Agilent 1100 Series Dual Loop Autosampler, Preparative Scale

User's Guide

Agilent Technologies

Notices

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CAUTION

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In This Guide...

This manual contains technical reference information about the Agilent 1100 Series Dual Loop Autosampler, preparative scale. The manual describes the following:

1 Configuration and Operation of the Dual Loop Autosampler

This chapter describes the configuration and operation of the Dual Loop Autosampler including guidelines to optimize the system and to avoid problems.

2 Troubleshooting and Test Functions

This chapter describes the modules built-in troubleshooting and test functions.

3 Repairing the Dual Loop Autosampler

This chapter contains instructions on simple repair and maintenance procedures.

4 Parts and Materials

This chapter contains lists for identification of common repair and maintenance parts.

5 Specifications

This chapter contains performance specifications of the Dual Loop Autosampler.

A Safety Information

This appendix provides a safety summary.

Contents

1 Concepts

Introduction

The Agilent 1100 Series Dual Loop Autosampler, Preparative Scale, 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 Appendix 7

Front View

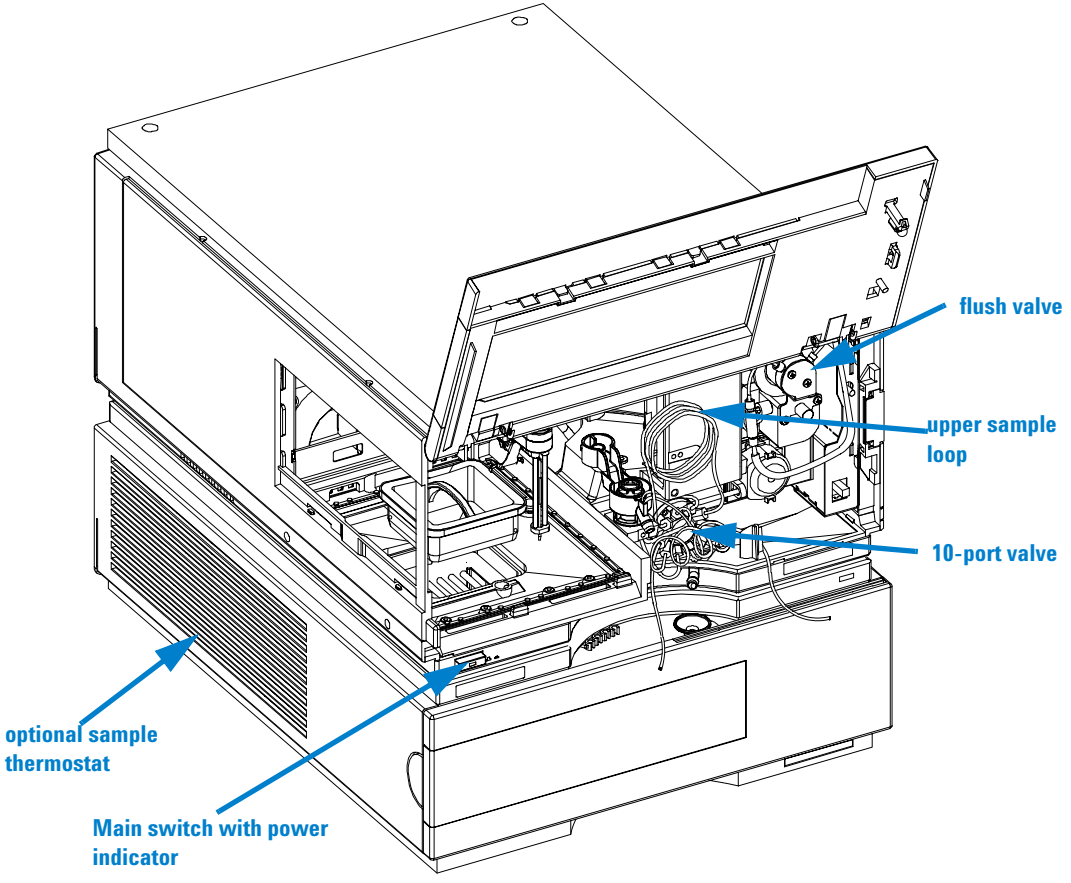


Figure 1 Front View of the Dual Loop Sampler

Theory of Operation

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

The Agilent 1100 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.

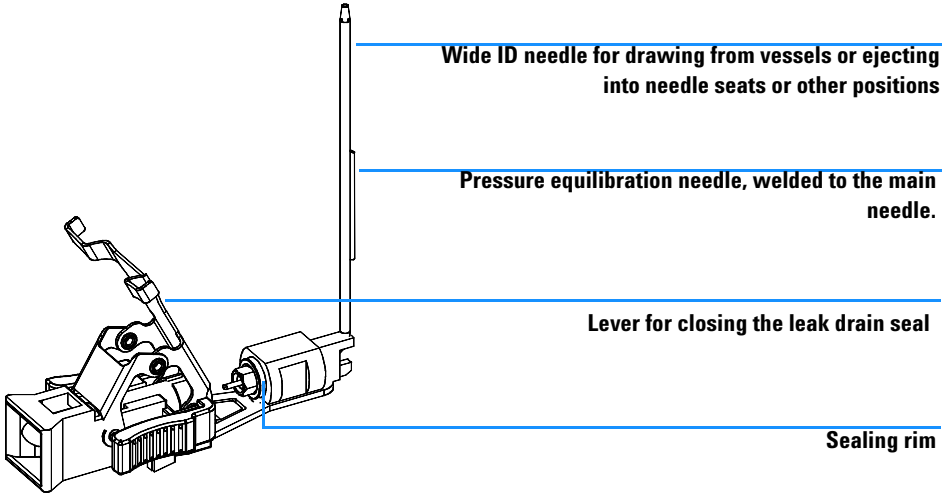


Figure 2 Dual Loop Autosampler Twin Needle Assembly

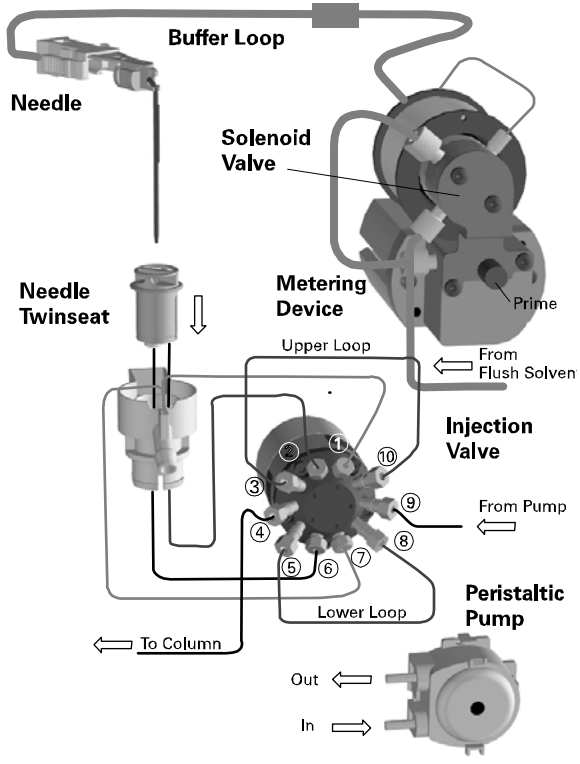


Figure 3 Plumbing Diagram of the Dual Loop Autosampler

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

Table 1 Connections to the 10-Port Valve (continued)

Port	Connecting to
• 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

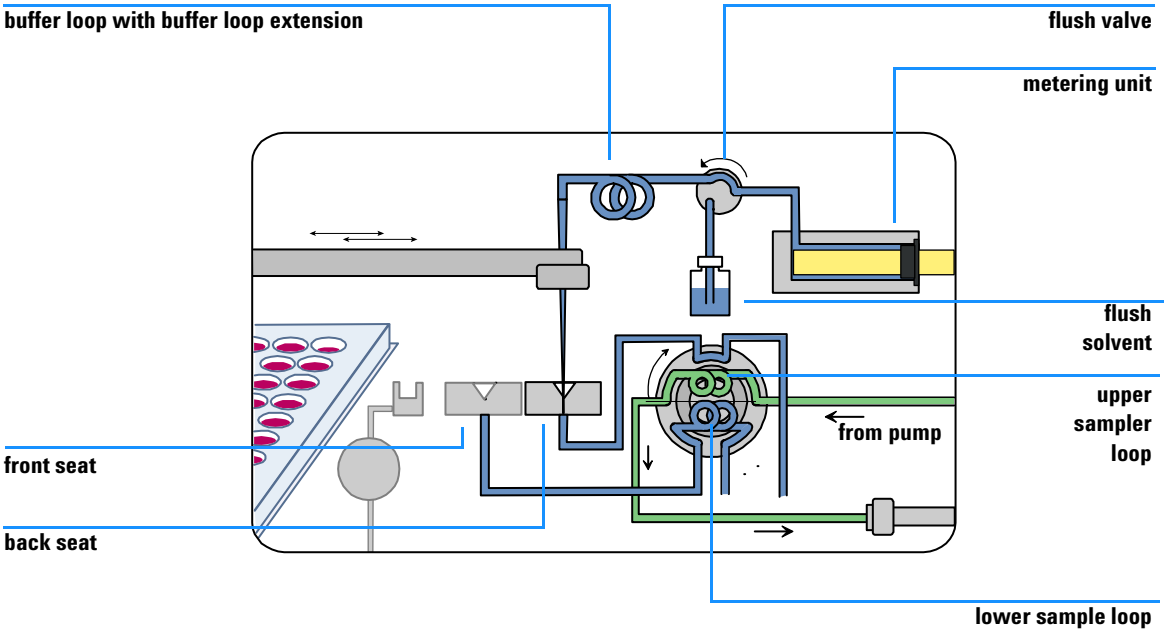


Figure 4 10-port valve in Mainpass

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

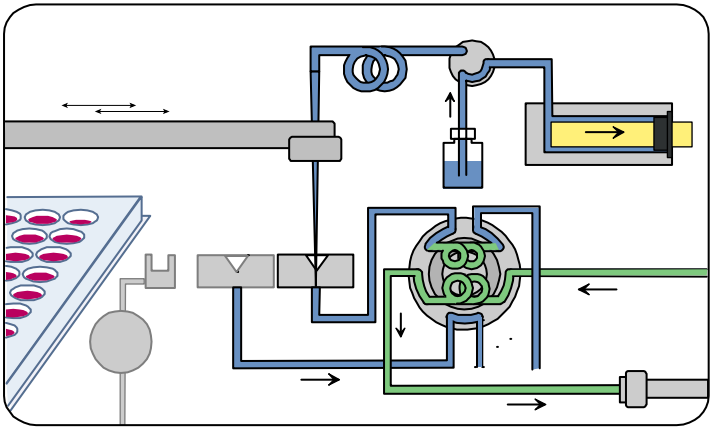


Figure 5 10-port valve in Bypass

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)

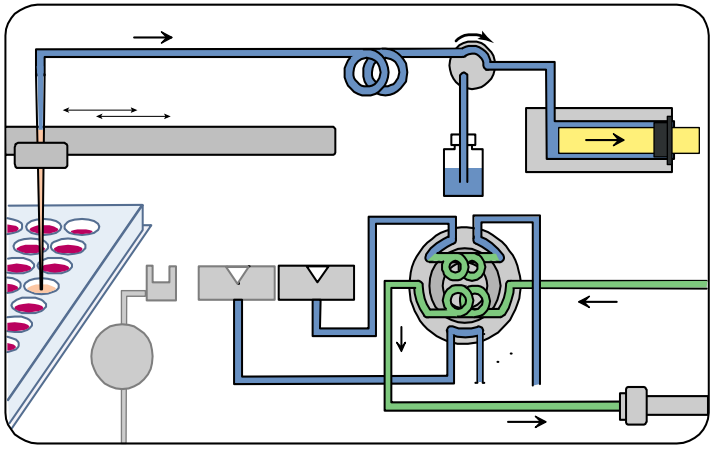


Figure 6 Metering device is drawing a plug of buffer

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 µl for each plug.

Drawing Sample

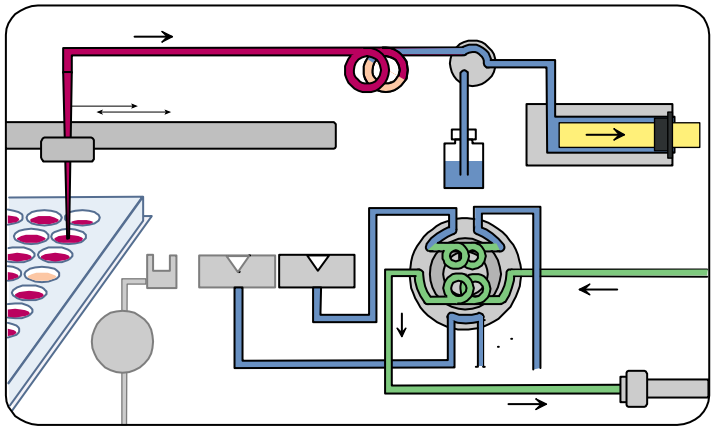


Figure 7 Metering device drawing sample

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

Washing the Needle (optional step)

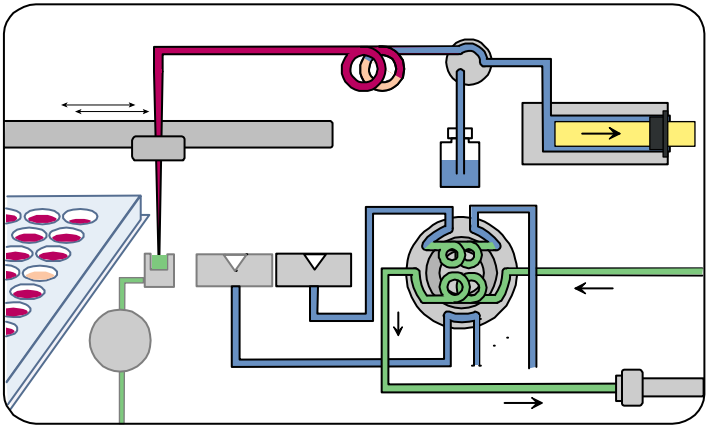


Figure 8 Needle in the wash port

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)

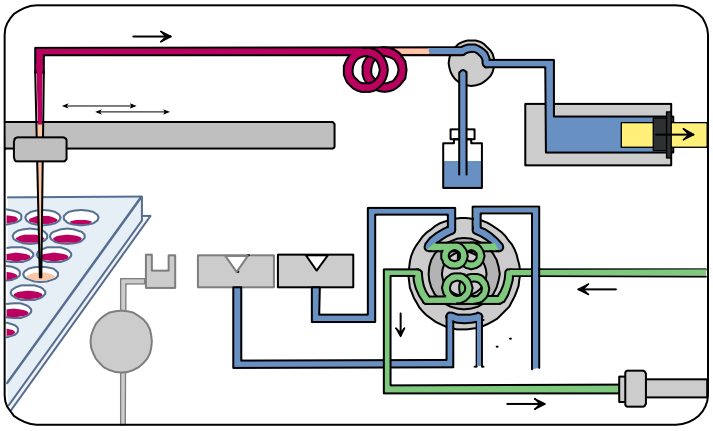


Figure 9 Metering device is drawing a plug of buffer

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

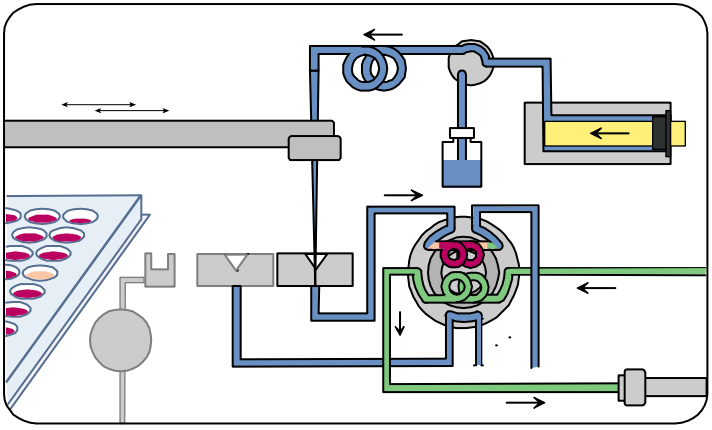


Figure 10 metering device loading the working loop

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

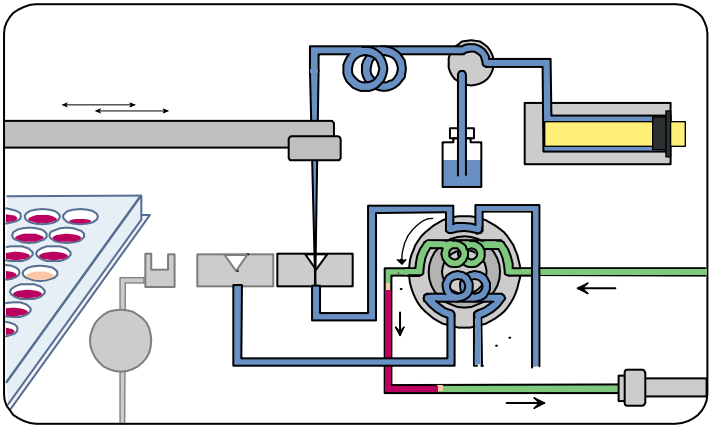


Figure 11 10-port valve switching to mainpass

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

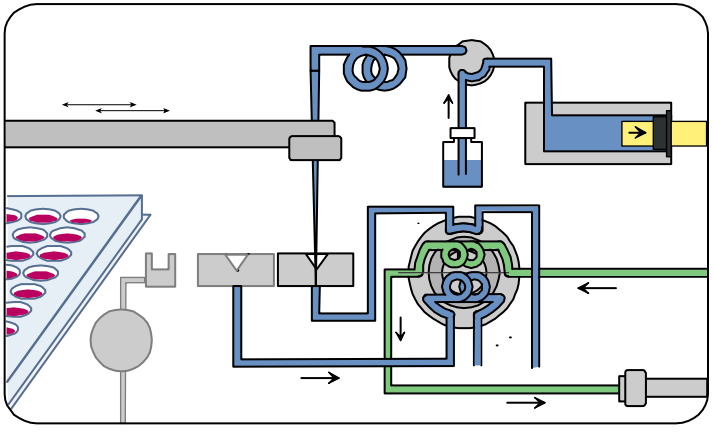


Figure 12 Metering device drawing flush solvent

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

Washing the Sampling Path

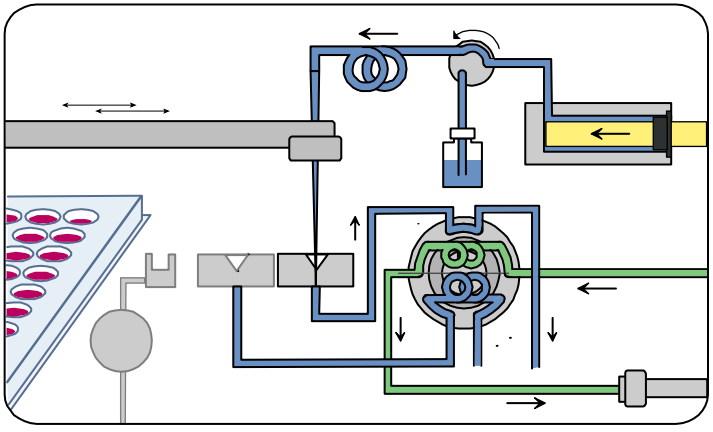


Figure 13 Flushing sampling flow path with flush buffer

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

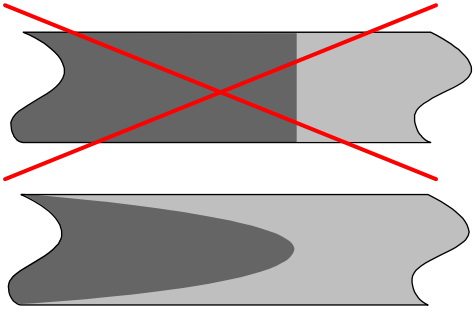
Fixed loop autosamplers usually purge the loop with sample before switching it into the flow path and flushing the content onto the column. As a consequence, changing the injection volume requires the installation of a loop of different size. Volumes of loops of identical size vary up to 65% depending on loop size and material.
The Agilent 1100 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 *overfill factor* is defined as

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



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 57 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 tot he 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
Configuration and Operation of the Dual Loop Autosampler, PS

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 the Control Module

Major keys on the Agilent 1100 Control Module

Table 2

ESC	Return to previous screen, abort any change of parameters and toggle between the last two top layer views
m	Open context sensitive menus
i	Information/Help
Enter	Store changed parameters or execute a choice
Done	(If available) Activate settings of current screen
On/Off	Switch on individual Instrument(s) or complete System
Start	Start a location range or sequence
Plot	View online signals
Views	Change between analysis - (samples)- status - system views

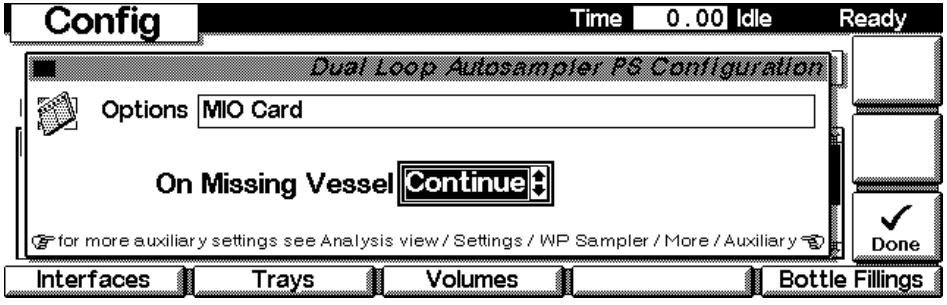
NOTE The screens shown on the next pages are based on:
Control Module firmware revision B.03.11 (G1323B)
HPLC Module firmware revision 5.09

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

Configuring the Dual Loop Sampler with the Control Module

Configure: On Missing Vessel

This dialog offers different options for what will happen if an empty sample position is accessed.

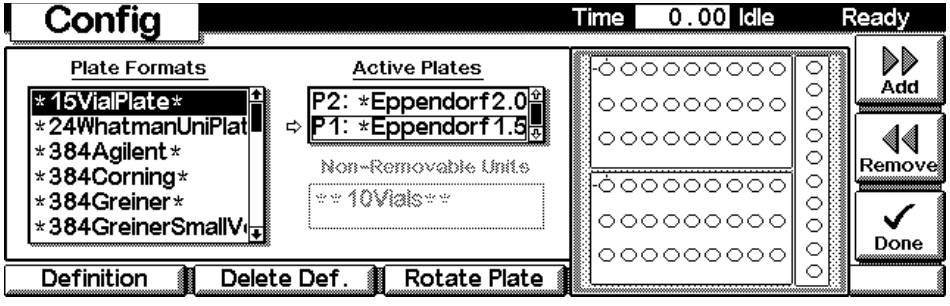


How to access: Views - System - Configure- DL Sampler

Abort The series of runs (sequence) will be stopped and a message will be generated in the logbook.

Continue The autosampler will start a blank run of 6 seconds for the missing sample and will then continue with the next sampler position.

Configure: Select Well Plates or Vial Plates



How to access: Views - System - Configure- DL Sampler - Trays

In the Plate Formats list select/highlight the desired well plate or vial plate with the up and down arrow keys. F7/F8 (Add/Remove) allows you to move the selected plate from the Plate Formats list to the Active Plates list and vice versa.
Use the left and right arrow keys to move the cursor between the lists.

F1 (Definition) opens a dialog that allows the definition of non-listed plates. For details see "Configuring Custom Sample Plates" on page 91

F2 (Delete Definition) deletes the selected plate definition.

Press F3 (Rotate) rotate the selected plate.

F6 (Done) All changes must be acknowledged with F6

CAUTION

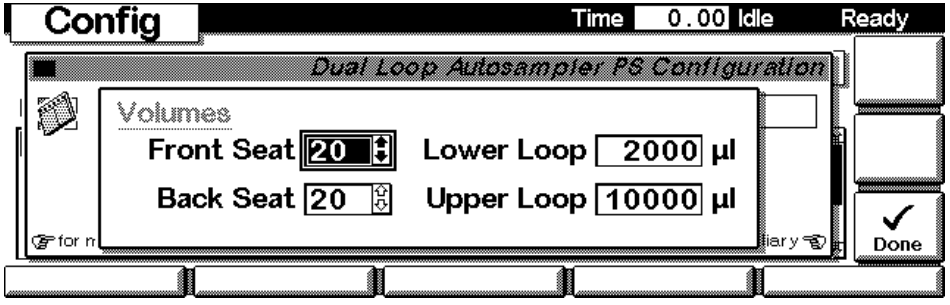
Mind the height limits for the supported well plates/vial plates (measured from bottom to top of closing mat or vial caps)

When using well plate trays G1367-60001 and G1329-60001 - 48 mm

When using well plate tray G2258-60001 - 50 mm

Configure: Volumes

In this dialog the volumes of sample loops and seat capillaries are defined.



How to access: Views - System - Configure- DL Sampler - Volumes

Table 3 Default Volumes of Loops and Seat Capillaries

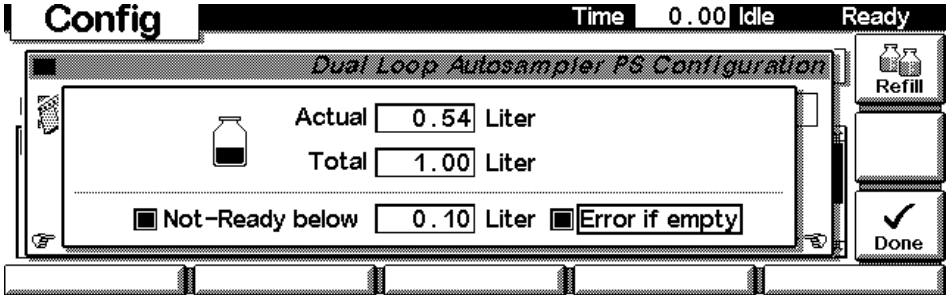
Type of Capillary/Tubing	Volume
Upper Loop:	Volume of the upper sample loop in µl, default is 5000µl
Lower Loop:	Volume of the upper sample loop in µl, default is 50µl
Seat Capillary (upper loop):	24 µl for the original PTFE tubing.
	6 µl for 0.25 mm ID seat capillary
	2.3 µl for 0.17 mm ID seat capillary (available in future)
Seat Capillary (lower loop):	20 µl for the original PTFE tubing.
	5 µl for 0.25 mm ID seat capillary
	2.3 µl f capillary (available in future)

NOTE For analytical applications with limited sample volume the seat tubings can be replaced by stainless steel seat capillaries of 0,25mm ID or (in future) 0.17mm ID.

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

Configure: Bottle Filling

In this screen you can specify the total and actual volume of the syringe wash solvent bottle. The sampler automatically recalculates the actual volume when syringe washes are performed.



How to access: Views - System - Configure- DL Sampler - Bottle Fillings

Not Ready Below Check and enter a certain volume if the system should generate a Not Ready condition as soon as the actual value falls below the specified value.

Error if Empty Check if the system should generate an error condition of the Dual Loop Sampler as soon as the calculated actual value reaches zero.

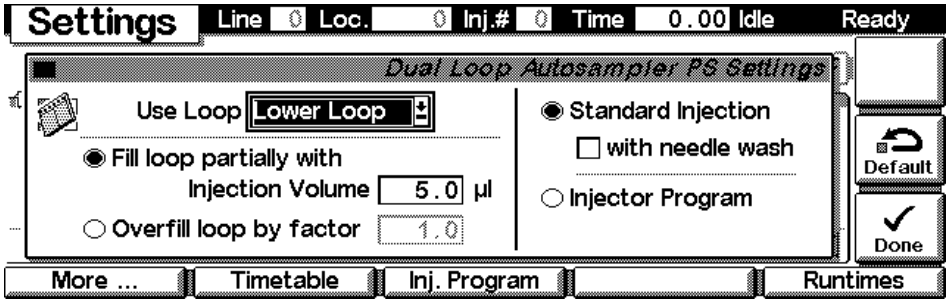
F8 (Refill) Press to reset the current actual bottle volume to the specified total volume.

F6 (Done) Press to confirm your new settings.

Setting Method Parameters with the Control Module

Settings: Loop parameters

In this screen loop and loop filling mode are defined.



How to access: Views - Analysis - Settings - DL Sampler - Settings

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 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 24

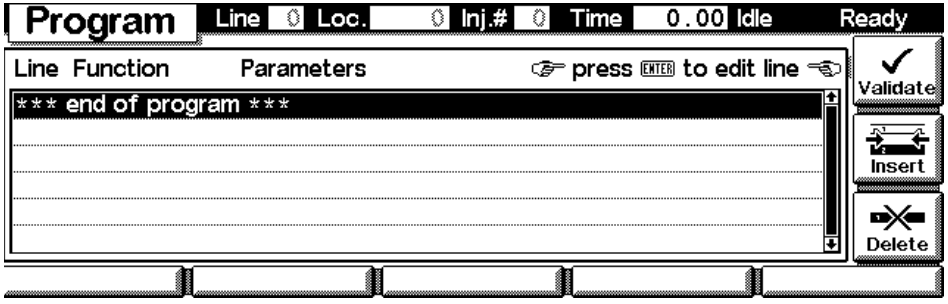
Overfill loop This is the preferred mode of operation if you are aiming for highest peak area accuracy and reproducibility. The disadvantage is that sample is wasted for overfilling the sample loop. Typical overfill factors for best results are 3 - 5.

Standard Injection Checking this button makes the autosampler use the default injection sequence which is a good choice for most applications. Carryover can be reduced by checking the **with needle wash** box.

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

Injector Program Details

The injector program editor is a convenient way to combine most functions of the sampler sequentially and store this injector program with the method.



How to access: Views - Analysis - Settings - DL Sampler - Settings - Inj. Program

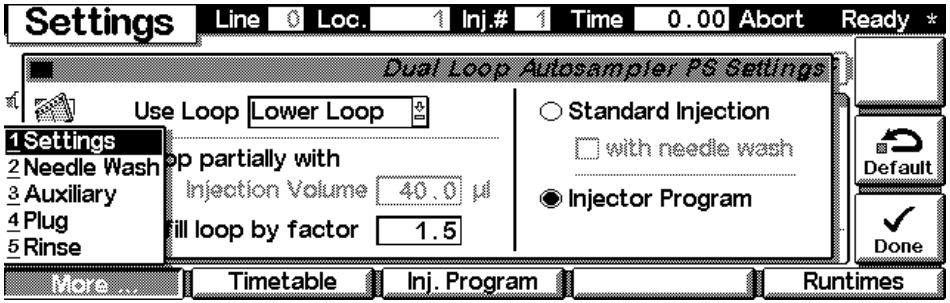
The injector program consists of one instruction per line which are sequentially processed from top to bottom.
For a detailed description of all injector program parameters read "Injector Program Functions and Parameters" on page 86

F8 (Validate) checks the injector program for runtime errors. It is recommended to use this functions after lines have been added or altered.

F7 (Insert) adds a new line at the current positions and opens the dialog described in Injector Program Functions and Parameters 86

F6 (Delete) removes the highlighted line from the injector program.

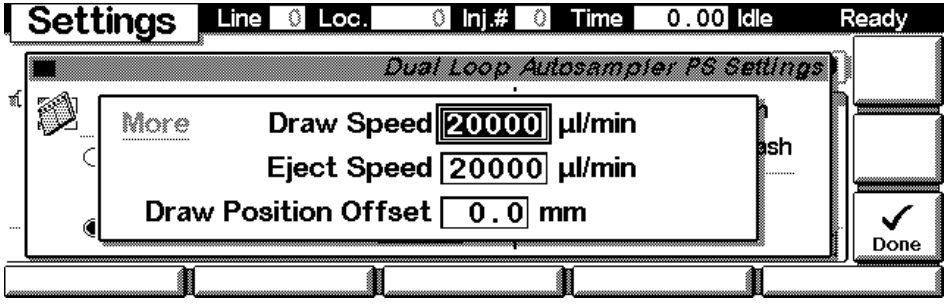
More Settings



How to access: Views - Analysis - Settings - DL Sampler - Settings - More

Use the **F1 (MORE)** button to access additional method presets.

Settings



How to access: Views - Analysis - Settings - DL Sampler - Settings - More - Setting

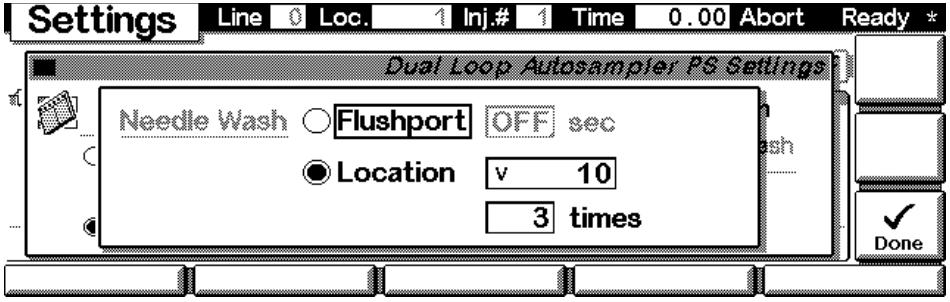
Draw Speed Defines at what flow rate liquid is sucked into the buffer loop. Valid entries are 350 µl/min - 50,000 µl/min.

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.

Draw Position Offset 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.

Needle Wash

Needle wash allows to minimize carryover by washing the outside of the needle. Cleaning the inside of needle and buffer loop is referred to as *rinsing* in this book.

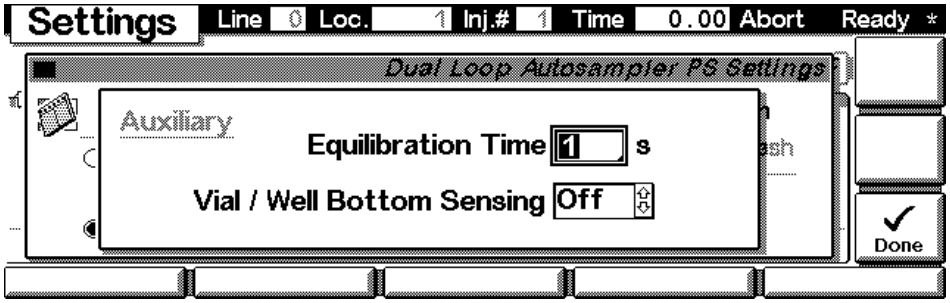


How to access: Views - Analysis - Settings - DL Sampler - Settings - More - Needle Wash

Flushport Washes the outside of the needle for a given number of seconds in the washport. Read also xxx considerations about needle wash liquids.

Location Dips the needle a given number of times into a wash vessel. This vessel can be an location on the front plate (**P1**), on the rear plate (**P2**) or any of the ten 2 ml vials in the sample tray.

Auxiliary



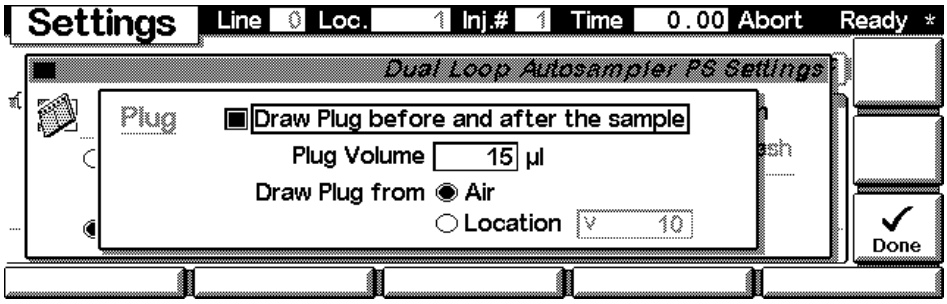
How to access: Views - Analysis - Settings - DL Sampler - Settings - More - Auxiliary

Equilibration Time This parameter is useful if tightly closed sample containers like vials are used and a large sample volume is drawn at high speed. Although the Dual Loop Sampler is fitted with a twin needle to allow for rapid pressure equilibration between lab and vial while sample is drawn, it may be necessary to make the sampler wait a given number of seconds after drawing from or ejecting into a capped vial.

Vial / Well Bottom Sensing When this feature is turned on, the sampler detects the bottom of the sample vessel by moving the needle down until it hits the vessel bottom. The needle arm moves up slightly to allow for unobstructed liquid flow.
This feature works well if the vessel bottom is either flat or concave.

Plug

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



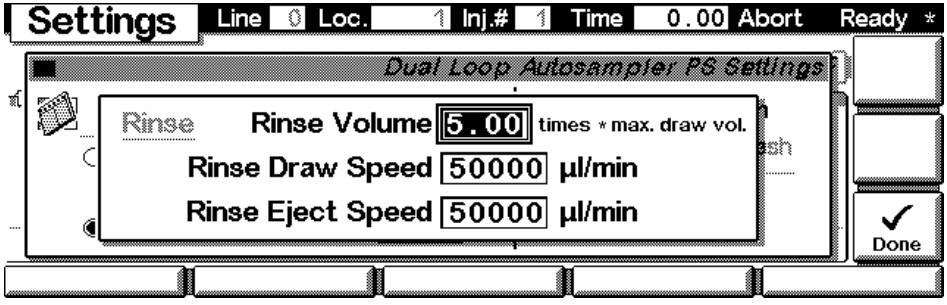
How to access: Views - Analysis - Settings - DL Sampler - Settings - More - Plug

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

Draw Plug from This parameter offer the choice of either air plugs or plugs from any solvent from a given vessel position.
See also xxx considerations about plugging.

Rinse

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



How to access: Views - Analysis - Settings - DL Sampler - Settings - More - Rinse

Rinse Volume Defines the relative rinse volume for buffer loop and needle. Example: if the injection volume was 50µl and the Rinse Volume setting was 5, buffer loop and needle would be flushed with 250 µl wash liquid after each injection.

Rinse Draw Speed, Rinse Eject Speed Speed at which the sampler draws and ejects flush liquid. 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.

Operating the Dual Loop Sampler with Chemstation

Navigation in 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.

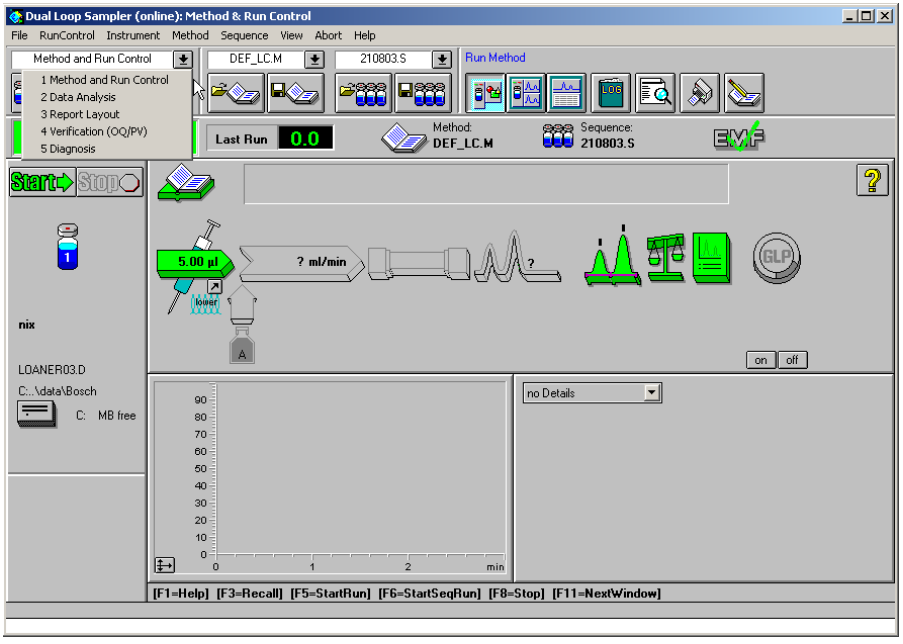


Figure 17 Chemstation Views

Configuring the Dual Loop Sampler with Chemstation

The *Method and Run Control* screen of 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.*

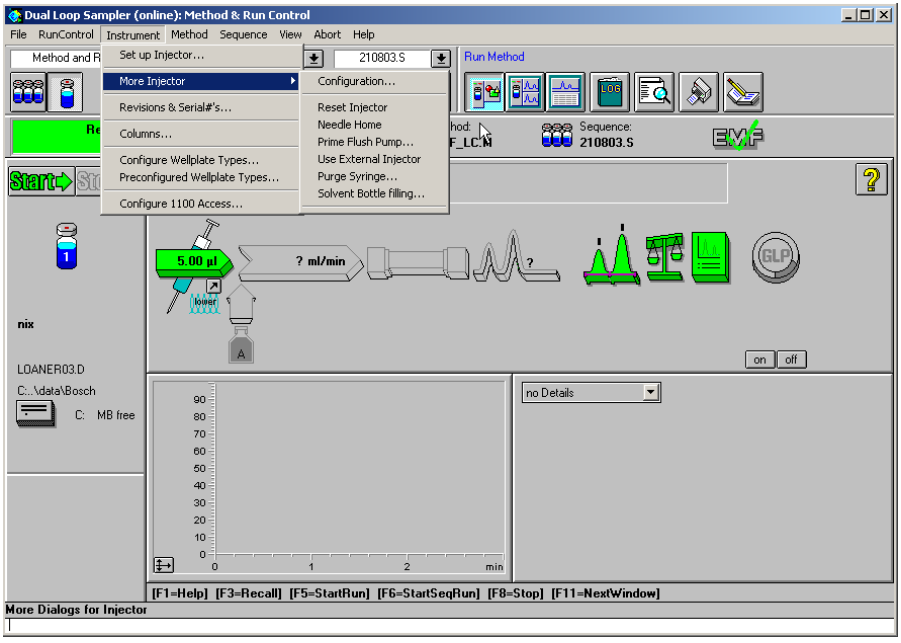


Figure 18 Accessing the DLA configuration in Chemstation

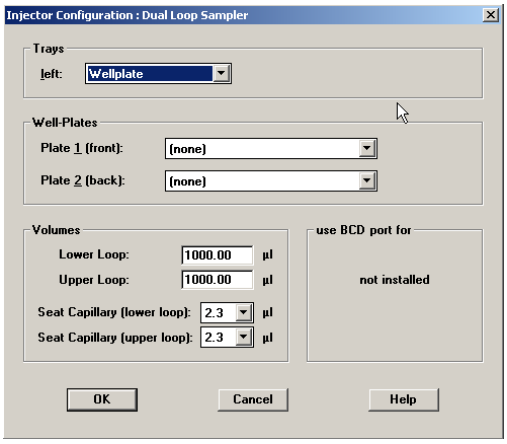


Figure 19 DLA Configuration Screen in Chemstation

Trays

Shows the installed tray type. The sampler is recognizing the installed tray automatically. Mind the "General Comments about Sample Trays" on page 28

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 and Caps" on page 95. Non-listed plates can be defined using the "Configure Wellplate Types" function. For details see "Operating the Dual Loop Sampler with Chemstation" on page 41

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 2000µl/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

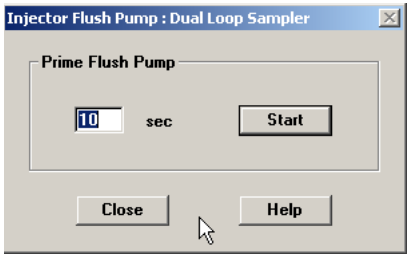


Figure 20 Prime Flush Pump

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 1100 module. When *Use External Injector* is activated the autosampler icon turn grey in 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 “Flushing the Syringe” on page 52

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.
Find a detailed description in “How much Flush Solvent is needed?” on page 54

Setting Method Parameters in 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*.

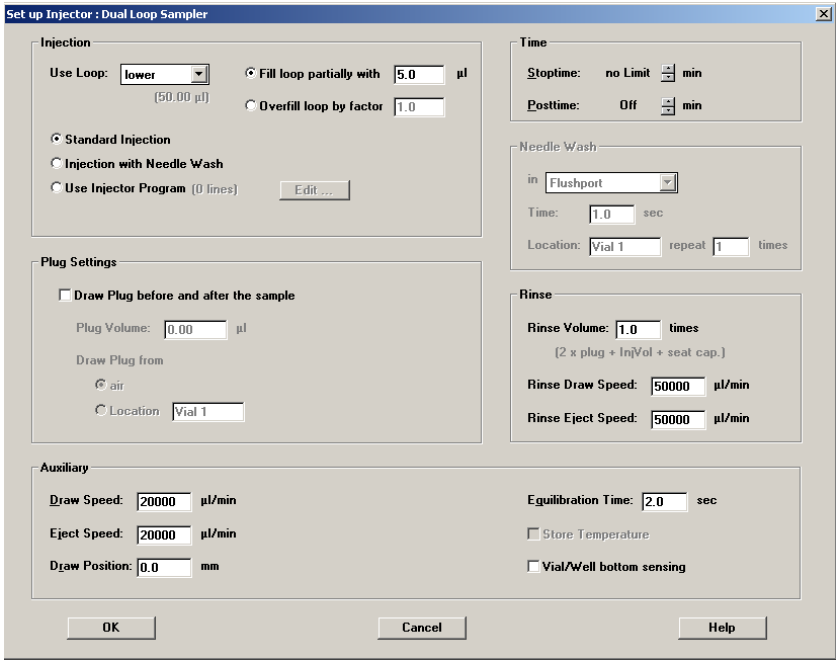


Figure 21 Chemstation DLA Setup Screen

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 24

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 24

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 the *Edit* button 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.

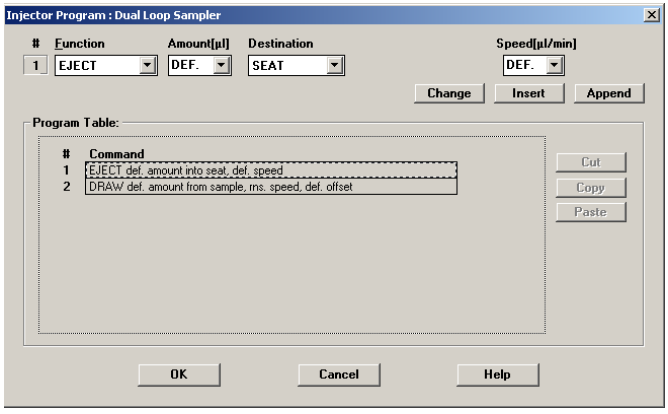


Figure 22 The Injector Program Editor

An injector program consists of one instruction per line. Select the desired function from the *Function* drop-down menu and add it by clicking the *Insert* or *Append* buttons. To change a program line highlight it and hit the *Change button*. The *Cut, Copy* and *Paste* button can 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. Conceptional 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.he control module. For details consult the Chemstation help function.

For a detailed description of all injector program parameters see "Injector Program Functions and Parameters" on page 86

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.
See also xxx

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 the *More* button 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.

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 1100 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 a inaccurate well definitions may cause the sampler to slam the needle into the bottom of the sample vessel causing damage to the needle assembly!

3
Performance Optimization

"Sampler Preparation before starting a Run" on page 52

Sampler Preparation before starting a Run

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 23)

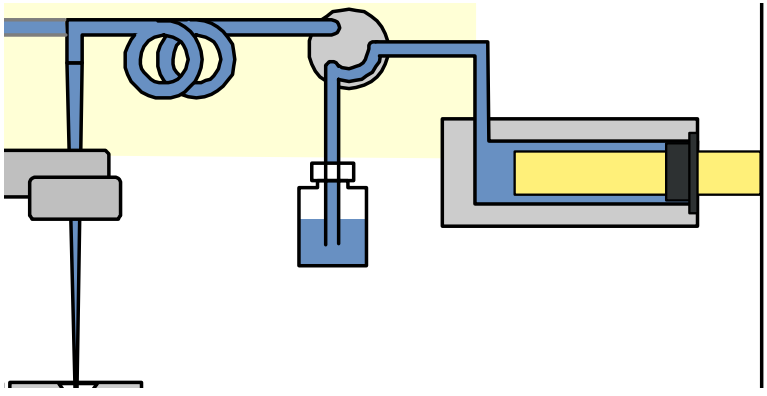


Figure 23 Schematic of needle, buffer loop, wash valve and syringe

- 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.
- 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 Chemstation right-click the DLA icon and select *Purge Syringe* from the drop-down menu (see)

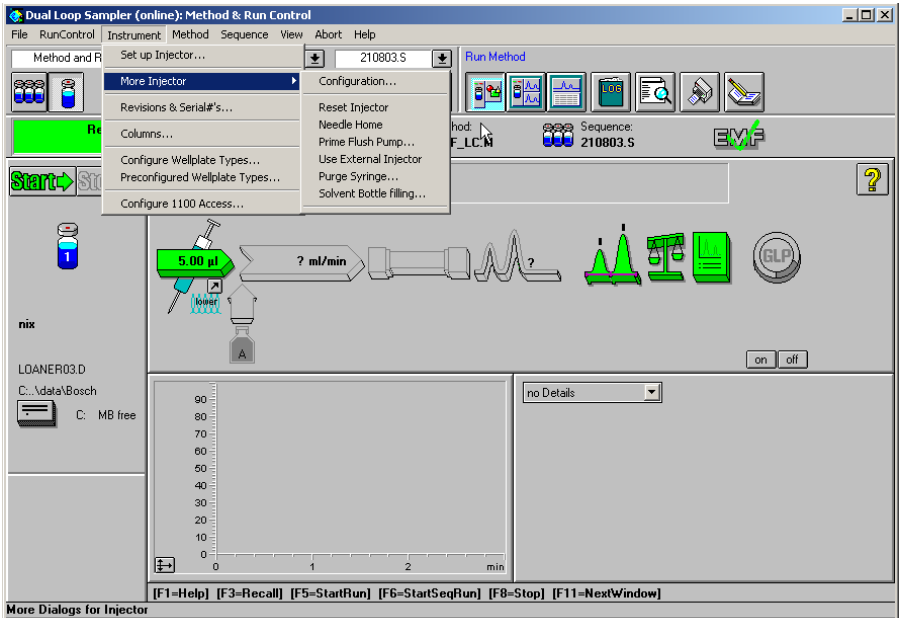


Figure 24 Accessing the Purge Syringe Dialog

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

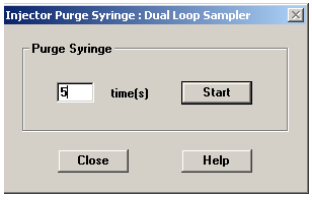


Figure 25 Purge Syringe Dialog

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 1100 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*.
For information the implementation of this function in the control module see “Configure: Bottle Filling” on page 33

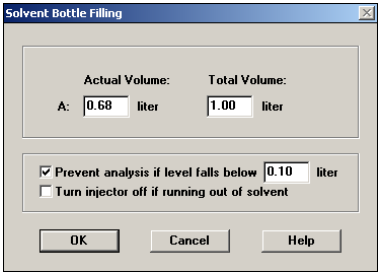


Figure 26 Solvent Bottle Filling

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 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 G2258 is compatible with all well-established organic solvents as well as with pure water and organic solvent/water mixtures.

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

Limitations and how to avoid Problems

24 Well plates Well plates with well diameters larger than the diameter of the vial pusher are not suitable for the Dual Loop Autosampler because the pusher will be dipped into the sample while no plate is detected.

Slit septa Due to the large ID twin needle pre-slit septa are required. Standard septa may get pushed into the vial or require too much force to be pierced.

Closing mats The same applies for closing mats. Use only pre-slit cloping mats or leave the well plates uncovered.

Use of buffers When using buffer solutions make sure to flush the sampler thoroughly with water after use. In case a buffer solution is used as flush solvent replace the bottle by HPLC water and run at least 20 syringe flush cycles to remove any residual buffer from the metering device (see "How to flush the Syringe" on page 52).

Replacing sample loops The fittings of the 10-port valve are extremely close to each other. When replacing loop or capillaries check if all fittings are still tight.

Application Notes

More information about the 1100 Dual Loop Autosampler and the Agilent Purification Systems is available on the Agilent website at

http://www.chem.agilent.com

4
Troubleshooting and Test Functions

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 61).

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the instrument generates an error message in the user interface. For a detailed description of the failure, a list of probable causes of the problem, and a list of suggested actions refer to the Agilent 1100 Series Dual Loop Autosampler Service Manual G2258-90100.

Maintenance Functions

The maintenance functions position the transport unit and needle carrier assembly in certain positions for maintenance, homing or parking (see "Maintenance Functions" on page 63).

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 have been replaced. This function can be accessed via the diagnose screen of ChemStation or through the *System* View of the Control Module.

CAUTION The sample transport self alignment requires one of the supported well plate trays (G1367-60001 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 Dual Loop Autosampler status.

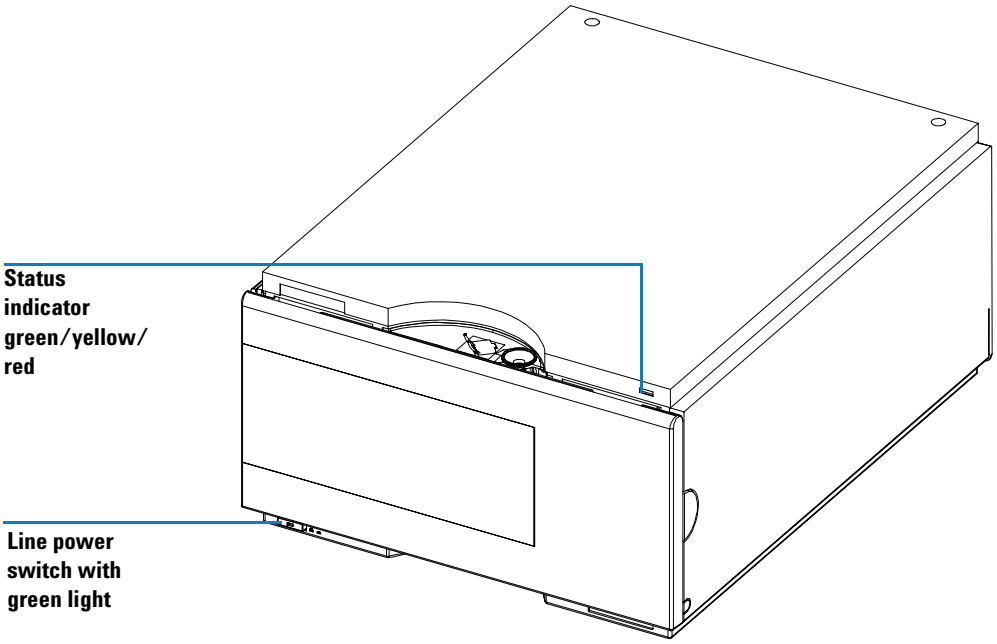


Figure 27 Location of Status Indicators

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.

Maintenance Functions

Some maintenance procedures require the needle arm, and needle carrier to be moved to specific positions to enable easy access to components. The maintenance functions move these assemblies into the appropriate maintenance position. In the ChemStation the Dual Loop Sampler maintenance positions can be selected from the **Maintenance menu** in the **Diagnosis** view (see Figure 28). In the Control Module the functions can be selected in the Test screens of the Dual Loop Autosampler.

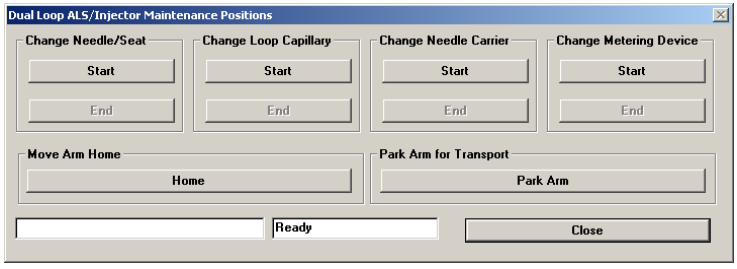


Figure 28 DLA Maintenance Positions dialog box

Change Needle/Seat

If you click **Start** the transport unit will move upwards, the needle carrier assembly will move to the front center and then turn off the theta motor to allow free rotation of the theta arm. This position enables easy access to the transport unit to change:

- The needle assembly
- The needle carrier assembly
- The twin seat assembly

After the maintenance or repair task has been finished, click **End** to move the transport assembly into the **standby** position

Change Loop Capillary

This function works exactly like the previous one, but positions the needle arm pointing towards the left side cover for easier access to the loop fitting at the needle assembly.

After the maintenance or repair task has been finished, click **End** to move the transport assembly into the **standby** position

Change Needle Carrier

Moves the needle arm into a position that makes it easy to reach the hex screws that fix the arm to the transport unit.

After the maintenance or repair task has been finished, click **End** to move the transport assembly into the **standby** position

Change Metering Device

Retracts the piston of the metering device completely to take the spring load off the metering head.

After the maintenance or repair task has been finished, click **End** to move the transport assembly into the **standby** position

Home Position

This maintenance function moves the arm up and to the right rear for better access and exchange of the trays.

Park Arm

This maintenance position moves the arm to the park position at the upper rear left side of the tray for transporting or shipping the Dual Loop Autosampler.

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 you exchange the transport unit, the needle carrier assembly or the MTP main board.

This function is in the diagnose screen of the ChemStation or the Control Module.

CAUTION

The sample transport self alignment requires one of the 2-well-plate trays (Part Number: G1367-60001 or G2258-60001), but well plates MUST NOT be installed.

If the Transport Unit Self Alignment is started with well plates on the tray, the alignment procedure is aborted WITHOUT error message.

When is a Transport Unit Self Alignment Necessary?

The sample transport self alignment is required after disassembling the module or when you exchange:

- The transport unit.
- The needle carrier assembly.
- The MTP main board.

How to perform a Transport Unit Self Alignment?

Steps		Comments
1	If the transport unit has been exchanged or if it is very badly misaligned, set the 8-bit configuration switch to the **Forced Cold Start** Configuration.	For details see: "Forced Cold Start" in the Dual Loop Autosampler Service Manual.
2	Install a 2-well-plate tray (G1367-60001 or G2258-60001)	**IMPORTANT: Remove all plates!**

How to perform a Transport Unit Self Alignment?

Steps	Comments
3 Select the **Maintenance** menu in the **Diagnosis** view of the Agilent ChemStation.	
4 In the menu choose **DLA Transport Alignment...** to start the automated procedure.	The Transport Alignment Procedure takes approximately 10-15 minutes
5 Set the 8-bit configuration switch to the default setting and power cycle the autosampler.	See "8-bit configuration switch" in the Dual Loop Autosampler Service Manual.

NOTE If the Transport Unit Self Alignment is started with well plates on the tray, the alignment procedure is aborted without any error message.

Step Commands

Some movements of the Dual Loop Sampler injection sequence can be done under manual control. This is useful during troubleshooting where close observation of each of the injection steps is required to confirm a specific failure mode or verify successful completion of a repair.

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

In the ChemStation the step commands can be selected from the “Test Selection Box” (see Figure 29) in the Diagnosis display. In the Control Module the step commands can be accessed from the pull-down menu in the Dual Loop Autosampler “Test”.

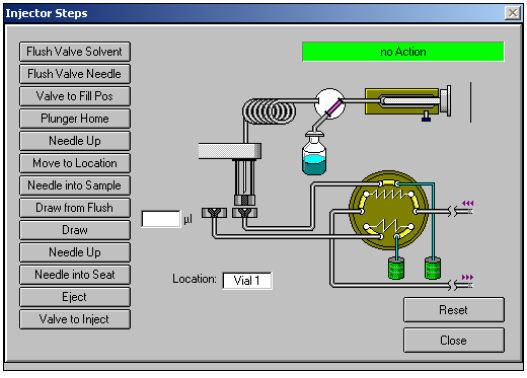


Figure 29 DLA Step Commands

Table 4 Step Commands

Step	Action	Comments
Flush Valve Solvent.	Connects the syringe to the flush solvent bottle	
Flush Valve Needle	Connects the syringe to buffer loop and needle	
Valve to Fill Position	Switches the 10-port Valve to Bypass	
Plunger Home	Moves the syringe plunger to the front end-stop.	
Needle up	Moves the needle out of the seat.	Command also switches the valve to bypass if it is not already in that position
Move to Location	Moves the needle arm above the sample position.	
Needle into Location	Moves the needle into the sample	
Draw from Flush	Draws the defined volume from the flush solvent bottle.	
Draw	Draws the defined volume from the sample vessel	
Needle up	Raises the needle out of the sample vessel	
Needle into Seat	Moves the needle into the needle seat	Seat location is determined by active loop setting.
Eject	Syringe ejects the defined volume from the buffer loop into the needle seat	
Valve to INject	Switches the 10-port valve to mainpass	

Troubleshooting

If the Dual Loop Autosampler is unable to perform a specific step due to a hardware failure, an error message is generated. You can use the step commands to perform an injection sequence and observe how the Dual Loop Autosampler responds to each command.

5
Specifications

Performance Specifications of the Dual Loop Autosampler

Table 5 Performance Specifications Agilent 1100 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
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 5 Performance Specifications Agilent 1100 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 6 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

Table 6 Carry-over Test Method

Parameter	Setting
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

6
Safety Information

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 **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 7 shows safety symbols used on the instrument and in the manuals.

Table 7 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 fejlagtic handtering. Udskiftning ma 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 appararleverandoren.**

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

Radio Interference

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

Test and Measurement

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

Sound Emission

Manufacturer's Declaration

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

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

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

Solvent Information

Observe the following recommendations on the use of solvents.

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:

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

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.

- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Agilent Technologies on Internet

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

http://www.agilent.com

Select “Products” - “Chemical Analysis”

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

Appendix

Injector Program Functions and Parameters

Table 8 Injector Program Functions and Parameters

Function	Parameter	Options	Explanation
DRAW			Draws a specified volume from a specified source
	Amount	DEF	Default amount as specified in"Settings: Loop parameters" on page 34
		MAX	Draws 5000 µl minus the volume that has been drawn into the metering device in previous injector program steps.
		numeric entry	any value from 0.1 µl to 5000 µl
	Source	SAMPLE	The actual sample position specified in the method or sequence
		SAMPLE+	The next t sample after the current one. Mind the sample order as set in "More Settings" on page 36
		VIAL+	
		LOCATION	
		SEAT	
		AIR	
	Speed	DEF	as defined in the method
		MAX	50,000 ml/min
		numeric entry	any value between 350 - 50,000 µl/min
	Offset	DEF	as defined in the method
		numeric entry	-10 mm to +50 mm
EJECT	same as **DRAW**		Ejects a specified volume from a specified source
MIX	same as **DRAW**		
INJECT			Switches the valve to mainpass and starts the analysis
WAIT	WAIT	numeric entry	Pauses the injector program from 0 - 10,0000 min.

Table 8 Injector Program Functions and Parameters (continued)

Function	Parameter	Options	Explanation
WAIT EQUILIB	WAIT	DEF	as defined in the method
		numeric entry	0 - 10,000 seconds
VALVE	POSITION	MAINPASS	The active sample loop is switched into the flow path.
		MAIN + START	The active loop is switched into the flow path and a start pule is sent out.
		BYPASS	The active sample loop is bypassed.
NEEDLE	ACTION	UP	Lifts the needle out of the needle seat.
		IN SEAT	Moves the needle into the seat of the active loop.
		IN LOC	Allows to position the needle into an sample position, the active seat, or into the air. A needle offset can be defined (see DRAW command)
		TO WASH	Moves the needle to the wash port.
		TO HOME TO TRANS	Moves the needle to special positions that allow access to tray or sample plates
WASH	POSITION	DEFAULT	Use wash location defined in the method.
		FLUSH PORT	Needle to flush port Flush for given time (1 - 99s)
		DEF LOCATION	Dip the needle into the wash vessel specified in the method a given times (1 - 5).
		LOCATION	Same as above, but location and needle offset can be set individually.
		SEAT	Use this to wash the ports of the 10-port valve for a given time (1 - 99s).
OUTPUT	NUMBER	numeric input	Sends a given number (0 - 4095) to the BCD output (optional BCD-board required).
REMOTE	ACTION	READY NOT READY START PULSE STOP PULSE PREPARE PULSE START REQUEST	Allows to control all signals of the remote start/stop connector manually.

Table 8 Injector Program Functions and Parameters (continued)

Function	Parameter	Options	Explanation
CONTACT	CONTACT	A, B, C, D	Allows to define the state of 4 external contacts (optional BCD board required).
WAIT FOR	ACTION	READY START START REQUEST STOP PULSE	The sampler waits until a selected signal is present at the start/stop connector.
	TIMEOUT	numeric input	Allows to define a timeout (0 - 9999 min) after which the sampler generates an error and starts it's error method.
REPEAT	# TIMES	numeric input	Command for building loops into the injector program.
END REP.			Loop end command
INCREMENT	SAMPLE	TRAY	Increments the tray # by a given value.
		PLATE	Increments the plate # by a given value
		ROW	Increments the row # of the current plate by a given value
		COLUMN	Increments the column # of the current plate by a given value
RESET	ACTUAL SAMPLE POS	TRAY PLATE ROW COL	Allows to reset the counters that have been incremented.
SYRINGE			Moves the piston of the metering device to it's front position (= homing).
COMMENT			Inserts a non-executed line of text into the injector program.
INJECT			switches the valve to mainpass and starts the analysis
WAIT	WAIT	numeric entry	pauses the injector program from 0 - 10,0000 min.
WAIT EQUILIB	WAIT	DEF	as defined in the method
		numeric entry	0 - 10,000 seconds

Table 8 Injector Program Functions and Parameters (continued)

Function	Parameter	Options	Explanation
VALVE	POSITION	MAINPASS	The active sample loop is switched into the flow path.
		MAIN + START	The active loop is switched into the flow path and a start pule is sent out.
		BYPASS	The active sample loop is bypassed.
NEEDLE	ACTION	UP	Lifts the needle out of the needle seat.
		IN SEAT	Moves the needle into the seat of the active loop.
		IN LOC	Allows to position the needle into an sample position, the active seat, or into the air. A needle offset can be defined (see DRAW command)
		TO WASH	Moves the needle to the wash port.
		TO HOME TO TRANS	Moves the needle to special positions that allow access to tray or sample plates
WASH	POSITION	DEFAULT	Use wash location defined in the method.
		FLUSH PORT	Needle to flush port Flush for given time (1 - 99s)
		DEF LOCATION	Dip the needle into the wash vessel specified in the method a given times (1 - 5).
		LOCATION	Same as above, but location and needle offset can be set individually.
		SEAT	Use this to wash the ports of the 10-port valve for a given time (1 - 99s).
OUTPUT	NUMBER	numeric input	Sends a given number (0 - 4095) to the BCD output (optional BCD-board required).
REMOTE	ACTION	READY NOT READY START PULSE STOP PULSE PREPARE PULSE START REQUEST	Allows to control all signals of the remote start/stop connector manually.
CONTACT	CONTACT	A, B, C, D	Allows to define the state of 4 external contacts (optional BCD board required).

Table 8 Injector Program Functions and Parameters (continued)

Function	Parameter	Options	Explanation
WAIT FOR	ACTION	READY START START REQUEST STOP PULSE	The sampler waits until a selected signal is present at the start/stop connector.
	TIMEOUT	numeric input	Allows to define a timeout (0 - 9999 min.) after which the sampler generates an error and starts it's error method.
REPEAT	# TIMES	numeric input	Command for building loops into the injector program.
END REP.			Loop end command
INCREMENT	SAMPLE	TRAY	Increments the tray # by a given value.
		PLATE	Increments the plate # by a given value
		ROW	Increments the row # of the current plate by a given value
		COLUMN	Increments the column # of the current plate by a given value
RESET	ACTUAL SAMPLE POS	TRAY PLATE ROW COL	Allows to reset the counters that have been incremented.
SYRINGE			Moves the piston of the metering device to it's front position (= homing).
COMMENT			Inserts a non-executed line of text into the injector program.

Configuring Custom Sample Plates

If the plate you are using is not found on the “List of Recommended Plates” on page 96 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 ChemStation or the Control Module.

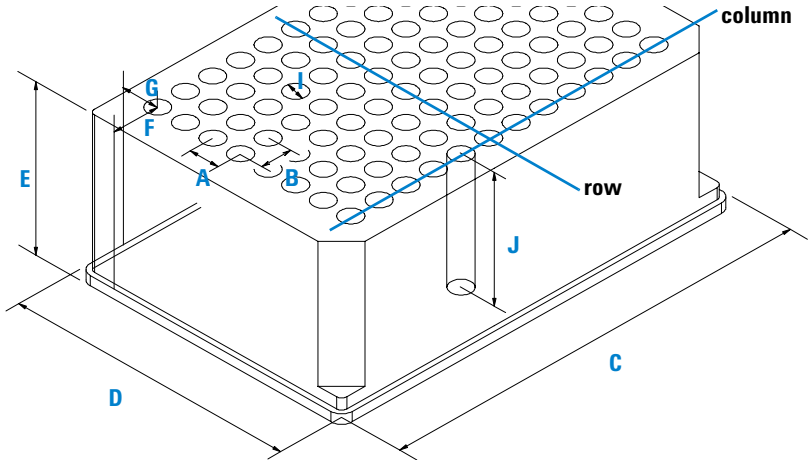


Figure 30 Well-plate Dimensions (straight)

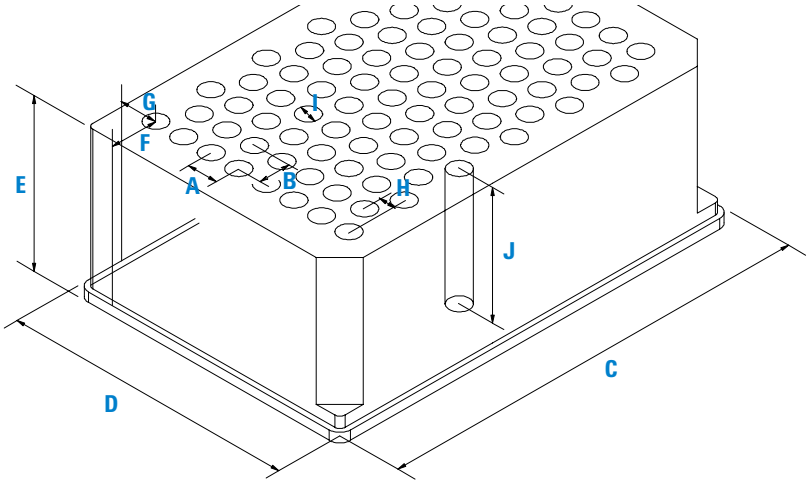


Figure 31 Well-plate Dimensions (staggered)

Table 9 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

Table 9 Configuring Well-plate Types (continued)

Location	Description	Definition	Limits
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
	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

List of Supported Trays

Table 10 Supported Trays

Description	Part Number	Comments
Standard 2 well plate tray, 10 vials	G1367-60001	for sample plates with a height of 48 mm max.
Well plate tray, 2 well plates, 10 vials	G2258-60001	for 2 sample plates with a height of 50mm max.

List of Recommended Vials and Caps

Table 11 SnapTop Vials (Caps for Use with the Analytical Scale Fraction Collector, only!)

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0544	5183-4504	5183-4507
Clear glass, write-on spot	2	5182-0546	5183-4505	5183-4508
Amber glass, write-on spot	2	5182-0545	5183-4506	5183-4509

Table 12 Snap Caps for 2 ml vials

Description	Septa	100/Pack
clear snap cap with slit septa	Clear PTFE/silicone	5183-4511

Table 13 Screw Cap Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	6	9301-1377		

Table 14 Screw Caps and slit septa for 6 ml vialsFraction Collector

Description	Septa	100/Pack
screw cap for 6ml vial, black		9301-1379
pre-slit septa	Clear PTFE/silicone	5188-2758

List of Recommended Plates

Table 15 Recommended Plates

Item	Description	Volume (ml)	Package	Part Number
1	96 polypropylene well-plate	0.5	10	5042-1386
2	96 polypropylene well-plate	0.5	120	5042-1385
3	96 polypropylene deep well pate	1.0	50	5042-6454
4	96 polypropylene conical-well plate	0.15	25	5042-8502
5	Pre-slit closing mat for 96 well plates		50	5042-1389
6	54 x 2ml vial plate	1.5	6	G2255-68700
7	15 x 6ml vial plate	6	6	5065-9949
8	Eppendorf plate	0.5, 1, 1.5	1	5022-6538

List of Unsupported Plates

Table 16 Unsupported Plates

Item	Description	Part Number
1	Any 384 well plates	
2	24 well plates and any well plates with well ID > needle pusher diameter	5042-1385
3	96 Polypropylene well plate with glass inserts, caps and septa	5065-4402

NOTE Any combination of two supported sample plates can be used in the Dual Loop Sampler.

WARNING **If you are using flammable solvents, remove the plates from the Dual Loop Sampler after turning it OFF. Use pre-slit closing mats if possible. You avoid the risk of building explosive gas mixtures in the instrument.**

CAUTION Due to the large diameter of the twin needle only pre-slit closing mats are recommended for use with the Dual Loop Sampler. If excessive force is needed to penetrate a non-slit septum or a closing mat, the sampler will generate an error.

Dual Loop Autosampler Accessory Kit

Table 17 Dual Loop Autosampler Accessory Kit Contents

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)
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

Table 17 Dual Loop Autosampler Accessory Kit Contents

Description	Quantity	Part Number
ESD wrist strap	1	9300-1408
Drawing tube assembly for flush solvent	1	G2258-87307

Table 18 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

7 Appendix

Dual Loop Autosampler Accessory Kit

Index

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In This Book

This manual contains technical reference information about the Agilent 1100 Series Dual Loop Autosamplers. The manual describes the following:

- configuration and operation of the Dual Loop Autosampler,
- troubleshooting and test functions,
- optimization tips,
- specifications,
- safety information.

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