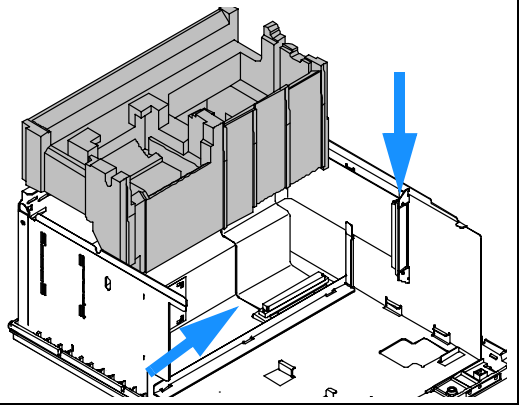
7 Install the power supply in the module.



8 Connect the light pipe to the coupler.



9 Install the bottom foam. Ensure the cables are positioned as shown.



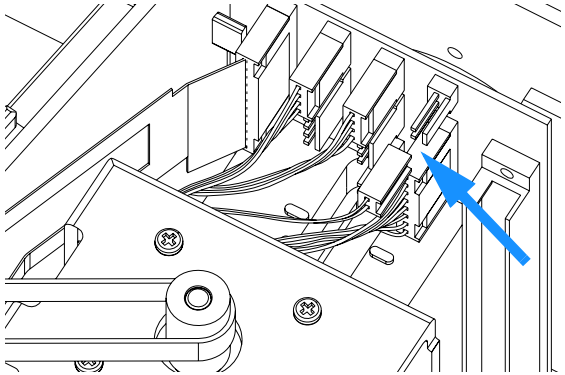
On completion of this procedure:

- Install the ASM board (page 103).
- Install the fan (page 101). Install the sampling unit (page 87).

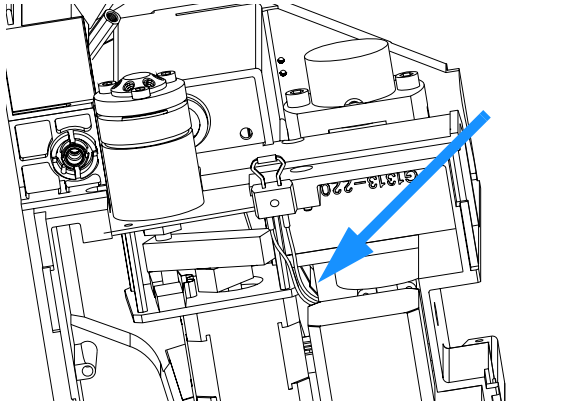
Leak Sensor

Frequency	When defective
Tools required	None.
Parts required	Leak sensor 5061-3356.
Preparations for this procedure	Remove the top cover (page 80). Remove the transport assembly (page 85). Remove the sampling unit (page 87).

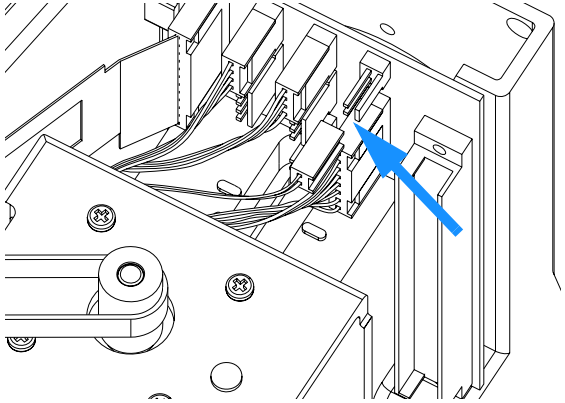
1 Disconnect the leak sensor from the SUD board (labelled "leak sensor"). Remove the sensor.



2 Feed the cable of the new sensor through the base of the sampling unit to the SUD board.



3 Connect the connector to the connector (labelled “leak sensor”).



On completion of this procedure:

- Install the sampling unit (page 87).
- Install the transport assembly (page 85).
- Install the top cover (page 80). Verify the transport assembly alignment (page 272).

4
Parts and Materials

Main Assemblies

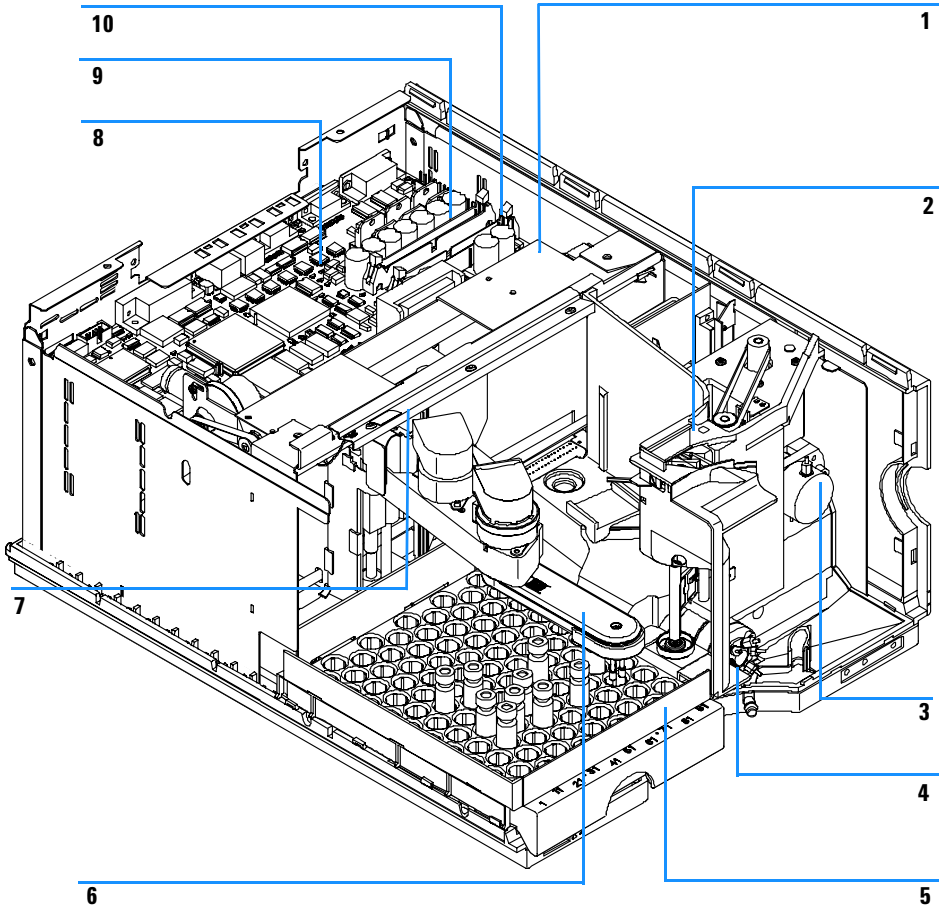


Figure 18 Autosampler Main Assemblies

Table 12 Autosampler Main Assemblies

Item	Description	Part Number
1	Transport assembly *for G1329A-2260A*	G1329-60009
2	Sampling unit assembly *for G1329A* Sampling unit assembly *for G2260A* (The assy comes without injection valve and analytical head)	G1329-60008 G2260-60008
3	Analytical head assembly (100 µl) *for G1329A and G1329B* Preparative head assembly (900 µl) *for G1329A (P<200Bar)* Preparative head assembly (900 µl) *for G2260A (P<400Bar)*	01078-60003 G1313-60007 G2260-60007
4	Injection valve assembly *for G1329A* Injection valve assembly *for G1329B* Injection valve assembly *for G2260A*	0101-0921 0101-1422 0101-1267
5	Vial tray, thermostatted (see page 138)	G1329-60011
6	Gripper assembly	G1313-60010
7	Illumination assembly	G1367-60040
8	Autosampler Main Board (ASM) *for G1329A and 2260A* Autosampler Main Board (ASM) *for G1329B*	G1329-69530 G1329-69540
	Standoff - GPIB connector (part not shown)	0380-0643
	Standoff - remote connector (part not shown)	1251-7788
9	Ribbon cable, sample transport	G1313-81601
10	Ribbon cable, sampling unit	G1313-81602
	Sampler - TCC cap (380 mm 0.1 mm id) *for G1329A* Sampler - Column cap (600 mm, 0.5 mm id) *for G2260A*	01090-87306 G2260-87300
	Power supply assembly (part not shown)	0950-2528
	Screw M4, 8 mm lg - power supply (part not shown)	0515-0910
	BCD board (not shown)	G1351-68701
	Cable, autosampler to ALS thermostat (part not shown)	G1330-81600

Sampling Unit Assembly

Table 13 Autosampler Sampling Unit Assembly

Item	Description	Part Number
	Sampling unit assembly *for G1329A and G1329B* Sampling unit assembly *for G2260A* (The assy comes without injection valve and analytical head)	G1329-60008 G2260-60008
1	Sampling unit connector board (SUD)	G1313-66503
2	Belt gear *for metering unit and needle arm*	1500-0697
3	Stepper motor *for metering unit and needle arm*	5062-8590
4	Loop capillary (100 µl) *for G1329A /G1329B/ G2260A* Loop ext. capillary (900 µl) *for G1329A / G2260A* Union for (900 µl) loop extension capillary	01078-87302 G1313-87303 5022-2133
5	Analytical head assembly (100 µl) *for G1329A and G1329B* Preparative head assembly (900 µl) *for G1329A (P<200Bar)* Preparative head assembly (900 µl) *for G2260A (P<400Bar)*	01078-60003 G1313-60007 G2260-60007
6	Inj. valve - Anal. head cap (160 mm 0.25 mm) *for G1329A* Inj. valve - Prep. head cap (160 mm 0.50 mm) *for G2260A*	G1313-87301 G2258-87301
7	Injection valve assembly *for G1329A* Injection valve assembly *for G1329B* Injection valve assembly *for G2260A*	0101-0921 0101-1422 0101-1267
8	Leak sensor	5061-3356
9	Waste tube injection valve assy (120 mm) *for G1329A/G1329B/G2260A*	G1313-87300
10	Safety cover	G1329-44105
11	Needle-seat assy (0.17 mm i.d 2.3 µl) *for G1329A/B (STANDARD)* Needle-seat assy (0.12 mm i.d 1.2 µl) *for G1329A/B*Needle-seat assy (0.50 mm i.d 20 µl) *for G2260A*	G1313-87101 G1313-87103 G2260-87101
12	Seat adapter	G1313-43204
13	Safety flap	G1313-44106
14	Flex board	G1313-68715

Table 13 Autosampler Sampling Unit Assembly (continued)

Item	Description	Part Number
15	Needle assembly *for* G1313-87101 *or* G1313-87103 *needle-seat*	G1313-87201
	Needle assembly *for* G1329-87101 *or* G1329-87103 *needle seat*	G1329-80001
	Needle assembly (900 µl loop capillary) *for* G1313-87101 *needle seat*	G1313-87202
	Needle assembly (900 µl loop capillary) *for* G2260-87101 *needle-seat*	G2260-87201
	Clamp Kit (includes needle clamp and 2 x clamp screw)	G1313-68713

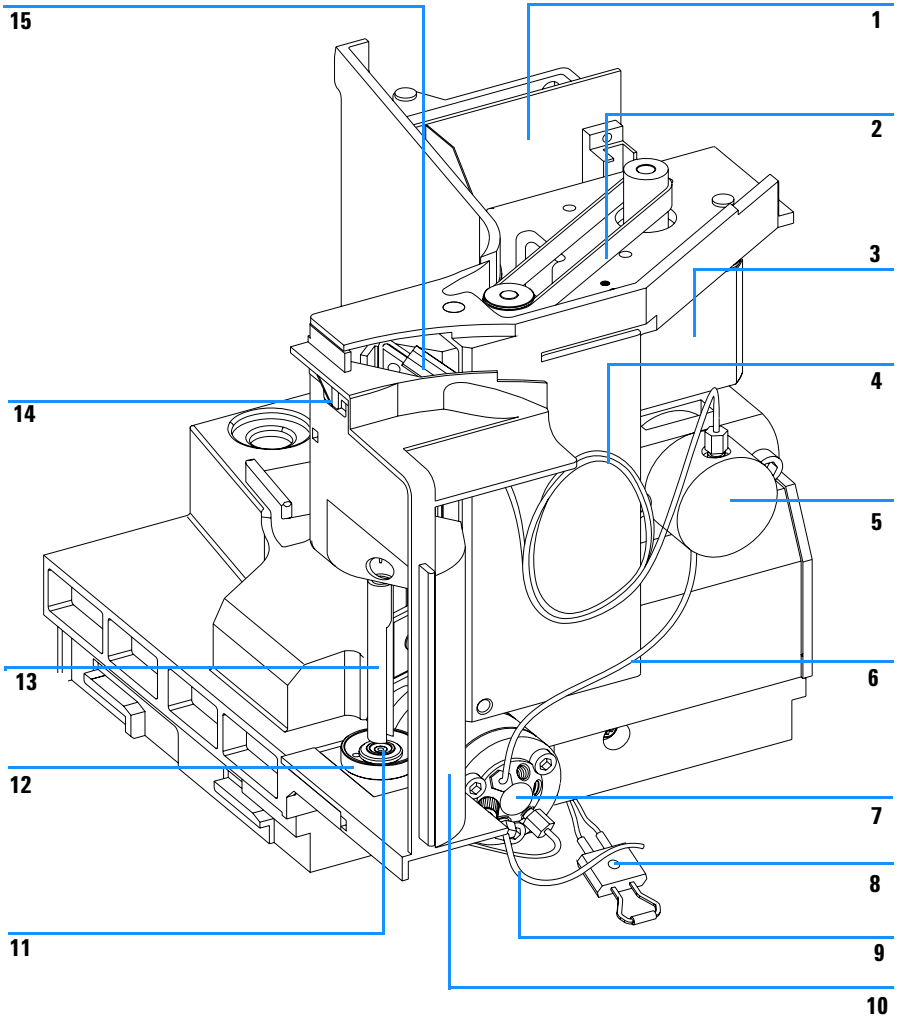


Figure 19 Autosampler Sampling Unit Assembly

Analytical-Head Assembly

Table 14 Analytical-Head Assembly (100 µl) for G1329A / G1329B

Item	Description	Part Number
	Analytical head assembly, includes items 1 – 6	01078-60003
1	Screws	0515-0850
2	Plunger assembly	5063-6586
3	Adapter	01078-23202
4	Support seal assembly	5001-3739
5	Metering seal (pack of 2)	5063-6589
6	Head body	01078-27710
7	Screw M5, 60 mm lg, for mounting of assembly	0515-2118

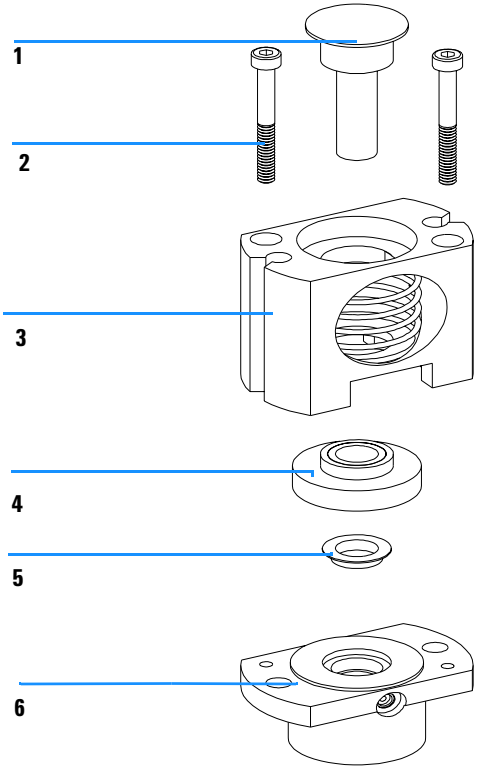


Figure 20 Analytical-Head Assembly

Table 15 Preparative-Head Assembly (900 µl) for G1329A only

Item	Description	Part Number
	Analytical head assembly 900 µl*, includes items 1 – 6	G1313-60007
1	Plunger assembly, 900 µl	5062-8587
2	Screws	0515-0850
3	Adapter	01078-23202
4	Support seal assembly, 900 µl	5001-3764
5	Metering seal, 900 µl	0905-1294
6	Head body, 900 µl	G1313-27700
	Screw M5, 60 mm lg, for mounting of assembly	0515-2118

* This head is limited to 200 Bars

Table 16 Preparative-Head Assembly (900 µl) for G2260A

Item	Description	Part Number
	Preparative head assembly 900 µl*, includes items 1 – 6	G2260-60007
1	Plunger assembly, 900 µl	5062-8587
2	Screws	0515-0850
3	Adapter	01078-23202
4	Support seal assembly, 900 µl	5001-3764
5	Metering seal, 900 µl	0905-1294
6	Head body, 900 µl	G2260-27700
	Screw M5, 60 mm lg, for mounting of assembly	0515-2118

* This head is limited to 400 Bars. It can only be assembled on a sampling unit with the description “supports 900 µl at 400 Bar.

Injection-Valve Assembly

Table 17 Injection-Valve Assembly for G1329A

Item	Description	Part Number
1	Injection-valve assembly, includes items1 – 6	0101-0921
2	Isolation seal	0100-1852
3	Rotor seal (Vespel)	0100-1853
3	Rotor seal (Tefzel)	0100-1849
4	Stator face	0100-1851
5	Stator head	0100-1850
6	Stator screws	1535-4857

Table 18 Injection-Valve Assembly for G1329B

Item	Description	Part Number
1	Injection-valve assembly, includes items 2 – 5	0101-1422
2	Isolation seal	0100-1852
3	Rotor seal (PEEK) includes 3 screws 1535-4857	0101-1416
5	Stator head	0101-1417
6	Stator screws	1535-4857

* item 4missing: 0101-1422 does not contain a stator face

Table 19 Preparative Injection-Valve Assembly for G2260A

Item	Description	Part Number
1	MBB* -Injection-valve assembly, includes items 1 – 6	0101-1267
2	Isolation seal	0100-1852
3 - 4	Rotor seal (PEEK) + Stator face (PEEK) kit	0101-1268
5	Stator head	0100-2195
6	Stator screws	1535-4857

* MBB (Make Before Brake) is a trademark by Rheodyne

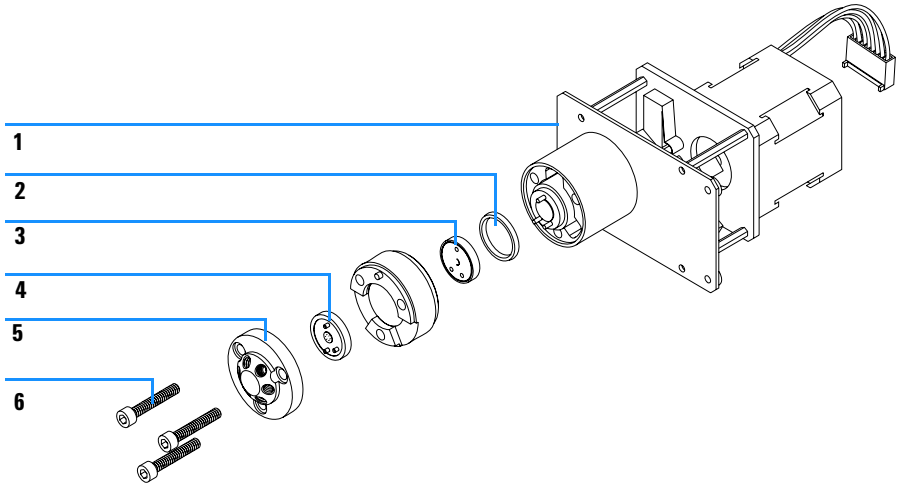


Figure 21 Injection-Valve Assembly

Sheet Metal Kit

Table 20 Sheet Metal

Item	Description	Part Number
1	Slot cover	5001-3772
2	Screw cover	5022-2112
3	Autosampler Sheet metal kit *for G1329A / G1329B / G2260A*	G1329-68701

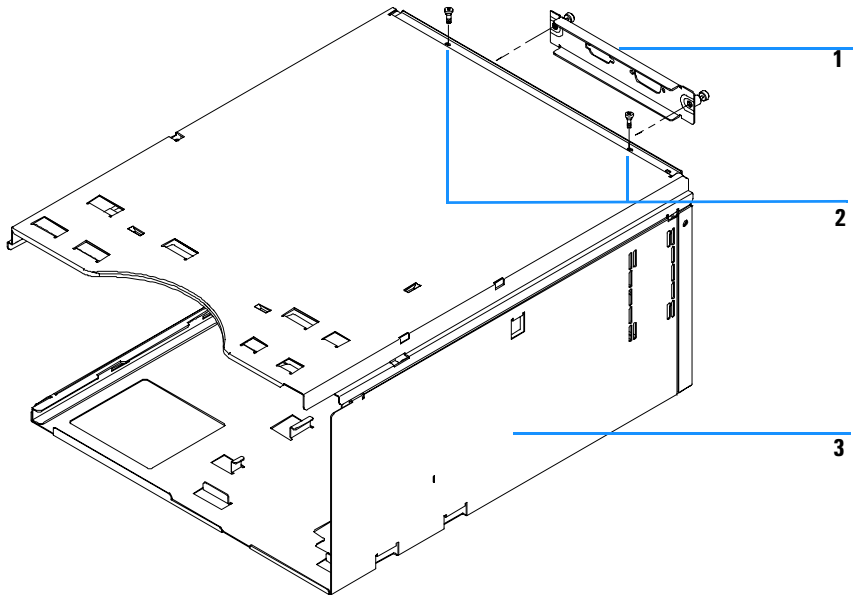


Figure 22 Sheet Metal Kit

Cover Parts

Table 21 Covers

Item	Description	Part Number
1	Autosampler Cover kit *for G1329A / G1329B / G2260A* (include base, side panels and top cover)	G1329-68713
2	Name plate for Agilent 1200 Series	5042-8901
3	Transparent front cover	G1313-68714
4	Door repair kit (includes transparent side and front door)	G1329-68707
5	Light protection kit (includes opaque side and front door, opaque front cover)	G1329-68708
	Cabinet upgrade kit (includes side panels, top cover, transparent side and front door, front cover and side insulation cover for cooled autosampler)	G1329-68706

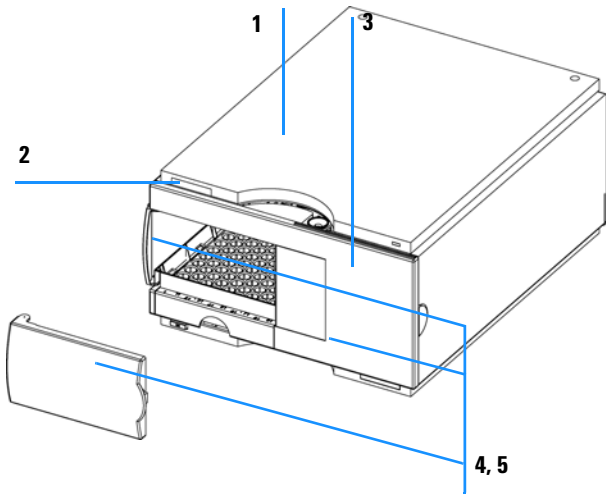


Figure 23 Cover Parts

Foam Parts

Table 22 Foam Parts

Item	Description	Part Number
	Foam kit, includes items 2 and 3	G1313-68702
1	Board guides	5041-8395
2	Top foam	Order foam kit
3	Bottom foam	Order foam kit

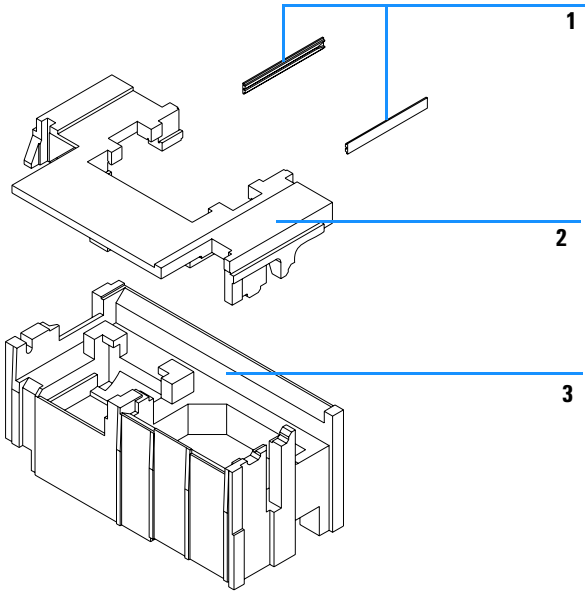


Figure 24 Foam Parts

Power and Status Light Pipes

Table 23 Power and Status Light Pipes

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

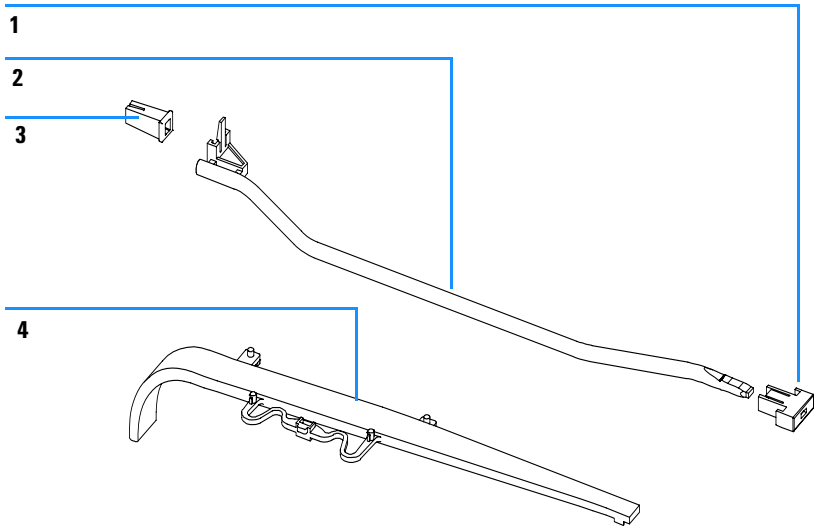


Figure 25 Power and Status Light Pipes

Leak System Parts

Table 24 Leak System Parts

Item	Description	Part Number
1	Leak funnel holder	5041-8389
2	Leak sensor	5061-3356
3	Leak plane	G1313-44511
4	Leak tubing 120 mm*	5062-2463
5	Leak funnel	5041-8388

* reorder gives 5 m

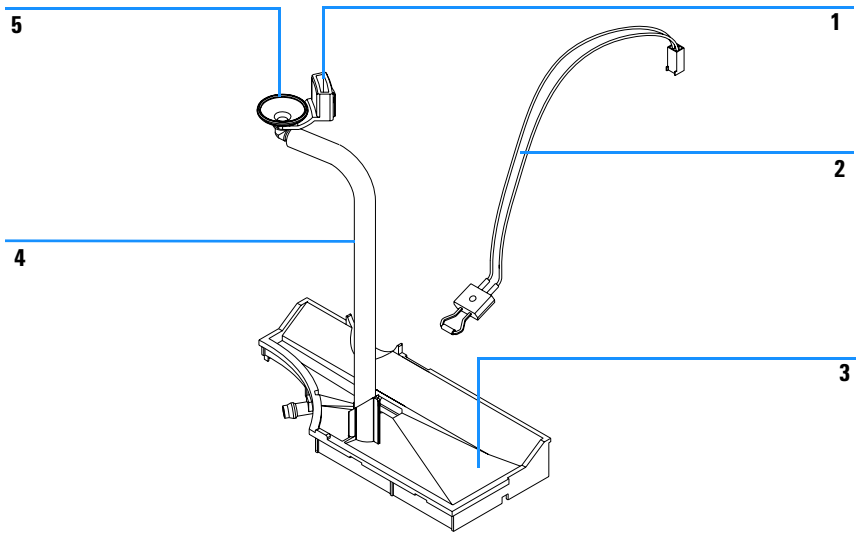


Figure 26 Leak System Parts

Vial Trays

Table 25 Thermostatted Autosampler Vial Trays and Tray Base

Item	Description	Part Number
1	Adapter, air channel	G1329-43200
2	Tray for 100 × 2-ml vials, thermostattable	G1329-60011
3	Spring	G1313-09101
4	Tray base *for G1329A / G1329B / G2260A* (includes items 4, 5).	G1329-60000
5	Spring stud	0570-1574
	Halftray for 40 × 2-ml vials (not shown)	G1313-44512
	Halftray for 15 × 6-ml vials (not shown)	G1313-44513

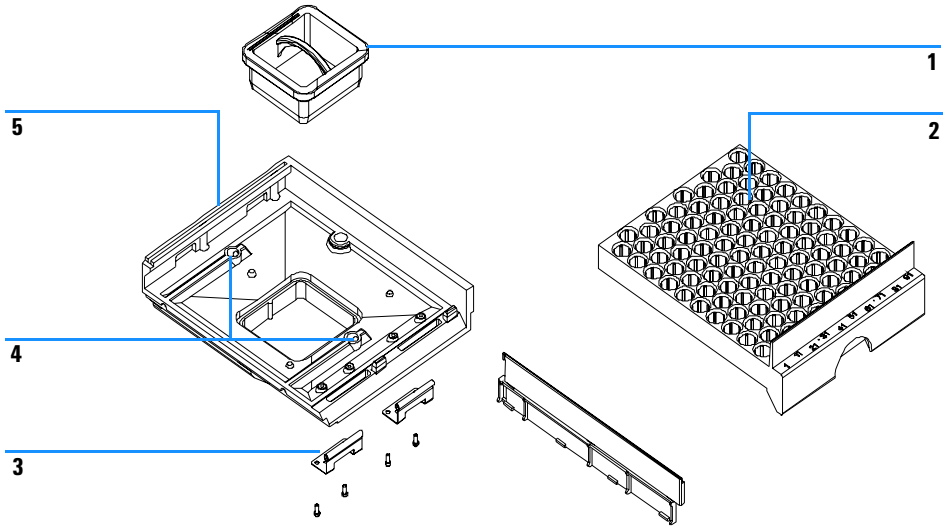


Figure 27 Thermostatted Autosampler Vial Trays and Tray Base

Standard Autosampler Accessory Kit G1329-68725

Table 26 G1329A/G1329 B - Standard Autosampler Accessory Kit Contents G1329-68725

Description	Part Number
Flexible tubing assy (120 cm)	5063-6527
Filter promo kit	no PN
CAN cable, 1 m long	5181-1519
Screw cap vials, clear 100/pk	5182-0714
Blue screw caps 100/pk	5182-0717
Label halftray	no PN
Vial instruction sheet	no PN
Wrenches 1/4 - 5/16 inch	8710-0510
Rheotool socket wrench 1/4 inch	8710-2391
Hex key 4 mm, 15 cm long, T-handle	8710-2392
Hex key 9/64 mm, 15 cm long, T- handle	8710-2394
Hex key 2.5 mm, 15 cm long, straight handle	8710-2412
Finger caps x3 (reorder gives pack of 15)	5063-6506
Front door cooled autosampler	no PN
Air channel adapter	G1329-43200
Cover insulation	no PN
Capillary 0.17 mm, 900 mm	G1329-87300
Capillary heat exchanger	01090-87306
Note for Agilent 1200 Series Autosampler door upgrade	no PN

Preparative Autosampler Accessory Kit G2260-68705

Table 27 G2260A - Preparative Autosampler Accessory Kit Contents G2260-68705

Description	Part Number
Flexible tubing assy (120 cm)	5063-6527
Filter promo kit	no PN
CAN cable, 1 m long	5181-1519
Screw cap vials, clear 100/pk	5182-0714
Blue screw caps 100/pk	5182-0717
Label halftray	no PN
Wrenches 1/4 - 5/16 inch	8710-0510
Rheotool socket wrench 1/4 inch	8710-2391
Hex key 4 mm, 15 cm long, T-handle	8710-2392
Hex key 9/64 mm, 15 cm long, T- handle	8710-2394
Hex key 2.5 mm, 15 cm long, straight handle	8710-2412
Finger caps x3 (reorder gives pack of 15)	5063-6506
Front door cooled autosampler	no PN
Air channel adapter	G1329-43200
Tray for 15 x 6 ml vials (x2)	G1313-44513
Union, loop extension	5022-2133
Seat extension capillary (500 µl)	G1313-87307
Seat extension capillary (1500 µl)	G1313-87308
Sampler - Column capillary	G2260-87300
Pump - Sampler capillary	G2260-87301

Maintenance Kit G1313-68709 for G1329A

Table 28 Maintenance Kit for G1329A

Item	Description	Part Number
1	Rotor seal (Vespel)	0100-1853
2	Needle assembly (100 µl)	G1313-87201
3	Needle-seat assembly 0.17 mm	G1313-87101
4	Metering seal (pack of 2)	5063-6589
5	Finger caps (pack of 15)	5063-6506

Maintenance Kit G1313-68719 for G1329B

Table 29 Maintenance Kit for G1329A

Item	Description	Part Number
1	Rotor seal (PEEK)	0101-1416
2	Needle assembly (100 µl)	G1313-87201
3	Needle-seat assembly 0.17 mm	G1313-87101
4	Metering seal (pack of 2)	5063-6589
5	Finger caps (pack of 15)	5063-6506

Multi-Draw Kit G1313-6871

Table 30 Multi-Draw Kit for G1329A and G1329B

Item	Description	Part Number
1	Seat capillary, 500 µl, 0.5 mm id	G1313-87307
2	Seat capillary, 1500 µl, 0.9 mm id	G1313-87308
2	Seat capillary, 5000 µl	0101-0301
3	Union	5022-6515

900 µl Injection Upgrade Kit G1363A for G1329A

Table 31 900 µl Injection Upgrade Kit for G1329A only

Item	Description	Part Number
1	Analytical Head, 900 µl	G1313-60007
2	Loop Extension, 900 µl	G1313-87303
3	Union, loop extension	5022-2133
4	Needle, 900 µl	G1313-87202

External Tray G1313-60004

Table 32 External Tray

Item	Description	Part Number
1	External tray	G1313-60004
2	Disposal tube	G1313-27302

5
Identifying Cables

This chapter provides information on cables.

Cable Overview

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

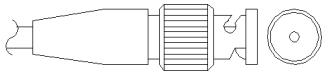
Table 33 Cables Overview

Type	Description	Part Number
Analog cables	3390/2/3 integrators	01040-60101
	3394/6 integrators	35900-60750
	35900A A/D converter	35900-60750
	General purpose (spade lugs)	01046-60105
Remote cables	3390 integrator	01046-60203
	3392/3 integrators	01046-60206
	3394 integrator	01046-60210
	3396A (Series I) integrator	03394-60600
	3396 Series II / 3395A integrator, see page 155	
	3396 Series III / 3395B integrator	03396-61010
	Agilent 1200 / 1050 modules / 1046A FLD	5061-3378
	1046A FLD	5061-3378
	35900A A/D converter	5061-3378
	1090 liquid chromatographs	01046-60202
	Signal distribution module	01046-60202

Table 33 Cables Overview (continued)

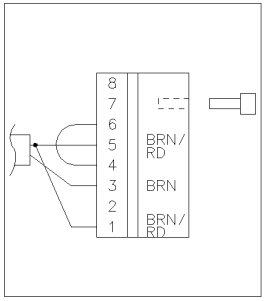
Type	Description	Part Number
BCD cables	3396 integrator	03396-60560
	General purpose (spade Lugs)	G1351-81600
Auxiliary	Agilent 1200 Series vacuum degasser	G1322-61600
CAN cables	Agilent 1200 module to module, 0.5 m	5181-1516
	Agilent 1200 module to module, 1 m	5181-1519
	Agilent 1200 module to control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

Analog Cables

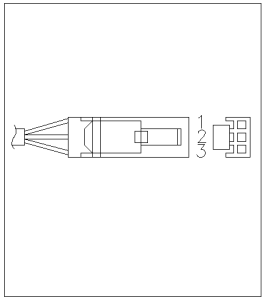


One end of these cables provides a BNC connector to be connected to Agilent 1200 Series modules. The other end depends on the instrument to which connection is being made.

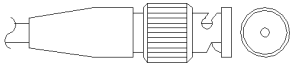
Agilent 1200 to 3390/2/3 Integrators

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

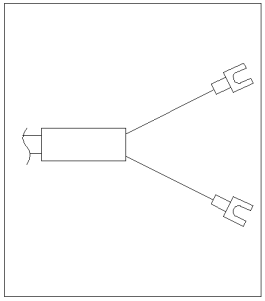
Agilent 1200 to 3394/6 Integrators

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

Agilent 1200 to BNC Connector

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

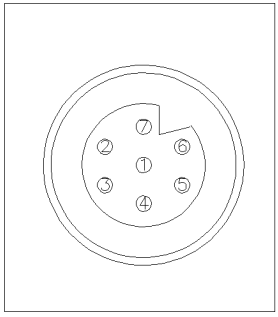
Agilent 1200 to General Purpose

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

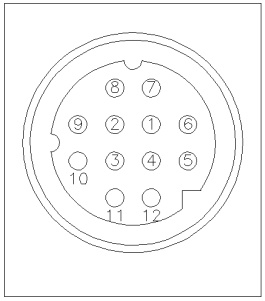
Remote Cables

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

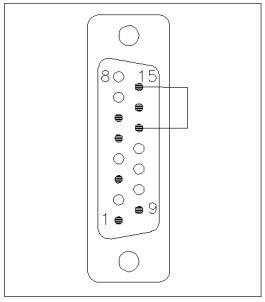
Agilent 1200 to 3390 Integrators

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

Agilent 1200 to 3392/3 Integrators

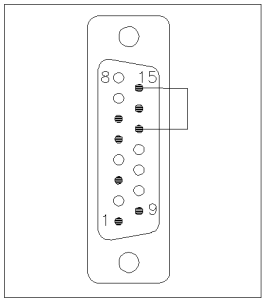
Connector 01046-60206	Pin 3392/3	Pin Agilent 1200	Signal Name	Active (TTL)
 4 - Key	3	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	11	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	9	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 -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

Agilent 1200 to 3394 Integrators

Connector 01046-60210	Pin 3394	Pin Agilent 1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	1	9 - Black	Start request	Low
	13, 15		Not connected	

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

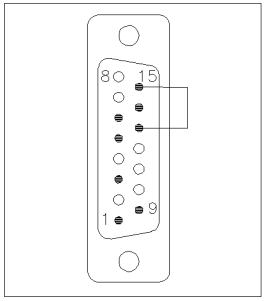
Agilent 1200 to 3396A Integrators

Connector 03394-60600	Pin 3394	Pin Agilent 1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

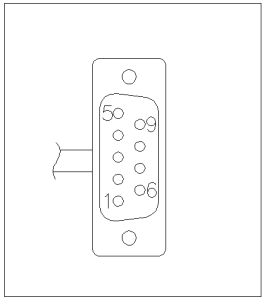
Agilent 1200 to 3396 Series II / 3395A Integrators

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

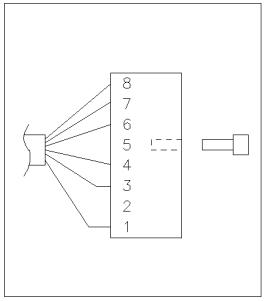
Agilent 1200 to 3396 Series III / 3395B Integrators

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

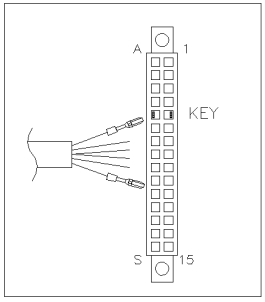
Agilent 1200 to HP 1050, HP 1046A or Agilent 35900 A/D Converters

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

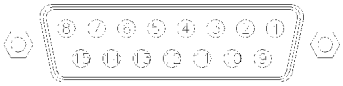
Agilent 1200 to HP 1090 LC or Signal Distribution Module

Connector 01046-60202	Pin HP 1090	Pin Agilent 1200	Signal Name	Active (TTL)
 5 - Key	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 1200 to General Purpose

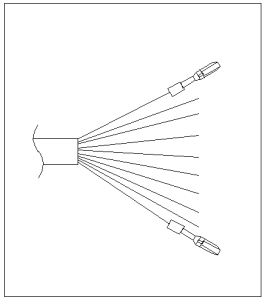
Connector 01046-60201	Pin Universal	Pin Agilent 1200	Signal Name	Active (TTL)
		1 - White	Digital ground	
		2 - Brown	Prepare run	Low
		3 - Gray	Start	Low
		4 - Blue	Shut down	Low
		5 - Pink	Not connected	
		6 - Yellow	Power on	High
		7 - Red	Ready	High
		8 - Green	Stop	Low
		9 - Black	Start request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

BCD Cables

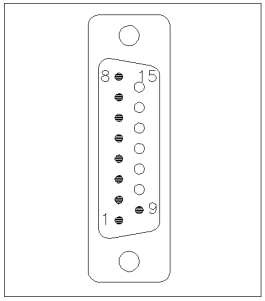


One end of these cables provides a 15-pin BCD connector to be connected to the Agilent 1200 Series modules. The other end depends on the instrument to be connected to

Agilent 1200 to General Purpose

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

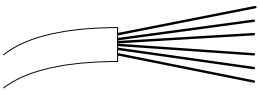
Agilent 1200 to 3396 Integrators

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

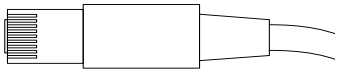
Auxiliary Cable

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

Agilent 1200 Series Degasser to general purposes

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

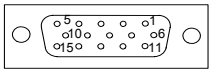
CAN Cable



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

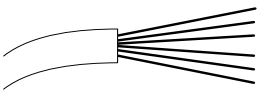
Agilent 1200 module to module, 0.5 m	5181-1516
Agilent 1200 module to module, 1 m	5181-1519
Agilent 1200 module to control module	G1323-81600

External Contact Cable



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

Agilent 1200 Series Interface Board to general purposes

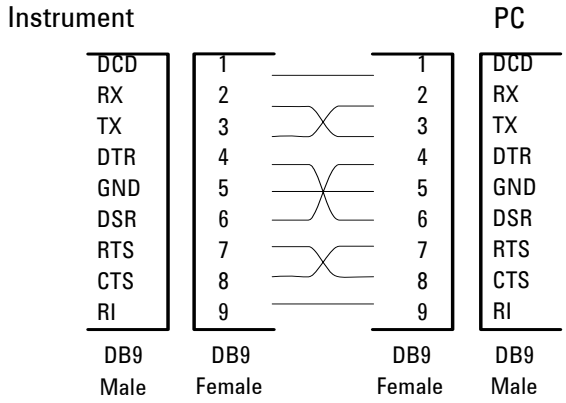
Connector G1103-61611	Color	Pin Agilent 1200	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected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

RS-232 Cable Kit

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

Agilent 1200 module to PC

RS-232 Cable Kit 34398As



LAN Cables

Recommended Cables

Table 34

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

6
Introduction to the Autosampler

Introduction to the Autosampler

Three models of Agilent 1200 Series autosamplers are available; within this introduction they will be referred to as the standard autosampler (G1329A), the standard autosampler SL (G1329B) and the preparative autosampler (G2260A). Unless otherwise stated all information in this section is valid for all models.

The Agilent 1100 Series autosamplers and Agilent 1200 Series autosamplers are designed for use with other modules of the Agilent 1200 Series LC system, with the HP 1050 Series, or with other LC systems if adequate remote control inputs and outputs are available. The autosamplerss are controlled from the Agilent 1200 Series control module (G4208 A Instant Pilot) or from the Agilent ChemStation for LC.

Three sample-rack sizes are available for the autosamplers. The standard full-size rack holds 100 × 1.8 ml vials, while the two half-size racks provide space for 40 × 1.8 ml vials and 15 × 6 ml vials respectively. Any two half-size rack trays can be installed in the autosamplers simultaneously. A specially designed sample-rack holding 100 × 1.8 ml vials is available for use with thermostatted autosamplers. The half-size racks trays are not designed for an optimal heat transfer when they are used with a thermostatted autosampler.

The autosamplers transport mechanism uses an X-Z-Theta movement to optimize vial pick-up and return. Vials are picked up by the gripper arm, and positioned below the sampling unit. The gripper transport mechanism and sampling unit are driven by motors. Movement is monitored by optical sensors and optical encoders to ensure correct operation. The metering device is always flushed after injection to ensure minimum carry-over.

The standard analytical head device provides injection volumes from 0.1 – 100 µl. Two preparative head devices provide injection volumes from 0.1 – 900 µl. One head is limited by a system pressure of 200 bars, the other by a system pressure of 400 bars. The G1329B autosampler SL uses an analytical head providing injection volumes from 0.1 – 100 µl for pressures up to 600 bar as used in rapid resolution systems.

The six-port injection valve unit (only 5 ports are used) is driven by a high-speed hybrid stepper motor. During the sampling sequence, the valve unit bypasses the autosamplers, and directly connects the flow from the pump to

the column. During injection and analysis, the valve unit directs the flow through the autosamplers which ensures that the sample is injected completely into the column, and that any sample residue is removed from the metering unit and needle from before the next sampling sequence begins. Different valves are available for the standard and preparative autosamplers.

Control of the vial temperature in the thermostatted autosampler is achieved using an additional Agilent 1200 Series module; the ALS thermostat. Details of this module are given in the Agilent 1200 Series thermostatted autosampler Supplemental Manual.

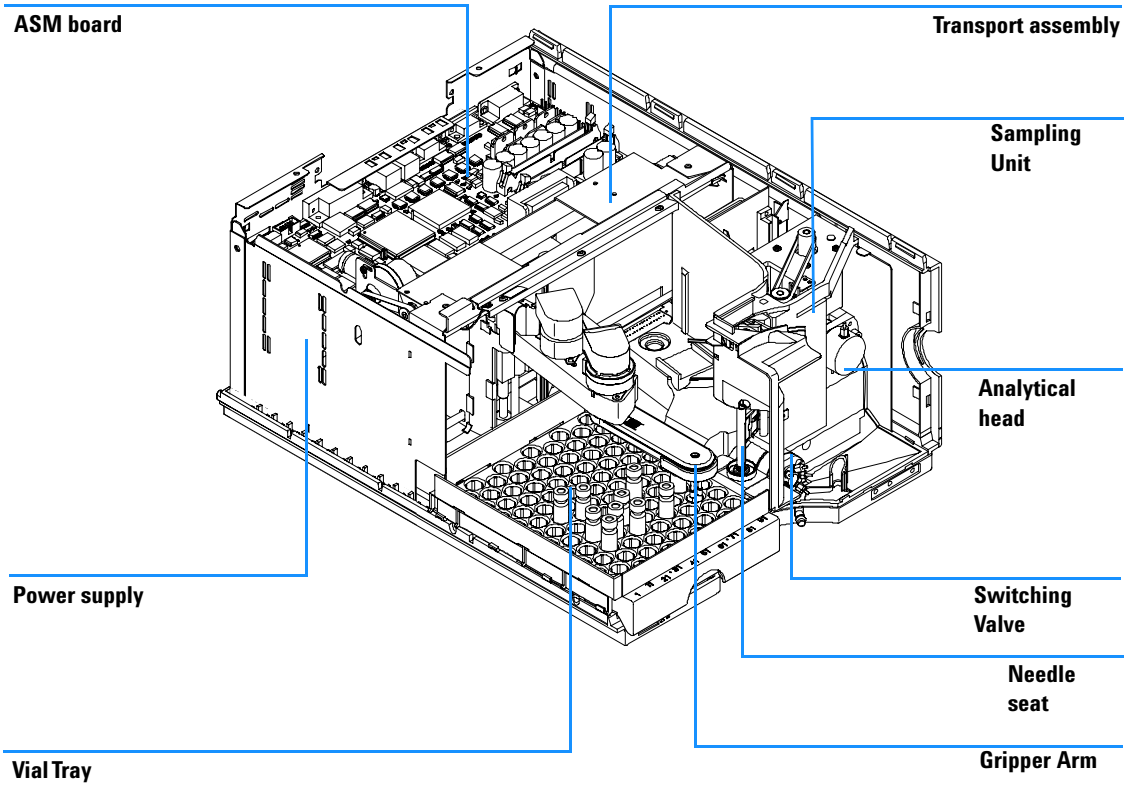


Figure 28 Overview of the Autosampler

Sampling Sequence

The movements of the autosampler components during the sampling sequence are monitored continuously by the autosampler processor. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sampling sequence can't be completed successfully, an error message is generated.

Solvent is bypassed from the autosamplers by the injection valve during the sampling sequence. The sample vial is selected by a gripper arm from a static sample rack, or from external vial positions. The gripper arm places the sample vial below the injection needle. The required volume of sample is drawn into the sample loop by the metering device. Sample is applied to the column when the injection valve returns to the mainpass position at the end of the sampling sequence.

The sampling sequence occurs in the following order:

1 The injection valve switches to the bypass position.

2 The plunger of the metering device moves to the initialization position.

3 The gripper arm moves from the home position, and selects the vial. At the same time, the needle lifts out of the seat.

4 The gripper arm places the vial below the needle.

5 The needle lowers into the vial.

6 The metering device draws the defined sample volume.

7 The needle lifts out of the vial.

8 If the automated needle wash is selected (see "Using the Automated Needle Wash" on page 45), the gripper arm replaces the sample vial, positions the wash vial below the needle, lowers the needle into the vial, then lifts the needle out of the wash vial.

9 The gripper arm checks if the safety flap is in position.

10 The gripper arm replaces the vial, and returns to the home position. Simultaneously, the needle lowers into the seat.

11 The injection valve switches to the mainpass position.

Injection Sequence

Before the start of the injection sequence, and during an analysis, the injection valve is in the mainpass position (Figure 29). In this position, the mobile phase flows through the autosamplers metering device, sample loop, and needle, ensuring all parts in contact with sample are flushed during the run, thus minimizing carry-over

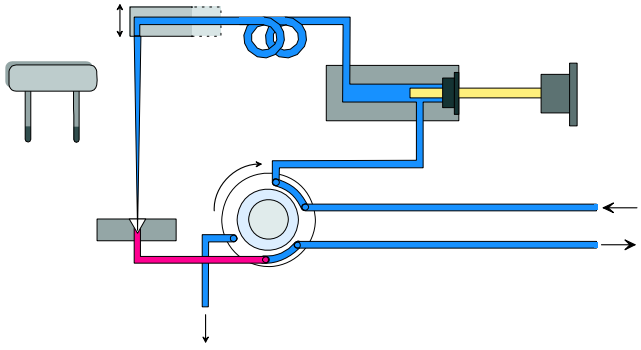


Figure 29 Mainpass Position

When the sample sequence begins, the valve unit switches to the bypass position (Figure 30). Solvent from the pump enters the valve unit at port 1, and flows directly to the column through port 6.

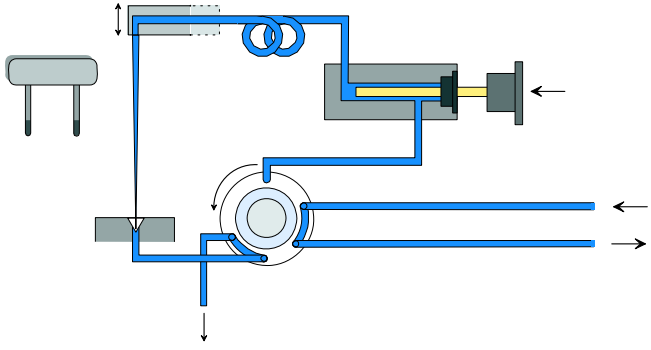


Figure 30 Bypass Position

Next, the needle is raised, and the vial is positioned below the needle. The needle moves down into the vial, and the metering unit draws the sample into the sample loop (Figure 31).

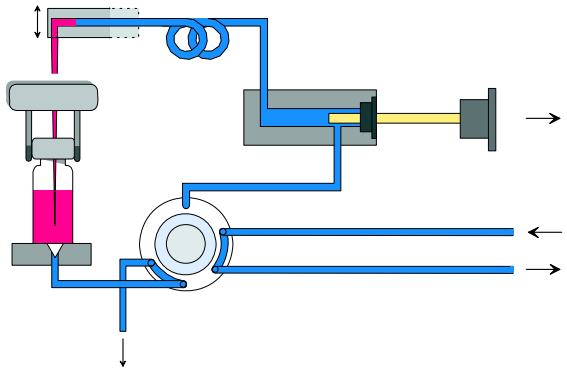


Figure 31 Drawing the Sample

When the metering unit has drawn the required volume of sample into the sample loop, the needle is raised, and the vial is replaced in the sample tray. The needle is lowered into the needle seat, and the injection valve switches back to the mainpass position, flushing the sample onto the column (Figure 32).

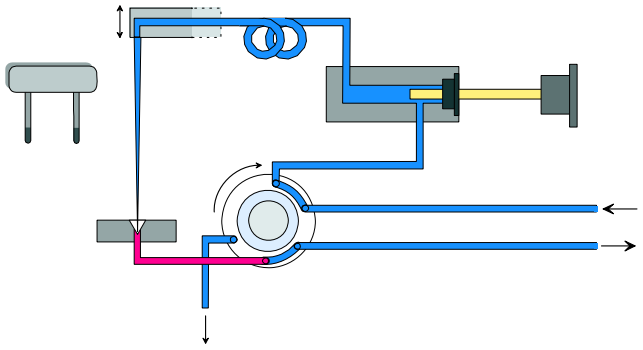


Figure 32 Mainpass Position (Sample Injection)

Sampling Unit

The sampling unit comprises three main assemblies: needle drive, metering device, and injection valve.

NOTE The replacement sampling unit *excludes* the injection valve and metering head assemblies.

The sampling units for the standard and the preparative autosamplers are different.

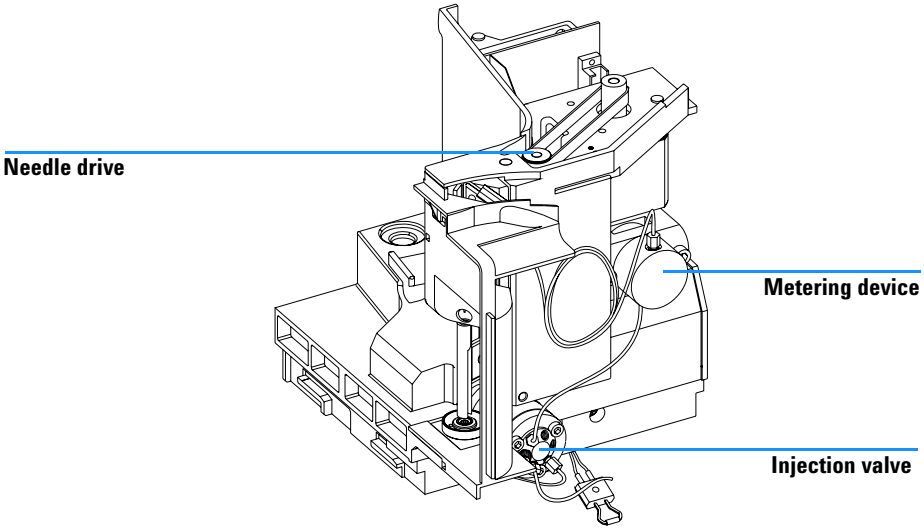


Figure 33 Autosampler Sampling Unit

Needle-Drive

The needle movement is driven by a stepper motor connected to the spindle assembly by a toothed belt. The circular motion of the motor is converted to linear motion by the drive nut on the spindle assembly. The upper and lower needle positions are detected by reflection sensors on the sampling unit flex board, while the needle-in-vial position is determined by counting the motor steps from the upper needle-sensor position.

Analytical head / preparative head

The analytical head is driven by the stepper motor connected to the drive shaft by a toothed belt. The drive nut on the spindle converts the circular movement of the spindle to linear motion. The drive nut pushes the sapphire plunger against the tension of the spring into the analytical head. The base of the plunger sits on the large bearing of the drive nut, which ensures the plunger is always centered. A ceramic ring guides the movement of the plunger in the analytical head. The home position of the plunger is sensed by an infra-red sensor on the sampling unit flex board, while the sample volume is determined by counting the number of steps from the home position. The backward movement of the plunger (driven by the spring) draws sample from the vial.

Table 35 Analytical Head Technical Data

	Standard (100 µl	Standard (900 µl)	Preparative (900 µl)
Number of steps	15000	15000	15000
Volume resolution	7 nl/motor step	60 nl/motor step	60 nl/motor step
Maximum stroke	100 µl	900 µl	900 µl
Pressure limit	600 bar	200 bar	400 bar
Plunger material	Sapphire	Sapphire	Sapphire

Injection-Valve

The two-position 6-port injection valve is driven by a stepper motor. Only five of the six ports are used (port 3 is not used). A lever/slider mechanism transfers the movement of the stepper motor to the injection valve. Two microswitches monitor switching of the valve (bypass and mainpass end positions).

No valve adjustments are required after replacing internal components.

Table 36 Injection-Valve Technical Data

	Standard	Preparative MBB™
Motor type	4V, 1.2A stepper motor	4V, 1.2A stepper motor
Seal material	Vespel™ (Tefzel™ available)	PEEK
Stator material	Ceramic/PEEK	PEEK
Number of ports	6	6
Switching time	< 150 ms	< 150 ms

Injection-Valve Technical Data (continued)

	Autosampler SL
Motor type	4V, 1.2A stepper motor
Seal material	PEEK
Stator material	None
Number of ports	6
Switching time	< 150 ms

Transport Assembly

The transport unit comprises an X-axis slide (left-right motion), a Z-axis arm (up-down motion), and a gripper assembly (rotation and vial-gripping).

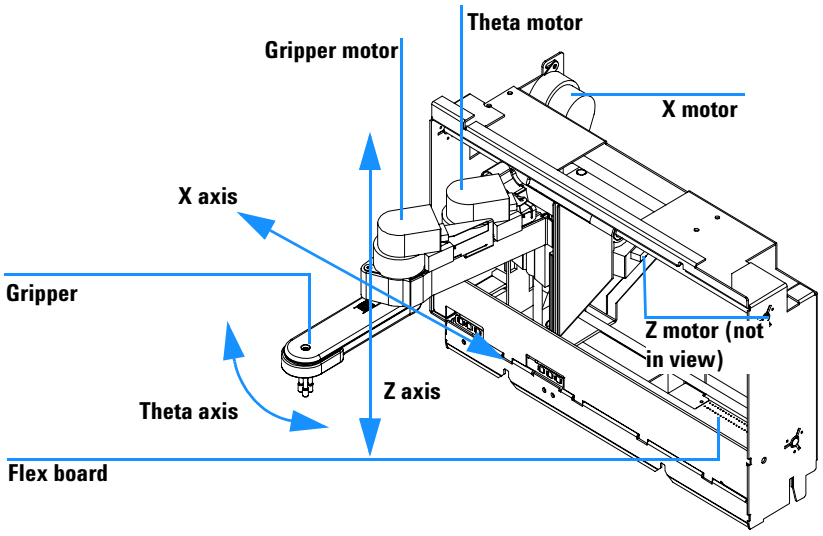


Figure 34 Transport Assembly

The transport assembly uses four stepper motors driven in closed-loop mode for accurate positioning of the gripper assembly for sample-vial transport. The rotational movement of the motors is converted to linear motion (X- and Z-axes) by toothed belts connected to the drive spindles. The rotation (theta axes) of the gripper assembly is transferred from the motor by a toothed belt and series of gears. The opening and closing of the gripper fingers are driven by a stepper motor linked by a toothed belt to the planetary gearing inside the gripper assembly.

The stepper motor positions are determined by the optical encoders mounted onto the stepper-motor housing. The encoders monitor the position of the motors continually, and correct for position errors automatically (e.g. if the gripper is accidentally moved out of position when loading vials into the vial

tray). The initialization positions of the moving components are sensed by reflection sensors mounted on the flex board. These positions are used by the processor to calculate the actual motor position. An additional six reflection sensors for tray recognition are mounted on the flex board at the front of the assembly.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components in the flow path which are subject to mechanical wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the instrument and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-setable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

The autosamplers provides two EMF counters. Each counter increments with autosamplers use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Each counter can be reset to zero after maintenance has been done. The autosamplers provides the following EMF counters:

Injection valve counter

This counter display the total number of switches of the injection valve since the last reset of the counter.

Needle Movements Counter

This counter displays the total number of movements of the needle into the seat since the last reset of the counter.

Using the EMF Counters

The user-setable EMF limits for the EMF counters enable the early maintenance feedback to be adapted to specific user requirements. The wear of autosamplers components is dependent on the analytical conditions, therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially, no EMF limit should be set. When instrument performance indicates maintenance is necessary, make note of the values displayed by the injection valve and needle movements counters. Enter these values (or values slightly less than the displayed values) as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

Electrical Connections

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

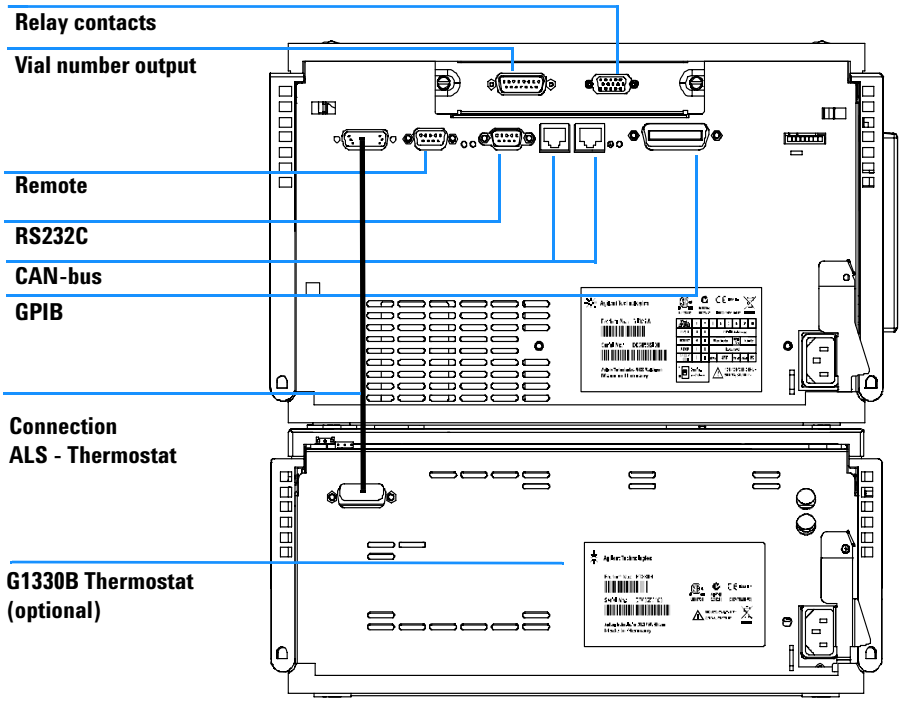


Figure 35 Autosampler (plus Thermostat) Electrical Connections

- The GPIB connector is used to connect the autosamplers with a computer. The address and control switch module next to the GPIB connector determines the GPIB address of your autosamplers. The switches are preset to a default address (see Table 44 on page 196) which is recognized once after power on.
- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal Agilent 1200 Series module data transfer and synchronization.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as common shut down, prepare, and so on.
- The RS-232 connector may be used to control the autosamplers from a computer through an RS-232 connection, using appropriate software. This connector needs to be activated by the configuration switch module next to the GPIB connector. The software needs the appropriate drivers to support this communication. See your software documentation for further information.
- The Thermostat-Autosampler connection is used for control signal transfer and synchronization of the two modules. The cable must be installed for operation of the ALS thermostat.

WARNING **DO NOT disconnect or reconnect the autosampler to ALS thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.**

- The power input socket accepts a line voltage of 100–120 or 220–240 volts AC ± 10 % with a line frequency of 50 or 60 Hz. There is no voltage selector on your autosamplers because the power supply has wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply. The security lever at the power input socket prevents that the autosamplers cover is taken off when line power is still connected.
- The interface board slot is used for external contacts, BCD output and for future use.

7
Theory of Operation

Autosampler Control and Electronics

The ASM board controls the vial-transport mechanism, sampling needle, metering unit, and high-speed injection valve. These devices are controlled by a versatile electronics design based upon a 68000 family processor which also contains battery backup RAM, flash ROM, a real time clock, and several communications options.

Position and Movement Sensors

Position sensing of movement of autosampler components is done by sensors on the sample transport and sampling unit flex boards. The following sensors are used:

Table 37 Sample Transport Flex Board

Sensor Type	Number of Sensors	Position/Movement Sensed
Reflection Sensor	6	Vial tray identification
Reflection Sensor	1	Gripper initialization
Reflection Sensor	3	Transport assembly Initialization

Table 38 Sampling Unit Flex Board

Sensor Type	Number of Sensors	Position/Movement Sensed
IR light sensor	1	Metering device home (reference) position
Reflection sensor	2	Needle end positions
Hall sensor	2	Front cover in position
Microswitch	2	Valve switching

Autosampler Main Board (ASM)

Common Electronics

A common electronics and firmware design is used for all Agilent 1200 Series LC modules. This core design provides a basic set of functions to each module.

Table 39 Common Electronics

Core-processor	MC68332
Core-memory	The core unit has 3 memory blocks: 128k *16 bit PSRAM 1M*8 Flash memory 32k*8 NVRAM 24*8 serial NVRAM from the real time clock
Communication Interfaces	The core unit directly supports the following interfaces: CAN bus GPIB RS232 Remote MIO

ASIC — Application-Specific Integrated Circuit

The application-specific integrated circuit (ASIC) provides interfacing to external devices through drivers, including GPIB, CAN, APG Remote. It is directly connected to the four control LEDs located near the connectors on this board and the 8-bit configuration switch which is used to configure the address for the GPIB communication, baud rate for RS-232 transfer, and so on. Also, the ASIC controls and drives module specific functions and reads static status signals.

Leak Converter

Solvent leaking from the autosampler cools down the PTC. This changes the resistance of the PTC causing the leak converter to generate a leak signal. The leak converter consists of a PTC (for leak sensing) and an NTC (for ambient-temperature compensation). This configuration ensures ambient temperature changes do not affect the leak-sensing circuit.

Fan Drive The fan speed (two speeds are possible) is controlled by the main processor according to the internal heat distribution inside the module. The fan provides a PWM signal which is proportional to the revolution. This fan status signal is used for diagnostics.

Electronic Fuses The circuits that are connected to + 36 V are fused on the board electronically.

Onboard Battery An onboard lithium battery buffers the electronic memories when the module is turned off. For safety information on lithium batteries see "Lithium Batteries Information" on page 217.

Autosampler-Specific Electronics

The autosampler specific functions provided by the electronics are:

- closed loop control of four axis vial handling servos
- electric valve control
- Needle unit control
- metering device control

Transport Unit Control

The transport drive electronics use current-controlled pulse-width modulation (PWM) to drive the X, Z, θ, and gripper motors in closed-loop servo control mode. Dedicated electronics in the SGS L6506 provide the current-control loop. Commutation is done in FPGA logic. SGS L6201 SMT output drivers are used for all four stepper motors. Motor encoder signals are connected to the ASIC where the encoder quadrature decoded clock and the up/down signal are used in the FPGA to provide instantaneous stepper motor commutation with respect to the motor rotor position.

Wiring between the autosampler main board (ASM) and the motors and encoders uses a flat-band cable (64 pin) and a flex board on which 10 reflection light sensors are located. Six light sensors are used for vial-tray identification, one for gripper decoding, and three for decoding of the initialization position.

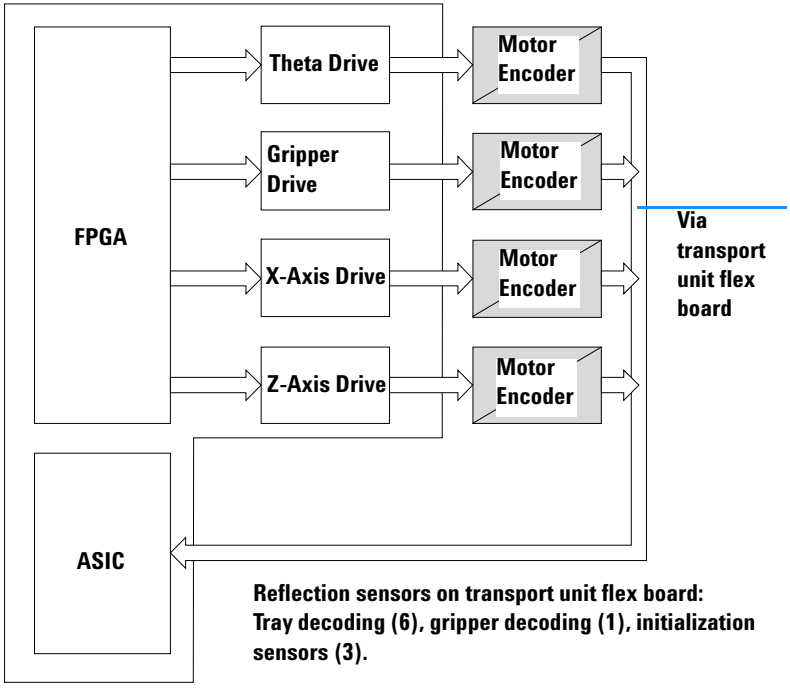


Figure 36 Transport unit control

Sampling Unit Control

Needle arm, metering device and valve motors are driven by controlled pulse-width modulation in the same way as the SGS L6506 (see "Transport Unit Control" on page 186). The motors require fast speed but do not require precise position control. Therefore, a closed loop servo system is not required. Commutation is done in FPGA logic. The needle arm, metering device and valve motors use SGS L6203 output drivers to deliver the higher currents required for fast movement or high torque.

The movement sensing of the valve motor is done by two microswitches. Two reflection light sensors are used to detect the end positions of the needle arm. One photo sensor is required to detect the home position of the metering device. Two hall sensors detect correct closure of the door (needle arm movement is interrupted if the door is open). All the sensors are mounted on one flex board. The flex board and motors are connected to the sampling unit distribution board (SUD). The SUD board is connected to the autosampler main board (ASM) via a flat-band cable (64 pin).

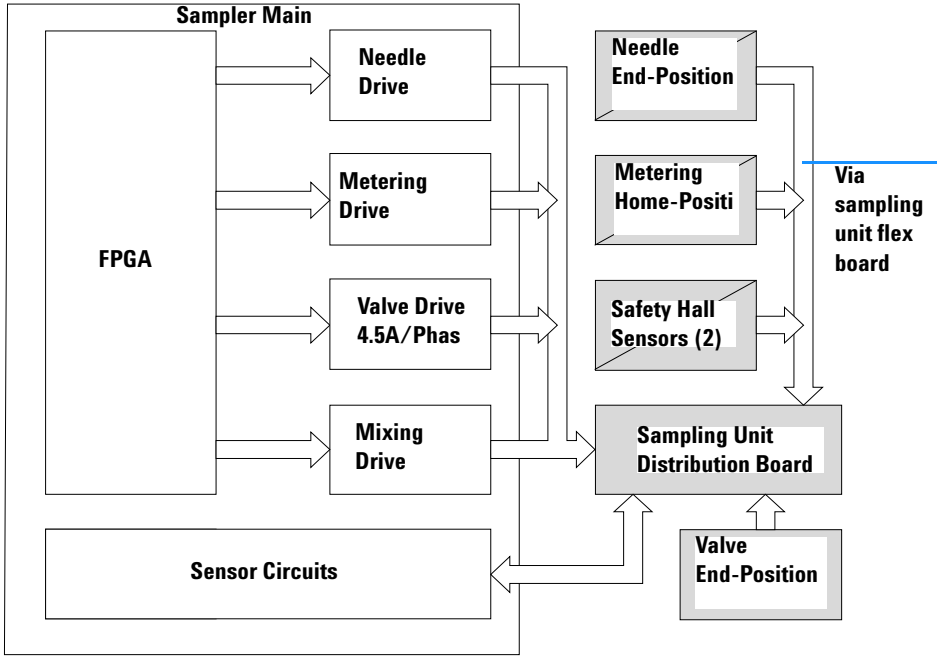


Figure 37 Sampling unit control

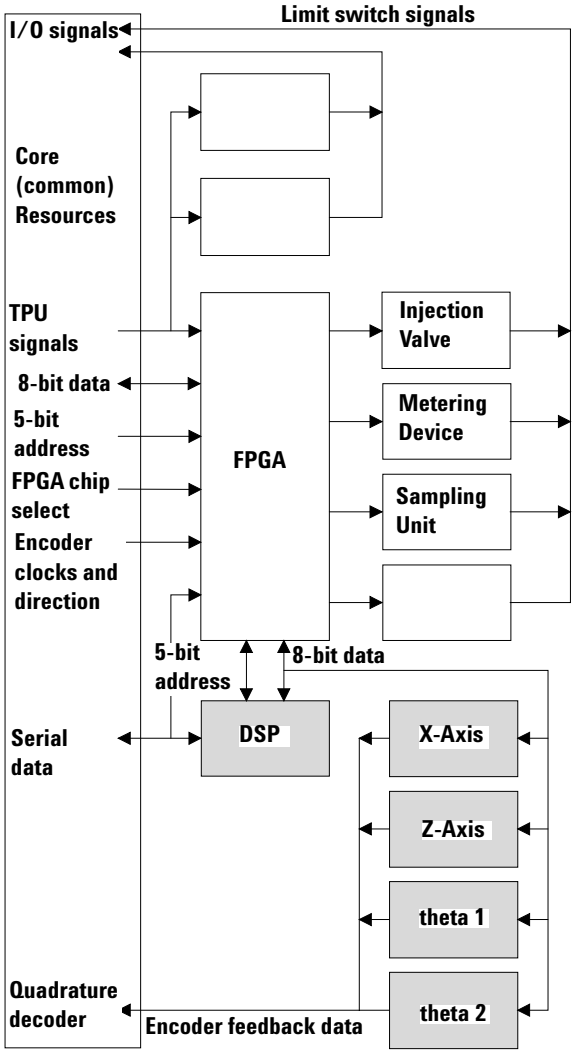


Figure 38 Autosampler block diagram

Firmware Description

The firmware of the instrument consists of two independent sections:

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

Resident System

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

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

Main System

Its properties are:

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

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

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

or module specific functions like

- internal events such as metering device, gripper and needle movements,

Firmware Updates

Firmware updates can be done using your user interface:

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

The file naming conventions are:

xxxx-vvv.DLB, where

xxxx is the product number, e.g. 1329 for the G1329A Autosampler), and vvv is the revision number, for example 380 is revision 3.80

For instructions refer to your user interface.

NOTE

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

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

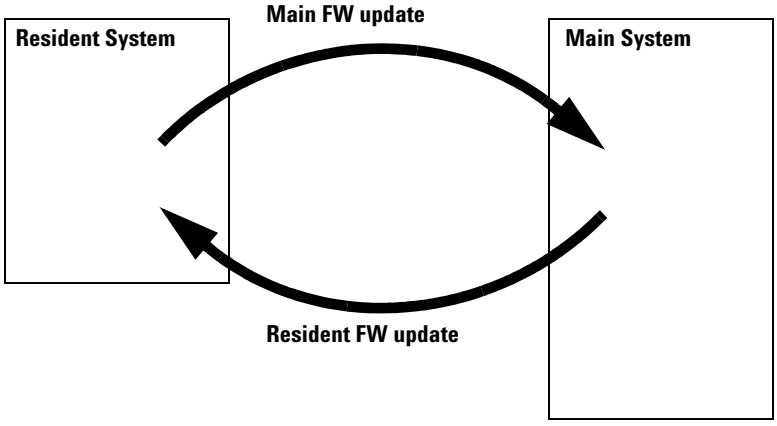


Figure 39 Firmware Update Mechanism

Optional Interface Boards

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

Table 40 Optional Interface Boards

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

BCD Board

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

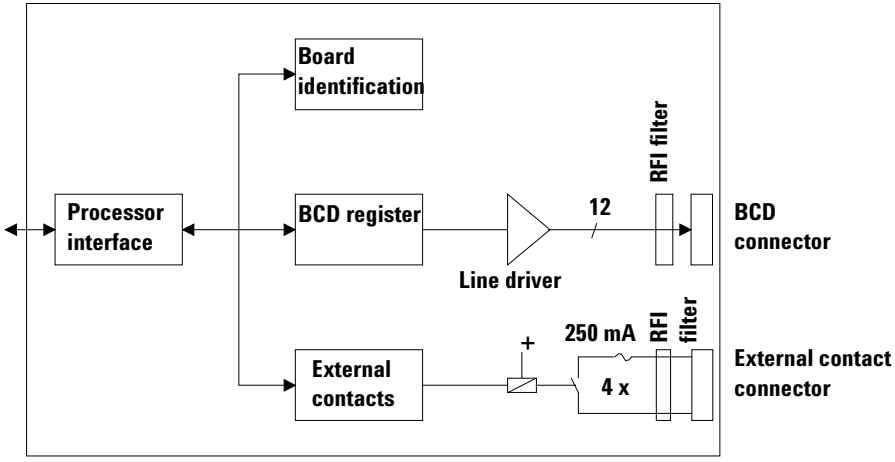


Figure 40 Block Diagram BCD Board

There are general purpose cables available to connect the BCD output, see “BCD Cables” on page 158 and the external outputs, see “External Contact Cable” on page 162 to external devices.

Table 41 Detailed connector layout (1200)

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

LAN Communication Interface Board

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

NOTE The LAN board can only be used together with:

a main board version G13XX-66520 (for G1315A, G1365A, G1314A, G1310A, G1311A, G1312A and G1329A) or newer and on all other Agilent 1200 Series modules.

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

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

Table 42 LAN Boards

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

NOTE These cards (*) may be longer orderable. Minimum firmware of these Hewlett Packard JetDirect cards is A.05.05.

Recommended Cables

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

Interfaces

The Agilent 1200 Series modules provide the following interfaces:

Table 43 Agilent 1200 Series Interfaces

Interface Type	Pumps	Autosampler	DA Detector MW Detector FL Detector	VW Detector RI Detector	Thermostatted Column Compartment	Vacuum Degasser
CAN	Yes	Yes	Yes	Yes	Yes	No
GPIB	Yes	Yes	Yes	Yes	Yes	No
RS-232C	Yes	Yes	Yes	Yes	Yes	No
Remote	Yes	Yes	Yes	Yes	Yes	Yes
Analog	Yes	No	2 ×	1 ×	No	Yes*
Interface board	Yes	Yes	Yes	Yes	No	No

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

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

For identification and location of the connectors Figure 6 on page 28.

WARNING **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations, see "External Tray G1313-60004" on page 145.**

Analog Signal Output

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

GPIB Interface

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

Table 44 Default Addresses

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

CAN Interface

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

Remote Interface

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

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

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

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

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

Table 45 Remote Signal Distribution

Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
4	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
5		Not used
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.

Table 45 Remote Signal Distribution (continued)

Pin	Signal	Description
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

RS-232C

The RS-232C connector is used to control the instrument from a computer through RS-232C connection, using the appropriate software. This connector can be activated by the configuration switch module next to the GPIB connector.

The RS-232C is designed as DCE (Data Communication Equipment) with a 9-pin male SUB-D type connector. The pins are defined as follows:

Table 46 RS-232C Connection Table

Pin	Direction	Function
1	In	DCD
2	In	RxD
3	Out	TxD
4	Out	DTR
5		Ground
6	In	DSR
7	Out	RTS
8	In	CTS
9	In	RI

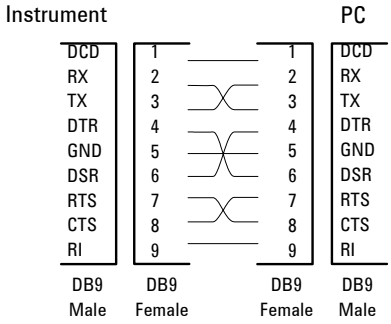


Figure 41 RS-232 Cable

Setting the 8-bit Configuration Switch

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

factory setting is shown for autosampler

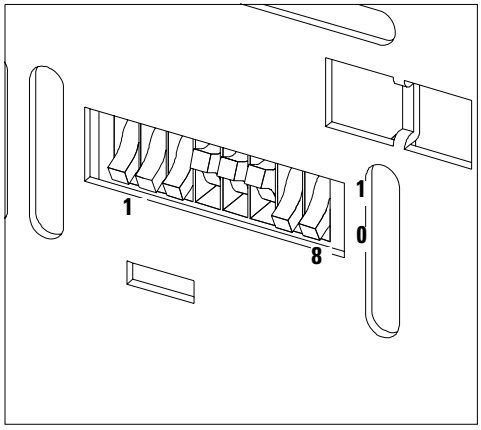


Figure 42 8-bit Configuration Switch

Table 47 8-bit Configuration Switch

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

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

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

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

GPIB Default Addresses

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

Default GPIB address is set to the following addresses:

Table 48 Default Addresses for Agilent 1200 Series Modules

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

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

Communication Settings for RS-232C Communication

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

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

Table 49 Communication Settings for RS-232C Communication

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

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

Table 50 Baud Rate Settings

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

Table 51 Data Bit Settings

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

Table 52 Parity Settings

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

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

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

Forced Cold Start Settings

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

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

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

Table 53 Forced Cold Start Settings

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

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

Stay-Resident Settings

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

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

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

Table 54 Stay Resident Settings

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

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

The Main Power Supply Assembly

The main power supply comprises a closed assembly (no onsite repair possibility).

The power supply provides all DC voltages used in the module except for the voltages supplied by the lamp power supply to the deuterium and tungsten lamps in the detectors. The line voltage can vary in a range from 100 – 120 or 220 – 240 volts AC ± 10 % and needs no manual setting.

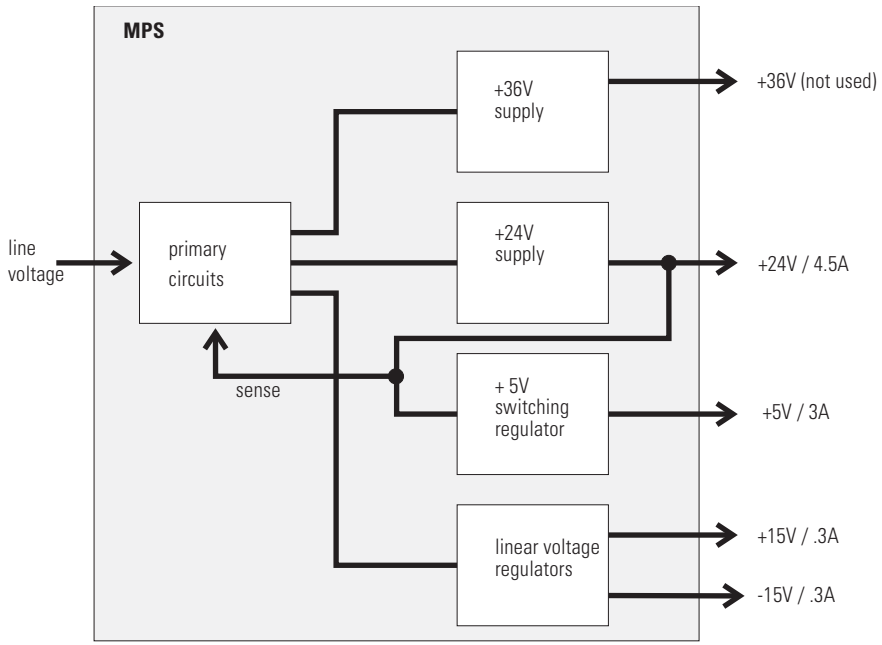


Figure 43 Main Power Supply (MPS) Blockdiagram

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

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

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

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

Table 55 Main Power Supply Specifications

Maximum power	130 W	Continuous output
Line Input	100 – 120 or 220 – 240 volts AC ± 10 %, line frequency of 50/60 Hz	Wide ranging
Output 1	+ 24 V / 4.5 A (maximum)	total power consumption of + 24 V and + 36 V must not exceed 107 W.
Output 2	+ 36 V / 2.5 A (maximum)	
Output 3	+ 5 V / 3 A	
Output 4	+ 15 V / 0.3 A	
Output 5	- 15 V / 0.3 A	

8
Specifications

Performance Specifications

Table 56 Performance Specifications Agilent 1200 Series Autosampler (G1329A). Valid when standard 100 µl metering head installed.

Type	Specification
Pressure	Operating range 0-40 MPa (0-400 bar, 0-5900 psi)
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
Communications	Controller-area network (CAN). GPIB (IEEE-448), RS232C, APG-remote standard, optional four external contact closures and BCD vial number output
Safety features	Leak detection and safe leak handling, low voltages in maintenance areas, error detection and display
Injection range	0.1 – 100 µl in 0.1 µl increments Up to 1500 µl with multiple draw (hardware modification required)
Replicate injections	1 – 99 from one vial
Precision	< 0.25 % RSD from 5 – 100 µl, < 1 % RSD 1 – 5 µl variable volume
Minimum sample volume	1 µl from 5 µl sample in 100 µl microvial, or 1 µl from 10 µl sample in 300 µl microvial
Carryover	Typically < 0.1 %, < 0.05 % with external needle cleaning
Sample viscosity range	0.2 – 50 cp
Replicate injections per vial	1 – 99
Sample capacity	100 × 2-ml vials in 1 tray 40 × 2-ml vials in ½ tray 15 × 6-ml vials in ½ tray (Agilent vials only)
Injection cycle time	Typically 50 s depending on draw speed and injection volume

Table 57 Performance Specifications Agilent 1200 Series standard autosampler (G1329A).
Valid when standard 900 µl metering head installed.

Type	Specification
Pressure	Operating range 0-20 MPa (0-200 bar, 0-2950 psi)
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
Communications	Controller-area network (CAN). GPIB (IEEE-448), RS232C, APG-remote standard, optional four external contact closures and BCD vial number output
Safety features	Leak detection and safe leak handling, low voltages in maintenance areas, error detection and display
Injection range	0.1 – 900 µl in 0.1 µl increments (recommended 1 µl increments) Up to 1800 µl with multiple draw (hardware modification required)
Replicate injections	1 – 99 from one vial
Precision	Typically < 0.5 % RSD of peak areas from 5 – 2000 µl, Typically < 1 % RSD of peak areas from 2000 – 5000 µl, Typically < 3 % RSD of peak areas from 1 – 5 µl
Minimum sample volume	1 µl from 5 µl sample in 100 µl microvial, or 1 µl from 10 µl sample in 300 µl microvial
Carryover	Typically < 0.1 %, < 0.05 % with external needle cleaning
Sample viscosity range	0.2 – 50 cp
Sample capacity	100 × 2-ml vials in 1 tray 40 × 2-ml vials in ½ tray 15 × 6-ml vials in ½ tray (Agilent vials only)
Injection cycle time	50 s for draw speed 200 µl/min, ejection speed 200 µl/min, injection volume 5 µl

Table 58 Performance Specifications Agilent 1200 Series standard autosampler SL (G1329B).

Type	Specification
Pressure	Operating range 0-60 MPa (0-600 bar, 0-8850 psi)
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
Communications	Controller-area network (CAN). GPIB (IEEE-448), RS232C, APG-remote standard, optional four external contact closures and BCD vial number output
Safety features	Leak detection and safe leak handling, low voltages in maintenance areas, error detection and display
Injection range	0.1 – 100 µl in 0.1 µl increments (recommended 1 µl increments) Up to 15 00 µl with multiple draw (hardware modification required)
Replicate injections	1 – 99 from one vial
Precision	Typically < 0.25 % RSD of peak areas from 5 – 100 µl, Typically < 1 % RSD of peak areas from 1 – 5 µl,
Minimum sample volume	1 µl from 5 µl sample in 100 µl microvial, or 1 µl from 10 µl sample in 300 µl microvial
Carryover	Typically < 0.1 %, < 0.05 % with external needle cleaning
Sample viscosity range	0.2 – 50 cp
Sample capacity	100 × 2-ml vials in 1 tray 40 × 2-ml vials in ½ tray 15 × 6-ml vials in ½ tray (Agilent vials only)
Injection cycle time	50 s for draw speed 200 µl/min, ejection speed 200 µl/min, injection volume 5 µl

Table 59 Performance Specifications Agilent 1200 Series Preparative Autosampler (G2260A)

Type	Specification
Pressure	Operating range 0-40 MPa (0-400 bar, 0-5800psi)
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
Communications	Controller-area network (CAN). GPIB (IEEE-448), RS232C, APG-remote standard, optional four external contact closures and BCD vial number output
Safety features	Leak detection and safe leak handling, low voltages in maintenance areas, error detection and display
Injection range	0.1 – 900 µl in 0.1 µl increments (recommended 1 µl increments) Up to 1800 µl with multiple draw (hardware modification required) Up to 5000 µl with multiple draw (hardware modification required)
Replicate injections	1 – 99 from one vial
Precision	Typically < 0.5 % RSD of peak areas from 5 – 2000 µl, Typically < 1 % RSD of peak areas from 2000 – 5000 µl, Typically < 3 % RSD of peak areas from 1 – 5 µl
Minimum sample volume	1 µl from 5 µl sample in 100 µl microvial, or 1 µl from 10 µl sample in 300 µl microvial
Sample viscosity range	0.2 – 50 cp
Sample capacity	100 × 2-ml vials in 1 tray 15 × 6-ml vials in ½ tray (Agilent vials only)
Injection cycle time	Typically 50 s, depending on draw speed and injection volume

A
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.

General

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

This instrument is designed and certified as a general purpose laboratory instrument for research and routine application only. It is not certified for in-vitro or medical applications.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. Do not use repaired fuses and avoid to short-circuit fuseholders.

CAUTION The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

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

WARNING **Any adjustment, maintenance, and repair of the opened instrument under voltage is forbidden.**

WARNING **Disconnect the instrument from the line and unplug the power cord before maintenance.**

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.

Use the instrument only with Agilent CAN connected instrument or with remote controlled instrument.

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

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

Safety Symbols

Table 60 shows safety symbols used on the instrument and in the manuals.

Table 60 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to prevent risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected conductor terminal.
	Eye damage may result from directly viewing the light produced by the Xenon flash lamp used in this product. Always turn the xenon flash lamp off before removing it.

WARNING **A warning alerts you to situations that could cause physical injury or damage to the equipment. Do not proceed beyond a warning until you have fully understood and met the indicated conditions.**

CAUTION A caution alerts you to situations that could cause a possible loss of data. Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Lithium Batteries Information

WARNING **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Lithium batteries may not be disposed-off into the domestic waste.**

Transportation of discharged Lithium batteries through carriers regulated by IATA/ICAO, ADR, RID, IMDG is not allowed. Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

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

WARNING **Lithiumbatteri - Eksplosionsfare. Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres appararleverandoren.**

NOTE Bij dit apparaat zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.

Radio Interference

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

Test and Measurement

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

Sound Emission

Manufacturer's Declaration

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

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

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

Solvent Information

Observe the following recommendations on the use of solvents.

Flow Cell

Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.

Prevent any crystallization of buffer solutions. This will lead into a blockage/damage of the flow cell.

If the flow cell is transported while temperatures are below 5 degree C, it must be assured that the cell is filled with alcohol.

Aqueous solvents in the flow cell can built up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add small % of organic solvents (e.g. Acetonitrile or Methanol ~5%).

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. Avoid the use of the following steel-corrosive solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).
- High concentrations of inorganic acids like nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

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

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

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1 % solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

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.

B
Troubleshooting and Test Functions

Overview of the Sampler's Indicators and Test Functions

Status Indicators

The autosamplers are provided with two status indicators which indicate the operational state (prerun, run, and error states) of the instrument. The status indicators provide a quick visual check of the operation of the autosampler (see "Status Indicators" on page 225).

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the instrument generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided (see "Error Messages" on page 227).

Maintenance Functions

The maintenance functions position the needle arm, gripper assembly, and metering device for easy access when doing maintenance (see "Maintenance Functions" on page 254).

Tray Alignment

Tray alignment is required after repair of internal components, or after a firmware update. The procedure aligns the gripper arm correctly to ensure the positioning of the gripper arm is correct for all vials (see "Tray Alignment" on page 261).

Step Commands

The step functions provide the possibility to execute each step of the sampling sequence individually. The step functions are used primarily for troubleshooting, and for verification of correct autosampler operation after repair (see "Step Commands" on page 263).

Status Indicators

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

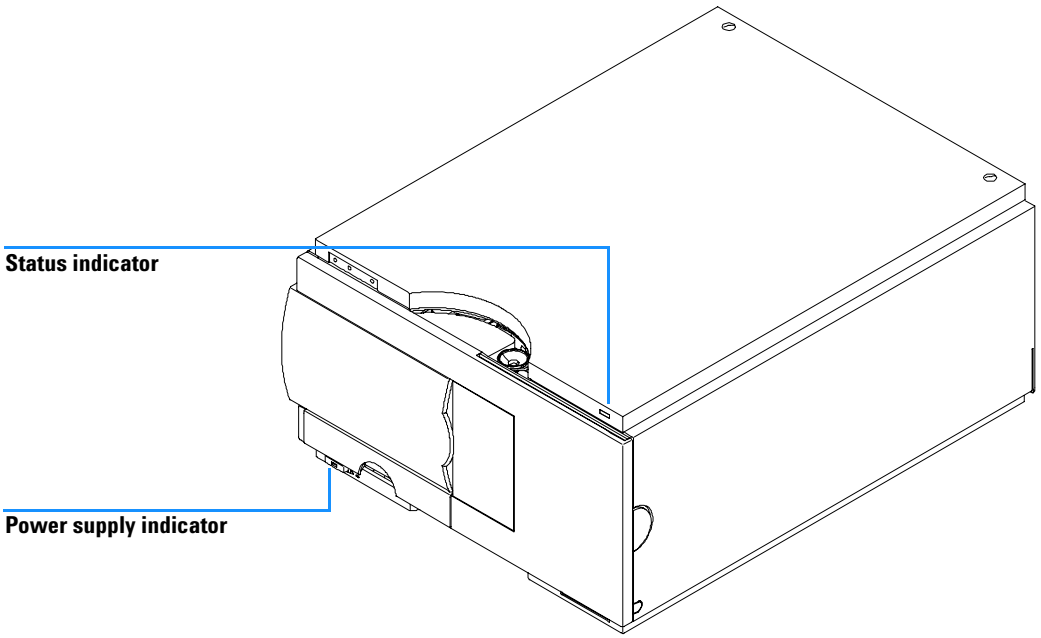


Figure 44 Location of Status Indicators

Power Supply Indicator

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

Instrument Status Indicator

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

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

Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the module is switched on, and an entry is written to the instrument log book.

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

Timeout

The timeout threshold was exceeded.

Probable Causes

- The analysis was completed successfully, and the timeout function switched off the pump as requested.
- A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.

Suggested Actions

✔ Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

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

The autosampler continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable Causes

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

Suggested Actions

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

✔ Check external instruments for a shut-down condition.

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

Remote Timeout

A not-ready condition is still present on the remote input.

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

Probable Causes

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

Suggested Actions

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

✔ Exchange the remote cable.

✔ Check the instrument for defects (refer to the instrument's reference documentation).

Synchronization Lost

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed.

The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable Causes

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

Suggested Actions

✔ Ensure all the CAN cables are connected correctly.

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

✔ Ensure all CAN cables are installed correctly.

Leak

A leak was detected in the autosampler.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak-sensor circuit on the ASM board.

Probable Causes

- Loose fittings.
- Broken capillary.
- Leaking rotor seal or needle seat.
- Defective metering seal.

Suggested Actions

✔ Ensure all fittings are tight.

✔ Exchange defective capillaries.

✔ Exchange the rotor seal or seat capillary.

✔ Exchange the metering seal.

Leak Sensor Open

The leak sensor in the autosampler has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current generated by the sensor is less than the lower limit, the error message is generated

Probable Causes

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

Suggested Actions

✔ Ensure the leak sensor is connected correctly.

✔ Exchange the leak sensor.

Leak Sensor Short

The leak sensor in the autosampler has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current generated by the sensor is larger than the upper limit, the error message is generated.

Probable Causes

- Defective leak sensor.

Suggested Actions

✔ Exchange the leak sensor.

Compensation Sensor Open

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

The resistance across the temperature compensation sensor (NTC) on the ASM board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable Causes

- Defective ASM board.

Suggested Actions

✔ Exchange the ASM board.

Compensation Sensor Short

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

The resistance across the temperature compensation sensor (NTC) on the ASM board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable Causes

- Defective ASM board.

Suggested Actions

✔ Exchange the ASM board.

Fan Failed

The cooling fan in the autosampler has failed.

The hall sensor on the fan shaft is used by the ASM board to monitor the fan speed. If the fan speed falls below 2 revolutions/second for longer than 5 seconds, the error message is generated.

Probable Causes

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

Suggested Actions

✔ Ensure the fan is connected correctly.

✔ Exchange fan.

✔ Exchange the ASM board.

Open Cover

The top foam has been removed.

The sensor on the ASM board detects when the top foam is in place. If the foam is removed, the fan is switched off, and the error message is generated.

Probable Causes

- The top foam was removed during operation.
- Foam not activating the sensor.
- Sensor defective.

Suggested Actions

✔ Replace the top foam.

✔ Exchange the ASM board.

Restart Without Cover

The autosampler was restarted with the top cover and foam open.

The sensor on the ASM board detects when the top foam is in place. If the autosampler is restarted with the foam removed, the autosampler switches OFF within 30 s, and the error message is generated.

Probable Causes

- autosampler started with the top cover and foam removed.

Suggested Actions

✔ Replace the top cover and foam.

Arm Movement Failed

The transport assembly was unable to complete a movement in one of the axes.

The processor defines a certain time window for the successful completion of a movement in any particular axis. The movement and position of the transport assembly is monitored by the encoders on the stepper motors. If the processor does not receive the correct position information from the encoders within the time window, the error message is generated.

See figure "Transport Assembly" on page 174 for axes identification.

Arm Movement 0 Failed: X-axis.

Arm Movement 1 Failed: Z-axis.

Arm Movement 2 Failed: Theta (gripper rotation).

Arm Movement 3 Failed: Gripper (gripper fingers open/close).

Probable Causes

- Mechanical obstruction.
- High friction in transport assembly.
- Defective motor assembly.
- Defective transport assembly flex board.
- Defective ASM board.

Suggested Actions

✔ Ensure unobstructed movement of the transport assembly.

✔ Exchange the transport assembly.

✔ Exchange the ASM board.

Valve to Bypass Failed

The injection valve failed to switch to the bypass position.

The switching of the injection valve is monitored by two microswitches on the valve assembly. The switches detect the successful completion of the valve movement. If the valve fails to reach the bypass position, or if the microswitch does not close, the error message is generated.

Probable Causes

- Defective injection valve.
- Defective ASM board.

Suggested Actions

✔ Exchange the injection valve.

✔ Exchange the ASM board.

Valve to Mainpass Failed

The injection valve failed to switch to the mainpass position.

The switching of the injection valve is monitored by two microswitches on the valve assembly. The switches detect the successful completion of the valve movement. If the valve fails to reach the mainpass position, or if the microswitch does not close, the error message is generated.

Probable Causes

- Defective injection valve.
- Defective ASM board.

Suggested Actions

✔ Exchange the injection valve.

✔ Exchange the ASM board.

Needle Up Failed

The needle arm failed to move successfully from the seat or out of the vial to the upper position.

The upper position of the needle arm is monitored by a position sensor on the sampling unit flex board. The sensor detects the successful completion of the needle movement to the upper position. If the needle fails to reach the end point, or if the sensor fails to recognize the needle arm movement, the error message is generated.

Probable Causes

- Defective or dirty position sensor.
- Defective motor.
- Sticking spindle assembly.
- Defective ASM board.

Suggested Actions

✔ Exchange the sampling unit flex board.

✔ Exchange the needle drive motor.

✔ Exchange the spindle assembly or sampling unit assembly.

✔ Exchange ASM board.

Needle Down Failed

The needle arm failed to move down into the needle seat.

The lower position of the needle arm is monitored by a position sensor on the sampling unit flex board. The sensor detects the successful completion of the needle movement to the needle seat position. If the needle fails to reach the end point, or if the sensor fails to recognize the needle arm movement, the error message is generated.

Probable Causes

- Needle installed incorrectly, or wrong needle type (too long).
- Defective or dirty position sensor.
- Defective motor.
- Sticking spindle assembly.
- Defective ASM board.

Suggested Actions

✔ Ensure the correct needle type is used, and installed correctly.

✔ Exchange the sampling unit flex board.

✔ Exchange the needle drive motor.

✔ Exchange the spindle assembly or sampling unit assembly.

✔ Exchange the ASM board.

Missing Vial

No vial was found in the position defined in the method or sequence.

When the gripper arm picks a vial out of the sample tray, the processor monitors the gripper motor encoder. If a vial is present, the closing of the gripper fingers is limited by the vial. However, if no vial is present, the gripper fingers close too far. This is sensed by the processor (encoder position), causing the error message to be generated.

Probable Causes

- No vial in the position defined in the method or sequence.
- Incorrect gripper alignment.
- Defective gripper assembly (defective gripper fingers or belt).
- Defective transport assembly flex board.

Suggested Actions

✔ Install the sample vial in the correct position, or edit the method or sequence accordingly.

✔ Align gripper.

✔ Exchange the gripper assembly.

✔ Exchange the transport assembly.

Initialization Failed

The autosampler failed to complete initialization correctly.

The autosampler initialization procedure moves the needle arm and transport assembly to their home positions in a predefined sequence. During initialization, the processor monitors the position sensors and motor encoders to check for correct movement. If one or more of the movements is not successful, or is not detected, the error message is generated.

Probable Causes

- Mechanical obstruction.
- Defective sampling unit flex board.
- Defective transport assembly flex board.
- Defective sampling unit motor.
- Defective ASM board.

Suggested Actions

✔ Ensure unobstructed movement of the transport assembly.

✔ Exchange the defective sampling unit motor.

✔ Exchange the transport assembly.

✔ Exchange the ASM board.

Metering Home Failed

The metering plunger has failed to move back to the home position.

The home position sensor on the sampling unit flex board monitors the home position of the plunger. If the plunger fails to move to the home position, or if the sensor fails to recognize the plunger position, the error message is generated.

Probable Causes

- Dirty or defective sensor.
- Broken plunger.
- Defective metering-drive motor.
- Defective ASM board.

Suggested Actions

✔ Exchange the sampling unit flex board.

✔ Exchange the metering plunger and seal.

✔ Exchange the metering-drive motor.

✔ Exchange the ASM board.

Motor Temperature

One of the motors of the transport assembly has drawn excessive current, causing the motor to become too hot. The processor has switched OFF the motor to prevent damage to the motor.

See figure "Transport Assembly" on page 174 for motor identification.

Motor 0 temperature: X-axis motor.

Motor 1 temperature: Z-axis motor.

Motor 2 temperature: Theta (gripper rotation) motor.

Motor 3 temperature: Gripper motor (motor for gripper fingers).

The processor monitors the current drawn by each motor and the time the motor is drawing current. The current drawn by the motors is dependent on the load on each motor (friction, mass of components etc.). If the current drawn is too high, or the time the motor draws current is too long, the error message is generated.

Probable Causes

- Mechanical obstruction.
- High friction in the transport assembly.
- Motor belt tension too high.
- Defective motor.
- Defective transport assembly flex board.

Suggested Actions

✔ Switch OFF the autosampler at the power switch. Wait at least 10 minutes before switching on again.

✔ Ensure unobstructed movement of the transport assembly.

✔ Exchange the transport assembly.

Initialization with Vial

The autosampler attempted to initialize with a vial still in the gripper.

During initialization, the autosampler checks correct operation of the gripper by closing and opening the gripper fingers while monitoring the motor encoder. If a vial is still in the gripper when initialization is started, the gripper fingers cannot close causing the error message to be generated.

Probable Causes

- Vial still in gripper.

Suggested Actions

✔ Remove the vial using the “Release Vial” function in the user interface. Reinitialize the autosampler.

Safety Flap Missing

The safety flap was not detected.

Before the needle moves down into the needle seat to inject sample, the safety flap locks into position. Next, and the gripper checks the safety flap by trying to move the safety flap away from the needle. If the gripper is able to move beyond the safety flap position (safety flap not in position), the error message is generated.

Probable Causes

- Safety flap missing or broken.

Suggested Actions

✔ Exchange the safety flap.

Vial in Gripper

The gripper arm attempted to move with a vial still in the gripper.

During specific stages of the sampling sequence, no vial should be held by the gripper. The autosampler checks if a sample vial is stuck in the gripper by closing and opening the gripper fingers while monitoring the motor encoder. If the gripper fingers are unable to close, the error message is generated.

Probable Causes

- Vial still in gripper.

Suggested Actions

✔ Remove the vial using the “Release Vial” function in the user interface. Reinitialize the autosampler.

Missing Wash Vial

The wash vial programmed in the method was not found.

When the gripper arm picks a vial out of the sample tray, the processor monitors the gripper motor encoder. If a vial is present, the closing of the gripper fingers is limited by the vial. However, if no vial is present, the gripper fingers close too far. This is sensed by the processor (encoder position), causing the error message to be generated.

Probable Causes

- No wash vial in the position defined in the method.

Suggested Actions

✔ Install the wash vial in the correct position, or edit the method accordingly.

Invalid Vial Position

The vial position defined in the method or sequence does not exist.

The reflection sensors on the transport assembly flex board are used to check automatically which sample trays are installed (coding on tray). If the vial position does not exist in the current sample tray configuration, the error message is generated.

Probable Causes

- Incorrect tray or trays installed.
- Incorrect vial positions defined in the method or sequence.
- Tray recognition defective (dirty sample tray or defective transport assembly flex board).

Suggested Actions

✔ Install the correct trays, or edit the method or sequence accordingly.

✔ Ensure the coding surfaces of the sample tray are clean (located at the rear of the sample tray).

✔ Exchange the transport assembly.

Maintenance Functions

Certain maintenance procedures require the needle arm, metering device, and gripper assembly to be moved to specific positions to enable easy access to components. The maintenance functions move these assemblies into the appropriate maintenance position. In the ChemStation the ALS maintenance positions can be selected from the Maintenance menu in the Diagnosis display. In the Control Module the functions can be selected in the Test screens of the autosampler.

User Interface

The functions for the ChemStation and Control Module (different names for functions in the Control Module are shown in brackets) are:

Change Needle:

moves the safety flap away from the needle, and positions the needle arm for easy access to the needle and needle seat.

Change Piston:

relieves the tension on the metering spring (draws the piston to the outer position), enabling easy disassembly of the metering head assembly).

Park Arm (Park Gripper):

secures the gripper arm to the park position behind the sampling unit. ready for transport or shipping of the autosampler.

Home:

moves the tray arm to its home position for better access and exchange of the trays.

Change Gripper:

The change gripper function moves the gripper to the front of the autosampler enabling easy access to the gripper release mechanism.

Change Needle

WARNING **For needle exchange, the needle arm moves down automatically when the front cover is removed. To avoid personal injury, keep fingers away from the needle area during needle movement.**

The change-needle/seat function moves the safety flap out of position, and positions the needle for easy exchange and alignment of the needle and needle seat.

User Interface

The commands for the ChemStation and Control Module (different names for the commands in the Control Module are shown in brackets) are:

NOTE The autosampler front cover must be in place when “Start” and “End” are selected.

Start (Change)

Moves the safety flap away from the needle, and positions the needle approximately 15 mm above the needle seat.

Needle Up (Up Arrow)

Press function key couple of times to move the needle arm up in 2 mm steps.

Needle Down (Down Arrow)

Press function key couple of times to move the needle arm down in 2 mm steps. The lowest position (“end position”) is used to align the needle at the correct position in the needle seat.

End (Done)

Completes the procedure by moving the gripper arm to the home position, and releasing the safety flap.

Using the Change Needle Function

1 Ensure the front cover is installed.

2 Select "**Start**" ("**Change**") to move the needle arm to the maintenance position.

3 Remove the front cover.

NOTE Do not remove the front cover until the needle arm is in its maintenance position. Removing the cover while the needle arm is activated may lock up the system.

4 Exchange the needle or needle seat (see "Needle-Seat Assembly" on page 60 and "Needle Assembly" on page 59).

5 Replace the front cover.

6 Select "**End**" ("**Done**") to complete the procedure.

Change Piston

The change-piston function draws the piston away from the home position, relieving the tension on the spring. In this position, the analytical head assembly can be removed and reinstalled easily after maintenance.

User Interface

The commands for the ChemStation and Control Module (different names for commands in the Control Module are shown in brackets) are:

Start (Change)

Draws the piston away from the home position, relieving the tension on the spring.

End (Done)

Repositions the plunger at the home position.

Using the Change Seal Function

1 Select “**Start**” (“**Change**") to move the piston to the maintenance position.

2 Exchange the metering seal (see “Gripper Arm” on page 74).

3 Select “**End**” (“**Done**”) to move the piston back to the home position.

Park Arm (Park Gripper)

CAUTION Before transporting or shipping the autosampler, always secure the arm in the park position.

In order to prevent mechanical damage to the transport mechanism during transport, the gripper arm should be moved into the park position. The park arm function moves the gripper and transport slider to the home position behind the sampling unit, and lowers the gripper arm into the park position where the transport assembly is secured against a mechanical stop. The autosampler can be switched OFF after parking the arm.

NOTE Before parking the gripper arm, ensure there is no vial in the gripper. Use the "**Release Gripper**" function to remove the vial.

User Interface

In the ChemStation the Park Arm command is part of the ALS maintenance positions that can be selected from the Maintenance menu in the Diagnosis display. In the Control Module the Park Gripper command is located in the Control display of the autosampler.

The commands for the ChemStation and Control Module (different names for commands in the Control Module are shown in brackets) are:

Park Arm (Park Gripper)

moves the gripper arm to the park position.

Home

moves the gripper arm out of the park position to the home position.

Using the Park Arm Function

1 Select "**Park Arm**" ("**Park Gripper**").

2 When the arm is in the park position, the autosampler is ready for shipment, and can be switched OFF.

Change Gripper (Change Arm)

The change gripper function moves the gripper to the front of the autosampler enabling easy access to the gripper release mechanism.

User Interface

The commands for the ChemStation and Control Module (different names for commands in the Control Module are shown in brackets) are:

Start (Change)

Moves the transport assembly and gripper arm to the position required to change the gripper arm.

End (Done)

Repositions the transport assembly and gripper arm to the home position.

Using the Change Seal Function

1. Select “**Start**” (“**Change**") to move the gripper arm to the maintenance position.
2. Exchange the gripper arm (see “Gripper Arm” on page 74).
3. Select “**End**” (“**Done**”) to move the gripper arm to the home position.

Tray Alignment

Tray alignment is required to compensate for small deviations in positioning of the gripper which may occur after disassembling the module for repair.

The tray alignment procedure uses several tray positions as reference points. Because the tray is a rectangle, a two-point alignment is sufficient to corrects all other vial positions within the tray. On completion of the procedure, the corrected gripper positions are stored in the instrument firmware.

NOTE The alignment procedure requires an Agilent 1200 Series Control Module G1323B with firmware revision B.02.02 or higher. The screen with the alignment dialog box can be found under the menus **Views > System > Tests > Autosampler.** The alignment procedure must be done with the standard 100-position vial tray installed.

WARNING **The alignment procedure has to be performed in the correct order and without skipping parts, to ensure a proper working Autosampler.**

User Interface

In the Control Module the "**Align Tray**" function is located in the Control display of the autosampler.

Additional information can be found in the on-line information systems.

The correct procedure for the Control Module are:

1 Set alignment to factory default:
- Go to **Align > Tray** and press **Default**.
- Go to **Align > Transport** and press **Default**.

- Wait while the Autosampler performs a reset and go back to **Align > Transport**.

2 Put capped vials into positions #15 and #95 of the 100-vial tray.

3 Move the gripper arm to position of vial #15. Use **Enter** to hit **Goto Vial**.

4 Use **Arm down**(**F2**) to move the fingers as close as possible to the top of the vial, without the gripper fingers touching the vial.

5 Use the Up and Down arrows for Theta correction (rotational movement).

6 Use the Left and Right arrows for X-position correction (horizontal movement).

7 Open the gripper (**F4**) and move it further down for about 5 mm in such a way that vial cap and rubber of gripper fingers have the same height.

8 Visually re evaluate if the vial is in the center of the gripper fingers and correct X- and Theta position accordingly.

9 Press **Enter** to hit **Next Vial**; enter `vial #95` and press **Goto Vial**.

10 Repeat steps 4 to 8 to align the gripper at position #95.

11 Press **Average** (**F8**) to balance the alignment.

12 Press **Done** (**F6**) to store the alignment permanently in non-volatile memory and to reset the module.

13 To check the result go back to the alignment dialog box, move to vial position #15 and #95 to see if the alignment is acceptable.

NOTE To leave the alignment screen without changes use the **Esc** key.

NOTE The result can be a compromise e.g. if the X position at #15 and #95 are off to the same side, then it is OK. However, if at both positions the correction still should be in one direction or, if the failure in one position is larger than the other, you must restart the alignment procedure with step 3. The same goes for the Theta correction.

Step Commands

Each movement of the sampling sequence can be done under manual control. This is useful during troubleshooting where close observation of each of the sampling steps is required to confirm a specific failure mode or verify successful completion of a repair.

Each injector step command actually consists of a series of individual commands which move the autosampler components to predefined positions enabling the specific step to be done.

In the ChemStation the step commands can be selected from the "**Test Selection Box**" in the Diagnosis display. In the Control Module the step commands can be accessed from the pull-down menu in the autosampler "**Test**".

Table 61 Injector Step Commands

Step	Action	Comments
Bypass	Switches injection valve to the bypass position.	
Plunger Home	Moves the plunger to the home position.	
Needle Up	Lifts the needle arm to the upper position.	Command also switches the valve to bypass if it is not already in that position.
Vial to Seat	Moves the selected vial to the seat position.	Command also lifts the needle to the upper position.
Needle into Vial	Lowers the needle into the vial.	Command also positions the vial at the seat, and lifts the needle to the upper position.

Table 61 Injector Step Commands (continued)

Step	Action	Comments
Draw	Metering device draws the defined injection volume.	Command also positions the vial at the seat, lifts the needle, and lowers the needle into vial. Command can be done more than once (maximum draw volume of 100µl cannot be exceeded). Use “Plunger Home” to reset the metering device.
Needle Up	Lifts the needle out of the vial.	Command also switches the valve to bypass if it is not already in that position.
Vial to Tray	Returns the selected vial to the tray position.	Command also lifts the needle to the upper position.
Needle into Seat	Lowers the needle arm into the seat.	Command also returns the vial to the tray position.
Mainpass	Switches the injection valve to the mainpass position.	
Needle Up/Mainpass	Lifts the needle arm to the upper position and Switches the injection valve to the mainpass position.	Command available from Control Module only.

Troubleshooting

If the autosampler is unable to perform a specific step due to a hardware failure, an error message is generated. You can use the injector steps to do the injection sequence, while observing how the instrument responds. Table 62 summarizes the injector steps, and lists the associated error messages and probable causes of step failures.

Table 62 Step Failures

Step Function	Probable Failure Modes
Bypass	Valve already in bypass. Valve not connected. Defective injection valve.
Plunger Home	Defective or dirty sensor on the sampling-unit flex board. Defective metering-drive motor.
Needle Up	Needle already in the upper position. Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Vial to Seat	No vial in selected position. Vial already in seat position. Defective transport assembly motors. Sticking transport assembly. Defective gripper assembly. Gripper not aligned (see page 261).
Draw	Sum of all draw volumes exceeds 100µl. Defective metering-drive motor.
Needle Up	Needle already in the upper position. Needle already in the upper position. Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor.

Table 62 Step Failures (continued)

Step Function	Probable Failure Modes
Vial to Tray	Defective transport assembly motors. Sticking transport assembly. Defective gripper assembly. Gripper not aligned (see page 261).
Needle Down	Needle already in the lower position. Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Mainpass	Valve already in mainpass. Valve not connected. Defective injection valve.
Needle Up/Mainpass	Blockage in the sample loop or needle (no solvent flow). Needle already in the upper position. Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor.Valve already in mainpass. Valve not connected. Defective injection valve.

Troubleshooting Guide for the Sample Transport Assembly

This troubleshooting guide is meant to help you diagnose and repair autosampler problems.

In general, autosampler problems can be divided into three categories.

1 Intermittent lock-ups with or without vial in the gripper fingers with error messages

- **motor overtemp** (0 or 1 or 2 or 3)
- **movement failed** (0 or 1 or 2 or 3)
- **missing vial**

Many times the sampler is being used very heavily.

2 Jittery (shaky) movement in X and/or theta axes and/or when the needle goes through the gripper arm into the vial with error messages

- **motor overtemp** (0 or 2)
- **movement failed** (0 or 2)

3 Poor alignment, seen during vial pickup and vial replacement and/or when the needle hits the gripper arm with error messages

- **motor overtemp** (0 or 2 or 3)
- **movement failed** (0 or 2 or 3)
- **missing vial**

NOTE Motor 0=X; 1=Z; 2=Theta; 3=Gripper.

Intermittent lock-ups with or without vial in the gripper fingers

With error messages

- **motor overtemp** (0 or 1 or 2 or 3)
- **movement failed** (0 or 1 or 2 or 3)
- **missing vial**

NOTE When a motor over temperature message has occurred, the sampler must be turned OFF for about 10 minutes to allow the motor to cool down.

1 Check the firmware and update to the latest revision if necessary.

Since firmware revision A.03.61 (resident A03.60) most “**movement failed**”, “**motor over temp**”, “**initialization failed (X-axis)**” errors are solved.

2 Check the vials and the caps.

For reliable operation, vials used with the Agilent 1200 Series Autosampler must not have tapered shoulders or caps that are wider than the body of the vial. For more details see the *service note G1313-017*.

3 Very heavy usage - use a macro.

A pre-sequence macro, **QMBUVHW_PDF** will automatically reset the sampler at the start of a sequence (ChemStation).

4 Check if the “**INJECT**” line is used in the “**Injector Program**”.

Remove this line from the program. In this mode the system does not need this command to do the injection. A firmware revision (>3.81) will address this problem. For more details see the *service note G1313-018*.

5 Reset the sampler alignment to default value.

Reset tray alignment, and transport alignment is possible with the Control Module and the ChemStation. To reset the transport alignment with the ChemStation, enter following command in the command line. Print sendmodule$(lals, “tray:alig 0.00,0.00”)

6 Check the tension of the belts.

For this use the **Torque2.mac** and measure the torque for each axis.

Table 63

Typical ranges	Theta (both) 30-50
	X-axis (both) 50-90
	Z-axis (both) 90-130
	Gripper open 30-65
	Gripper closed maximum 30

NOTE If the Gripper open/closed torque is not in the range, proceed with STEP 7. If the theta or X torque is not in the range, proceed with STEP 8 (if you think you can adjust the torque), otherwise proceed with STEP 9.

7 Exchange the gripper arm assembly (part number G1313-60010).

8 Adjust the belt tension.

- If the measured torque value is too low, the belt needs to be tightened.
- If the measured torque value is too high, the belt needs to be loosened.

For this, slide the motor (X or theta) on the holder bracket in the appropriate direction and test the tension with the **torque2** macro. Repeat this steps until the values are in the appropriate torque range.

9 Exchange the sample transport assembly (G1329-60009).

10 Exchange the main board (part number G1329-69520).

Jittery (shaky) movement in X and or theta axes and/or when the needle goes through the gripper arm into the via

With Error messages

- **motor overtemp** (0 or 2)
- **movement failed** (0 or 2)

NOTE When a motor over temperature message has occurred, the sampler must be turned OFF for about 10 minutes to allow the motor to cool down.

1 Check the firmware and update to the latest revision if necessary.

Since firmware revision A.03.61 (resident A03.60) most of following errors "**movement failed**", "**motor over temp**" and "**initialization failed (X-axis)**" are solved.

2 Check the cleanliness of the transport rods (X-axis) and clean them.

If the rod is dirty or sticky, clean it with Isopropanol and wipe it with a lint free cloth. The rod can be lubricated with the following synthetic oil: part number 6040-0854.

NOTE DO NOT use other lubricant as mentioned above.

3 Lubricate the X-gear.

Friction can result in the belt slipping on the gear so that the position of the belt teeth towards the gear changes.

To avoid this, apply some grease from the sample transport repair kit to the X-motor-gear.

NOTE Do not use other grease as the one in the kit and carefully follow the instruction from the technical note.

4 Check the tension of the belts.

For this use the **Macro2.mac** and measure the torque for theta and X-axis.

Table 64

Typical ranges	Theta (both) 30-50
	X-axis (both) 50-90

- If the theta or X torque is not in the range, proceed with STEP 5 (if you think you can adjust the torque). Otherwise proceed with STEP 7.

5 Adjust the belts tension.

- If the measured torque value is too low, the belt needs to be tightened.
- If the measured torque value is too high, the belt needs to be loosened.

For this, slide the motor (X or theta) on the holder bracket in the appropriate direction and test the tension with the **Torque2.mac** macro. Repeat this steps until the values are in the appropriate torque range.

6 Reset the sampler alignments to default value.

Reset tray alignment, and transport alignment is possible with the Control Module and the Chemstation. To reset the transport alignment with the Chemstation enter following command in the command line.

Print sendmodule$(lals, “tray:alig 0.00,0.00”)

7 Exchange the sample transport assembly (part number G1329-60009).

8 Exchange the main board (part number G1329-69520).

Poor alignment, seen during vial pickup and vial replacement and/or when the needle hits the gripper arm

With Error messages

- **motor overtemp** (0 or 2 or 3)
- **movement failed** (0 or 2 or 3)

NOTE When a motor over temperature message has occurred, the sampler must be turned OFF for about 10 minutes to allow the motor to cool down.

1 Check the firmware and update to the latest revision if necessary.

Since revision A.03.61 (resident A03.60) most of following "**movement failed**", "**motor over temp**" and "**initialization failed (X-axis)**" errors are solved.

2 Reset the sampler alignment to default value.

Reset tray alignment, and transport alignment is possible with the Control Module and the Chemstation. To reset the transport alignment with the Chemstation enter following command in the command line.

Print sendmodule$(lals, "tray:alig 0.00,0.00")

3 Lubricate the X-gear.

Friction can result in the belt slipping on the gear so that the position of the belt teeth towards the gear changes.To avoid this, apply some grease from the sample transport repair kit to the X-motor-gear.

NOTE Do not use other grease as the one in the kit and carefully follow the instruction from the technical note.

4 Check the tension of the belts.

For this use the **Torque2.mac** and measure the torque for each axis.

Table 65

Typical ranges	Theta (both) 30-50
	X-axis (both) 50-90
	Z-axis (both) 90-130
	Gripper open 30-65
	Gripper closed maximum 30

NOTE If the Gripper open/closed torque is not in the range, proceed with STEP 5. If the theta or X torque is not in the range, proceed with STEP 6 (if you think you can adjust the torque), otherwise proceed with STEP 7.

5 Exchange the gripper arm assembly (part number G1313-60010).

The gripper arm exchange procedure is explained in the reference manual G1329-90010, section *"Repairing the Autosampler"*.

6 Adjust the belts tension.

- If the measured torque value is too low, the belt needs to be tightened.
- If the measured torque value is too high, the belt needs to be loosened.

For this, slide the motor on the holder bracket in the appropriate direction and test the tension with the **Torque2.mac** macro. Repeat this steps until the values are in the appropriate torque range.

7 Exchange the sample transport assembly (part number G1329-60009).

8 Exchange the main board (part number G1329-69520).

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In This Book

This manual contains technical reference information about the Agilent 1200 Series Standard and Preparative Autosamplers.

The manual describes the following:

- installing the autosamplers,
- optimizing performance,
- troubleshooting and test functions,
- repairing the autosamplers,
- parts and materials,
- introduction to the autosamplers,
- screens of the local control module
- specifications
- safety and warranty

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