Agilent 1260 Infinity High Performance Micro Autosampler

User Manual

Agilent Technologies

Notices

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1 Introduction

This chapter gives an introduction to the High Performance Micro Autosampler.

Introduction to the Autosampler

The Agilent 1260 Infinity High Performance Micro Autosampler is designed to perform capillary LC with injection of sample volumes ranging from nL to µL.

Features: A micro Rheodyne® valve and the optimized design of the needle seat, loop and seat capillaries minimize dispersion. A high-resolution metering device offers resolution ten times better than a standard autosampler, bypass operation facilitates low delay volume, increased sample injection speed for high sample throughput, flexible and convenient sample handling with different types of sample containers. Using 384-well plates allows to process up to 768 samples unattended.

Technical Principle: The well plate sampler transport mechanism uses an X-Z-theta robot to optimize the positioning of the sampling arm on the well plate. Once the sampling arm is positioned over the programmed sample position, the programmed sample volume is drawn by the metering device into the sampling needle. The sampling arm then moves to the injection position where the sample is flushed onto the column.

The autosamplers employ a vial/plate pusher mechanism to hold down the vial or the plate while the needle is drawn back from the sample vessel (a must in the case a septum is used). This vial/plate pusher employs a sensor to detect the presence of a plate and to ensure accurate movement regardless of plate used. All axes of the transport mechanism (x-,z-,theta-robot) are driven by stepper-motors. Optical encoders ensure the correct operation of the movement.

The micro metering device provides injection volumes from 0.01 – 8 µL with the standard loop capillary installed and from 0.01 – 40 µL with the extended loop capillary. The entire flowpath including the metering device is always flushed by the mobile phase after injection for minimum internal carry-over.

An additional needle flush station with a peristaltic pump is installed to wash the outside of the needle. This reduces the already low carry-over for very sensitive analysis. The bottle containing the mobile phase for the wash procedure will be located in the solvent bottle cabinet. Produced waste during this operation is channeled safely away through a waste drain.

The six-port (only 5 ports are used) injection valve unit is driven by a high-speed hybrid stepper motor. During the sampling sequence, the valve unit bypasses the autosampler, and connects flow from the pump to the column directly. During injection and analysis, the valve unit directs the flow through the autosampler which ensures that all of the sample is injected onto the column, and that the metering unit and needle are always free from sample residue before the next sampling sequence begins. All the injection valves have different stator heads and different rotor seals. The volume of each valve is different.

Control of the vial/plate temperature in the thermostatted autosampler is achieved using an additional Agilent module; the Agilent 1290 Infinity Thermostat for ALS/FC/Spotter.

The thermostat contains Peltier-controlled heat-exchangers. A fan draws air from the area above the sample vial tray of the autosampler. It is then blown through the fins of the cooling/heating module. There it is cooled or heated according the temperature setting. The thermostatted air enters the autosampler through a recess underneath the special designed sample tray. The air is then distributed evenly through the sample tray ensuring effective temperature control, regardless of how many vials are in the tray. In cooling mode condensation is generated on the cooled side of the Peltier elements. This condensed water is safely guided into a waste bottle for condensed water.

Sampling Sequence

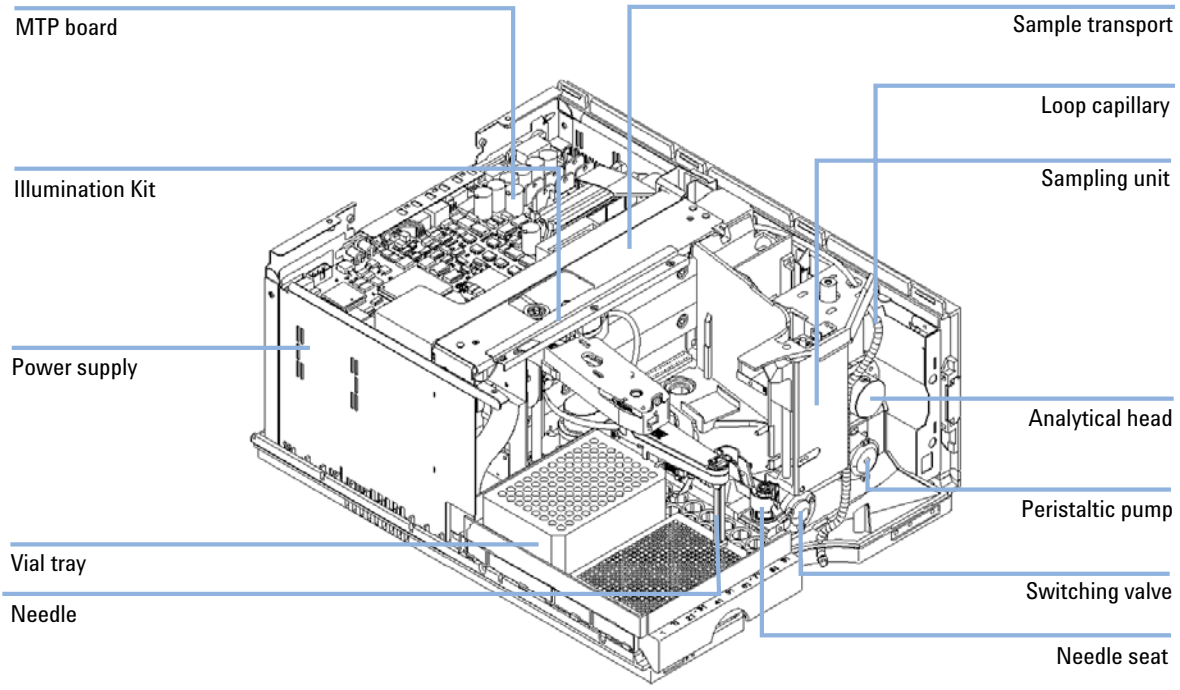


Figure 1 Overview of the autosampler

The movements of the autosampler components during the sampling sequence are monitored continuously by the autosampler processor. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sampling sequence is not completed successfully, an error message is generated. Solvent is bypassed from the autosampler by the injection valve during the sampling sequence. The needle moves to the desired sample vial position and is lowered into the sample liquid in the vial to allow the metering device to draw up the desired volume by moving its plunger back a certain distance. The needle is then raised again and moved onto the seat to

close the sample loop. Sample is applied to the column when the injection valve returns to the mainpass position at the end of the sampling sequence.

The standard sampling sequence occurs in the following order:

1 The injection valve switches to the bypass position.
2 The plunger of the metering device moves to the initialization position.
3 The needle lock moves up.
4 The needle moves to the desired sample vial position.
5 The needle lowers into the vial.
6 The metering device draws the preset sample volume.
7 The needle lifts out of the vial.
8 The needle is then moved onto the seat to close the sample loop.
9 The needle lock moves down.
10 The injection cycle is completed when the injection valve switches to the mainpass position.

If needle wash is required it will be done between step 7 and 8.

Injection Sequence

Before the start of the injection sequence, and during an analysis, the injection valve is in the mainpass position (Figure 2 on page 12). In this position, the mobile phase flows through the autosampler metering device, sample loop, and needle, ensuring all parts in contact with sample are flushed during the run, thus minimizing carry-over

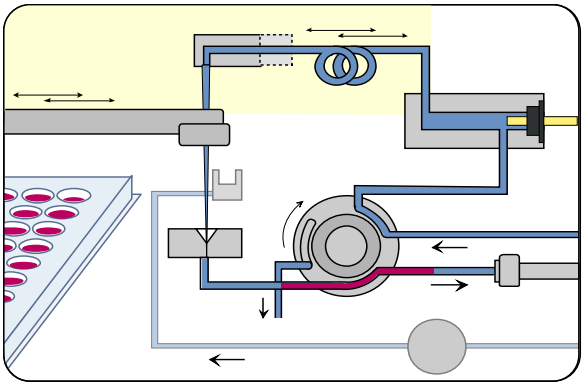


Figure 2 Mainpass Position

When the sample sequence begins, the valve unit switches to the bypass position (Figure 3 on page 12). Solvent from the pump enters the valve unit at port 1, and flows directly to the column through port 6.

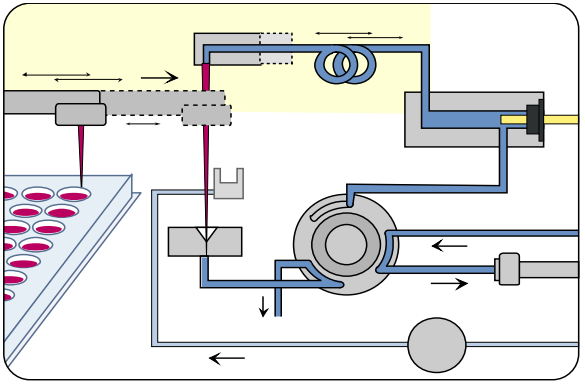


Figure 3 Bypass Position

The standard injection starts with „draw sample from vial”. In order to do this the needle moves to the desired sample vial position and is lowered into the sample liquid in the vial to allow the metering device to draw up the desired volume by moving its plunger back a certain distance. The needle is then raised again and moved onto the seat to close the sample loop. In case of an injector program several steps are interspersed at this point.

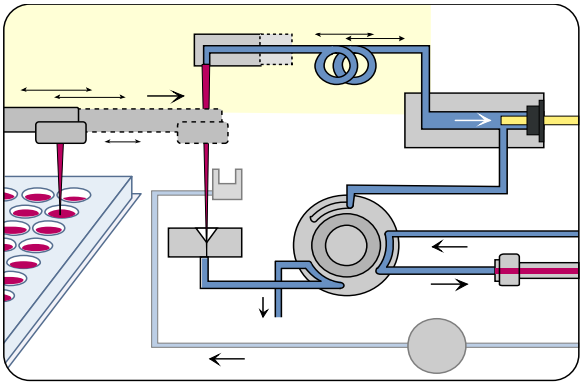


Figure 4 Drawing the Sample

Flush the Needle

Before injection and to reduce the carry-over for very sensitive analysis, the outside of the needle can be washed in a flush port located behind the injector port on the sampling unit. As soon the needle is on the flush port a peristaltic pump delivers some solvent during a defined time to clean the outside of the needle. At the end of this process the needle returns to the injection port.

Inject-and-Run

The final step is the inject-and-run step. The six-port valve is switched to the main-pass position, and directs the flow back through the sample loop, which now contains a certain amount of sample. The solvent flow transports the sample onto the column, and separation begins. This is the beginning of a „run” within an analysis. In this stage, all major performance-influencing hardware is flushed internally by the solvent flow. For standard applications no additional flushing procedure is required.

Sampling Unit

The sampling unit consists of subsystems as well. The main carrier part is a die casting part which carries the following functional elements.

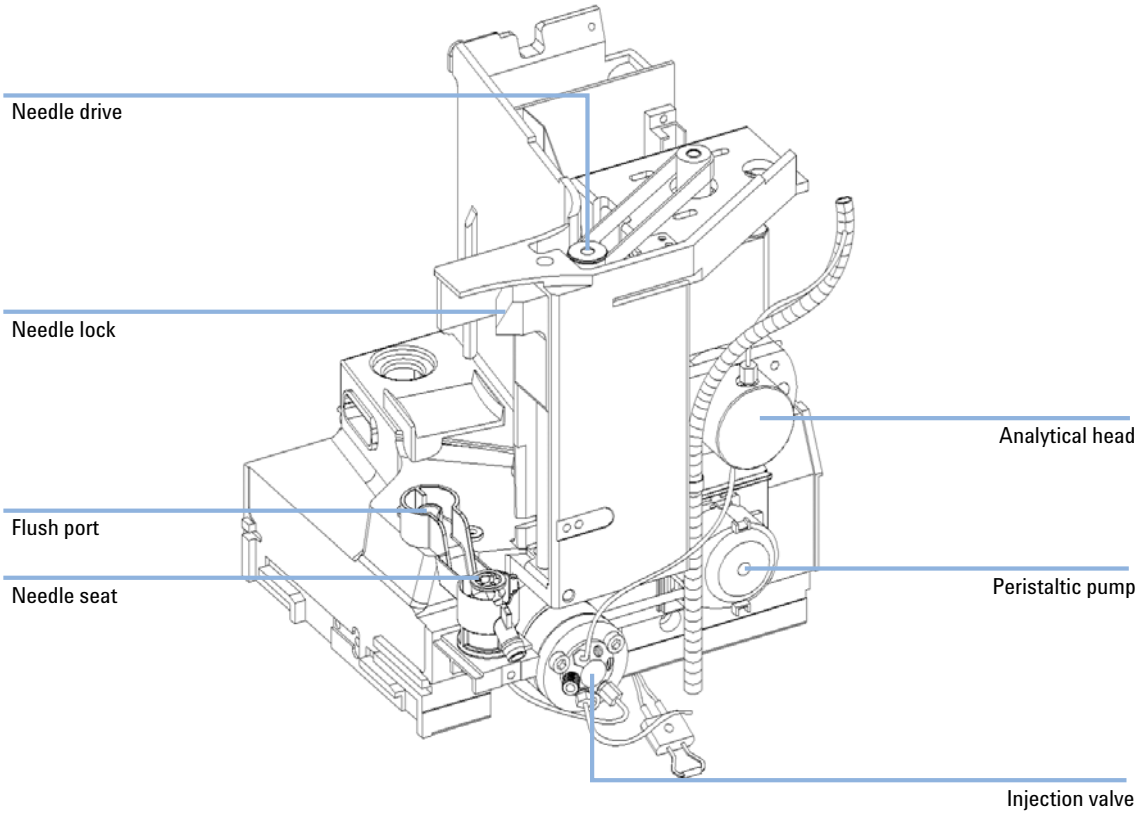


Figure 5 Sampling unit

Analytical Head

The analytical head is driven by the stepper motor connected to the drive shaft by a toothed belt. The drive nut on the spindle converts the circular movement of the spindle to linear motion. The drive nut pushes the sapphire plunger against the tension of the spring into the analytical head. The base of the plunger sits on the large bearing of the drive nut, which ensures the plunger is always centered. A ceramic ring guides the movement of the plunger in the analytical head. The home position of the plunger is sensed by an infra-red sensor on the sampling unit flex board, while the sample volume is determined by counting the number of steps from the home position (7 nl/motor step). The backward movement of the plunger (driven by the spring) draws sample from the vial.

To reduce potential user mistakes different versions of analytical heads are recognized by RF-tags sitting on the exchangeable assembly.

Table 1 Analytical head Technical Data

	Standard 100 µl (G1367-60003)	**High Pressure 40µl (G1377-60023)**	**Micro 40 µl (G1377-60013)**
Number of steps	15000	15000	60000
Volume resolution	14 nl/motor step	5.6 nl/motor step	1.4 nl/motor step
Maximum stroke	100 µl	40 µl	40 µl
Pressure limit	400 bars	600 bars	400 bars
Plunger material	Sapphire	Sapphire	Sapphire

Injection-Valve

A high pressure 6-port/2-position-valve to direct streams of mobile phase and sample to different directions (e.g. via loop to column or directly to column).

The two-position 6-port injection valve is driven by a stepper motor. Only five of the six ports are used (port 3 is not used). A lever/slider mechanism transfers the movement of the stepper motor to the injection valve. Two microswitches monitor switching of the valve (bypass and mainpass end positions). The injection valve has a ceramic stator, Vespel rotor seal (Tefzel seal available), and stainless-steel head. Three screws hold the head and internal components in place. No valve adjustments are required after replacing internal components.

Table 2 Injection-Valve Technical Data

	Standard (0101-0921)	Micro (0101-1050)	High pressure (0101-1422)
Motor type	4 V, 1.2 A stepper motor	4 V, 1.2 A stepper motor	4 V, 1.2 A stepper motor
Seal material	Vespel™ or Tefzel™	Vespel™	PEEK
Stator material	Ceramic/PEEK	Head coated SST	Ultralife
Number of ports	6	6	6
Switching time	< 150 ms	< 150 ms	< 150 ms

Needle Flush Station

A needle flush station to wash the outer surface of the injection needle and a peristaltic pump to deliver fresh solvent to the wash station. (The reservoir for the solvent is located in the solvent cabinet, the waste is channeled by a separate flex tube to a waste bottle.

Needle Lock

A needle lock is used to support the needle carrier in its function making a firm seal of the needle in its seat.

The needle lock arm is driven by a stepper motor connected to the spindle assembly by a toothed belt.

Needle/Sample Transport Assembly

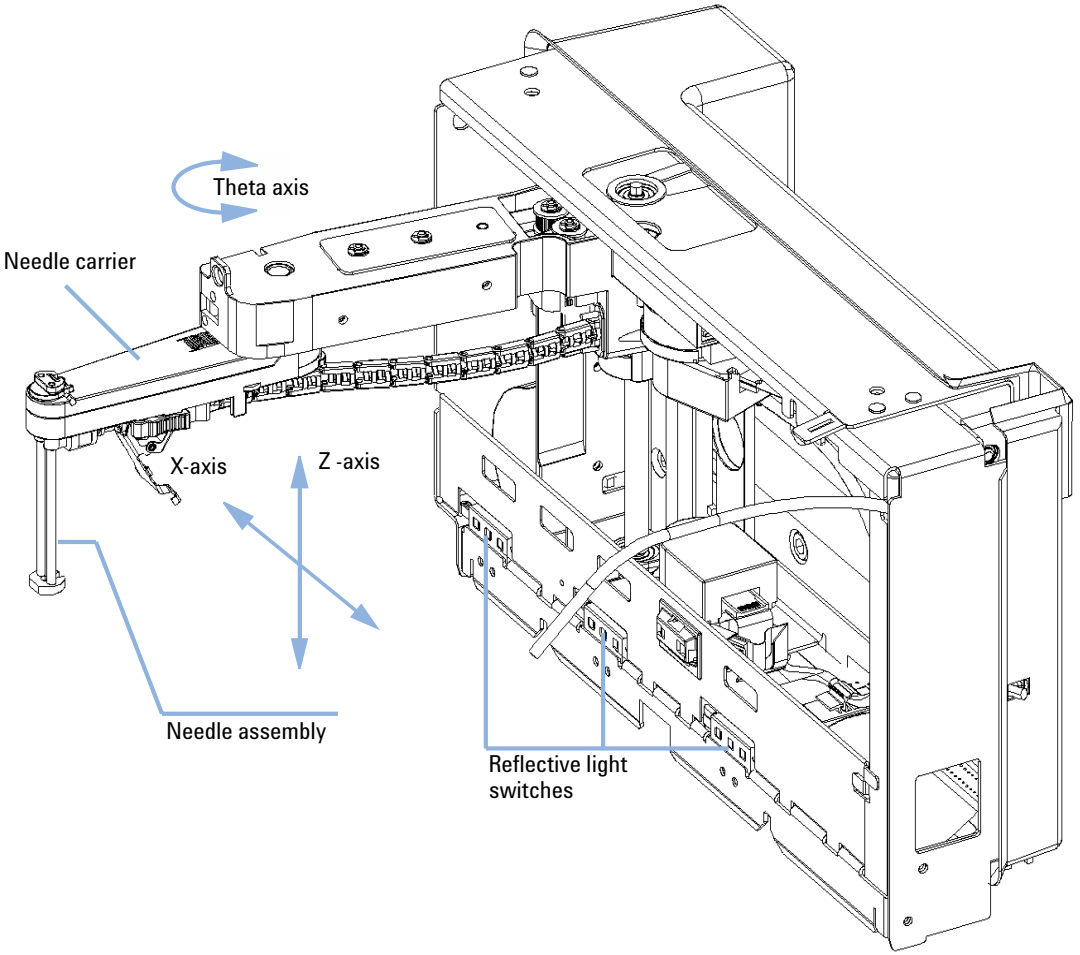


Figure 6 Needle/Sample Transport Assembly

The needle/sample transport is a multifunctional module capable of moving the needle into various positions (such as different wells in two different plates, different vials, needle wash position and the needle-seat position). The active movable axes are the X-axis, the Z-axis and the theta-axis, the vial-/plate pusher is an additional passive axis. All axes are stepper motor driven and encoder controlled in order to have tight feedback for the axes position. The theta and Z axes have spring loaded belt-tensioner.

Reflective light switches detect the presence and type of different trays. The X-slide carries the antenna and electronics of a RF-sensor. This device has multiple functions:

- It allows to read and write information from a tag, located in the new tray.
- It allows to increase the number of different trays.
- It allows to read the revision and other data tags of the needle/sample transport assembly and sampling unit.

Complex flex boards make the electrical connection to the various motors, sensors and the MTP-board. The needle carrier has an integrated plate/vial pusher with an additional linear encoder to sense vials and the presence of plates.

The needle and the loop capillary are user-exchangeable.

The back of the needle/sample transport assembly has a cover to protect the electronics from potential solvent vapor.

Advanced Operating Modes

Multi-Draw Mode (Optional)

The multi-draw mode provides injection volumes up to 1500 µl. In this case a capillary which holds the additional volume is assembled between seat and valve. Then the aspirated sample is pushed into the enlarged seat capillary before repetitive aspiration starts. After the last aspiration took place the injection valve switches and the mobile phase transports sample towards column.

Injector Program

A sequence of all available single sampling steps can be tailored to customer needs for special applications. Injector program capability is offered with the standard instrument

Active Needle Wash

The active needle wash mode allows also the flushing of the outer surface of the needle. This results in an additional decrease of sample carry-over. Duration of the procedure is setable.

Overlap Injection Cycle

Overlapped injection is the mode where the autosampler runs the injector program for the next analysis during the current analysis (without injecting).

After the sample has reached the column the valve is switched back to bypass and the next injection cycle starts but waits with switching to main-pass until the actual run is finished. This mode allows it to increase the sample throughput.

Low Delay Volume Mode

This mode is especially interesting for gradient elution with small bore or capillary columns. The injection valve is switched back to bypass after the sample is eluted beyond the injection valve port # 6. This decreases the delay volume, because the gradient needs not to pass the metering device and the loop capillary.

Early Maintenance Feedback (EMF)

The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-settable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

For details on EMF counters and how to use them, see Agilent Lab Advisor.

Electrical Connections

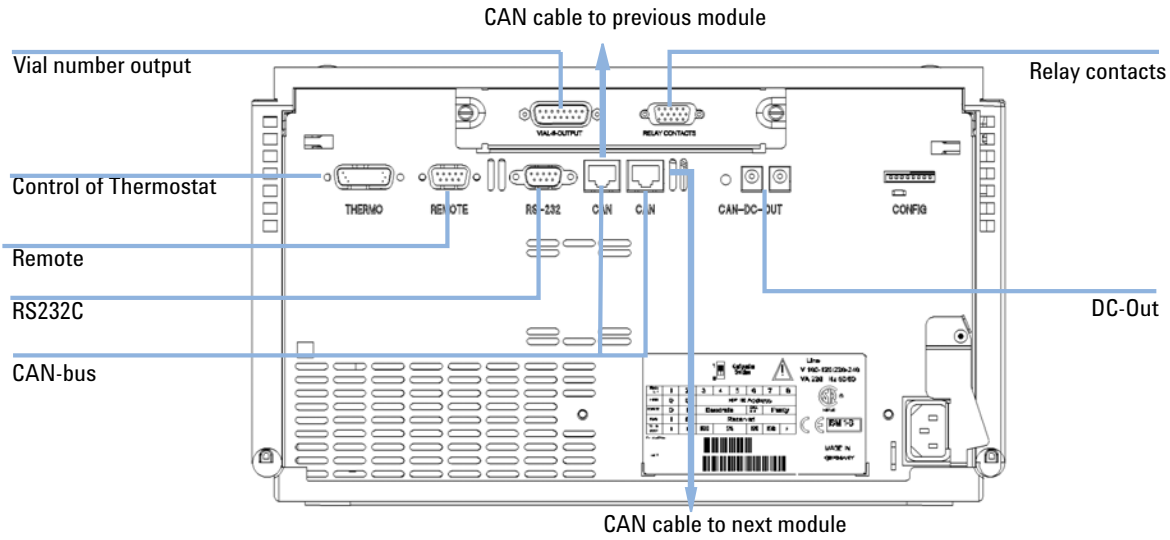


Figure 7 Autosampler Electrical Connections

Interfaces

The Agilent 1200 Infinity Series modules provide the following interfaces:

Table 3 Agilent 1200 Infinity Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Special
Pumps							
G1310B Iso Pump G1311B Quat Pump G1311C Quat Pump VL G1312B Bin Pump G1312C Bin Pump VL 1376A Cap Pump G2226A Nano Pump	2	Yes	No	Yes	1	Yes	
G4220A/B Bin Pump	2	No	Yes	Yes	No	Yes	
G1361A Prep Pump	2	Yes	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves
Samplers							
G1329B ALS G2260A Prep ALS	2	Yes	No	Yes	No	Yes	THERMOSTAT for G1330B
G1364B FC-PS G1364C FC-AS G1364D FC-µS G1367E HiP ALS G1377A HiP micro ALS G2258A DL ALS	2	Yes	No	Yes	No	Yes	THERMOSTAT for G1330B CAN-DC- OUT for CAN slaves
G4226A ALS	2	Yes	No	Yes	No	Yes	
Detectors							
G1314B VWD VL G1314C VWD VL+	2	Yes	No	Yes	1	Yes	
G1314E/F VWD	2	No	Yes	Yes	1	Yes	

Table 3 Agilent 1200 Infinity Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Special
G4212A/B DAD	2	No	Yes	Yes	1	Yes	
G1315C DAD VL+ G1365C MWD G1315D DAD VL G1365D MWD VL	2	No	Yes	Yes	2	Yes	
G1321B FLD G1362A RID	2	Yes	No	Yes	1	Yes	
G4280A ELSD	No	No	No	Yes	Yes	Yes	EXT Contact AUTOZERO
Others							
G1316A/C TCC	2	No	No	Yes	No	Yes	
G1322A DEG	No	No	No	No	No	Yes	AUX
G1379B DEG	No	No	No	Yes	No	No	AUX
G4227A Flex Cube	2	No	No	No	No	No	
G4240A CHIP CUBE	2	Yes	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves THERMOSTAT for G1330A/B (NOT USED)

NOTE The detector (DAD/MWD/FLD/VWD/RID) is the preferred access point for control via LAN. The inter-module communication is done via CAN.

- CAN connectors as interface to other modules
- LAN connector as interface to the control software
- RS-232C as interface to a computer
- REMOTE connector as interface to other Agilent products
- Analog output connector(s) for signal output

Overview Interfaces

CAN

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

LAN

The modules have either an interface slot for an LAN card (e.g. Agilent G1369A/B LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a connected PC with the appropriate control software.

NOTE If an Agilent detector (DAD/MWD/FLD/VWD/RID) is in the system, the LAN should be connected to the DAD/MWD/FLD/VWD/RID (due to higher data load). If no Agilent detector is part of the system, the LAN interface should be installed in the pump or autosampler.

RS-232C (Serial)

The RS-232C connector is used to control the module from a computer through RS-232C connection, using the appropriate software. This connector can be configured with the configuration switch module at the rear of the module. Refer to *Communication Settings for RS-232C*.

NOTE There is no configuration possible on main boards with on-board LAN. These are pre-configured for

- 19200 baud,
- 8 data bit with no parity and
- one start bit and one stop bit are always used (not selectable).

The RS-232C is designed as DCE (data communication equipment) with a 9-pin male SUB-D type connector. The pins are defined as:

Table 4 RS-232C Connection Table

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

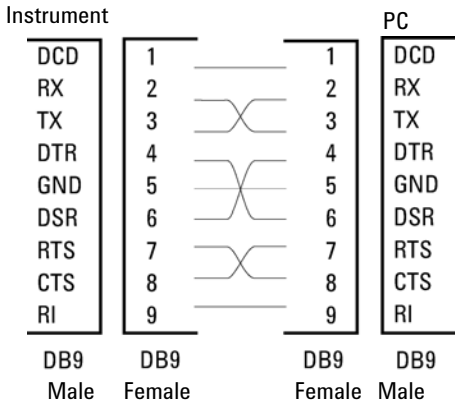


Figure 8 RS-232 Cable

Analog Signal Output

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

APG Remote

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

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

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

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

- standard TTL levels (0 V is logic true, + 5.0 V is false),
- fan-out is 10,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

NOTE All common TTL circuits operate with a 5 V power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5.0 V (with respect to the ground terminal).

Table 5 Remote Signal Distribution

Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
4	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
5		Not used
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

Special Interfaces

Some modules have module specific interfaces/connectors. They are described in the module documentation.

Setting the 8-bit Configuration Switch (On-Board LAN)

The 8-bit configuration switch is located at the rear of the module. Switch settings provide configuration parameters for LAN, serial communication protocol and instrument specific initialization procedures.

All modules with on-board LAN, e.g. G1315/65C/D, G1314D/E/F, G4212A/B, G4220A:

- Default is ALL switches DOWN (best settings) - Bootp mode for LAN.
- For specific LAN modes switches 3-8 must be set as required.
- For boot/test modes switches 1+2 must be UP plus required mode.

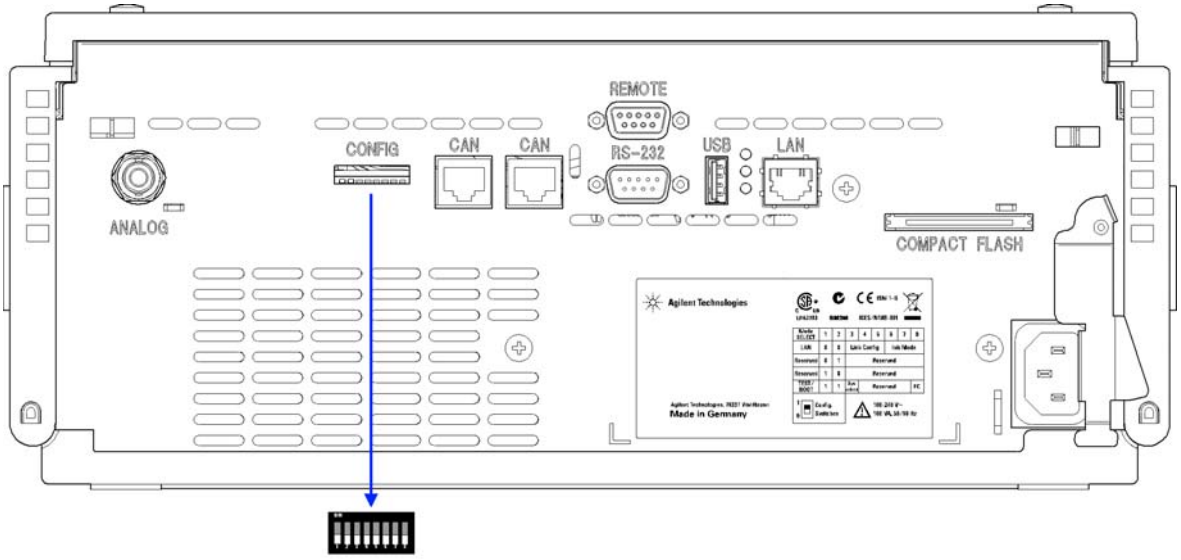


Figure 9 Location of Configuration Switch (example shows a G4212A DAD)

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF. For details on the LAN settings/configuration refer to chapter LAN Configuration.

Table 6 8-bit Configuration Switch (with on-board LAN)

	Mode		Function					
	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
LAN	*0*	*0*	Link Configuration			Init Mode Selection		
Auto-negotiation			*0*	x	x	x	x	x
10 MBit, half-duplex			1	*0*	*0*	x	x	x
10 MBit, full-duplex			1	*0*	1	x	x	x
100 MBit, half-duplex			1	1	*0*	x	x	x
100 MBit, full-duplex			1	1	1	x	x	x
Bootp			x	x	x	*0*	*0*	*0*
Bootp & Store			x	x	x	*0*	*0*	1
Using Stored			x	x	x	*0*	1	*0*
Using Default			x	x	x	*0*	1	1
TEST	1	1	System					NVRAM
Boot Resident System			1					x
Revert to Default Data (Coldstart)			x	x	x			1

Legend:

0 (switch down), 1 (switch up), x (any position)

NOTE When selecting the mode TEST, the LAN settings are: Auto-Negotiation & Using Stored.

NOTE For explanation of "Boot Resident System" and "Revert to Default Data (Coldstart)" refer to "Special Settings" on page 35.

Setting the 8-bit Configuration Switch (without On-Board LAN)

The 8-bit configuration switch is located at the rear of the module.

Modules that do not have their own LAN interface (e.g. the TCC) can be controlled through the LAN interface of another module and a CAN connection to that module.

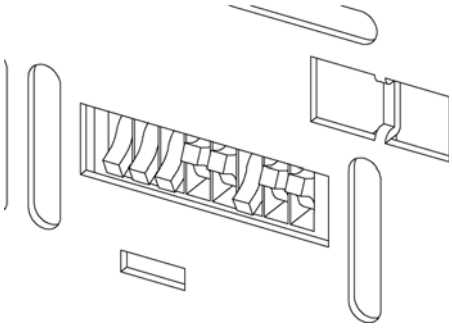


Figure 10 Configuration switch (settings depend on configured mode)

All modules without on-board LAN:

- default is ALL DIPS DOWN (best settings) - Bootp mode for LAN
- for boot/test modes DIPS 1+2 must be UP plus required mode

Switch settings provide configuration parameters for GPIB address, serial communication protocol and instrument specific initialization procedures.

NOTE With the introduction of the Agilent 1260 Infinity, all GPIB interfaces have been removed. The preferred communication is LAN.

NOTE The following tables represent the configuration switch settings for the modules without on-board LAN only.

Table 7 8-bit Configuration Switch (without on-board LAN)

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

NOTE The LAN settings are done on the LAN Interface Card G1369A/B. Refer to the documentation provided with the card.

Communication Settings for RS-232C

The communication protocol used in the column compartment supports only hardware handshake (CTS/RTR).

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

Table 8 Communication Settings for RS-232C Communication (without on-board LAN)

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

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

Table 9 Baudrate Settings (without on-board LAN)

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

Table 10 Data Bit Settings (without on-board LAN)

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

Table 11 Parity Settings (without on-board LAN)

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

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

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

Special Settings

The special settings are required for specific actions (normally in a service case).

NOTE The tables include both settings for modules – with on-board LAN and without on-board LAN. They are identified as LAN and no LAN.

Boot-Resident

Firmware update procedures may require this mode in case of firmware loading errors (main firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident mode. It is not operable as a module. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Table 12 Boot Resident Settings (without on-board LAN)

	Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
LAN	TEST/BOOT	1	1	1	0	0	0	0	0
No LAN	TEST/BOOT	1	1	0	0	1	0	0	0

Forced Cold Start

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

CAUTION Loss of data

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

➔ Save your methods and data before executing a forced cold start.

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

Table 13 Forced Cold Start Settings (without on-board LAN)

	Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
LAN	TEST/BOOT	1	1	0	0	0	0	0	1
No LAN	TEST/BOOT	1	1	0	0	1	0	0	1

2
Site Requirements and Specifications

This chapter describes the site requirements and specifications of the High Performance Micro Autosampler.

Site Requirements

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

Power Consideration

The autosampler power supply has wide-ranging capability (see Table 14 on page 41). Consequently there is no voltage selector in the rear of the autosampler. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

The thermostatted autosampler comprises two modules, the sampler (G1367B/D or G1377A) and the thermostat (G1330B). Both modules have a separate power supply and a power plug for the line connections. The two modules are connected by a control cable and both are turned on by the sampler module. The thermostat power supply has two externally accessible fuses.

WARNING

Damaged electronics

Disconnecting or reconnecting the sampler to thermostat cable when the power cords are connected to either of the two modules will damage the electronics of the modules.

➔ Make sure the power cords are unplugged before disconnecting or reconnecting the sampler to thermostat cable.

WARNING

Incorrect line voltage at the instrument

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

➔ Connect your instrument to the specified line voltage.

CAUTION

Unaccessable power plug.

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

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

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

Power Cords

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

WARNING

Absence of ground connection or use of unspecified power cord

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

➔ Never operate your instrumentation from a power outlet that has no ground connection.

➔ Never use a power cord other than the Agilent Technologies power cord designed for your region.

WARNING

Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

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

WARNING

Unintended use of supplied power cords

Using power cords for unintended purposes can lead to personal injury or damage of electronic equipment.

➔ Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.

Bench Space

The module dimensions and weight (see Table 14 on page 41) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench should carry an Agilent system, make sure that the bench is designed to bear the weight of all modules.

The module should be operated in a horizontal position.

Condensation

CAUTION

Condensation within the module

Condensation will damage the system electronics.

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

➔ If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.

Physical Specifications

Table 14 Physical Specifications

Type	Specification	Comments
Weight	15.5 kg (35 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	300 VA / 200 W / 683 BTU	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 (6562 ft)	
Non-operating altitude	Up to 4600 m (15091 ft)	For storing the module
Safety standards: IEC, CSA, UL	Installation Category II, Pollution Degree 2	For indoor use only.

Performance Specifications

Table 15 Performance Specifications

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
Safety features	Leak detection and safe leak handling, low voltages in maintenance areas, error detection and display
Injection range	0.01– 8 µl in 0.01 µl increments with the small loop capillary 0.01– 40 µl in 0.01 µl increments with the extended loop capillary
Precision	Typically < 0.5% RSD of peak areas from 5 – 40 µl, Typically < 1% RSD from 1 – 5 µl Typically < 3% RSD from 0.2 – 1 µl
Pressure range	up to 400 bar (5880 psi)
Sample viscosity range	0.2 – 5 cp
Sample capacity	2 × well-plates (MTP) + 10 × 2 ml vials 108 x 2-mL vials in 2 x 54 vial plate plus 10 additional 2 mL vials 30 x 6-mL vials in 2 x 15 vial plate plus 10 additional 2 mL vials 54 Eppendorf tubes (0.5/1.5/2.0 mL) in 2 x 27 Eppendorf tube plate
Injection cycle time	Typically < 30 s using following standard conditions: Default draw speed: 4 µl/min Default eject speed: 10 µl/min Injection volume: 0.1 µl
Carry-over	Typically < 0.05% using the following conditions: Column: 150 x 0.5 mm Hypersil ODS, 3 µm Mobile phase: Water/Acetonitrile = 85/15 Column Flow rate: 13 µl/min Injection volume: 1 µl caffeine (=25 ng caffeine), 1 µl water to test carryover Outside wash of needle before injection: 20 sec with water using flush port

3 Installing the Autosampler

This chapter describes the installation of the High Performance Micro Autosampler.

Unpacking the Sampler

NOTE If you need to ship the autosampler at a later date, always use the shipping protection foam parts (see "Transporting the Sampler" on page 62).

Damaged Packaging

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

Delivery Checklist

Ensure all parts and materials have been delivered with the 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.

Accessory Kits

p/n	Description
5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
9222-0518	Bag - plastics
G1315-45003	Torque adapter
G1367-60006	WPS Leak Kit
G1375-87304	Fused silica/PEEK capillary 50 µm, 50 cm
G1375-87316	Seat Capillary (150 mm 0.075 mm ID) for G1377-87101 Needle Seat
G1329-43200	Adapter air channel
5181-1519	CAN cable, Agilent module to module, 1 m
8710-1534	Wrench, 4 mm both ends, open end
G1377-44900	tool for Micro Seat Capillary Mounting
G1377-87300	Loop capillary, 40 µL for G1377A

Optimizing the Stack Configuration

If your autosampler is part of a system, you can ensure optimum performance, ensuring minimum delay volume by installing the following configuration. Figure 11 on page 47 and Figure 12 on page 48 show the configuration recommended for the sampler. Figure 13 on page 49 and Figure 14 on page 50 show the configuration recommended for the thermostatted sampler.

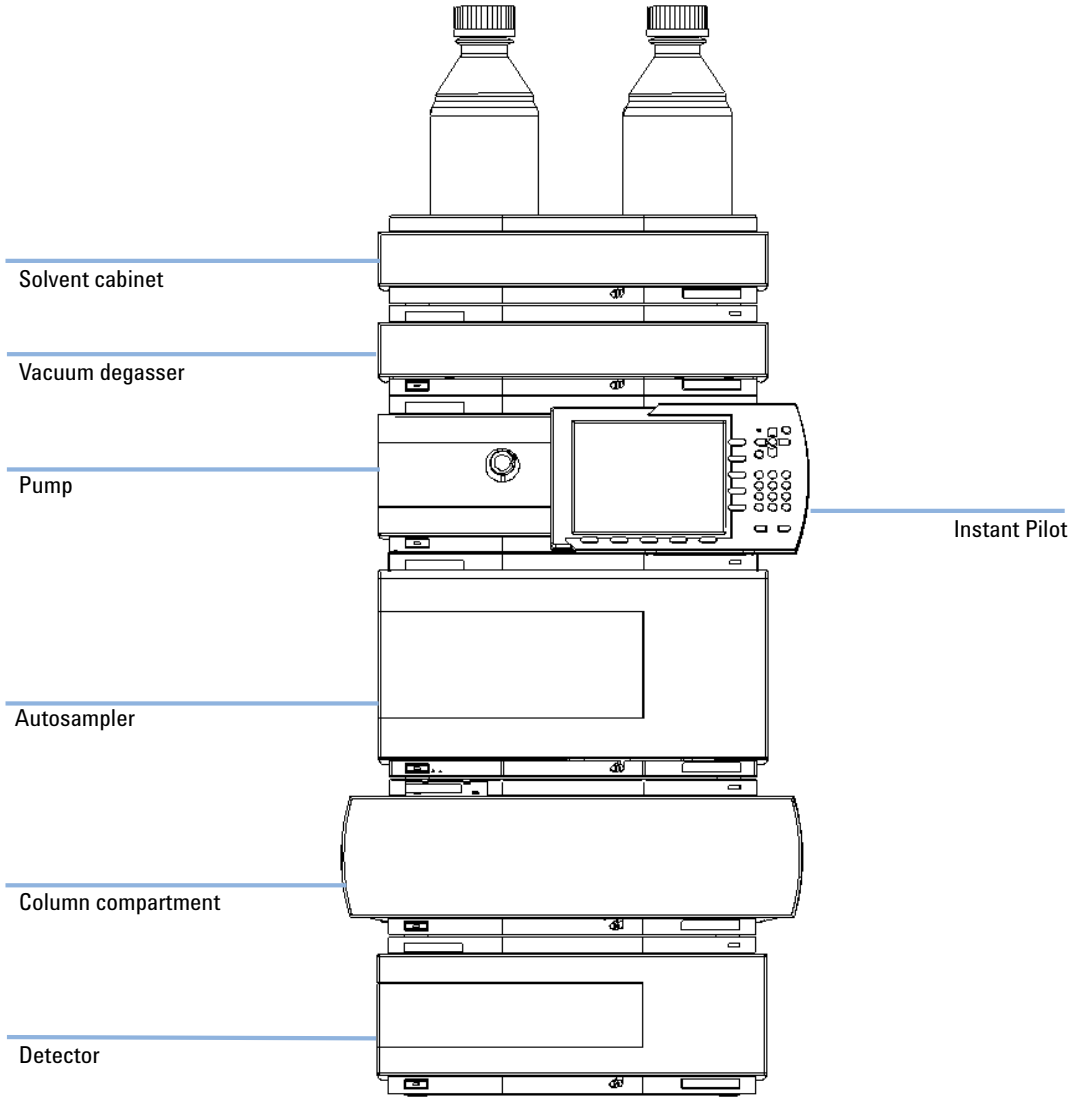


Figure 11 Recommended Stack Configuration - Well Plate Autosampler (Front View)

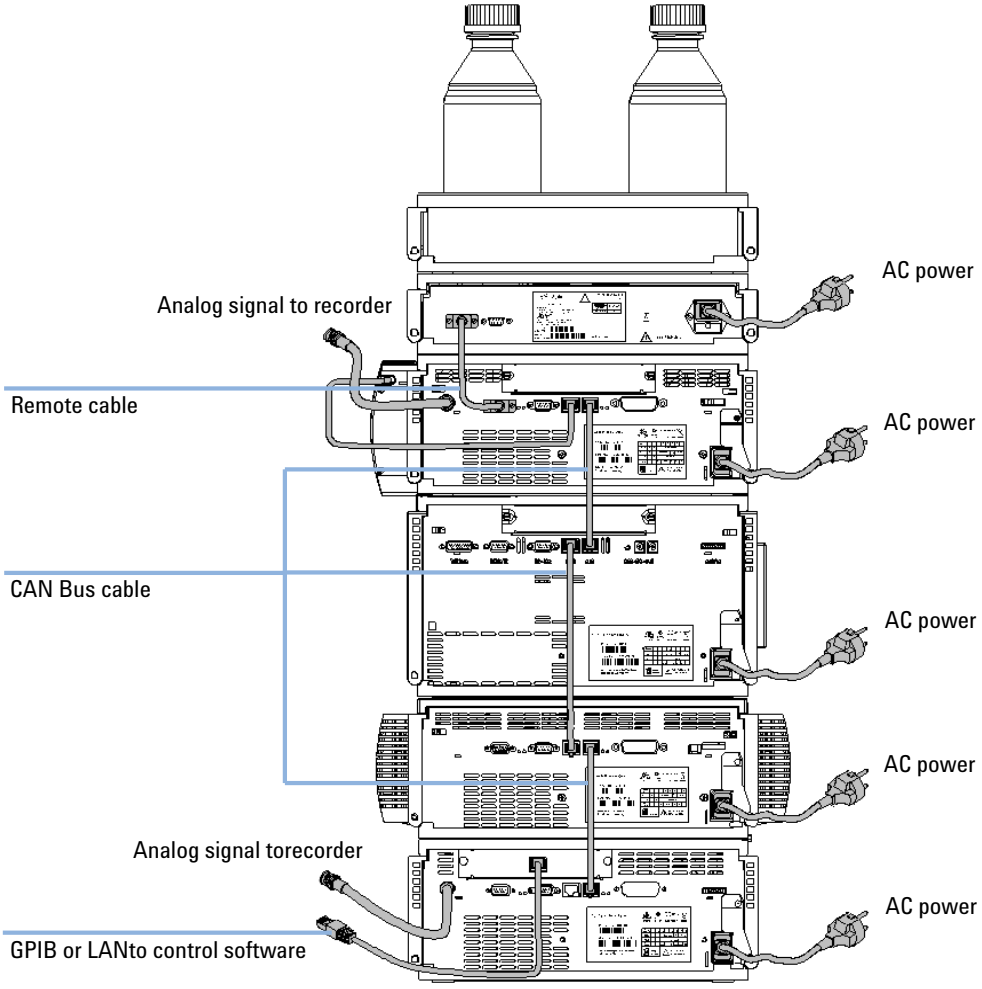


Figure 12 Recommended Stack Configuration - Well Plate Autosampler (Rear View)

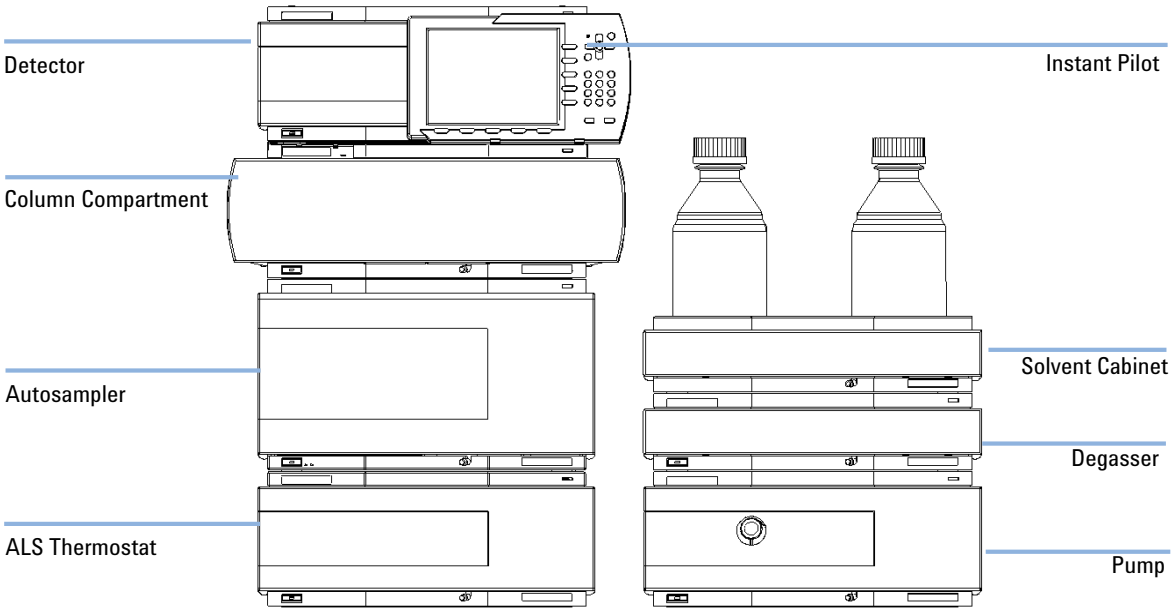


Figure 13 Recommended Stack Configuration - Thermostatted Autosampler (Front View)

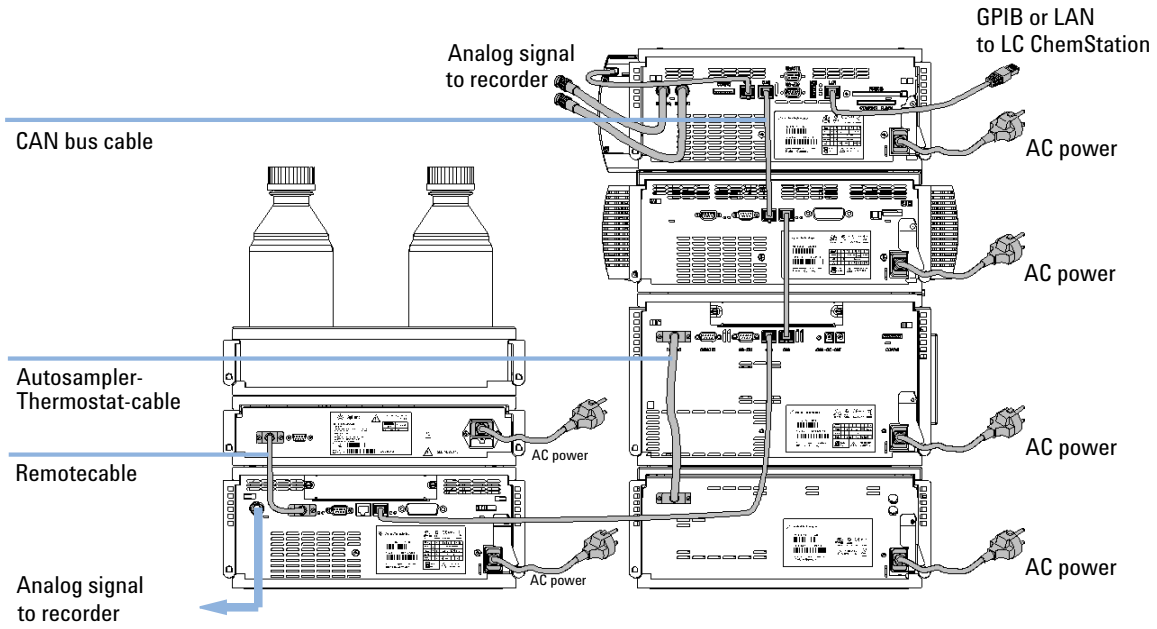


Figure 14 Recommended Stack Configuration - Thermostatted Autosampler (Rear View)

Installing the Autosampler

Parts required

#	Description
1	Sampler Power cord.

Preparations

- Locate bench space Provide power connections Unpack the sampler

WARNING

Instruments are partially energized when switched off

The power supplies still use some power, even if the power switch on the front panel is turned off.

➔ To disconnect the thermostatted autosampler from line power, unplug the power cord from the autosampler and the ALS thermostat.

➔ Make sure that it is always possible to access the power plug.

WARNING

Personal injury

To avoid personal injury, keep fingers away from the needle area during autosampler operation.

➔ Do not attempt to insert or remove a vial or a plate when the needle is positioned.

CAUTION

"Defective on arrival" problems

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

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

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

1 Install the LAN interface board in the sampler (if required).
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 Re-install the corrugated waste tube in the plastic port.
6 Re-install the left side door (take care of the magnet at the back).
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 modules.
11 If a Agilent ChemStation is the controller, connect the LAN connection to the LAN interface
12 Connect the APG remote cable (optional) for non Agilent 1200 Infinity Series instruments.
13 Ensure the side panel is correctly installed.
14 Turn ON power by pushing the button at the lower left hand side of the sampler.

15 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 off.

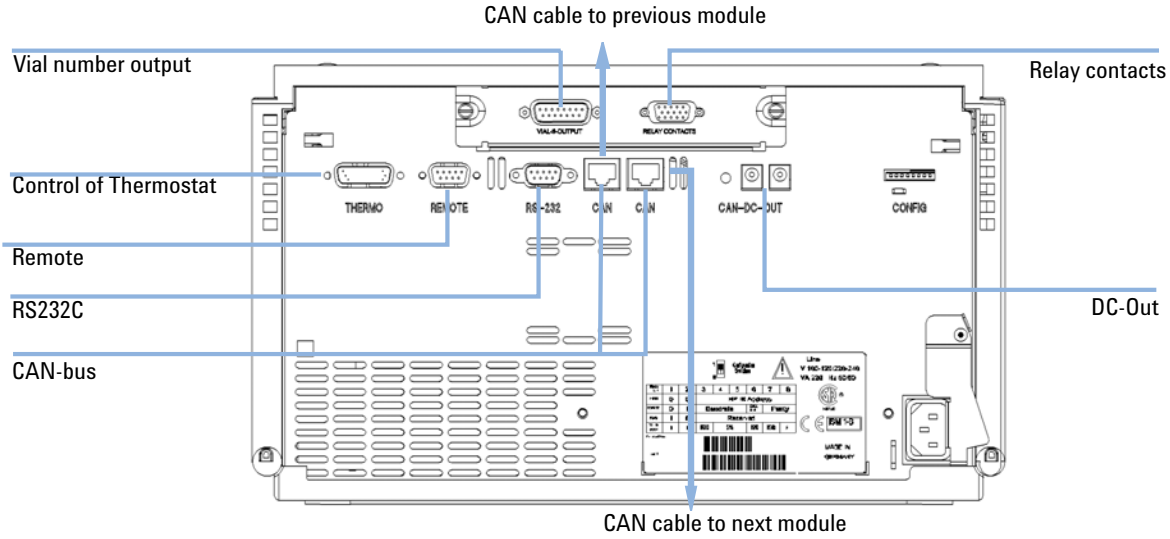


Figure 15 Cable Connections

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.

Installing a Thermostatted Autosampler

Parts required

#	Description
1	Sampler and thermostat Power cord.

Preparations

- Locate bench space Provide power connections Unpack the sampler and the thermostat

WARNING

Instrument is partially energized when switched off

The power supply still uses some power, even if the power switch at the front of the panel is turned off.

➔ To disconnect the sampler from the line, unplug the power cord.

CAUTION

Damaged electronics

Disconnecting or reconnecting the sampler to thermostat cable when the power cords are connected to either of the two modules will damage the electronics of the modules.

➔ Make sure the power cords are unplugged before disconnecting or reconnecting the sampler to thermostat cable.

CAUTION

Damage through condensation

If the condensation 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.

➔ Make sure that the condensation tube is always above the liquid level in the vessel.

WARNING

Personal injury

To avoid personal injury, keep fingers away from the needle area during autosampler operation.

➔ Do not attempt to insert or remove a vial or a plate when the needle is positioned.

1 Place the thermostat on the bench.

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

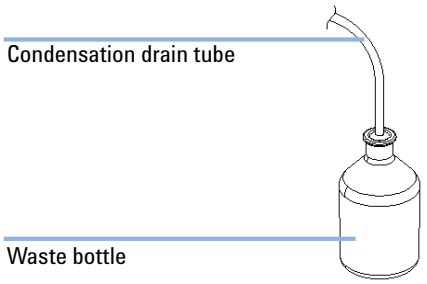


Figure 16 Condensation leak outlet

3 Install the LAN interface board in the sampler (if required).

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 Re-install the corrugated waste tube in the plastic 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 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 pressed down. This assures that the cold airstream from the thermostat is correctly guided to the tray area of the well plate sampler.

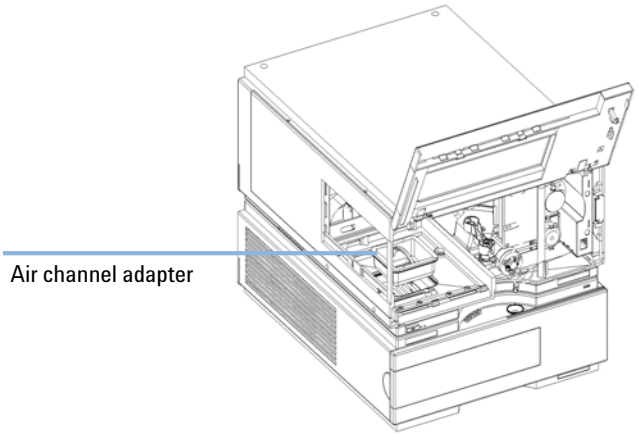


Figure 17 Installation of Thermostat and Autosampler

11 Re-install the tray.

12 Ensure the power switch on the front of the sampler is 0FF and the power cables are disconnected.

13 Connect the cable between the sampler and the thermostat, see Figure 18 on page 57.

14 Connect the power cables to the power connectors.

15 Connect the CAN cable to other Agilent modules.

16 If a Agilent ChemStation is the controller, connect the LAN connection to the LAN interface

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

18 Ensure the side panel is correctly installed.

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

20 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 tile hardware initialisation process. At the end of this process the status LED should be off.

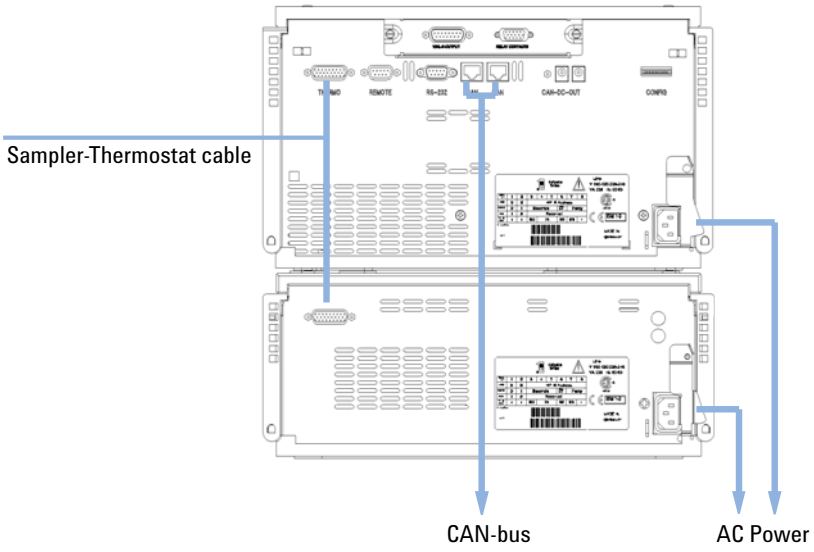


Figure 18 Connection at the rear of thermostatted Autosampler

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.

Flow Connections to the Sampler

Parts required

#	Description
1	Parts from the accessory kits, see "Accessory Kits" on page 45

Preparations

- Sampler is installed in the LC system

WARNING

When opening capillary or tube fittings solvents may leak out.

The handling of toxic and hazardous solvents and reagents can bear health risks.

➔ Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

1. Connect the pump outlet capillary to port 1 of the injection valve.
2. Connect column-compartment inlet capillary to port 6 of the injection valve.
3. Connect the corrugated waste tube to the seat adapter and the solvent waste from the leak plane.
4. Ensure that the waste tube is positioned inside the leak channel.
5. Drive the tube from the peristaltic flush pump to the solvent bottle in the solvent cabinet

6 Seat capillary: see recommendations in “Choice of Seat Capillary” on page 87

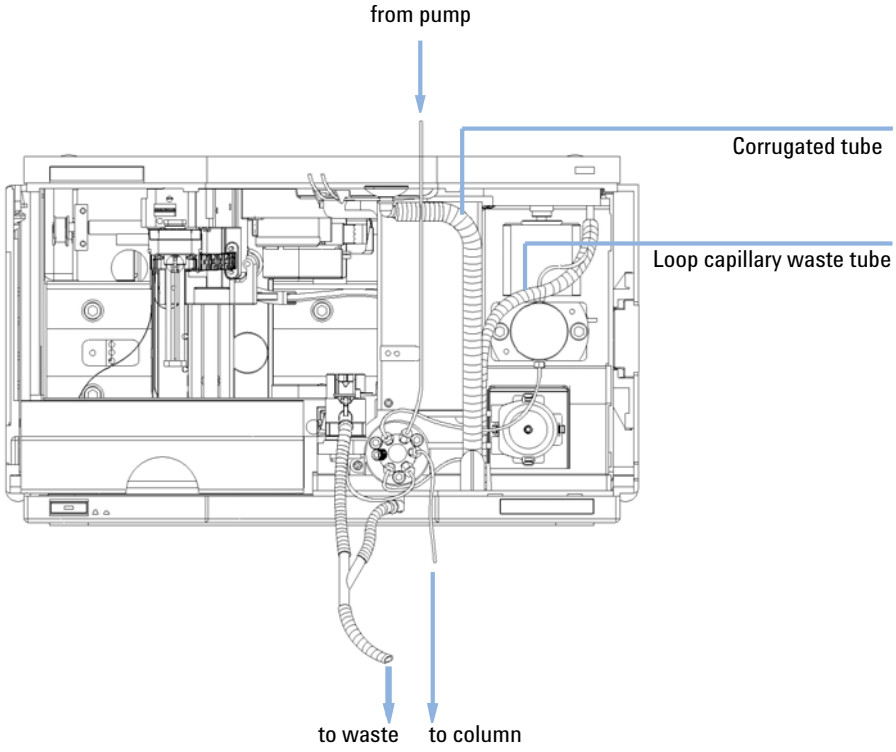


Figure 19 Hydraulic Connections

Installing the Sample Tray

1. Press the bottom on the right side to release the front door.
2. Lift the front door.
3. Load the sample tray with sample well plates and vials as required.
4. Slide the sample tray into the autosampler so that the rear of the sample tray is seated firmly against the rear of the sample-tray area.
5. Press the front of the sample tray down to secure the tray in the autosampler.

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

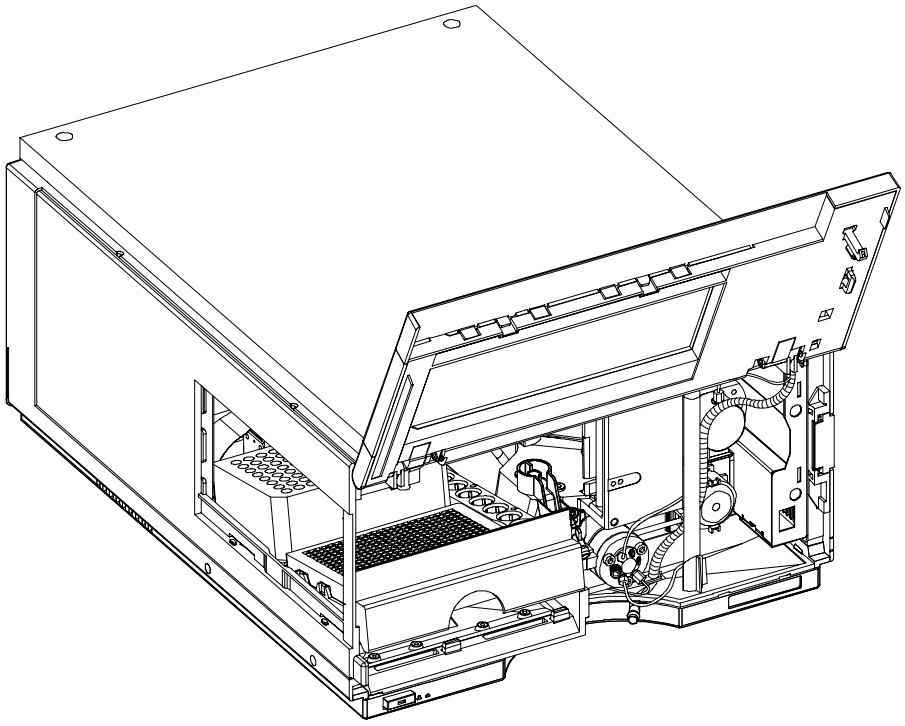


Figure 20 Installing the Sample Tray

Transporting the Sampler

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

- The transport assembly is in the park position. Use the Lab Monitor and Diagnostic software or the Instant Pilot for this command.
- The vial tray and the sample transport mechanism is secured with the transport protection foam.

4
Using the Autosampler

This chapter describes the usage of the High Performance Micro Autosampler.

Sample Trays

Supported Trays for an Autosampler

Table 16 Trays for an Autosampler

G2258-60011	Tray for 2 well plates or vial plates and 10 x 2 ml vials

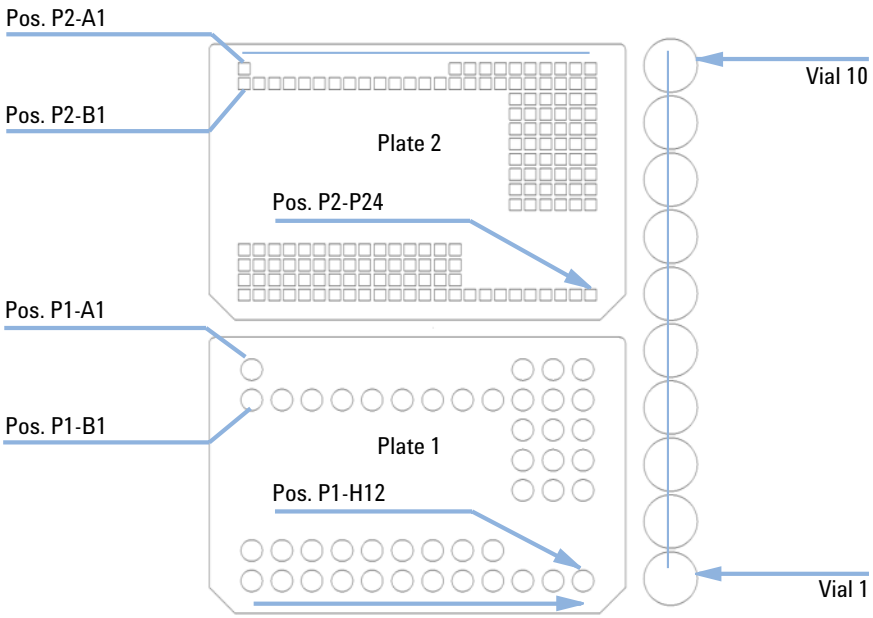


Figure 21 Numbering of vial and well plate position

List of Recommended Plates and Closing Mat

WARNING

Explosive gas mixtures

There is a risk of building explosive gas mixtures in the instrument if flammable solvents are used.

➔ Cover the plates.

➔ Remove the plates from the sampler after turning it OFF.

WARNING

Contamination with adhesives

Closing mats with adhesive can give some contamination in the system. The adhesive is soluble in most of the solvents used in HPLC.

➔ In general do not use closing mats with adhesive. The sampler has no prepunch needle, therefore the adhesive will clog the needle after several injections.

Table 17 Recommended plates and closing mat

Description	Rows	Columns	Plate height	Volume (µl)	Part Number	Package
384Agilent	16	24	14.4	80	p/n 5042-1388	30
384Corning	16	24	14.4	80	No Agilent PN	
384Nunc	16	24	14.4	80	No Agilent PN	
96Agilent	8	12	14.3	400	p/n 5042-1386 p/n 5042-1385	10 120
96Agilent conical	8	12	17.3	150	p/n 5042-8502	25
96CappedAgilent	8	12	47.1	300	p/n 5065-4402	1
96Corning	8	12	14.3	300	No Agilent PN	
96CorningV	8	12	14.3	300	No Agilent PN	
96DeepAgilent31mm	8	12	31.5	1000	p/n 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	
Closing mat for all 96 Agilent plates	8	12			p/n 5042-1389	50

Table 18 Recommended Vial plates

Description	Part Number
• Vial plate for 54 x 2 ml vials (6/pk)	p/n G2255-68700
• Vial plate for 15 x 6 ml vials (1/pk)	p/n 5022-6539
• Vial Plate for 27 Eppendorf tubes	p/n 5022-6538

List of Recommended Vials and Caps

Table 19 Crimp Top Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	p/n 5181-3375	p/n 5183-4491	
Clear glass, write-on spot	2	p/n 5182-0543	p/n 5183-4492	p/n 5183-4494
Amber glass, write-on spot	2	p/n 5182-3376	p/n 5183-4493	p/n 5183-4495

Table 20 SnapTop Vials

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

Table 21 Screw Top Vials

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

Table 22 Crimp Caps

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

Table 23 Snap Caps

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

Table 24 Screw Caps

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

Configure Well Plate Types

If the plate you are using is not found on the "List of Recommended Plates and Closing Mat" on page 65 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.

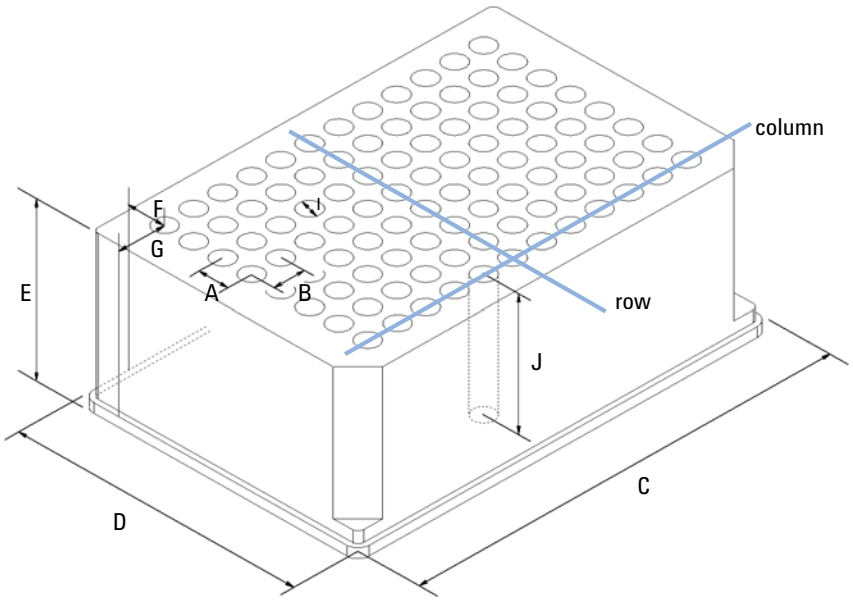


Figure 22 Well Plate Dimensions (straight)

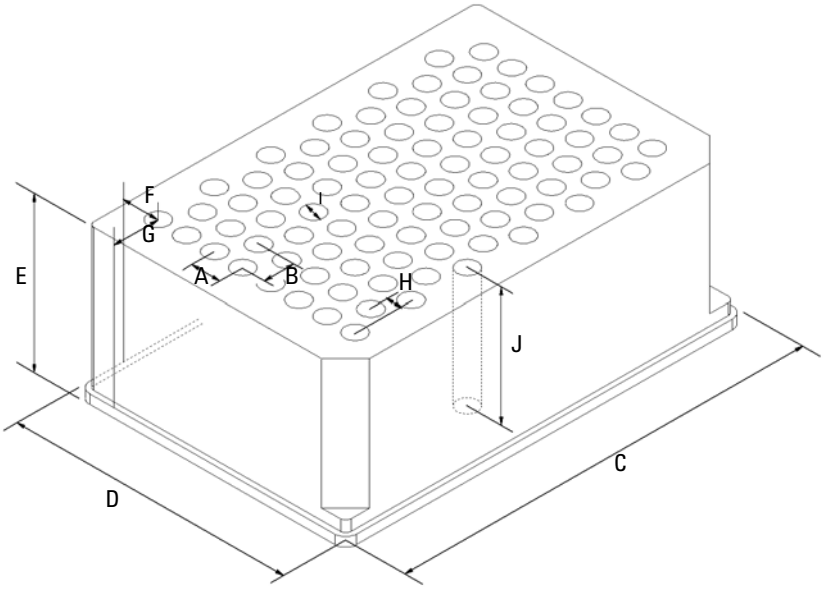


Figure 23 Well Plate Dimensions (staggered)

Table 25 Well Plate Dimensions

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	up to 47 mm
F	Row offset	Distance (in mm) from the back edge (bottom) to the center of the first hole (A1)	
G	Column offset	Distance (in mm) from the left 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	
I	Well diameter	Diameter (in mm) of the well	at least 4 mm
J	Well depth	Distance (in mm) from the top of the plate to the bottom of the well	up to 45 mm

NOTE The distances need to be measured with high precision. It is recommended to use calipers.

Turn ON and Initialization Steps

A successful turn-on/initialization takes about 3.5 minutes, and consists of five steps

1. WPS turn on, begins when the main power button is pushed ON. Power indicator turns green. Front cover latch activates immediately.
2. Main fan and exhaust fan turn-on immediately.
3. Main board self-test begins. Status indicator tests red, green and yellow, then goes to yellow. This takes about 20 seconds (from turn-on). The status indicator remains yellow until the initialization process is complete. The user interface indicates “initializing” during this period.
4. The vapor blowout period begins. This lasts for about 2 minutes.
5. WPS sample transport and sampling unit initialization begins at the 2-minutes mark (from turn-on), if the front cover is closed. If the front cover is open at the 2 minutes mark, initialization will start only when the front cover is closed. Initialization takes about 1.5 minutes. When initialization is complete the needle is in the needle seat, the needle lock is down, and the status indicator is off.

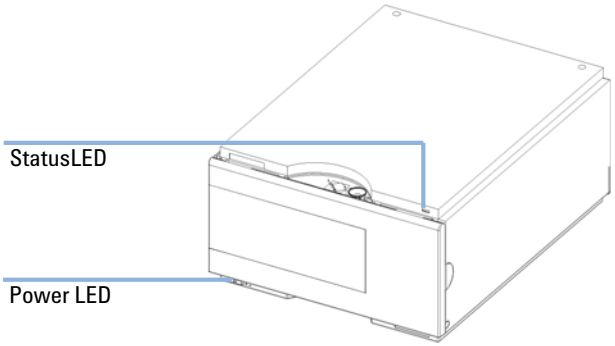


Figure 24 Instrument LED indicator

5 Optimizing Performance

This chapter provides information on how to optimize the autosampler.

Optimizing Performance

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

The informations below will help you on how to optimize some parameters to achieve best results for:

- lowest carry-over for reliable quantitative data
- Fast injection cycles for high throughput
- Low delay volume for fast gradient
- Precise injection volume

Optimization for Lowest Carry-Over

Carry over (CO) is not only a topic for injection systems but may have multiple sources:

Hardware related

- sample loop
- needle outside
- needle inside
- needle seat
- seat capillary
- injection valve
- flush time
- wash vials
- fittings
- column (carry-over depends on frit design/material/blockage)
- surface activity of frits
- capillaries

Chemistry/Physics related:

- suitable sample solvent (has to be compatible with mobile phase)
- suitable wash solvent
- suitable mobile phase
- column packing material (e.g. interaction of basic sample with silanols of stationary phase)

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

General recommendations for lowest carry-over

Issues in setting up the experiments:

- Use a flush solvent which dissolves the sample well (e.g. aqueous/(organic) acidic for basic samples); set needle wash time to at least 10 sec.
- Use a sample solvent which is compatible with sample and mobile phase. Organic sample solvents (e.g. DMSO) injected into aqueous mobile phase often cause samples to partially deposit on surfaces causing high carry-over. Chlorhexidine, for example, dissolved as a free base in methanol and injected into an acidic aqueous mobile phase shows increased carryover than if it is dissolved in 0.1% TFA. Since it dissolves slowly (but well) in acidic aqueous solvents, it partially deposits on surfaces during the injection cycle.
- Take care at loop capillary change: Push loop capillary forward when tightening the fitting to the needle, ensuring gapless transition from loop to needle. A replaced needle-seat-pair may need 100-200 injections for best carry-over results

Routinely work:

- Prime flush pump for 30 sec. with appropriate solvent previous to the first run after usage outage.
- Ensure that the needle seat is not contaminated. For cleaning the needle seat see chapter “Cleaning the needle seat”.
- Use mainpass operation to avoid discrimination of samples.
- Notice backpressure of a new column; an increase of 10% over time may cause an 10 fold increase in carry-over due to the column.
- Blank vials can be used at least 30 injections.

Specific recommendations if bypass operation is performed

Bypass operation can severely impact carry-over performance due to the fact that during gradient operation the sample path is not flushed with organic mobile phase. This may cause sample discrimination and/or adsorption of especially lipophilic components in loop, needle and seat flow path.

The term bypass operation in this context describes all cases where the Autosampler is switched to the “Bypass Mode” so that the exposure of the Autosampler’s internal flow path parts to the solvent flow coming from the pump may become too short. This may be the case:

- when overlapped Injection with option “when sample is flushed out” is selected
- when the delay volume is minimized by using “Automated Delay Volume Reduction”

This mode is not recommended as there may arise two sources for carry-over. The outlet groove of the injection valve may be contaminated with sample. This is the minor issue and can be resolved by performing steps for cleaning the injection valve (by method or by injector program). The much more problematic issue is that there may remain portions of sample in the sampler. Especially if the sample and sample solvent doesn’t fit to the mobile phase an arbitrarily large amount of sample may miss the column but stay in the main pass. The “Injector Purge Kit” was developed for this purpose. During run the syringe is used as purge pump and afterwards exchanges the purge solvent with (gradient) start conditions. Using this kit decreases the poor bypass carry-over significantly. Eventually main pass performance may be obtained. But the kit does not resolve the problem of discriminating sample compounds.

Contraindication for usage:

- If run times are below 2-3min the purge kit won’t help as the purge step with reasonable purge volume lasts at least 2min.
- In highly carry-over sensitive applications purge kit is not recommended as best performance is got when the Autosampler stays in mainpass the full solvent gradient.

Control software support for the Purge kit is provided and fully operated and controlled through the ChemStation or and G4208A Instant Pilot via the Autosampler Settings (Requires Agilent ChemStation B.01.03 or higher and Firmware A.06.01 and higher on ALL Agilent 1260 Infinity modules that are part of the system).

Using the Automated Needle Wash

The automated needle wash can be programmed either as “injection with needle wash” or the needle wash can be included into the injector program. When the automated needle wash is used, the needle is moved into the wash port after the sample is drawn. By washing the needle after drawing a sample, the sample is removed from the outer surface of the needle immediately. As the flush port is automatically refilled with fresh wash solvent this option should be used routinely. Using wash vials is usually not necessary but available for special applications.

Using a wash vial

If a wash vial is used, it should be considered not to cap the vial. Otherwise small amounts of sample remain on the surface of the septum, which may be carried on the needle to the next sample.

Using the Flush Port

During the injection process when the sample is in the loop and when the valve still is in Bypass, the outside of the needle can be washed in a flush port located behind the injection port on the sampling unit. During the wash cycle as soon the needle is in the flush port a peristaltic pump fills the flush port with fresh solvent during a defined time. The volume of the flush port is about 680 µl and the pump delivers 6 ml/min. Setting the wash time to 10 seconds is sufficient to refill 2 times the flush port. In most cases this is enough to clean the needle outside. Additionally after the needle left the flush port the flush pump keeps running runs for 6 sec. to ensure refill with fresh solvent. At the end of this flush process – if “injection with needle wash” is selected – the needle returns to the injection port, the injection valve is switched to the mainpass position and directs the pump flow back through the sample loop.

For further information on how to reduce carry over see “Optimization for Lowest Carry-Over” on page 75

Recommended Wash Solvents

- water
- ethanol
- methanol
- water/acid (especially for basic compounds)
- water/base (espeecially for acidic compounds)
- water/acetonitrile

NOTE The life time of the tubing in the peristaltic pump is shortened by the usage of organic solvents.

Cleaning the needle seat

If flush port has run out of solvent or the option “needle wash” hasn’t been used for several injections or in case the needle seat has got contaminated, the needle seat may be contaminated and carry-over is significantly higher than expected. For cleaning the needle seat there is an automatic procedure using the mobile phase’s solvents. If that doesn’t work a manual cleaning has to be done. the following procedure can be used to clean the needle seat

Automatic procedure

There’s an injector command for flushing the seat. So a cleaning method can be set up using an injector program.

Injector program

- INJECT
- FLUSH SEAT for 90.0 sec., 0.0 mm offset
- VALVE mainpass

Line 1 starts the run so the pump’s time table is started. Line 2 let’s the needle move above the seat and switches the valve to mainpass so that the pump’s solvent is directed through the loop and the needle onto the seat. The liquid leaves the seat via the drainage for the flush port. The offset can be used for getting a kind of blast pipe effect. Generally an offset of 0.0mm is a proper value. After the flush time (here 90sec) the valve is switched to bypass. Line 3 moves the needle back into the seat and switches valves back to main pass to restore hydraulic flow as it was before the cleaning process.

The pump’s time table can be used if special solvents for cleaning are connected to the pump or if the flushing flow should be adjusted. Here’s an illustrating example:

	Time	%B	Flow	Max. Press.
1	0.00	100.0		
2	0.10		0.500	
3	0.11		3.000	
4	0.70	100.0	3.000	
5	0.71	0.0	0.500	

Along with upper injector program this time table uses solvent B for cleaning the seat with an even higher flow rate than the perhaps limiting 0.5ml/min for column flow. To ensure that the flow rate isn't applied to the column and that column doesn't come in contact with flush solvent (in this case solvent B) choose a considerably long time (in this case 90sec) for flushing the seat in the injector program.

Manual procedure

If the automatic procedure doesn't succeed there is the semi-automatic seat back-flushing.

Preparation

- Move the needle to home position.
- Set pump flow to zero
- Connect the seat capillary with the pump capillary using a zero dead volume fitting.

Flushing

- Increase pump flow: The seat is flushed backwards, solvent bubbles over the seat and leaves the seat via the drainage for the flush port

Reconfigure system

- Set pump flow to zero
- Connect the pump outlet capillary to port 1 of injection valve
- Connect the seat capillary to port 5 of the injection valve.
- Reset the injector.

Fast Injection Cycle and Low Delay Volume

Short injection cycle times for high sample througput is one of the main issues in analytical laboratories. Shortening cycle time starts with:

- shortening column length
- high flow rate
- steep gradient
- The detector balance may be set to OFF

General recommendations for Fast Injection Cycle Times

As described in this section, the first step to provide short cycle times is optimizing the chromatographic conditions. Then the following Autosampler related issues should be considered:

- Use proper solvent for needle wash to decrease the wash time
- Reduce injection volume
- Increase eject speed
- Increase draw speed (if the viscosity of the sample and the solvent in Autosampler's flow path allows it)
- Do injection preparation in parallel with column equilibration (section "Overlapped Injection after gradient is flushed out")

Having optimized these parameters, further reduction of cycle times can be obtained if column equilibration is short compared to injector preparation or if automated column regeneration is configured. "Overlapped Injection during run mode" decreases this time between runs. But note that carry-over and discrimination may increase dramatically doing so.

Overlapped Injection after gradient is flushed out

In this process the injection can be done in parallel to column equilibration phase without compromising any of the Autosampler's specifications.

This mode has one parameter. The time when to start the overlapped injection defined as "time after begin of run".

Considering a composition gradient that ends after 1 min. with reestablishing starting conditions the overlap time has to be set to somewhat above 1 min. to let the pump fill also the Autosampler's loop with start conditions.

Overlapped Injection during Run

In this process, as soon as the sample has reached the column, the injection valve is switched back to bypass and the next injection cycle is performed except for switching the injection valve to mainpass. This is done after actual run is finished and next analysis is started. Doing so the sample preparation time is saved as parallel to the run.

Switching the valve into the bypass position reduces the system delay volume by the complete Autosampler's flow path volume e.g. 270µl for G1367B. Here the mobile phase is directed to the column without passing sample loop, needle and needle seat capillary. This can help to have faster cycle times especially if low flow rates have to be used like it is mandatory in narrow bore and micro bore HPLC.

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

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

Precise Injection Volume

Injection Volumes Less Than 2 µl

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

Draw and Eject Speed

Draw Speed

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

Eject Speed

The default draw speed is suitable for the majority of applications. When using large injection volumes, setting the eject speed to a higher value speeds up the injection cycle by shortening the time the metering unit requires to eject solvent at the beginning of the injection cycle (when the plunger returns to the home position).

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

Table 26 Draw and eject speed

	Draw speed (µl)	Eject speed (µl)
High performance autosampler		
Default value	200	200
Minimum	10	10
Maximum	1000	1000
High performance autosampler SL+		
Default value	100	100
Minimum	4	4
Maximum	1000	1000
Micro Well Plate Autosampler with 8 µl loop capillary		
Default value	4	10
Minimum	0.7	0.7
Maximum	20	100
Micro Well Plate Autosampler with 40 µl loop capillary		
Default value	4	10
Minimum	0.7	0.7
Maximum	250	250

Choice of Rotor Seal

Vespel™ Seal

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

Tefzel™ Seal

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

PEEK Seal

With the High Performance SL+ Autosampler a PEEK rotorseal is used. This warrants a leak tight system at high pressures and allows the usage of solvents ranging from pH 2.3 to 12. The PEEK material may show a reduced lifetime if used with following solvents:

- Methylene chloride
- DMSO
- THF
- High concentrations of sulfuric acid
- High concentrations of nitric acid

Choice of Seat Capillary

The needle seat assembly is made up of two parts: needle seat and seat capillary.

Different models of seat capillaries are available.

p/n	Description
G1377-87101	Needle-Seat (without capillary) for G1377A
G1375-87317	Seat Capillary (150 mm 0.10 mm ID) for G1377-87101 Needle Seat
G1375-87316	Seat Capillary (150 mm 0.075 mm ID) for G1377-87101 Needle Seat
G1375-87300	Seat Capillary (150 mm 0.05 mm ID) for G1377-87101 Needle Seat

Seat Capillary (150 mm 0.10 mm ID) for G1377-87101 Needle Seat (p/n G1375-87317) is the capillary preinstalled in the micro well plate autosamplers upon delivery. This capillary is recommended for applications with a 0.3 mm column or higher. It provides less plugging of the capillary in general and especially with biological samples. For small K' this capillary can provide a higher peak width for isocratic analysis.

Seat Capillary (150 mm 0.075 mm ID) for G1377-87101 Needle Seat (p/n G1375-87316) is available as a spare part and is recommended for applications with a 0.3 mm column or smaller. This capillary gives full chromatographic performance.

Seat Capillary (150 mm 0.05 mm ID) for G1377-87101 Needle Seat (p/n G1375-87300) is available as a spare part and is recommended for applications with a 0.3 mm column or smaller. This capillary gives full chromatographic performance. Due to the small diameter, this capillary can show some blockage.

6
Troubleshooting and Diagnostics

This chapter gives an overview to troubleshooting the High Performance Micro Autosampler.

Agilent Lab Advisor Software

The Agilent Lab Advisor software is a standalone product that can be used with or without data system. Agilent Lab Advisor software helps to manage the lab for high quality chromatographic results and can monitor in real time a single Agilent LC or all the Agilent GCs and LCs configured on the lab intranet.

Agilent Lab Advisor software provides diagnostic capabilities for all Agilent 1200 Infinity Series modules. This includes diagnostic capabilities, calibration procedures and maintenance routines for all the maintenance routines.

The Agilent Lab Advisor software also allows users to monitor the status of their LC instruments. The Early Maintenance Feedback (EMF) feature helps to carry out preventive maintenance. In addition, users can generate a status report for each individual LC instrument. The tests and diagnostic features as provided by the Agilent Lab Advisor software may differ from the descriptions in this manual. For details refer to the Agilent Lab Advisor software help files.

This manual provides lists with the names of Error Messages, Not Ready messages, and other common issues.

Overview of the Sampler's Indicators and Test Functions

Status Indicators

The 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 autosampler (see "Status Indicators" on page 93).

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the instrument generates an error message in the user interface. For details on error messages and error handling, please refer to the Agilent Lab Monitor & Diagnostic Software.

Maintenance Functions

The maintenance functions position the needle assembly, the needle carrier, the sample transport assembly and the metering device for easy access when doing maintenance (see "Maintenance Functions" on page 112).

Sample Transport Self Alignment

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

The sample transport self alignment is required after disassembling the system or when you exchange the sample transport, the sampling unit, the tray or the MTP main board.

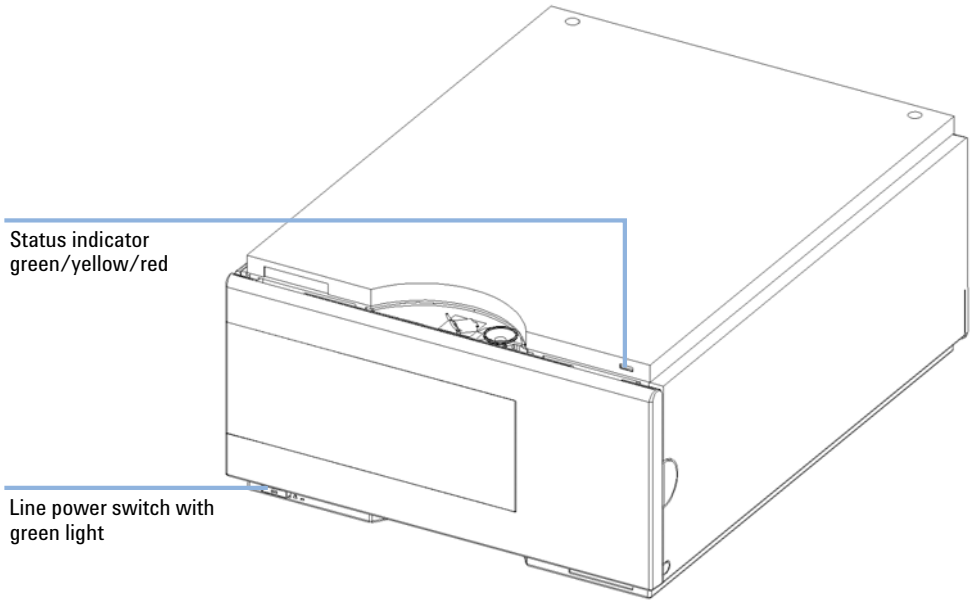
This function is in the diagnose screen of the Chemstation or the Control Module.

Step Commands

The step functions enable execution of each step of the sampling sequence individually. The step functions are used primarily for troubleshooting, and for verification of correct autosampler operation after repair (see "High Performance Autosampler Step Commands" on page 114). For details on step commands, please refer to the Agilent Lab Monitor & Diagnostic Software.

Status Indicators

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



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.

Error Messages

Error Messages

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

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

`Timeout`

The timeout threshold was exceeded.

Probable cause	Suggested actions
1 The analysis was completed successfully, and the timeout function switched off the module as requested.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shut-Down

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

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

Probable cause	Suggested actions
1 Leak detected in another module with a CAN connection to the system.	Fix the leak in the external instrument before restarting the module.
2 Leak detected in an external instrument with a remote connection to the system.	Fix the leak in the external instrument before restarting the module.
3 Shut-down in an external instrument with a remote connection to the system.	Check external instruments for a shut-down condition.

Remote Timeout

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

Probable cause	Suggested actions
1 Not-ready condition in one of the instruments connected to the remote line.	Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2 Defective remote cable.	Exchange the remote cable.
3 Defective components in the instrument showing the not-ready condition.	Check the instrument for defects (refer to the instrument's documentation).

Synchronization Lost

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

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

Probable cause	Suggested actions
1 CAN cable disconnected.	• Ensure all the CAN cables are connected correctly. • Ensure all CAN cables are installed correctly.
2 Defective CAN cable.	Exchange the CAN cable.
3 Defective main board in another module.	Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak

A leak was detected in the module.

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

Probable cause	Suggested actions
1 Loose fittings.	Ensure all fittings are tight.
2 Broken capillary.	Exchange defective capillaries.

Leak Sensor Open

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

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

Probable cause	Suggested actions
1 Leak sensor not connected to the main board.	Please contact your Agilent service representative.
2 Defective leak sensor.	Please contact your Agilent service representative.
3 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.

Leak Sensor Short

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

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

Probable cause	Suggested actions
1 Defective flow sensor.	Please contact your Agilent service representative.
2 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.

Compensation Sensor Open

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

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

Probable cause	Suggested actions
1 Defective main board.	Please contact your Agilent service representative.

Compensation Sensor Short

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

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

Probable cause	Suggested actions
1 Defective main board.	Please contact your Agilent service representative.

Fan Failed

The cooling fan in the module has failed.

The hall sensor on the fan shaft is used by the main board to monitor the fan speed. If the fan speed falls below a certain limit for a certain length of time, the error message is generated.

Probable cause	Suggested actions
1 Fan cable disconnected.	Please contact your Agilent service representative.
2 Defective fan.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Exhaust Fan Failed

The exhaust fan in the module has failed.

The hall sensor on the fan shaft is used by the main board to monitor the fan speed. If the fan speed falls below a certain value the error message is generated and the module shuts down.

Probable cause	Suggested actions
1 Fan cable disconnected.	Please contact your Agilent service representative.
2 Defective fan.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Front Door Error

The front door and/or the SLS board are damaged.

Probable cause	Suggested actions
1 The sensor on the SLS board is defective.	Please contact your Agilent service representative.
2 The door is bent or the magnet is misplaced/broken.	Please contact your Agilent service representative.

Side Door Error

The side door and/or the main board are damaged.

Probable cause	Suggested actions
1 The door is bent or the magnet is misplaced/broken.	Please contact your Agilent service representative.
2 The sensor on the main board is defective.	Please contact your Agilent service representative.

Arm Movement Failed or Arm Movement Timeout

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

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

See figure for axes identification.

- Arm Movement 0 Failed: X-axis.
- Arm Movement 1 Failed: Z-axis.
- Arm Movement 2 Failed: Theta (needle carrier rotation).

	Probable cause	Suggested actions
1	Mechanical obstruction.	Ensure unobstructed movement of the transport assembly.
2	High friction in the transport assembly.	Please contact your Agilent service representative.
3	Defective motor assembly.	Please contact your Agilent service representative.
4	Defective sample transport assembly flex board.	Please contact your Agilent service representative.
5	Defective main board.	Please contact your Agilent service representative.

Valve to Bypass Failed

The injection valve failed to switch to the bypass position.

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

Probable cause	Suggested actions
1 Valve in an intermediate position between the By-and the Main position.	Turn the WPS main power OFF and ON.
2 Defective injection valve.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Valve to Mainpass Failed

The injection valve failed to switch to the mainpass position.

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

Probable cause	Suggested actions
1 Valve in an intermediate position between the bypass and mainpass positions.	Turn the sampler main power OFF and ON.
2 Defective injection valve.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Needle Lock Failed

The lock assembly on the sampling unit failed to move successfully.

The upper and lower positions of the needle lock are monitored by position sensors on the sampling unit flex board. The sensors detect the successful completion of the needle lock movement. If the needle lock fails to reach the end point, or if the sensors fail to recognize the needle lock movement, the error message is generated.

Probable cause	Suggested actions
1 Defective or dirty position sensor.	Clean the position sensor.
2 Sticking spindle assembly.	Please contact your Agilent service representative.
3 Defective needle drive motor	Please contact your Agilent service representative.
4 Defective main board.	Please contact your Agilent service representative.

Needle to Needle Seat Position

The needle failed to reach the end position in the needle seat.

The position of the needle is monitored by a position encoder on the needle carrier. If the needle fails to reach the end point, or if the encoder fails to recognize the needle carrier movement, the error message is generated.

Probable cause	Suggested actions
1 Bad sample transport/sampling unit alignment	Do an auto-alignment
2 Bent needle.	Check and exchange the needle assembly if necessary.
3 Missing needle.	Clean or change the needle seat assembly if necessary.
4 Blocked seat.	Exchange the needle carrier assembly.
5 Defective position sensor in the needle carrier assembly.	Please contact your Agilent service representative.
6 Defective MTP board.	Please contact your Agilent service representative.

Needle Carrier Failed

The needle carrier on the Sample Transport Assembly failed to move correctly.

Probable cause	Suggested actions
1 Defective Z-motor.	Exchange the needle carrier assembly.
2 Vial pusher blocked.	Please contact your Agilent service representative.
3 Bad needle carrier positioning in X or Theta.	Exchange the needle carrier assembly.
4 Defective vial pusher sensor.	Please contact your Agilent service representative.
5 Defective MTP main board.	Please contact your Agilent service representative.

Missing Vial or Missing Wash Vial

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

When the needle carrier moves to a vial and the needle goes into the vial, the position of the needle is monitored by an encoder behind the vial pusher. If no vial is present, the encoder detects an error and the message “missing vial” is generated.

Probable cause	Suggested actions
1 No vial in the position defined in the method or sequence.	Install the sample vial in the correct position, or edit the method or sequence accordingly.
2 Defective needle carrier assembly.	Exchange the needle carrier assembly.
3 Defective transport assembly flex board.	Please contact your Agilent service representative.
4 Defective MTP board.	Please contact your Agilent service representative.

Initialization Failed

The autosampler failed to complete initialization correctly.

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

Probable cause	Suggested actions
1 Side door not installed correctly.	• Check if the side door is installed correctly. • Check if the magnet is in place in the side door.
2 Sample transport/sampling unit not aligned correctly.	Do an auto-alignment
3 Mechanical obstruction.	Ensure unobstructed movement of the transport assembly.
4 Defective sampling unit flex board.	Please contact your Agilent service representative.
5 Defective transport assembly flex board.	Please contact your Agilent service representative.
6 Defective sampling unit motor.	Please contact your Agilent service representative.
7 Defective MTP main board.	Please contact your Agilent service representative.

Metering Home Failed

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

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

Probable cause	Suggested actions
1 Dirty or defective sensor.	Exchange the sampling unit flex board.
2 Broken plunger.	Exchange the metering plunger and seal.
3 Defective metering-drive motor.	Please contact your Agilent service representative.
4 Defective MTP board.	Please contact your Agilent service representative.

Motor Temperature

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

See figure for motor identification.

- Motor 0 temperature: X-axis motor.
- Motor 2 temperature: Theta (gripper rotation) motor.
- Motor 1 temperature: Z-axis motor.

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

	Probable cause	Suggested actions
1	Mechanical obstruction.	Ensure unobstructed movement of the transport assembly.
2	High friction in the transport assembly.	Please contact your Agilent service representative.
3	Motor belt tension too high.	Switch off the autosampler at the power switch. Wait at least 10 minutes before switching on again.
4	Defective motor.	Please contact your Agilent service representative.
5	Defective transport assembly flex board.	Please contact your Agilent service representative.

Invalid Vial Position

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

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

Probable cause	Suggested actions
1 Incorrect tray installed.	Install the correct trays, or edit the method or sequence accordingly.
2 Incorrect tray definition.	Install the correct trays, or edit the method or sequence accordingly.
3 Incorrect vial positions defined in the method or sequence.	Install the correct trays, or edit the method or sequence accordingly.
4 Tray recognition defective (dirty sample tray or defective transport assembly flex board).	Please contact your Agilent service representative.

Peristaltic Pump Error

The peristaltic pump motor in the autosampler has failed.

The current on the motor is used by the MTP board to monitor the speed of the peristaltic pump motor. If the current falls below a certain value, the error message is generated.

Probable cause	Suggested actions
1 Defective motor.	Please contact your Agilent service representative.
2 Defective SUD board.	Please contact your Agilent service representative.
3 Defective MTP main board.	Please contact your Agilent service representative.

Vessel or Wash Vessel Error

The needle does not reach the target position in the vial or in the vessel of the well plate.

The sensor behind the vial pusher in the needle carrier assembly detects the successful completion of the needle movement to the vessel. If the needle fails to reach the end point, the sensor fails to recognize the needle movement and the error message is generated.

Probable cause	Suggested actions
1 Bad vessel definition in the plate configuration.	Check the vessel definition in the plate configuration.
2 Closing mat to rigid/thick.	Check that the closing mats is not too thick.
3 Bad X or Theta positioning.	Exchange the needle carrier assembly.
4 Defective encoder on the needle carrier assembly.	Please contact your Agilent service representative.

Vessel Stuck to Needle

The vessel sticks to the needle when the needle moves up.

Probable cause	Suggested actions
1 Closing mat to rigid/thick.	Check that the closing mat is not too thick.
2 Bad X or Theta positioning and the needle sticks into the wall between two holes.	Exchange the needle carrier assembly.
3 Defective encoder on the needle carrier assembly.	Please contact your Agilent service representative.

Maintenance Functions

Some maintenance procedures require the needle arm, metering device, 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 sampler maintenance positions can be selected from the Maintenance menu in the Diagnosis display. In the Control Module the functions can be selected in the Test screens of the autosampler. In the Agilent Lab Monitor & Diagnostic Software the maintenance positions can be selected from the "Tools" icon.

Maintenance Functions

The maintenance functions moves the arm assembly in a specific position in order to enables easy access for maintenance operations

Home Position

The “home position” function moves the arm to the right side for better access and exchange of the trays

Park Position

The “park position” function moves the arm to the left side of the tray. In this position it is possible to secure the sample transport mechanism with the protection foam.The sample transport is than ready for transporting.

Change Piston

The “change-piston” function draws the piston away from the home position, relieving the tension on the spring. In this position, the analytical head assembly can be removed and reinstalled easily after maintenance. This position is also used to change the analytical head plunger and metering seal.

Table 27 Maintenance positions

Function	Arm position in X	Arm position in Theta	Arm Position in Z	Note
Change Needle	Left side	Straight	Up	No current on Theta
Change Carrier assembly	Left side	Straight	Middle	No current on the ST
Change Loop capillary	Middle	Left	Up	
Home position	Right side	Left rear	Up	
Park arm	Left side	Right rear	Up	

Sample Transport Self Alignment

The sample transport alignment with the sampling unit and the well plate tray is required to compensate for larger deviations in positioning the needle carrier. This function is in the diagnose screen of the Chemstation or the Control Module. In the Agilent Lab Monitor & Diagnostic Software, this function is in the "Calibration" icon.

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

- The sample transport.
- The sampling unit.
- The MTP main board.
- The autosampler tray base

High Performance Autosampler Step Commands

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

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

Table 28 Step Commands

Step	Action	Comments
Valve Bypass	Switches injection valve to the bypass position.	
Plunger Home	Moves the plunger to the home position.	
Needle Up	Lifts the needle arm to the upper position.	Command also switches the valve to bypass if it is not already in that position.
Move to Location	Move the needle arm to the vial location on the plate	
Needle into sample	Lowers the needle into the vial.	
Draw	Metering device draws the defined injection volume.	Command lifts the needle, and lowers the needle into sample. Command can be done more than once (maximum draw volume of 40/100/5000 µl cannot be exceeded). Use **Plunger Home** to reset the metering device.
Needle Up	Lifts the needle out of the vial.	
Needle into Seat	Lowers the needle arm into the seat.	

Table 28 Step Commands

Step	Action	Comments
Valve Mainpass	Switches the injection valve to the mainpass position.	
Needle Up/Mainpass	Lifts the needle arm to the upper position and Switches the injection valve to the mainpass position.	

Troubleshooting

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

Table 29 on page 116 summarizes the step commands, and lists the error messages and probable causes associated with each possible failure.

Table 29 Step Failures

Step Function	Probable Failure Modes
Valve Bypass	Valve not connected. Defective injection valve.
Plunger Home	Defective or dirty sensor on the sampling-unit flex board. Defective metering-drive motor.
Needle	Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Draw	Sum of all draw volumes exceeds 100 µl (or 40 µl). Defective metering-drive motor.
Needle	Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor.
Valve Mainpass	Valve not connected. Defective injection valve.
Needle Up/Mainpass	Blockage in the sample loop or needle (no solvent flow). Defective or dirty sensor on the sampling-unit flex board. Sticking needle-arm assembly. Defective needle-drive motor. Valve not connected. Defective injection valve.

Troubleshooting the Autosampler

Gather Information About the Problem

- When did the problem start?
- What was done/changed prior to the start of the problem?

In the Agilent Lab Monitor & Diagnostic Software the "Instrument Status Report" generates a report. This report includes the Instrument configuration with the instrument serial numbers and the firmware revisions, the instrument error history, the EMF editor, the result of the guided diagnostic and the method parameter (optional).

Errors Which May Occur During the Turn ON and Initialization Process

Failure to Turn ON

No activity when power button is pushed on. Power indicator stays off.

Probable cause	Suggested actions
1 Defective main board.	• Turn the sampler off. Disconnect the power supply from the main board, see if power indicator becomes green when the sampler is turned-on. • If yes, change the main board (G1367-69520).
2 Defective power supply.	• Turn the sampler off. Disconnect the power supply from the main board, see if power indicator becomes green when the sampler is turned-on. • If no, change the power supply (0905-2528 Rev G or higher).

Fan Failure

Early during the turn-on/initialization process a main fan or an exhaust fan error occurs.

Probable cause	Suggested actions
1 Fan not connected to the main board	Make sure the fan is connected to the main board correctly
2 Fan connector defective	Examine the fan connector for irregularities. Correct if possible
3 Defective fan.	Replace the defective fan (main fan: 3160-1017, exhaust fan: 3160-4097)
4 Defective main board.	Replace the main board (G1367-69520)

Main Board Initialization Fails (I)

Status indicator remains off, but the rest of the turn-on/initialization process is successful.

Probable cause	Suggested actions
1 The heel of the light pipe is not positioned correctly above the LED on the main board	Correctly position the light pipe
2 Defective main board.	Replace the main board (G1367-69520)

Main Board Initialization Fails (II)

Status indicator remains off, and the rest of the turn-on/initialization process fails as well.

Probable cause	Suggested actions
1	Refer to the possible causes and actions for step 5 bellow

Problem With the Vapor Blowout Period

The vapor blowout period does not end approximately 2 minutes after turn-on, initialization does not begin.

Probable cause	Suggested actions
1 The front cover is not closed	Close the front cover. If the “front cover open” message is still displayed:
2 The front cover is closed, but the user interface displays a “front cover open” message	• Make sure the front cover magnet is close enough to the magnet sensor • Check the ribbon cable from the SLS board to the main board • Replace the SLS board (G1367-66505) • replace the main board (G1367-69520)
3 The left side cover is removed	Install the side door. If the “side door open” message is still displayed:
4 The left side cover is installed, but the user interface displays a “side cover open” message	• Make sure the side cover magnet is present in the side door • Make sure the side cover magnet is oriented with the correct pole toward the magnet sensor on the main board and positioned in the side cover such that it is close enough to the magnet sensor • Replace the main board (G1367-69520)

Initialization Fails

The initialization fails to complete its required movements, resulting in one or more of a variety of possible error messages. The error message produced depends on when the failure occurred during the initialization.

Gather the revisions information, user interface error and logbook information, and error code information as described on page 1. Also, consider anything which may have been done just before the initialization failure occurred.

To date, we have seen initialization errors occur for a variety of reasons. As an overall troubleshooting plan, follow the suggested actions described bellow.

If this does not help, take the information from the instrument logbook, refer to the appropriate section in the next chapter and follow the recommended actions step by step.

Probable cause	Suggested actions
1	• Turn the sampler off, manually change the X-position of the sample transport and rotate the needle carrier to a different position, turn-on the sampler again. • If there is any weight on top of the sampler, remove that weight, turn-off the sampler and then turn it on again.

Instrument Logbook Errors and Step by Step Repair Proces

Instrument Logbook Errors and Step by Step Repair Process

The errors in the instrument logbook can be classified in 8 groups. In this section you can find a general step by step troubleshooting process for each of them.

1. Fan Error (Main Fan or Exhaust Fan)

Probable cause	Suggested actions
1	• Make sure the fan is connected to the main board correctly • Examine the fan connector for irregularities. Correct if possible • Replace the defective fan (main fan: 3160-1017, exhaust fan: 3160-4097) • Replace the main board (G1367-69520)

2. Initialization Error

Probable cause	Suggested actions
1	• Upgrade the firmware revision to A.04.14 or higher and the ChemStation revision to A.08.04 or higher • Check the sample transport connectors on the main board/sample transport • Check the connector on the bottom of the sample transport unit • Check for mechanical obstruction on the sample transport (X,Theta, Z) • Change sample transport unit • Change the main board (G1367-69520)

3. Metering Sensor Error

Probable cause	Suggested actions
1	• Check the connectors on the SUD board • Check the sampling unit connector on the main board • Check the connector on the sampling unit • Change the analytical head • Change the sampling unit • Change the main board (G1367-69520)

4. Rheodyne Valve Error

Probable cause	Suggested actions
1	• Turn the system off and on twice • Check the connectors on the SUD board • Check the sampling unit connector on the main board • Check the connector on the sampling unit • Change the rheodyne valve • Change the sampling unit • Change the main board (G1367-69520)

5. Needle Lock Error

Probable cause	Suggested actions
1	• Check the connectors on the SUD board • Check the sampling unit connector on the main board • Check the connector on the sampling unit • Change the sampling unit • Change the main board (G1367-69520)

6. Needle Into Seat Error

Probable cause	Suggested actions
1	• Upgrade the firmware revision to A.04.14 or higher and the ChemStation revision to A.08.04 or higher • Check needle position and correct alignment in the pusher • Perform an auto-alignment

6. Needle Into Seat Error (during initialization of the Sampler)

Probable cause	Suggested actions
1	• Turn-off the system • Perform a forced cold start (move the 8-bit configuration dip switches 1,2,8 at the rear of the instrument to position 1) • Turn-on the system • Perform an auto-alignment • Turn-off the system • Move the 8-bit configuration dip switches 1,2,8 at the rear of the instrument to position 0 • Turn-on the system • Check the connector from needle carrier to the sample transport unit • Check the sample transport connectors on the main board/sample transport • Check the connector on the bottom of the sample transport unit • Change the needle carrier assembly (G1367-60010) • Change the sample transport unit • Change the main board (G1367-69520)

7. Needle / Seat Error

Probable cause	Suggested actions
1	• Upgrade the firmware revision to A.04.14 or higher and the ChemStation revision to A.08.04 or higher • Check if the needle is installed (the sample transport comes without needle) • Check the needle position and correct alignment in the pusher • Check if the seat is not blocked with any parts or material (crystals, glass) • Perform an auto-alignment • Check the connector from the needle carrier to the sample transport unit • Check the sample transport connectors on the main board/sample transport • Check the connector on the bottom of the sample transport • Change the needle and the seat • Change the needle carrier assembly (G1367-60010) • Change the sample transport unit • Change the main board (G1367-69520)

8. Sample Location Error

Probable cause	Suggested actions
1	• Check the plate configuration in the user interface • Ensure the right vials and plates are used • Perform an auto-alignment • Check the connector from the needle carrier to the sample transport unit • Check the sample transport connectors on the main board/sample transport • Check the connector on the bottom of the sample transport unit • Change the needle and the seat • Change the needle carrier assembly (G1367-60010) • Change the sample transport unit • Change the main board (G1367-69520)

Needle Centering Over the Vial or the Well

NOTE The positioning of the needle is very precise. You have to take no action if the needle hits in the safe area.

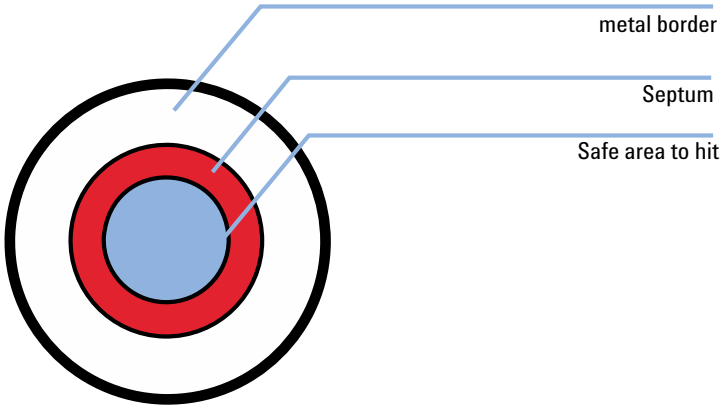


Figure 25 Vial cap

NOTE If the diameter for the safe area is approximately *1mm smaller* than the diameter of the septum no corrective action is necessary.

Action to Take if the Needle Does Not Hit in the Safe Area

- ✔ Check if the right vials or plates are used (see) or (see "List of Recommended Vials and Caps" on page 67).
- ✔ Make sure the needle is correctly installed. It should be pushed into the needle carrier as far forward as possible and centered in the vial pusher.
- ✔ Upgrade the firmware revision to A.04.14 or higher and the ChemStation revision to A.08.04 or higher
- ✔ Perform an auto-alignment (without any plates in place)
- ✔ Change the tray G2258-60011 (see service note G1367-007)

7 Maintenance

This chapter describes the maintenance of the autosampler.

Introduction to Maintenance and Repair

Simple Repairs - Maintenance

The autosampler is designed for easy repair. The most frequent repairs such as changing a needle assembly can be done from the front of the instrument with the instrument in place in the system stack. These repairs are described in "Maintenance Procedures" on page 135.

Warnings and Cautions

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- ➔ When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor and follow good laboratory practice.
- ➔ The amount of substances should be reduced to the minimal volume required for the analysis.
- ➔ Do not operate the instrument in an explosive atmosphere.

WARNING

Electrical shock

Repair work at the module can lead to personal injuries, e.g. shock hazard, when the cover is opened.

- ➔ Do not remove the metal top cover of the module. No serviceable parts inside.
- ➔ Only certified persons are authorized to carry out repairs inside the module.

WARNING

Personal injury or damage to the product

Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

➔ Use your Agilent products only in the manner described in the Agilent product user guides.

CAUTION

Safety standards for external equipment

➔ If you connect external equipment to the instrument, make sure that you only use accessory units tested and approved according to the safety standards appropriate for the type of external equipment.

Cleaning the Module

The module case should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and mild detergent. Do not use an excessively damp cloth as liquid may drip into the module.

WARNING

Liquid dripping into the electronic compartment of your module.

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

➔ Do not use an excessively damp cloth during cleaning.

➔ Drain all solvent lines before opening any fittings.

Maintenance Functions

Some maintenance procedures require the needle arm, metering device, 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. For details, refer to “Maintenance Functions” on page 112.

Early Maintenance Feedback (EMF)

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

EMF Counters

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

Injection Valve Counter

This counter counts the number of valve switching EF4512, since the last reset of the counter.

Needle Assembly Counter

This counter counts the total number of needle into seat movements (used for the needle life time) EF4510, since the last reset of the counter.

Seat Assembly Counter

This counter counts the total number of needle into seat movements (used for the seat life time) EF4511, since the last reset of the counter.

Peristaltic Pump

This counter gives the accumulates active pump time in units seconds EF4513.

Using the EMF Counters

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

Setting the EMF Limits

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

Maintenance Procedures

The procedures described in this section can be done with the autosampler in place in the stack. These procedures can be done on a more frequent basis.

Table 30 Simple Repair Procedures

Procedure	Typical Frequency	Notes
Exchanging the needle assembly	When the limit in the needle into seat counter in the EMF is exceeded. When needle shows indication of damage or blockage	See "Removing the Needle Assembly" on page 136
Exchanging the needle carrier assembly	When the needle carrier is defective	See "Removing the Needle Carrier Assembly" on page 139
Exchanging the needle seat assembly	When the limit in the needle into seat counter in the EMF is exceeded. When needle seat shows indication of damage or blockage	See "Exchange the Needle Seat" on page 141
Exchanging the rotor seal	When the limit in the injector valve switches counter in the EMF is exceeded. When the valve performance shows indication of leakage or wear	See "Rotor Seal" on page 143
Exchanging the metering seal	When autosampler reproducibility indicates seal wear	See "Removing the Metering Seal" on page 144
Exchanging the loop capillary	When loop capillary blocked or broken	See "Removing the Loop Capillary" on page 146
Exchanging the peristaltic pump	When tubing broken	See "Peristaltic Pump" on page 149

Removing the Needle Assembly

When
- When the needle is visibly damaged
- When the needle is blocked

Tools required
- Two 1/4 inch-5/16 inch wrenches 8710-0510 (supplied in accessory kit)
- 4 mm open end wrench 8710-1534 (supplied in accessory kit)

Parts required

#	p/n	Description
1	G1377-87201	Needle assembly

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

➔ Be carefull when you remove the needle carrier assembly.

➔ Use the silicon safety tube supplied with every new needle.

1 In the user interface start the maintenance mode and select the “Change Needle/Seat” function. In the Agilent Lab Monitor & Diagnostic Software the “Change Needle/Seat” function can be found in the “Tools” icon.

2 Open the front door and remove the side door.

3 Remove the plate tray from the tray base.

4 Push the silicon safety tube, supplied in the WPS leak kit (G1367-60006) and with every new needle, over the needle.

5 Unlock the needle tighter lock system.

6 Loosen the loop capillary fitting on the analytical head side.

7 Remove the loop capillary corrugated waste tube.

8 Pinch the holder clamp, pull back and remove the needle assembly with the loop capillary from the needle carrier.

9 Attach the 5/16 inch wrench to hold position at the needle assembly. Use the 4 mm wrench to loosen the fitting of the loop capillary.

NOTE

Do not bend the sheet metal of the needle.

10 Pull the loop capillary out from the needle assembly.

Installing the Needle Assembly

When
- When the needle is visibly damaged
- When the needle is blocked

Tools required
- Two 1/4 inch-5/16 inch wrenches 8710-0510 (supplied in accessory kit)
- 4 mm open end wrench 8710-1534 (supplied in accessory kit)

Parts required

#	p/n	Description
1	G1377-87201	Needle assembly

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

➔ Be carefull when you remove the needle carrier assembly.

➔ Use the silicon safety tube supplied with every new needle.

1 Push the silicon safety tube, supplied in the WPS leak kit (G1367-60006) and with every new needle, over the needle.

2 Pull the loop capillary in the new needle assembly (G1367-87201, G1367-87202 or G1377-87201).

3 Attach the 5/16 inch wrench to hold position at the needle assembly. Use the 4 mm wrench to tighten the fitting of the loop capillary.

NOTE

Do not hold the needle during this step to avoid to bending it.

4 Push the loop capillary into the loop capillary protection tube until it comes out on the sampling unit side.

5 Tighten the loop capillary fitting to the analytical head.

6 Install the loop capillary corrugated waste tube over the loop capillary.

7 Pinch the holder clamp and reinsert the needle assembly into the needle carrier.

8 Lock the needle tighter lock system.

9 Push the black chain into the needle assy until the stop.

10 Check the alignment of the needle in the needle pusher of the needle carrier by viewing from several directions to see that it is aligned in the center of the needle pusher.

NOTE The needle must be centered in the needle pusher as all alignment by the autosampler is calculated from the needle pusher position.

11 Remove the silicon safety tube from the needle.

12 Replace the plate tray in the tray base. Re-install the side door and close the front door.

13 In the user interface close the “Change Needle/Seat” function and exit the maintenance mode. In the Agilent Lab Monitor & Diagnostic Software the "Change Needle/Seat" function can be found in the "Tools" icon.

Removing the Needle Carrier Assembly

When When the needle carrier is defect

Tools required
- 2 mm hex key 8710-2438 (supplied in accessory kit)

Parts required

#	p/n	Description
1	G1367-60010	Needle Carrier assembly

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

➔ Be carefull when you remove the needle carrier assembly.

➔ Use the silicon safety tube supplied with every new needle.

1 In the user interface start the maintenance mode and select the “Change Needle Carrier” function. In the Agilent Lab Monitor & Diagnostic Software the "Change Needle Carrier" function can be found in the "Tools" icon.

2 Open the front door and remove the side door.

3 Remove the plate tray from the tray base.

4 Push the silicon safety tube, supplied in the WPS leak kit (G1367-60006) and with every new needle, over the needle.

5 Pinch the holder clamp, pull back and remove the needle assembly from the needle carrier.

6 Unplug the flex board on the sample transport.

7 Unscrew the three holding hex screws with the 2 mm hex key.

8 Remove the needle carrier assy.

Installing the Needle Carrier Assembly

When When the needle carrier is defect

Tools required
- 2 mm hex key 8710-2438 (supplied in accessory kit)

Parts required

#	p/n	Description
1	G1367-60010	Needle Carrier assembly

1. Install a new needle carrier (G1367-60010) on place
2. Install the three holding hex screws with the 2 mm hex key.
3. Plug in the flex board on the sample transport.
4. Push the silicon safety tube, supplied in the WPS leak kit (G1367-60006) and with every new needle, over the needle.
5. Pinch the holder clamp and reinsert the needle assembly into the needle carrier.
6. Check the alignment of the needle in the needle pusher of the needle carrier by viewing from several directions to see that it is aligned in the center of the needle pusher.

NOTE The needle must be centered in the needle pusher as all alignment by the autosampler is calculated from the needle pusher position.

7. Remove the silicon safety tube from the needle.
8. Replace the plate tray in the tray base.
9. Re-install the side door and close the front door.
10. In the user interface close the “Change Needle Carrier” function and exit the maintenance mode. The instrument will reset. In the Agilent Lab Monitor & Diagnostic Software the "Change Needle Carrier" function can be found in the "Tools" icon.

Exchange the Needle Seat

When

- When the seat is visibly damaged
- When the seat capillary is blocked

Tools required

- 1/4 inch-5/16 inch wrench 8710-0510 (supplied in accessory kit)
- 4 mm open end wrench 8710-1534 (supplied in accessory kit)
- Flat screwdriver

Parts required

#	p/n	Description
1	G1377-87101	Needle-Seat (without capillary) for G1377A
1	G1375-87317	Seat Capillary (150 mm 0.10 mm ID) for G1377-87101 Needle Seat
1	G1375-87316	Seat Capillary (150 mm 0.075 mm ID) for G1377-87101 Needle Seat
1	G1375-87300	Seat Capillary (150 mm 0.05 mm ID) for G1377-87101 Needle Seat

1 In the user interface start the maintenance mode and select the “Change Needle/Seat” function. In the Agilent Lab Monitor & Diagnostic Software the "change needle/seat" function can be found under the "Tools" icon.

2 Open the front door and remove the side door.

3 Remove the plate tray from the tray base.

4 Disconnect the seat capillary from the needle seat with the 4 mm open wrench.

5 Use the flat-head screwdriver to remove the needle seat.

6 Insert the new needle seat. Press it firmly in position.

7 Connect the seat capillary to the needle seat with the 4 mm open wrench.

8 Replace the plate tray in the tray base. Re-install the side door and close the front door.

9 In the user interface close the “Change Needle/Seat” function and exit the maintenance mode. In the Agilent Lab Monitor & Diagnostic Software the "change needle/seat" function can be found under the "Tools" icon.

NOTE The seat capillary can be exchanged alone if the needle seat is not damaged.

Exchange the Seat Capillary

When

- When the seat is visibly damaged
- When the seat capillary is blocked

Tools required

- 1/4 inch-5/16 inch wrench 8710-0510 (supplied in accessory kit)
- 4 mm open end wrench 8710-1534 (supplied in accessory kit)
- Flat screwdriver

Parts required

#	p/n	Description
1	G1375-87317	Seat Capillary (150 mm 0.10 mm ID) for G1377-87101 Needle Seat
1	G1375-87316	Seat Capillary (150 mm 0.075 mm ID) for G1377-87101 Needle Seat
1	G1375-87300	Seat Capillary (150 mm 0.05 mm ID) for G1377-87101 Needle Seat
1	G1377-87101	Needle-Seat (without capillary) for G1377A

1 Disconnect the seat capillary from the injection valve (port 5) with the 1/4 - 5/16 inch wrench.

2 Remove the needle seat, see "Exchange the Needle Seat" on page 141.

3 Use the seat capillary mounting tool (provided in the accessory kit) and replace the seat capillary from the seat with the 4 mm wrench.

4 Install the seat assembly in its location and reconnect the capillary to the injection valve (port 5).

5 Follow the procedure in "Exchange the Needle Seat" on page 141 to finish the installation.

NOTE Choose the seat capillary diameter, as function of the column and the application you run on the system. See, "Choice of Seat Capillary" on page 87.

Rotor Seal

When
- When poor injection-volume reproducibility
- When leaking injection valve

Tools required
- 1/4 inch-5/16 inch wrench 8710-0510 (supplied in accessory kit)
- 9/64 inch 15 cm long, T-handle hex key 8710-2394 (supplied in accessory kit)

Parts required

#	p/n	Description
1	0100-2088	Vespel Rotor Seal for 0101-1050 injection valve (G1377A)

1 Open the front door.

2 Remove all capillaries from the injection-valve ports with the 1/4 inch wrench.

3 Unscrew and remove the three stator screws from the stator head with the 9/64 inch wrench.

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

5 Remove the rotor seal (and isolation seal if required).

6 Install the new rotor seal and isolation seal (if required). The metal spring inside the isolation seal must face toward the valve body. In other words, the metal spring should not be visible when the isolation seal is installed.

7 Reinstall the stator ring.

8 Place the stator face on the stator head. The pins on the stator face must engage in the holes on the stator head.

9 Install this stator head/face assy on the injection valve. Tighten the screws alternately with the 9/64 inch wrench until the stator head is secure.

10 Reconnect all the capillaries to the injection valve ports with the 1/4 inch wrench.

11 Close the front cover.

Metering Seal and Plunger

Removing the Metering Seal

When

- When poor injection-volume reproducibility
- When leaking metering device

Tools required

- 1/4 inch-5/16 inch wrench 8710-0510 (supplied in accessory kit)
- 4 mm open end wrench 8710-1534 (supplied in accessory kit)
- 4 mm, 15 cm long, T-handle hex key 8710-2392 (supplied in accessory kit)
- Small flat head screwdriver.

Parts required

#	p/n	Description
1	5063-6589	Metering seal (pack of 2) for 100 µl analytical head
1	5063-6586	Plunger
1	5022-2175	Metering Seal (pack of 1) for the G1377-60013 40 µl Analytical Head
1	5064-8293	Micro Plunger assembly

1. In the user interface start the maintenance mode and select the “Change Piston” function. In the Agilent Lab Monitor & Diagnostic Software the "Change Piston" function can be found under the "Tools" icon.
2. Open the front door
3. Remove the corrugated leak tubing
4. Remove the two capillaries from the analytical head (Use a 1/4 inch wrench if you have a SST capillary or a 4 mm wrench if you have a fused silica capillary).
5. Unscrew alternately the two fixing screws with the 4 mm hex key and remove them.
6. Pull the analytical head away from the sampling unit.
7. Remove the two fixing screws from the base of the analytical head.
8. Remove the head body.
9. Using the piston, carefully remove the metering seal. Clean the chamber and ensure all particular matter is removed.

Installing the Metering Seal

When

- When poor injection-volume reproducibility
- When leaking metering device

Tools required

- 1/4 inch-5/16 inch wrench 8710-0510 (supplied in accessory kit)
- 4 mm open end wrench 8710-1534 (supplied in accessory kit)
- 4 mm, 15 cm long, T-handle hex key 8710-2392 (supplied in accessory kit)
- Small flat head screwdriver.

Parts required

#	p/n	Description
1	5063-6589	Metering seal (pack of 2) for 100 µl analytical head
1	5063-6586	Plunger
1	5022-2175	Metering Seal (pack of 1) for the G1377-60013 40 µl Analytical Head
1	5064-8293	Micro Plunger assembly

1. Install the new metering seal. Press it firmly into position.
2. Reassemble the analytical head. Press the plunger assembly into the seal.
3. Put the two fixing screws in place and reinstall the analytical head to the sampling unit.
4. Tighten alternately the two fixing screws with the 4 mm hex key.
5. Connect the two capillaries to the analytical head (Use a 1/4 inch wrench if you have a SST capillary or a 4 mm wrench if you have a fused silica capillary).
6. Reinstall the corrugated leak tubing.
7. Close the front door.
8. In the user interface close the “Change Piston” function and exit the maintenance mode. In the Agilent Lab Monitor & Diagnostic Software the "Change Piston" function can be found under the "Tools" icon.

Removing the Loop Capillary

When
- Capillary blocked
- Capillary broken

Tools required
- Two 1/4 inch-5/16 inch wrenches 8710-0510 (supplied in accessory kit)

Parts required

#	p/n	Description
1	G1375-87315	Loop capillary
1	G1377-87300	Loop capillary, 40 µL for G1377A

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

➔ Be careful when you remove the loop capillary.

➔ Use the silicon safety tube for the needle.

NOTE

If the loop capillary is not broken and no solvent has leaked into the loop capillary tube, the solvent draw up steps using the syringe can be skipped (steps 5, 6, 8).

1. In the user interface start the maintenance mode and select the “Change Loop Capillary” function. In the Agilent Lab Monitor & Diagnostic Software the "Change Loop Capillary" function can be found under the "Tools" icon.
2. Open the front door and remove the side door.
3. Remove the plate tray from the tray base.
4. Push the silicon safety tube over the needle
5. Remove the corrugated loop capillary waste tube and introduce the small tubing from the leak kit into the loop capillary protection tube.
6. Draw up the liquid with the syringe.
7. Unlock the needle tighter lock system.
8. Draw up the rest of the solvent from the loop capillary protection tube.
9. Loosen the loop capillary fitting on the analytical head side.
10. Pinch the holder clamp, pull back and remove the needle assembly with the loop capillary from the needle carrier.

11 Attach the 5/16 inch wrench to hold position at the needle assembly. Use the 4 mm wrench to loosen the fitting of the loop capillary.

12 Pull the loop capillary out from the needle assembly.

Installing the Loop Capillary

When
Capillary blocked
Capillary broken

Tools required
- Two 1/4 inch-5/16 inch wrenches 8710-0510 (supplied in accessory kit)

Parts required

#	p/n	Description
1	G1375-87315	Loop capillary
1	G1377-87300	Loop capillary, 40 µL for G1377A

1 Pull the new loop capillary in the needle assembly.
2 Attach the 5/16 inch wrench to hold position at the needle assembly. Use the second wrench to tighten the loop capillary fitting.
3 Push the loop capillary into the loop capillary protection tube until it comes out on the sampling unit side.
4 Re install the loop capillary corrugated waste tube over the loop capillary.
5 Retighten the loop capillary fitting on the analytical head.
6 Pinch the holder clamp and reinsert the needle assembly into the needle carrier.
7 Push the black chain into the needle assembly until the stop.
8 Lock the needle tighter lock system.
9 Check the alignment of the needle in the needle pusher of the needle carrier by viewing from several directions to see that it is aligned in the center of the needle pusher.

NOTE The needle must be centered in the needle pusher as all alignment by the autosampler is calculated from the needle pusher position.

10 Remove the silicon safety tube from the needle.
11 Replace the plate tray in the tray base. Re-install the side door and close the front door.
12 In the user interface close the “Change Loop Capillary" function and exit themaintenance mode. In the Agilent Lab Monitor & Diagnostic Software the "Change Loop Capillary" function can be found under the "Tools" icon.

Peristaltic Pump

When
- Tubing blocked or broken.

Tools required
- sand paper

Parts required

#	p/n	Description
1	5065-4445	Peristaltic pump with Pharmed tubing

NOTE The peristaltic pump is a replaceable unit. The tubing inside the pump is not replaceable.

1. Remove the corrugated leak tubing.
2. Press the two clips on the front of the peristaltic pump.
3. Pull the pump forward off the motor shaft.
4. Disconnect the tubing leading to the wash port and the tubing coming from the solvent bottle.
5. Connect the wash port tubing to the upper tubing of the new pump (use sandpaper to get a good grip on the tubing).
6. Connect the tubing coming from the solvent bottle to the lower tubing of the new pump.
7. Push the pump onto the motor shaft until the clips click into place.
8. Reinstall the corrugated leak tubing.

Installing Interface Board

When
- For all repairs inside the sampler or for installation of the board.

Tools required
- Flat head screwdriver

Parts required

#	Description
1	Interface board

CAUTION

Electrostatic discharge at the interface board

The interface board is sensitive to electrostatic discharge.

➔ Always use the ESD strap when handling electronic boards.

1. Switch off the autosampler at the main power switch.
2. Disconnect all cables from the existing interface board. Then loosen the interface board holding screws and slide the board out of its holding rails.
3. Identify the interface board slot cover. Loosen the two holding screws, and remove the cover.
4. Carefully insert the new interface board into the holding rails, and push the board into the slot. Make sure the board plugs into the socket correctly.
5. Reconnect all cables to the new interface board.
6. Switch on the sampler.

8
Parts and Materials for Maintenance

his chapter provides information on parts for maintenance.

Sampler Main Assemblies

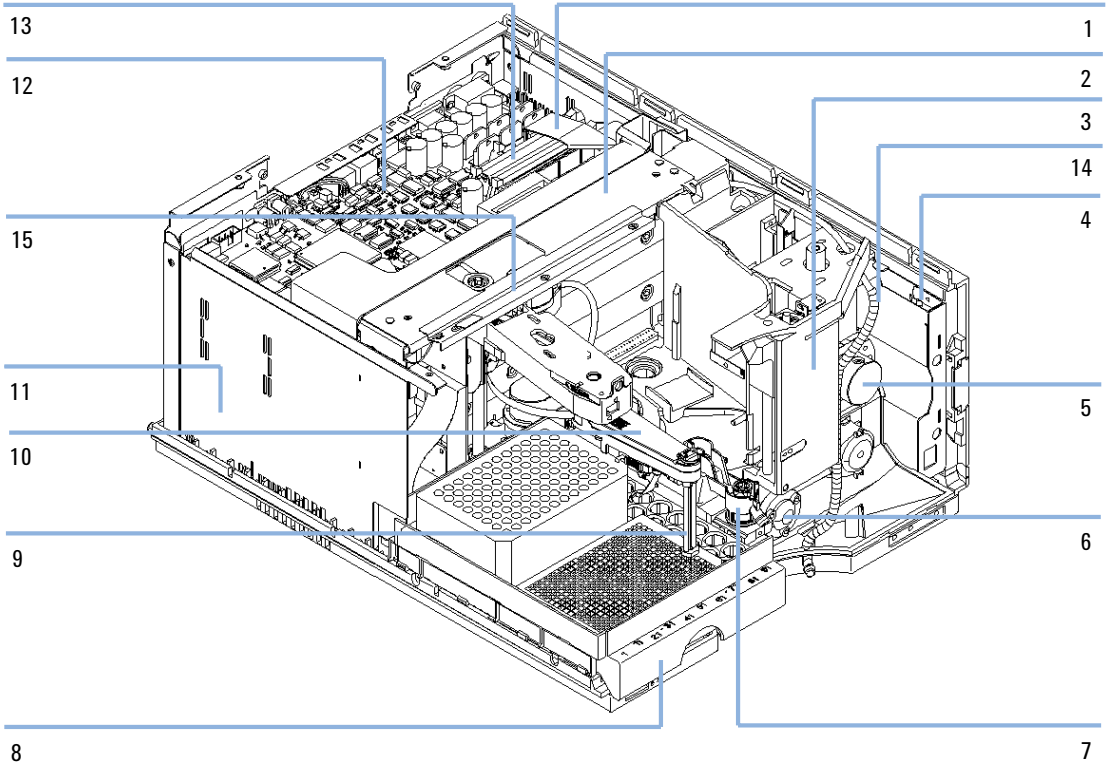


Figure 26 Autosampler Main Assemblies

Table 31 Autosampler Main Assemblies

Item	Description	Part Number
1	Ribbon Cable (from SU to MTP)	p/n G1313-81602
2	Sample Transport assembly for G1377A (new exchange part) Sample Transport assembly for G1377A (refurbished exchange part)	p/n G1377-60009 p/n G1377-69009
3	Sampling Unit assembly for G1377A (The assy comes without injection valve and analytical head)	p/n G1367-60028 p/n G1377-60008
4	SLS board (not shown)	p/n G1367-66505
5	Analytical Head assembly (40 µl) for G1377A	p/n G1377-60023 p/n G1377-60013
6	Micro Injection valve assembly for G1377A	p/n 0101-1050
7	Needle Seat assy for G1377A (without capillary) Seat cap. (0.10 mm ID) for G1377-87101 Needle Seat Seat cap. (0.075 mm) for G1377-87101 Needle Seat Seat cap. (0.05 mml) for G1377-87101 Needle Seat	p/n G1377-87101 p/n G1375-87317 p/n G1375-87316 p/n G1375-87300
8	Plate Tray base	p/n G2258-60011
9	Needle assy for G1377A	p/n G1377-87201
10	Needle Carrier assembly	p/n G1367-60010
11	Power supply assembly (not visible)	p/n 0950-2528
12	Autosampler Main Board (MTP) Exchange Assembly - MTP board	p/n G1367-66520 p/n G1367-69520
13	Ribbon Cable (from ST to MTP) Ribbon Cable (from SLS to MTP) (not visible)	p/n G1364-81601 p/n G1367-81600
14	Loop capillary for G1377A (8µl injection volume) Loop capillary for G1377A (40µl injection volume)	p/n G1375-87315 p/n G1377-87300
15	Illumination assembly for sampler	p/n G1367-60040
	Sampler-TCC cap. (500 mm, 0.05 mm id) for G1377/78A	p/n G1375-87304
	Fan (not visible)	p/n 3160-1017
	Fan exhaust (not visible)	p/n 3160-4097
	BCD board (not visible)	p/n G1351-68701

Vial Trays

Table 32 Autosampler Vial Trays and Tray Base

Item	Description	Part Number
1	Tray for 2 plates + 10 × 2-ml vials	p/n G2258-60011
2	Screws for springs	p/n 0515-0866
3	Spring	p/n G1313-09101
4	Spring stud	p/n 0570-1574
5	Tray base (includes items 4,5,6)	p/n G1329-60000
6	Adapter air channel	p/n G1329-43200
	Plug channel (not shown)	p/n G1367-47200

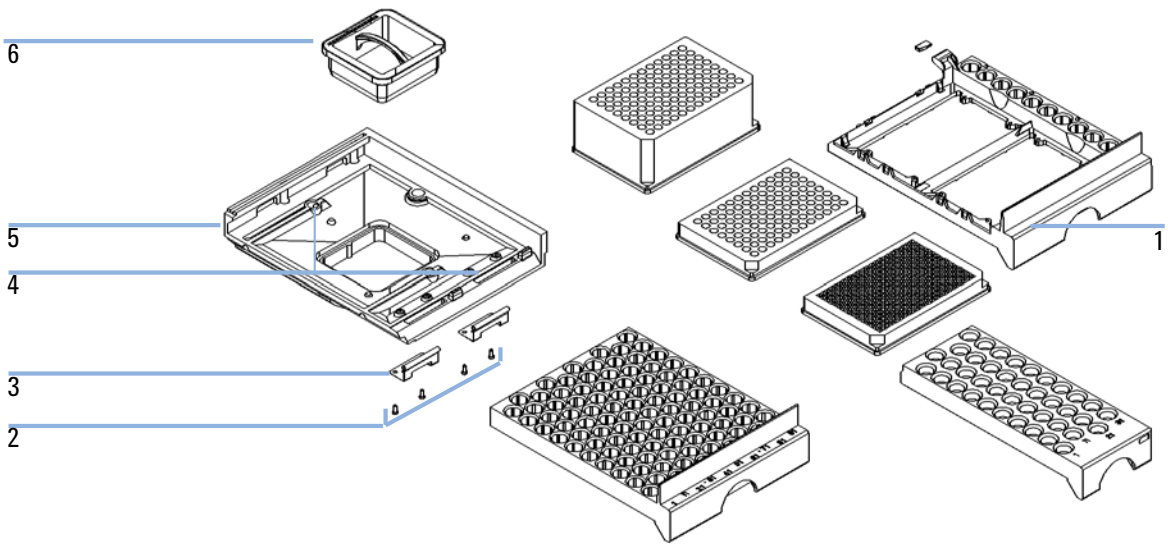


Figure 27 Vial trays and Tray Base

Table 33 Recommended plates and closing mat

Description	Rows	Columns	Plate height	Volume (µl)	Part Number	Package
384Agilent	16	24	14.4	80	5042-1388	30
384Corning	16	24	14.4	80	No Agilent PN	
384Nunc	16	24	14.4	80	No Agilent PN	
96Agilent	8	12	14.3	400	p/n 5042-1386 p/n 5042-1385	10 120
96Agilent conical	8	12	17.3	150	p/n 5042-8502	25
96CappedAgilent	8	12	47.1	300	p/n 5065-4402	1
96Corning	8	12	14.3	300	No Agilent PN	
96CorningV	8	12	14.3	300	No Agilent PN	
96DeepAgilent31mm	8	12	31.5	1000	p/n 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	
Closing mat for all 96 Agilent plates	8	12			p/n 5042-1389	50

Table 34 Recommended Vial plates

Description	Part Number
Vial plate for 54x2ml vials (6/pk)	p/n G2255-68700
Vial plate for 15x6ml vials (1/pk)	p/n 5022-6539
Vial plate for 27 Eppendorf tubes (1/pk)	p/n 5022-6538

Accessory Kits

p/n	Description
5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
9222-0518	Bag - plastics
G1315-45003	Torque adapter
G1367-60006	WPS Leak Kit
G1375-87304	Fused silica/PEEK capillary 50 µm, 50 cm
G1375-87316	Seat Capillary (150 mm 0.075 mm ID) for G1377-87101 Needle Seat
G1329-43200	Adapter air channel
5181-1519	CAN cable, Agilent module to module, 1 m
8710-1534	Wrench, 4 mm both ends, open end
G1377-44900	tool for Micro Seat Capillary Mounting
G1377-87300	Loop capillary, 40 µL for G1377A

Thermostat for ALS/FC/Spotter

Table 35 Thermostat for ALC/FC/Spotter

Item	Description	Part Number
1	Thermostat, exchange assembly	p/n G1330-69040

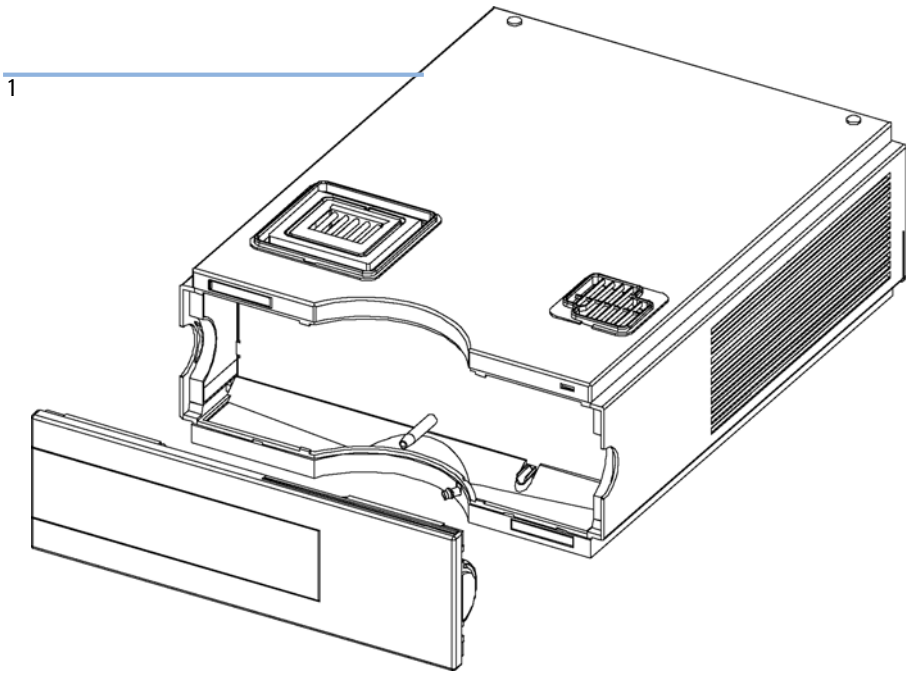


Figure 28 Thermostat for ALS/FC/Spotter

9
Cable Identification

This chapter provides information on cables used with the Agilent 1260 Infinity modules.

Cable Overview

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

Analog cables

p/n	Description
35900-60750	Agilent module to 3394/6 integrators
35900-60750	Agilent 35900A A/D converter
01046-60105	Analog cable (BNC to general purpose, spade lugs)

Remote cables

p/n	Description
03394-60600	Agilent module to 3396A Series I integrators
	3396 Series II / 3395A integrator, see details in section "Remote Cables" on page 164
03396-61010	Agilent module to 3396 Series III / 3395B integrators
5061-3378	Agilent module to Agilent 35900 A/D converters (or HP 1050/1046A/1049A)
01046-60201	Agilent module to general purpose

BCD cables

p/n	Description
03396-60560	Agilent module to 3396 integrators
G1351-81600	Agilent module to general purpose

CAN cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

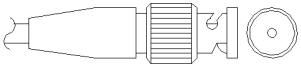
External Contact Cable

p/n	Description
G1103-61611	External contact cable - Agilent module interface board to general purposes

RS-232 cables

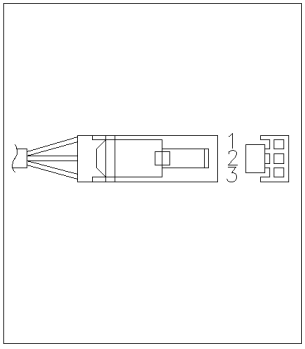
p/n	Description
G1530-60600	RS-232 cable, 2 m
RS232-61600	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

Analog Cables

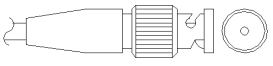


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

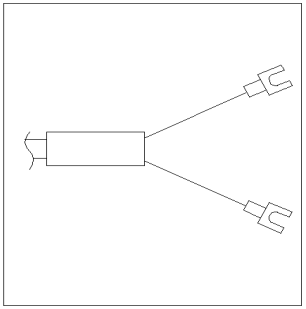
Agilent Module to 3394/6 Integrators

p/n 35900-60750	Pin 3394/6	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

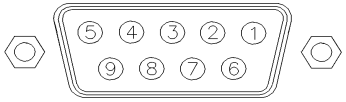
Agilent Module to BNC Connector

p/n 8120-1840	Pin BNC	Pin Agilent module	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

Agilent Module to General Purpose

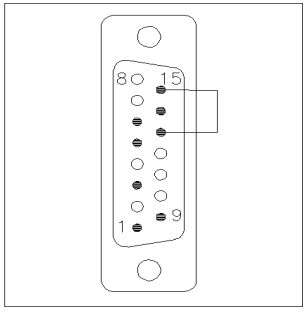
p/n 01046-60105	Pin 3394/6	Pin Agilent module	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables



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

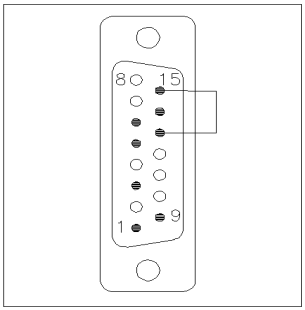
Agilent Module to 3396A Integrators

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

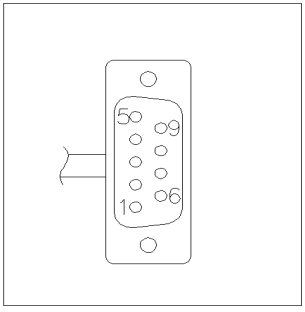
Agilent Module to 3396 Series II / 3395A Integrators

Use the cable Agilent module to 3396A Series I integrators (p/n 03394-60600) and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

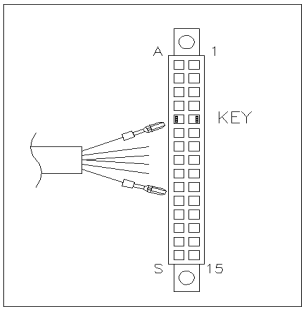
Agilent Module to 3396 Series III / 3395B Integrators

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

Agilent Module to Agilent 35900 A/D Converters

p/n 5061-3378	Pin 35900 A/D	Pin Agilent module	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

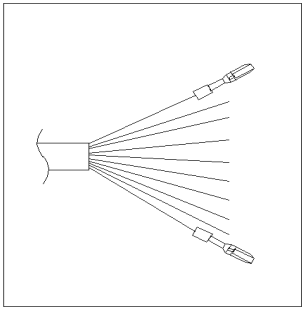
Agilent Module to General Purpose

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

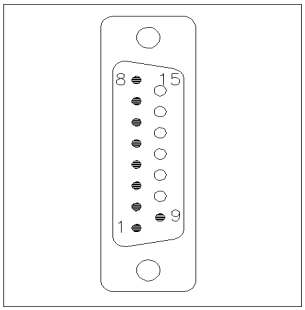
BCD Cables

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

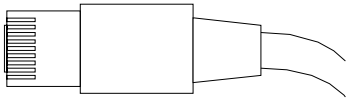
Agilent Module to General Purpose

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

Agilent Module to 3396 Integrators

p/n 03396-60560	Pin 3396	Pin Agilent module	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

CAN/LAN Cables



Both ends of this cable provide a modular plug to be connected to Agilent modules CAN or LAN connectors.

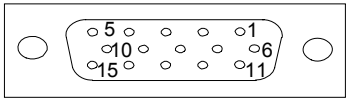
CAN Cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN Cables

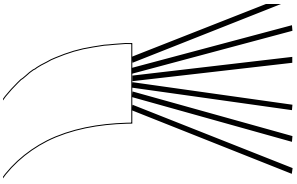
p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

External Contact Cable



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

Agilent Module Interface Board to general purposes

External contact cable - Agilent module interface board to general purposes (p/n G1103-61611)	Color	Pin Agilent module	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected
	Brown/green	14	Not connected
	White/yellow	15	Not connected

RS-232 Cables

p/n	Description
G1530-60600	RS-232 cable, 2 m
RS232-61600	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

10 Appendix

This appendix provides general safety and environmental information.

General Safety Information

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

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

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

Safety Standards

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

Operation

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

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

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

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

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

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

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

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

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

Safety Symbols

Table 36 Safety Symbols

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

WARNING

A WARNING

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

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

CAUTION

A CAUTION

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

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

The Waste Electrical and Electronic Equipment Directive

Abstract

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

NOTE

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

Product Category:

With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a Monitoring and Control Instrumentation product.

NOTE

Do not dispose off in domestic household waste

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

Lithium Batteries Information

WARNING

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.

Danger of explosion if battery is incorrectly replaced.

➔ Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

➔ Replace only with the same or equivalent type recommended by the equipment manufacturer.

WARNING

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering.

Udskiftning må kun ske med batteri af samme fabrikat og type.

➔ Lever det brugte batteri tilbage til leverandøren.

WARNING

Lithiumbatteri - Eksplosionsfare.

Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten.

➔ Brukt batteri returneres appararleverandoren.

NOTE

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

Radio Interference

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

Test and Measurement

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

Sound Emission

Manufacturer's Declaration

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

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

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

Use of Solvents

Observe the following recommendations on the use of solvents.

- Brown glass ware can avoid growth of algae.
- Avoid the use of the following steel-corrosive solvents:
  - Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on),
  - High concentrations of inorganic acids like sulfuric acid and nitric acid, especially at higher temperatures (if your chromatography method allows, replace 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,
  - Solvents containing strong complexing agents (e.g. EDTA),
  - 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 modules for download.

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www.agilent.com

In This Book

This manual contains user information about the Agilent 1260 Infinity High Performance Micro Autosampler. The manual describes the following:

- introduction to the sampler,
- site requirements and specifications,
- installing, configuring and using the autosampler
- optimizing performance,
- troubleshooting and diagnostics,
- maintenance,
- parts and materials,
- information on cables,
- safety and legal information.

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