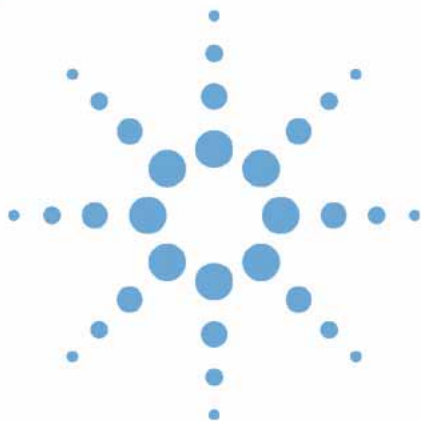




Agilent 1200 Series Dual Loop Autosampler, Preparative Scale



User's Guide



Agilent Technologies

Notices

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In This Guide...

This manual contains technical reference information about the Agilent 1200 Series Dual Loop Autosampler, preparative scale. The manual describes the following:

1 Introduction to the Dual Loop ALS

This chapter gives an introduction to the Dual Loop Autosampler.

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This chapter describes the Site Requirements and Specifications of the Dual Loop Autosampler.

3 Installing the Dual Loop Autosampler

This chapter describes the Installation of the Dual Loop Autosampler.

4 Using the Dual Loop Autosampler

This chapter describes the Usage of the Dual Loop Autosampler.

5 Troubleshooting Overview

This chapter gives an Overview to Troubleshooting the Dual Loop Autosampler.

6 Introduction to Repairing the Dual Loop Autosampler

This chapter gives an Introduction to Repairing the Dual Loop Autosampler.

7 Maintaining the Dual Loop Autosampler

This chapter describes the Maintenance and Simple Repairs of the Dual Loop Autosampler.

8 Easy Repair Parts

This chapter describes the Consumables and Accessories of the Dual Loop Autosampler.

A Safety Information

This chapter gives Safety Information for the use of the Dual Loop Autosampler.

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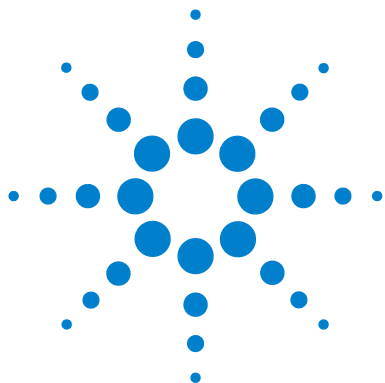
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1

Introduction to the Dual Loop ALS

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This chapter gives an introduction to the Dual Loop Autosampler.



Introduction

The Agilent 1200 Series Dual Loop Autosampler, model G2258A, is optimized for applications that require rapid injection of high sample volumes. Typically, these are preparative HPLC separations or sample trapping and enrichment methods.

The dual loop concept with two preinstalled sample loops of different volume allows convenient switching between preparative scale and analytical scale applications without the need for hardware modifications.

The sample tray can hold up to two well plates, vial plates or Eppendorf tube plates in any combination. For details see [“List of Recommended Well Plates and Vial Plates”](#) on page 123

Front View

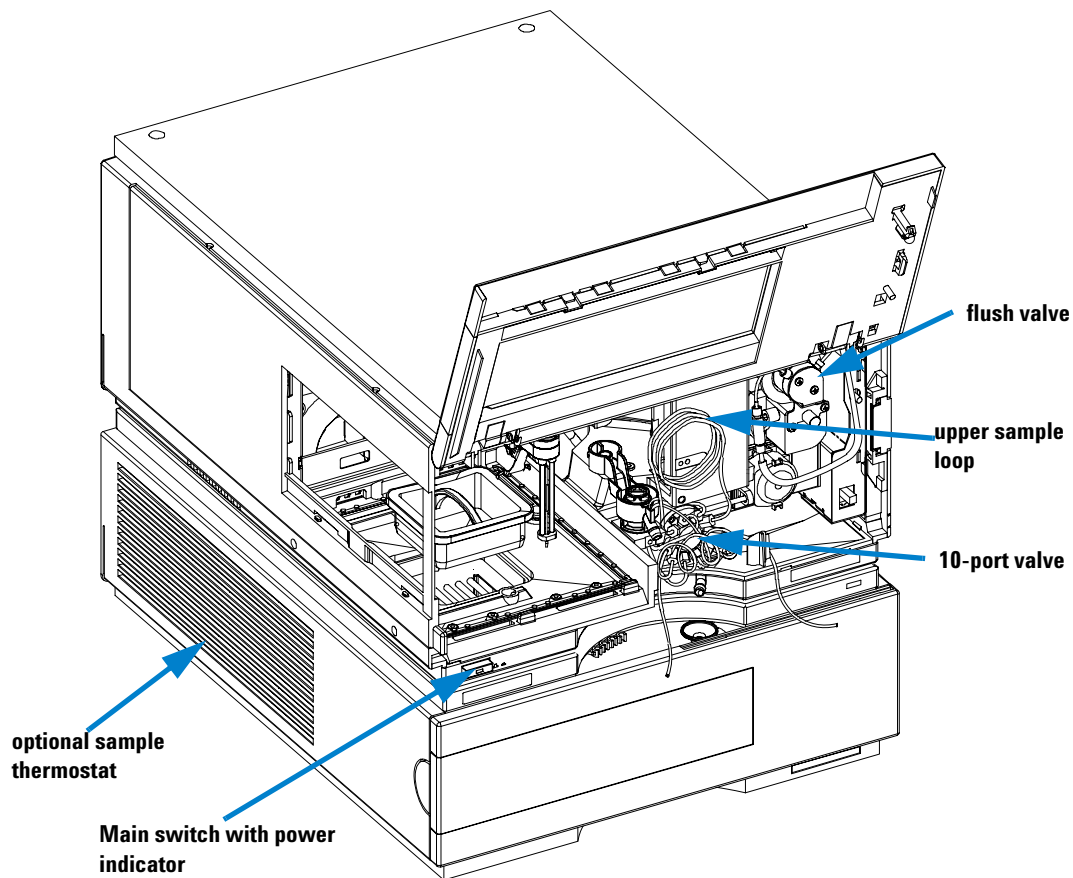


Figure 1 Front View of the Dual Loop Sampler.

Theory of Operation

Successful operation of an analytical device requires a sound understanding of the underlying techniques. This section gives an overview of the functional groups of the sampler and explains how sample is introduced into the HPLC flow path.

The Agilent 1200 Series Dual Loop Autosampler is a fixed loop sampler with two different sample loops. As a consequence of this design the metering device, also referred to as *syringe*, is not a part of the solvent flow path from pump to HPLC column. An additional flush solvent bottle is used to rinse this part of the hydraulic path after each injection.

In order to minimize carryover, the sampler is equipped with a needle wash function which dips the needle into a wash vial or the wash port. The wash port is fed by a peristaltic pump and can be operated with most common HPLC solvents.

The needle seat assembly incorporates two independent needle seats. The front needle seat is used to fill the lower sample loop whereas the back seat is connected to the upper sample loop.

The needle is fitted with a second shorter needle that vents the vial to the outside and guarantees rapid pressure equilibration between vial and ambient.

CAUTION

Due to the strong force that is needed to penetrate the vial septum with this needle assembly, Agilent recommends to use pre-slit septa and closing mats only.

Non pre-slit septa may get pushed into the vials or cause needle movement errors.

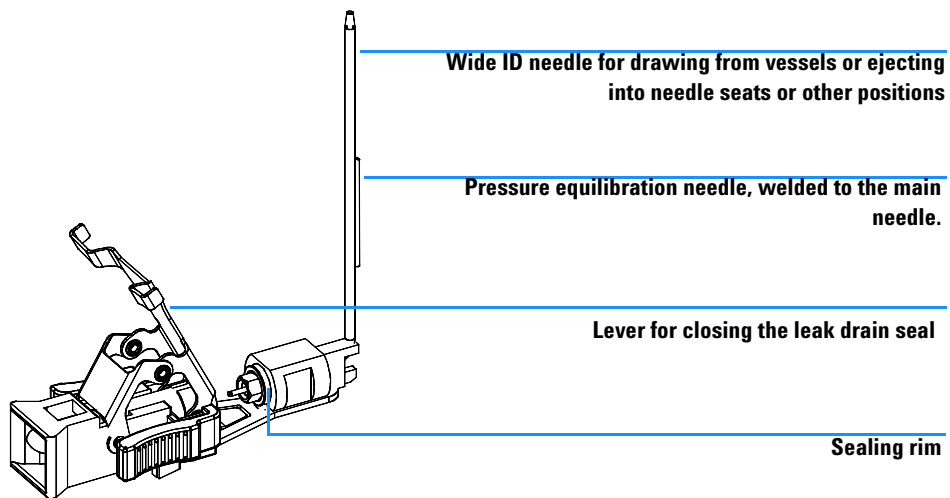


Figure 2 Dual Loop Autosampler Twin Needle Assembly

Theory of Operation

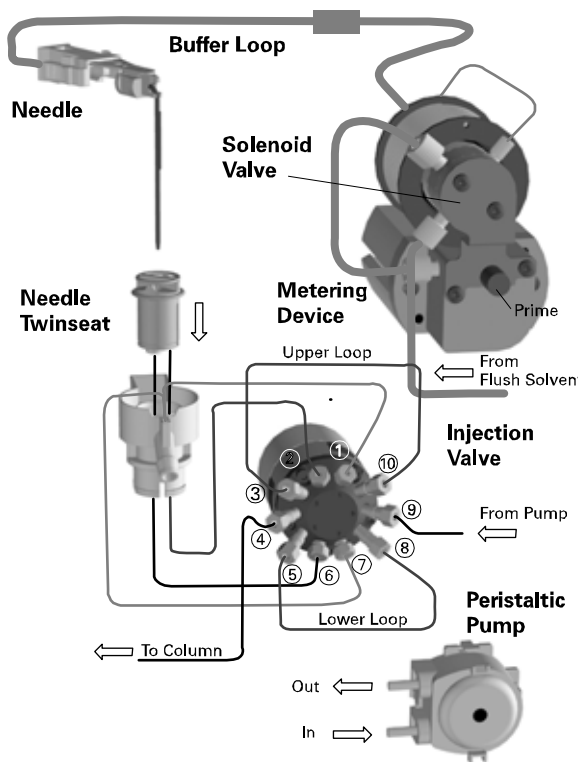


Figure 3 Plumbing Diagram of the Dual Loop Autosampler

Table 1 Connections to the 10-Port Valve

Port	Connecting to
• 1	Waste tubing (short)
• 2	Back seat tubing (large)
• 3	Upper loop
• 4	Outlet capillary to column
• 5	Lower loop
• 6	Front seat tubing (short)
• 7	Waste tubing (long)
• 8	lower loop
• 9	Inlet capillary from pump
• 10	Upper loop

The Injection Sequence

Idle or Run Position

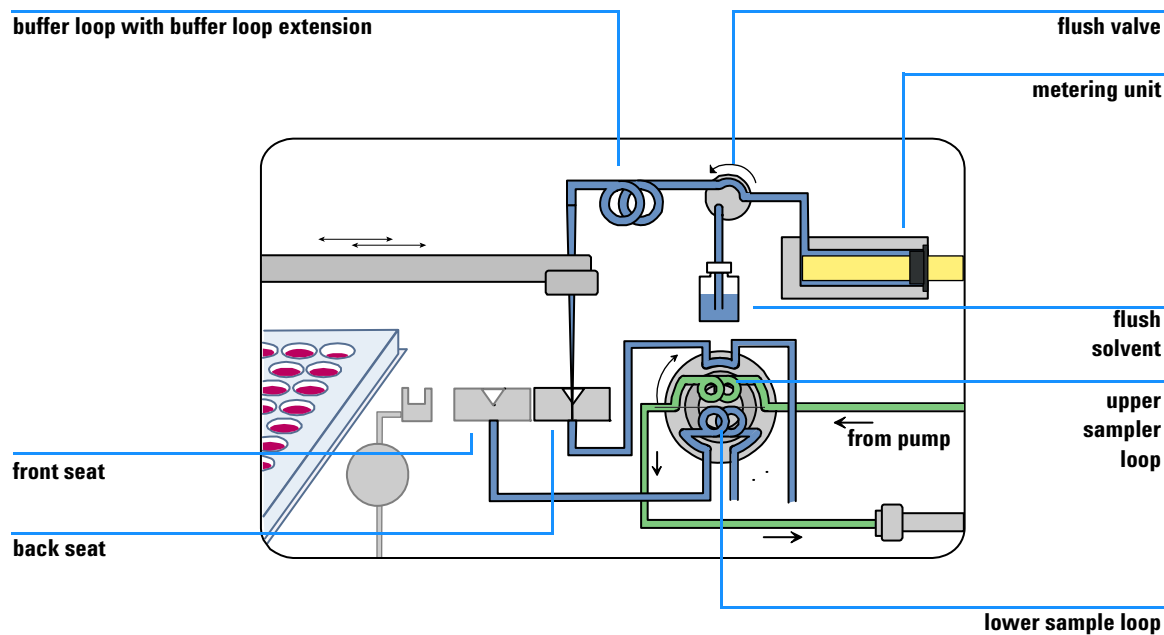


Figure 4 10-port valve in Mainpass

This is the standard position of the 10-port valve. The mobile phase coming from the pump flows through the active sample loop (in this case the upper one) to the HPLC column. The sample loop is thereby thoroughly flushed out.

Switching to Bypass and Drawing a Dead Volume Compensation Plug

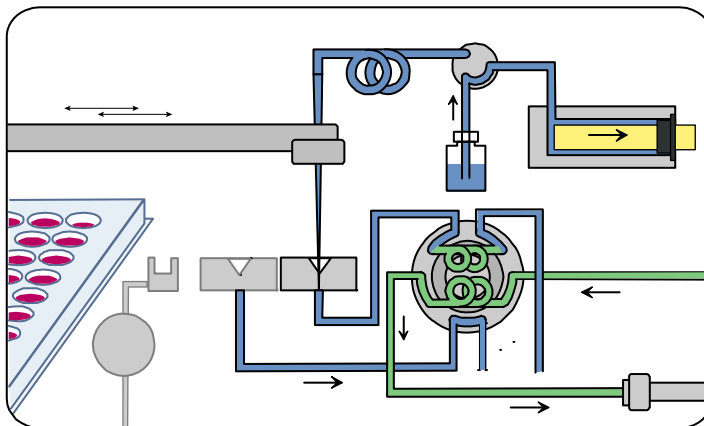


Figure 5 10-port valve in Bypass

The 10-port valve switches to bypass mode. The solvent flow from pump to detector is bypassed through the second sample loop.

The flush valve is activated and connects the metering device to the flush solvent reservoir. The syringe draws a small volume of flush solvent (more precisely, the volume of the seat tubing of the active sample loop + the volume of one groove of the 10-port valve rotor).

CAUTION

When running preparative HPLC methods with flow rates > 20 ml/min. switching to bypass may generate significant back pressure and get the system into a high pressure error state. It is recommended to determine the back pressure during method development and replace the analytical size sample loop by a larger one if necessary.

Drawing the Leading Buffer or Air Plug (optional step)

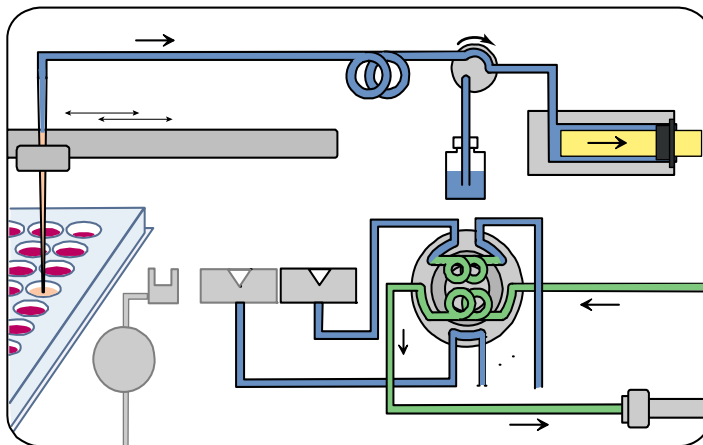


Figure 6 Metering device is drawing a plug of buffer

The needle arm moves to the defined location (any sample tray position or just air). The metering device plunger moves backwards, thereby drawing the defined plug volume into needle and buffer loop. Plug volumes may be defined in the range of 0 - 25 μ l for each plug.

Drawing Sample

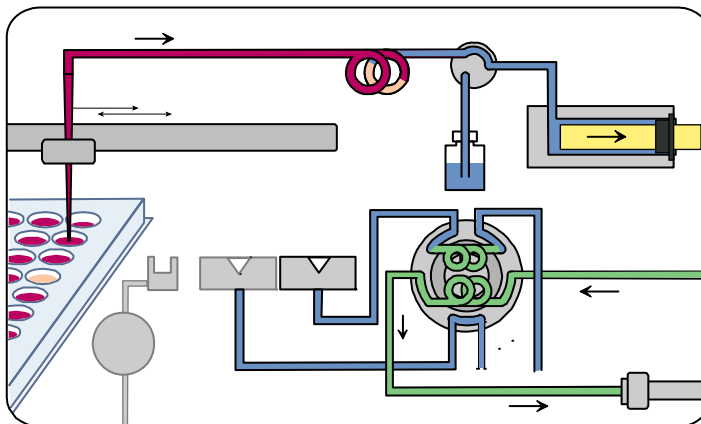


Figure 7 Metering device drawing sample

The needle lowers into the sample vessel. The syringe draws sample into the buffer loop.

Washing the Needle (optional step)

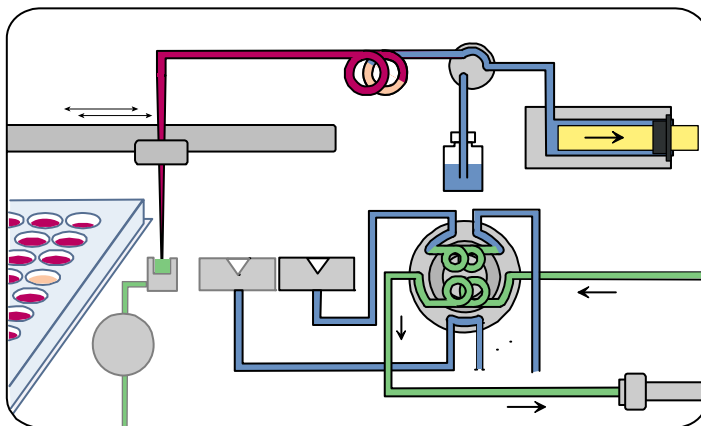


Figure 8 Needle in the wash port

The needle is lowered into the wash port. The peristaltic pump delivers needle wash solvent for the defined wash time.

Drawing the Trailing Buffer or Air Plug (optional step)

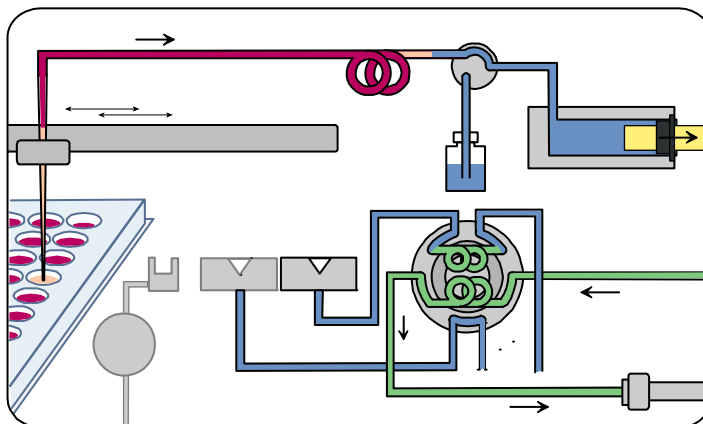


Figure 9 Metering device is drawing a plug of buffer

The needle arm moves to the defined location (any sample tray position or just air). The syringe is drawing a buffer or air plug of the same volume as the leading plug.

Loading the Sample Loop

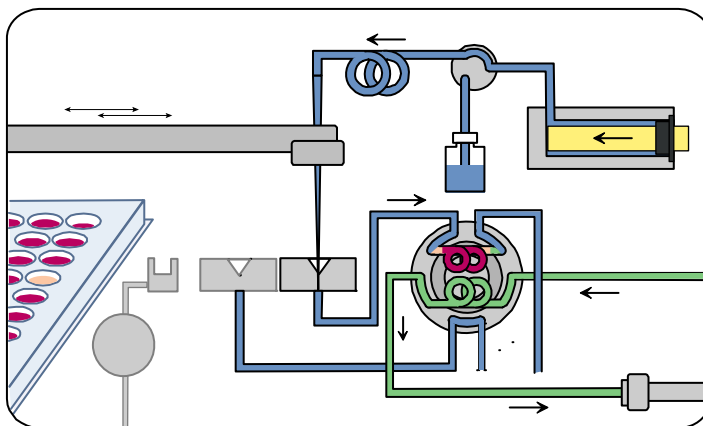


Figure 10 metering device loading the working loop

The needle moves into the seat of the working loop (rear seat = upper loop, front seat = lower loop). The plunger ejects both (optional) buffer plugs and the sample into the working loop. The dead volume of seat tubing and valve groove are compensated for by the flush solvent plug drawn in step 1. In case the working loop is only loaded partially, the remaining volume is still filled with run solvent.

Injecting

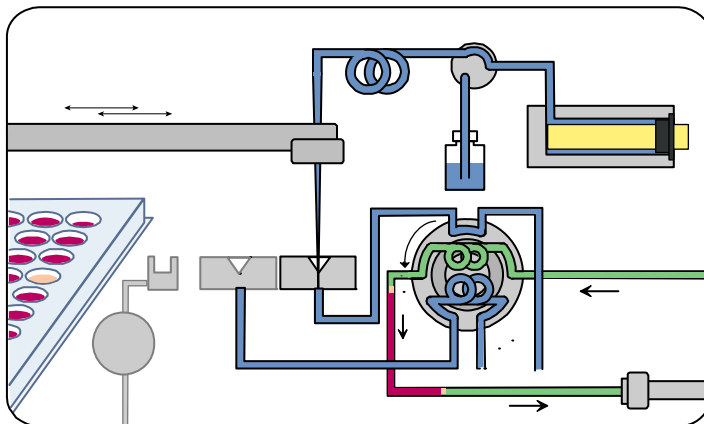


Figure 11 10-port valve switching to mainpass

The 10-port valve switches to mainpass and the content of the sample loop is flushed out towards the column. The sample loop stays in the flow path until the end of the run.

Drawing Flush Solvent

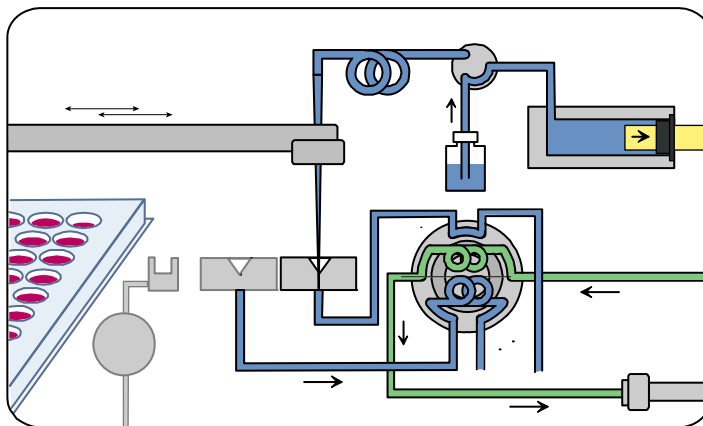


Figure 12 Metering device drawing flush solvent

The flush valve connects the syringe to the flush solvent bottle. The metering device draws the flush volume ($2 \times V_{\text{plug}} + V_{\text{sample}}$).

Washing the Sampling Path

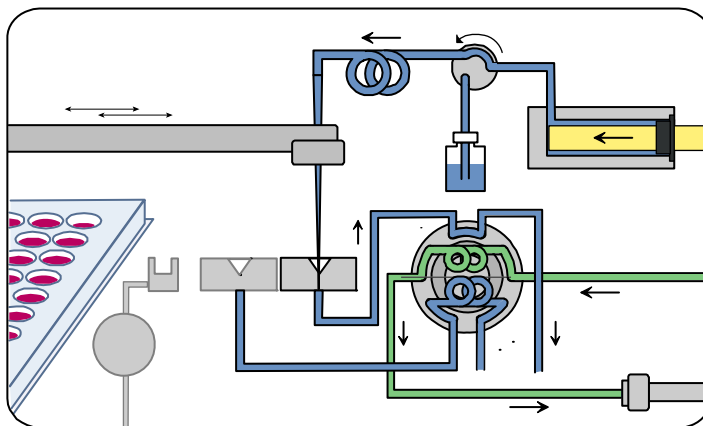


Figure 13 Flushing sampling flow path with flush buffer

Buffer loop, needle, needle seat, seat capillary and valve groove are purged with flush solvent. The last two steps can be repeated multiple times to ensure lowest carryover. 3 - 5 wash cycles are sufficient for most samples.

Loop Filling Modes

Fixed loop autosamplers usually purge the loop with sample before switching it into the flow path and flushing the content onto the column. As a consequence, changing the injection volume requires the installation of a loop of different size. Volumes of loops of identical size vary up to 65% depending on loop size and material.

The Agilent 1200 Series Dual Loop Autosampler overcomes this limitation with a 10-port valve and two loops of different sizes. Furthermore, it offers different loop filling modes that allow the injection of virtually any desired volume.

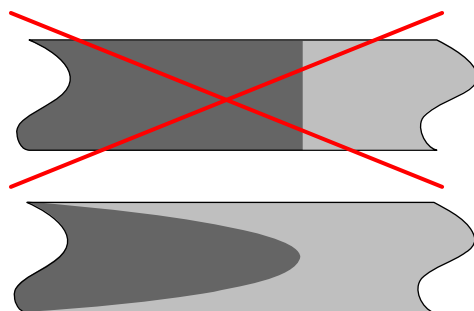
Complete Loop Filling



Figure 14 Complete Loop Filling

Complete loop filling means that 100% of the sample loop volume will be filled with sample prior to injection. Due to the laminar flow profile (see [Figure 15](#)) in needle and capillaries high precision injections require drawing excessive solvent to overfill the sample loop. This so called *overflow factor* is defined as

$$\frac{V(\text{drawn})}{V(\text{loop})}.$$



When solvent is pumped through capillaries the flow profile is not a bulk flow as one might expect but laminar flow profile. This is caused by the friction of the capillary wall which slows down the nearby solvent. The schematics to the left illustrate this phenomenon with the example of sample being loaded into a solvent filled loop capillary.

Figure 15 The Laminar Flow Profile

Depending on sample loop size typically overfill factors of 3 - 8 are necessary to obtain good peak area precision. Smaller loops require higher overfill factors. We recommend an overfill factor of 5 as a good starting point.

The G2258A Dual Loop Sampler uses a technique called *Centered Complete Loop Filling*. When the loop is completely filled, equal plugs of excessive sample are left on both ends of the loop

NOTE

Refer to “[Application Notes](#)” on page 107 for optimization of the overfill factor

Partial Loop Filling

Partially loop filling allows to inject any sample volume between 0 µl and the total sample loop volume.



Figure 16 Partial Loop Filling

Partial loop fill without plug settings To compensate for the volume of needle seat tubing and valve groove, the sampler draws the respective volume from the flush solvent bottle. Next, the desired sample volume is drawn from the sample vessel. At the end of this step the sample plug ends at the needle tip. The sampler ejects both sample and buffer plug into the needle seat. Since the buffer plug has exactly the same volume as the seat tubing the complete sample volume reaches the sample loop. The loop volume that was not filled with sample still contains mobile phase (see [Figure 16](#)).

NOTE

Partial loop filling without plugs has the advantage that no flush solvent enters the column which would change column selectivity and affect the shape of fast eluting peaks.

Partial loop fill with plug settings: This mode allows to sandwich the sample between air or solvent from any sampler location. It is useful to prevent precipitation of sample or when using immiscible mobile phase solvents.

Typically, the plug volume is calculated according to the following equation:

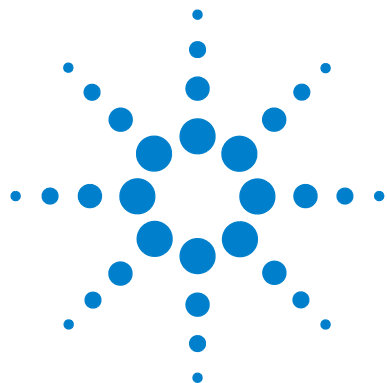
$$V(plug) = \frac{V(loop) - V(sample)}{2}$$

The sampler places a plug of the given volume on either side of the sample.

If the plug volume is smaller than calculated with the above equation, the residual volume will be filled with mobile phase.

In all cases, the trailing plug will reach the column prior to the sample and potentially effect the peak geometry of fast eluting peaks.

This effect may increase with increasing plug volume relative to the sample volume (reason: the mobile phase composition at the column head changes dramatically with some impact on the column selectivity).



2 Site Requirements and Specifications

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This chapter describes the Site Requirements and Specifications of the Dual Loop Autosampler.



Site Requirements

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

Power Consideration

The autosampler power supply has wide-ranging capability (see [Table 1](#) on page 32). Consequently there is no voltage selector in the rear of the sampler. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

The thermostatted autosampler comprises two modules, the sampler (G2258A) and the thermostat (G1330B). Both modules have separate power supplies and power plugs for the line connections. The two modules are connected by a control cable and both are turned on by the sampler module. The thermostat power supply has two externally accessible fuses.

WARNING

To disconnect the Dual Loop 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 Dual Loop Autosampler from line power, unplug the power cord from the autosampler and the 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 Dual Loop 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 Dual Loop Autosampler dimensions and weight (see [Table 1](#) on page 32) 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 sampler is installed in a horizontal position.

The thermostatted Dual Loop Autosampler dimensions and weight (see [Table 2](#) on page 33) 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 sampler is installed in a horizontal 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 “Recommended Stack Configuration - Agilent 1200 Series Preparative LC System”. Make sure that in this configuration there is 25 cm (10 inches) space on either side of the thermostatted Dual Loop Autosampler for the circulation of air.

Environment

Your Dual Loop Sampler will work within specifications at ambient temperatures and relative humidity as described in [Table 1](#) and [Table 2](#) on page 33.

CAUTION

Do not store, ship or use your Dual Loop Autosampler under conditions where temperature fluctuations may cause condensation within the Dual Loop Autosampler. Condensation will damage the system electronics. If your Dual Loop 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 - Dual Loop Autosampler G2258A

Type	Specification	Comments
Weight	14 kg (29.8 lbs)	
Dimensions (height × width × depth)	200 × 345 × 440 mm (8 × 13.5 × 17 inches)	
Line voltage	100 – 240 VAC, ±10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ±5 %	
Power consumption (apparent power)	200 VA	Maximum
Power consumption (active power)	180 W	Maximum
Ambient operating temperature	4 – 55 °C (41 – 131 °F)	
Ambient non-operating temperature	-40 – 70 °C (-4 – 158 °F)	
Humidity	< 95 %, at 25 – 40 °C (77 – 104 °F)	Non-condensing
Operating Altitude	Up to 2000 m (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the Dual Loop Autosampler
Safety standards: IEC, CSA, UL	Installation Category II, Pollution Degree 2	for indoor use only!

Table 2 Physical Specifications - Thermostat (G1330B)

Type	Specification	Comments
Weight	18.5 kg (40.7 lbs)	
Dimensions (height × width × depth)	140 × 345 × 435 mm (5.5 × 13.5 × 17 inches)	
Line voltage	100 – 120 or 220 – 240 VAC, $\pm 10\%$	Wide-ranging capability
Line frequency	50 or 60 Hz, $\pm 5\%$	
Power consumption (active power)	210 W	Maximum
Power consumption (apparent power)	260 VA	Maximum
Ambient operating temperature	4 – 40 °C (41 – 131 °F)	
Ambient non-operating temperature	-40 – 70 °C (-4 – 158 °F)	
Humidity	< 95 %, at 25 – 40 °C (77 – 104 °F)	Non-condensing
Operating Altitude	Up to 2000 m (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the Dual Loop Autosampler
Safety standards: IEC, CSA, UL, EN	Installation Category II, Pollution Degree 2	for indoor use only!

Performance Specifications of the Dual Loop Autosampler

Table 3 Performance Specifications Agilent 1200 Series Dual Loop Autosampler, Preparative Scale

Type	Specification
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors
Communications	Controller-area network (CAN). RS232C, APG-remote standard, optional: four external contact closures and BCD vial number output optional: LAN communication card
Instrument control	Agilent ChemStation software Agilent HT Purification SW Agilent G1323B Control Module Agilent G4208A Instant Pilot
Safety features	Leak detection and safe leak handling, low voltages in maintenance areas, error detection and display
Injection modes	Partial loop filling Complete loop filling
Injection range	0.1 – 5000 µl in 0.1 µl increments Recommended injection range 10 - 5000 µl
Area precision Complete Loop Fill	Typically < 0.5% RSD,(50 µl loop, overfill factor 3 or greater)
Area precision Partial Loop Fill	Typically < 1.0% RSD,(5000 µl loop, 1000µl injection volume, draw/eject speed 20 ml/min)
Carry-over	< 0.1% with rinse factor > 3 (see test method listing)
Area precision Complete Loop Fill	Typically < 0.5% RSD,(50 µl loop, overfill factor 3 or greater)
Area precision Partial Loop Fill	Typically < 1.0% RSD,(5000 µl loop, 1000 µl injection volume, draw/eject speed 20 ml/min)
Draw/eject speed	max. 50 ml/min (selectable in 1 µl/min steps)
Loop size	max. loop size 5 ml (selectable range: 5 µl - 50000 µl)

Table 3 Performance Specifications Agilent 1200 Series Dual Loop Autosampler, Preparative Scale (continued)

Type	Specification
Sample viscosity range	0.2 – 5 cp
Injection volume	Selectable range: 0 - 50000 µl in 0.1 µl steps Recommended range: 10 µl - 5000 µl in 1 µl steps
Temperature controlled version with G1330B	Temperature range of sample compartment: 4 - 40 deg C
Sample capacity	2 × well-plates (MTP) + additional 10 × 2 ml vials
Supported sample plates	Any combination of 2 of the following plates: 96 well plate (shallow/deep/conical) 54 x 2 ml vial plate 15 x 6 ml vial plate 27 x Eppendorf plate for Eppendorf tubes of 0.5 ml, 1.5 ml or 2.0ml Maximum plate height with plate tray G2258-60001: 50 mm

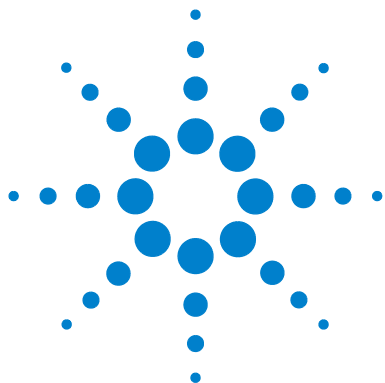
NOTE

Vial septa and closing mats must be pre-slit.

Method for Carry-over Test

Table 4 Carry-over Test Method

Parameter	Setting
Column	Zorbax SB-C18, 21.2 x 50 mm, 5 µm
Solvents	A = water, B = ACN
Gradient	0 min: 5% B 5.0 min: 95% B 5.5 min: 95% B
Flow rate	20 ml/min
Stop time	5.5 min
Post time	2 min
Inj. volume	250 µl (partial loop filling, 500 µl loop)
Column temperature	ambient
DAD	254 nm /8 (ref. 360nm /100) Preparative flow cell (0.3 mm path length)
Sample	Caffeine, Primidone, Mandelic acid, Benzylester, Biphenyl 5 mg each on column



3

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This chapter describes the Installation of the Dual Loop Autosampler.



Unpacking the Dual Loop Autosampler

CAUTION

If you need to ship the Dual Loop Autosampler at a later date, always use the shipping protection foam parts (see “[Special Transport Unit Positions](#)” on page 68).

Damaged Packaging

Upon receipt of your autosampler, inspect the shipping containers for any signs of damage. If the containers or cushioning material are damaged, keep them until the contents have been checked for completeness and the Dual Loop Autosampler has been mechanically and electrically checked. If the shipping container or cushioning material are damaged, notify the carrier and keep the shipping material for the carrier’s inspection.

CAUTION

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

Delivery Checklist

Ensure all parts and materials have been delivered with the Dual Loop Autosampler. For this compare the shipment content with the checklist included in each instrument box. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Two versions of the Agilent 1200 Series Dual Loop Autosampler are available:

- *G2258A Dual Loop Autosampler, preparative scale*, designed for flow rates from 1ml/min to 100 ml/min. It can be used with a wide variety of vials and well plates (see “[Consumables](#)” on page 122)Fraction Collector.
- *G2258A Thermostatted Dual Loop Autosampler, preparative scale*, thermostatisation is achieved by adding a *G1330B* thermostat.

The term (*thermostatted*) *Dual Loop Autosampler, preparative scale* refers to these Agilent 1200 Series modules in this manual. Unless otherwise stated all information in this section is valid for both models.

Table 1 Delivery Checklist for the G2258A Dual Loop Autosampler

Description	Quantity
Dual Loop Autosampler module with inlet / waste tubing assemblies	1
Power cord, local (Matching the sockets in your country or region)	1
Accessory kit (see below)	1

Table 2 Delivery Checklist for the G1330B Thermostat Module (optional)

Description	Quantity
Thermostat Module	1
Power cord, local (Matching the sockets in your country or region)	1
Accessory kit thermostat module (see below)	1

Accessory Kits

Each sampler comes with an Accessory Kit which contains the tools and consumables needed to install the LC-system and make the first runs.

•
Table 3 Dual Loop Autosampler Accessory Kit Contents G2258-68705

Description	Quantity	Part Number
1/16 front ferrule, 316 stainless steel	6	0100-0043 re-order 5180-4108 (pack of 10)
1/16 back ferrule, 316 stainless steel	6	0100-0044 re-order 5180-4114 (pack of 10)
Vial plate 54 x 2 ml	1	5022-6502 re-order G2258-68700 (pack of 6)

3 Installing the Dual Loop Autosampler

Unpacking the Dual Loop Autosampler

Table 3 Dual Loop Autosampler Accessory Kit Contents G2258-68705 (continued)

Description	Quantity	Part Number
Vial plate 15 x 6 ml	1	5022-6539 re-order 5065-9949 (pack of 6)
Tubing assembly	2	5063-6527
Flexible capillary, 0.5 x 800 mm, no fittings	1	5065-9926
Flexible capillary, 0.25 x 800 mm, no fittings	1	5065-9930
CAN cable, 1 m	1	5181-1519
Wrench, open end, 1/4 - 5/16 inch	2	8710-0510
Wrench, open end, 4mm	1	8710-1534
Rheotool socket wrench 1/4 inch	1	8710-2391
Hex key 4mm, 150 mm long, with T-handle	1	8710-2392
Hex key 2.0 mm	1	8710-2438
Hex key driver 3/32 inch	1	8710-2462
Fitting screw 1/16 inch	3	79814-22406 re-order 5061-3303 (pack of 10)
Fitting screw 1/16 inch, extra long	3	G1156-22402 re-order 5065-4454 (pack of 10 screws, front ferrules, back ferrules)
Air channel adapter	1	G1329-43200
ESD wrist strap	1	9300-1408
Drawing tube assembly for flush solvent	1	G2258-87307

- The Accessory kit (G1330-68705) shown in [Table 4](#) is shipped with the (G1330B) thermostat module if the thermostat module was ordered.

Table 4 (Optional) Thermostat Module Accessory Kit Contents G1330-68705

Description	Quantity	Part Number
Waste tubing (1.2 m) ¹	1	5062-2463
Cable thermostat module to Dual Loop Autosampler	1	G1330-81600

¹ Reorder gives 5 m

Optimizing the Stack Configuration

If your Dual Loop Autosampler is part of a system, you can ensure optimum performance and minimum delay volume by installing the following configuration.

- [Figure 1](#) and [Figure 2](#) on page 44 show the configuration recommended for the autosampler in an analytical scale system.
- [Figure 3](#) on page 45 and [Figure 4](#) on page 46 show the configuration recommended for the sampler in a preparative scale system.

Analytical System

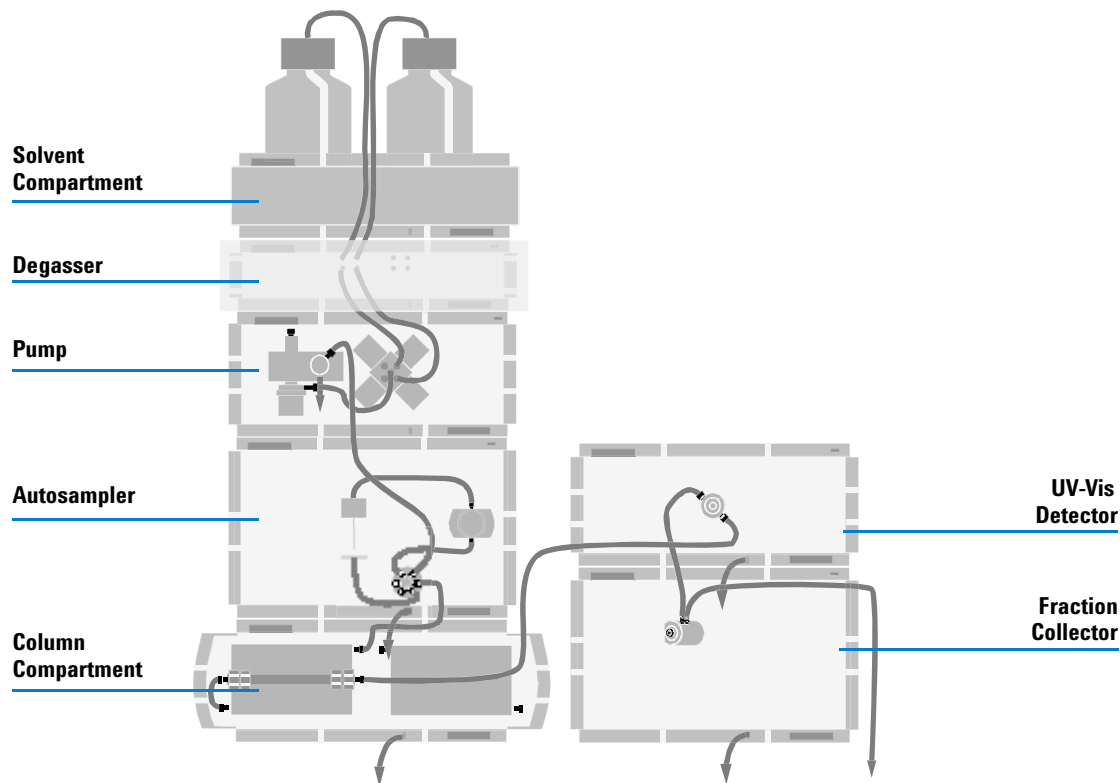


Figure 1 Recommended Stack Configuration - Analytical System (Front View)

NOTE

For information about connecting a G1946C/D LC-MSD or a Non-1200 or Non-UV-Vis detector to the system, please refer to the "User's Guide for Purification / High Throughput System", PN G2262-90003 or to the "Installation Note for the Mass Based Fraction Collection Kit", PN G1968-90000.

3 Installing the Dual Loop Autosampler

Optimizing the Stack Configuration

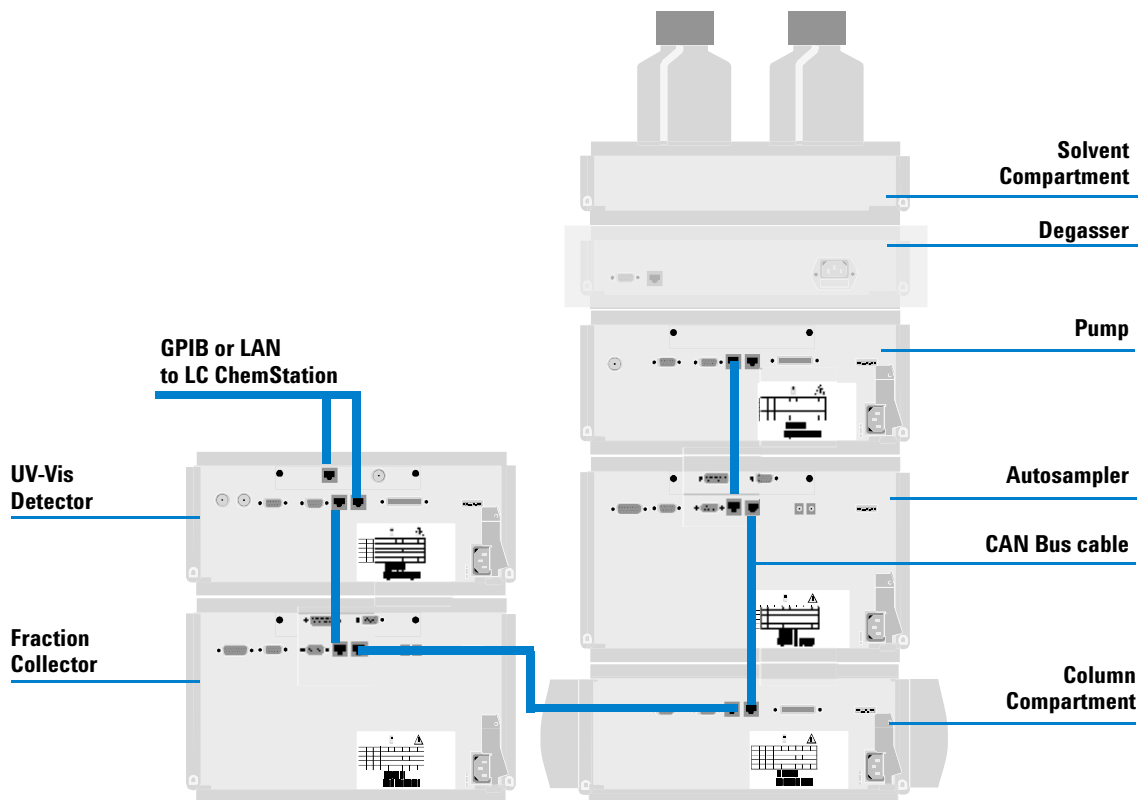


Figure 2 Recommended Stack Configuration - Analytical System (Rear View)

NOTE

If a G1330B ALS thermostat is part of the system it must always be installed underneath the Dual Loop Autosampler (see "I" on page 53).

Preparative System

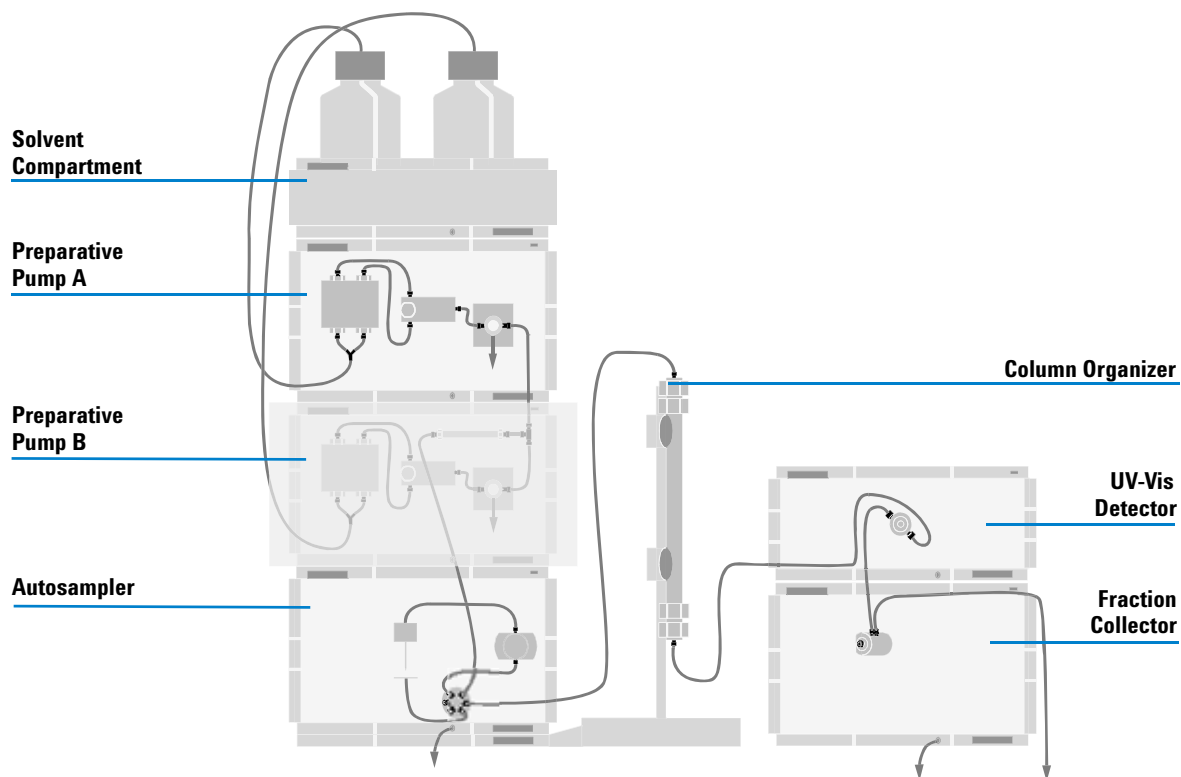


Figure 3 Recommended Stack Configuration -Preparative System (Front View)

NOTE

For information about connecting a G1946C/D LC-MSD or a Non-1200 or Non-UV-Vis detector to the system, please refer to the "User's Guide for Purification / High Throughput System", PN G2262-90003 or to the "Installation Note for the Mass Based Fraction Collection Kit", PN G1968-90000.

3 Installing the Dual Loop Autosampler

Optimizing the Stack Configuration

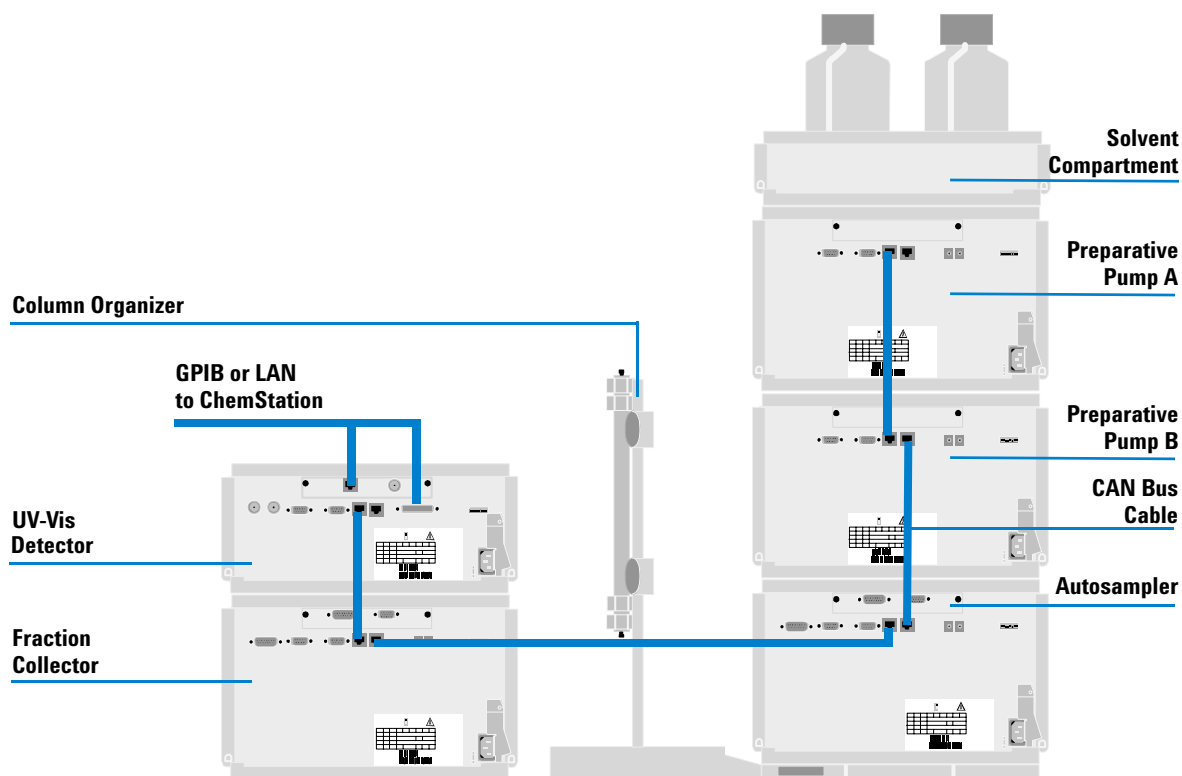


Figure 4 Recommended Stack Configuration - Preparative System (Rear View)

NOTE

If a G1330B ALS thermostat is part of the system it must always be installed underneath the Dual Loop Autosampler (see “I” on page 53).

Installation

Installing the Dual Loop Autosampler

Preparation	Locate bench space Provide power connections Unpack the sampler
Parts required	Sampler Power cord, for the other cables see below and “Cable Overview” in the Service Manual Chemstation rev. A.10.02 or higher and/or Control Module G1323B rev. B.03.21 or higher and/or Instant Pilot G4208A.

WARNING

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

- 1 Install optional BCD or LAN interface boards in Agilent 1200 Series detector.
For details, see “Firmware Description” in the Service Manual.

CAUTION

Always use the detector as access point for the data system. If another module is used to connect the PC, all data (especially 3D data from the detector) have to be routed via the CAN bus. This may result in reduced system stability.
The LAN interface should only be installed if no other option is available.

- 2 Remove the adhesive tape which covers the side and front doors.
- 3 Open the front door and remove the left side door.
- 4 Remove the transport protection foam.
- 5 Install two pieces of corrugated waste tubing to the drain ports of the leak plane and the needle wash port.
- 6 Re-install the left side door (take care of the magnet at the back).

3 Installing the Dual Loop Autosampler

Installation

- 7 Place the autosampler in the stack or on the bench in all horizontal position.
- 8 Ensure the power switch at the front of the sampler is OFF.
- 9 Connect the power cable to the power connector at the rear of the sampler.
- 10 Connect the CAN cable to the other Agilent 1200 Series modules.
- 11 If a Agilent ChemStation is the controller, connect the computer to the Agilent 1200 Series stack by either LAN connection or GPIB.
- 12 Connect the APG remote cable (optional) for non Agilent 1200 Series instruments.
- 13 Ensure the side panel is correctly installed.
- 14 Place the plate tray into the tray base.
- 15 Turn ON power by pushing the button at the lower left hand side of the sampler.
- 16 Close the front door. The exhaust fan will turn ON and remove the vapor from the tray compartment. After 1-2 minutes the sampler will start the hardware initialisation process. At the end of this process the status LED should be green.

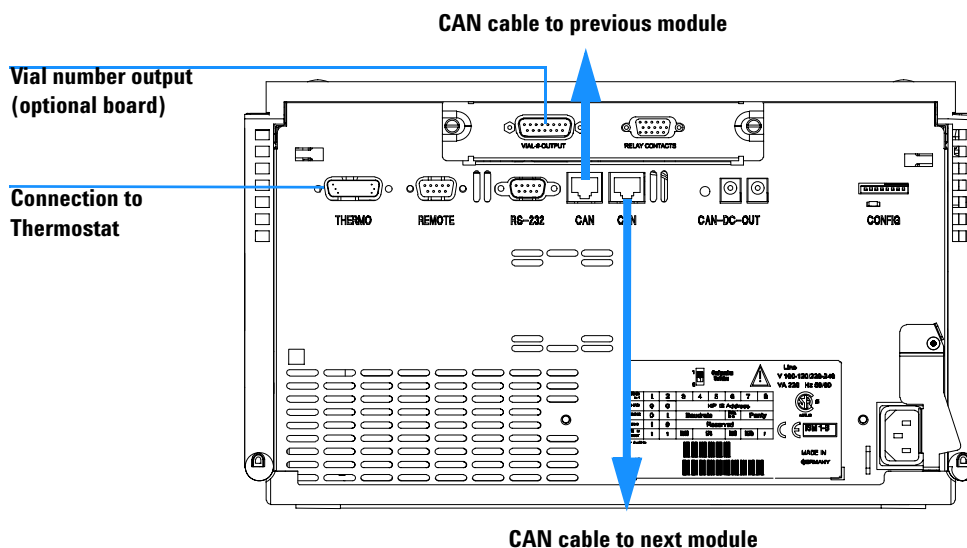


Figure 5 Cable Connections

NOTE

The sampler is turned ON when the line power switch is pressed and the green indicator lamp is illuminated. The sampler 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 a Thermostatted Dual Loop Autosampler

Preparation	Locate bench space
	Provide power connections
	Unpack the sampler and the thermostat
Parts required	Sampler and thermostat
	Power cord, for the other cables see below and Cable Overview in the Service Manual
	ChemStation and/or Control Module G1323B and/or Instant Pilot G4208A.

- 1 Place the thermostat onto the bench.
- 2 Remove the front cover and route the condensation drain tube to the waste bottle.

WARNING

Make sure that the condensation drain 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.

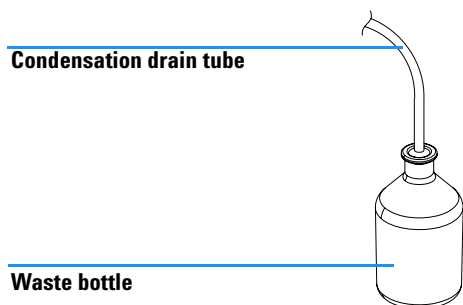


Figure 6 Condensation leak outlet

- 3 Install optional BCD or LAN interface boards in Agilent 1200 Series detector.
For details, see [“Firmware Description”](#) in the Service Manual.

CAUTION

Always use the detector as access point for the data system. If another module is used to connect the PC, all data (especially 3D data from the detector) have to be routed via the CAN bus. This may result in reduced system stability.
The LAN interface should only be installed if no other option is available.

- 4 Remove the adhesive tape which covers the side and front doors.
- 5 Open the front door and remove the left side door.
- 6 Remove the transport protection foam.
- 7 Install two pieces of corrugated waste tubing to the drain ports of the leak plane and the needle wash port.
- 8 Re-install the left side door (take care of the magnet at the back).
- 9 Place the sampler on top of the thermostat. Make sure that the sampler is correctly engaged in the thermostat locks.
- 10 Install the connection cable between sampler and thermostat

3 Installing the Dual Loop Autosampler

Installation

WARNING

Do not disconnect or reconnect the Dual Loop Autosampler to thermostat cable when the power cords are connected to either of the two modules. This will damage the electronics of the modules.

- 11** Remove the tray and the plastic cover from the tray base, place the air channel adapter into the sampler tray base. Make sure the adapter is fully seated.
- 12** Place the plate tray into the tray base.
- 13** Turn ON power by pushing the button at the lower left hand side of the Dual Loop Autosampler.
- 14** The exhaust fan will turn ON and remove potential solvent vapor from the inside of the instrument. After 2 minutes close the front door. Then the Dual Loop Autosampler will start the hardware initialization process. At the end of this process the status LED should be green.

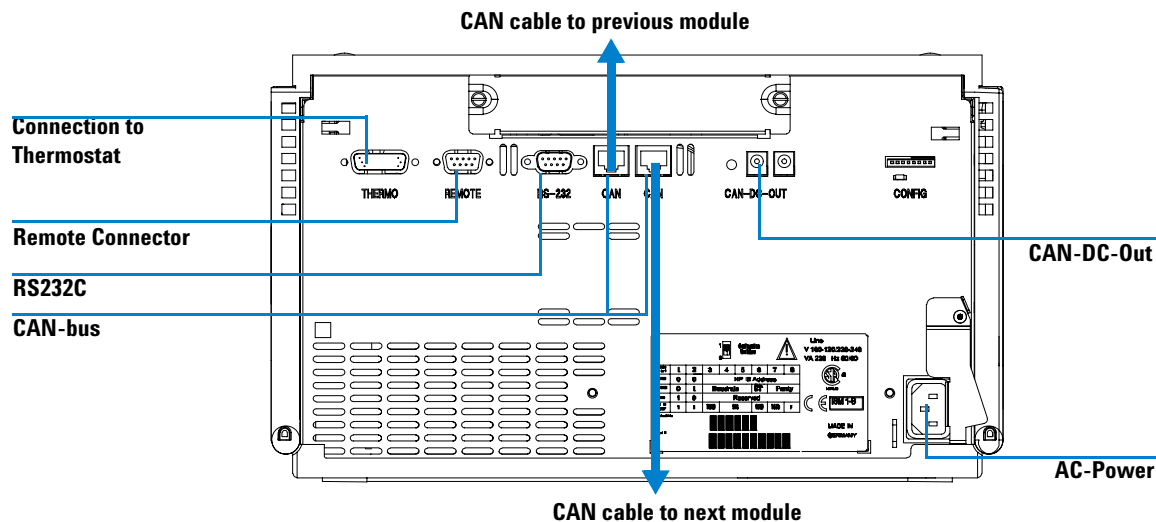


Figure 7 Cable Connections

NOTE

The Dual Loop Autosampler 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 Dual Loop Autosampler from the line, unplug the power cord. The power will supply still uses some power, even switch at the front panel is turned OFF.

CAUTION

The Dual Loop Autosampler thermostat requires 25 cm (10 inch) space on each for sufficient air circulation.

WARNING

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

3 Installing the Dual Loop Autosampler

Installation

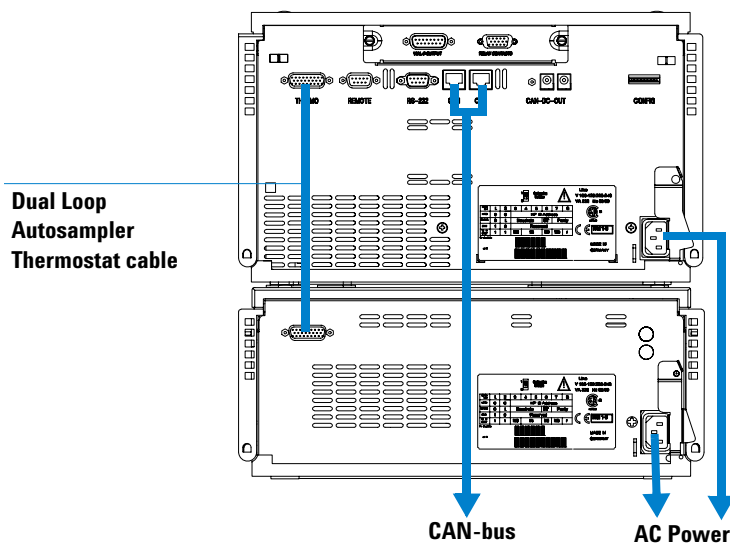


Figure 8 Connections at the Rear of the Thermostatted Dual Loop Autosampler

Flow Connections to the Dual Loop Autosampler

Preparation	Dual Loop Autosampler is installed in the LC system
Parts required	Parts from the accessory kit, see “Dual Loop Autosampler Accessory Kit” on page 126

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.

WARNING

Regularly inspect the buffer loop tubing and exchange it if worn out or showing visible signs of damage.

WARNING

This instrument should only be used with solvents that have an ignition temperature higher than 200°C!

Connect the flush solvent tubing from the accessory kit to the lower left port of the flush valve. Screw the bottle cap onto the flush solvent bottle and place it into the solvent cabinet of the LC-system.

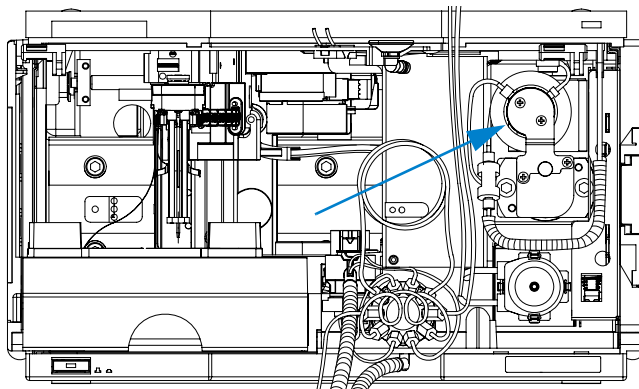


Figure 9 Position of the Flush Solvent Port of the Flush Valve

3 Installing the Dual Loop Autosampler

Installation

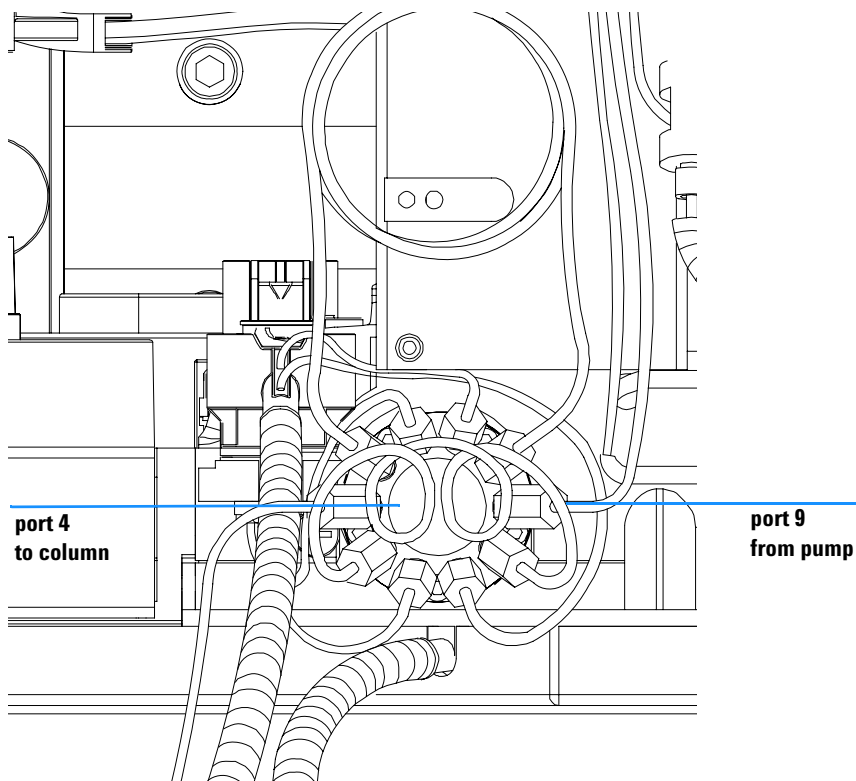


Figure 10 Flow Connections to and from the Dual Loop Autosampler.

Since the ports of the 10-port valve are very close to each other, fitting screws of different lengths are provided in the DLA accessories kit. The shortest fittings screws are used for the connection that doesn't require frequent access, like twin seat tubings and waste tubings.

The sample loops are fitted with medium length fittings. The very long fittings are intended for connecting the capillaries from the pump and to the column or column thermostat.

To change sample loop it may be necessary to disconnect inlet and outlet capillaries first.

CAUTION

After replacing sample loops or capillaries on the 10-port valve, check if all other connections are still tight. Due to the very tight space it may happen the an adjacent fitting gets loose.

- 1 String a back ferrule, a front ferrule and long fitting screw onto the orange 0.5 x 800 mm capillary from the accessories kit.
- 2 Put the end of the capillary completely into port 9 of the 10-port valve.
- 3 Tighten the fitting screw while pushing the tubing in to the valve port.
- 4 When finger-tight, use a 1/4 inch wrench or the RheoTool to tighten the screw another 1/2 to 3/4 turn to seal the fitting pressure tight.
- 5 Repeat steps 1 to 4 with the other end of the capillary but use the pump outlet fitting for swaging. Use one of the shorter fitting screws. This procedure ensures that dead volumes are avoided, no matter what pump is used.
- 6 String a back ferrule, a front ferrule and long fitting screw onto the blue 0.25 x 800 mm capillary from the accessories kit.
- 7 Put the end of the capillary completely into port 4 of the 10-port valve.
- 8 Tighten the fitting screw while pushing the tubing in to the valve port.
- 9 When finger-tight, use a 1/4 inch wrench or the RheoTool to tighten the screw another 1/2 to 3/4 turn to seal the fitting pressure tight.
- 10 Swage the other end of the blue capillary to the fitting of your column accordingly. Use one of the shorter fitting screws.

Flushing the Metering Device

Initial Priming by Backflushing with External Pump

When required	At initial installation or if the metering head is filled with air (e.g. after replacing seal or piston)
Tools required	1/4 inch-5/16 inch wrench 8710-0510 (supplied in accessory kit)
Parts required	none

Air in the metering device results in unpredictable injection volumes and large peak area standard deviation. It is essential to remove any gas from the metering head, the solenoid valve and all tubing before an analysis is started. The following procedures explain for this is achieved effectively.

Steps 1 - 7 are only necessary if metering head and tubings are completely dry (e.g. during installation or after replacing metering seal or piston)

- 1** Fill the flush solvent bottle of the Dual Loop Sampler with 250 ml Isopropanol
- 2** Remove the blue purge plug from the metering head assembly. Connect the pump of the LC system (e.g. G1310A, G1311A, G1312A or G1361A) with a 0.5 mm ID capillary to this purge port.
- 3** Put the solvent intake tubing of the pump into a vessel with Isopropanol. Turn the pump on and start flushing at 5 ml/min until the solvent drains from on of the 10-port valve waste tubings.
- 4** Accelerate the pump to 10 ml/min (max.) for another 3 – 5 min
- 5** Switch OFF the pump flow.
- 6** Disconnect the capillary and close the purge port with the blue plug.
- 7** Place the flush solvent bottle into your solvent cabinet.

Purging the Syringe

NOTE

The syringe purge function of the autosampler works best if the flush solvent bottle is located slightly above the sampler. We recommend to keep it in the solvent cabinet. Avoid placing it onto the lab bench as this will result in an underpressure in the tubing and may generate air bubble in the metering head.

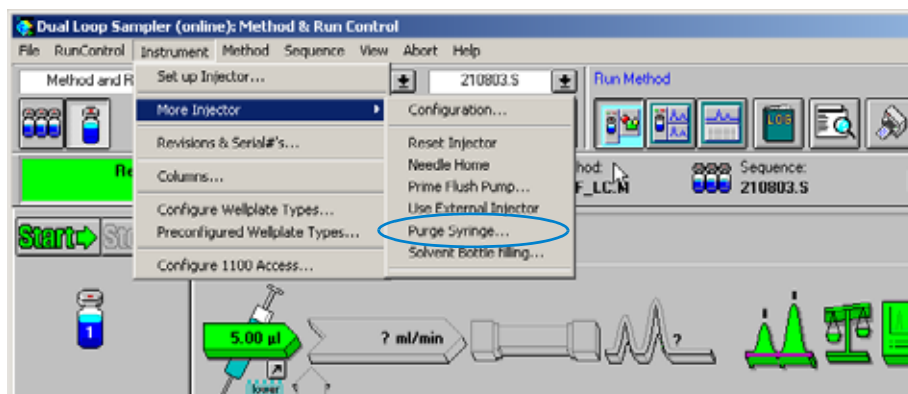


Figure 11 Accessing the Purge Syringe Command

It is suggested to use this function at least before starting a sequence to ensure that no gas bubbles have formed inside the metering unit. When changing solvents it may be necessary to use intermediate flushing steps with Isopropanol or water.

CAUTION

Air in the metering device results in unpredictable injection volumes and large peak area standard deviation. It is essential to remove any gas from the metering head, the solenoid valve and all tubing before an analysis is started.

3 Installing the Dual Loop Autosampler

Flushing the Metering Device

- 1 Start purging the sampler from the *Instrument* menu of Agilent ChemStation (see [Figure 11](#)) or from **Views > System > DL Sampler > Purge > Syringe** on the handheld controller until the flush solvent has reached the inlet tubing to the metering head.
- 2 Continue purging for another 5 to 10 times to ensure that metering head is free of gas bubbles.
- 3 If applicable:
Change the solvent as needed and flush 10 times with new solvent.

Flushing the Syringe

Reasons to flush the Syringe

The metering device (syringe) of the Dual Loop Autosampler is a dead end part of the system (see [Figure 12](#))

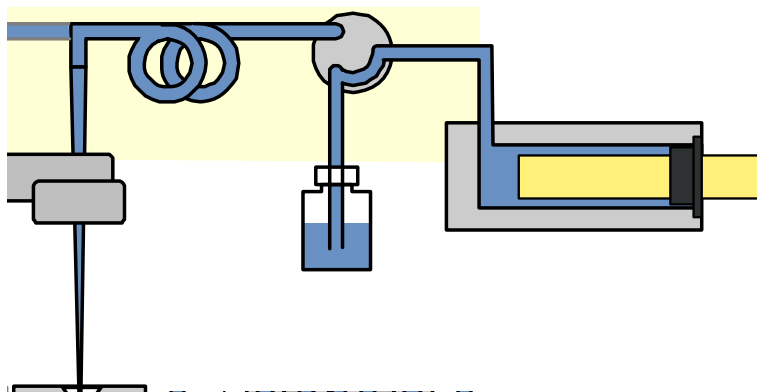


Figure 12 Schematic of needle, buffer loop, wash valve and syringe

Gas bubbles the syringe will not flushed out automatically. Due to the higher compressibility of air compared to liquids, precision and reproducibility of the sampler will suffer significantly if any gas bubbles are present in the metering device.

The use of premixed 5-10% MeOH in water minimizes the formation of air bubbles over time.

- In order to keep sample contamination low, you will have to rinse the syringe loop prior to next injection. (This is not necessary for repetitive injections).

How to flush the Syringe

In Agilent ChemStation right-click the **DLA** icon and select **Purge Syringe** from the drop-down menu (see)

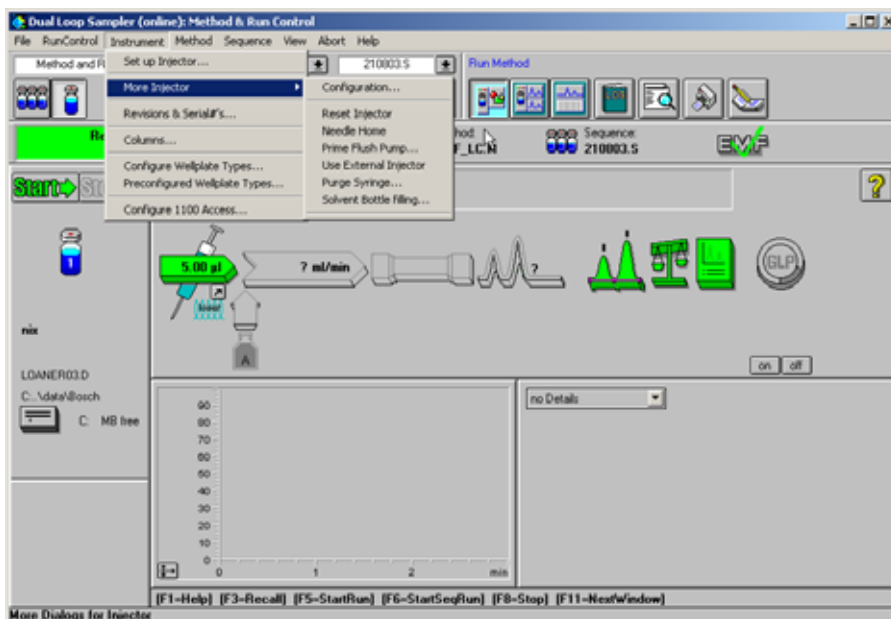


Figure 13 Accessing the Purge Syringe Dialog

In the appearing dialog box the number of syringe purge cycles can be defined.



Figure 14 Purge Syringe Dialog

3 Installing the Dual Loop Autosampler

Flushing the Metering Device

This command is interactive. Add how often you wish to purge the syringe and press **Start**.

In the example above, the syringe will draw and eject five times its total volume of 5 ml flush solvent at the maximum speed of 50 ml/min. The flush solvent is ejected directly into waste. (The waste position is in front of the needle wash port).

How much Flush Solvent is needed?

Whenever changing the flush solvent to a solvent with different properties, flush your syringe about 5 – 10 times, depending on the viscosity and the volume of the inlet tube, to be sure that the old solvent has been replaced quantitatively.

CAUTION

Use Propanol-2 as an intermediary for not completely miscible solvents.

Additional Information

Store your flush solvent in the solvent cabinet on top of the Agilent 1200 Series system. The metering device can draw solvent only from the same height as the metering device itself or higher.

Always use the inlet solvent filter and clean or replace it from time to time in order to protect your metering device.

Similar to the *Bottle Filling* function of the Agilent HPLC pumps, the Dual Loop Autosampler tracks the flush solvent level and stops the system before running out of solvent. In ChemStation the function is accessed from the **Method & Run Control** screen by pulling down the **Instrument** menu clicking **Solvent Bottle Filling**.

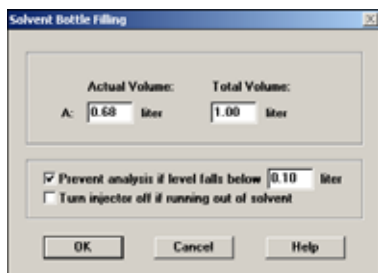


Figure 15 Solvent Bottle Filling

Enter the capacity of the solvent bottle into the **Total Volume** box and the actual volume into the **Actual Volume** box.

The Actual Volume field is updated by Agilent ChemStation as flush solvent is consumed. When refilling the solvent bottle, enter the new actual volume into the **Actual Volume** box.

There is no direct measurement of the bottle filling. The Autosampler is calculates the actual volume by subtracting the volume of each flush cycle from the initial value of the **Actual Volume** variable.

Select **Prevent analysis** if level falls below and enter a threshold in the field to ensure that the pump generates a **Not Ready** condition if the calculated solvent bottle filling level falls below the set threshold. The current run is completed, but the sequence will not continue with the next analysis.

Select **Turn off injector** if running out of solvent to ensure that the injector generates an error if the calculated solvent bottle filling level is zero. The error is recorded in the instrument logbook, the analysis is stopped immediately and the whole system goes into an error state.

Adjust the length of the solvent inlet tube to the appropriate length. Take off the inlet filter, shorten the tubing with a cutter and replace the frit again.

NOTE

Keeping the flush solvent tubing short minimizes the dead volume when changing flush solvents.

NOTE

The G2258A is compatible with all well-established organic solvents as well as with pure water and organic solvent/water mixtures.

Configuring Wellplate Types

If the plate you are using is not found on the “[List of Recommended Well Plates and Vial Plates](#)” on page 123 you may configure a custom plate. Measure the exact dimensions of the plate as marked below and enter the values in the plate configuration table of the Agilent ChemStation or the Control Module.

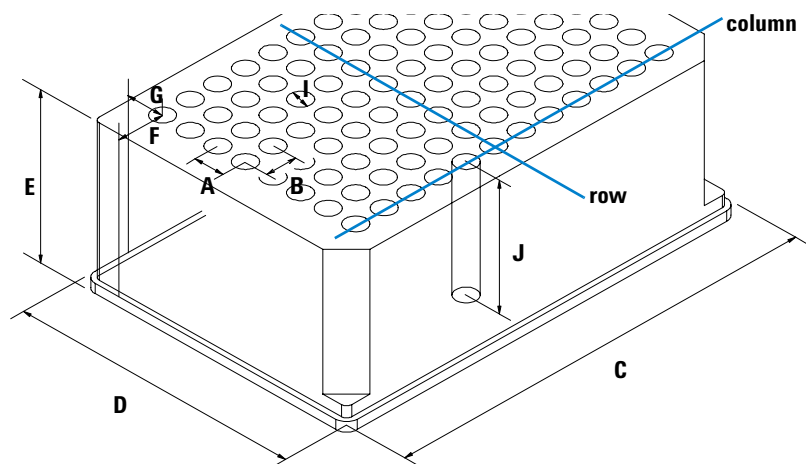


Figure 16 Well-plate Dimensions (straight)

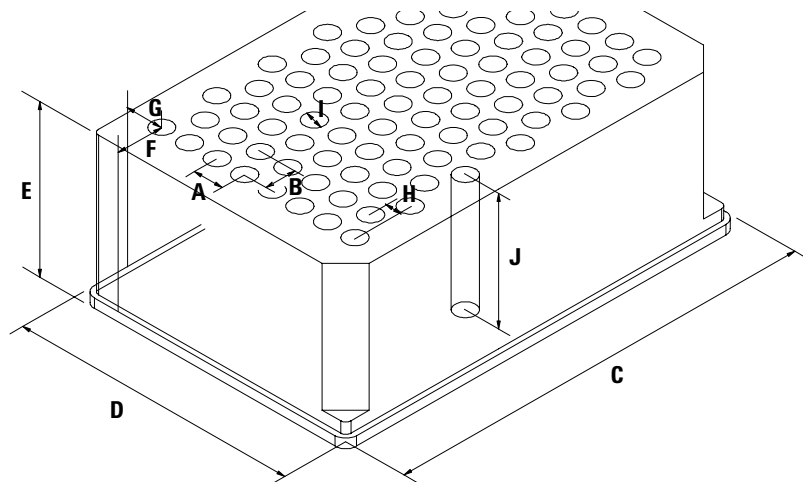


Figure 17 Well-plate Dimensions (staggered)

3 Installing the Dual Loop Autosampler

Configuring Wellplate Types

Table 5 Configuring Well-plate Types

Location	Description	Definition	Limits
	Rows	Number of rows on the plate	up to 16
	Columns	Number of columns on the plate	up to 24
	Volume	Volume (in μl) of a sample vessel	
A	Row distance	Distance (in mm) between the center of two rows	
B	Column distance	Distance (in mm) between the center of two columns	
C	Plate length	X size (in mm) at the bottom of the plate	127.75+/- 0.25 mm (SBS Standard)
D	Plate width	Y size (in mm) at the bottom of the plate	85.50+/-0.25 mm (SBS Standard)
E	Plate height	Size (in mm) from the bottom to the top of the plate. If you use well plates with inlets, caps and septa, you have to specify the distance from the bottom to the top of the caps.	up to 47 mm
F	Column offset	Distance (in mm) from the left edge (bottom) to the center of the first hole (A1)	
G	Row offset	Distance (in mm) from the back edge (bottom) to the center of the first hole (A1)	
H	Column shift	Offset (in mm) to Y when the rows are not straight but staggered	
J	Well depth	Distance (in mm) from the top of the plate to the bottom of the well. If you use well plates with inlets, caps and septa, you have to specify the distance from the top of the septa to the bottom of the inlets.	up to 45 mm

Table 5 Configuring Well-plate Types (continued)

Location	Description	Definition	Limits
	Well X size	Size of the well in x direction (Plate length) If you use well plates with inlets, caps and septa, you have to specify the x size of the septa.	min. 3.7 mm min. 3.0 mm with position accuracy alignment (micro scale)
	Well Y size	Size of the well in y direction (Plate width). If you use well plates with inlets, caps and septa, you have to specify the y size of the septa.	down to 3.7 mm min. 3.0 mm with position accuracy alignment (micro scale)
	Bottom size	For round wells, the relative of the top and bottom of the well	1.0: cylindrical well 0.0: conical well
	Square	Click in the field to specify whether the well is rectangular or round	Yes: rectangular No: round /oval
	Is well plate	Click in this field to specify if this is a well plate or not. Relevant for continuous flow operation.	Yes: well plate or MALDI Target No: Vial Tray or Eppendorf tray

NOTE

The distances need to be measured with high precision. It is recommended to use a caliper. If possible contact the vendor of non-predefined well plates to obtain these dimensions.

Special Transport Unit Positions

Transporting the Dual Loop Autosampler

When moving the Dual Loop Autosampler inside the laboratory, no special precautions are needed. However, if the Dual Loop Autosampler needs to be shipped to another location via carrier, ensure:

- ✓ The transport assembly is in the park position. Use the Agilent ChemStation or the Control Module for this command.

To move the arm to the park position:

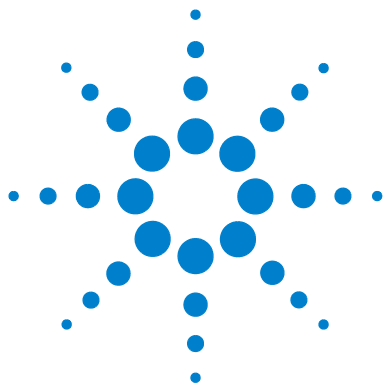
- 1 Switch to the **Diagnosis** view of the Agilent ChemStation and select **Dual Loop ALS > Maintenance Positions** from the **Maintenance** menu.
 - 2 In the upcoming dialog box click the **Park Arm** button.
- ✓ The vial tray and the sample transport mechanism is secured with the transport protection foam.

Maintenance Positions

Maintenance and repairs require to move certain assemblies of the Dual Loop Autosampler into dedicated maintenance positions.

Access to the maintenance positions

Chemstation Diagnosis View - Maintenance - Dual Loop ALS - Maintenance Positions



4 Using the Dual Loop Autosampler

General Comments about Sample Trays	70
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This chapter describes the Usage of the Dual Loop Autosampler.



General Comments about Sample Trays

Supported Trays

The Dual Loop Autosampler recognizes the installed tray automatically. Two supported trays are available:

Standard 2 well plate tray, PN G1367-60001 This tray can hold up to two well plates or vial plates. The maximum vessel height is 48mm.

Well plate tray, 2 well plates, 10 vials (supports 50 mm plates), PN G2258-60001

This new tray can hold up to two well plates or vial plates. The sample plates are positioned two millimeters lower than in the standard sample tray. This allows the use of vessels with a maximum height of 50mm

CAUTION

Other trays are not supported with the Dual Loop Autosampler because their use may cause damages to the needle under special circumstances. These damages are not covered by instrument warranty.

Unsupported Trays

The following vial trays are not supported with the G2258A Dual Loop Autosampler:

- Std. tray for 100 x 2ml vials, PN G1313-44500
- Std. tray for 100 x 2ml vials, thermostat able, PN G1329-60001
- Half tray for 40 x 2ml vials, PN G1313-44502
- Half tray for 15 x 6ml vials, PN G1313-44503

These trays have larger bore holes for the vial which spoil the positioning accuracy of the Dual Loop Autosampler

Operating the Dual Loop Sampler with Agilent ChemStation

Navigation in Agilent ChemStation

The Agilent ChemStation chromatography software is structured into five main screens. These screens can either be selected from the **VIEWS** menu or from the drop-down list in the left upper corner of the screen.

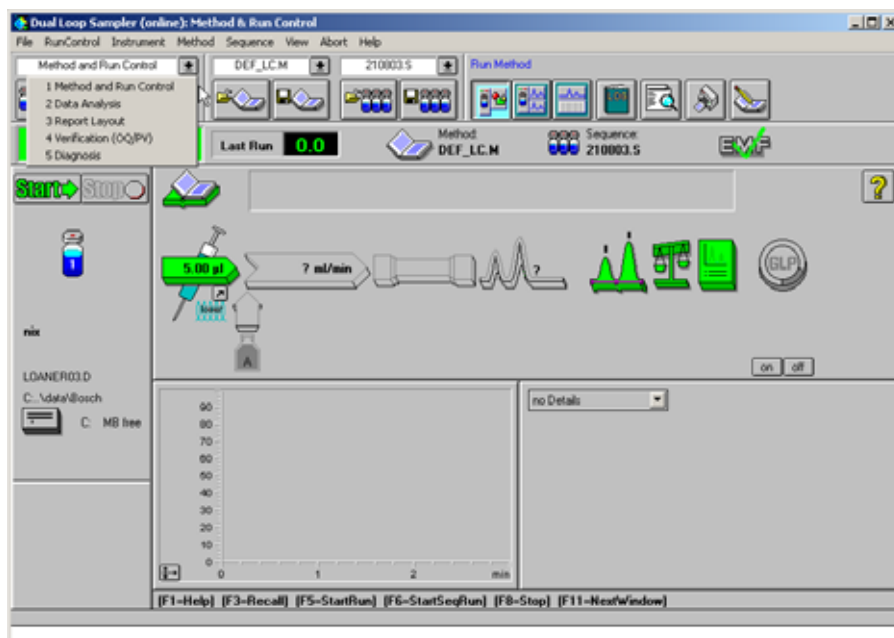


Figure 18 ChemStation Views

Configuring the Dual Loop Sampler with ChemStation

The **Method and Run Control** screen of Agilent ChemStation is the place where the hardware is configured and where method and sequence parameters are entered.

Pull the **Instrument** menu to access the DLA configuration by clicking **More Injector - Configuration**.

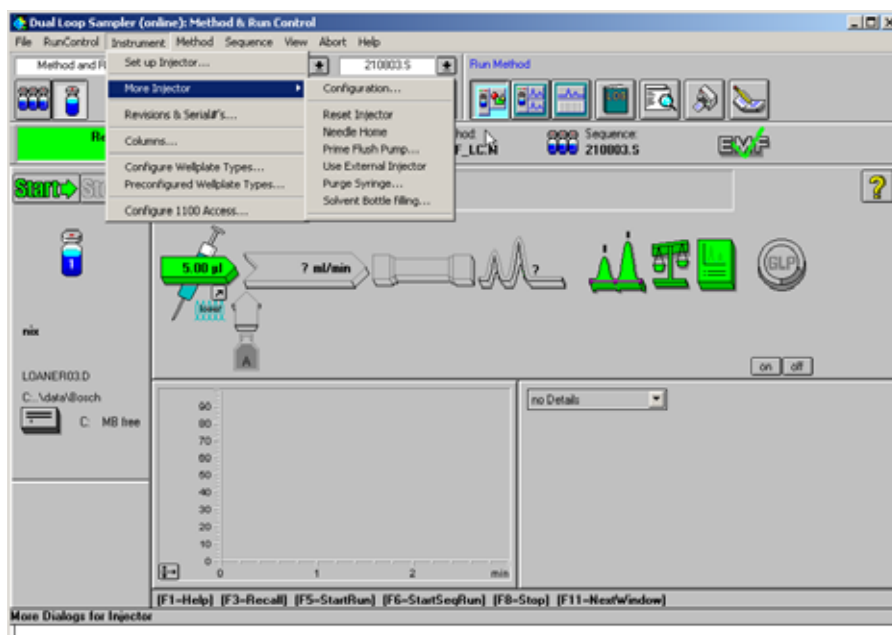


Figure 19 Accessing the DLA configuration in ChemStation

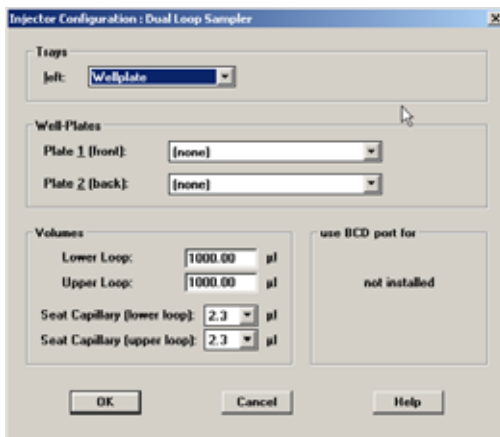


Figure 20 DLA Configuration Screen in ChemStation

Trays

Shows the installed tray type. The sampler is recognizing the installed tray automatically. Mind the [“General Comments about Sample Trays”](#) on page 70

Well-Plates

Select the plates you intend to use from the list. Front and back plate can be different types. For a list of supported plates and vials see [“List of Recommended Vials, Caps and Septa”](#) on page 124. Non-listed plates can be defined using the “Configure Wellplate Types” function. For details see [“Operating the Dual Loop Sampler with Agilent ChemStation”](#) on page 71

Volumes

Upper Loop: Volume of the upper sample loop in µl, default is 5000µl.

Lower Loop: Volume of the upper sample loop in µl, default is 50µl

Seat Capillary (upper loop): • c 24µl for the original PTFE tubing

Seat Capillary (lower loop): • c20µl for the original PTFE tubing.

NOTE

For analytical applications with limited sample volume the seat tubings can be replaced by stainless steel seat capillaries with 0,25mm ID

CAUTION

Smaller ID seat capillaries will increase the pressure in the buffer loop during ejection. Decrease the eject speed to 2000 μ l/min or lower when using non-standard seat capillaries. Overpressure in the buffer loop will destroy the wash valve.

Additional Configuration and Control Functions

Reset Injector

Use this command to recover the sampler from error conditions and to move all subassemblies into a defined state.

When executing this command the needle arm moves into the seat of the active loop (as defined in the currently loaded method), the 10-port valve switches the active loop to mainpass and the plunger of the metering device goes to it's front position.

Needle Home

Switches the 10-port valve to bypass, moves the Needle arm out of the needle seat and places it into an elevated position behind the wash port. This command is useful if unrestricted access to the sample tray is needed.

Prime Flush Pump

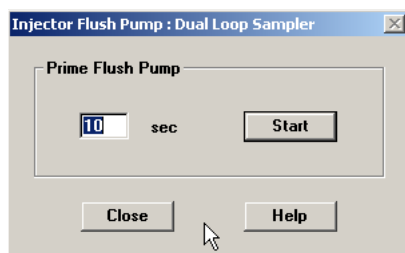


Figure 21 Prime Flush Pump

Put the end of peristaltic pump intake tubing into a bottle with needle wash solvent and place it into the solvent cabinet. In case the same solvent is used to wash the outside of the needle and buffer loop and inside of the needle, one bottle can be used for both.

Prime the peristaltic pump for a given time (1 - 1000 seconds) to remove air and previously used solvent. Since the needle wash solvent is drained through the wash port, ensure proper routing of the corrugated waste tubing.

Use External Injector

This function allows to start the run from an external device which is connected to APG start/stop connector of any 1200 module. When *Use External Injector* is activated the autosampler icon turns grey in Agilent ChemStation GUI and the sampler is ignored.

Purge Syringe

This command allows to purge the metering device interactively. Doing so is e.g. required when changing the flush solvent or to remove air bubbles. For an in-depth discussion of this function read [“Purging the Syringe”](#) on page 59.

Solvent Bottle Filling

Tracks the filling of the flush solvent bottle and inhibits further analysis or generates an error condition when certain solvent limits are reached.

Setting Method Parameters in Agilent ChemStation

All method related autosampler parameters are consolidated in one expandable screen. It can be accessed from the **Method & Run Control** screen in two different ways.

- By left-clicking the autosampler icon in the graphical user interface
- By pulling down the **Instrument** menu and selecting **Set up Injector**.

Set up Injector : Dual Loop Sampler

Injection

Use Loop: **lower** (50.00 µl) ☒ Fill loop partially with **5.0** µl ☐ Overfill loop by factor **1.0**

☒ Standard Injection
☐ Injection with Needle Wash
☐ Use Injector Program (0 lines) **Edit...**

Plug Settings

☐ Draw Plug before and after the sample

Plug Volume: **0.00** µl

Draw Plug from
☒ air
☐ Location: **Vial 1**

Auxiliary

Draw Speed: **20000** µl/min
Eject Speed: **20000** µl/min
Draw Position: **0.0** mm

Time

Sleeptime: **no Limit** min
Posttime: **OFF** min

Needle Wash

in: **Flushport**
Time: **1.0** sec
Location: **Vial 1** repeat **1** times

Rinse

Rinse Volume: **1.0** times
(2 x plug + InjVol + seat cap.)
Rinse Draw Speed: **50000** µl/min
Rinse Eject Speed: **50000** µl/min

Equilibration Time: **2.0** sec

☐ Store Temperature
☐ Vial/Well bottom sensing

OK **Cancel** **Help**

Figure 22 ChemStation DLA Setup Screen

Injection Parameters

In this part of the screen the active loop and the loop filling mode are defined.

Use Loop Select the sample loop you want to use with the method. Mind that it is not possible to use both loops in the same method.

Fill loop partially with Use this injection mode if the intended injection volume is smaller than the volume of the selected sample loop.

Partial loop filling is a useful mode if only limited quantities of sample are available and diminished peak area accuracy and reproducibility are not critical. For an in-depth discussion see “[Loop Filling Modes](#)” on page 26

Overfill loop This is the preferred mode of operation if you are aiming for highest peak area accuracy and reproducibility. The disadvantage is that sample is wasted for overfilling the sample loop. Typical overfill factors for best results are 3 - 5. See also “[Loop Filling Modes](#)” on page 26

Standard Injection Checking this button makes the autosampler use the default injection sequence which is a good choice for most applications.

Injection with Needle Wash When this radio button is clicked the **Needle Wash** parameters on the right hand side of the input screen become accessible.

Injector Program Check this box if you want to use an individual series of injection steps, called Injector Program.

Click **Edit** to open the injector program editor. Injector programs are a powerful way to combine most sampler functions and execute them sequentially as part of the ChemStation method.

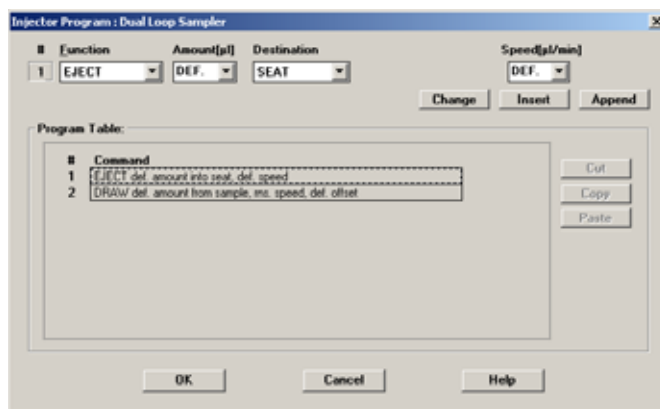


Figure 23 The Injector Program Editor

4 Using the Dual Loop Autosampler

Operating the Dual Loop Sampler with Agilent ChemStation

An injector program consists of one instruction per line. Select the desired function from the **Function** drop-down menu and add it by clicking **Insert** or **Append**. To change a program line highlight it and hit **Change**. **Cut**, **Copy** and **Paste** are useful for reuse injector program lines. To check and transfer the injector program to the autosampler press **OK**.

CAUTION

The ChemStation code validation check performs a basic syntax check. Conceptual weaknesses or wrong parameter values won't be detected and remain the responsibility of the user.

The maximum number of injector program lines is limited by the amount of free memory on the Dual Loop Sampler mainboard. If needed additional memory can be allocated to extend the available space for the injector program from approximately 60 lines to 120 lines. However, in that case the injector program cannot be processed by the control module. For details consult the ChemStation help function.

Plug Setting

This parameter allows to enclose the sample into either plugs of air or of any desired liquid

Plug Volume Defines the volume of each plug. Typical plug volumes are 5 - 10% of the sample volume.

Draw Plug from This parameter offer the choice of either air plugs or plugs of any solvent from a given vessel position.

Needle Wash

Needle wash minimizes carryover by dipping the needle into either the flush port or any sample location. The flush port is fed by a peristaltic pump. Needle flush solvent can either be taken from the flush solvent bottle or a different vessel.

Rinse

Complementing the *Wash* command, *Rinse* allows to flush buffer loop and the inside of the needle.

Rinse Volume Defines the relative rinse volume for buffer loop and needle according to the following formula:

$$V(flush) = 2V(plug) + V(sample) + V(seatcap) + V(valve)$$

with

$V(flush)$ =	Flush volume
$V(plug)$ =	Volume of buffer or air plug
$V(sample)$ =	Volume of injected sample
$V(seatcap)$ =	Volume of installed seat tubing
$V(valve)$ =	Volume of valve stator ports and rotor groove (4,9 µl)

Rinse Draw Speed, Rinse Eject Speed Speed at which the sampler draws and ejects flush solvent. As small volume deviations are not critical, higher speeds as when drawing sample can be used. Limits are 350 µl/min to 50,000 µl/min. Default is 50.000µl/min.

More Method Parameters

By clicking **More** the windows expands and auxiliary parameters become visible.

Draw Speed Defines at what flow rate liquid is sucked into the buffer loop. Valid entries are 350 µl/min - 50,000 µl/min.

Eject Speed Defines at what flow rate the content of the buffer loop is ejected in to the sample loop, any vessel or to waste. Valid entries are 350 µl/min - 50,000 µl/min.

4 Using the Dual Loop Autosampler

Operating the Dual Loop Sampler with Agilent ChemStation

Draw Position Allows to change the needle position in sample vessels in the range of -10 mm (10 mm lower) to +50 mm (50 mm higher).
The use of this parameter requires careful consideration as improper use may damage needle and sample vessel.

Equilibration Time Defines for how many seconds the sampler waits for pressure equilibration in sample vial and buffer loop until it proceeds with the next injection step. This parameter allows to optimize reproducibility for viscous samples, higher draw speeds and large injection volumes.

Store Temperature Stores the temperature of the sample compartment as part of the data file (requires optional Agilent 1200 Series Sample Thermostat).

Vial/Well Bottom Sensing If this box is ticked the sampler auto detects the bottom of the sample vessel.

A few conditions are not suitable for this function:

- The needle moves off-center into the well with spherical or conical bottom.
- The vial plate/well plate has not been defined properly.

The latter point is of special importance because the sampler moves the needle at high speed into the vessel and slows down only a few millimeters above the bottom. At low speed the needle moves further down until the sampler notices an increase in motor current.

CAUTION

Using Bottom Sensing with inaccurate well definitions may cause the sampler to slam the needle into the bottom of the sample vessel causing damage to the needle assembly!

Achieving the best recovery results with the Agilent 1200 Series Dual-Loop Autosampler PS

CAUTION

Important Information!

Please read before using the instrument!

Introduction

The injection principle of the dual-loop autosampler PS is different to that of other Agilent 1200 Series autosamplers. It is a fixed-loop push-through design as shown in [Figure 24](#). Since the sample has to be drawn into a buffer loop and then transferred into the injection loop several items have to be considered to achieve best recovery results.

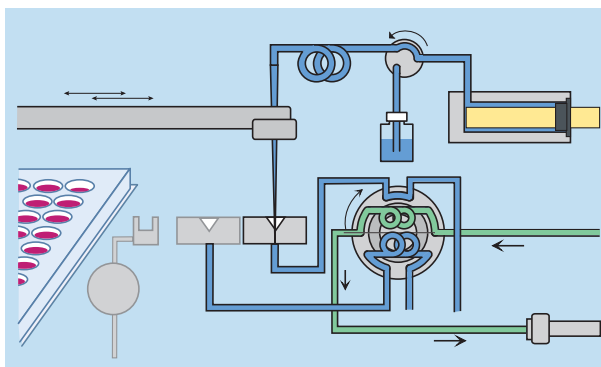


Figure 24 Injection principle dual-loop autosampler

Rinse solvent

- The rinse solvent is used to rinse the injection port, the seat capillary and the injection valve after sample injection.

4 Using the Dual Loop Autosampler

Achieving the best recovery results with the Agilent 1200 Series Dual-Loop Autosampler PS

- To avoid precipitation problems, use a solvent in which the sample is readily soluble. For reversed-phase chromatography this could be acetonitrile, methanol or DMSO/acetonitrile 50:50 v/v, for example (pure DMSO is not recommended due to its high viscosity, see "Sample draw and eject speed").
- We strongly recommend to use the Rinse function subsequently to each injection. The rinse volume, which is calculated from the injection volume and a user-defined factor, should be at least 300 µL.
- The syringe should be purged at least 5 times using the *Purge Syringe* command from the **Instrument/More Injector** menu prior to the first run of a sequence.

Flush solvent

The flush solvent is used to flush the needle's exterior prior to the injection of the sample. Therefore a solvent should be used, in which the sample is readily soluble. For a list of solvents compatible with the tubing of the peristaltic pump see [Table 6](#) below.

Table 6 Solvents compatible with tubings

Solvent	PharMed	Silicone [†]	
Acetic acid > 5%	A	B	A Fully compatible
Acetone	D	D	
Acetonitrile	A	-	
Hexane, Heptane	C	-	B Minor reaction, e.g. slight corrosion or discoloration
NH4 acetate	C	-	
Ethanol	C	B	C Not recommended for continuous use. Swelling/shrinkage, loss of strength.
Formic acid	A	C	
MeOH	D	A	D Severe reaction, not recommended for use
Propanol	C	A	
Trichloroacetic acid	D	D	
Water	A	A	

* Pre-installed

† Can be ordered (5042-8507)

Sample draw and eject speed

Due to the push-through design of the dual-loop autosampler the sample draw and eject speed influence the recovery. Increasing the draw speed has only a minor effect, however the influence of the eject speed has a much higher impact, as shown in [Figure 25](#).

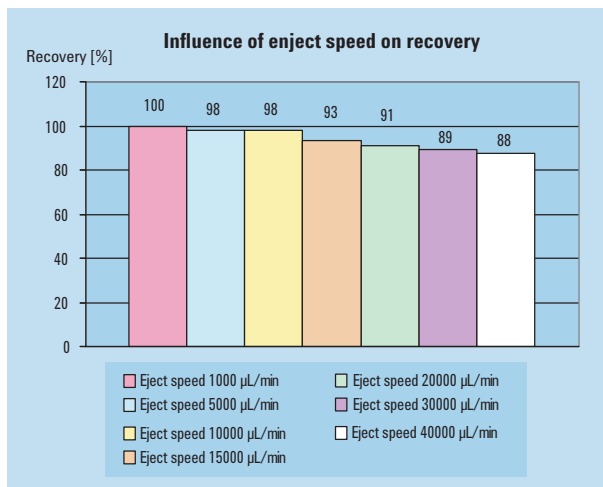


Figure 25 Influence of eject speed on recovery (draw speed 20000 µL/min)

- For best recovery results the sample draw speed should not exceed 20000 µL/min.
- Lower eject speeds yield better recoveries. The default eject speed is 10000 µL/min, however, for best recovery results this value should be lowered further.
- Highly viscous rinse solvents like DMSO, for example, yield lower recoveries even with low eject speeds. Therefore, we recommend using a mixture of DMSO/acetonitrile 50:50 v/v instead.

Sample loop overfill factor for complete loop filling

Depending on the size of the used sample loop, the loop overfill factor should range between at least 3-5 times the volume of the used loop in order to achieve best possible reproducibility of the results with minimum deviations.

4 Using the Dual Loop Autosampler

Achieving the best recovery results with the Agilent 1200 Series Dual-Loop Autosampler PS

Sample loop fill factor for partial loop fill

Figure 26 shows the result of several injections with various injection volumes using the same sample loop (1000 μL). The peak area increases linearly until the loop is filled approximately up to 50 % (fill factor 0.5), which is represented by the red line. This means that in order to maximize the sample recovery the maximum injection volume should not exceed 50 % of the sample loop volume.

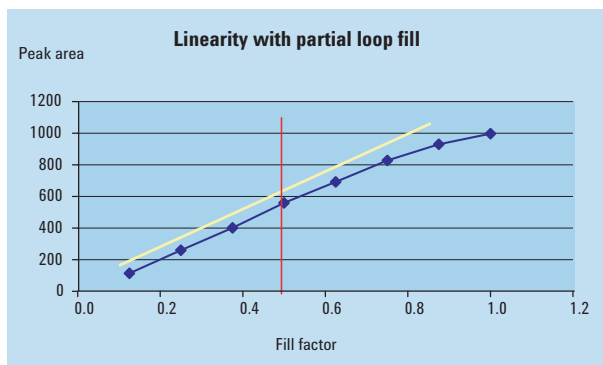
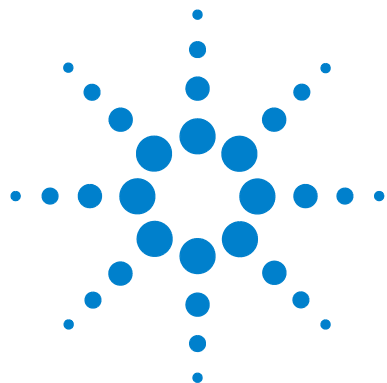


Figure 26 Linearity of peak area for partial loop fill



5 Troubleshooting Overview

Overview 82
Status Indicators 84

This chapter gives an Overview to Troubleshooting the Dual Loop Autosampler.



Overview

Status Indicators

The Dual Loop Autosampler is provided with two status indicators which indicate the operational state (prerun, not ready, run, and error states) of the instrument. The status indicators provide a quick visual check of the operation of the Dual Loop Autosampler (see [“Status Indicators”](#) on page 84).

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”](#) in the Service Manual).

Maintenance Functions

The maintenance functions position the transport unit and needle carrier assembly in certain positions for maintenance, homing or parking (see [“Maintenance Functions”](#) in the Service Manual).

Transport Unit Self Alignment

The transport unit alignment with the transport unit and the well-plate tray is required to compensate for larger deviations in positioning the needle carrier assembly.

The transport unit self alignment is required after disassembling the system or when transport unit, needle carrier assembly or MTP main board are replaced. This function is in the diagnose screen of the Agilent ChemStation or the Control Module.

WARNING

The sample transport self alignment requires one of the 2-well-plate trays (Part Number: G2258-44502 or G2258-60001), but well plates MUST NOT be installed!

Status Indicators

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

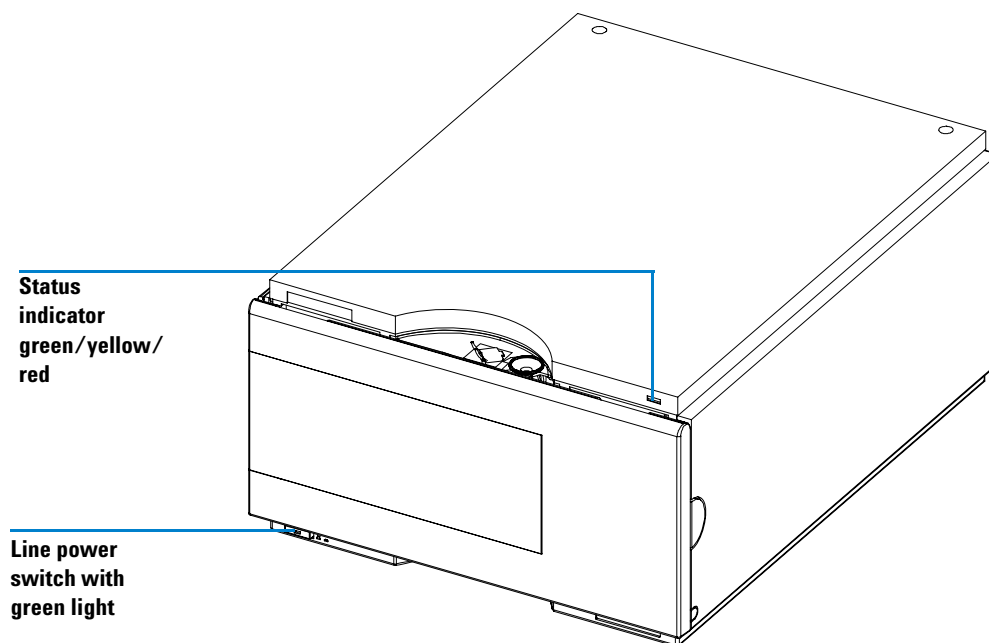


Figure 27 Location of Status Indicators

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* status 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 door not closed), 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.

5 Troubleshooting Overview

Status Indicators



6

Introduction to Repairing the Dual Loop Autosampler

Cleaning the Dual Loop Autosampler [93](#)

Using the ESD Strap [93](#)

This chapter gives an Introduction to Repairing the Dual Loop Autosampler.



Introduction to Repairing the Dual Loop Autosampler

Simple Repairs

The Dual Loop Autosampler is designed for easy repair. All maintenance tasks and most easy repairs such as changing rotor seal, needle assembly, needle seat assembly or tubings can be done from the front of the instrument without removing the module from the system stack. These procedures are described in [“Maintenance Procedures and Simple Repairs”](#) on page 96.

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.

WARNING

Regularly inspect all plastic tubings of the sampler and exchange them if they are worn out or show visible signs of damage.

Exchanging Internal Parts

Some repairs require the replacement of defective internal parts. In these cases it is necessary to remove the autosampler from the stack, take the covers off and disassemble the module. These repairs are described in [“Exchanging Internal Parts”](#) in the Service Manual.

WARNING

To prevent personal injury, the power cable must be removed from the instrument before opening the top cover. Do not connect the power cable to the sampler while the cover is OFF.

Cleaning the Dual Loop 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 from which liquid could drip into the instrument or organic solvents as they may damage the plastic cover.

WARNING

Dripping water into the instrument may cause a shock hazard or damage to the instrument.

Using the ESD Strap

CAUTION

Electronic boards are sensitive to electrostatic discharge (ESD). In order to prevent damage, always use the ESD strap supplied in the accessory kit.

- 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.

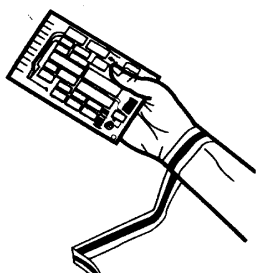
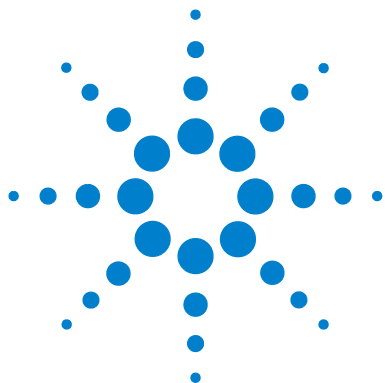


Figure 28 Using the ESD Strap

6 Introduction to Repairing the Dual Loop Autosampler

Introduction to Repairing the Dual Loop Autosampler



7 Maintaining the Dual Loop Autosampler

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Replacing Seal or Piston of the Metering Unit	115
Exchanging or Installing the (Optional Interface) BCD Board	120

This chapter describes the Maintenance and Simple Repairs of the Dual Loop Autosampler.



Maintenance Procedures and Simple Repairs

The procedures described in this section can be done without removing the Dual Loop Autosampler from the stack.

Table 7 Maintenance Procedures

Procedure	Typical Frequency	Notes
Replacing the rotor seal of the 10-port valve	When worn out, if valve is leaky, typically once per year.	See “Replacing the Rotor Seal of the 10-Port Valve” on page 97
Replacing the needle assembly	When worn out, blocked or damaged. Typically once per year.	See “Replacing the Needle Assembly” on page 100
Exchanging the buffer loop tubing	When the buffer loop tubing is damaged or too short. Typically replaced with every 3rd needle assembly.	See “Replacing the Buffer Loop” on page 104
Replacing the front seat/back seat assembly or seat tubings	When worn out, leaky, or showing visual signs of damage, typically once per year	See “Replacing Front Seat/Back Seat Assembly or Seat Tubings” on page 108
Replacing peristaltic pump	When defective (internal / external leak, valve not switching any more)	See “Replacing the Peristaltic Pump” on page 110
Replacing the needle carrier assembly	When defective	See “Exchanging the Needle Carrier Assembly” on page 112
Exchanging the seal or piston of the metering unit	When leaky, worn or defective	See “Replacing Seal or Piston of the Metering Unit” on page 115
Exchanging or installing the (optional) BCD board	When defective or new board installed	See “Exchanging or Installing the (Optional Interface) BCD Board” on page 120

Replacing the Rotor Seal of the 10-Port Valve

Frequency	When worn out, if valve is leaky, typically once per year.
Tools required	1/4 inch wrench 3/32 inch hexagonal key tweezers
Parts Required	rotor seal fro 10-port valve, PN 0100-2415

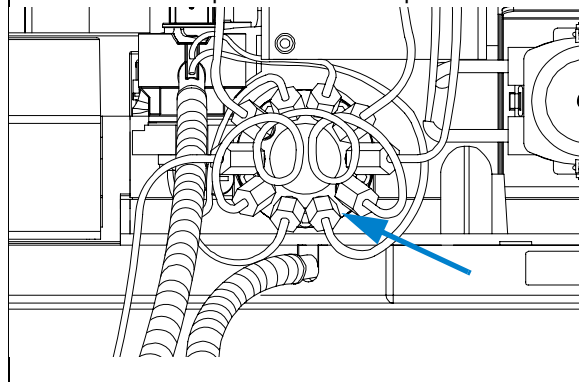
WARNING

To avoid personal injury, keep fingers away from the needle area during Dual Loop Autosampler operation.

Before beginning this procedure:

- Disconnect the analytical column and remove toxic or corrosive solvents from the sampler by flushing with appropriate solvents (e.g. water or IPA).
- Position the transport unit of the Dual Loop Autosampler in the “Home Position” (see “[Maintenance Functions](#)” in the Service Manual).
- Remove the trays from the tray base.
- Turn the instrument OFF.

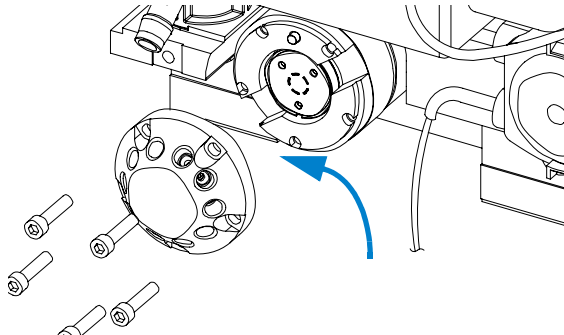
1 Disconnect all capillaries from the 10-port valve.



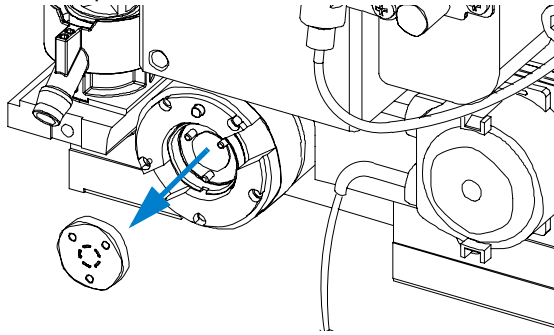
7 Maintaining the Dual Loop Autosampler

Maintenance Procedures and Simple Repairs

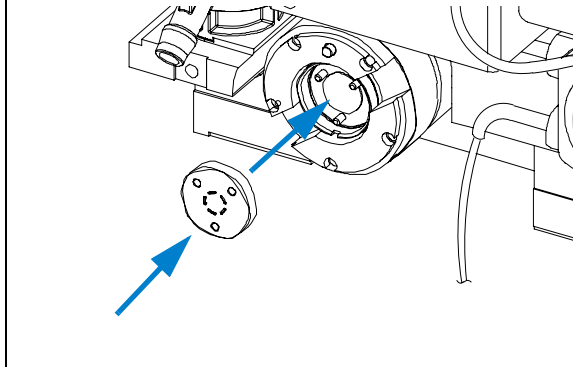
2 Using the 3/32 inch hexagonal key remove 5 hex screws and take the stator head of the valve off.



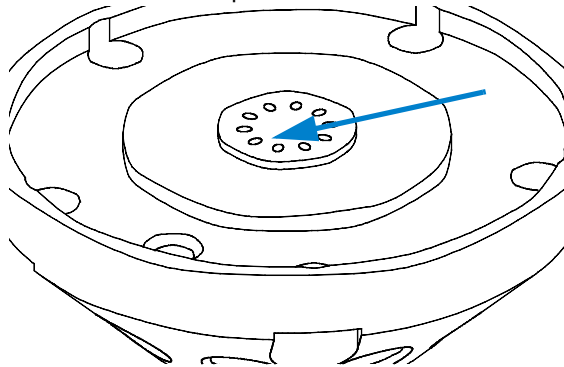
3 Pull the old rotor seal out. It may be necessary to grab it with a pair of tweezers



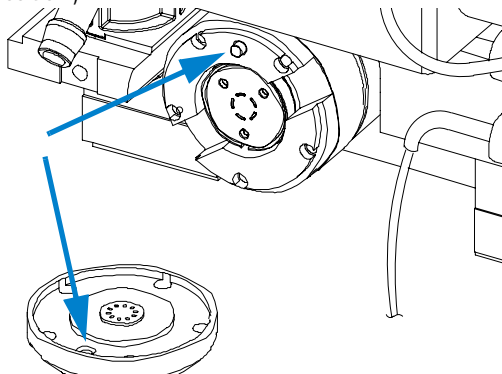
4 Push the new seal onto the three alignment pins of the valve rotor. The pins are not equidistant and will only allow to fit the seal in the correct orientation.



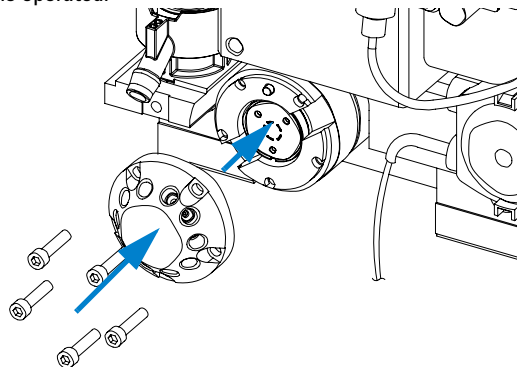
5 Inspect the sealing surface of the stator head. Replace the stator head if scratches are visible which cannot be removed with a soft piece of cloth.



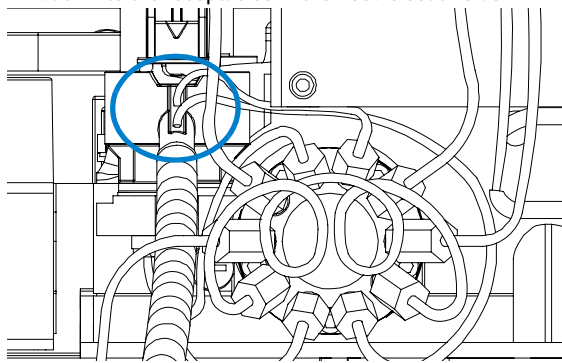
6 Remount the stator head. The alignment pin of the valve ensures that the stator can only be mounted in the correct position.)



7 Reinstall the 5 hex screws. Tighten them over cross and as equally as possible. This ensures that the stator face is parallel to the rotor seal and does not leak when the valve is operated.



8 Reconnect the tubings, loops and capillaries to the valve. Start with the shortest fittings and connect the tubings from pump and to column last. Push the waste tubings back into the receptacles in the needle seat holder.



On completion of this procedure:

- Re-install the tray(s) in the tray base.
- Turn the instrument ON.
- Close the front cover.
- Perform a pressure test

WARNING

Abrasive cleaning of the 10-port stator head will destroy the coating of the sealing surface and make the part unusable!

Replacing the Needle Assembly

Frequency	When worn out, blocked or damaged. Typically once per year.
Tools required	Sharp knife or cutter blade
Parts Required	Needle assembly 2mm ferrule kit

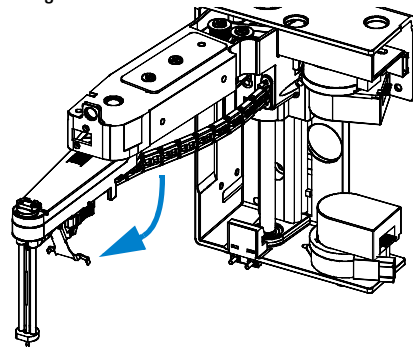
WARNING

Thoroughly follow the described installation procedures to maximize the lifetime of the Dual Loop Autosampler capillary and to avoid potential spills or fraction losses. Regularly inspect the capillary and exchange it if it is worn out or shows visible signs of damage.

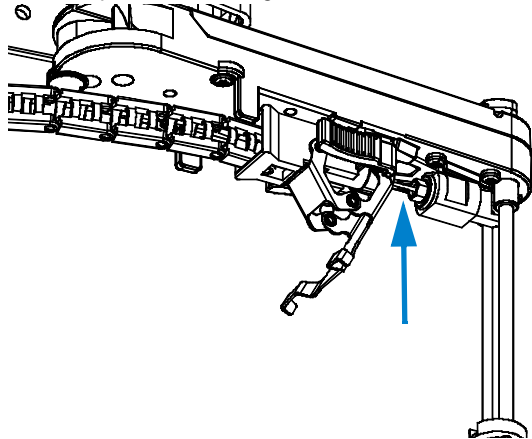
Before beginning this procedure:

- Position the transport unit of the Dual Loop Autosampler in the “Home Position” (see [“Maintenance Functions”](#) in the Service Manual).
- Remove the sample tray from the tray base.
- Position the needle arm of the sampler into the “Change Needle/Seat” position (see [“Maintenance Functions”](#) in the Service Manual).
- Turn the instrument OFF.
- Open the front door and pop the left side cover out to get good access to the needle arm.

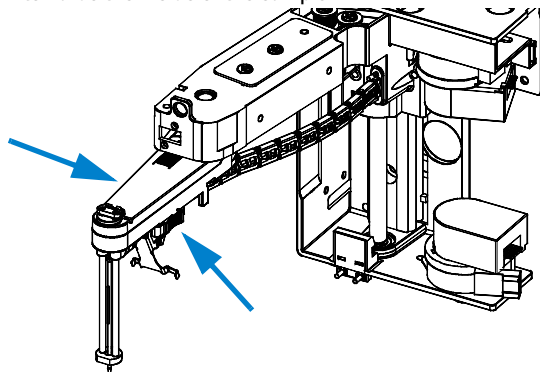
- 1 Pull the lever latch of the needle assembly down to expose the needle fitting.



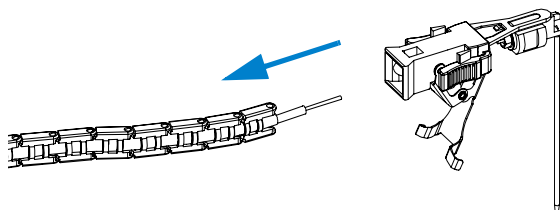
- 2** Using a knife or cutter, cut the transparent plastic tubing directly behind the fitting screw.



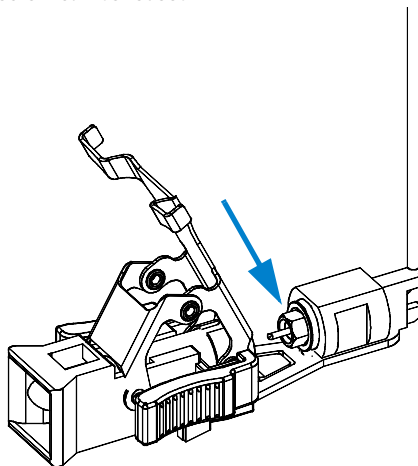
- 3** Remove the needle assembly by pressing the blue plastic handles of the needle assembly together while sliding it towards the inside of the sampler.



- 4** Pull the needle assembly out of the guidance chain.



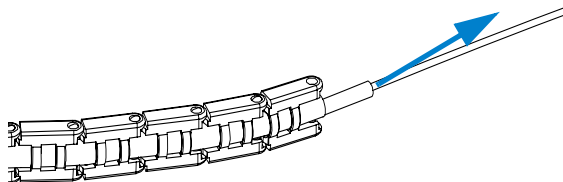
- 5** Using a 4mm wrench remove the fitting screw and pull the cut-off end of the plastic tubing out of the needle fitting. Discard the ferrule and the compression ring. The fitting screw can be reused.



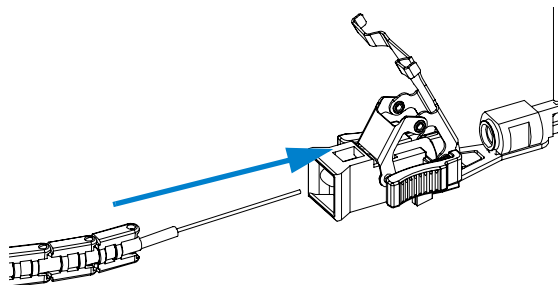
7 Maintaining the Dual Loop Autosampler

Maintenance Procedures and Simple Repairs

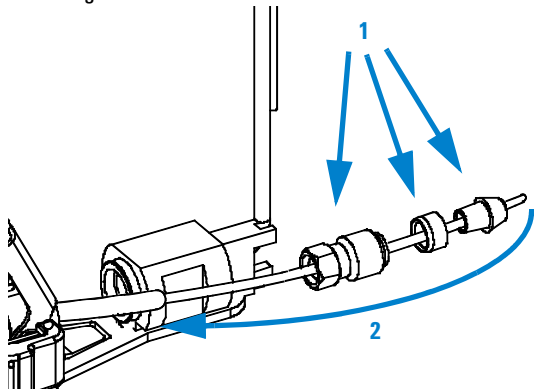
6 Pull approx. 5cm (2 ") of buffer loop out of the guide tubing. Push from the other end if necessary.



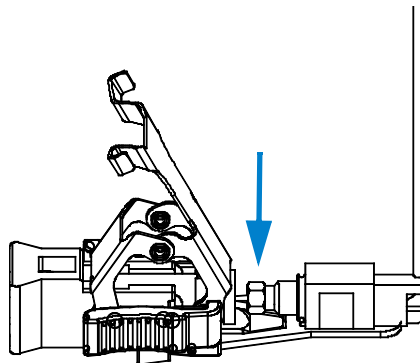
7 push the loop tubing through the new needle assembly.



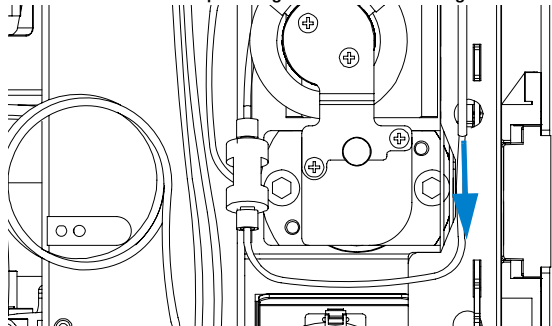
8 String ferrule screw, new ferrule ring and new ferrule together. Place the end of the buffer loop into the needle fitting...



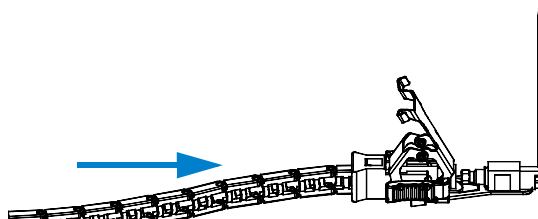
9 Tighten the ferrule screw carefully while pressing the buffer loop firmly into the fitting to avoid dead volume.



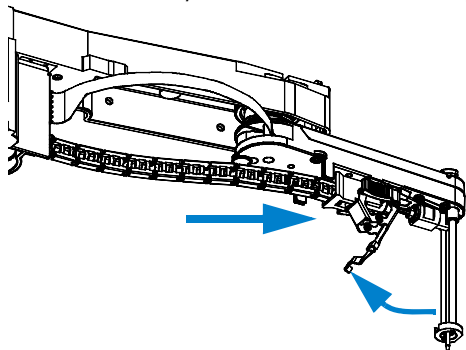
10 Pull excessive loop tubing out at the metering head side.



11 Push guide tubing and plastic chain into the needle assembly until they hit the hard stop.



12 Slide the needle assembly into the guide on the needle carrier assembly and lock the needle assembly lever.



On completion of this procedure:

- Turn the needle carrier assembly inwards
- Re-install the side cover
- Re-install the tray(s) in the tray base.
- Turn the instrument ON.
- Close the front door.

Replacing the Buffer Loop

Frequency	When contaminated, worn out or visibly damaged Typically once per year
Tools required	Wrench, open end, 4mm, PN 8710-1534 (supplied in accessory kit) Tweezers, (supplied in accessory kit) Cutter or sharp knife
Parts Required	Twin needle assembly, PN G2258-87306 2mm fitting kit, PN 5065-9950 Upper loop tubing assembly, PN G2258-87300 (only every 3rd time)

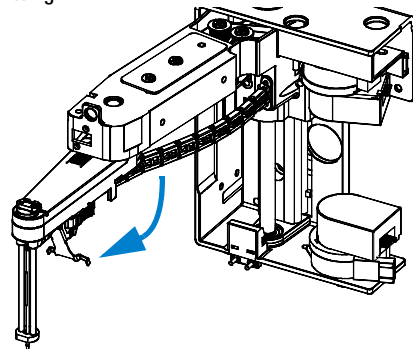
WARNING

Thoroughly follow the described installation procedures to maximize the lifetime of the buffer loop tubing and to avoid potential spills. Regularly inspect the tubings and exchange them if they are worn out or show visible signs of damage.

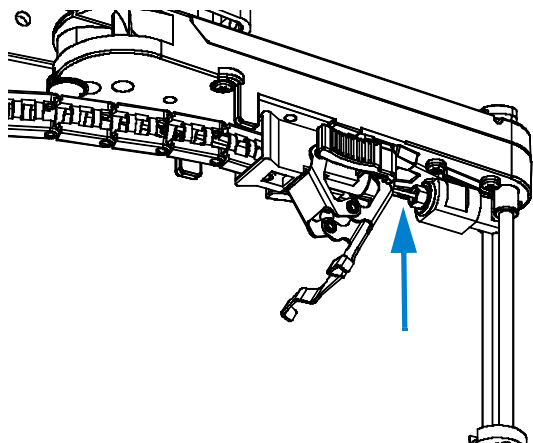
Before beginning this procedure:

- Position the transport unit of the Dual Loop Autosampler in the “Home Position” (see [“Maintenance Functions”](#) in the Service Manual).
- Remove the sample tray from the tray base.
- Position the needle arm of the sampler into the “Change Loop Capillary” position (see [“Maintenance Functions”](#) in the Service Manual).
- Turn the instrument OFF.
- Open the front door and pop the left side cover out to get good access to the needle arm.

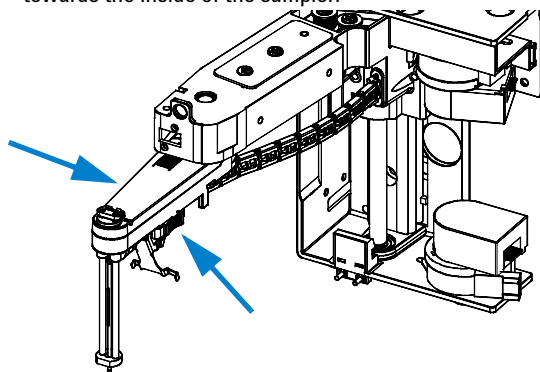
- 1** Pull the lever latch of the needle assembly down to expose the needle fitting.



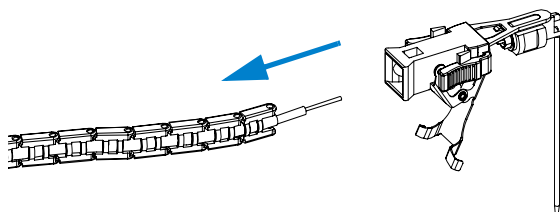
- 2** Using a knife or cutter, cut the transparent plastic tubing directly behind the fitting screw.



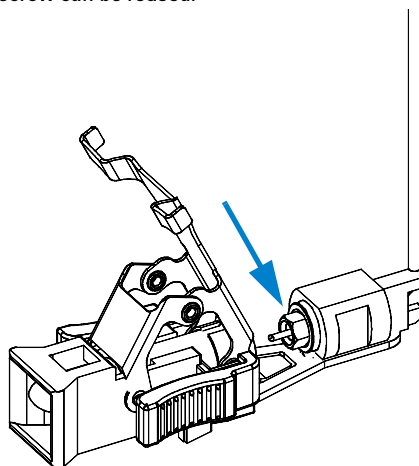
- 3** Remove the needle assembly by pressing the blue plastic handles of the needle assembly together while sliding it towards the inside of the sampler.



- 4** Pull the needle assembly out of the guidance chain.



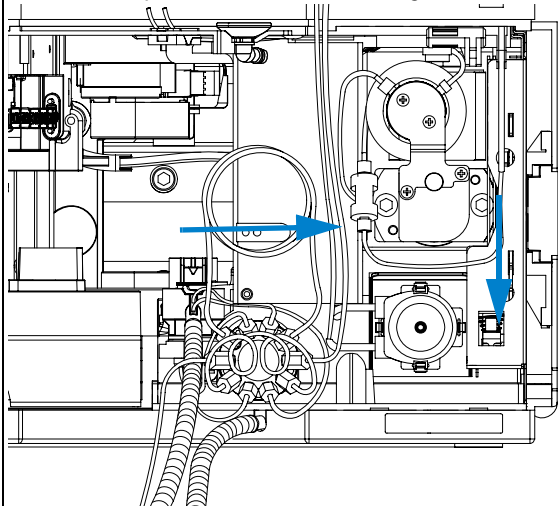
- 5** Using a 4mm wrench remove the fitting screw and pull the cut-off end of the plastic tubing out of the needle fitting. Discard the ferrule and the compression ring. The fitting screw can be reused.



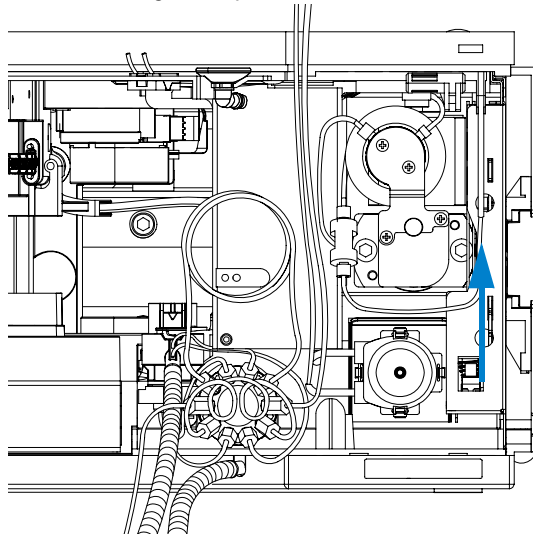
7 Maintaining the Dual Loop Autosampler

Maintenance Procedures and Simple Repairs

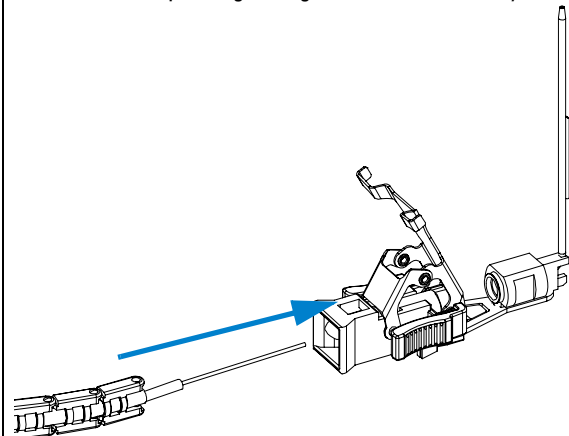
6 Disconnect the other end of the buffer loop from the PEEK union and pull it out of the sleeve tubing.



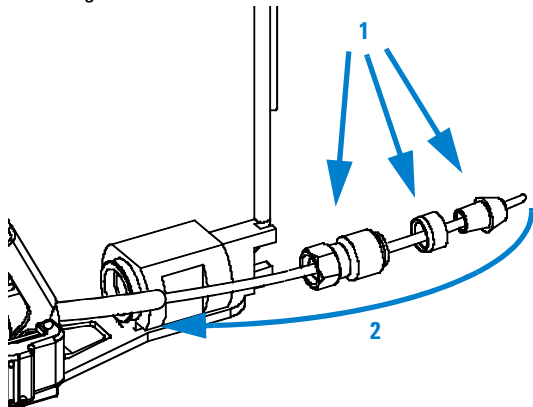
7 Push the open end of the new loop capillary into the sleeve tubing until it protrudes at the needle arm side.



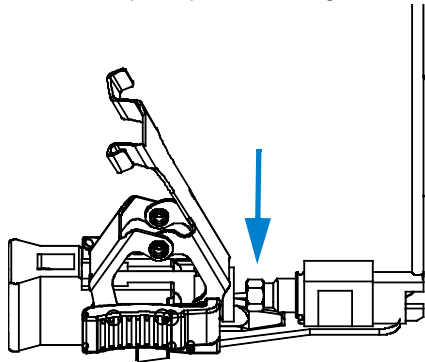
8 Push the loop tubing through the needle assembly.



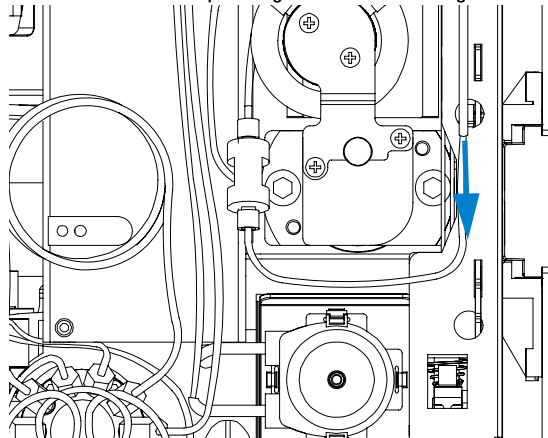
9 String ferrule screw, new ferrule ring and new ferrule together. Place the end of the buffer loop into the needle fitting...



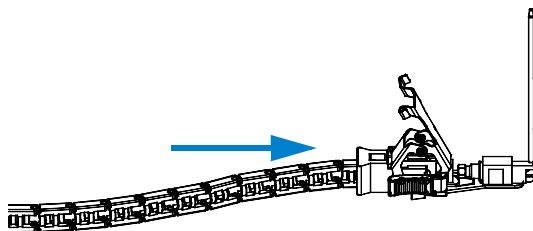
10 Tighten the ferrule screw carefully while pressing the buffer loop firmly into the fitting to avoid dead volume.



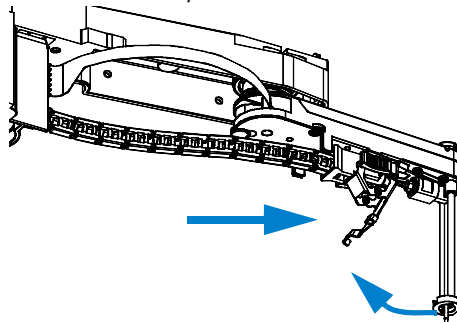
11 Pull excessive loop tubing out at the metering head side.



12 Push guide tubing and plastic chain into the needle assembly until they hit the hard stop.



13 Slide the needle assembly into the guide on the needle carrier assembly and lock the needle assembly lever.



On completion of this procedure:

- Turn the needle carrier assembly inwards
- Re-install the side cover
- Re-install the tray(s) in the tray base.
- Turn the instrument ON.
- Close the front door.

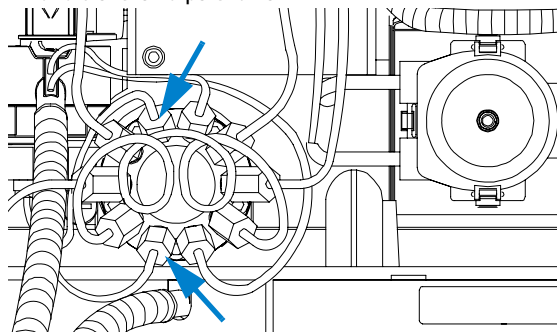
Replacing Front Seat/Back Seat Assembly or Seat Tubings

Frequency	When one of the needle seats is leaky or worn out. Typically once per year. Seat tubings need to be replaced only when damaged or severely contaminated.
Tools required	Wrench, open end, 1/4 – 5/16 inch, PN 8710-0510 (supplied in accessory kit) flat blade screw driver with 1/4" or 6mm blade
Parts required	Twin seat assembly, PN G2258-87102 Front seat tubing 0.5mm ID, PN G2258-87308 Back seat tubing 0.8mm ID, PN G2258-87309

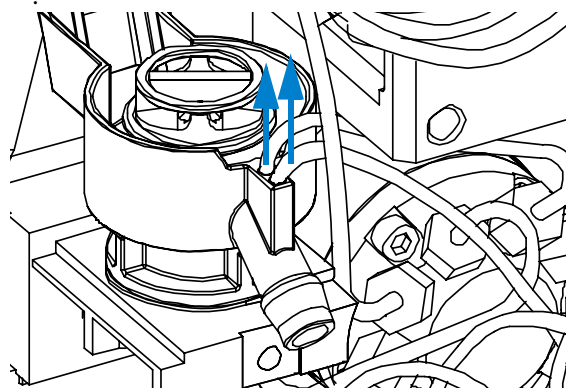
Before beginning this procedure:

- Position the transport unit of the Dual Loop Autosampler in the "Home Position" (see ["Maintenance Functions"](#) in the Service Manual).
- Remove the tray from the tray base.
- Position the transport unit of the Dual Loop Autosampler in the "Change Parts Position" (see ["Maintenance Functions"](#) in the Service Manual).
- Turn the instrument OFF.

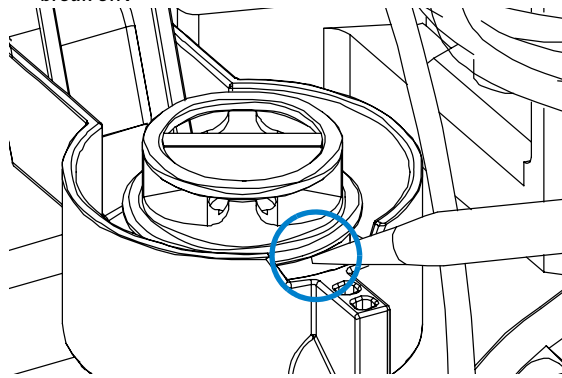
1 Using a 1/4 wrench unscrew the seat tubings from port 2 and 6 of the 10-port valve.



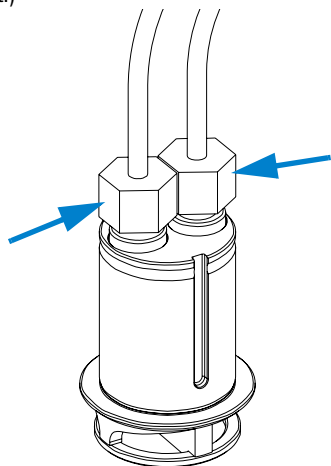
2 Pull the two waste tubings out of the twin seat adapter.



3 Use a flat blade screwdriver to lever the twin seat from the seat adapter. *Attach the screwdriver blade to the solid rim at the bottom of the seat and not to the top ring as it will break off!*



4 Remove the seat tubings from the old seat with a 1/4" wrench and attach them to the new seat assembly. (Mind the correct orientation, the wider ID tubings goes into the rear seat.)



On completion of this procedure:

- Push the seat into the seat adapter until it snaps in place. Mind the guide notch.
- Reconnect the seat tubings to ports 2 and 6 of the 10-port valve.
- Fix the two valve waste tubings into the holes of the twin seat adapter.
- Re-install the tray(s) in the tray base.
- Start the instrument.
- Close the front cover.

Replacing the Peristaltic Pump

Frequency	When defective (internal / external leak, solvent draining trough)
Tools required	none
Parts required	Peristaltic pump, includes tubing, PN 5065-4445

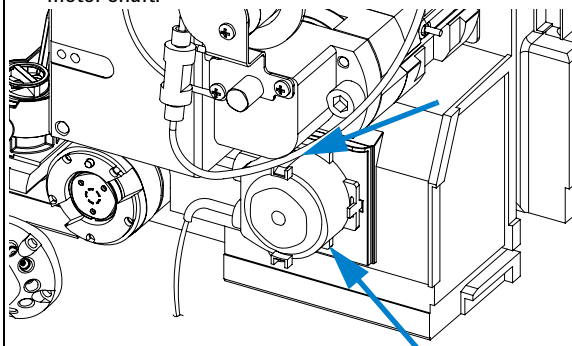
NOTE

The tubing of the peristaltic pump is pre assembled into the housing and not individually available. Replacement level is the complete pump body without motor.

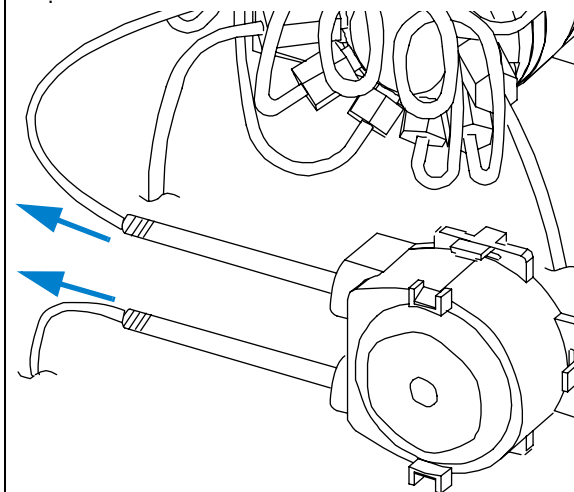
Before beginning this procedure:

- Purge the peristaltic pump with non-toxic liquid, e.g. water.
- Remove the flush OFF.
- open the front door

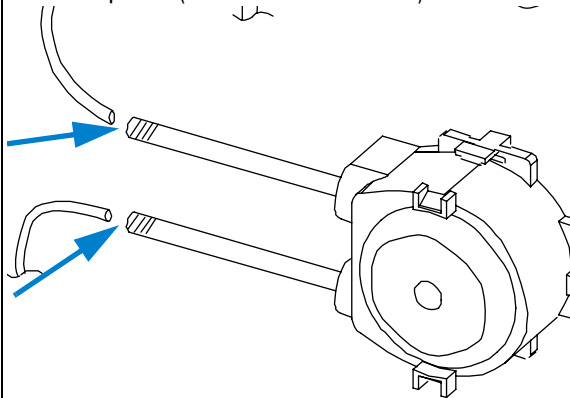
- 1 Press the clips on the upper and lower side of the peristaltic pump body together while pulling it off the motor shaft.



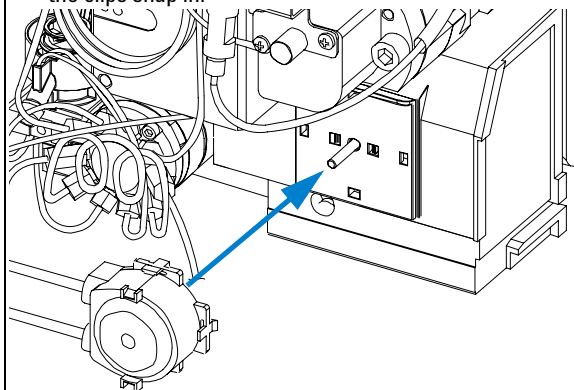
2 Pull the plastic tubings out of the pump tubing



3 Push the plastic tubings into the tubing of the new peristaltic pump.
upper port: out (to needle wash port)
Lower port: in (from wash solvent bottle)



4 Slide the new peristaltic pump onto the motor shaft until the clips snap in.



On completion of this procedure:

- Re-install the flush solvent bottle.
- Start the instrument.
- Close the front cover.

Exchanging the Needle Carrier Assembly

Frequency	When defective
Tools required	Hex key 2.0 mm, PN 8710-2438 (supplied in accessory kit)
Parts required	Needle carrier assembly, PN G1367-60010

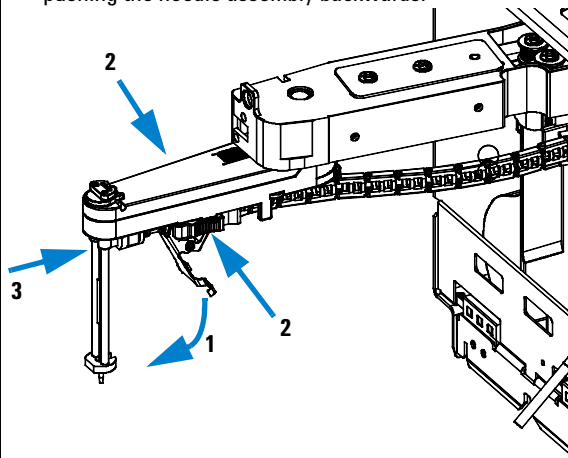
WARNING

Be careful when handling the needle assembly. The pointed tip of the needle may cause personal injury when touched.

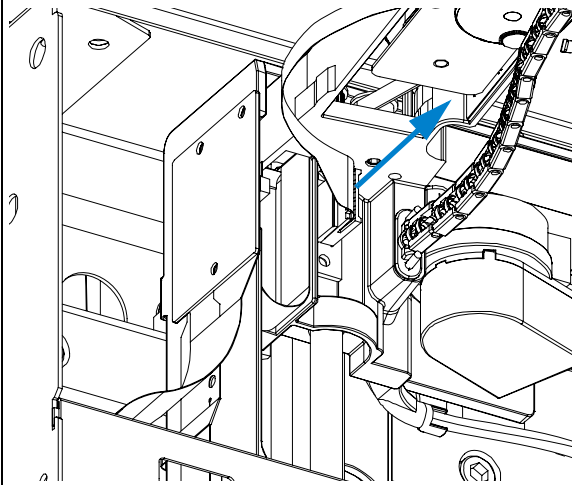
Before beginning this procedure:

- Position the transport unit of the Dual Loop Autosampler in the “Home Position” (see “[Maintenance Functions](#)” in the Service Manual).
- Remove all installed trays from the tray base.
- Position the transport unit of the Dual Loop Autosampler in the “Change Needle Carrier” position (see “[Maintenance Functions](#)” in the Service Manual) and turn the instrument off.

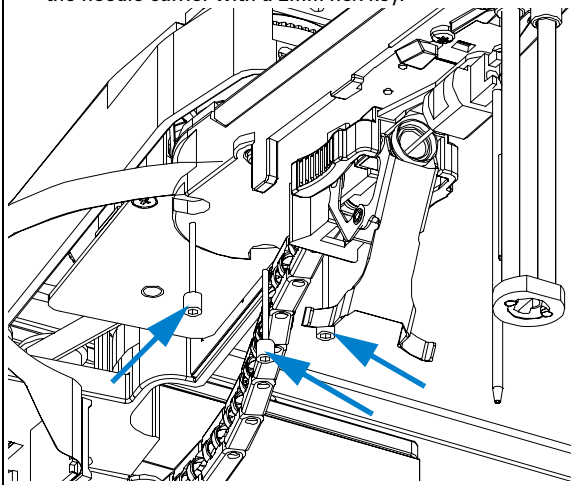
- 1** Pull the needle lever latch down. Remove the needle assembly by pressing plastic clamps together while pushing the needle assembly backwards.



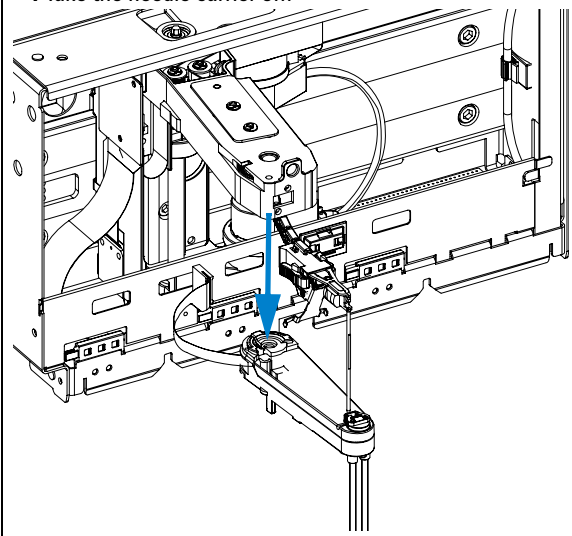
2 Unplug the flex board from the transport assembly.



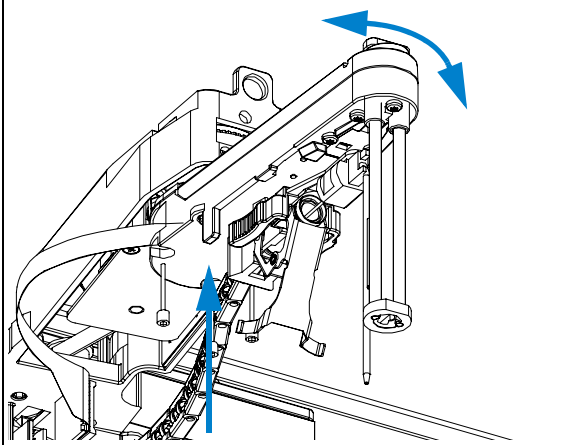
3 Remove the three hexagonal screws at the bottom side of the needle carrier with a 2mm hex key.



4 Take the needle carrier off.



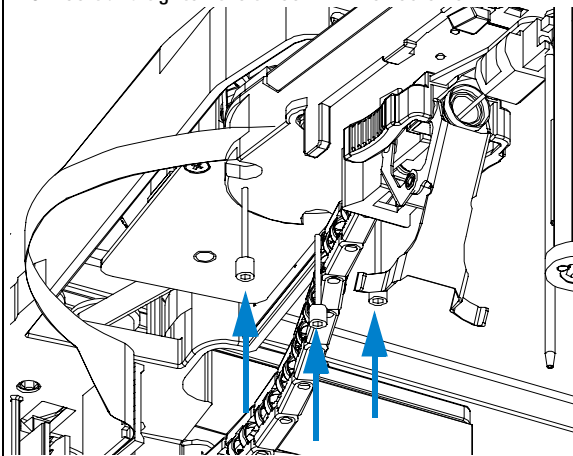
5 Hold the new needle carrier against the transport assembly arm and rotate it until it is aligned.



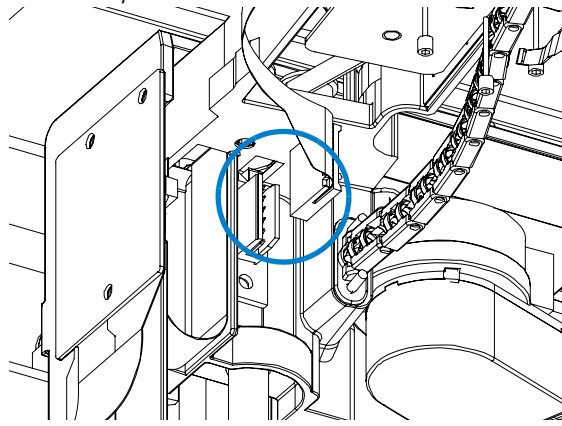
7 Maintaining the Dual Loop Autosampler

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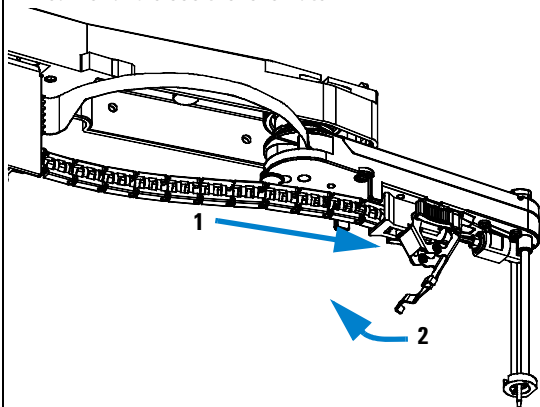
6 Insert and tighten the three 2mm hex screws.



7 Plug the flex board into the connector on the transport assembly arm.



8 Slide the needle assembly into the guide of the needle carrier and close the lever latch.



On completion of this procedure:

- Re-install the tray(s) in the tray base.
- Re-install the side cover.
- Start the instrument.
- Close the front cover.
- Perform a DLA Transport Alignment

Replacing Seal or Piston of the Metering Unit

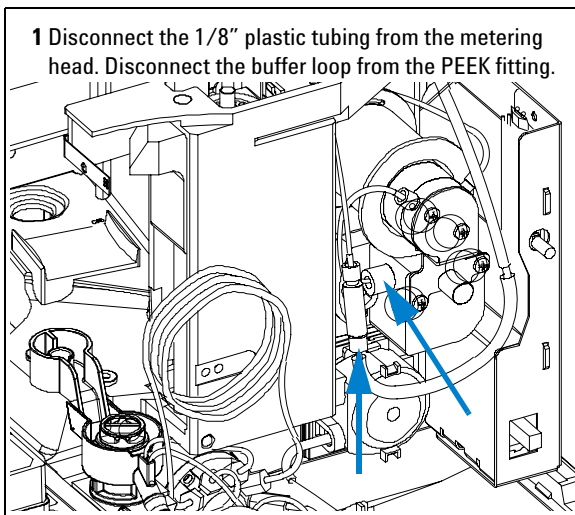
Frequency	When leaky or defective
Tools required	Pozidrive no. 1 screwdriver (supplied in accessory kit) 4mm hex key with T-handle, PN 8710-2392 (supplied in accessory kit)
Parts required	Metering piston seal, PN 0905-1599 Metering piston, PN G2258-60003

WARNING

When opening capillary or tube fittings solvents may leak out. Flush the metering unit with appropriate non-toxic solvents, e.g. water before carrying out this procedure.

Before beginning this procedure:

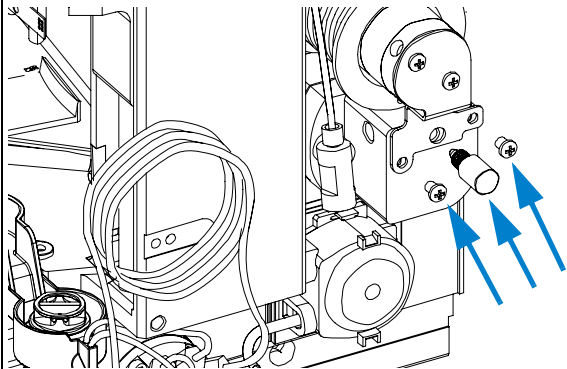
- Move the piston into the “Change Metering Device” position (see “[Maintenance Functions](#)” in the Service Manual).



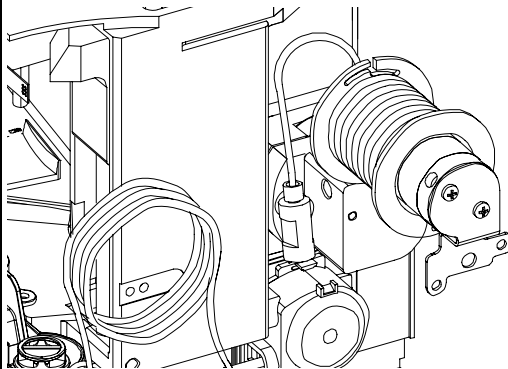
7 Maintaining the Dual Loop Autosampler

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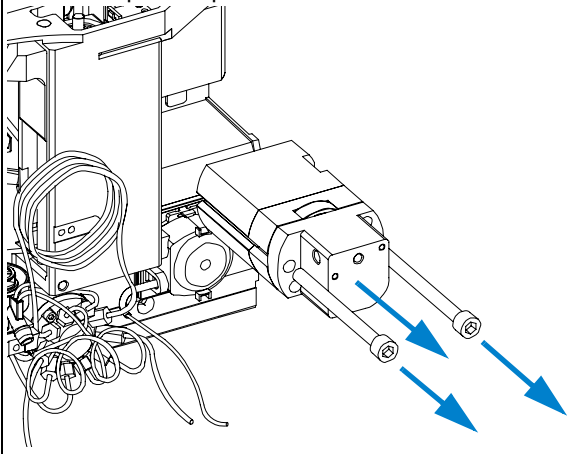
- 2** Remove the purge plug and the two 3mm screws that hold the valve bracket.



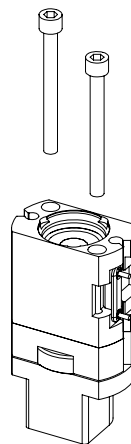
- 3** Carefully pull the flush valve and the buffer loop extension out. *Beware of the solenoid cable.*



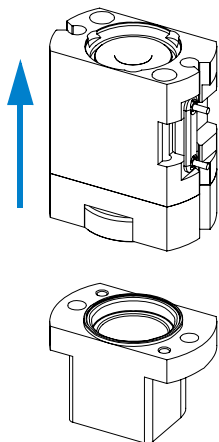
- 4** Using a 4mm hex key unscrew the two metering head screws. Pull the metering head assembly off the metering unit and place it upside down on a clean surface.



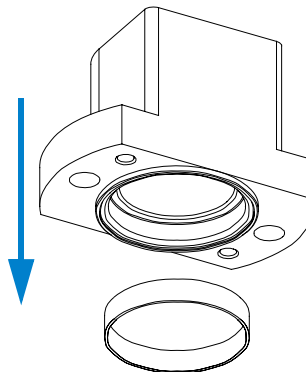
- 5** Unscrew the two screws on the rear side of the metering head assembly with a 3mm hex key.



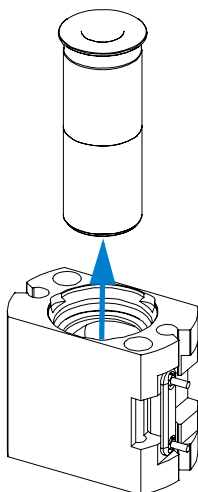
6 Separate the piston from the piston seal by holding down the metering head while pulling guide ring and spring housing upwards.



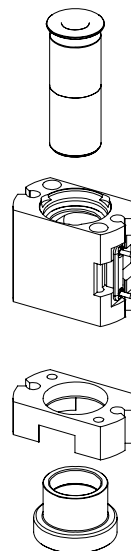
7 Remove the metering seal from the metering head. Place the new seal, spring upwards, onto a clean bench. Hold the metering head parallel to the bench surface and press it with gentle force onto the seal.



8 Push the piston out of the guide ring and the spring housing. Clean it with toothpaste if dirty. Replace it if it is scratched or damaged.)



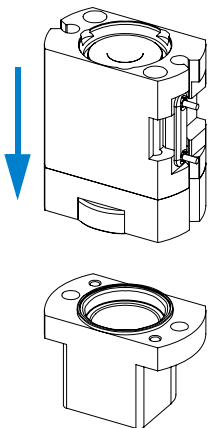
9 Stack guide ring, adapter and spring housing. Slide the piston into the stack.



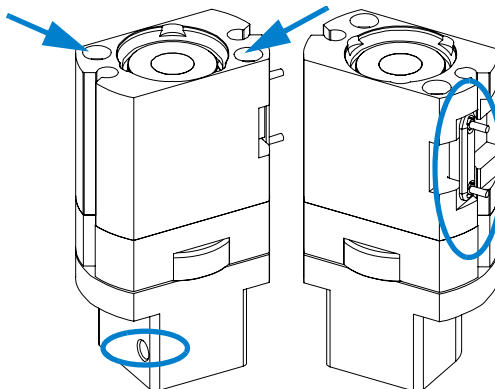
7 Maintaining the Dual Loop Autosampler

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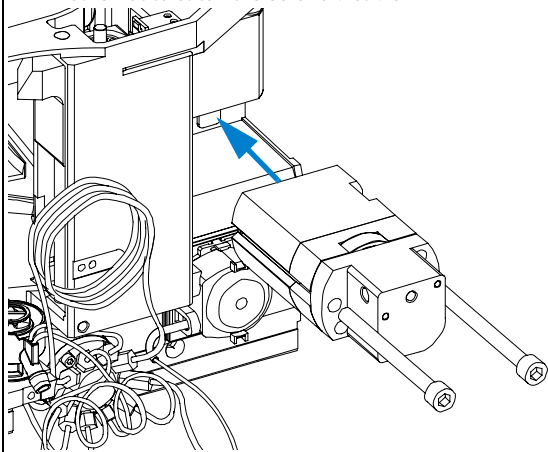
- 10** Place the stack onto the metering head. Push the piston down to align it with the seal.



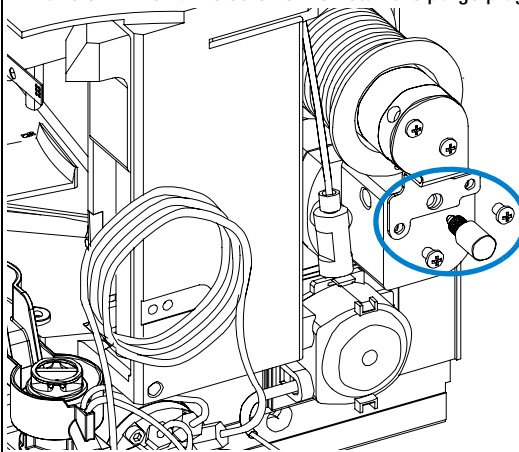
- 11** Check the orientation of the metering head assembly and correct if required. *Tubing port left, RF tag right.* Bolt the metering head assembly together with the two 4mm hex screws.



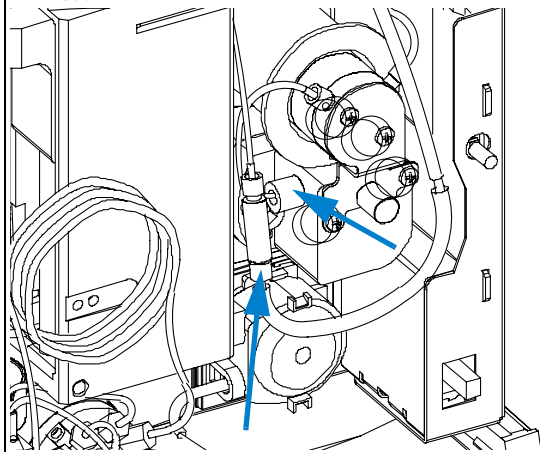
- 12** Insert the two hex screws into the metering head assembly and screw it onto the metering unit. *Ensure not to catch the solenoid cable.*



- 13** Position the solenoid valve and the buffer loop extension above the metering head assembly and fix them with the two 3mm Pozidrive screws. Reinstall the purge plug.



14 Reconnect the buffer loop to the PEEK fitting of the buffer loop extension and the solenoid tubing to the metering head.



On completion of this procedure:

- Start the instrument.
- Close the front cover.
- Prime the metering unit as described in [Flushing the Metering Device](#) 58

Exchanging or Installing the (Optional Interface) BCD Board

Frequency	At installation, when defective or for all repairs inside the Dual Loop Autosampler
Tools required	Flat-head screwdriver
Parts required	(Optional) interface board

CAUTION

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

- 1 Switch OFF the Dual Loop 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 Dual Loop Autosampler.
- 4 Install the interface board. Secure the screws.
- 5 Reconnect the cables to the board connectors

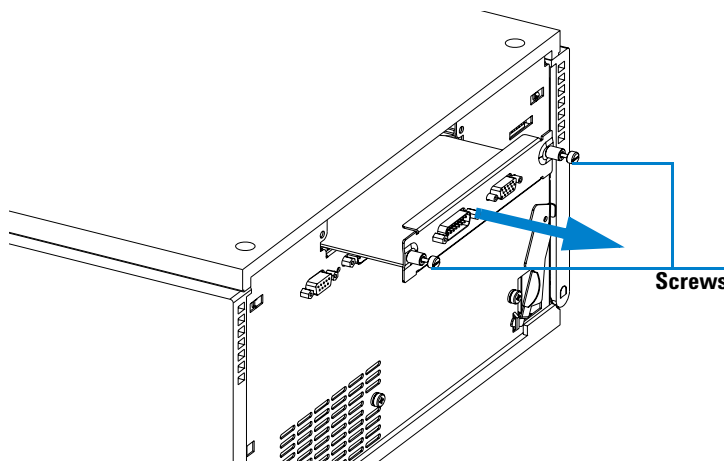
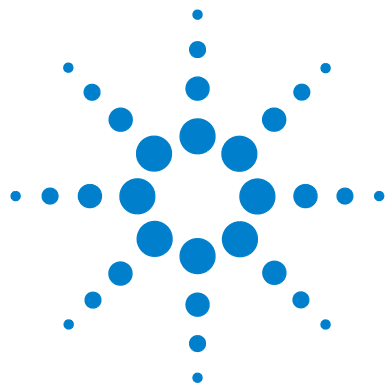


Figure 29 Exchanging the Interface Board



8 Easy Repair Parts

- Consumables [122](#)
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This chapter describes the Consumables and Accessories of the Dual Loop Autosampler.



Consumables

List of Supported Plate Trays

Table 8 Dual Loop Autosampler Vial Trays and Tray Base

Item	Description	Part Number
2	Tray for 2 plates + 10 × 2-ml vials, max. height 50mm	G2258-60011
2	Screws for springs	0515-0866
3	Spring	G1313-09101
4	Spring stud	0570-1574
5	Tray base (includes items 4,5,6)	G1329-60000
6	Adapter air channel	G1329-43200
	Plug channel (not shown)	G1367-47200
7	Vial plate for 15 x 6 ml vials (pack. of 6)	5065-9949
8	Vial plate for 54 x 2 ml vials (pack. of 6)	G2255-68700

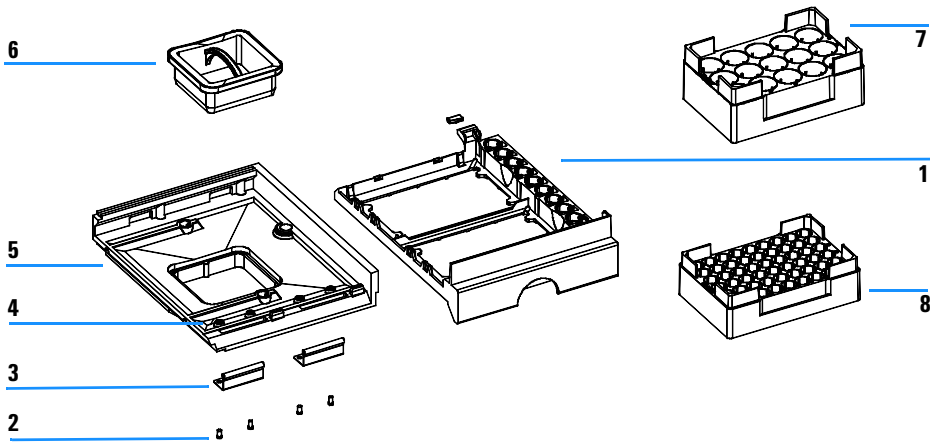


Figure 30 Vial trays and Tray Base

List of Recommended Well Plates and Vial Plates

Table 9 Recommended plates

Description	Rows	Columns	Plate height	Volume (µl)	Part Number	Package
96Agilent	8	12	14.3	400	5042-1386 5042-1385	10 120
96Corning	8	12	14.3	300	No Agilent PN	
96CorningV	8	12	14.3	300	No Agilent PN	
96DeepAgilent31mm	8	12	31.5	1000	5042-6454	50
96DeepNunc31mm	8	12	31.5	1000	No Agilent PN	
96DeepRitter41mm	8	12	41.2	800	No Agilent PN	
96Greiner	8	12	14.3	300	No Agilent PN	
96GreinerV	8	12	14.3	250	No Agilent PN	
96Nunc	8	12	14.3	400	No Agilent PN	
96 Agilent conical	8	12	14.3	150	5042-8502	25
54 x 2 ml vials	6	9	27	2000	G2255-68700	6
15 x 6 ml vials	3	5	35	6000	5065-9949	6

List of Recommended Vials, Caps and Septa

Table 10 Recommended vial, caps and septa

Description	Rows	Columns	Plate height	Volume (µl)	Part Number	Package
96Agilent	8	12	14.3	400	5042-1386 5042-1385	10 120
96Corning	8	12	14.3	300	No Agilent PN	
96CorningV	8	12	14.3	300	No Agilent PN	
96DeepAgilent31mm	8	12	31.5	1000	5042-6454	50
96DeepNunc31mm	8	12	31.5	1000	No Agilent PN	
96DeepRitter41mm	8	12	41.2	800	No Agilent PN	
96Greiner	8	12	14.3	300	No Agilent PN	
96GreinerV	8	12	14.3	250	No Agilent PN	
96Nunc	8	12	14.3	400	No Agilent PN	
96 Agilent conical	8	12	14.3	150	5042-8502	25
54 x 2 ml vials	6	9	27	2000	G2255-68700	6
15 x 6 ml vials	3	5	35	6000	5065-9949	6

Sample Loops for the G2258A 10-port Valve

Table 11 Sample Loops for the G2258A 10-port Valve

Description	ID (mm)	Part Number
• 10 µl sample loop	0.30	0100-1923
• 20 µl sample loop	0.30	0100-1922
• 50 µl sample loop	0.51	0100-1924
• 100 µl sample loop	0.51	0100-1921
• 200 µl sample loop	0.76	0101-1247
• 500 µl sample loop	0.76	0101-1246
• 1 ml sample loop	0.76	0101-1245
• 2 ml sample loop	1.00	0101-1244
• 5 ml sample loop	1.00	0101-1243

Dual Loop Autosampler Accessory Kit

Table 12

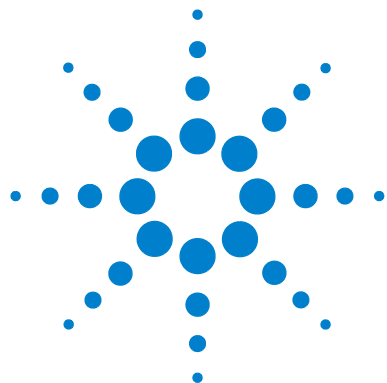
Description	Quantity	Part Number
1/16 front ferrule, 316 stainless steel	6	0100-0043 re-order 5180-4108 (pack of 10)
1/16 back ferrule, 316 stainless steel	6	0100-0044 re-order 5180-4114 (pack of 10)
Vial plate 54 x 2 ml	1	5022-6502 re-order G2258-68700 (pack of 6)
Vial plate 15 x 6 ml	1	5022-6539 re-order 5065-9949 (pack of 6)
Tubing assembly	2	5063-6527
Flexible capillary, 0.5 x 800 mm, no fittings	1	5065-9926
Flexible capillary, 0.25 x 800 mm, no fittings	1	5065-9930
CAN cable, 1 m	1	5181-1519
Wrench, open end, 1/4 - 5/16 inch	2	8710-0510
Wrench, open end, 4mm	1	8710-1534
Rheotool socket wrench 1/4 inch	1	8710-2391
Hex key 4mm, 150 mm long, with T-handle	1	8710-2392
Hex key 2.0 mm	1	8710-2438
Hex key driver 3/32 inch	1	8710-2462
Fitting screw 1/16 inch	3	79814-22406 re-order 5061-3303 (pack of 10)

Table 12

Description	Quantity	Part Number
Fitting screw 1/16 inch, extra long	3	G1156-22402 re-order 5065-4454 (pack of 10 screws, front ferrules, back ferrules)
Air channel adapter	1	G1329-43200
ESD wrist strap	1	9300-1408
Drawing tube assembly for flush solvent	1	G2258-87307

8 Easy Repair Parts

Dual Loop Autosampler Accessory Kit



A Safety Information

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This chapter gives Safety Information for the use of the Dual Loop Autosampler.



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.

WARNING

If you are using flammable solvents, remove the well-plates from the tray when you turn OFF the sampler. You avoid the risk of building explosive gas mixtures in the tray compartment.

WARNING

If you are using flammable solvents, cover the well-plates with pre-slit closing mats to avoid the risk of building explosive gas mixtures.

WARNING

After a leak in the sampler, make sure the leak plane is cleaned and dry.

Operation

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

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

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and shorting of fuse holders must be avoided.

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.

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

Table 13 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to 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 leverandoren.

WARNING

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

NOTE

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



Radio Interference

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

Test and Measurement

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

Sound Emission

Manufacturer's Declaration

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

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

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

Solvent Information

Observe the following recommendations on the use of solvents.

WARNING

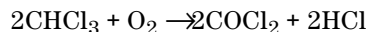
This instrument should only be used with solvents that have an ignition temperature higher than 200°C!

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:



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 complex forming agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Agilent Technologies on Internet

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<http://www.agilent.com>

Select “Products” - “Chemical Analysis”

It will provide also the latest firmware of the Agilent 1200 series modules for download.

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In This Book

This manual contains technical reference information about the Agilent 1200 Series Dual Loop Autosamplers. The manual describes the following:

- Introduction to the Dual Loop Autosampler,
- site requirements, specifications and installation,
- configuration and operation of the Dual Loop Autosampler,
- troubleshooting and test functions,
- maintaining the Dual Loop Autosampler,
- parts for maintenance,
- safety information.

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