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Operating Manual

Agilent 7673 Automatic Liquid Sampler

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Safety Information

The Agilent Automatic Liquid Sampler meets the following IEC (International Electrotechnical Commission) classifications: Safety Class 1, Transient Overvoltage Category II, and Pollutions Degree 2. This unit has been designed and tested in accordance with recognized safety standards and designed for use indoors. Whenever the safety protection of the Automatic Liquid Sampler has been compromised, disconnect the unit from all power sources and secure the unit against unintended operation.

The recyclable carbon mono-fluoride lithium battery is a BR-2/3 A 1,200 mAh. Fuses F001 and F002 are 3 A, 250 Vac, IEC 127 Type T. Fuses F201 and F202 are 10 A, 250 Vac, IEC 127 Type T. Fuse F101 is a 0.5 A, 250 Vac.

Warnings in this manual or on the instrument must be observed during all phases of operation, service, and repair of this instruments. Failure to comply with these precautions violates safety standards of design and the intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements. Refer servicing to qualified service personnel. Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard. Disconnect the AC power cord before removing covers. The customer should not attempt to replace the battery or fuses in this instrument.

Safety Symbols

This manual contains safety information that should be followed by the user to ensure safe operation.

WARNING

A warning calls attention to a condition or possible situation that could cause injury to the user.

CAUTION

A caution calls attention to a condition or possible situation that could damage or destroy the product or the user's work.

Sound Emission Certification for Federal Republic of Germany

If Test and Measurement Equipment is operated with unscreened cables and/or used for measurements in open set-ups, users have to assure that under these operating conditions the Radio Interference Limits are still met at the border of their premises.The following information is provided to comply with the requirements of the German Sound Emission Directive dated January 18, 1991:

Sound pressure Lp < 70db(A)

During normal operation

At the operator position

According to ISO 7779 (Type Test)

When operating the Automatic Liquid Sampler with cryo valve option, the sound pressure ≈ 78 db(A) during cryo valve operation for short burst pulses.

Schallemission

Werden Meß-und Testgeräte mit ungeschirmten Kabeln und/oder in offenen Meßaufbauten verwendet, so ist vom Betreiber sicherzustellen, daß die Funk-Entströbedingungen unter Betriebsbedingungen an seiner Grundstücksgrenze eingehalten werden. Diese Information steht im Zusammenhang mit den Anforderungen der Maschinenlärminformation sverordnung vom 18 Januar 1991.

Schalldruckpegel LP < 70 dB(A)

Am Arbeitsplatz

Normaler Betrieb

Nach DIN 45635 T. 19

(Typprüfung)

Bei Betrieb des Automatischer Slüssigkeitsprobengeber mit Cryo Ventil Option treten beim Oeffnen des Ventils impulsfoermig Schalldrucke Lp bis ca. 78 dB(A) auf.

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1

Setting Up

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Setting Up

The purpose of this chapter is to:

- Introduce you to the names of the major parts associated with installing the automatic liquid sampler and some preventive maintenance tips.
- Help you set up the automatic liquid sampler and turn on the power.

You must complete the following tasks during installation to be ready to turn on the power.

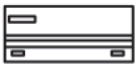
1. Install the mounting brackets for the injector and tray, along with any upgrade parts for the gas chromatograph (GC). Instructions for these installations are contained in link manuals that are packaged with the brackets or upgrade parts.
2. Mount the injector and tray on the brackets.
3. Verify that the controller switch settings are correct.
4. Connect the cables for the injector and tray to the controller.
5. Connect the communication cables for the controller, the GC, and the data handling device.
6. Install the power cord for the controller.

The instructions for tasks 2 through 6 start on page 11.

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The modules of the automatic liquid sampler

The automatic liquid sampler is made up of three modules:



The G1512A controller and communications module supplies power and communications to the injector and tray.



The G1513A injector module removes a volume of sample from a vial and injects it into the inlet.



The 18596C tray module moves sample vials to and from the injector and the bar code reader.

The automatic liquid sampler works with the PrepStation system to automate sample preparation procedures. The G1296A/G1926A bar code reader module is also available. It reads the vial numbers and special instructions for running a method. It can also be used for agitating the sample vial.

The automatic liquid sampler becomes part of your gas chromatography system. It introduces sample to an inlet or a column on your GC.

The automatic liquid sampler, with or without the tray, can be controlled by a variety of integrators and computers, including:

- 6890 Series GC
- Its own electronics (standalone control)
- 3396 integrators plus older models
- Most Agilent laboratory automation systems
- Most Agilent ChemStation systems
- Suitably programmed external computers

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Figure 1 illustrates how the automatic liquid sampler is an integral part of the analytical system.

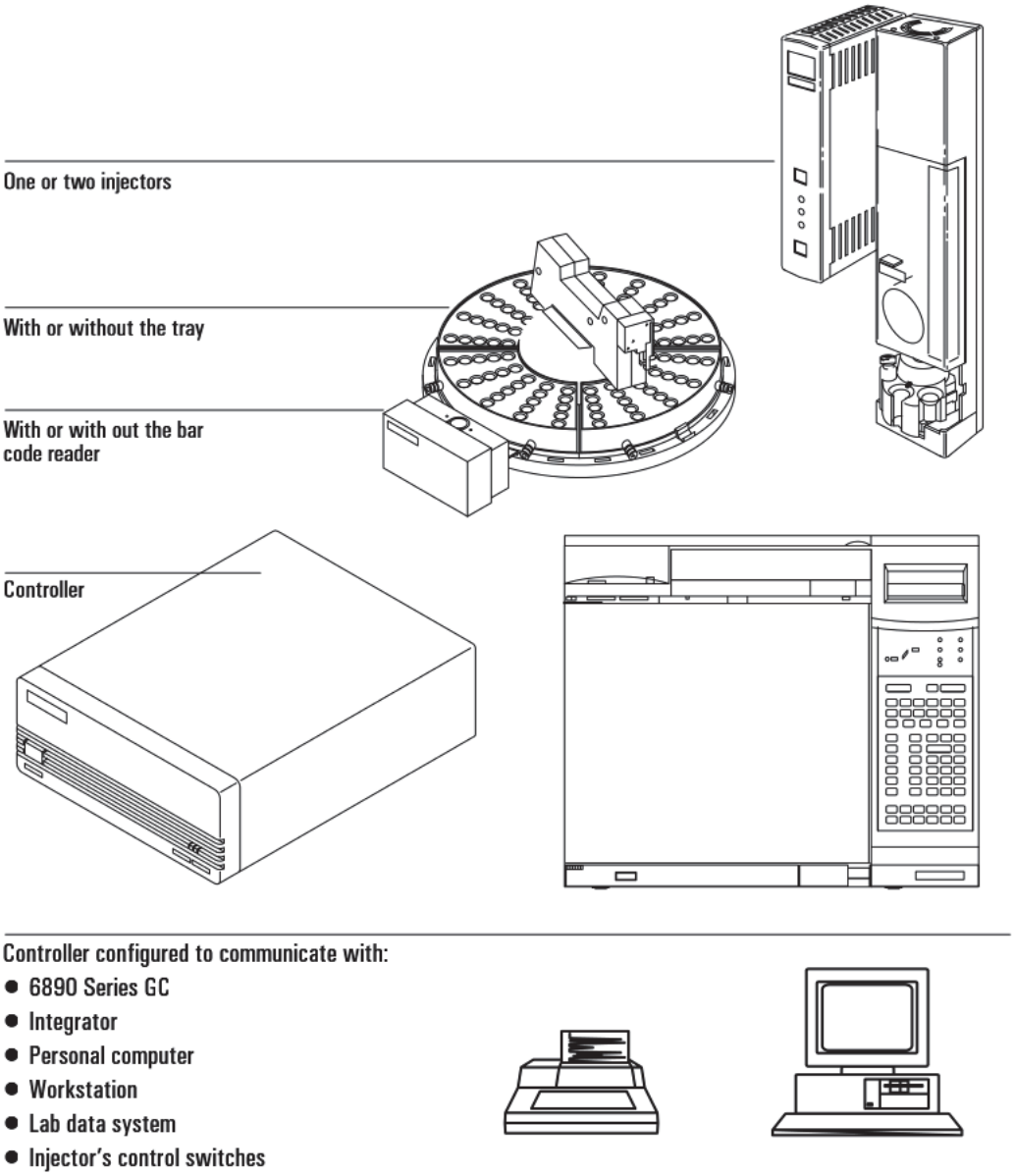


Figure 1. The automatic liquid sampler as part of your analytical system

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Preparing the site

The automatic liquid sampler has certain environmental, space, and electrical power requirements.

Environmental considerations

The automatic liquid sampler is designed to operate within ranges of temperature and relative humidity.

- Temperature range: 0° to 55°C
- Relative humidity range: 5% to 95% at 40°C
- Altitude ranges: up to 2,300 m

Agilent Technologies recommends an environment comfortable for the operators (reasonably constant temperature and humidity) for optimum performance and instrument lifetime.

Caution Do not place any instruments that release heat on top of or underneath the controller. For example, do not place an integrator on top of the controller. The additional heat can cause damage to its electrical components.

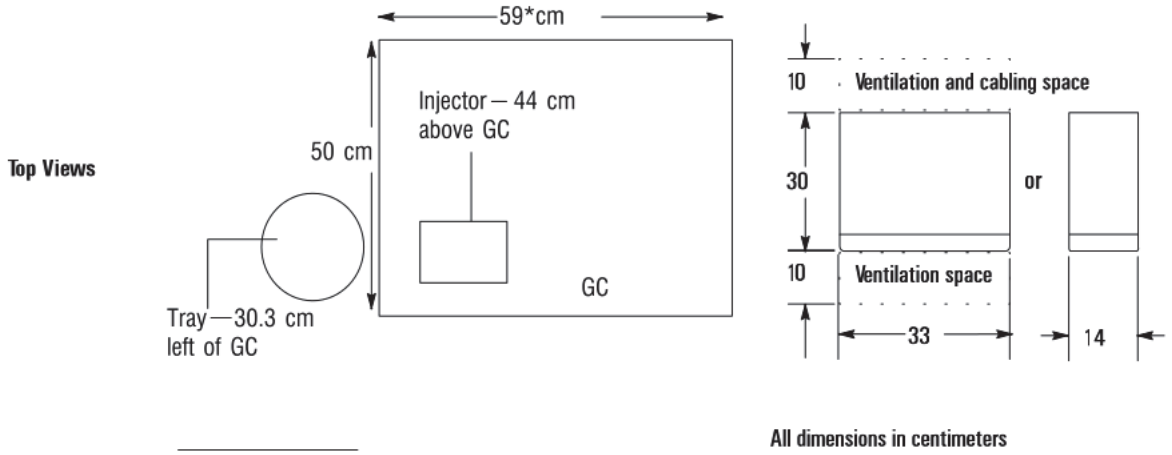
Space considerations

The injector and tray increase the space requirements for the GC. The exact amount depends on the model of the GC. Figure 2 shows the space requirements for the components with a 6890 Series GC.

Installed on the 6890 Series GC, the injector adds 44 cm (17 in.) in height. The tray adds 30.3 cm (9 in.) to the left side and 3 cm (2 in.) to the front. The controller requires a clear surface about 33 cm (13 in.) wide and 38 cm (15.2 in.) deep. About 20 cm (8 in.) of the depth is required for cabling. If you place the controller on its right-hand side (i.e., power switch up), it needs a clear surface of 38 cm (15.2 in.) deep and 14 cm (6 in.) wide.

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WARNING Place the G1512A controller where you can easily unplug it from the power source.



*68cm for non-EPC version.

Figure 2. Space considerations

Electrical power requirements

The controller is the power source for the injector and tray. The controller has an autoranging power supply:

- 100–240 Vac single phase
- 48–66 Hz maximum
- 320 VA maximum

The automatic liquid sampler requires a proper earth ground. To protect users, the metal instrument panels and cabinet are grounded through the three-conductor power line cord in accordance with International Electrotechnical Commission (IEC) requirements.

The power cord must be plugged into a receptacle connected to a suitable earth ground. The receptacle ground should be verified.

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WARNING Any interruption of the grounding conductor or disconnection of the power cord could cause a shock that results in personal injury.

Connecting the controller power cord

1. Check the on/off button on the front of the controller. It must be off or flush with the front panel before you plug in the power cord. The symbol " ⏻ " indicates standby. The symbol "I" indicates on.
2. Plug the female end of the power cord into the AC power receptacle on the back of the controller.
3. Plug the male end of the power cord into the AC power receptacle of your facility.

Installing the injectors

The injector contains the syringe, a syringe carriage, a six-position standard turret, a cooling fan that you can turn off, parameter switches, and a last sample vial switch.

The turret rotates sample vials and solvent and waste bottles into position under the syringe. Without a tray, you load the sample vials manually into the turret (maximum of three samples). With a tray, the robotic arm loads the vials (up to 100 samples). You load the solvent and wash bottles manually (the quantities of each depend on your controlling device). For more information on the fan, see "Using the injector fan" on page 34.

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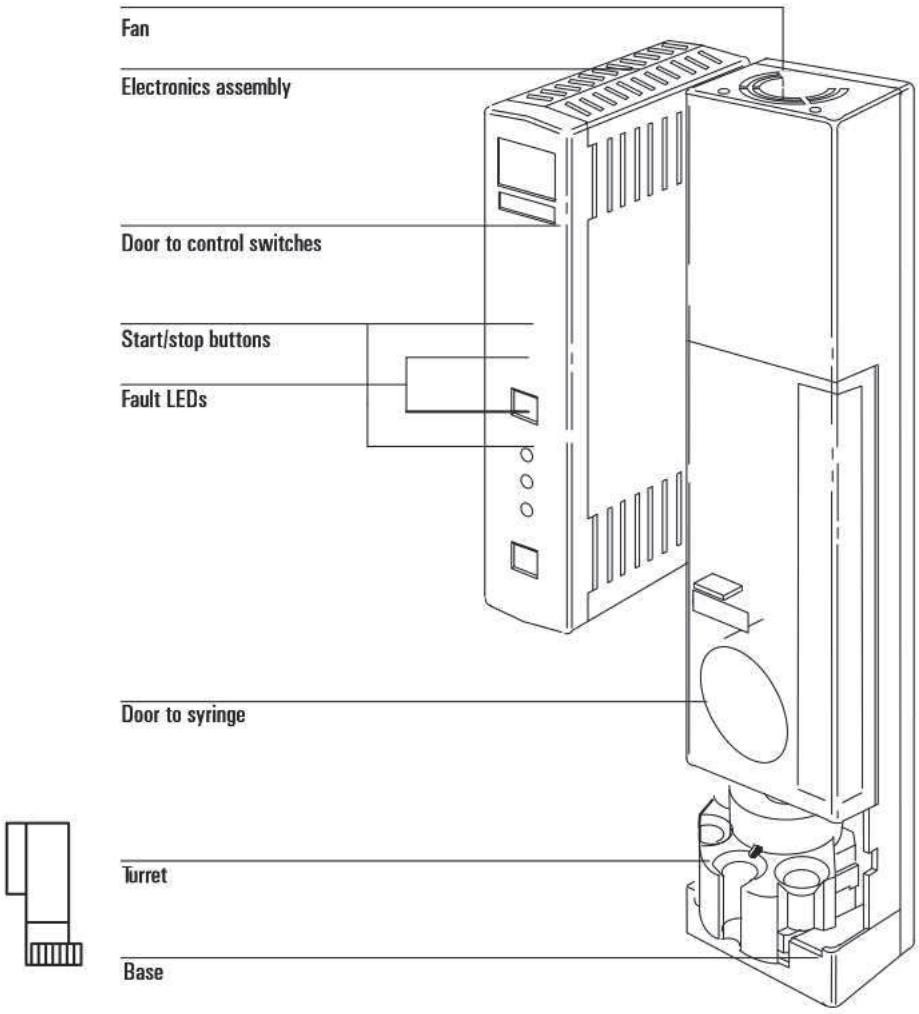


Figure 3. G1513A injector module

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Behind the door to the control switches

There are control switches behind the door on the injector's front panel.

- You use the rotary switch to set the number of sample vials when no tray is installed and the remaining ten switches to set six injector parameters when the system cannot be controlled by the 6890 Series GC, a computer, or an integrator. For example, you can set the number of injections per sample vial or the number of syringe washes. For more information, see "Setting the run parameters" on page 59.
- The injection switch can be used to set fast or slow injection with or without an integrator or computer controlling the system having any affect on that setting. However, it will be overridden by settings from the 6890 Series GC and the ChemStation.
- The Align LED is a diagnostic LED to warn users to perform the alignment procedure. See Chapter 5, *Preventive Maintenance and Troubleshooting*.

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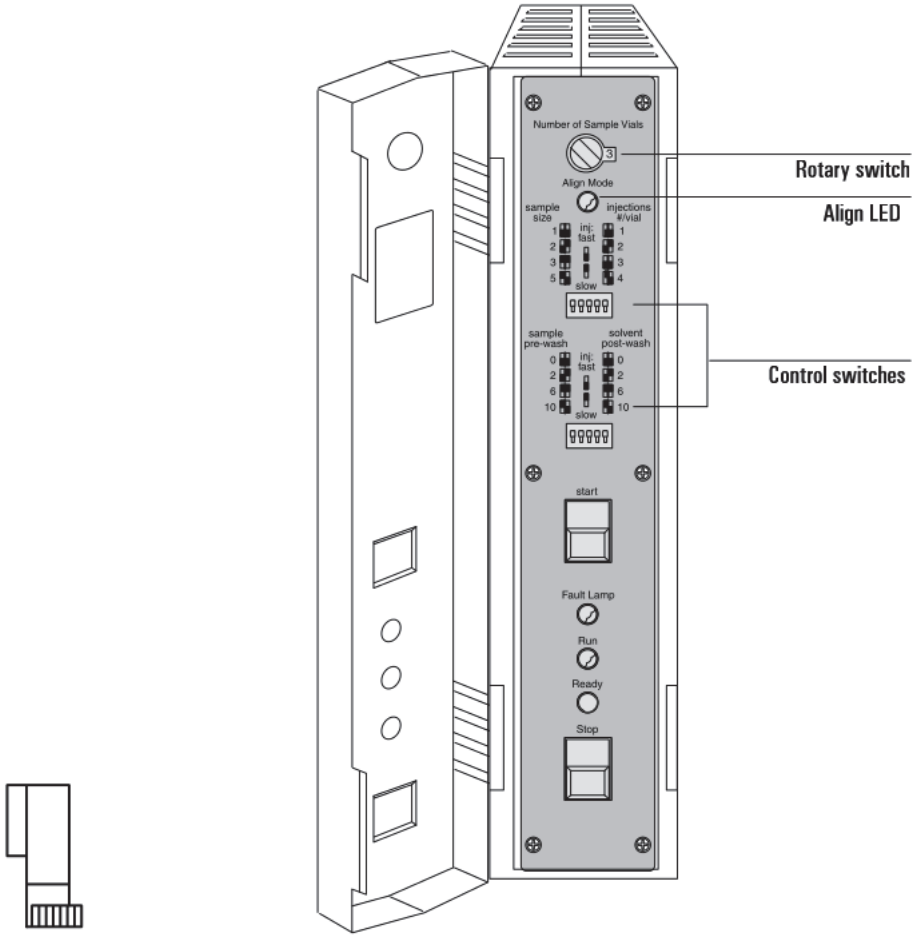


Figure 4. The parameter control switches

Before you start

To install an injector, you must first:

- Install the tray's mounting bracket before mounting the injectors (if your automatic liquid sampler includes a tray). The instructions and hardware are packaged together with the tray.
- Open the front panel, and remove the foam packing materials.

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- Install the injector mounting posts in the front and back locations of the injection bracket on the GC.

Mounting the injectors

The first part of each step describes how to mount the injector over the front inlet (injection port).

1. Hold the injector with both hands so the cable points toward you. Line up the hole in the base of the injector that is nearest the cable with the mounting post on the bracket. Lower the injector about an inch on to the post.

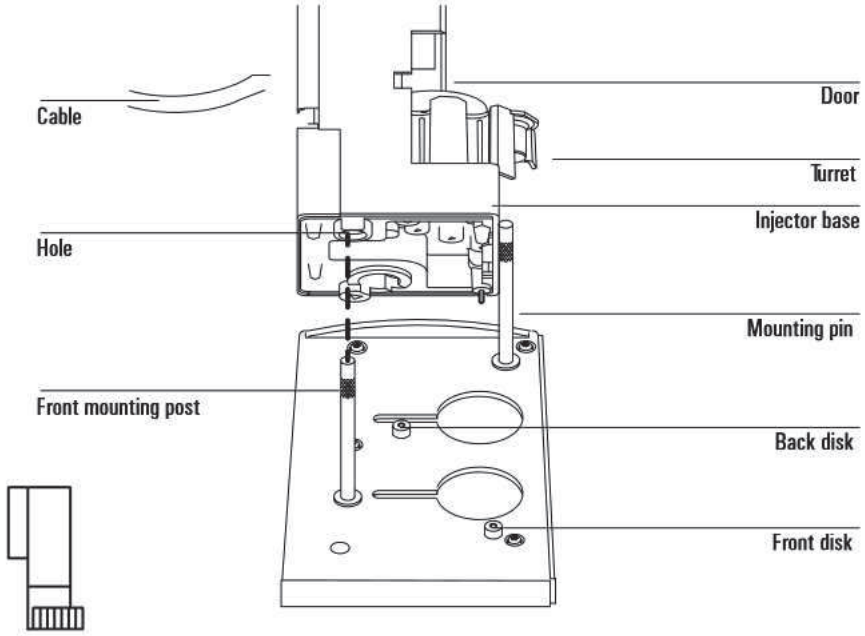


Figure 5. Lining up the injector with the mounting post

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2. Turn the injector so that the turret is facing toward you. Lower the injector so that the pin in the base enters the hole in the disk on the mounting bracket.

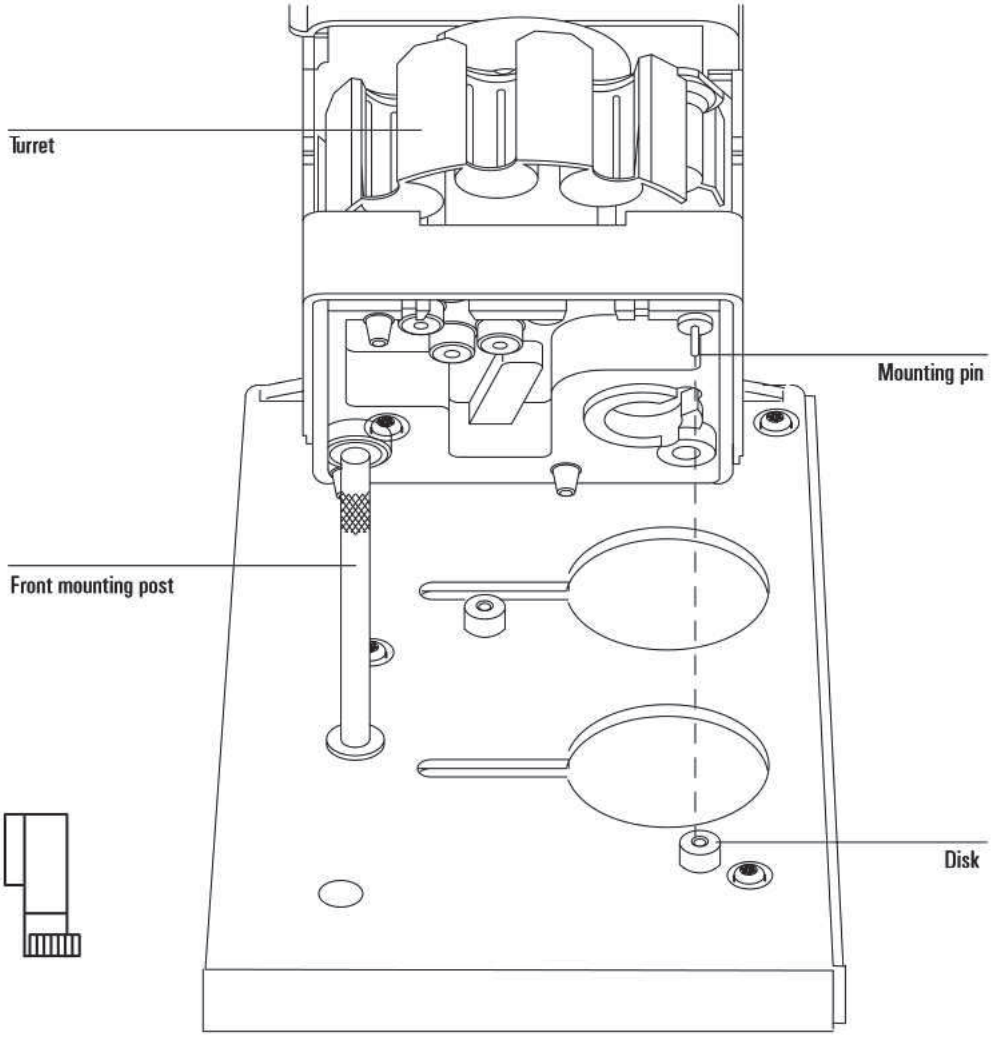


Figure 6. **Lowering the injector. The injector in this diagram is angled back to illustrate the position of the mounting pin.**

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Checking your work

- ❒ Be sure the mounting pin is seated in the hole of the disk. The injector's feet should touch the mounting bracket. Be sure the gas lines are not routed under the feet or the mounting pin.
- ❒ Turn the turret so you can see the inlet of the GC, and open the door to the syringe. Be sure the inlet is flush with the surface of the hole in the injector's base. This check does not apply to on-column inlets.
- ❒ If your system does not include a tray, read "Placing sample vials in the standard injector turret" in chapter 2.

For information on installing syringes, see "Selecting and installing syringes" in chapter 2. See this section for instructions on how to align the syringe to the inlet. Alignment is critical when injecting onto a 320- or 250-µm column. Chapter 6, "Special Topics," contains more information on use of 320- and 250-µm columns.

Installing the tray

The tray delivers samples to one or two injectors depending on the configuration of the gas chromatography system. The arm and gripper mechanism in the center of the tray loads sample vials into the injector turret and then returns them to the tray after each injection. It can also transport sample vials to and from the G1296A/G1926A bar code reader.

Each of the four removable tray quadrants holds 25 vials. Each is hollow and has fittings so that you can circulate a temperature-controlled fluid through it.

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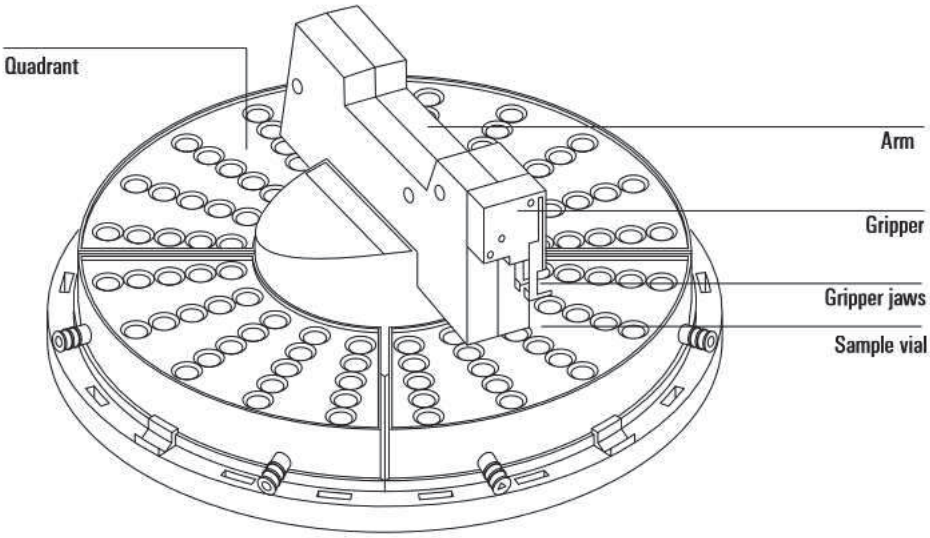


Figure 7. 18596B tray module

Before you start

Caution Do not remove the tray's arm back and forth. Do not move the tray's gripper up and down. These movements could damage the tray arm. If you need to move the arm, turn it in a clockwise or counterclockwise direction.

To install a tray, you must first install the tray mounting bracket. The mounting bracket for the tray attaches to the injector mounting bracket and the GC. The instructions and hardware are packaged together with the tray.

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Mounting the tray

1. Thread the cable through the hole in the mounting bracket. Lower the tray onto the bracket. Position the tray so that it sits flat on the bracket with the raised arrow pointing toward the right (the front injector). Move the injector cable out of the way.

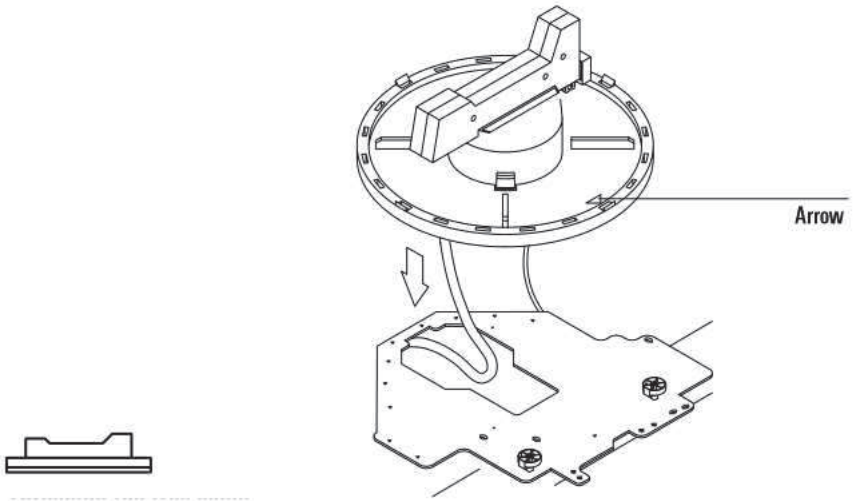


Figure 8. Threading the tray cable

2. Line up the arrow on the tray base with the alignment pin on the mounting bracket. Slide the tray to the right until the edge is under the two tray locks.

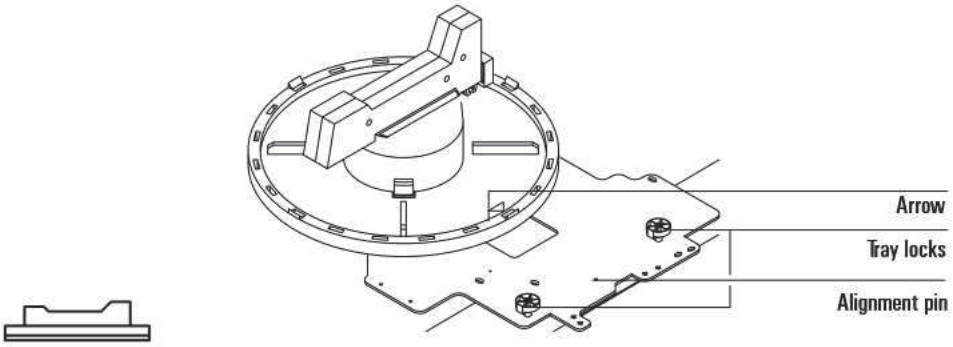


Figure 9. Attaching the tray

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3. Lock the tray into place by pulling each lock up (A), turning each lock (B), and inserting each tab into a slot in the tray (C).

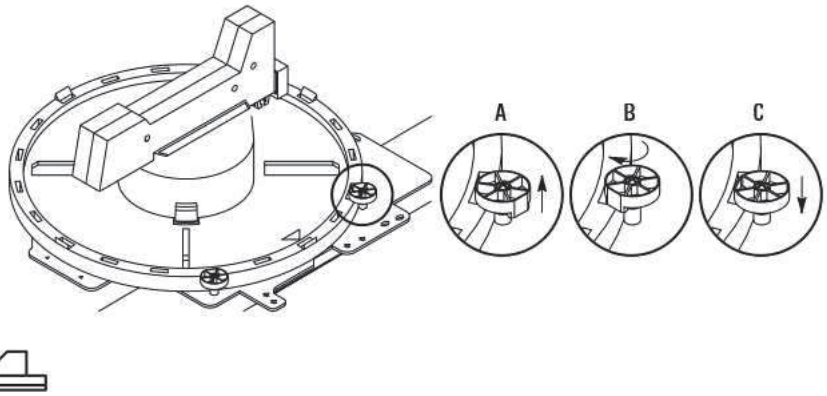


Figure 10. Locking the tray

4. Snap the tab of each tray quadrant into a slot on the base of the tray. The numbers on the quadrants should match the numbers on the base.

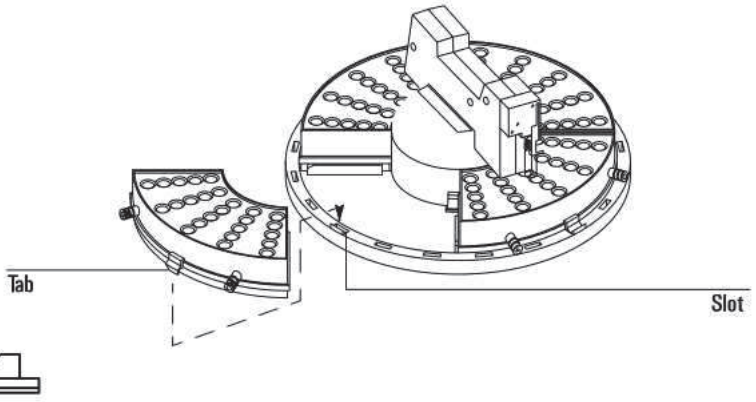


Figure 11. Inserting the tray quadrants

Checking your work

- ❒ Be sure the tray base is all the way to the right and locked into place.
- ❒ Be sure the quadrants are seated on the tray base.

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Installing the controller

The G1512A controller provides power and the communication interface for 18593A/B or G1513A injectors and for the 18596A or 18596B/C tray.

There are 11 connectors and two sets of switches for defining the communication type.

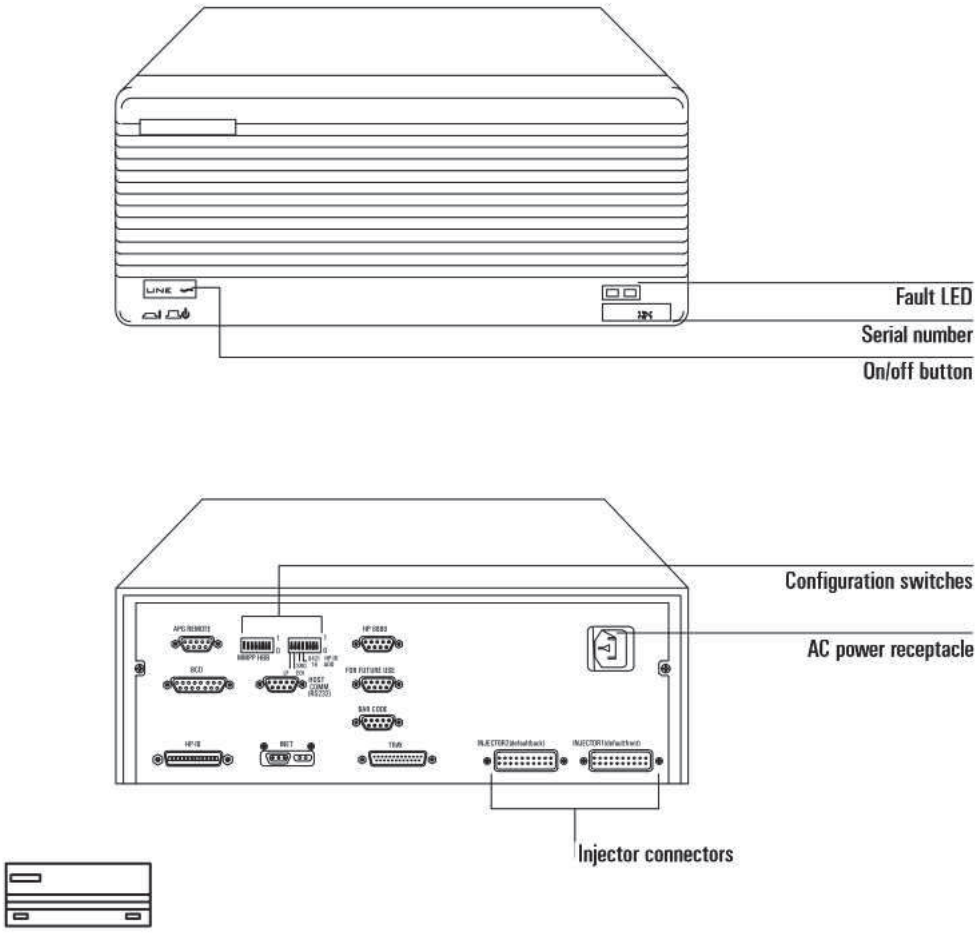


Figure 12. G1512A controller and communications module

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This section covers connecting the injector and tray cables to the controller, connecting the controller to the GC, connecting the controller to the data handling device, and plugging in the controller.

Find the power cord in the controller box. Check the shape of the plug and the source voltage listed on the packing contents sheet. Verify that the power cord is appropriate for the power source at your facility.

Connecting cables to other instruments

The automatic liquid sampler communicates to other instruments via cables that connect to the various connectors on the controller. Figure 13 shows the connectors on the back of the controller and what they are used for.

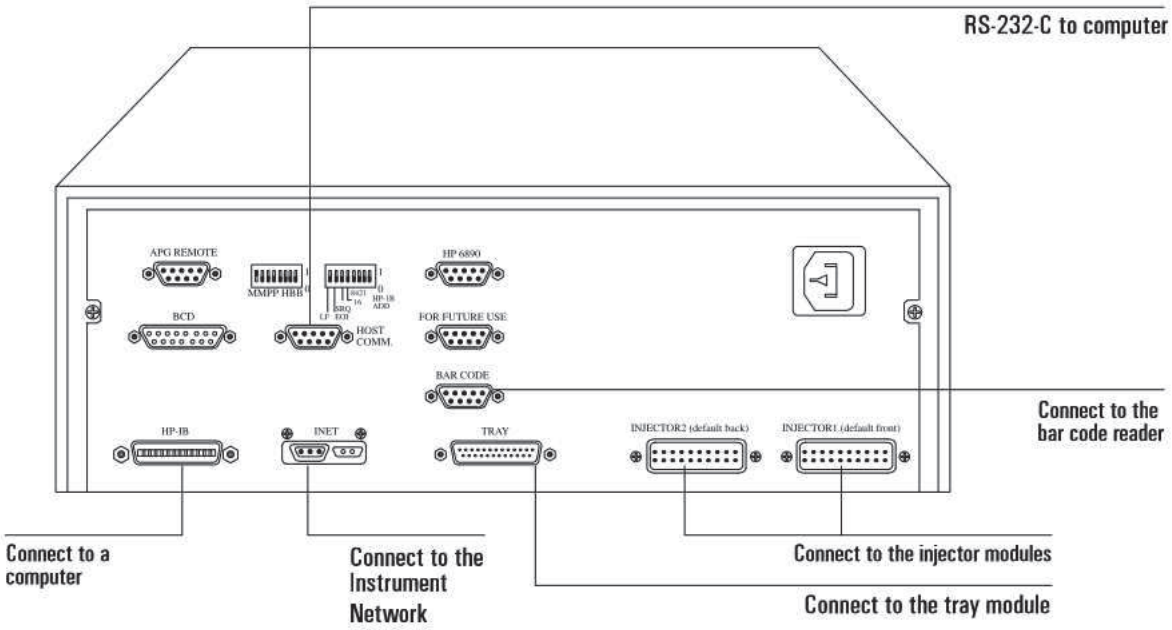


Figure 13. Common cable connections

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Setting the configuration switches

There are 16 switches on the back of the controller. Figure 14 and Figure 15 show the switches and settings for five common types of communications.

When you are using ChemStation software, you must set the GPIB address switches to a unique address. The address for the first sampler is usually set to "8." For a complete list of address switches, see Table 3.

Configuration switch definitions

The following tables describe the configuration switches and their settings.

Table 1. Left-hand Switch Settings

Switch	Description	Possible Values
MM	Communication mode type	00—INET, standalone 10—3365 ChemStation, MS ChemStation (Rev 3.65 and lower) 11—ChemStation, MS ChemStation (Rev 3.71 and higher) 01—Asynchronous standalone
PP	The bar code reader position	00—Front 01—Back 10—Right 11—Left
H	RS-232-C host handshake	0—XON/XOFF 1—RTS/CTS
BB	RS-232-C host baud rate	00—2400 01—9600 10—19.2 K 11—38.4 K

Table 2. Right-hand Switch Settings

Switch	Description	Possible Values
LF	Controller termination message	0—Line feed only 1—Carriage return and line feed
16,8,4,2,1	GPIB address of controller	00000 = 0, 00001 = 1, 00010 = 2, 00011 = 3, etc. (see Figure 14)

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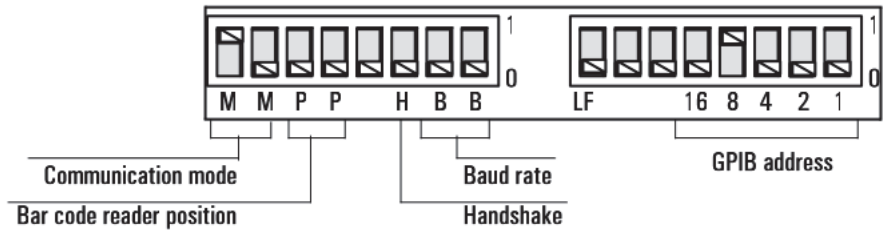


Figure 14. Setting the address switches

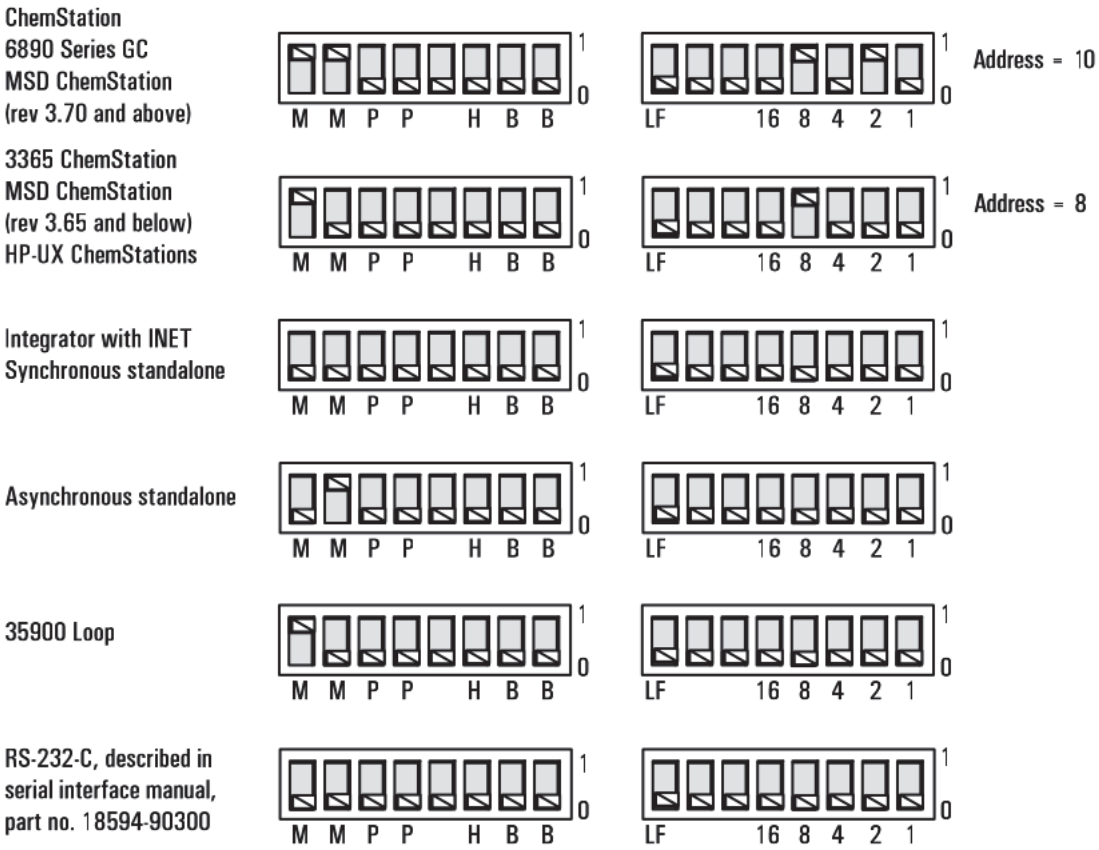


Figure 15. Examples of switch settings

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Table 3. Possible GPIB Address Switch Settings

GPIB Address	Switch Settings	GPIB Address	Switch Settings
0	00000	15	01111
1	00001	16	10000
2	00010	17	10001
3	00011	18	10010
4	00100	19	10011
5	00101	20	10100
6	00110	21	10101
7	00111	22	10110
8	01000	23	10111
9	01001	24	11000
10	01010	25	11001
11	01011	26	11010
12	01100	27	11011
13	01101	28	11100
14	01110	29	11101

Connecting the injector cables

With the power off, plug each injector cable into the connector on the back panel of the controller associated with the position of the injector, front or

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back. Be sure the spring clamps on either side of the plug snap onto the connector. Note the TOP label on the connector for orientation purposes.

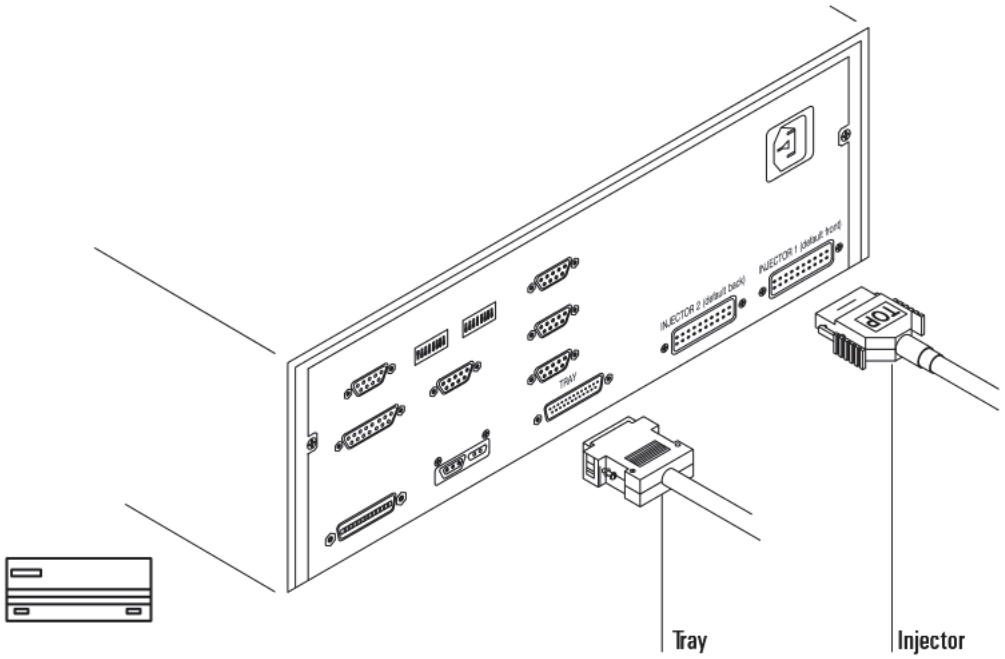


Figure 16. Connecting the injector and tray cables

Connecting the tray cable

Plug the cable into the tray connector on the back panel of the controller. Secure the plug to the connector with a small flathead screwdriver.

Connecting the controller power cord

1. Check the on/off button on the front of the controller. It must be off or flush with the front panel before you plug in the power cord.
2. Plug the female end of the power cord into the AC power receptacle on the back of the controller.
3. Plug the male end of the power cord into the AC power receptacle of your facility.

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Checking your work

- ❒ Be sure the injector and tray plugs are fastened securely.
- ❒ Be sure all the communication cables are installed and fastened securely.
- ❒ Be sure any external control or data handling devices are configured correctly by referring to the appropriate manual.
- ❒ Turn the controller on. Listen for a single beep. This means the system initialized correctly.
    - On the injector, the red, yellow, and green lights flash on together. The red and yellow lights go off. The green light stays on. If the red light stays on, be sure the injector is mounted correctly and the door to the syringe chamber is closed.
    - On the controller, the yellow and green lights flash on together. The green light stays on while the yellow light goes off.

To test the operation of the automatic liquid sampler, turn to chapter 2, “Preparing for Operation.”

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2

Preparing for Operation

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Preparing for Operation

This chapter contains detailed information for preparing the automatic liquid sampler for operation, including:

- Preparing sample vials
- Using the injector fan
- Preparing the solvent and waste bottles
- Selecting and installing syringes
- Maintaining the inlet
- Adapting for cool on-column injection

To optimize your sampler operation, it is important to have thorough preparation of your samples, sample vials, syringes, and inlets. Regular maintenance also keeps your equipment and analysis running smoothly. For more information, see chapter 5, “Preventive Maintenance and Troubleshooting.”

Preparing sample vials

This section explains how to select, label, fill, cap, and place the sample vials.

Selecting and labeling sample vials

The injector and the tray use glass sample vials and crimp caps or Target® DP™ screw-cap vials that meet a set of specifications. These are available with a write-on spot for easy labeling. If you choose to make your own labels, read the following specifications for location and thickness of labels.

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The location and thickness of a vial label can affect the delivery of the bottles to and from the injector. Agilent Technologies recommends the position and maximum label thickness shown in the following diagram.

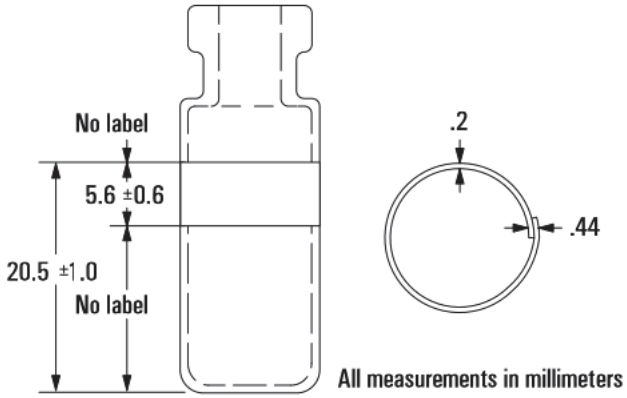


Figure 17. Label specifications

Caution The correct sample vial dimensions are critical for proper operation. Vials that do not meet specifications may cause sampler errors. Service calls and repairs found to be due to vials and microvials that do not meet these specifications are not covered under warranty or the service contract.

Specifications

Figure 18 illustrates most of the critical dimensions for the sample vials and microvial inserts. These dimensions do not make up a complete set of

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specifications. Some of the dimensions are too difficult to measure without special instruments.

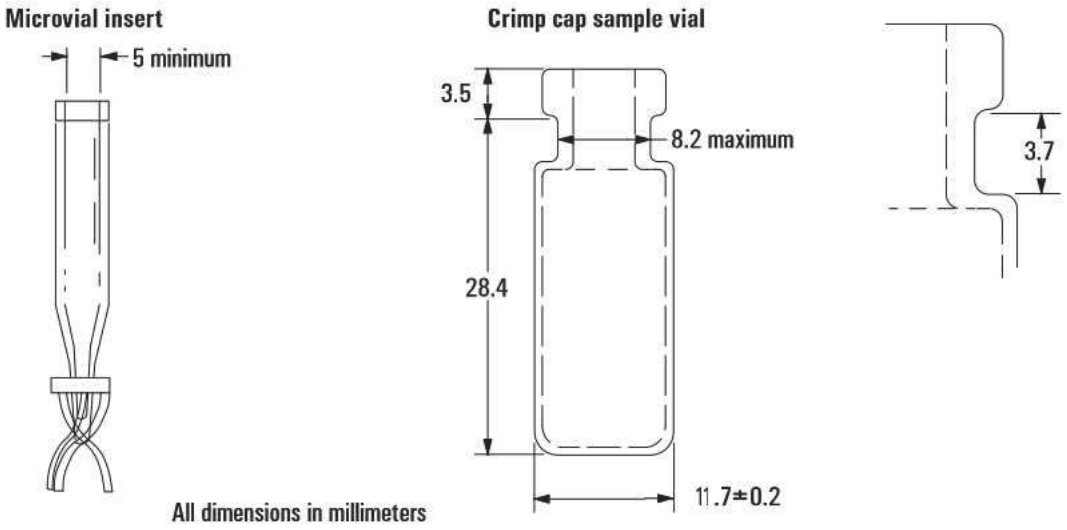


Figure 18. Dimensions for sample vials and microvial inserts

Sample caps and septum

Although septa come in different colors, the characteristics are measured by inertness and type of composition. There are two basic types of septa used with both crimp caps and screw-on caps. Each has different resealing characteristics and a different resistance to interaction with solvents.

- A general-purpose rubber formulation made from natural rubber is coated with Teflon on the sample side. It has a pH range of 4.0–7.5. It is least resistant to solvents after puncture, however, it is more easily cored. This coring may place septum pieces in the solvent that affect your chromatograms.
- A high-quality, low-extractable silicone rubber, coated with Teflon on one or both sides, is somewhat resistant to solvents after puncture.

Refer to your Agilent analytical supplies catalog for more information.

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Figure 19 illustrates the recommended and minimum diameter for vial cap apertures.

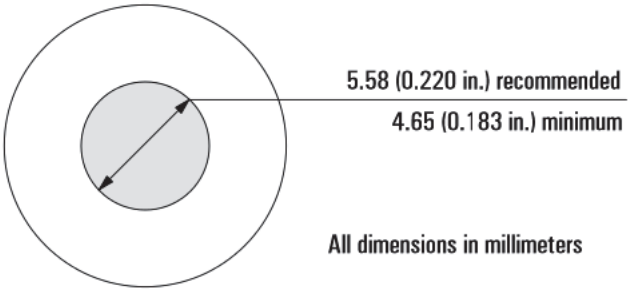


Figure 19. Specifications of vial cap aperture

Use amber glass vials for light-sensitive samples.

The last specification to consider is the total height of the capped vial. Figure 20 illustrates the recommended maximum height of a crimp capped or screw capped vial.

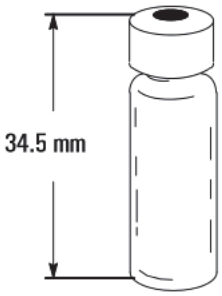


Figure 20. Maximum height of a vial with cap

Filling sample vials

Follow these recommendations to obtain reliable, high performance with the sampler and prevent contamination or injection volume problems. Recommended volumes for a maximum of five injections per vial are:

- 1 ml for the 2-ml vial
- 50 µl for the 100-µl vial

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For large volumes and multiple injections, you will have to decide how to divide the sample among several vials to obtain reliable results. You have to be aware when sample volume is low. For example, if the vials are less than half full, contaminants from the previous sample injection or solvent washes may affect the sample. Due to the various parameter settings available, the many suppliers of consumables, and the choices of vials, microvials, vial caps, and septa, some method development will need to be done to optimize your analysis.



*Needle position based on standard sampling depth. See chapter 3 for more information on setting parameters for sampling depth.

Figure 21. Recommended volumes for sample vials

Caution If the vials are more than half full, a vacuum may interfere with the syringe delivering a precise volume.
Do not inject air into the vial to compensate for the vacuum. Injecting air into the vial often damages the cap septum so that it is no longer airtight.

Crimp capping sample vials

Use a crimper to put on the airtight crimp caps.

1. Clean off the inside surfaces of the crimper jaws.
2. Place the crimp cap over the top of the vial.

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3. Lift the vial into the crimper, and squeeze the handle until the bottom grip reaches the adjuster screw.

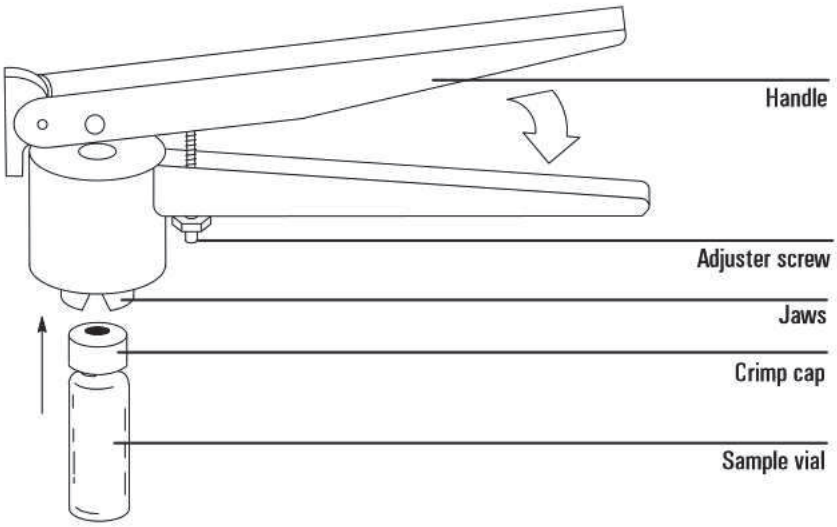


Figure 22. Crimping caps

Caution Vials that do not have properly crimped caps may cause sampler errors.

When a tray is not installed, you may be able to use sample vials with no caps, snap-on caps, or screw-on caps depending on your application. If a tray is installed, sample vials must have crimp caps or Target® DP™ screw-cap vials.

Check that your vial is crimped as follows:

1. Cap has no metal folds or wrinkles on the part of the cap that wraps under the neck of the vial.
   - If there are folds or wrinkles, flatten any wrinkles by turning the vial about 10° and crimping it again. Adjust the crimper for a looser crimp by turning the adjusting screw clockwise.
2. Cap is too tight to turn by hand.
   - If the cap is loose, adjust the crimper for a tighter crimp by turning the adjusting screw counterclockwise. Crimp the cap again.

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3. Cap has a flat septum centered over the top of the vial.
    - If the septum is not flat, remove the cap, turn the adjusting screw clockwise, and try again.
    - If the cap is not centered, remove the cap, and make sure the new cap is flat on the top of the vial before you squeeze the crimper.

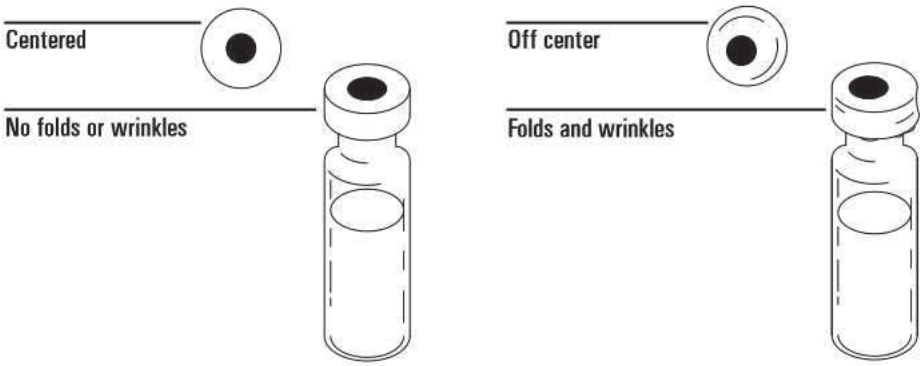


Figure 23. Acceptable and unacceptable caps

There are three reasons for crimping the cap properly:

- The syringe tends to core a curved vial septum and drop small pieces of the material into the sample.
- The syringe needle could hit the metal part of the uncentered cap.
- The tray gripper may drop a vial if the cap has folds or wrinkles in it.

Placing sample vials in the standard injector turret

If you do not use the tray, you can place one, two, or three vials in the injector turret. For two or three sample vials, you must convert some of the bottle positions to sample vial positions with sample inserts.

1. Place the appropriate sample inserts in bottle positions 2 and 3 on the turret.
    - For one sample, no inserts are needed. Position one is molded into the turret.

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2. Place the sample vials into the sample inserts.

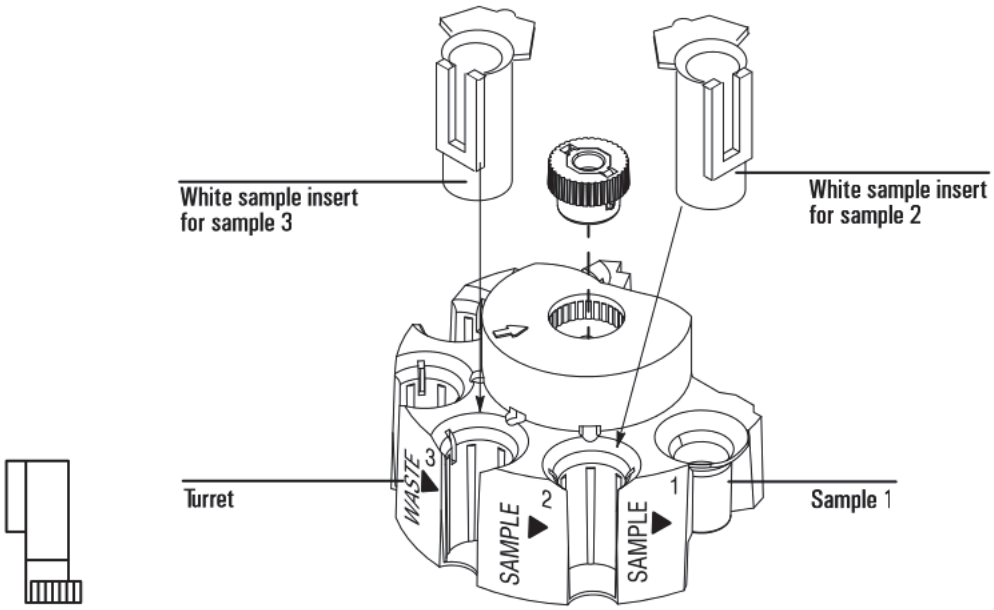


Figure 24. Placing sample inserts for three sample vials

Placing sample vials in a tray

You can place up to 100 samples in the tray's four quadrants. The tray gripper picks up the vials and delivers them to the sample vial position in the turret.

When you are not using the external control instruments, place the first bottle in quadrant position 1. The tray continues to deliver vials until it delivers the last one in the series or until it encounters an empty position. For more information, see chapter 4, "Standalone Control."

When you are using another instrument such as an integrator or ChemStation to control the tray, the first and last bottle positions are defined when you set the sequence parameters. The tray begins picking up sample vials at the position that corresponds to the "first bottle" and stops after it replaces the vial that corresponds to the "last bottle."

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For more information, see “Setting the run parameters” in chapter 3.

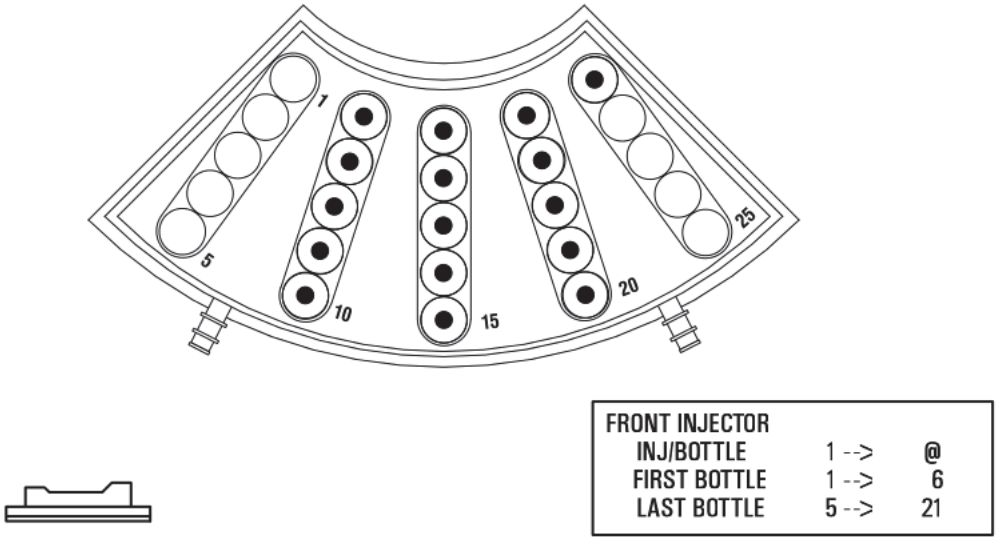


Figure 25. Specifying tray positions with a 3396 integrator and 5890 or 6890 GC

Using the injector fan

The purpose of the fan is to push cool air over the samples and solvent to keep them cooler. Also, some samples may boil out of the syringe if heat builds up in the injector.

For a particular application, you may want the area around the samples to be warm. Heat can help the delivery of viscous, high-boiling samples.

The default position of the fan is on. If your analysis requires the fan to be off, use the instructions “Turning the fan off” below.

Turning the fan off

To turn the fan off, follow these steps.

1. Turn the controller power switch off.
2. Put on a grounded wrist strap.

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Caution This procedure requires protection against electrostatic discharge. Use a static control wrist strap connected to a ground (part no. 9300-0969 for large wrists or part no. 9300-0970 for small wrists). If you do not use static protection, you may damage the electronics of the injector. Do not touch any of the electrical components, especially the microprocessor.

3. Open the door to the injector electronics assembly, and remove the three screws on the left edge of the panel with a No. 1 Point Pozidrive screwdriver.
4. Open the left-hand side of the assembly. Remove the blue ribbon cable (P3) so P6 is more visible. Locate the P6 jumper switch on the top left front corner of the printed circuit board.
5. Connect the P6 jumper so that it covers the top two prongs on the circuit board labeled **OFF**. See Figure 26. Return the ribbon cable to its original position.

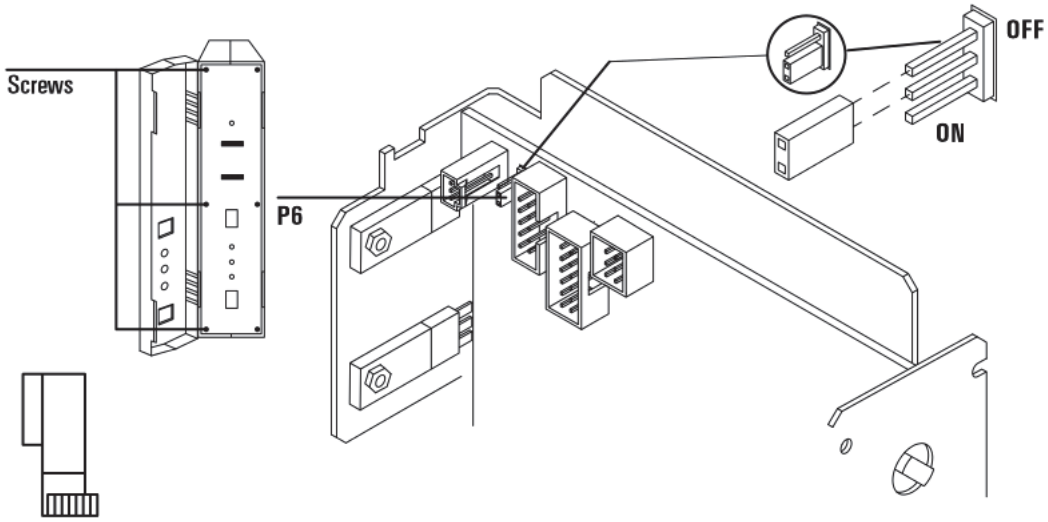


Figure 26. P6 jumper setting

6. Close the left-hand side of the assembly, and replace the three screws on the left edge of the front panel.

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7. Restore the power. The fan should now be off. If it is still running, reopen the injector, and check the position of the P6 jumper according to the instructions in step 5.

Preparing the solvent and waste bottles

The solvent bottles hold solvent for rinsing the syringe between injections. The injector dispenses the solvent washes and sample washes into waste bottles.

The first two parts of this section explain how to select, fill, and place the solvent and waste bottles. The last two parts of this section explain how to estimate the maximum number of vials you can run at one time and how the injector controls carryover.

For information on how to set the number of washes, see “Setting the run parameters” in chapter 3.

Selecting the bottles

The injector uses 4-ml bottles with diffusion caps to hold the solvent and waste. You can use diffusion caps or septa on these bottles to reduce evaporation and diffusion of your solvents and waste. Agilent Technologies recommends diffusion caps over septa for two reasons:

- The diffusion cap allows multiple entrances into a bottle without contaminating the liquid inside the bottle with small pieces of septum material.

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- For many common solvents, the rate of diffusion out of the bottle is less with a diffusion cap than with a septum that has been punctured with a standard syringe needle.

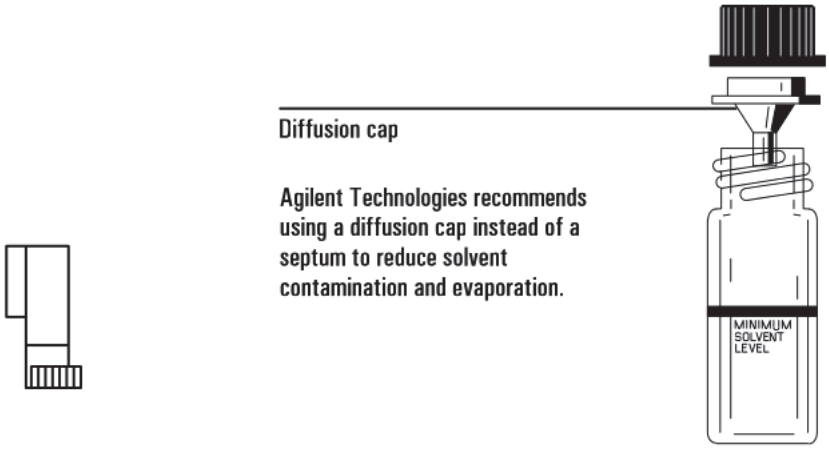


Figure 27. 4-ml bottle used for solvent and waste

Filling and placing the bottles

Before each sequence or group of sequences, prepare your solvent and waste bottles by doing the following:

1. Rinse and fill each solvent bottle with 4 to 4.5 ml of fresh solvent. The liquid level should be near the shoulder of the bottle. If the solvent bottle is filled with 4.5 ml of solvent, the syringe can reach about 2 ml or about 250 washes for a 10-µl syringe.

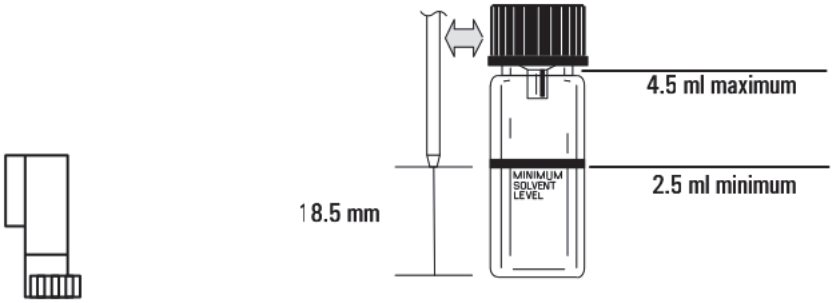


Figure 28. Shows position of the syringe tip when withdrawing solvent

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2. Empty and rinse each waste bottle. The syringe can dispense about 4 ml of waste into the waste bottle or about 500 washes for a 10-µl syringe.

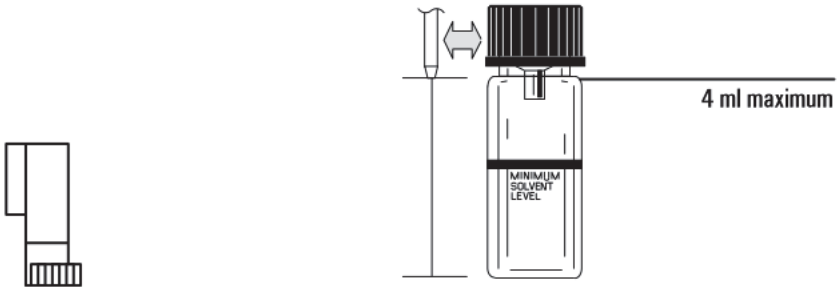


Figure 29. Shows position of syringe tip when dispensing waste

3. Place the bottles in the appropriate positions on the injector turret according to the table on page 40. The positions are labeled on the turret, Solvent A, Waste A, Solvent B, and Waste B.

Caution Do not refill a solvent bottle that still has solvent left in the bottle. The solvent from the last analysis may be contaminated.

Figure 30 shows an example of the turret positions used with and without a tray.

- If a tray is installed, place four bottles in turret positions solvent A, waste A, solvent B, and waste B.

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- If a tray is not installed, place two or three bottles (solvent A, waste A, and solvent B) in the turret positions. Position 3 in the turret can be used as sample 3 or solvent B. Make sure you have the correct vial in the turret.

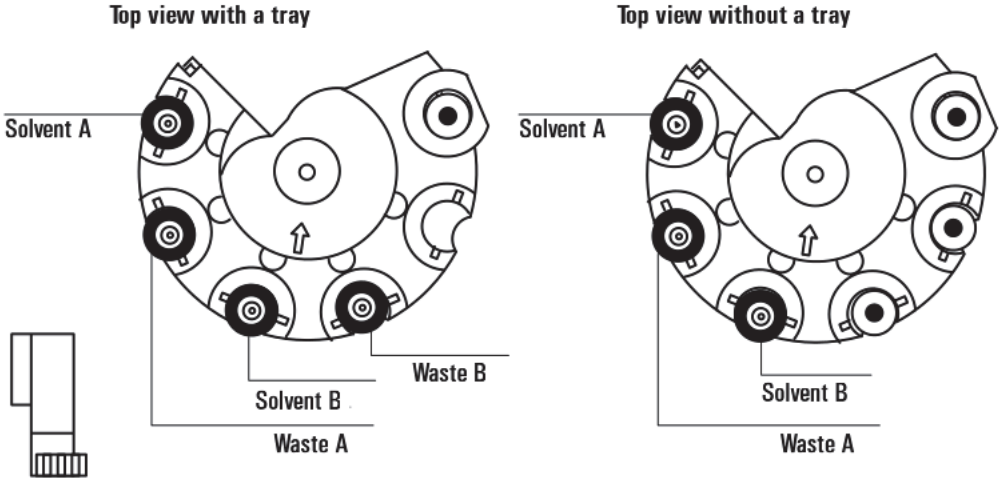


Figure 30. Examples with and without a tray

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Caution When a tray is installed, place a waste bottle in **both** waste position A and waste position B. The injector alternates dispensing waste between the two positions. With the 6890 Series GC, you can choose A, B, or both.

System		Solvent	Waste
Standalone	With a tray	A & B	A & B
	Without a tray	A	A
3365/5890	With a tray	A, B, or both	A & B
	Without a tray	A, B, or both	A
3366/5890	With a tray	A, B, or both	A & B
	Without a tray	A	A
3396/6890	With a tray	A, B, or both	A, B or both
	Without a tray	A, B, or both	A
Multitechnique ChemStation/5890	With a tray	A, B, or both	A & B
	Without a tray	A, B, or both	A
Multitechnique ChemStation/6890	With a tray	A, B, or both	A, B or both
	Without a tray	A, B, or both	A

Do you need to read further?

The volumes of the solvent and waste bottles determine the number of sample vials that you can run at one time. If your application requires more than the maximum number of washes listed in Figure 31, you must read the next section entitled, “Estimating the maximum number of sample vials.” The total number of washes includes all solvent (pre- and post-injection) and sample washes using the default needle depth. This is critical to your solvent supply if solvent prewashes are not part of your solvent needed estimation.

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Number of Bottles	Solvent Limit		Waste Limit	
Syringe size	5 µl	10 µl	5 µl	10 µl
Two bottles	1,000	500	2,000	1,000
One bottle	500	250	1,000	500

Note: Wash volume is 0.8 times the syringe volume.

Figure 31. The maximum number of washes (pre- and post-injection)

Caution Do not exceed the solvent and waste limits of the bottles. If you exceed these limits, sample carryover may affect your analysis.

Example 1 (tray not installed): Your application requires 10 sample washes and 10 solvent washes with a 10-µl syringe. For three sample vials (five injections per vial), you need 150 solvent washes, and you need to dispense 300 syringe volumes of waste. With this example, you are limited to one bottle for solvent and one bottle for waste.

Figure 31 shows that you can have up to 250 washes from one solvent bottle and can dispense up to 500 washes into the waste bottle. You are within the limits and do not have to read any further.

Example 2 (tray installed): Your application requires three sample washes and three solvent washes with a 10-µl syringe. For 40 sample vials (two injections per vial), you need 240 solvent washes, and you need to dispense 480 syringe volumes of waste. With this example, you are using two bottles for solvent and two bottles for waste.

Figure 31 shows that you can have up to 250 washes from each solvent bottle and can dispense up to 1,000 washes into the waste bottles. You are within the limits and do not have to read any further.

Example 2b (tray installed): Your application requires three sample washes and three solvent washes with a 10-µl syringe. If you had 60 samples, you would need 360 washes from the solvent bottles. You would have to place

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solvent bottles in both positions and set the run parameters for solvent washes from both positions (e.g., one from solvent A and two from solvent B).

Example 3 (tray installed): Your application requires three sample washes, three solvent A washes, and three solvent B washes with a 10-µl syringe. For 100 sample vials (two injections per vial), you need 600 solvent washes and need to dispense 1,200 syringe volumes of waste. With this example, you are using two bottles for solvent and two bottles for waste.

Figure 31 shows that you can have up to 250 washes from each solvent bottle and can dispense up to 1,000 washes into the waste bottles. You would exceed the solvent and waste capacity of the bottles. Read the next section to estimate the maximum number of sample vials you can run at one time.

Estimating the maximum number of sample vials

This section contains equations and tables for estimating the maximum number of sample vials you can run before you must replace the solvent or empty the waste bottles.

Caution The number of sample vials given in the equations and tables are estimates. Characteristics of the solvent, such as the evaporation rate and surface tension, may affect the capacity of the bottles.

If you use either the tables or the equations, you must know the following parameters for your application:

- The number of injections per vial.
- The number of solvent washes per pre- and post-injection required from each solvent bottle.
- The number of sample wastes and solvent washes per injection that the injector dispenses into each waste bottle. When the tray is installed, you must use two waste bottles. The injector dispenses the waste equally between the two bottles unless you have specified differently on the 6890 Series GC.
- The syringe size, 5 µl or 10 µl.

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Using the equation to estimate

1. Substitute the parameters of your application into both equations.
   - If you are using a 5-µl syringe, substitute 0.004 ml/wash for the 0.008 ml/wash in each equation.
   - If a tray is installed or both waste bottles are being used, substitute 8.0 ml of waste for the 4.0 ml of waste in the second equation.
2. Calculate the answers for both equations. Use the smaller of the two answers for the estimate.
   - Equation **S** estimates the maximum number of vials from the volume of solvent available from the bottle associated with the largest number of washes.

Equation S

$$\text{Maximum Number of Vials} = \frac{2.0 \text{ ml of solvent}}{0.008 \text{ ml/wash} \times \text{Number injections/vial} \times \text{Largest number solvent washes from a bottle}}$$

   - Equation **W** estimates the maximum number of vials from the waste bottle capacity.

Equation W

$$\text{Maximum Number of Vials} = \frac{4.0 \text{ ml of waste}}{0.008 \text{ ml/wash} \times \text{Number injections/vial} \times \text{Number solvent and sample washes/injection}}$$

Equation method example

Assume a tray is installed and your application parameters are:

- Two injections per vial
- Three washes from solvent bottle A
- Two washes from solvent bottle B
- Two sample washes
- 10-µl syringe

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1. Substitute the parameters of your application into equations S and W.

   S: Maximum number of vials = 2.0 (0.008 x 2 x 3) = 41

   W: Maximum number of vials = 8.0 (0.008 x 2 x 7) = 71

2. Calculate the answers for both equations. Use the smaller of the two answers, **answer (41)**.

Using the table to estimate

1. Go to the **S** table in Figure 32. In the left-hand column, find the largest number of solvent washes you need from a solvent bottle. If you use a tray, you can divide the solvent washes between *both* waste bottles.
2. Read across this row to the column with the number of injections you are taking from each vial. The intersection of row and column is the maximum number of vials that you can run from the limiting bottle.
   - When you are using a 5-µl syringe, multiply the maximum number of vials listed in the figure by 2.

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S

Number of solvent washes per injection	Number of injections per vial					
	1	2	3	4	5	6
1	100+	100+	83	62	50	41
2	100+	62	41	31	25	20
3	83	41	27	20	16	13
4	62	31	20	15	12	10
5	50	25	16	12	10	8
6	41	20	13	10	8	6
7	35	17	11	8	7	5
8	31	15	10	7	6	5
9	27	13	9	6	5	4
10	25	12	8	6	5	4
11	22	11	7	5	4	3
12	20	10	6	5	4	3
13	19	9	6	4	3	3
14	17	8	5	4	3	2
15	16	8	5	4	3	2



Figure 32. Maximum number of sample vials with one solvent bottle and a 10-µl syringe

3. Go to the **W** table in Figure 33. In the left-hand column, find the number of solvent wastes and sample washes you need.
4. Read across this row to the column with the number of injections you are making from each vial. The intersection of row and column is the maximum number of vials that you can run with one bottle.
   - If a tray is installed, multiply the maximum number of vials listed in the figure by 2.

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Number of pre-and post-solvent washes + sample washes per injection	Number of injections per vial					
	1	2	3	4	5	6
1	100+	100+	100+	100+	100	83
2	100+	100+	83	62	50	41
3	100+	83	55	41	33	27
4	100+	62	41	31	25	20
5	100	50	33	25	20	16
6	83	41	27	20	16	13
7	71	35	23	17	14	11
8	62	31	20	15	12	10
9	55	27	18	13	11	9
10	50	25	16	12	10	8
11	45	22	15	11	9	7
12	41	20	13	10	8	6
13	38	19	12	9	7	6
14	35	17	11	8	7	5
15	33	16	11	8	6	5

Figure 33. Maximum number of sample vials with one waste bottle and a 10-µl syringe

5. Compare the answers from both tables. Use the smaller of the two answers for the estimate.

Table method example

Assume a tray is installed and your application parameters are:

- Two injections per vial
- Three washes from solvent bottle A
- Two washes from solvent bottle B
- Two sample washes
- 10-µl syringe

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1. Go to the **S** table in Figure 32. In the left-hand column, find the largest number of solvent washes you need from a solvent bottle, **answer (3).**
2. Read across this row to the column indicating the number of injections you are taking from each vial, **answer (2)**.

   The intersection of row and column is the maximum number of vials that you can run from the limiting bottle, **answer (41)**.
3. Go to the **W** table in Figure 33. In the left-hand column, find the number of solvent and sample washes you need, **answer (7)**.
4. Read across this row to the column indicating the number of injections you are making from each vial, **answer (2)**.

   The intersection of row and column is the maximum number of vials for one bottle, **answer (35)**.

   - Because a tray is installed, multiply the maximum number of vials listed in the table by 2, **answer (70)**.
5. Compare the answers from both tables. Use the smaller of the two answers for the maximum vial estimate, **answer (41)**.

Controlling sample carryover

This section describes the features of the injector used to control carryover. For an explanation of sample carryover, see the Glossary.

You can use solvent washes, sample washes, and pumps to control carryover because each dilutes the concentration of sample left in the syringe. The effectiveness of each depends on your application.

You may be able to adjust your application for a more efficient use of solvent and sample and increase the number of sample vials you can run at one time.

- Solvent washes

  The injector fills the syringe to eight-tenths of its volume (4 µl with the 5-µl syringe and 8 µl with the 10-µl syringe) from either the solvent A or solvent B position. Then it dispenses the syringe contents into one of the waste bottles. Solvent washes can be set to occur before taking a sample (preinjection solvent wash) or immediately after the injection (postinjection solvent wash).

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- Sample washes

  The injector fills the syringe to eight-tenths of its volume with the next sample and dispenses the contents into one of the waste bottles. Sample washes occur before the injection. When sample is limited, you can use a solvent prewash to wet the syringe before drawing sample.

- Pumps

  The injector fills the syringe to eight-tenths of its volume with the next sample and dispenses it back into the sample vial. Pumps occur after the sample washes and immediately before the injection. Pumps serve to eliminate bubbles. If the needle contains solvent from a previous wash, the pumps may add a small amount of solvent that mixes with the sample and can dilute a small volume.

The number and type of washes are determined with the run parameters. See "Setting the run parameters" in chapter 3 for details.

Under ideal conditions, four washes reduce the carryover to one part in 10,000. The actual number and type of washes you need depends on many factors, including:

- The percentage of carryover that you can accept
- The viscosity and solubility of the analyte(s)
- The volatility of the solvent(s)
- The extent of wear in the syringe barrel

The number and type of washes is often set for you as a standard method. You can also determine the number and type of washes experimentally.

To measure the percentage of carryover in your procedure, run a solvent blank after a sample, and compare the peak areas of the components.

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Selecting and installing syringes

Selecting syringes

Select the type of syringe you need based on the inlet (injection port) you are using and the volume of sample you want to inject.

1. The syringe needle must have a cone tip. Do not use sharp-tipped needles. These needles tear the inlet septum causing leaks. Also, sharp-tipped needles wipe off on the septum as they exit resulting in a large solvent tail on the chromatogram.

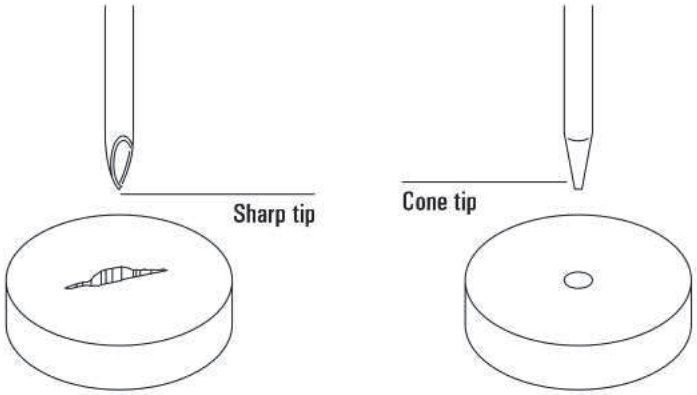


Figure 34. Needle tip

Figure 35 illustrates some of the critical syringe dimensions. These dimensions do not make up a complete set of specifications. Some of the dimensions are too difficult to measure without special instruments.

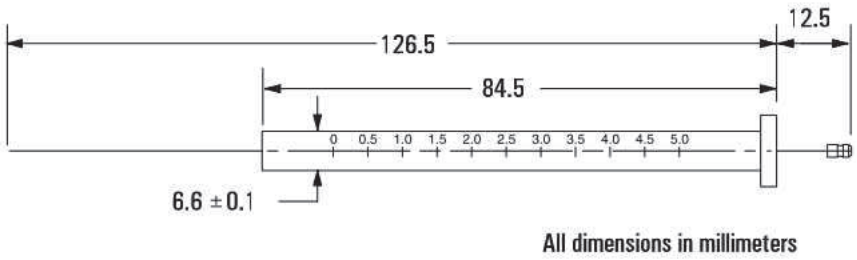


Figure 35. Syringe dimensions

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Figure 36 illustrates the shapes of the two fixed needles:

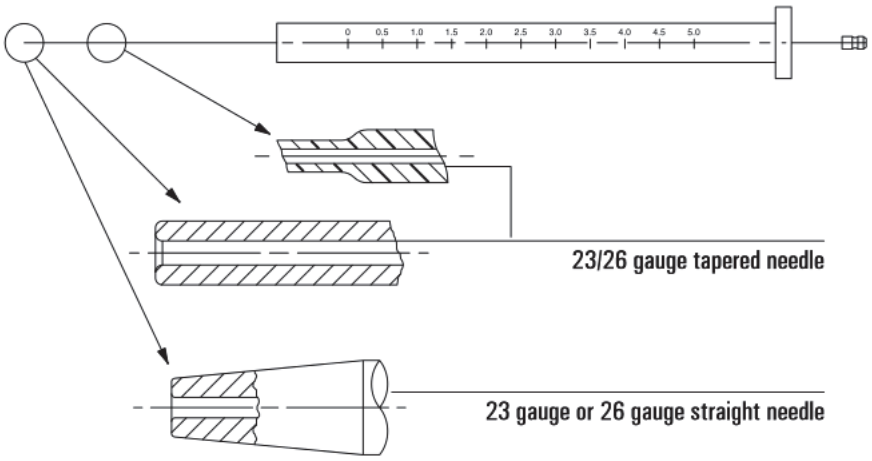


Figure 36. Needle shapes

2. Select the appropriate syringe needle gauge. If you need more help in making your selection, refer to chapter 6, "Special Topics."

Inlet	Needle Gauge	Column Type
Packed, split, or splitless	23 gauge or 23/26 gauge tapered	
Cool on-column	23/26 gauge tapered, 26 gauge,	530 µm
	32/26 gauge	320 µm
	32/26 gauge	250 µm

Figure 37. Needle gauge selection

3. Select the 5-µl or 10-µl syringe. Figure 38 shows the range of volumes you can inject according to the sample volume setting, the syringe size, and whether the nanoliter adapter, accessory 18599N, is installed.

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Sample Volume Setting		Standard Injection		With Nanoliter Adapter	
	Syringe Size	5 µl	10 µl	5 µl	10 µl
1		0.5	1.0	0.1	0.2
2		1.0	2.0	.05	1.0
3		1.5	3.0	1.0	2.0
4		2.0	4.0	1.5	3.0
5		2.5	5.0	2.0	4.0

Figure 38. Injection volumes depend on sample volume setting, syringe size and injection type

Caution Failure to use an on-column syringe when injecting into an on-column inlet could damage the injector, syringe and column.

Inspecting syringes

Before installing the syringe:

1. Roll the syringe on the edge of a clean flat surface. If the tip of the needle seems to follow a circular motion, bend it slightly near where it connects to the syringe barrel, and check it again.

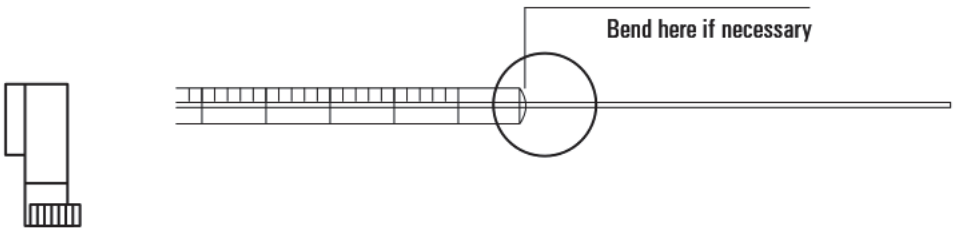


Figure 39. Syringe parts and needle inspection

2. Check for a rough needle. The needle may contain closely spaced concentric ridges that act like a miniature file and abrade pieces of the septum into the inlet. The ridges are easy to see under 10X magnification.

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If there are ridges, polish the needle by pulling it through a folded piece of fine emery paper between your finger and thumb until the ridges are gone. Be careful not to modify the special blunt tip of the syringe.

3. Check for a sticky plunger. Slide the plunger of the syringe up and down a few times. It should move smoothly without sticking or binding. If it is sticky, remove the plunger, and clean it with solvent.

Installing syringes

After completing this task, check your work with the following instructions:

1. Open the injector door.
2. Pass the syringe needle through the hole in the needle support foot.
3. Align the syringe barrel with the flange guide and syringe clip. Press the syringe in place, keeping the needle in the hole of the needle support foot.
4. Close the syringe latch by swinging it clockwise.

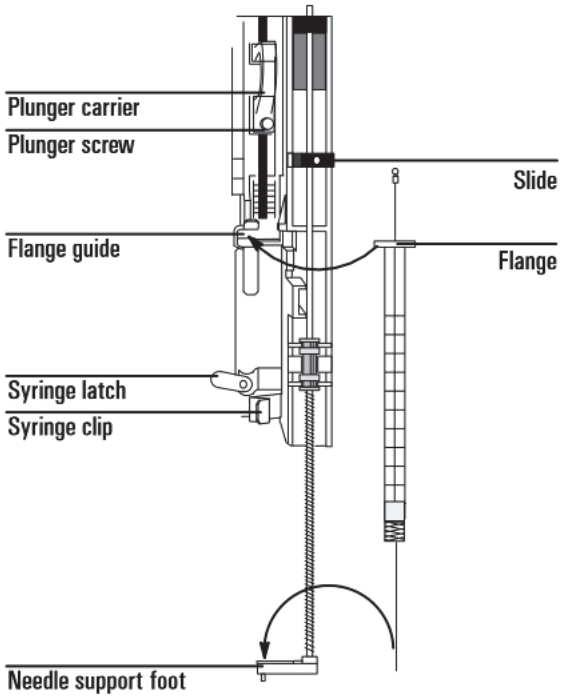


Figure 40. Installing the syringe in the syringe carriage and needle support

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5. Move the plunger carrier loop down and tighten the plunger screw.

Checking your work

- ❒ Move the plunger carrier up and down. If the syringe plunger does not move along with the carrier, repeat the previous steps. Be sure the plunger carrier screw is tight.
- ❒ Check that the needle is aligned with the needle guide in the foot by moving the slide up and down. The needle should slide smoothly in the needle guide.

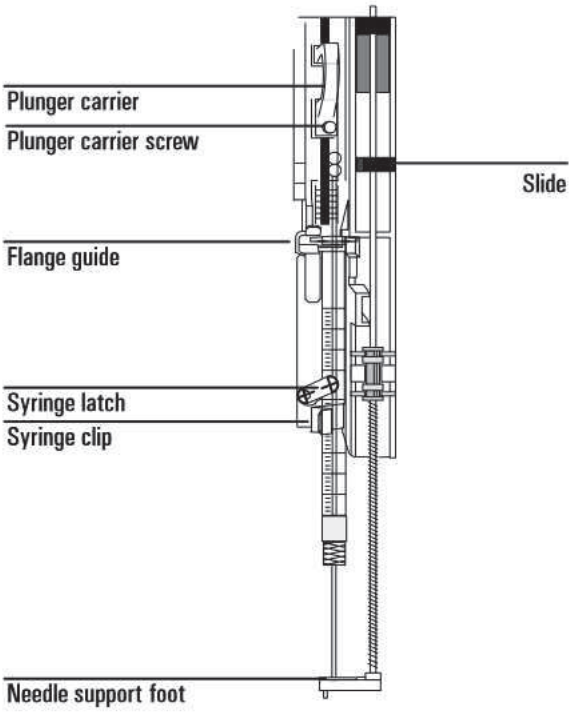


Figure 41. Plunger carrier and needle support with needle installed

Caution Failure to use the on-column syringe when injecting into an on-column inlet could damage the injector, syringe, and column.

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Caution Do not operate the injector without a syringe in place because the syringe latch may interfere with the motor if it is allowed to swing freely.

❒ To check the alignment of the syringe needle to ensure an average septum life of 200 injections, follow these instructions:

1. Pull down the syringe carriage until the needle tip is near the top of the inlet septum nut. The needle should be centered exactly over the hole in the septum retainer nut. Use a small light to see that the needle will hit the septum without rubbing on the nut.
2. If it is not centered, check that the syringe is installed correctly in the syringe carriage, the syringe needle is straight, and the mounting bracket is aligned with the inlet.

Maintaining the inlet

This section contains inlet information to help you maintain good chemical performance from your GC.

Changing septa

The average life of an inlet septum should be 200 injections. This is influenced by the alignment of the injector bracket, the syringe, and the type of septum.

When you replace the septum:

- Clean off the metal surfaces that create the seal.
- Replace with the correct septum.
- Make sure the bottom of the septum is flat against the base.
- For packed and split/splitless inlets, tighten the septum retainer nut only until the split ring begins to turn on the top of the nut.

Caution Do not tighten the septum retainer nut too much. The syringe needle will core the septum and push out pieces of the septum material into inlet. Septum life is often reduced to as few as five injections.

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Changing or cleaning liners

Most samples contain nonvolatile material that accumulates on and partially pyrolyzes on the liner. Replace the liner or clean the liner periodically.

Some active components interact with the glass liner and glass wool plug of the capillary liner. If these components are in the sample, the liner should be deactivated before installation and periodically replaced or cleaned and deactivated. There are several commercially available solutions for deactivating the liner. Take the appropriate safety precautions when using any of these solutions. Refer to the Agilent analytical consumables and supplies catalog for deactivated liners.

Suggestions for packed inlets with 530-μm columns

When using a heated, packed inlet with a 530-µm column, do the following:

- Install the column so that no more than 1 to 2 mm of the column extends past the ferrule. This avoids large unswept volumes at the base of the inlet.
- Use polyimide ferrules (Vespel) instead of graphite. A small portion of the column ferrule is exposed to sample vapor.
- Insulate the part of the inlet that projects into the oven. If the oven is programmed to increase temperature, the lower part of the inlet could become a cold spot.

Adapting for cool on-column injection

For cool on-column inlets, you must specify on-column injection with the sampler parameters so that the injector:

- Slows the carriage speed to 500 milliseconds. The syringe needle moves more slowly into and out of the inlet and spends more time in the inlet.
- Lowers the tip of the syringe needle an additional 19 mm (3/4-inch) to the column.

You can use the slow injection parameter along with on-column injection. This adds the following change to the injection:

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- Slows the plunger speed to 1/18 the normal speed

Complete the following:

1. Install an on-column syringe. Agilent Technologies recommends syringes with a 23/26 gauge tapered-tip needle for injections onto 530-µ columns and 32/26 gauge for 320- and 250-µ columns.
2. If the injector is controlled by an external device, such as an integrator or a workstation, change the on-column parameter to ON or YES.

   If the injector is controlled by a 6890 GC, this will be set automatically when the GC configures for the on-column inlet.

   If the injector is operated with standalone control, change the on-column switch to the YES, or down, position. For more information on the on-column switch, see “On-column injection mode” in chapter 4.
3. The inlet must be configured for cool on-column injection. Install the appropriate needle guide, septum, spring, and insert for the GC.

   If you have an on-column inlet on a 5890A GC with a cooling tower (part no. 19245-20540), replace it with a septum nut base assembly (part no. 19245-80520).

   If you are performing automated injection onto 320-µm and 250-µm columns, replace the standard septum nut base assembly (part no. 19245-80520) with the small septum nut base assembly (part no. 07673-61330)
4. For injecting onto 320-µm or 250-µm columns, see “Performing cool on-column injection onto 250-µm and 320-µm columns” in chapter 6.

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3

Operation

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Operation

This chapter contains detailed information for operating the automatic liquid sampler, including:

- Setting the run parameters
- Starting and stopping the automatic liquid sampler
- What happens during a run
- Running the samples
- Four methods of control
- Using two injectors
- Examples of operation

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Setting the run parameters

This section describes each run parameter, lists the range of values for the common controlling devices, and contains three examples.

The run parameters tell the injector and the tray what to do. For example, they tell the injector how much sample to inject and tell the tray where to find sample vials. You can set many of the parameters either with the control switches of the injector or with an external device, such as an integrator, ChemStation, or the 6890 Series GC.

For information about setting parameters with the control switches on the injector panel, see chapter 4, “Standalone Control.”

Description of the parameters

Injections per vial

Specifies the number of times the run is repeated for each sample vial. For example, if the value is two, each vial is analyzed twice.

Caution Too many injections per vial can allow sample to evaporate, deplete sample, or contaminate sample in the vial. This may affect the reproducibility of the injection volume.

Position of first vial

Specifies the tray or injector turret position of the first sample vial. Each position on the tray and turret is numbered. Tray values range from 1 to 100. Only three sample positions are available in the standard injector turret.

Position of last vial

Specifies the tray or injector turret position of the last sample vial. Tray values range from 1 to 100. Only three sample positions are available in the standard injector turret.

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Number of sample washes

Specifies the number of times the syringe is rinsed with sample before the injection. The injector lowers the needle into the sample vial, fills the syringe to eight-tenths its full volume, and empties it into one of the waste bottles.

Number of sample pumps

Specifies the number of times the syringe plunger is moved up and down while the needle is in the sample to expel air bubbles and improve reproducibility.

Viscosity delay

Specifies the number of seconds the plunger pauses at the top of the stroke during sample pump, sample draw, and sample and solvent washes. For viscous samples, the pause during sample draw allows the sample to flow into the vacuum created by the syringe. During wash strokes, it allows diffusion of the viscous sample into the wash solvent. Viscosity delay settings range from 0–7 seconds.

Solvent washes—pre- and post-injection

Number of solvent A washes: Specifies the number of times the syringe is rinsed with solvent from the solvent A bottle. The injector lowers the needle into the solvent A bottle, fills the syringe to eight-tenths its full volume, and empties it into one of the waste bottles.

Number of solvent B washes: Specifies the number of times the syringe is rinsed with solvent from the solvent B bottle. The injector lowers the needle into the solvent B bottle, fills the syringe to eight-tenths its full volume, and empties it into one of the waste bottles.

Volume

Specifies the injection volume. Each volume stop corresponds to a volume of one-tenth the syringe's capacity. Valid setpoints are 1–5 stops.

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Caution Do not set the volume parameter for splitless inlets more than 2 µl. Larger volumes cause sample to be lost through the purge vent and may contaminate carrier inlet lines.

Dwell time

This setpoint specifies the time delay of the needle in the inlet for both pre- and post-injection. This adds the following changes to the injection parameters:

- Preinjection dwell: Time delay of the needle in the inlet before the plunger is depressed to inject sample. When preinjection dwell is selected, one stop of air is drawn after the sample for volume settings from 1–4 stops. With a setpoint of five stops, no air is drawn.
- Postinjection dwell: Time delay after injection before needle is withdrawn from the inlet

The allowable range for both dwell times is 0–1 minute in increments of 0.01 minute.

Priority samples

This setpoint specifies whether the arm of the tray should look for a priority sample in position 100 between runs. If the feature is turned on, the tray checks position 100 before each regular vial in the sequence. If a vial is in position 100, the tray arm delivers the vial to the injector turret. After the injection, the tray arm places the vial in position 99.

If you are using the priority sample feature, use only tray positions 1 to 98.

Slow injection

This setpoint specifies the speed of the syringe plunger during the injection stroke and whether or not the syringe needle stays in the inlet (dwell time) after injection of the sample. It enables you to reduce the average speed of the plunger from about 100 µl/sec to about 5 µl/sec (with a 10-µl syringe). This

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parameter also holds the syringe in the inlet for 4 seconds after the injection. The plunger speed during the pump and waste dispensing does not change.

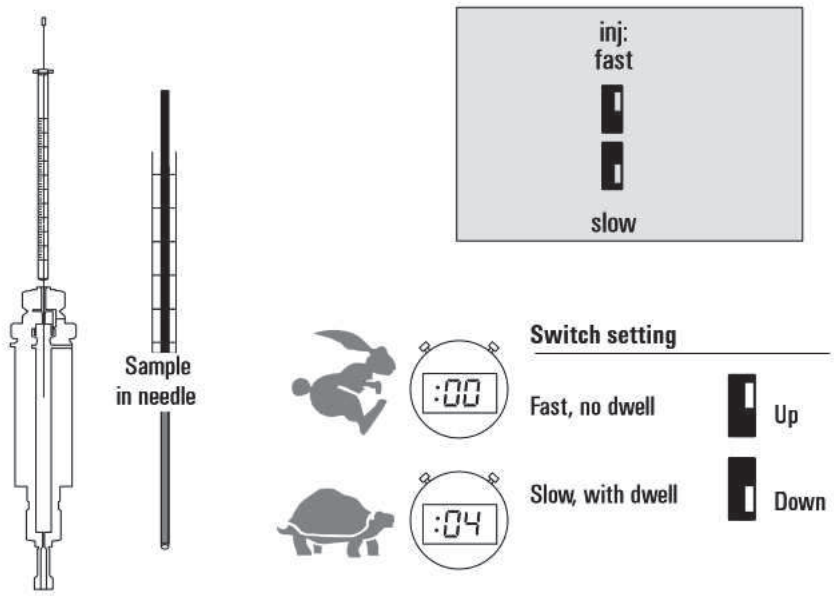


Figure 42. Injection speed

Caution

The slow setting is recommended only for a few specific splitless and cool on-column applications. For most applications, set this switch to "fast." A setting of "slow" for other applications may cause peak area discrimination and reduced quantitative precision.

Slow plunger

This setpoint specifies the speed of the syringe plunger during injection. It enables you to reduce the average plunger speed. The plunger speed during the pump and waste dispensing does not change. Selecting slow plunger reduces the rate to about 5 µl/sec, compared to the fast speed of about 100 µl/sec (with a 10-µl syringe).

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Sampling depth

This setpoint allows you to move the position of the needle tip up or down to approximate locations from the nominal position of zero (default). Default is the standard position (see Figure 43).

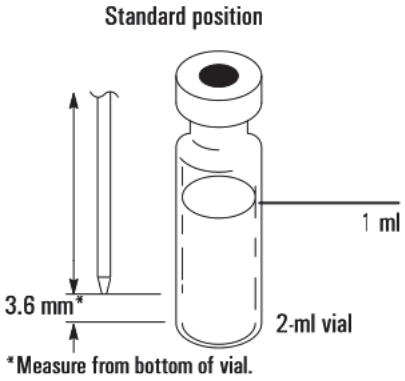


Figure 43. Variable sampling depth

Injection mode

Specifies whether the injector is in the normal or on-column injection mode. The normal injection mode is used with packed and split/splitless inlets. The on-column injection mode is used with cool on-column inlets. For the on-column injection mode, the injector reduces the carriage speed and lowers the tip of the syringe needle an additional 19 mm (3/4-inch) into the column.

Caution Be sure you are using the correct injection mode. If you use the wrong injection mode, you may damage the column, needle, and syringe.

For more information on setting up the inlet for on-column injection, see Chapter 4 of the *Agilent 6890 Series Gas Chromatograph Operating Manual* or the *Agilent 5890 Series II and Series II Plus Programmable Cool On-Column Manual*.

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Position

This setpoint indicates which tower is on which inlet (front or back). Typically, the location of the injector cable in the controller box, front or back, is the position associated with that injector.

With an INET integrator and dual injectors, this setpoint specifies which injector, front or back, is associated with the INET data channel and which is associated with the auxiliary data channel. This parameter determines where the sample vial numbers are printed when more than one injector is installed.

On the 6890 Series GC, the position of the injector cables are not significant because you can set the injector position from the keypad. With only one injector, you no longer have to move the cables when you move the tower, merely reconfigure the tower position.

Caution Always turn off the power to the controller before you remove and reconnect the injector cables.

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Table 4. Range of Values for Common Controlling Devices

Parameter	6890 and Multitechnique ChemStation*	3396 INET Integrator	3365 ChemStation**
Injections per vial	1 to 99	0 to 15	1 to 99
Position of first and last vials (front)	1-3, 101-103, or 1-100	1-3 or 1-100	1-3 or 1-100
Position of first and last vials (back)	1-3, 201-203, or 1-100	1-3 or 1-100	4-6 or 1-100
Number of sample prewashes	0-15	0-15	0-15
Number of pumps	0-15	0-15	0-15
Variable sampling depth	-2 to 30 mm	n/a	n/a
Viscosity	0-7 sec	0-7 sec	0-7 sec
Volume (tenths of syringe volume)	1-5	1-5	1-5
Number of solvent A washes (post)	0-15	0-15	0-15
Number of solvent A prewashes	0-15	0-15	0-15
Number of solvent B washes (post)	0-15	0-15	0-15
Number of solvent B prewashes	0-15	0-15	0-15
Preinjection dwell	0-1 min	n/a	n/a
Postinjection dwell	0-1 min	n/a	n/a
Priority samples	Create sequence	0 = no, 1 = yes	Create special method
On-column injection mode	Set by GC		
Normal mode		0	no
On-column mode		1	yes
Variable plunger speed	yes/no		
Fast		1	1
Slow		0	0
Position	1 = front, 2 = back		In instrument definition

* MS ChemStation rev 3.71 and above

**MS ChemStation rev 3.65 and below

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What happens during a run?

In the following description, the run parameters that determine the automatic liquid sampler's actions are surrounded by quotes ("run parameter"). From the point when you start the run, the automatic liquid sampler does the following:

1. The syringe carriage, plunger carrier, injector turret, tray arm, and gripper move to their home positions.
2. With a tray, the tray gripper picks up a vial from the "position of first vial" and delivers it to the injector turret associated with sample position." Without a tray, the samples are already in the injector turret.
3. If this is the first sequence after the power is turned on, the injector goes through a solvent "prewash" and pauses for "viscosity delay."
4. The injector lowers the syringe into the vial ("sampling depth"). The injector fills the syringe with sample, pauses for "viscosity delay," and dispenses it into one of the waste bottles according to the "number of sample washes."
5. The injector fills the syringe with sample and dispenses it back into the sample vial according to the "number of pumps." The syringe plunger may pause at the top of the pump stroke according to the "viscosity delay."
6. The injector fills the syringe with the "volume/stop" of sample. The syringe plunger may pause at the top of the injection stroke according to the "viscosity" then draws up one stop of air for "predwell." The injector then lowers the syringe into the injection port, remains for the "preinjection dwell," injects it, applying "plunger speed", and holds it for the "postinjection dwell time."
7. The injector fills the syringe with solvent from solvent bottle A, pauses for "viscous delay" with the syringe over the waste bottle, and dispenses it into one of the waste bottles according to the "number of solvent A washes."
8. The injector fills the syringe with solvent from solvent bottle B, pauses for "viscosity delay" with the syringe over the waste bottle, and dispenses it into the same waste bottle according to the "number of solvent B washes."
9. With a tray, the tray gripper picks up the vial and returns it to its original position in one of the tray quadrants.

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The injector waits until the GC sends a ready signal to continue. Steps 1, 2, and 3 through 9 are repeated according to the “injections per vial.”

With a tray, the steps are repeated until the tray returns the last sample to the “position of last vial.” Without a tray, the steps are repeated according to the rotary switch setting.

If the “priority sample” feature is turned on, the tray gripper looks for a sample in tray quadrant position 100 after each vial. After a priority sample is run, the tray returns it to tray quadrant position 99.

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Checklist

Use this checklist to make sure the sampler is ready before you begin.



❒ Sample vials are half full
❒ Cap centered, no wrinkles, septum is flat
❒ Sample inserts and vials match the run parameters
❒ Tray quadrants snapped in place



❒ 4.5 ml of fresh solvent in each solvent bottle
❒ Waste bottles are clean and empty
❒ Two waste bottles (with tray)
❒ Limit to number of sample vials

❒ New or clean syringe
❒ Correct syringe design and size
❒ Plunger carrier holds plunger button
❒ Needle is aligned with septum retainer nut
❒ Syringe is rinsed with solvent



❒ Liner is clean and deactivated
❒ Liner is correct type for injection technique
❒ Septum type is correct
❒ Septum is less than 200 injections old
❒ Correct septum nut



❒ Injector run parameters are set correctly

- Injection mode matches type of inlet
- Number of injections per vial is less than five
- Injection volume is not greater than 2 µl for splitless inlet

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Running the samples

This section describes starting and stopping a run or sequence and the movements of the automatic liquid sampler during a run.

Starting a run or sequence

After completing the checklist above, start the run or sequence by pressing the start button on the injector or entering the appropriate command at your controlling device.

Stopping or interrupting a run or sequence

The following events interrupt a run:

1. The power to the controller or controlling device fails.
2. You press the stop button or `Stop/Abort` from a ChemStation.
3. The sampler recognizes a safety or operator fault, such as:
    - You open the syringe access door.
    - The tray gripper drops a sample vial.
    - The syringe needle hits the metal side of the crimp cap.

The sampler responds to these interruptions differently depending on the controlling device. With standalone control, any of the interruptions causes the automatic liquid sampler to stop and abort a sequence.

With the 3396 integrator and INET communications, power failures only interrupt the sequence. The integrator recovers and restarts the sequence with the last sample run on the automatic liquid sampler. If the interruption is caused by number 2 or 3, the run is aborted, and the sequence must be restarted.

If the interruption was caused by a problem that the sampler recognizes, it provides you with some feedback by a combination of flashing LED indicators or error messages or a ChemStation message. For more information, see chapter 5, “Preventive Maintenance and Troubleshooting.”

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To restart an aborted sequence from the point of interruption:

1. Identify the last sample vial that was run successfully. Check the vial number of the last successful chromatogram.
2. Reset the parameter that identifies the first sample vial to the next vial number.
3. Press the stop button to clear any faults.
4. Start the revised sequence from your controlling device. From the multitechnique ChemStation, you can run a partial sequence to keep the original sample numbers.

Using two injectors

Two-injector configurations have the following characteristics:

- Input and output signals are shared.
- The system sends only one **injector ready** signal to the GC when both injectors are ready and one **start** signal at the beginning of the injection stroke.
- The injectors can operate in the synchronous mode (both inject simultaneously).

The capabilities of a two-injector configuration vary with the communication device.

For information on using two injectors with standalone control or for operation in asynchronous standalone mode, see chapter 4, “Standalone Control.”

With a tray

The tray delivers sample vials to the front and back injectors according to the run parameters. There is a separate set of run parameters for each injector.

The tray delivers vials to the front injector before the back injector.

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When you set up the run parameters, you must identify which data channel is for which injector.

Different communication devices assign the position and data channel differently.

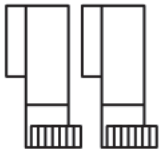
- Using a 6890 Series GC, the channel is assigned when you set up the sequence.
- Using the ChemStations, you assign the channel when defining the instruments.
- Using the 3396 integrator (INET), you assign the channel when you set up the run parameters for the second injector.

Once both injectors have samples, they begin the injection cycle, including any sample washes. After both injectors have completed the specified sampling steps, they inject the samples. After the injection, both injectors go through the solvent wash cycle. When both injectors are done, then the tray picks up the sample vial from the front injector first and returns it to its original position on the tray, then picks up the vial from the back injector and returns it to its original position.

When the parameters tell the tray arm to deliver the same sample vial to both injectors at the same time, the tray delivers the vial to the front injector first. After the injection, the tray arm delivers this sample to the back injector and delivers the next sample vial in the front injector sequence to the front injector. These samples are injected at the same time. Similarly, if the first and last sample vial parameters are the same for both injectors, the samples are injected in the synchronous N-1 injection mode (see Figure 44).

Note: The ChemStation method for a single run will not allow you to set the same vial number for front and back injector, however, you can run a dual-column sequence with a single set of vials.

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Injection Number	Front Injector	Back Injector
1st	Vial 1	Idle
2nd	Vial 2	Vial 1
3rd	Vial 3	Vial 2
.	.	.
.	.	.
.	.	.
nth	Vial n	Vial n-1
Last	Idle	Vial n

Figure 44. Synchronous N-1 injection mode

To inject the same sample into the front and back inlet in the same run, you must do the following:

1. Prepare two sets of sample vials, two vials for each sample.
2. Place the sets in two different locations in the quadrants.
3. Set up the sequence parameters so that the tray delivers the first bottle of one set to the front injector and the first bottle of the other set to the back injector.

For example, with ten samples, you must have 20 vials (two vials for each sample). Place one vial of each in tray positions 1 to 10. Place one vial of each in tray positions 11 to 20. Set the first vial position for the front injector to 1 and the last vial position to 10. Set the first vial position for the back injector to 11 and the last vial position to 20.

Without a tray

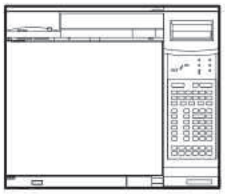
The injectors go through the same motions as with a tray. The injectors inject samples from position 1 first, followed by samples from positions 2 and 3. If the two injectors do not have the same number of samples, the injector that completes its sequence first remains idle while the other finishes.

You can mount two injectors onto the 6890, the 5890, and the 5880 GCs. You cannot mount two injectors onto 5700 Series GCs.

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Four methods of control

There are a number of ways to control the automatic liquid sampler. Each controlling device allows different functionality when using the G1513A or 18593B injectors. Always check the manual of your chosen controlling device for exact feature sets.



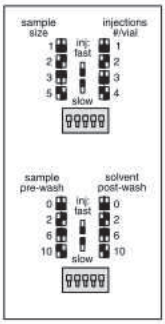
Agilent 6890 Series GC control



Multitechnique ChemStation control with a 5890 or 6890 Series GC, the 3365 ChemStation control (MS-DOS series) with a 5890 GC, or the MS ChemStation.



Agilent 3396 integrator using the Instrument Network (INET) with a 5890 or 6890 series GC.



Standalone control with a 5890 or 5700 series GC.

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Examples of operation

This section describes the basic steps to set up your automatic liquid sampler using different methods of control. The following examples are for three specific systems with one injector module mounted over the front inlet. For more information on other types of configurations, see the manual of your controlling device.

- 6890 Series GC
- 3396 integrator with a 5890 GC
- Multitechnique ChemStation with a 6890 Series GC
- 3365 ChemStation (MS-DOS Series) with a 5890 GC

For information on controlling the automatic liquid sampler without an external instrument, see chapter 4, “Standalone Control.”

To complete the following examples successfully, the following statements should be true:

- The automatic liquid sampler is installed correctly on the GC.
- The external controlling device is installed and configured correctly.
- You have a basic understanding of the GC and the external controlling device.

Preparing the GC and controlling device

For a trial run, you can minimize the time for the GC to be ready by setting the oven to a low temperature, removing any temperature ramp program, and setting the equilibration time to zero. You can minimize the amount of time the integrator or computer collects data by turning the detector or signal off and setting the run time to about 10 seconds.

To set up your automatic liquid sampler for a run, the following examples will help you get started.

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6890 Series GC Control

The following procedure allows you to configure the setpoints associated with the injector waste bottle and tower positions.

Configure tower position

Injector cables are connected to either the `INJ1` (front) or `INJ2` (back) port on the controller. This setpoint indicates which tower is on which inlet. With only one injector, you no longer have to move cables when you move the tower, merely reconfigure the tower position.

Configure waste bottle position with a tray

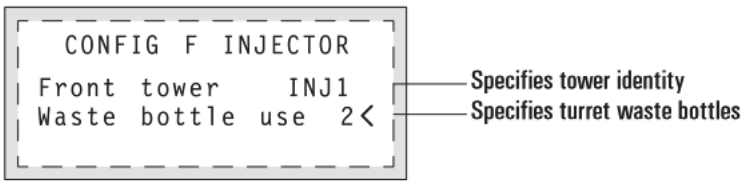
The turret waste bottle positions are controlled by entering a value of:

- 0 for the A position only
- 1 for the B position only
- 2 to alternate between the two waste bottles

Configure the injector

To configure the injector:

1. Press [Config][Front Injector] or [Config][Back Injector].



2. With the cursor on a tower line, use the [On] or [Off] key to set the tower position to either `INJ1` or `INJ2`.
3. Enter a value for `Waste bottle use`.

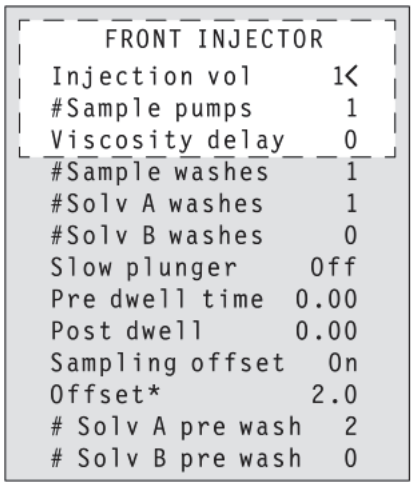
When the tray is disabled, only waste A is used.

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Injector parameter setpoints

To enter injector setpoints:

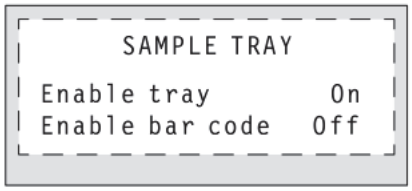
1. Press [Front Injector] or [Back Injector].
2. Scroll to the desired setpoint.
3. Enter a setpoint value, or turn the setpoint on or off.



*The `Offset` line appears only when "On" is selected.

Sample tray setpoints

1. Press [Sample Tray] to access the sample tray and bar code reader setpoints.



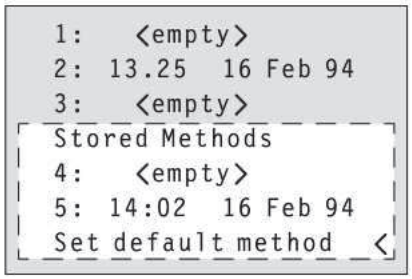
2. Press [On] or [Off] to enable or disable the tray.
3. Press [On] or [Off] to enable or disable the bar code reader.

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Storing injector setpoints

After setting up injector setpoints, sample tray setpoints, and bar code reader configurations, store them as part of a method. This method becomes a part of the sequence used to run the samples.

1. Press [Method], and scroll to the method number you wish to use.



2. Press the [Store] key. Press [Enter] to confirm the store.

Operating in cool on-column mode

When the injector is configured to a cool on-column inlet, the on-column mode is selected automatically.

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Creating a sequence

A sequence specifies which samples to run and the stored method to be used for each. It is divided into subsequences, each of which uses a single method plus a priority sequence and postsequence events.

The sequence definition control table is accessed by pressing [Seq]. The [Seq] key toggles between the stored sequence control table and the sequence definition control table (Figure 45).

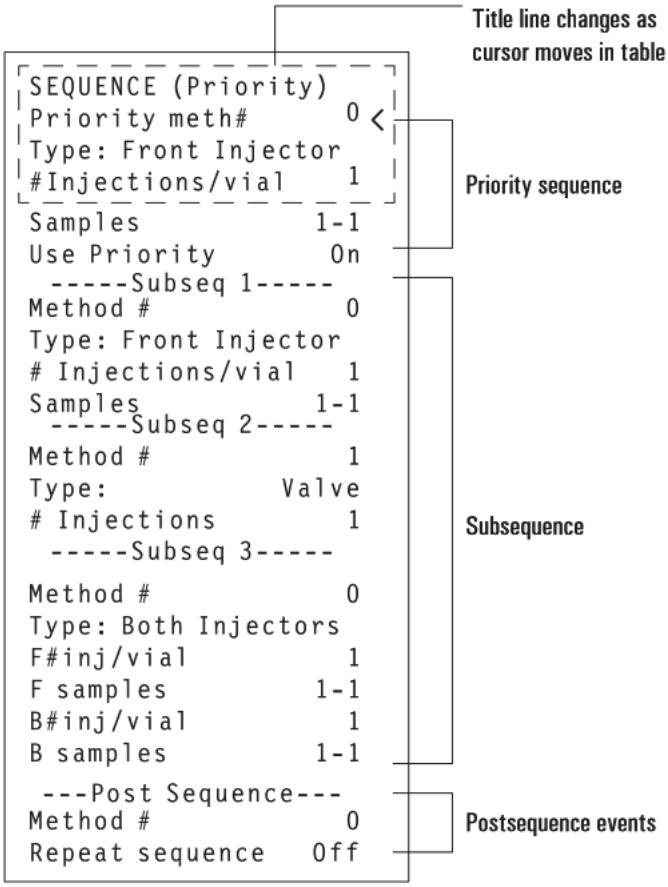


Figure 45. Sequence definition control table

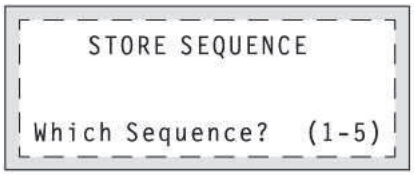
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When in the sequence control table, you will find the [Info] key useful if an explanation of sequence parameters is needed.

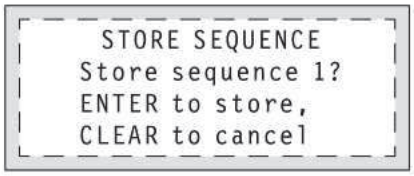
Storing a sequence

Up to five sequences can be stored.

1. To store a sequence, press [Store][Seq]. This opens the Store Sequence control table.



2. Enter an identifying number for the sequence.



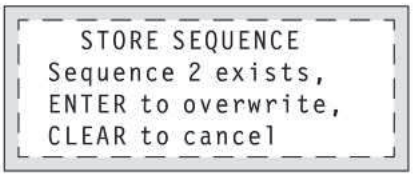
3. Press [Enter] to store the sequence.



If the sequence number you specified already exists, you will be prompted to either:

- Overwrite the existing sequence, which will replace the existing sequence with the new sequence.

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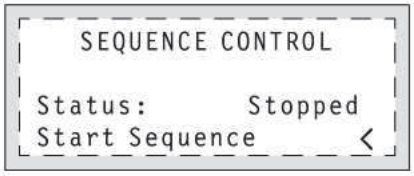


- Cancel the store, and return to the STORED SEQUENCES status table.

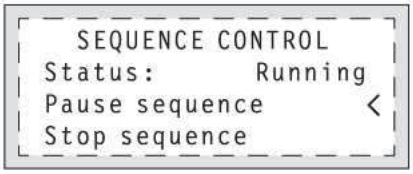
Sequences can also be stored from within the STORED SEQUENCES status setpoint table by scrolling the cursor to the appropriate sequence number and pressing the [Store] key.

Starting/running a sequence

Press the [Seq Control] key, scroll to the Start sequence line, and press [Enter].



Pressing [Enter] changes the sequence status to Running.



If a sequence is started and the instrument is not ready (due to oven temperature, equilibration times, etc.), the sequence will not start until all instrument setpoints are ready.

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Special considerations when using an integrator with a 6890 Series GC

The definitions of sequence are not the same in the 6890 Series GC and in the 3396 integrator. The following points must be considered when sequences are used with this GC/integrator combination:

- The integrator has only one subsequence plus the priority sequence. Only one GC method can be used within an integrator sequence.
- The automatic liquid sampler method parameters are prepared using the [Front Injector] and [Back Injector] keys on the 6890 keyboard.
- The sample information table is prepared on the integrator.
- The injection sequence parameters can be prepared either with the [Seq] key on the 6890 GC keyboard or in the [PREP][SEQ] dialog of the 3396. Setting sequence parameters on either instrument changes the sequence in both places.
- The Start sequence function on the GC is inactive.
- A sequence must be started from the integrator using [SEQ][START].
- If you use INET, pressing the stop key on either instrument stops the run and aborts the sequence.
- If you use the part no. 03396-61010 cable instead of INET, the two stop keys have different effects. The [STOP] key on the integrator stops the current run and aborts the sequence. Stop on the GC stops the current run, but the sequence continues as soon as the GC becomes ready.

For more information on the 6890 Series GC, see “Using Sequences” in the *Agilent 6890 Series Gas Chromatograph Operating Manual*.

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Figure 46 shows an example of the injector parameter portion of a method printout using a 6890 Series GC, a 3396 integrator, and a G1513A injector in the front position and a 18593B in the back position.

```
*  LIST: METH @


INJECTOR  1
 Injection vol                  1
 #Sample pumps                  5
 Viscosity delay                0
 #Sample washes                 1
 #Solv A washes                 3
 #Solv B washes                 3
 Slow plunger                 Off
 Pre dwell time              0.00
 Post dwell                  0.00
 Sampling offset               On
 Offset                       0.0
 #Solv A pre wash               0
 #Solv B pre wash               0
 Front tower                 INJ1
 Waste bottle use               2

*

INJECTOR 2
 Injection vol                  1
 #Sample pumps                  6
 Viscosity delay                0
 #Sample washes                 0
 #Solv A washes                 0
 #Solv B washes                 0
 Slow injection               Off
 Back tower                  INJ2
 Waste bottle use               2
```

Figure 46. Injector parameters on a 3396 integrator with a 6890 GC

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3396 integrator with a 5890 GC

1. Set the run time to 0.1 minutes by pressing [TIME] [.] [1] [STOP].
2. Begin the dialog to prepare a sequence by pressing the keys for [PREP] [SEQ].
3. Answer yes to INET SAMPLER CONTROL by pressing [Y] [ENTER].
4. Select INJ1 by pressing [ENTER].

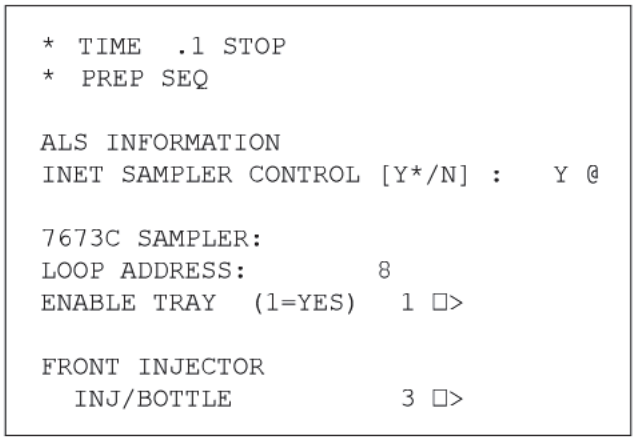


Figure 47. 3396 integrator with a 6890 GC

5. Set the number of injections per sample vial to one.
   INJ/BOTTLE 1 --> Press [1] [ENTER].
6. Identify the location of the first sample vial.
   FIRST BOTTLE --> Press [1] [ENTER].
7. Identify the location of the last sample vial.
   LAST BOTTLE --> Press [3] [ENTER].
8. Set the number of sample washes per sample vial to two.
   # OF SAMPLE WASHES --> Press [2] [ENTER].
9. Set the number of pumps to six.
   # OF PUMPS --> Press [6] [ENTER].

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10. Set the viscosity delay to zero.

    VISCOSITY –> Press `[0] [ENTER]`.

11. Set the sample size (injection volume) to 1 ml.

    VOLUME –> Press `[1] [ENTER]`.

12. Set the injection speed to fast.

    SLOW INJECTION –> Press `[0] [ENTER]`.

13. Set the number of solvent A washes to one.

    # OF SOLVENT A WASHES –> Press `[1] [ENTER]`.

14. With a tray, set the number of solvent B washes to one.

    # OF SOLVENT B WASHES –> Press `[1] [ENTER]`.

    Without a tray, skip to the next instruction.

15. Turn the priority sample feature off.

    PRIORITY SAMPLE (1=YES) –> Press `[0] [ENTER]`.

16. Set the injection mode. CAPILLARY ON-COLUMN

    Normal for capillary or packed inlet.

    Press `[0] [ENTER]`.

    or

    On-column for an on-column inlet.

    Press `[1] [ENTER]`.

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Checking your work

List the parameters by pressing the keys for [LIST][SEQ].

```
*   LIST:   SEQ @

ALS INFORMATION
INET SAMPLER CONTROL  . . . . .  YES

EQUILIBRATION TIME IN SECONDS . .  0

7673C SAMPLER:
  LOOP ADDRESS:  8

ENABLE TRAY  (1=YES)            1
FRONT TOWER  =  INJ1

FRONT INJECTOR
  INJ/BOTTLE                    1
  FIRST BOTTLE                  1
  LAST BOTTLE                   3
  # OF SAMPLE WASHES            2
  # OF PUMPS                    6
  VISCOSITY                     0
  VOLUME                        1
  SLOW INJECTION                0
  # OF SOLVENT A WASHES         1
  # OF SOLVENT B WASHES         1
  PRIORITY SAMPLE (1=YES)       0
  CAPILLARY ON-COLUMN           0
*
```

Figure 48. 3396 integrator with a 5890 GC

If there are any errors, edit the parameter by pressing the keys for [EDIT][SEQ].

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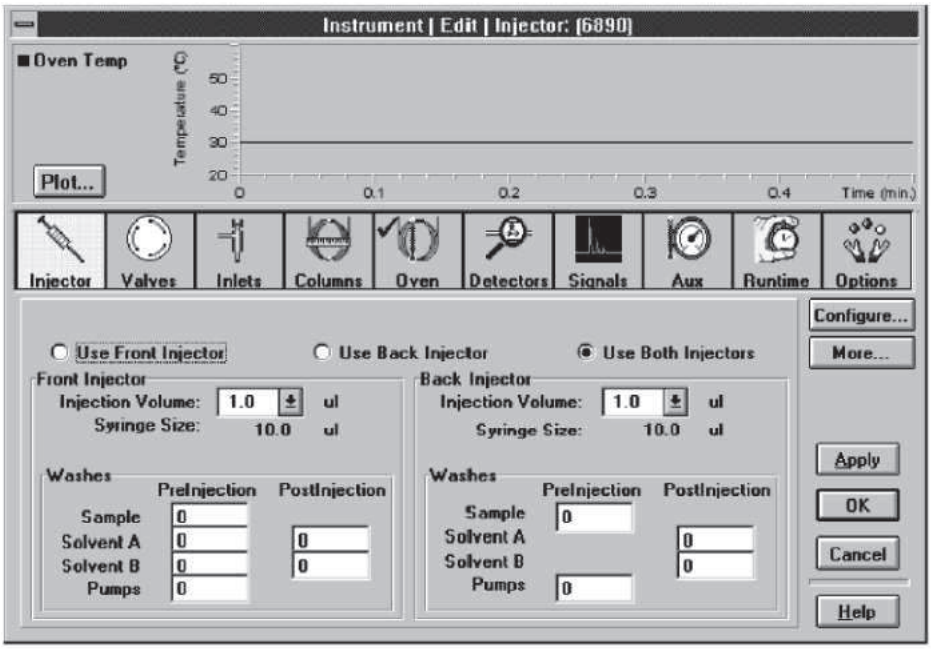
Multitechnique ChemStation control with a 6890 Series GC

The following is an example of the multitechnique ChemStation control of the G1513A injector in the front position and a 18593B injector in the back position with a 6890 Series GC.

Injector parameters

Use the Injector Parameters dialog box to specify injector parameters for the automatic liquid sampler. To get the Injector Parameters dialog box, select Edit Parameters... from the Instrument menu.

Click on the ICON labeled `Injector`.



The enhanced parameters are not available with the 18593B back injector.

Figure 49. Injector parameters dialog box with a 6890 GC

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Washes

Sample (preinjection)

Number of times the syringe is rinsed with the next sample following any preinjection solvent washes. For each wash, the syringe is filled to eight-tenths its full volume (4 µl for the 5-µl syringe and 8 µl for the 10-µl syringe), and then emptied into a waste vial. Valid entries: 0 to 15. The default entry is 0.

Solvent A (pre- or post-injection)

Number of times the syringe is rinsed with solvent A. For each wash, the syringe is filled to eight-tenths its full volume (4 µl for the 5-µl syringe and 8 µl for the 10-µl syringe) and then emptied into a waste vial. Valid entries: 0 to 15. The default entry is zero.

Solvent B (pre- or post-injection)

Number of times the syringe is rinsed with solvent B. For each wash, the syringe is filled to eight-tenths its full volume (4 µl for the 5-µl syringe and 8 µl for the 10-µl syringe) and then emptied into a waste vial. Valid entries: 0 to 15. The default entry is zero.

Pumps (preinjection)

Number of times the syringe is filled with the next sample prior to injection. For each pumping stroke, the syringe is filled to eight- tenths its full volume (4 µl for the 5-µl syringe and 8 µl for the 10-µl syringe), and then emptied back into the sample vial. Valid entries: 0 to 15. The default entry is 0.

Position

To specify the front, the back, or both injectors, click on the corresponding option button. The selection you make here determines which injector parameters (front, back, or both) become available not only at this dialog box, but also at the Extended Injector Parameters and Injector Configuration dialog boxes.

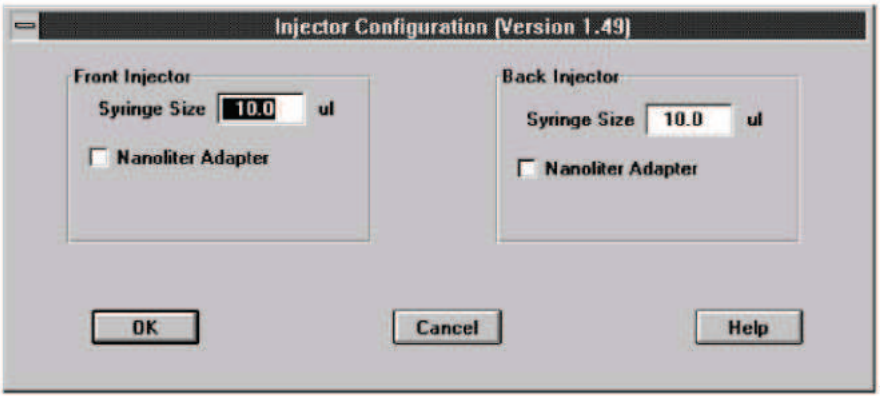
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Injection Volume

Injection Volume is the volume (in µl) of sample you want to be injected. The number of stops is automatically calculated based on your entry for injection volume and syringe size. You can indicate whether or not you are using a Nanoliter Adapter at the Injector Configuration dialog box. (Click on the Configure... button.) See Figure 50.

Syringe Size (5 µl or 10 µl)

Read-only display in this dialog box. You can modify the Syringe Size at the Injector Configuration dialog box. (Click on the Configure... button.) See Figure 50.



With the 5890 GC, there is also an On-Column Injection check box.

Figure 50. Injector Configuration dialog box

Extended Injector Parameters dialog box

Use the Extended Injector Parameters dialog box to specify additional injector parameters for the front and/or back injectors (depending on your selection at the Injector Parameters dialog box).

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Click on the [More...] button to display the Extended Parameters dialog box.

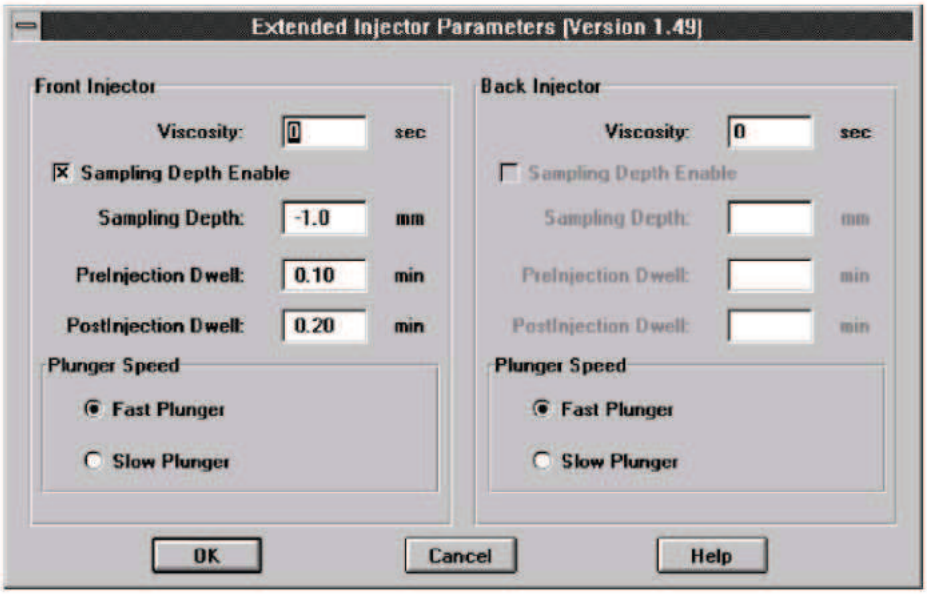


Figure 51. Extended Injector Parameters dialog box

Viscosity

Number of seconds the syringe plunger should pause between the last pumping stroke and the injection stroke. For viscous samples, the pause allows the sample to flow into the vacuum that has been created in the syringe. The pause during wash strokes allows diffusion of the viscous sample into the wash solvent. Valid entries: 0 to 7.

Sampling Depth

Depth of the needle tip in the sample vial. Click the check box next to Sample Depth Enable to enable or disable this function, then Set depth. When enabled, a sampling depth can be entered in mm as an offset from standard. (Standard equals zero.)

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PreInjection Dwell

Time in hundredths of a minute for the needle to stay in the inlet before the plunger is depressed to inject sample. Valid entries: 0.00 to 1.00.

PostInjection Dwell

Time in hundredths of a minute for the needle to stay in the inlet after the plunger is depressed to inject sample. Valid entries: 0.00 to 1.00.

Plunger Speed

Speed of the syringe plunger during injection. Select a Fast Plunger or a Slow Plunger speed.

Start a Run

Open the RunControl menu, and choose `Run Method` (after identifying the number of the sample vial in the Sample Info dialog box). The run will not start until the chromatographic instrument is ready.

Start a sequence

Open the RunControl menu, and choose `Run Sequence`.

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4

Standalone Control

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Standalone Control

Standalone control means using the automatic liquid sampler's electronics to control its own operation. The controls are switches located above the START button of the injector module and are shown in Figure 52. The G1512A controller has two standalone configurations, synchronous and asynchronous. (For more information on configuring the controller, see "Installing the controller" in chapter 1.)

This chapter discusses the operation of the automatic liquid sampler with standalone control. The topics are:

- Setting the run parameters
- Running the samples
- Using two injectors
- Example of standalone control setup

The basics of operating the automatic liquid sampler are discussed in chapter 3, "Operation."

Setting the run parameters

With standalone control, use the injector control switches to set the injection parameters and the rotary switch to set the number of sample vials in the injector turret. Instructions for setting these parameters are contained in this section. For a more detailed description of each run parameter, turn to page 53.

Set the following run parameters using the switches inside the front cover of the injector. Each switch moves up and down.

- Sample size—There are two switches for 1, 2, 3, or 5 stops.
- Injection—There is one fast/slow switch.
- Number of injections per vial—There are two switches for 1, 2, 3, or 4 injections per vial.

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- Number of sample washes—There are two switches for 0, 2, 6, or 10 sample washes
- On-column injection mode—There is one no/yes switch.
- Number of solvent washes—There two switches for 0, 2, 6, or 10 solvent washes.
- Position of first vial—If the tray is installed, the first vial must be in tray position 1. Without a tray, the first vial must be in turret position 1.
- Position of last vial—If the tray is installed, it starts with vial position 1 and continues until it does not find a vial in the next position. Without a tray and with more than one vial, the last vial is identified by the setting made on the rotary switch located at the top of the tower.

The following run parameters are either preset or not available:

- Number of pumps—This is preset to six pumps.
- Viscosity—There is 0 second delay at the top of the pump and injection strokes.
- Look for priority samples—This is not available with standalone control.
- Position—The injector position is based on the position of the injector cable connection in the controller module.

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Open the door to the injector control switches (where the start and stop buttons are located). The door hinge is on the left-hand side.

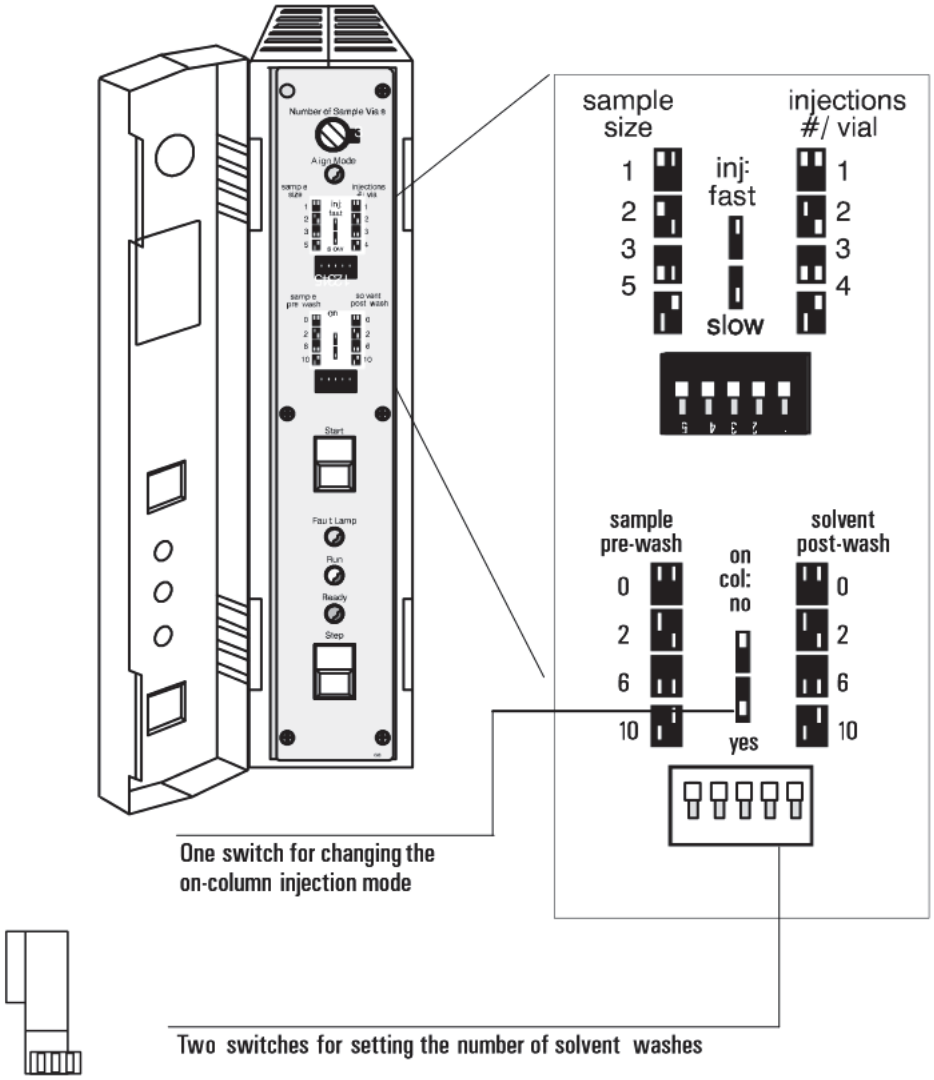


Figure 52. Switches for setting six injector parameters

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Sample size

Set the sample size with the two switches below the sample size label shown in Figure 53. The following table shows the injection volumes for each of the switch settings.

	Switch Setting	Tenths of Syringe Volume
	Both up	1
	Left up, right down	2
	Both down	3
	Left down, right up	5

The switch settings of 1, 2, 3, and 5 correspond to tenths of a syringe volume. For example, the switch setting 2 is for an injection volume of two-tenths of the syringe volume. For a 10-µl syringe, the volume would be 2 µl. For a 5-µl syringe, the volume would be 1 µl. For a 0.5-µl syringe, the volume is one-fifth of the syringe volume, so for switch setting 2, the volume would be 0.2 µl.



Set for 0.5 µl
with a 5-µl
syringe

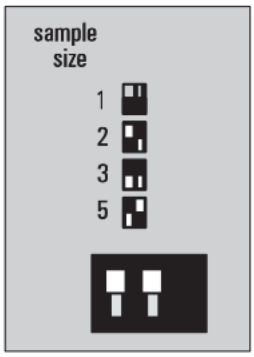


Figure 53. Switches for setting the sample size

Caution The injector volume for vaporizing injection ports must not produce an amount of vapor that would exceed the liner volume. Larger volumes cause sample to be lost through the purge vent and may contaminate carrier inlet lines. Refer to *GC Inlets—An Introduction.*

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