ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Keysight / Agilent 18594-60060* at our website: ***Click HERE***

Injection

Set this switch to specify the speed of the syringe plunger during the injection strokes and whether or not the syringe needle stays in the inlet after injection of the sample. This enables you to reduce the average speed of the plunger by a factor of 18 and, with a split/splitless inlet, hold the syringe needle in the inlet for 4 seconds after the injection. This is in combination with setting the on-column mode to "no." The plunger speed during the pump and waste dispensing strokes does not change.

When you are using the on-column injection mode, this switch changes *only* the speed of the plunger (no dwell is involved).

Note: With on-column injection, the carriage speed is always slower than with other inlets.

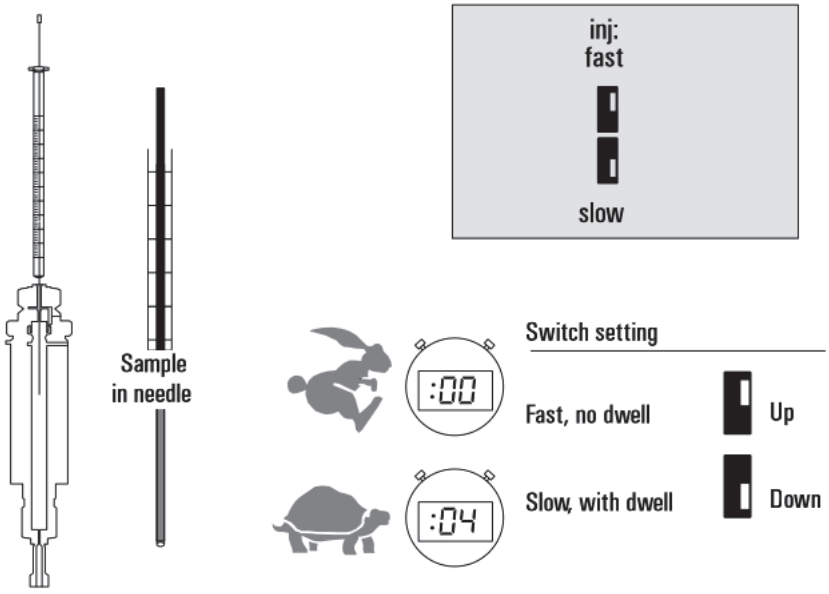


Figure 54. Switches for setting the injection speed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Caution The slow setting is only recommended 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.

Number of injections per vial

Set the number of injections per vial to 1, 2, 3, or 4. The following table shows the number of injections for each of the switch settings.

Switch Setting	Injections/Sample Vial
Both up	1
Left up, right down	2
Both down	3
Left down, right up	4

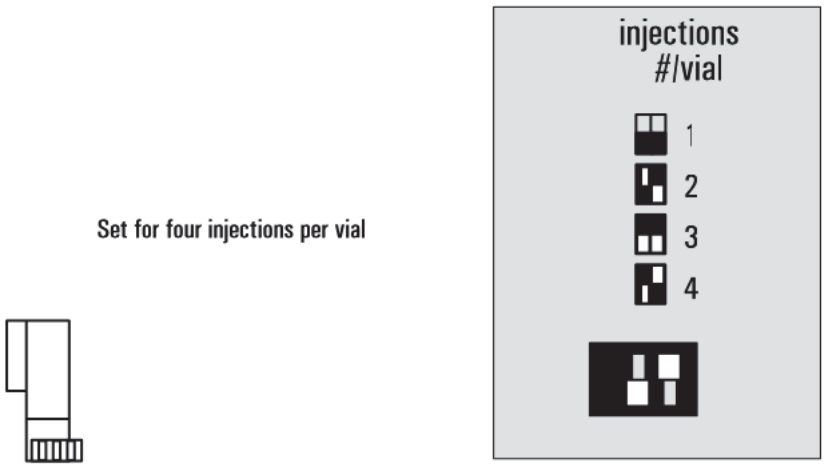


Figure 55. Switches for setting the number of injections from each sample vial

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Number of sample prewashes

Set the number of sample washes to 0, 2, 6, or 10 sample washes per injection. The following table shows the number of sample washes for each of the switch settings.

Switch Setting	Number of Sample Washes
Both up	0
Left up, right down	2
Both down	6
Left down, right up	10

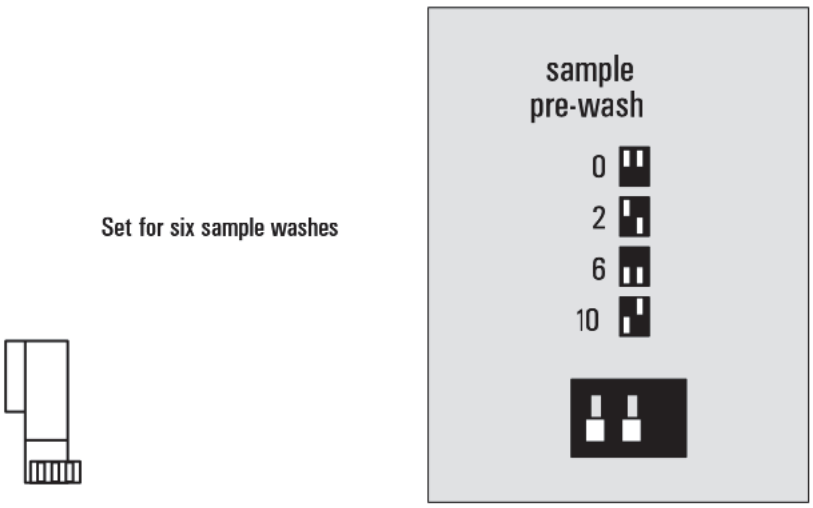


Figure 56. Switches for setting the number of sample washes

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

On-column injection mode

There are two injection modes: no (normal) and yes (on-column). Normal is used with packed and split/splitless inlets. On-column mode is used with on-column inlets and changes the carriage speed and the position over the inlet.

	Switch Setting	Injection Mode
	Up or no	Packed and split/splitless inlet
	Down or yes	On-column inlet

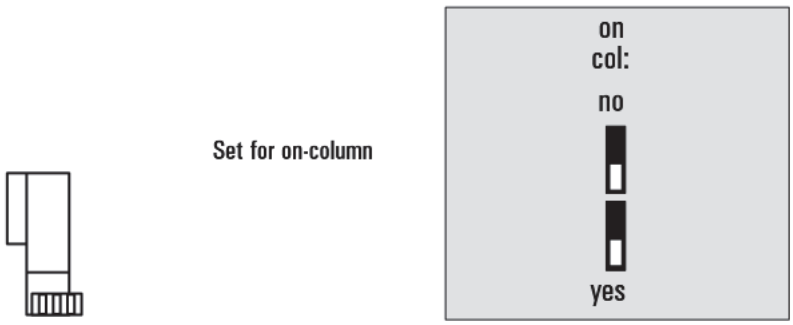


Figure 57. Switch for setting the on-column injection mode

Caution When you move the injector from one inlet to another, double-check the injection mode. Be sure it is set to the correct injection mode. If you use the wrong injection mode, you may damage the column, needle, and syringe. The chemical performance of your GC may also suffer because the carriage speed is slower.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Number of solvent postwashes

Set the number of solvent washes to 0, 2, 6, or 10 solvent washes per injection. The table shows the number of solvent washes for each switch setting.

Switch Setting	Number of Solvent Washes
Both up	0
Left up, right down	2
Both down	6
Left down, right up	10

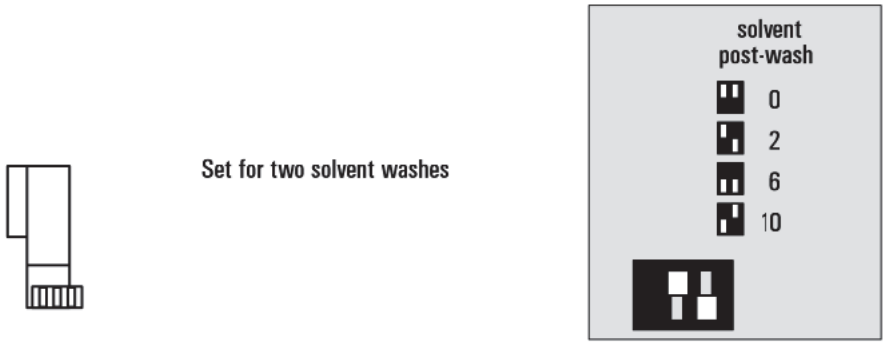


Figure 58. Switches for setting the number of solvent washes

When a tray is installed, place two solvent bottles and two waste bottles in the injector turret. The injector alternates between the solvent A and B bottles. The injector alternates dispensing waste between the two waste positions. For example, if you select two washes, the injector washes the syringe once with solvent from the solvent A bottle and once with solvent from the solvent B bottle. Without a tray, only solvent A and waste A bottles are used.

Caution Make sure you have placed bottles in both positions. Do not exceed the injector's limit for solvent and waste volumes. If you exceed these volumes, sample carryover may affect your analysis.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example of setting the injector switches

Draw in the position of the switches for the following run parameters.

Run parameters:

- 1.5 ml with a 5 ml syringe
- Fast injection
- 2 injections per sample vial
- 2 samples washes
- Split/splitless inlet
- 6 solvent washes

Indicates up

Indicates down

See page 108 for the answer.

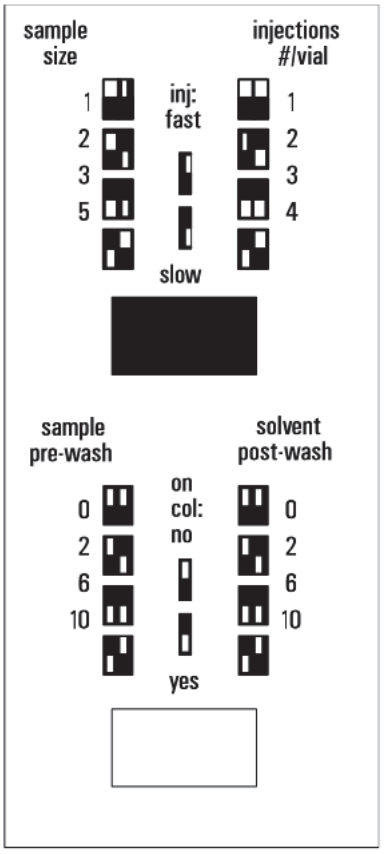




Figure 59. Self-test your expertise (see page 108 for solution)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting the position of the last vial

When using a tray, the tray arm delivers sample vials starting from position 1 and continues to deliver vials until it cannot find the next vial in the quadrant. For example, if sample vials are in positions 1 to 10 and 15 to 30, the tray delivers samples 1 to 10 and then stops at position 11.

Without the tray, you must identify the position of the last vial in the turret with the rotary switch. Any position over three will be ignored by the standard turret. Positions 4 to 8 are only accessible when the high-density turret is mounted. The high-density turret is not compatible with the tray.

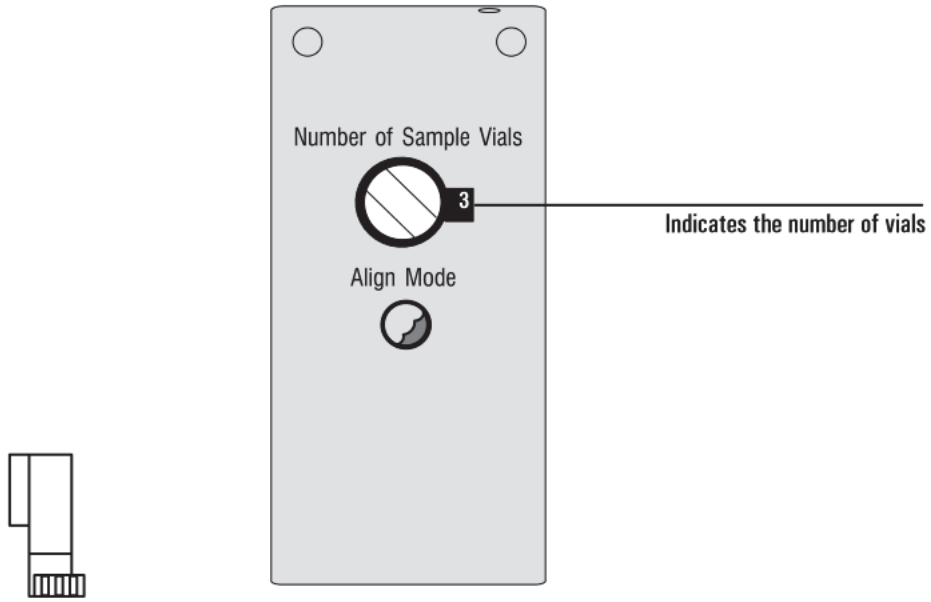


Figure 60. Setting the rotary switch for three sample vials

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Running the samples

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

Starting a run or sequence

Start the run or sequence by pressing the start button on the injector.

What happens during a run?

From the point when you start the sequence, the automatic liquid sampler does the following:

1. The injector reads the run parameters from the switch settings and moves the turret, syringe carriage, plunger carrier, and tray to their home positions.
2. If this is the first run after turning on the power, the injector goes through the solvent wash cycle. If it is not, the injector expels any remaining sample or solvent into a waste bottle.
3. If a tray is installed, the tray picks up a vial from position 1 (or the next vial) and delivers it to the turret.
4. The injector fills the syringe with sample and dispenses it into one of the waste bottles according to the “number of sample washes” set with the control switches.
5. The injector fills the syringe with sample and dispenses it back into the sample vial six times. This is the preset number of pumps.
6. The injector fills the syringe with the “volume” of sample set with the control switches and injects it. The depth and speed of the injection stroke is determined by the injection mode switch. Just before the needle pierces the inlet septum, the injector sends a start signal to the GC.
7. After injection, the injector washes the syringe with solvent according to the “number of solvent washes” set with the control switches.

   If a tray is installed, the injector takes half of the solvent washes from the solvent A bottle and half from the solvent B bottle. The injector dispenses

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

the waste into both waste positions. During one run, it dispenses all of the waste into one position. During the next run, it dispenses all of the waste into the other position.

If a tray is not installed, the injector takes all the washes from the solvent A bottle and expels the waste into the waste A bottle.

8. If a tray is installed, the tray returns the vial to its original position in the tray quadrant.
9. The automatic liquid sampler returns all its moving parts to their idle positions.
10. The injector waits until the GC sends a ready signal to continue.

Steps 3 through 8 are repeated according to the “injections per sample vial” set with the control switches and are repeated until the tray cannot find another vial or until the injector completes the last vial.

11. The controller gives a single beep to indicate end of sequence.

Stopping or interrupting a run or sequence

The following events interrupt a run:

- The power to the controller fails.
- You press the stop button.
- 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 plunger binds.

With standalone control, the sampler stops immediately and aborts any sequence. If the interruption occurs after the sample is injected into the GC, the GC and the data collecting device do not complete the sample-in-progress.

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.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

For more information, see chapter 5, “Preventive Maintenance and Troubleshooting.”

The sampler does not remember which sample vial was associated with the interruption. When you restart an interrupted sequence, the sampler returns any vials that were left in the injector turrets and begins a new sequence.

To restart the 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. Reposition the sample vials so that the next bottle you want to run is in position 1.
3. Press the stop button to clear any faults.
4. Press the start button.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Using two injectors

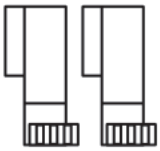
Using standalone control, you can operate two injectors and a tray. The standalone configuration of a tray with two injectors has the following characteristics:

- 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 system sends two binary-coded decimal (BCD) signals, one for each data channel.
- The injectors operate in the synchronous mode: they inject at the same time.

Synchronous mode

In the synchronous mode, the tray arm delivers the first vial to the front injector. During the first injection, the rear injector is idle. For the second injection, the tray arm delivers the first vial to the rear injector and the second vial to the front injector.

Once both injectors have samples, they inject the samples at the same time. Figure 61 illustrates the sequence of injections. This mode is recommended for dual-column applications.



Injection Number	Front Injector	Rear 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 61. Synchronous N-1 injection

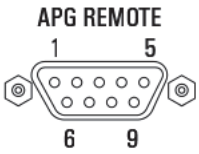
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

If you want to inject the same sample into both the front and rear injectors, you must set up two vials for each sample. If you pair the vials so that 1 and 2, 3 and 4, and 5 and 6 are the same sample, the even-numbered injections correspond to injections of the same sample.

Asynchronous mode

Asynchronous standalone mode is used when there are two injectors with no tray. The injectors operate independently or asynchronously; you must press START on the appropriate injector.

The APG remote is redefined to provide an independent Start, Ready in, Ready out, and Start Request signals for each injector. To configure your APG remote connector for asynchronous operation, see Figure 62.

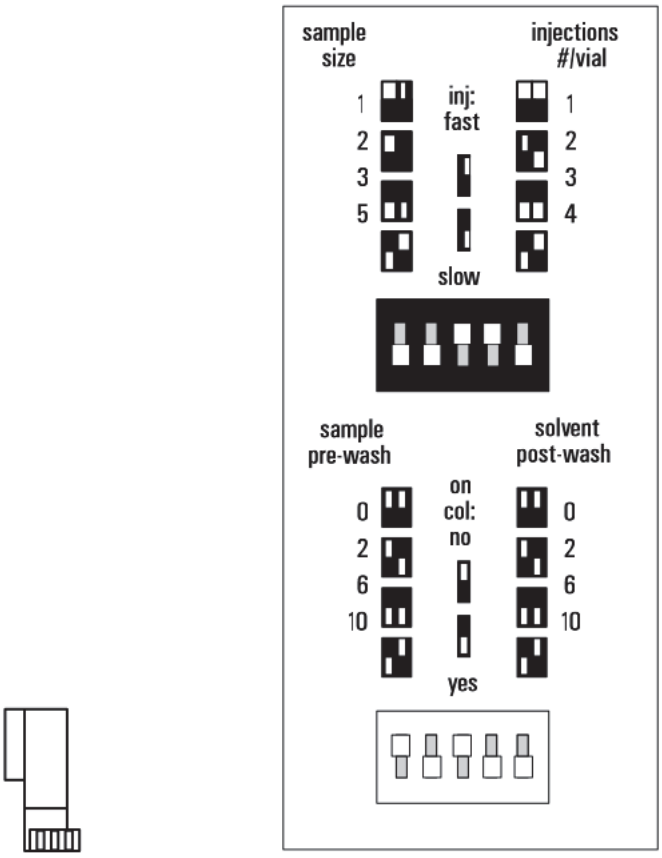


APG Remote Pin Out	General-Purpose Cable
Pin 1—Ground	Black
Pin 2—Front Ready In	White
Pin 3—Back Ready In	Red
Pin 4—Front Ready Out	Green
Pin 5—Back Ready Out	Brown
Pin 6—Front Start Request	Blue
Pin 7—Back Start Request	Orange
Pin 8—Front Start Out	Yellow
Pin 9—Back Start Out	Violet

Figure 62. General-purpose cable (part no. 35900-60670)

The asynchronous standalone control configuration with two injectors but without a tray is only supported by Agilent Technologies for isothermal analyses. Because there is no direct connection to the GC, this system only waits for readiness from an analog-to-digital (A/D) converter or other data handling device.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Switch settings for the example on page 101:

- 1.5 µl with a 5-µl syringe
- 2 injections per sample vial
- Injection set to “fast”
- 2 sample washes
- 6 solvent washes
- On-column injection mode set to “no”

Figure 63. Solution to page 101

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example of standalone control setup

1. Set the GC to minimize the time between injections.
2. Open the door to the injector control switches.

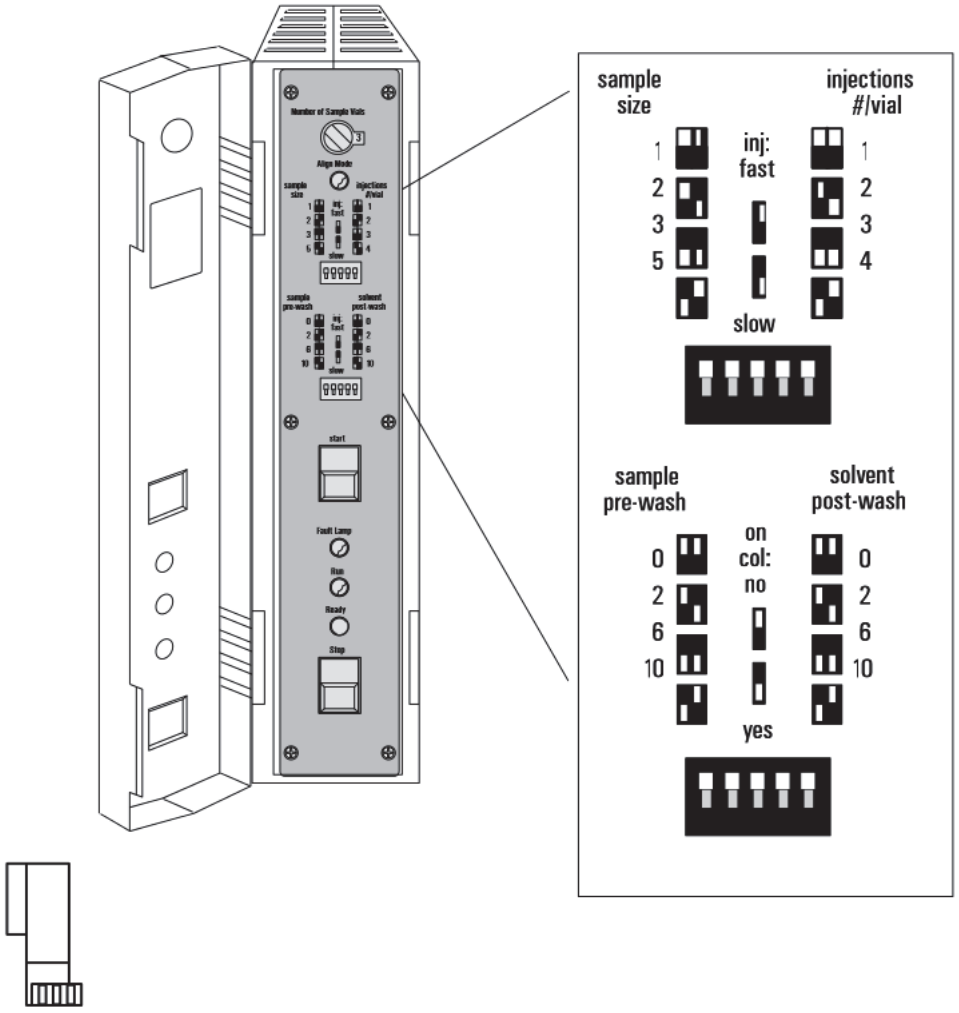


Figure 64. Switches for setting six injector parameters

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. Set the number of injections per sample vial to one.



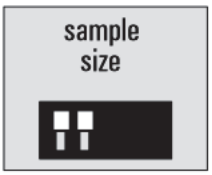
4. Set the number of sample washes per sample vial to two.

Left switch up,
right switch down



5. The number of pumps is preset to six.
6. The viscosity delay is preset to zero.
7. Set the sample size (injection volume) to 1 µl.

Both switches up



8. Set the number of solvent A washes to two.
   - With a tray, the two solvent washes are split so that the injector performs one solvent A and one solvent B wash.
   - Without a tray, the injector performs two solvent A washes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9. Set the injection mode

For a packed or split/splitless inlet, switch up

For an on-column inlet, switch down



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Checking your work

Before you start the sequence, check the run parameters.

Standalone control

Check the injector control switches that you set. The switches should look like the following:

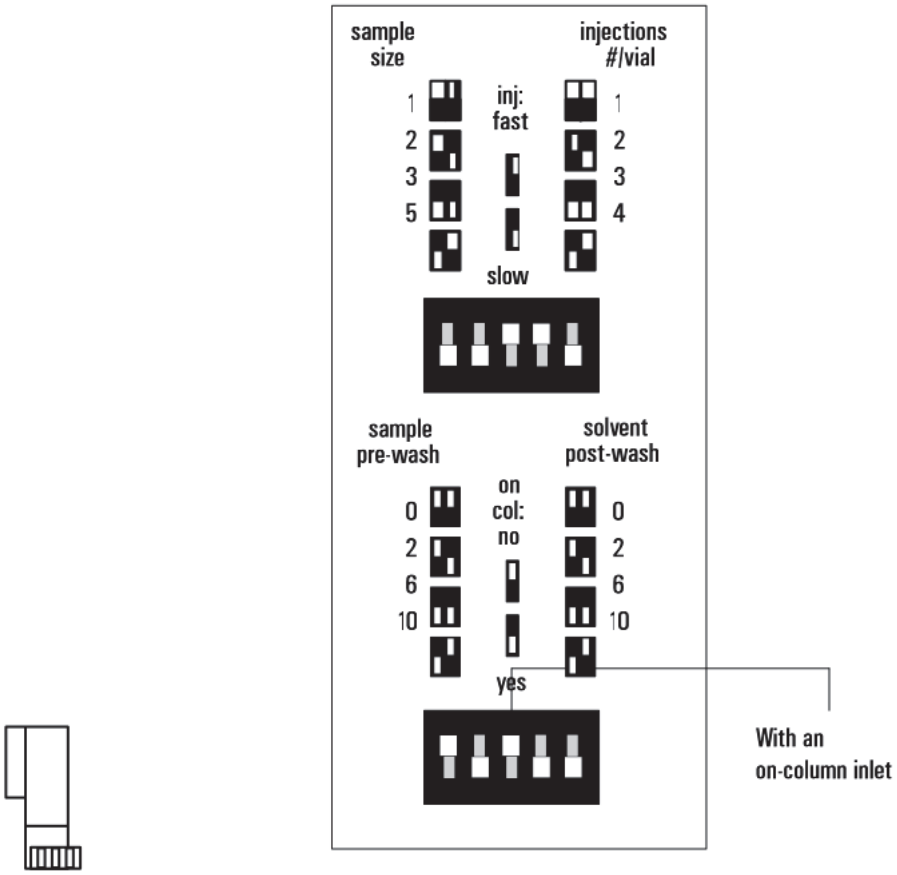


Figure 65. Example of switch setting

If there are any errors, change the appropriate switches.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5

Preventive Maintenance and Troubleshooting

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preventive Maintenance and Troubleshooting

Preventive maintenance

This section contains some suggestions for ensuring good performance. The maintenance interval varies with the use of the instrument.

Caution Do not use any lubricants on the automatic liquid sampler. They may affect the chemical performance of the GC and damage the instruments.

For instructions on the proper use and replacement of consumable parts, such as septa, inlet liners, syringes, and sample vials, see chapter 3, “Operation.” For instructions on aligning the brackets, see the bracket installation guides.

Regular basis (before you start a sequence

- Get a new or clean syringe rinsed with solvent.
- Be sure the plunger carrier holds the plunger button.
- Measure 4.5 ml of fresh solvent in each solvent bottle.
- Be sure the waste bottles are clean and empty.
- Be sure the number of sample vials does not exceed solvent capacity.
- Place the sample vials correctly according to the controlling device.
- Cap the sample vials properly.

Note: The inlet does not require maintenance.

Occasional basis

- Clean the surface of the tray arm, gripper, gripper jaws, and tray quadrants.
- Vacuum off any dust that builds up around the vents on the front and back of the controller.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Clean the needle guide and nearby surfaces of the injector. Dust and dirt accumulate in these areas and can be picked up easily by the syringe needle and carried into the inlet.
- Clean the sample vial inserts for the turret.
- Clean the surface of the injector. Vacuum off any dust that builds up around the vents of the electronics assembly.
- Realign and tighten the screw, standoffs, and mounting posts of the injector bracket.
- Tighten the screws and standoffs of the tray bracket.
- Be sure all the cables are attached securely to the back of the power supply.
- Be sure the tray is positioned over the alignment pin and locked in place.

Turret exchange

If you need to remove or exchange your turret, use the following instructions for proper replacement.

1. Turn off the controller if the injector is installed.
2. Open the tower door. Unscrew and remove the knurled nut from the top of the turret. (See Figure 66).
3. Rotate the turret so that the open section faces the back of the tower and the arrow on top of the turret points directly back. Push the stripper arm toward the back, lift the turret up so that it clears the center shaft, and remove it from the front of the tower.
4. To install the replacement turret, align the pin on the motor shaft with the slot located on the underside of the turret.
5. Push the stripper arm to the back of the tower, insert the turret with the open section facing the back of the tower with the arrow pointing back, and install the turret with the pin seated in the slot. Seat the turret on the shaft, rotating it gently, if necessary, until it drops completely into position. The top of the threaded shaft should be almost level with the top of the turret, and the stripper arm should clear the top by approximately 1 mm as the turret is rotated.
6. Replace the knurled nut, and tighten it firmly (finger-tight).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7. Restore power, and check for the green tower ready light. For proper needle depth in the sample vial, the syringe carriage height calibration must be carried out each time the turret is changed. See the following section, “Alignment procedure.”

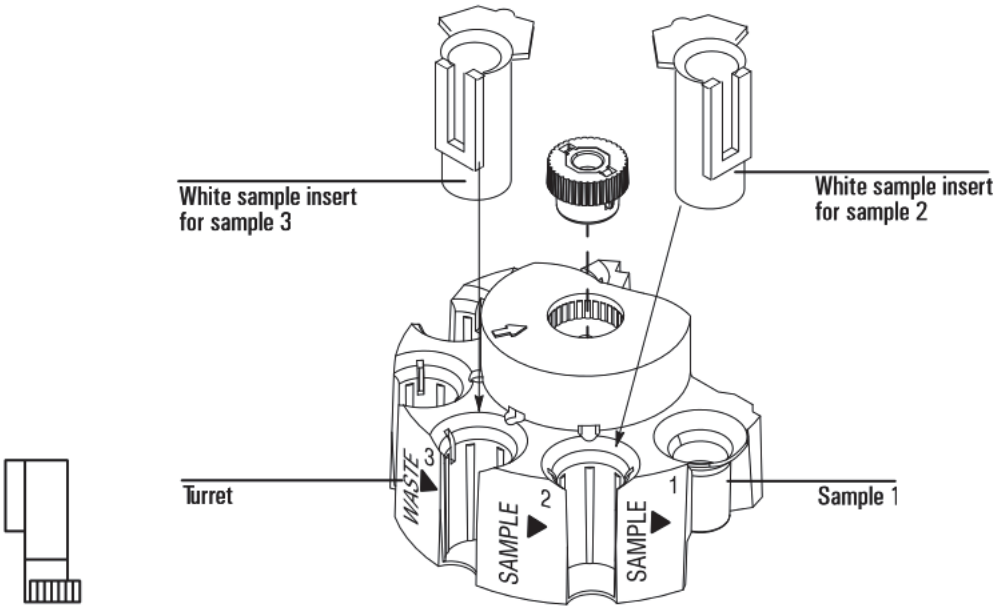


Figure 66. Placing sample inserts for three sample vials

Alignment procedure

After changing a turret, it is recommended to perform the alignment procedure. If the yellow Align LED is on the injector will not operate until this procedure has been performed. Use the following instructions to perform the alignment procedure.

1. Turn the controller off. Put the injector into diagnostic mode by simultaneously pressing the START and STOP buttons on the front of the injector while turning the controller on. Hold the START and STOP buttons down until the LEDs come on. They will be lighting in rotating pattern.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. Remove the syringe, and carefully remove the needle support rod from the injector.
3. Press the STOP button. The red LED will start flashing a double flash. Press STOP three times more, moving through displays of three, four, and five flashes. The sequence of five flashes is the starting point for alignment.
4. Press START to begin the alignment procedure. The injector will go through the following three steps:
   - The turret homes (this is a clockwise and then a counterclockwise continuous motion).
   - The syringe carriage starts moving up and down repeatedly to set a position relative to the inlet.
   - The syringe carriage is stepped down until it touches the turret. This sets the position relative to the turret.

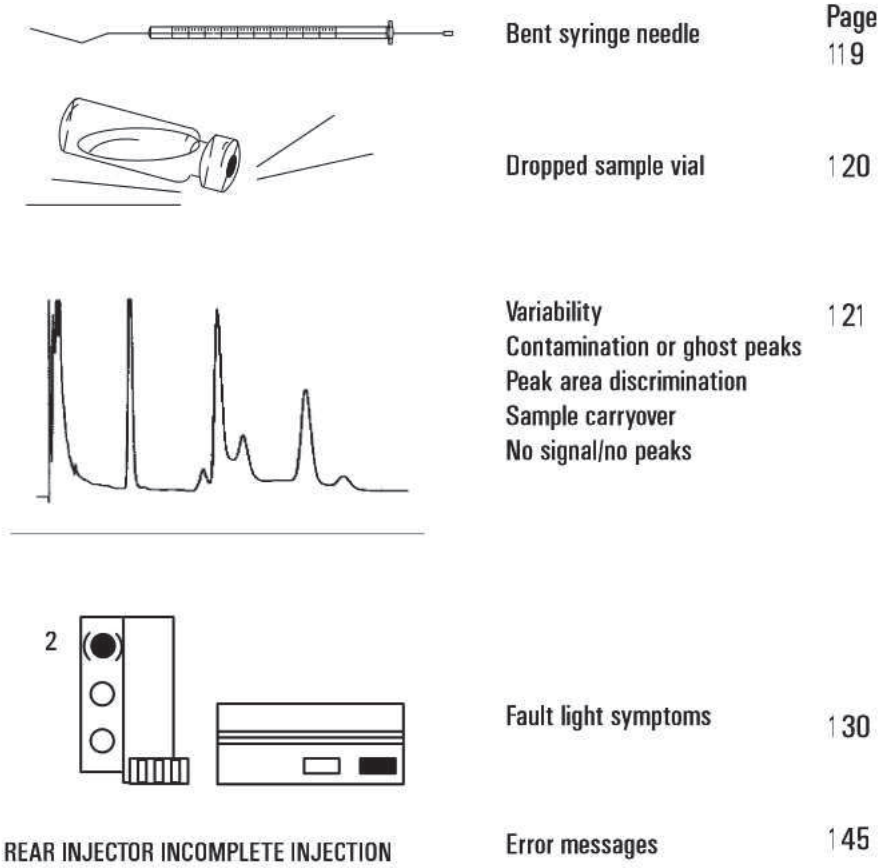
When the alignment is complete, the red LED will return to two flashes, and the yellow Align LED will go out. Power-cycle the controller to return it to the ready state. Return your syringe and needle support rod to their original positions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

Find the illustration in Figure 67 that best identifies your problem, and then turn to the appropriate page.

For information on how to obtain service from Agilent Technologies, see page 147.



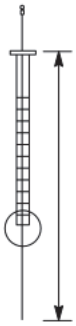
	Page
Bent syringe needle	119
Dropped sample vial	120
Variability Contamination or ghost peaks Peak area discrimination Sample carryover No signal/no peaks	121
Fault light symptoms	130
Error messages	145

Figure 67. Troubleshooting map

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bent syringe needle





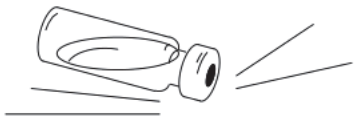
When you find a bent syringe needle, check:

- Was the syringe installed properly in the syringe carriage?
- Was the syringe needle straight? Roll the syringe on a flat surface and watch the tip of the needle.
- Are you using the correct syringe? Is the combined length of the syringe barrel and needle about 126.5 mm? For more information, see “Selecting and installing syringes” on page 49.
- Does the injection mode parameter match the type of inlet under the injector module (normal for packed or split/splitless inlets, on-column for on-column inlets)? For more information, see “Injection mode” on page 63.
- Are the needle support and needle guide cone clean? Remove any residue or septum deposits.
- Is the GC septum nut too tight? For more information, see “Changing septa” on page 54.
- Is the septum of the crimp cap centered over the sample vial? For more information, see “Crimp capping sample vials” on page 30.
- Are the inside diameters of the sample vial, microvial insert and vial cap septum at least 5 mm? For more information, see “Specifications“in chapter 2.

WARNING When troubleshooting the injector, keep your hands away from the syringe needle. The needle is sharp and may contain hazardous chemicals.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dropped sample vial



When you find a mishandled sample vial, check:

- Are there folds or wrinkles in the crimp cap, especially near the neck of the sample vial? For more information, see “Crimp capping sample vials” on page 30.
- Are you using the correct sample vials? Is the distance from the vial bottom to the top of the neck about 28.4 mm? For more information, see “Specifications“in chapter 2.
- If you use labels on the sample vials, are they the correct size? For more information, see “Selecting and installing syringes” on page 49.
- The installation of the tray bracket on the injector bracket. Specifically, check the location of the three standoffs used to attach the tray bracket to the injector bracket. See the installation guide for the tray bracket.
- The installation of the tray on the mounting bracket. Be sure that it is pushed all the way to the alignment pin and locked in place. See “Mounting the tray” on page 15.
- For obstacles to the tray arm or injector turret. Remove any obstacles.
- The condition of the tray quadrants and turret. Clean any residue from the sample positions. If a temperature-controlled liquid is being pumped through the quadrants, see “Controlling sample vial temperatures” on page 168.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chromatographic symptoms

You may suspect a problem in the automatic liquid sampler based on what you see in a chromatogram or by comparing chromatograms. Each of the five parts of this section is named after a chromatographic symptom. Each part contains a list of possible causes and recommended solutions.

It is often difficult to identify a cause. For this reason, the causes are listed from most common to least common.

If you cannot correct the problem, obtain Agilent service.

Variability



Figure 68. Retention times or areas are not reproducible

Inlet septum is leaking

If the septum is leaking, replace the septum. If the leaking septum has experienced less than 200 injections, check for the following:

- The septum retainer nut is too tight. See “Changing septa” on page 54.
- The syringe needle is not straight. See “Inspecting syringes” on page 51.
- The syringe is not installed correctly. See “Installing syringes” on page 52.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- The injector bracket is not aligned to the injection port. See the appropriate link manual that describes the installation.

Syringe is worn or dirty

If the syringe looks dirty or the plunger is sticking, clean the syringe with an appropriate solvent, or follow the syringe manufacturer's cleaning instructions.

Sample volume is too low or too high

If the sample vials are not filled correctly, evaporation or contamination may affect the analysis. The sample level should be approximately half of the volume of the vial. See "Filling sample vials" on page 29.

Vial caps are loose

If you can turn the vial crimp caps by hand, they are too loose. Loose caps may cause volatile samples to change concentrations over time. See "Crimp capping sample vials" on page 30.

Sample is not stable

Some samples change with heat or ultraviolet light. Check the sample stability. There are several ways to reduce changes to unstable samples:

- Use the injector fan to cool the sample waiting in the injector turret.
- Use the tray quadrants to cool the sample.
- Use amber sample vials.
- Store the samples in a protected environment.

Sample size varies

If the sample size varies, the syringe is probably not precise or the plunger is worn. Variations may be due to syringes with removable type needles because of dead volumes or needle-to-needle variation.

Air bubbles are in the needle

If air bubbles are in the needle, increase the run parameter that controls the number of pumps. See "Number of sample pumps" on page 60.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

If this does not help and the sample is viscous, try the following:

- Reset the viscosity run parameter. See “Viscosity delay” on page 60.
- Use the tray quadrants to warm the sample.
- Dilute the sample in the appropriate low-viscosity solvent.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contamination or ghost peaks

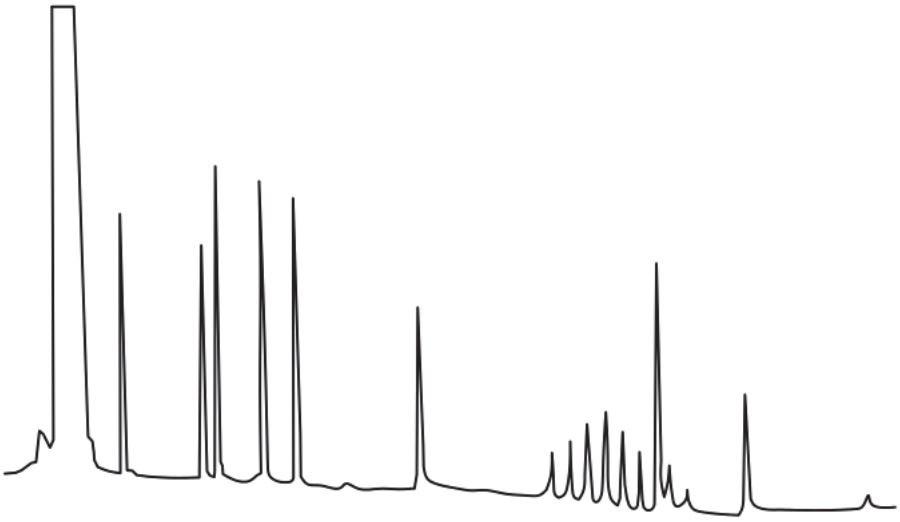


Figure 69. Contamination or ghost peaks

Vial cap septum is dissolving in solvent

Ghost peaks sometimes appear in the chromatogram when small pieces of vial septum material dissolve in the sample. Make several "blank" runs to determine the presence or absence of the ghost peaks. Check for the following:

- If the vial septum is not flat, the needle tends to core the septum and drop pieces into the sample. See "Crimp capping sample vials" on page 30.
- If the syringe needle has burrs, it could cut pieces of the septum and push them into the sample. See "Inspecting syringes" on page 51.
- If the vial septum is not resistant enough to the solvent you are using, try a more resistant type.

Sample vials are contaminated

Ghost peaks are sometimes caused by contaminated sample vials. Try new or clean vials to see if ghost peaks disappear. Store new vials in a contaminant-free location.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Injection port septum is giving off volatiles

Make several “blank” runs with a small piece of aluminum foil backing the inlet septum. If the contamination peaks disappear, they were probably due to the septum. Try replacing the septum you usually use with another type.

Column is contaminated

High molecular weight samples that contain residues may cause the syringe, the inlet liner, or the first few inches of column to become contaminated. Do the following:

- Replace or clean and deactivate the inlet liner.
- Examine the first few inches of a capillary column for foreign material by holding a light behind it. If possible, remove the contaminated section.

Sample is not stable

Some samples change with heat or ultraviolet light. Check the sample stability. There are several ways to reduce the change:

- Use the tray quadrants to cool the sample.
- Use amber sample vials.
- Store the samples in a protected environment.

Impurities in the carrier gas

Install a carrier gas trap in the gas line to the GC, or replace the existing trap. If the gas contains impurities, the contamination peaks gradually disappear once the trap is installed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Peak area discrimination (smaller or larger peaks than expected)

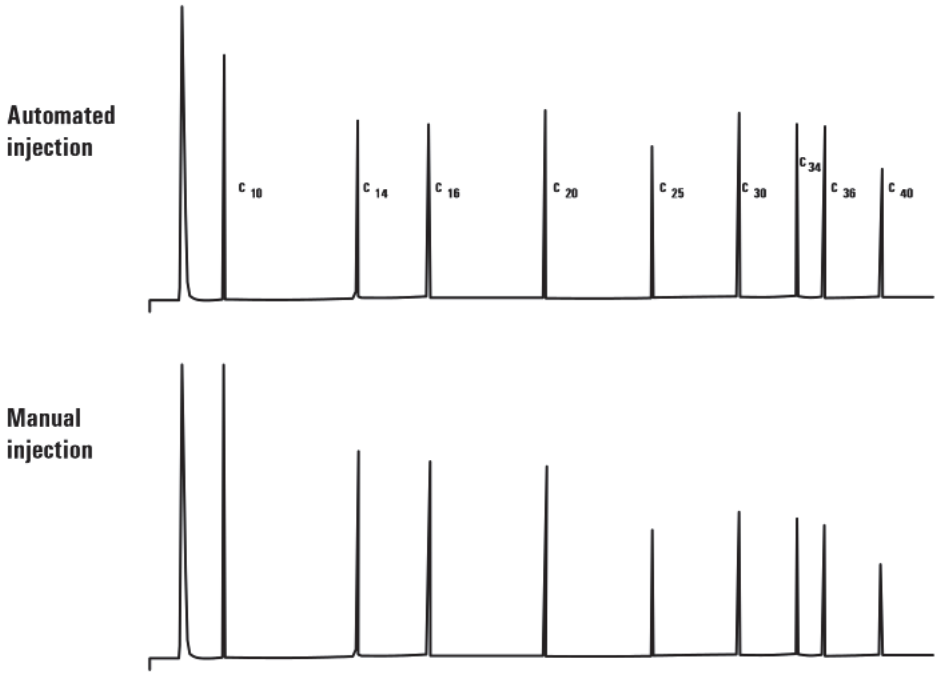


Figure 70. Smaller or larger peaks than expected

You are comparing a chromatogram without needle fractionation against one with needle fractionation

In the normal injection mode, the automatic liquid sampler uses fast injection to deliver a representative amount of the sample. Fast injection minimizes needle fractionation. Without fast injection, sample boils out of the needle. Chromatograms from manual injection or slower auto injection devices show higher levels of low molecular weight versus higher molecular materials because the low boilers boil out of the needle faster than the high boilers.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

You are using a packed inlet and a 530-μm column

Capillary columns used with packed inlets do have some inherent sample discrimination characteristics. See “Suggestions for packed inlets with 530-µm columns” on page 55.

You are using a packed column

Double-check the following:

- Is the inlet temperature correct for this particular sample?
- Is the sample reacting with the inlet liner or fittings?

There is a leak in the GC system

Replace the septum and check the fittings for leaks. If the leaking septum has experienced less than 200 injections, check for the following:

- The septum retainer nut is too tight. See “Changing septa” on page 54.
- The syringe needle is not straight. See “Inspecting syringes” on page 51.
- The syringe is not installed correctly. See “Installing syringes” on page 52.
- The injector bracket is not aligned to the injection port. See the appropriate link manual that describes the installation.

Sample is not stable

Some samples change with heat or ultraviolet light. Check the sample stability. There are several ways to reduce the change:

- Use the tray quadrants to cool the sample.
- Use amber sample vials.
- Store the samples in a protected environment.

Vial caps are loose

Loose vial caps can cause selective loss of lighter materials from a sample. The caps should not rotate easily if installed properly. See “Crimp capping sample vials” on page 30.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Detector response has changed

Recalibrate the detector. Absolute response factors can change several percentage points during the day depending on the type of detector in use.

Sample carryover

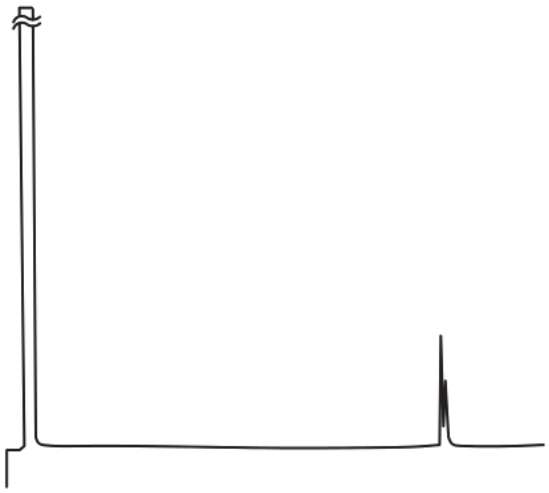


Figure 71. Blank run showing carryover peaks

Number or type of washes is insufficient

Check the run parameters for the number of sample and solvent washes. The number of washes you need depends on your application. See “Controlling sample carryover” on page 47.

You ran out of solvent

Check the solvent bottles. If the solvent level is below 2.5 ml, the syringe cannot reach the solvent. Replace the remaining solvent with 4 to 4.5 ml of fresh solvent. See “Filling and placing the bottles” on page 37.

Check the waste bottles. If the waste level is near the neck of the bottle, replace it with an empty bottle.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Syringe is worn or dirty

If the syringe looks dirty or the plunger is sticking, clean the syringe with an appropriate solvent, or follow the syringe manufacturer's cleaning instructions. If the syringe seems worn, replace it.

Samples (vial-to-vial) are of immiscible types

In this situation, the sample and solvent washes may not rinse the syringe properly. Either increase the number of wash cycles or use a solvent that rinses a variety of sample types.

No signal/no peaks

Syringe plunger is malfunctioning

Verify that the button of the syringe plunger is fastened properly by the plunger screw. If the plunger screw is loose, tighten it. See "Installing syringes" on page 52.

Also, check the syringe needle for plugging. If the syringe is plugged, replace or clean the syringe.

Sample level is too low in vial

If there is no or very little sample in the vial, the needle may not be able to reach it. See "Filling sample vials" on page 29.

Sample is viscous

If the sample is viscous, try the following:

- Increase the viscosity run parameter. See "Viscosity delay" on page 60.
- Use the tray quadrants to warm the sample.
- Dilute the sample in the appropriate low-viscosity solvent.
- Turn off tower fan.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Fault light symptoms

Four light-emitting diodes (LEDs) on the injector indicate the status of the injector. Two LEDs on the controller module indicate the status of the controller and the tray if it is installed.

During normal operation, the controller's green LED and the injector's green LED are on. If the injector is busy, the injector's yellow LED is also on.

When a problem occurs on the injector, the red LED flashes. When a problem occurs with the turret alignment, the yellow Align LED is on (located behind the injector front panel). When a problem occurs on the tray or controller, the yellow LED on the controller flashes, and a beeper sounds in synchronization with the flashes.

If the automatic liquid sampler is controlled by an external device (i.e., not standalone), the controller sends error messages to the controlling device. For example, the ChemStation software displays an error message. The controller LEDs do not flash.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Fault light locations, colors, and patterns

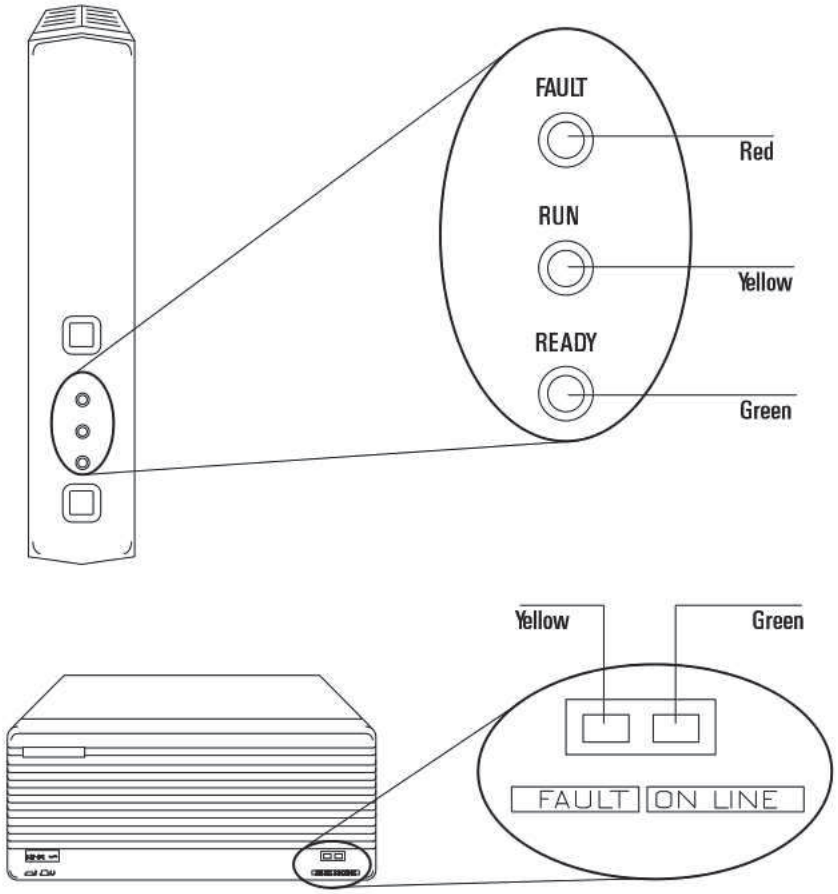
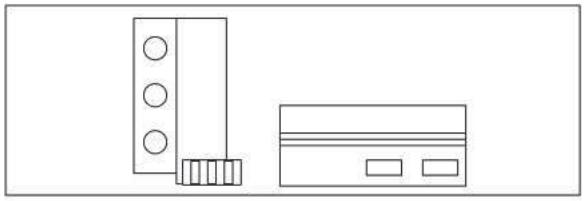


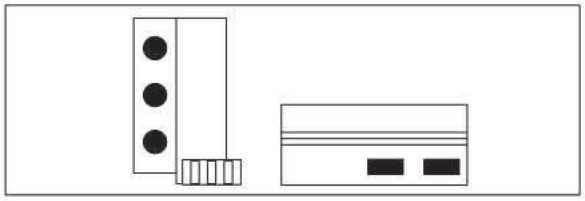
Figure 72. Location and pattern of LEDs during normal operation

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

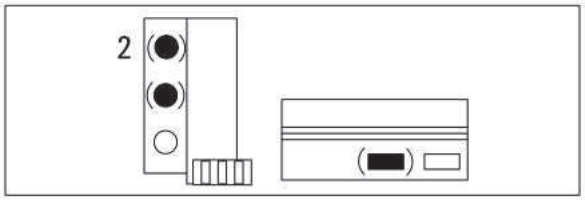
Throughout the rest of this section, an icon is used to represent the fault lights and beeps. The following are examples of the four basic patterns. A number indicates the number of flashes or double flashes that occur between the pauses. For example, the 2 indicates that the red injector LED flashes twice, then pauses, then flashes twice, and repeats this pattern until the fault is cleared or the controller is turned off.



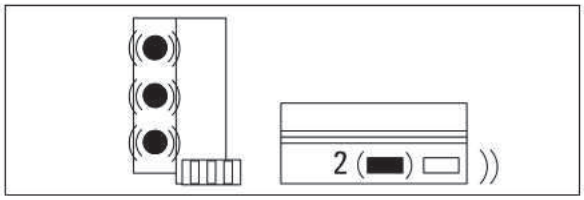
LEDs off



LEDs on



Red and yellow LED blinking



LEDs double-blinking and beeping

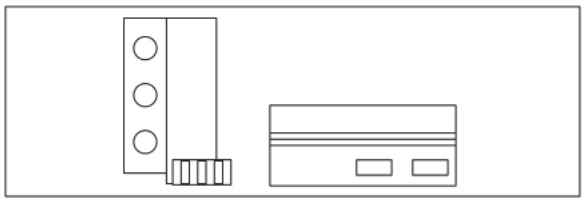
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Responding to the fault lights

Use the following instructions to try to solve the problem before obtaining Agilent service:

1. Find the icon on this and the following pages that describes the LED pattern on the injector and controller.
2. Read the information under the icon. Try the suggested actions.
3. If you cannot find the pattern or the suggested actions do not correct the problem, obtain Agilent service. See page 147.

Power error



Probable causes

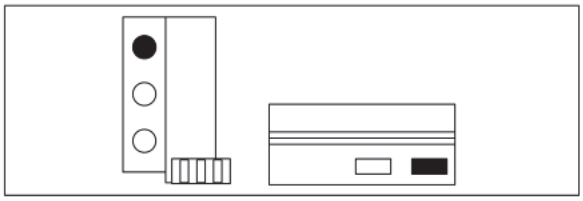
- The line voltage is off.
- The +5 V supply on the main controller board is not operating.

Suggested actions

1. Check the power source for your bench.
2. Check to see that the power cord is installed and the power switch is on.
3. Obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Injector door open/not mounted



Probable causes

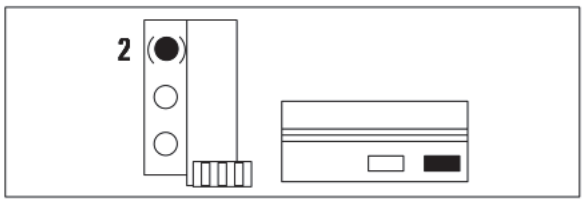
- The injector door is open.
- The injector is mounted incorrectly on the bracket.

Suggested actions

1. Ensure that the injector door is closed.
2. Ensure that the injector is mounted properly. For more information, see “Installing the injectors” on page 7.
3. If the fault light stays on, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Syringe error



Probable causes

- The syringe carriage motor has a problem.
- The syringe carriage cannot find its home position.
- The syringe carriage sensor is inoperable.
- The improper injection mode was used.

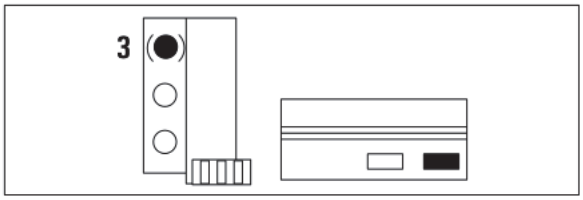
For information on the syringe carriage home positions, see the Glossary.

Suggested actions

1. Ensure the syringe is installed correctly. For more information, see “Selecting and installing syringes” on page 49.
2. Ensure the syringe meets specifications.
3. Check the on-column injection mode parameter. If the parameter was set incorrectly for on-column injection, check for damage to the inlet liner and column.
4. If the syringe needle is bent, also check the list of actions on page 119.
5. Press the `STOP` button on the injector to clear the fault indicators. Restart the sequence.
6. If the error occurs again, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Turret error



Probable causes

- Something has interfered with the turret rotation.
- The turret motor/encoder assembly is inoperable.
- The turret type was changed without performing the alignment procedure on the injector.

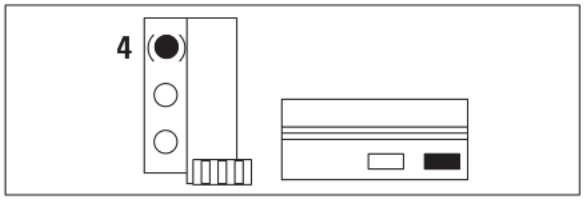
For information on the turret's home positions, see the Glossary.

Suggested actions

1. Clear any obstructions from the turret.
2. Press the STOP button on the injector to clear the fault indicators. Restart the sequence.
3. Check the Align LED. If it is lit, perform the alignment procedure. (See the "Alignment procedure" in this section.)
4. If the error occurs again, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Plunger error



Probable causes

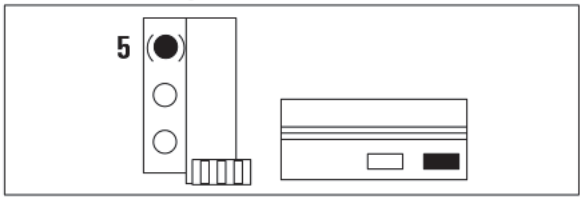
- The plunger carrier is out of position.
- The plunger carrier sensor(s) is inoperable.
- The plunger motor wires are disconnected.
- The plunger carrier is operating incorrectly.
- The plunger solenoid is binding.

Suggested actions

1. Remove the syringe, and check it for plunger stickiness or binding. Replace the syringe if necessary. For more information, see “Selecting and installing syringes” on page 49.
2. Check the viscosity of the sample against the viscosity parameter. Reset the viscosity parameter if necessary.
3. Press the STOP button on the injector to clear the fault indicators. Restart the sequence.
4. Connect the wires.
5. If the error occurs again, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Incomplete injection



Probable causes

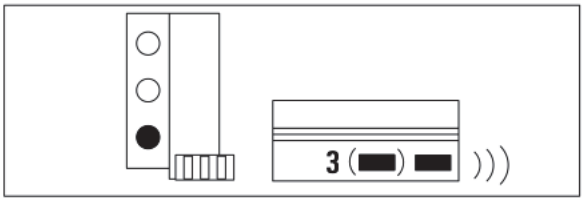
- There was an incomplete injection.
- The plunger or syringe carrier is operating incorrectly during injection.

Suggested actions

1. If the syringe needle is bent, check the list of actions on page 119.
2. Remove the syringe from the injector, and check the plunger for stickiness or binding. Replace the syringe if necessary.
3. Press the STOP button on the injector to clear the fault indicators. Restart the sequence.
4. If the error occurs again, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bottle in gripper



3 beeps

Probable cause

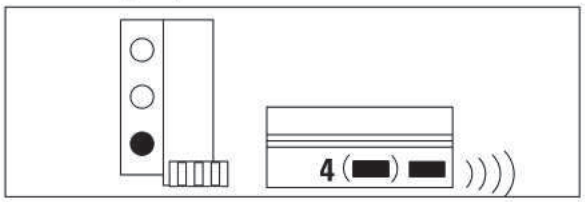
- The sample vial was not delivered properly and stayed in the tray gripper.

Suggested actions

1. Remove the vial and return it to its position in the tray.
2. Ensure that the tray quadrants are snapped into place.
3. Ensure that the injector is plugged into the correct connector on the back of the controller (front or rear).
4. Check the “deliver to” location for the vial, and verify that the location is empty and free from obstructions.
5. Press the STOP button on the injector to clear the fault indicators. Restart the sequence.
6. If the error occurs again, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Hard tray/injector error



4 beeps

Probable causes

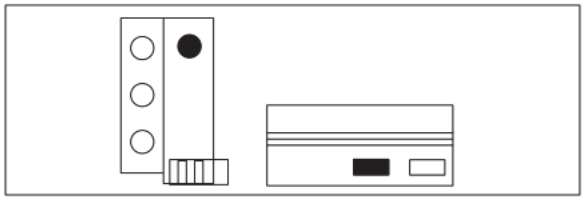
- The tray is not able to move.
- The injector is not responding to signals from the controller.

Suggested actions

1. Remove any obstructions from the tray that might keep the arm from moving through its full motion.
2. Press the STOP button on the injector to clear the fault indicators. Restart the sequence.
3. If the error occurs again, obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Align LED is On



Probable causes

- The type of turret was changed without performing the alignment procedure.
- The system was not initialized.
- There is an injector memory error.
- The injector main board was replaced.

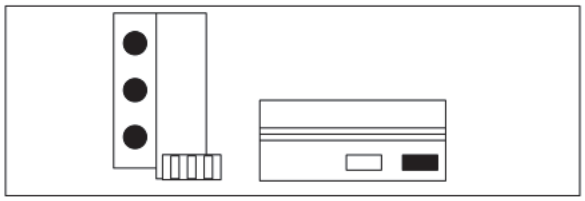
Suggested action

1. Perform the alignment procedure. (See the “Alignment procedure” in this section.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

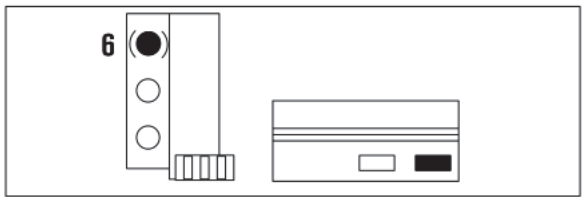
Other patterns

For any of the following patterns, obtain Agilent service.



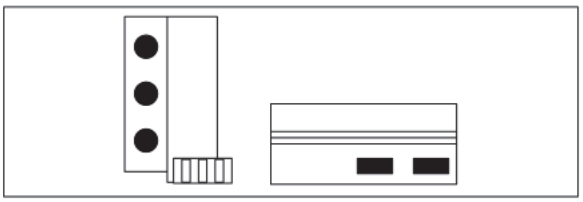
Probable cause

There is an injector board failure.



Probable causes

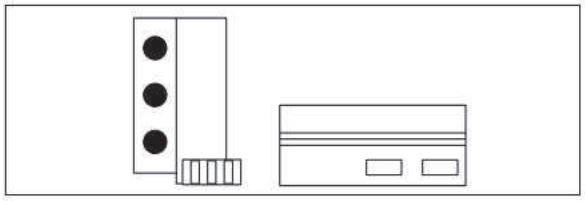
- There is an injector memory error.
- The injector main board is malfunctioning.



Probable cause

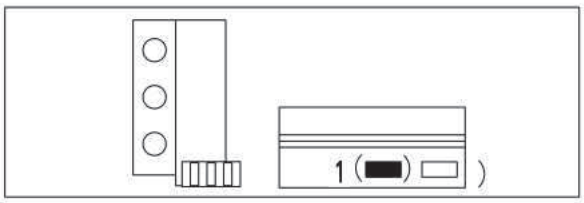
- The controller cannot be booted.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Probable causes

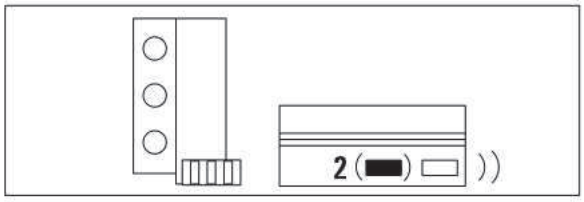
- The 18-V fuses have blown on the power supply board.
- The 18-V supply is not operable.



1 **beep**

Probable cause

- It failed the ±13 V self-test.

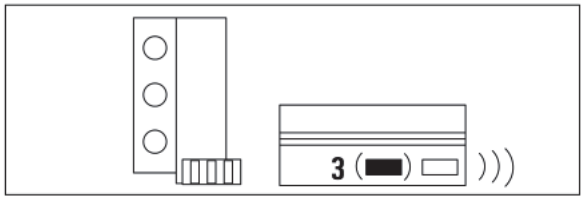


2 beeps

Probable cause

- It failed the ±18 V self-test.

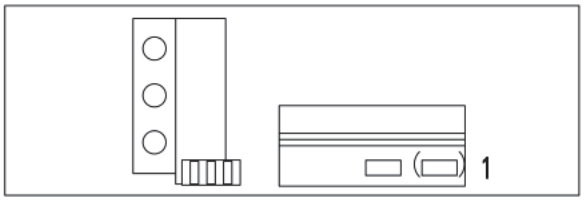
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



3 beeps

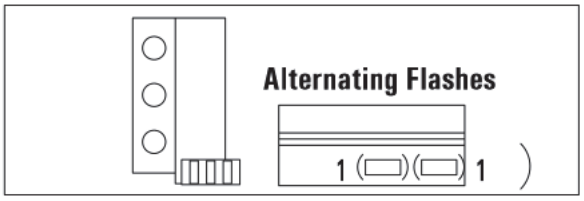
Probable cause

- It failed the fan self-test. Both fans failed.



Probable causes

- It failed the application test.
- In service mode



Continuous beep

Probable cause

- It failed the RAM test.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Error messages

This section is an alphabetical listing of possible error messages.

BOTTLE NOT FOUND

- The gripper did not find a sample vial in the injector turret during a removal attempt.

DOWNLOAD NOT COMPLETE FILE TOO LONG

- The method file is too long.

DOWNLOAD NOT COMPLETE INVALID PARAMETER

- The value of a run parameter is not within the legal limit. Check the run parameters.

DOWNLOAD NOT COMPLETE CONFIGURATION ERROR

- The method parameters do not match the installed software or hardware.

FRONT INJECTOR COMMUNICATIONS ERROR

- There is a communications error between the front injector and the controller.

FRONT INJECTOR SYRINGE ERROR

- Go to page 135.

FRONT INJECTOR TURRET ERROR

- Go to page 136.

FRONT INJECTOR PLUNGER ERROR

- Go to page 137.

FRONT INJECTOR INCOMPLETE INJECTION

- Go to page 138.

FRONT INJECTOR MEMORY ERROR

- There is an electronics hardware problem. Obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FRONT INJECTOR RESET

- There is an interruption in the ±18 V from the controller. Obtain Agilent service.

FRONT INJECTOR DOOR OPEN/NOT MOUNTED

- Go to page 134.

REAR INJECTOR COMMUNICATIONS ERROR

- There is a communications error between the rear injector and the controller.

REAR INJECTOR SYRINGE ERROR

- Go to page 135.

REAR INJECTOR TURRET ERROR

- Go to page 136.

REAR INJECTOR PLUNGER ERROR

- Go to page 137.

REAR INJECTOR INCOMPLETE INJECTION

- Go to page 138.

REAR INJECTOR MEMORY ERROR

- There is an electronics hardware problem. Obtain Agilent service.

REAR INJECTOR RESET

- There is an interruption in the ±18 V from the controller. Obtain Agilent service.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contacting Agilent Technologies

This section contains information on how to obtain Agilent Technologies service and how to ship or store the equipment.

Obtaining Agilent Technologies service

To obtain service, contact your local sales or support office.

If you compile the following information before you call, Agilent Technologies can give you better service:

- The instrument's name, model number, and serial number (e.g., G1513A injector module, 1111A11111). These numbers are on the unit identification label.
- A full description of the symptoms or problem.
- The maintenance agreement number(s).
- The date that Agilent Technologies shipped the instrument to you.
- Your complete return address and telephone number.
- Your local contact.

	Model No.	Serial No.	Shipped
Controller			
Injector (1)			
Injector (2)			
Tray			
Bar Code Reader			
Maintenance Agreement Number(s)			

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Shipment or storage

Original factory or authorized Agilent Technologies containers and packing materials should be used for either shipping or storage. If other packaging materials are used, they must meet the following requirements.

1. Use a double-wall carton of a least 275 pound test.
2. The tray must be foam packed, and the injector's syringe carriage must be locked from movement. Use enough shock-absorbing material on all sides to provide a firm cushion and to prevent movement within the container.
3. Mark the outside **fragile, delicate instruments** to ensure careful handling.

If you are storing the instrument, choose a clean environment that does not exceed the following parameters:

- 95% relative humidity
- An altitude of 7,620 meters (25,000 feet)
- A temperature range of –40°C to +75°C (–104°F to 167°F)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6

Special Topics

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Special Topics

The automatic liquid sampler allows injection onto 250-□m and 320-□m columns in addition to 530-□m columns.

This section explains how to adapt the GC and the automatic liquid sampler to use the smaller columns. Specifically, it outlines the following:

- How to install the needle into the syringe barrel
- How to check the needle-to-column size
- How to prepare the inlet
- How to use retention gaps
- How to prepare the injector
- How to replace the needle guide in the needle support foot
- How to troubleshoot 250-□m and 320-□m injections
- How to control sample vial temperatures
- How to use tray control commands

For a list of the consumables needed to perform 250 □m and 320 □m injections, see the Agilent analytical consumables and supplies catalog.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Performing cool on-column injection onto 250-µm and 320-µm columns

Installing the needle into the syringe barrel

The stainless steel needles used for 250-µm and 320-µm injections must be inserted into a glass syringe barrel (part no. 5182-0836 [5 µl]). Select the correct needle for the column you will use. Needles for 250-µm injections (part no. 5181-7442) have silver-colored stops. Needles for 320-µm injections (part no. 5181-1266) have gold-colored stops.

1. Unscrew the syringe barrel cap, and remove the spring.
2. Make sure the needle has the Teflon disk as shown in the picture below. If the syringe barrel does not have the Teflon disk, use the instructions in the syringe box to wrap the needle yourself.
3. Slide the spring and the cap down over the needle.
4. Insert the needle into the syringe barrel.
5. Screw the cap back on the syringe barrel.

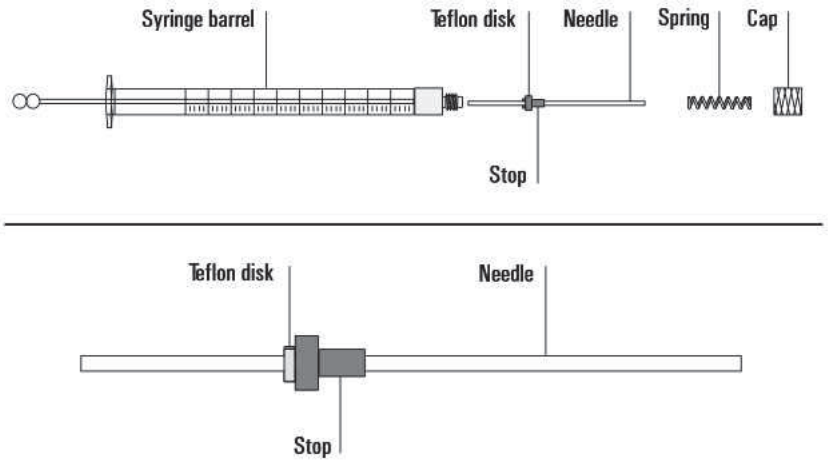


Figure 73. Syringe parts and assembly

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Checking the needle-to-column size

You need to check the needle-to-column fit because some manufacturers provide columns with internal diameters that are too small. You will bend the syringe if you try to inject into a column that is smaller than the needle.

You use the insert that is the same size as the syringe needle you will use in the analysis to verify that the column you plan to use is the correct size.

1. Identify the correct insert by the number of rings on it using the table below. The syringe needle size is listed to guide you in the choice of needles. Some of the needles listed have syringe barrels attached; some do not.

Column Size	Insert	Syringe Needles
250 µm	 Part no. 19245-20515 6 identification rings	26/32 tapered
320 µm	 Part no. 19245-20525 5 identification rings	26/32 tapered
530 µm Polyimide-coated	 Part no. 19245-20580 0 identification rings	23/26 tapered or 26 straight

Figure 74. Consumables for automatic injection

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. Insert the column into one end of the insert as shown in Figure 75.

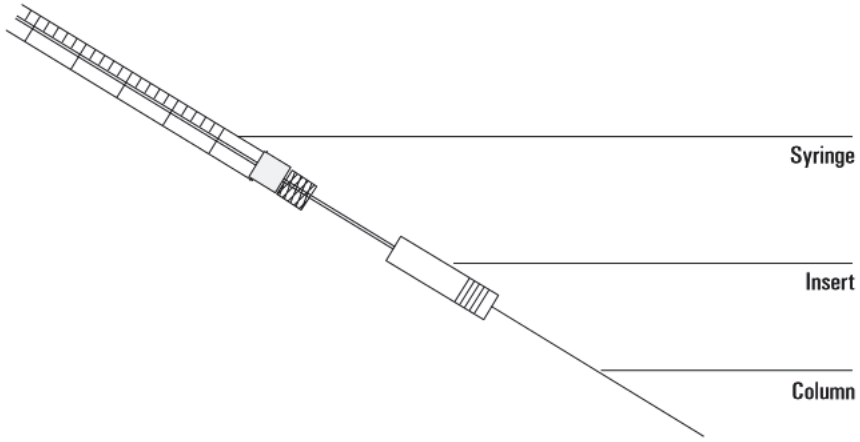


Figure 75. Checking the needle-to-column size

3. Insert the syringe needle through the other end of the insert and into the column. If the needle cannot pass easily into the column, reverse the insert to try the needle and column in the other ends.

   If the needle still cannot pass into the column, you may have a column with an incorrect internal diameter. Check the column to make sure it is labeled correctly, and try a new column.

Preparing the cool on-column inlet

To prepare the cool on-column inlet for injection into the 250-µm and 320-µm columns, you need to do the following:

- Change the insert and inlet septum nut.
- Align the inlet septum nut, septum, and insert.
- Install the column.
- Verify the alignment.

Changing the insert and inlet septum

The insert that you used to check the column size is installed in the inlet of the GC to guide the syringe needle into the column. The insert must correspond to

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

the size of the column and syringe needle you will use. (See the previous section to identify the correct insert.)

Use the following steps to remove an incorrect insert and to install a new one:

1. Lower the temperature of the GC oven. After the oven is cool, turn the oven off, and set the inlet pressure to 0.
2. Remove the column along with its column nut and ferrule.
3. On top of the oven, unscrew and remove the inlet septum nut.
4. Replace the old septum with the new through-hole septum, and set the septum nut aside.
5. Remove the spring from the inlet, and set it aside. Be careful not to lose or damage it because you will use the spring with the new insert.
6. Remove the existing insert from the inlet by pushing it out from below with a piece of column. Store the insert for possible later use.
7. Drop the new insert straight into the inlet from the top. The end of the insert in which you inserted the needle should be up; the end of the insert in which you inserted the column should be down (see the previous section on checking the needle-to-column size). Use the identification rings to help you remember which way to install the insert.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8. Replace the spring on top of the insert.

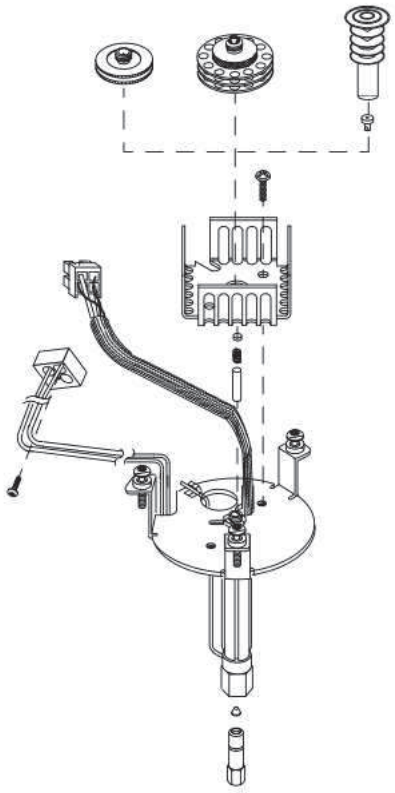


Figure 76. Inlet assembly

You will align and install the inlet septum nut in the next section.

Aligning the septum nut

For 250-µm and 320-µm on-column injections, the septum nut requires a 5-mm through-hole septum.

1. To ensure proper alignment, thread the septum and the septum nut onto a 26-gauge or larger needle or a piece of wire. The septum should rest in the cavity in the nut.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. Turn the needle over. Insert the wire, inlet septum nut and through-hole septum into the inlet.

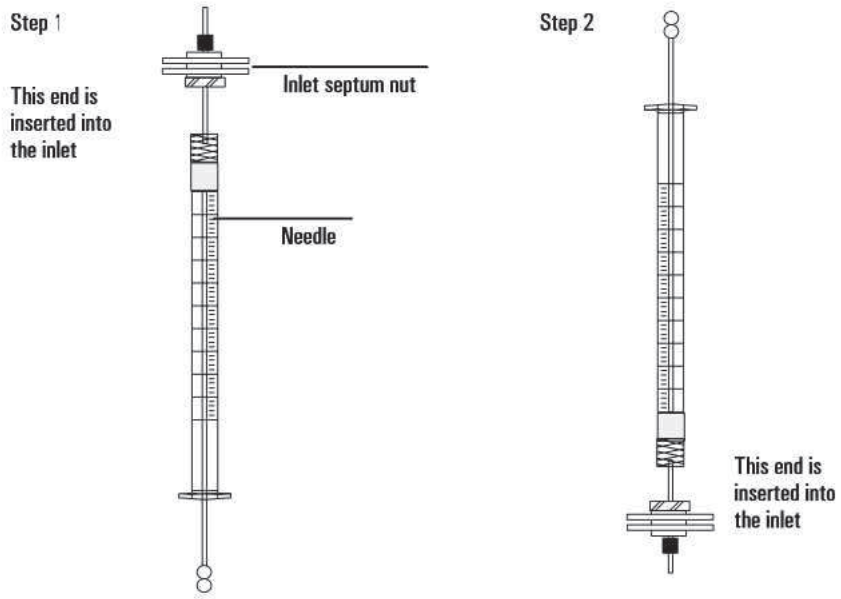


Figure 77. Ensuring proper alignment

3. Tighten the septum nut as tight as possible. If the septum nut is loose, the system may leak.
4. Remove the needle from the inlet.

Installing a fused silica capillary column into the inlet

You must cut the column correctly to ensure effective connection. The method shown below produces the recommended square cut.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WARNING Flying glass particles can cause eye injuries. Always wear safety glasses when cutting fused silica columns.

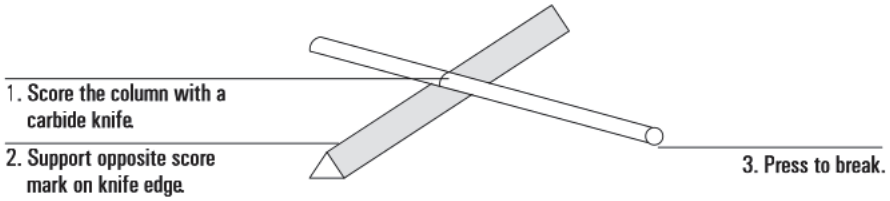


Figure 78. Cutting the column

1. Slide a column nut and ferrule onto the end of the column.
2. Cut off the column end with a square cut according to the illustration above.
3. Wipe the column end with methanol to remove oil and dust.
4. Insert the column into the inlet base until it stops against the insert.
5. Finger-tighten the column nut. Make sure the column remains against the insert while you tighten the nut.
6. Use a wrench to tighten the column nut an additional quarter turn.
7. Once you have selected the syringe, verify the column installation by manually pushing it into the inlet. There should be a gap of 12 mm or less between the septum nut and the syringe barrel. If there is more than 13 mm between the syringe barrel and septum nut, your needle is not reaching the column, and you cannot perform 250-µm or 320-µm

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

on-column injections. If this is the case, reinstall the insert and the column.

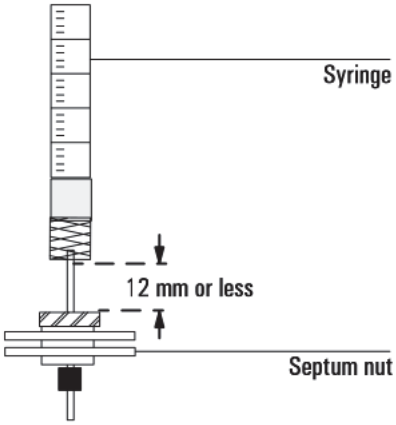


Figure 79. Verifying column installation

If you are using a retention gap, read the following section.

Using retention gaps and other precolumns

Precolumns are columns connected in front of the analytical column. They are commonly used to protect the analytical column from contamination.

A retention gap is a deactivated, uncoated (or thinly coated) precolumn. It is used to increase sample resolution and decrease peak splitting. Retention gaps have the effect of reforming broad injection bands at the head of the column.

When you inject a sample, the sample at first exists as both gas vapor and microdroplets. Without a retention gap, the gas vapor begins partitioning immediately at the stationary phase. The microdroplets, however, are carried farther into the column by carrier gas and cause loss of resolution and peak splitting. The addition of a retention gap in front of the column prevents this premature partitioning until all the microdroplets are vaporized.

In general, the length of the retention gap required and type of deactivation depend on injected volume and solvent polarity. A working rule of thumb is to use 1 m of retention gap per microliter injected. For a 3-µl sample, use a 3-m

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

retention gap. The retention gap should be wetted by the solvent, which means it should be deactivated with a material of similar polarity. Fused silica tubing is commercially available in a range of diameters and deactivations.

Press-fit connectors

Press-fit connectors are easy-to-use, general-purpose connectors for coupling capillary columns of the same or different diameters.

Advantages: They are inexpensive, have low dead volume, fit most fused silica columns, have low mass (no thermal lag), and are transparent. In most cases, simply pressing the column ends into the connector is the only installation task; heat from the oven completes the seal.

Disadvantages: Because they are made of glass, these connectors may be too reactive for some compounds. Deactivated press-fit connectors are available from the Agilent columns and supplies catalog. In addition, they may need separate heating for a reliable seal, and they expose a small amount of polyimide to the sample. If simply pressing the column ends into the connector does not give a good seal, try the following procedure:

1. Cut clean, square ends on the columns, and wipe them with methanol to remove fingerprints and dust.
2. Grasp one end of the connector with a folded tissue to avoid burned fingers. Heat the other end with a hot-air gun (clamped in a ring stand so hands are free) for about 30 seconds. Remove the connector from the heat, and immediately insert the column. Hold for about 1 minute while the fitting cools and shrinks around the column. Repeat with the other connection.
3. Finish forming the seal in the GC oven, above 200°C with low carrier pressure. You should now be able to see the polyimide seal.

Butt connectors

Butt connectors are also popular for connecting precolumns to columns, particularly for high-temperature use. Different-size ferrules are used, depending on the size of the columns. Because column ends are in contact with

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

each other inside the ferrule during tightening, exposure to ferrule material is minimized.

Purged connectors

Purged connectors are commercially available for column connection. The most complex of connector types, they purge the connection area and, thus, minimize contamination.

Preparing the injector

The preparation of the injector is divided into the following steps:

- How to change the needle support assembly
- How to install the syringe into the needle support assembly

Changing the needle support assembly in the injector

When changing to 250-µm or 320-µm injection, you must change the needle support assembly. The needle support assembly is a spring-loaded rod with a needle support foot at its base. The foot supports and guides the needle during injections.

Removing the needle support assembly

1. Lay the injector module on its back on a flat surface.
2. Open the injector door.
3. Loosen the plunger screw. (The plunger screw holds the plunger in the plunger carrier.)
4. Slide the loop of the plunger carrier up as far as it will go.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5. Swing the syringe latch counterclockwise to unlock the syringe.

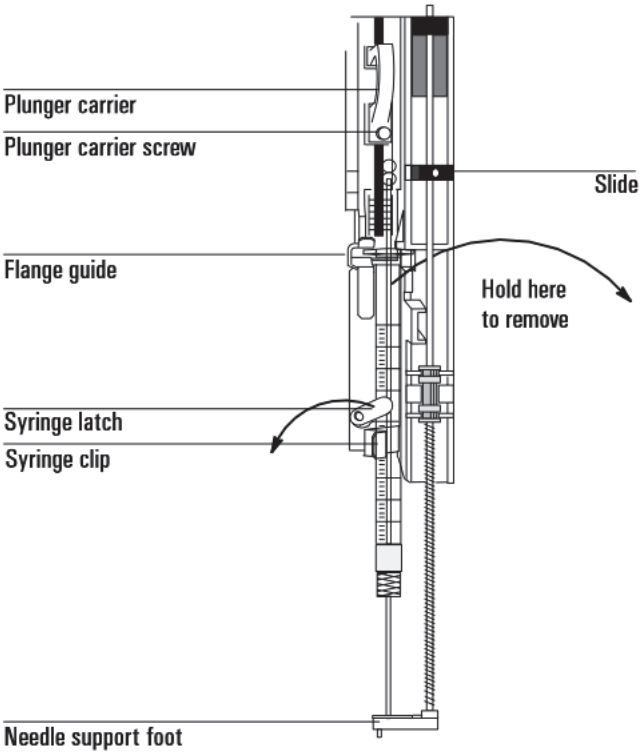


Figure 80. Removing the needle support assembly

6. With your finger under the upper portion of the syringe barrel (just above the syringe latch), pull the syringe up, and gently remove it.

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.

7. With your finger under the brass fitting of the needle support assembly, pull up gently to release the brass fitting from the syringe carriage, and remove the assembly.
8. Carefully use the brass fitting to pull the rod down until you can lift the assembly out of the syringe carriage.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Caution Be careful not to pull the assembly by its metal shaft. The shaft is easily bent.

Installing the 250/320-µm needle support assembly

1. Hold the new needle support assembly in your right hand, and insert the upper end of the rod into the plastic guide to the right of the plunger carrier.
2. Align the bearing on the needle support assembly with the plastic bearing clip to the right of the syringe latch.

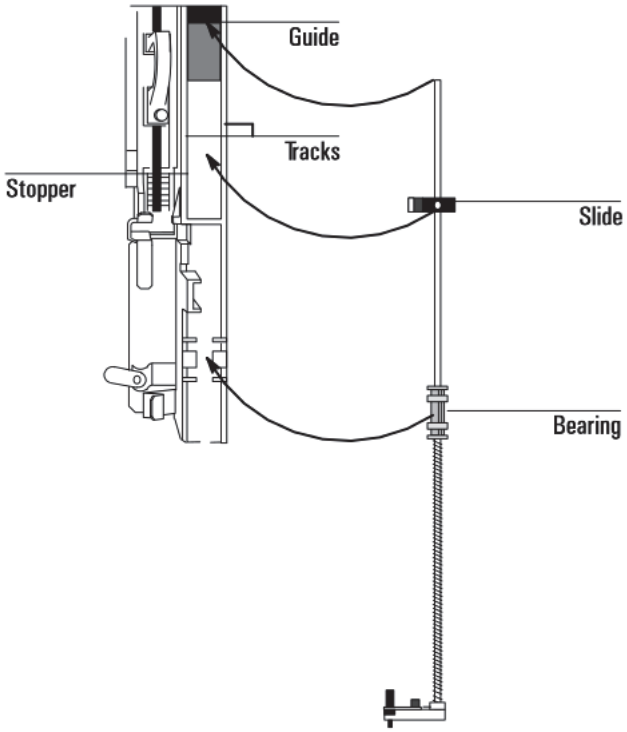


Figure 81. Installing the 250/320-µm needle support assembly

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. Push the assembly gently down into place. Make sure the slide lies flat on syringe carriage so that it glides up and down the tracks as shown in the illustration below.

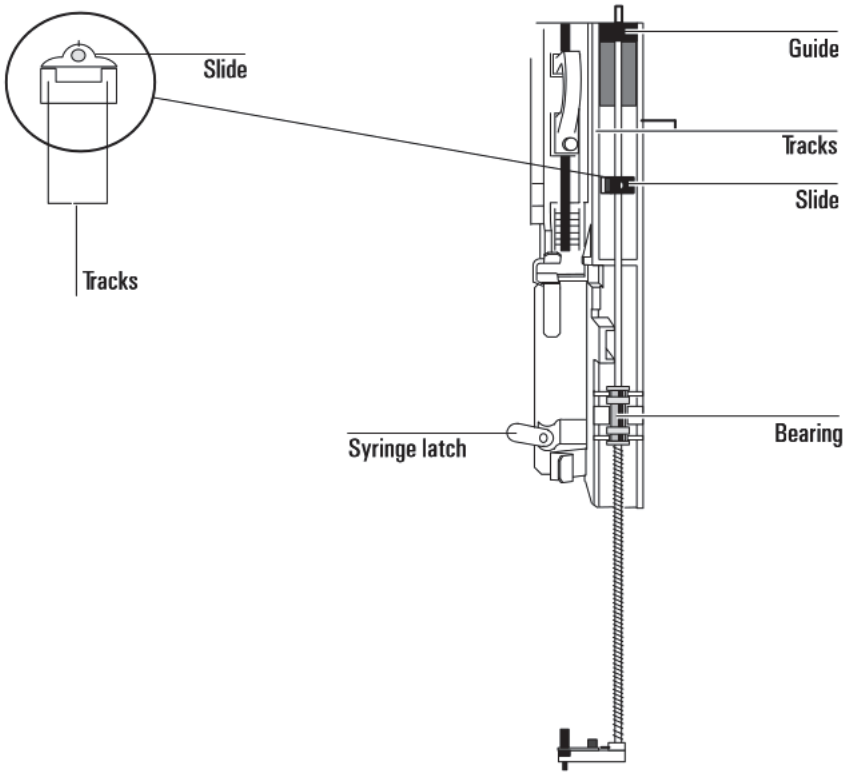


Figure 82. Cross-section of slide alignment

Installing the syringe into the needle support assembly

Use the following steps to install a new syringe:

1. If you have removed the injector module to install the needle support assembly, place the module back on the GC oven or on a parking post if you have one.
2. Open the injector door.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. Pass the syringe needle through the hole of the small needle guide in the needle support foot as shown below.

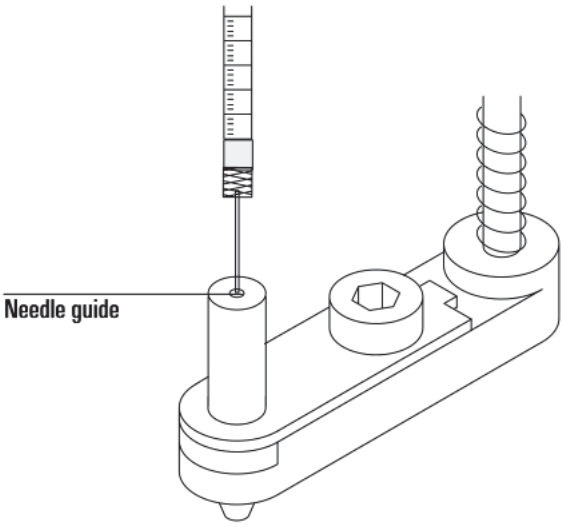


Figure 83. Needle support for 250-µm injection

4. Align the syringe flange with the flange guide and syringe clip, and gently press the syringe into place, keeping the needle in the hole of the needle guide. Be careful not to bend the needle during this step.
5. Close the syringe latch by swinging it clockwise.

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.

6. Move the plunger carrier loop down, and tighten the plunger screw.
7. Move the loop of the plunger carrier up and down to make sure the plunger is moving with the plunger carrier.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8. Check to make sure 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.

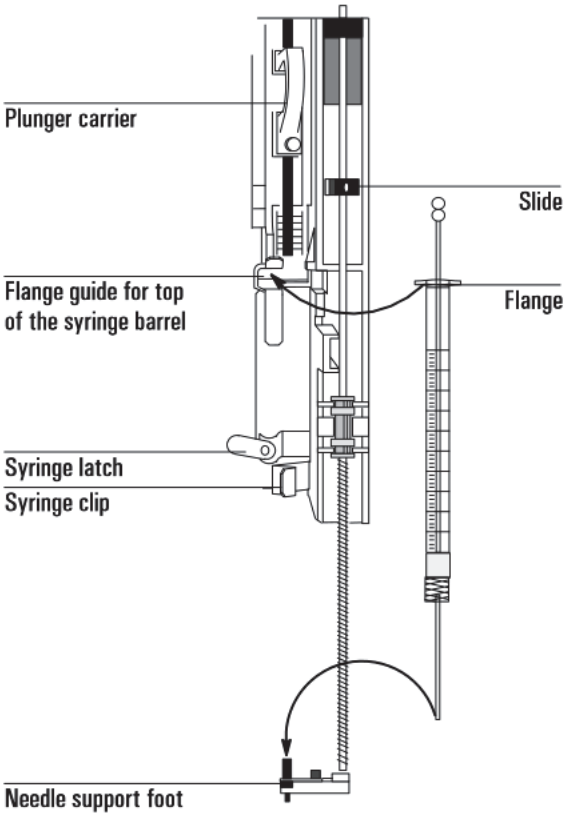


Figure 84. Installing the syringe for 250- or 320-µm on-column injection

Replacing the needle guide in the needle support foot

You need to check the needle guide for wear whenever you change the inlet septum. When the needle guide in the needle support foot shows signs of wear, use the following steps to replace it:

1. With an Allen wrench, remove the black screw from the needle support foot.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. Remove the small metal plate from the foot.
3. Remove the needle guide, and replace it with a new one.
4. Replace the metal plate.
5. Replace and finger-tighten the screw.
6. Finish tightening the screw with a 2-mm Allen wrench.

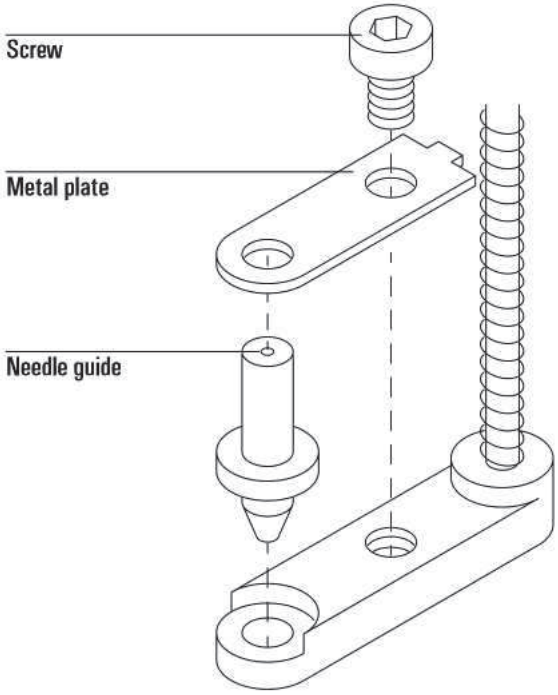


Figure 85. Needle support foot for 250-µm injection

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting 250-µm and 320-µm systems

Symptom	Possible Cause	Corrective or Preventive Action
Bent needle	Incorrectly installed needle support assembly	Check needle support assembly installation.
	Defective needle	Check each syringe before installation to make sure the needle is straight.
	Incorrect insert	Make sure the insert is the correct size for the column and needle you use. Also check that the insert is installed correctly.
	Worn or damaged needle guide	Check the needle guide on the needle support foot every time you change the inlet septum, and replace if necessary.
	Incorrect inlet septum	Use only a 5-mm septum with a through-hole.
	Poor alignment of inlet septum and septum nut	Align the inlet septum and septum nut according to the instructions provided in this manual.
	Incorrect column internal diameter	Check the internal diameter of the column by using the appropriate insert.
	Closed inlet septum hole	Replace the septum.
	Poor alignment of the inlet and the automatic injector	See the 5890 Series II Operating Manual for alignment instructions.
No peaks or unexpectedly small peaks	Plugged syringe needle	Replace the needle, or clean it with wire.
	Worn syringe barrel	Replace the syringe often, or use a Teflon-tipped plunger.
	Loose removable needle	Make sure the syringe barrel caps are screwed on tightly and that the Teflon disk is in place.
	Incorrectly placed or missing Teflon disk on the syringe needle	Check every syringe needle to make sure the Teflon disk is present and correctly placed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Symptom	Possible Cause	Corrective or Preventive Action
Poor precision, poor repeatability, or large standard deviation	Worn syringe barrel	Replace the syringe.
	Loose removable needle	Make sure the syringe barrel caps are screwed on tightly and that the Teflon disk is wrapped tightly as shown in this chapter.
	Widened holes in vial caps	Replace vial caps when holes widen and leaks develop.
	Inlet pressure set too low	Adjust the pressure.
	Incorrectly placed or missing Teflon disk on the syringe needle	Check every syringe needle to make sure the Teflon disk is present and correctly placed.

Controlling sample vial temperatures

This section explains how to connect tubing to the tray quadrants, how to calculate the water bath temperature used to obtain an approximate sample vial temperature, and the pressure limitations of the quadrants.

This section does not explain how to set up a water bath and pump.

You can control the temperature of the sample vials in the tray by:

- Pumping a temperature-controlled liquid through the tray quadrants.
- Freezing an ethylene glycol and water solution inside the tray quadrants.

The quadrants are designed for low flow rates, low pressures, and long temperature equalization times. If you freeze an ethylene glycol or alcohol solution in the quadrants, fill the quadrants to less than 90% of their total capacity.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Caution Ensure that the drainage tube is attached to the base of the tray, and remove any modules from underneath the tray. When controlling for a low sample temperature with a high ambient temperature or high humidity, water condensation from the quadrants and tray could damage equipment under the tray.

Attaching the drainage tube

Attach the drainage tube fitting and drainage tube to the bottom of the tray. The hardware is packaged with the tray.

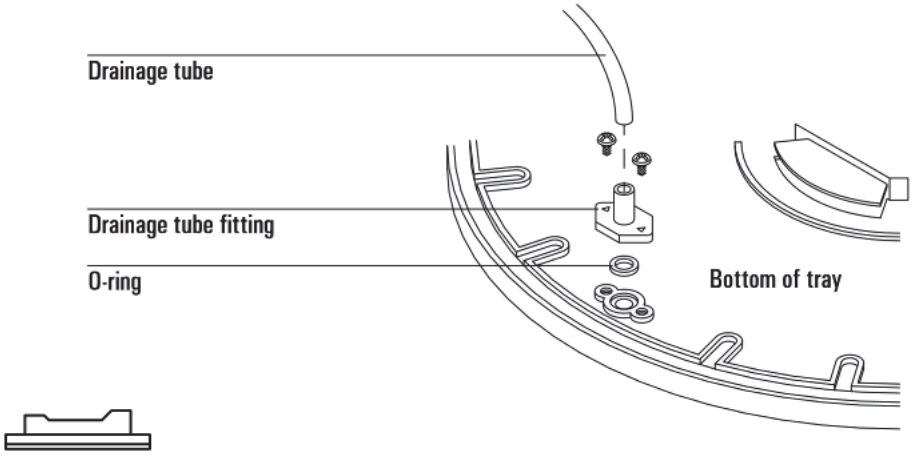


Figure 86. Attaching the tray drainage tube fitting

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Connecting the tray quadrants

The recommended plumbing used to connect the tray quadrants is shown in Figure 87. Use 6.35-mm id (1/4-in.) tubing.

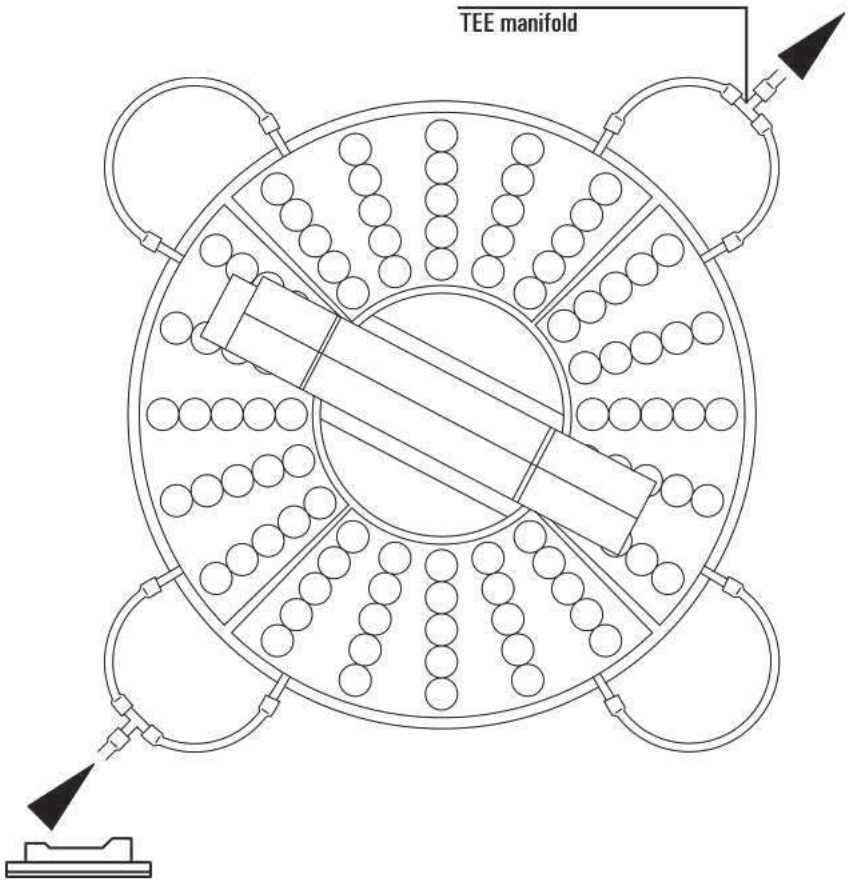


Figure 87. Tray quadrant plumbing

Calculating the water bath temperature

The temperature of the sample vials depends on several factors, including the ambient temperature of the air around the tray and the temperature of the water bath.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Caution If the sample temperature is critical for accuracy, experiments should be performed to validate water bath settings. Actual heat transfer varies with vial material, humidity, condensation on the vial, and flow rates.

To calculate the temperature needed for the water bath, complete the next four tasks. To convert temperature units, use the formula °C = 5/9 (°F – 32) or °F = 9/5(°C) + 32.

1. Measure the average ambient air temperature near the tray.
2. Find the desired sample vial temperature on the y-axis of the graph below.
3. From the point you selected in step 2, draw a horizontal line over to the diagonal line that corresponds with the ambient air temperature you measured in step 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. From the intersection of desired vial temperature and ambient temperature, draw a vertical line down to the x-axis of the graph and read the temperature needed for the water bath.

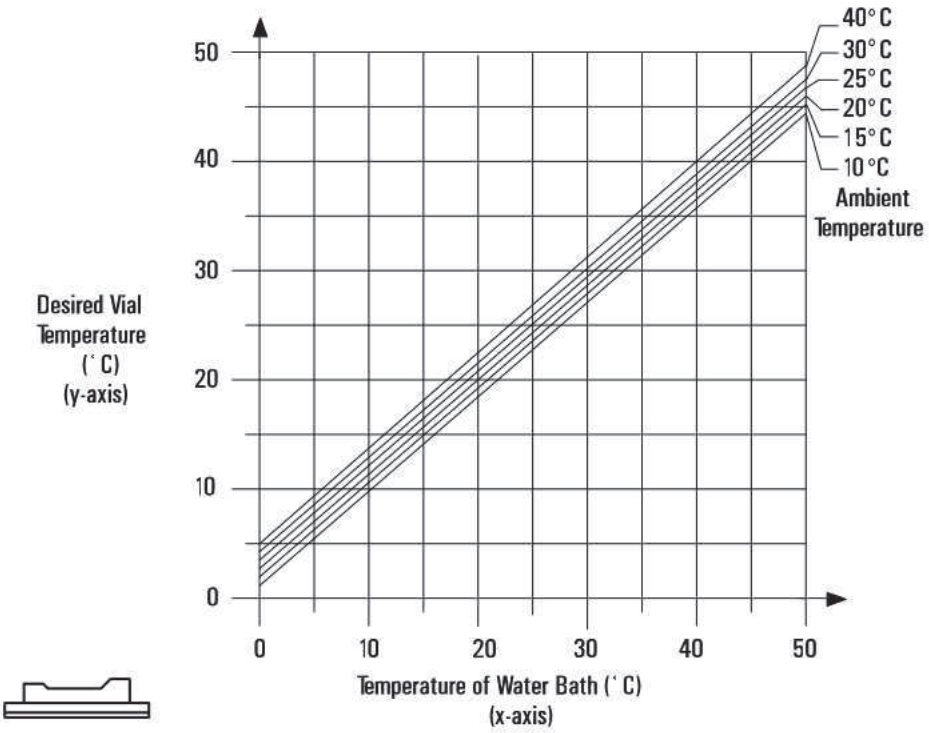


Figure 88. Sample vial temperature versus water bath temperature for values of ambient air temperature

Tray quadrant temperatures and pressures

Figure 88 shows the maximum pressures and temperatures measured at the output to the quadrant plumbing.

For example, with a water bath temperature of 40°C, the output pressure to the tray quadrants should not exceed 3.5 psi.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Caution Do not allow the inlet pressure and inlet temperature to exceed these limits. If you operate the bath outside this range, the quadrants could be damaged and cause sample vial delivery problems.

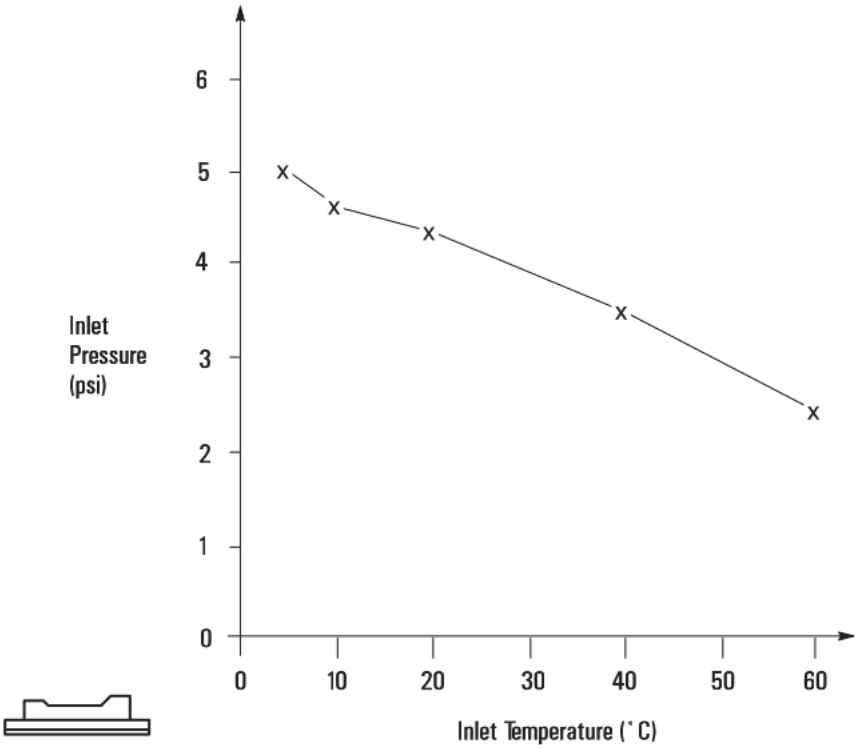


Figure 89. Maximum inlet pressures and temperatures

Water bath and pump specifications

The water bath and pump system used to control the sample vial temperatures should meet the following specifications.

- Safety requirements for the components must meet national standards, be suitable for unattended operation, be suitable for continuous operation, and be controllable for high-temperature protection.
- The minimum cooling power is 100 W at bath temperatures of 5°C.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- If you use a built-in pump, it must be suitable for external circulation of liquid and for connection of 6.35 mm id (1/4-inch) tubing.
- If you use a pressure pump, it must maintain a pressure between 1.5 and 2.5 psi.
- If you use a suction pump, the pump vacuum cannot exceed -4 psi.
- Use distilled water plus a maximum of 3% antifreeze.

Tray control commands

Programming devices can be used to tell the tray where to deliver and retrieve sample vials. The most common configuration is a device that is part of the Instrument Network (INET) and uses BASIC as a programming language. For example, you can use a 3396 integrator with BASIC to send special commands to the tray.

This section contains some general rules about using tray control commands, a description of their syntax, and an example of how to use them with a bar code reader.

General rules

- At least three letters of the tray commands must be used. Additional letters, up to the full length of the word, may be used for improved readability. For example, the MANUAL command may be entered as MAN, MANU, MANUA, or MANUAL.
- Unlike other setpoints in the automatic liquid sampler, manual sequencing mode is replaced with the normal sequencing mode after the power is turned off.
- It is recommended that the turrets not be left in an energized state longer than necessary to minimize power consumption and temperature changes. Also, if the turret is not returned to position 0 before the next injector operation (either an injection sequence or a MOVE, RETURN BOTTLES, or TURRET command), then there will be an additional delay while the turret goes through a homing operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- The firmware in the controller evaluates your commands. If there are no syntax errors, the tray responds with A NO ERRORS. If there are syntax errors, the tray responds with A and a description of the error.

Syntax and description

MOVE x,y	Picks up the bottle in position x and places it in position y. Positions x and y may be: • Numbers in the range 1 to 100, referring to bottle positions in the sample tray. • `FRONT` or `REAR`, referring to position 1 in the front or rear injector turret. • `EXT1` through `EXT19`, referring to positions in a circle beyond the outer row of bottles in the tray. Figure 6-18 maps these locations.

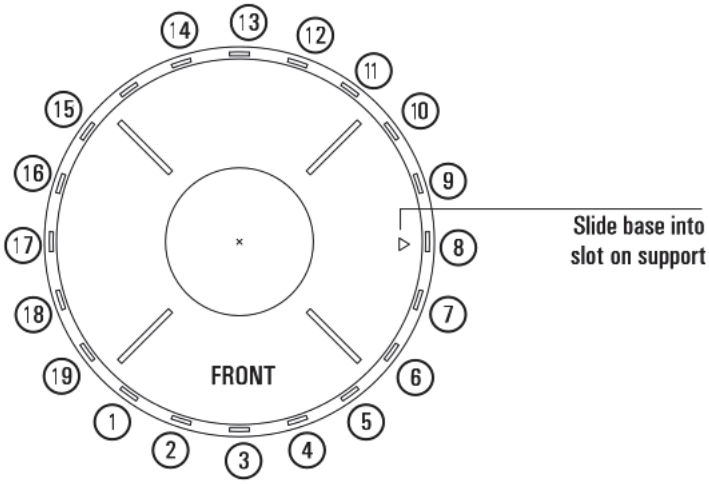


Figure 90. Map of locations on outer row of the tray

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MANUAL SEQUENCE	The MANUAL SEQUENCE command bypasses the normal sample sequencing performed by the automatic liquid sampler. Once manual sequencing mode has been activated, it is possible to manipulate sample bottles, moving them to and from the injectors with the MOVE command, and then inject from the bottles currently in the injectors simply by starting a sequence. In manual sequencing mode, the injections/bottle first bottle and last bottle setpoints are all ignored, and each injector will make just one injection but only if a bottle has been moved to its turret.
AUTO SEQUENCE	The AUTO SEQUENCE command returns the automatic liquid sampler to normal sequencing mode after being placed in manual mode.
RETURN BOTTLES	The RETURN BOTTLES command is a quick way to return bottles that have been moved out of the tray back to the positions where they originated. Bottles that are already in the tray are not affected even if they have been moved there from somewhere else. If a bottle has been in two or more positions within the tray, then only the most recent one will be remembered, and that is the one to which it will be returned. This command is also very useful if an error has occurred or a sequence has been aborted, and it is not known exactly where all the bottles are presently located.
TURRET x,y	This command rotates the front injector turret to position x and the rear injector turret to position y. The TURRET command controls the positioning of the injector turrets. Normally at the end of any injector operation, the sample turret is returned to its rest position with its motor de-energized so there is only a small residual holding torque to keep it in that position. By using the TURRET command, it is possible to move the turret to any one of ten other positions and leave the motor energized to provide a high-holding torque. (more)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TURRET x,y (continued)	The turret position values may be any integer from 0 to 10. When either value is omitted, that turret is not affected by the command. If both are omitted, the command performs no function. Position values 1 to 10 correspond to ten equally spaced turret positions at 36-degree intervals. The motor is left energized after the turret is moved to any of these positions. The position values 1 to 5 position the turret with sample positions 1, 2, and 3, `A WASH`, and `A WASTE`, respectively, facing directly toward the front of the injector. Position 0 is the rest position of the turret. When an injector is commanded to go to this position from one of the other ten positions, it takes the number of motor steps that should be required to get there and makes sure that it is at the right position. Then it de-energizes the motor. In this way, it is possible to check that no motor steps were lost in going to a turret position and back.
RESET	The `RESET` command clears error conditions in the injectors and tray. Often after an error has occurred, an error light will flash an error code and the automatic liquid sampler will not become ready for the next injection. Sending the `RESET` command will correct this condition.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example program with a bar code reader and tray

This program illustrates the following:

- Using bar code reader commands to read a bottle label
- Examining the bar code reader message for a specific character and agitating the sample if it is found
- Making the sample injection

The program simulates a sequence by repeating these actions for a range of tray positions. It uses the INET_IO command from 3393A or 3396 BASIC to transmit commands and receive responses. The same thing could be done with a short subroutine that directly controls a port.

Note the use of a dummy sequence (line 330). This sequence is set up for one injection of one sample; the program uses it repeatedly as it steps through the range of bottle numbers. The sequence is stored on a disk and loaded when required. See the integrator and BASIC manuals for more detail.

```
10   PRINT "USING THE BAR CODE READER IN AN ANALYTICAL SYSTEM"
20   PRINT
30   PRINT "THE LABEL FORMAT IS 14 CHARACTERS MAXIMUM."
40   PRINT
50   PRINT "IF A + SYMBOL APPEARS ANYWHERE ON THE LABEL, THE"
60   PRINT "SAMPLE WILL BE AGITATED BEFORE INJECTION."
70   PRINT
80   PRINT "IF THE SYSTEM CANN'T READ THE LABEL OR THE VIAL IS NOT"
90   PRINT "LABELED, IT WILL BE RETURNED TO ITS ORIGINAL POSITION."
100  PRINT
110  PRINT "THE USER MUST SUPPLY THE SAMPLER ADDRESS AND THE"
120  PRINT "NUMBERS OF THE FIRST AND LAST BOTTLES TO BE INJECTED."
130  PRINT
140  REM ****************************** DIMENSION STRING VARIABLES
150  DIM RESP$(40)      ! RESPONSE STRINGS THAT MATTER
160  DIM JUNK$(40)      ! RESPONSE STRINGS THAT DON'T MATTER
170  DIM BARCODE$(20)   ! THE BAR CODE DATA, ENCLOSED IN QUOTES
180  REM
190  REM ********************** ENTER THE SAMPLER INET ADDRESS
200  PRINT
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
210  PRINT
220  PRINT "ENTER THE INET ADDRESS OF THE SAMPLER."
230  INPUT AD
240  REM
250  REM ***** SET THE AUTOMATIC LIQUID SAMPLER TO MANUAL OPERATION
260  INET_IO AD,"MAN",JUNK$
270  REM
280  REM ******************************** SET UP THE VIAL SEQUENCE
290  PRINT "ENTER THE FIRST VIAL NUMBER:"
300  INPUT FIRST
310  PRINT "ENTER THE LAST VIAL NUMBER:"
320  INPUT LAST
330  IF LAST >= FIRST THEN GETSEQ "A:DUMMY" ELSE STOP
340  REM
350  REM ************************************ BEGIN SEQUENCE LOOP
360  FOR I=FIRST TO LAST
370  INET_IO AD,"RESET",JUNK$
380  INET_IO AD,"MOVE"&STR$(I)&",EXT3",JUNK$
390  INET_IO AD,"READ",RESP$
400  REM
410  REM ****************** FIND THE BEGINNING OF THE BAR CODE DATA
420  CODE=POS(RESP$,"=")+1
430  BARCODE$=RESP$(CODE:)
440  REM
450  REM ******************************* CHECK FOR A VALID BAR CODE
460  IF BARCODE$='""' THEN GOSUB INVAL_BC
470  IF BARCODE$<>'"" THEN GOSUB VALID_BC
480  NEXT I
485  INET_IO AD,"AUTO",JUNK$
490  PRINT
500  PRINT
510  PRINT "END OF DEMO--THANKS"
520  END
530  REM
540  REM ************************************SUBROUTINES FOLLOW
550  VALID_BC:
560  PRINT
570  PRINT "============================="
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
580  PRINT "      BEGIN ANALYSIS"
590  PRINT "      "&RESP$
600  PRINT "============================="
610  PRINT
620  IF POS(RESP$,"+")<>0 THEN INET_IO AD,"AGIT",JUNK$
630  INET_IO AD,"MOVE EXT3,FRONT",JUNK$
640  START SEQ_NOW
650  INET_IO AD,"MOVE FRONT,"&STR$(I),JUNK$
660  PRINT "============================="
670  PRINT "      END ANALYSIS"
680  PRINT "      "&RESP$
690  PRINT "============================="
700  RETURN
710  REM
720  INVAL_BC:
730  PRINT
740  PRINT "*****************************"
750  PRINT "INVALID OR MISSING LABEL ON "&RESP$
760  PRINT "*****************************"
770  PRINT
780  PRINT
790  INET_IO AD,"MOVE EXT3,"&STR$(I),JUNK$
800  RETURN
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Glossary

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Glossary

angular axis: the direction describing the rotation (clockwise and counterclockwise) of the tray's arm. The tray uses this motion to place the vial gripper above a group of five vials or in the proper orientation to the bar code reader or injector turret. It also uses this motion to engage or disengage the vial gripper's claw around the neck of the vial. See also **home positions**.

bleed: see **septum bleed.**

bottle: the 4 ml glass bottles placed in the injector turret to hold solvent or waste. See **vial**.

capillary column: modern capillary columns are divided into two classes: high resolution and low resolution. The low resolution columns have internal diameters of 0.4 mm to 0.75 mm. The high resolution columns have internal diameters of 0.1 mm to 0.4 mm.

configuration: the specific arrangement of automatic liquid sampler modules, gas chromatograph, and data handling devices to operate as a system.

cool on-column: an injection technique which places all of the sample directly onto the column without vaporization.

fast injection: a patented method of introducing a sample to a heated inlet without the negative affects of needle fractionation.

If you are using the automatic liquid sampler for the first time, you may not be aware of the changes you might see in the resulting chromatograms. With automated fast injection, you obtain chemical performance that is not available with manual injection. Most of the changes are due to:

- Eliminating the variation inherent in manual injection including the injection volume, the start time, and the amount of time the syringe needle is in the heated inlet.
- Reducing the amount of sample that boils out of the needle when injecting into heated inlets.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reducing the amount of vaporization from the needle may result in unexpected changes in your chromatogram.

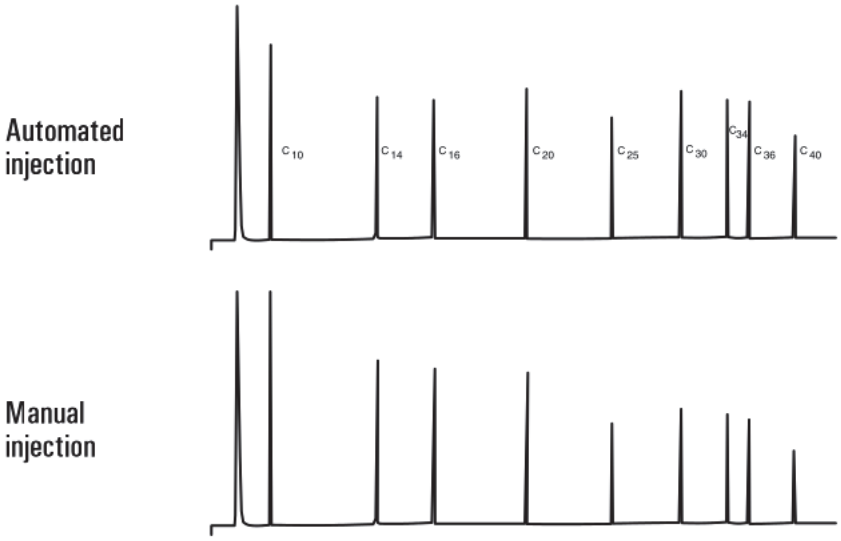
- The peak areas of your chromatograms may be smaller. Automatic fast injection delivers the desired setpoint volume of sample.

  Without fast injection, residual amounts of sample boil out of the needle and enter the inlet. This extra amount could measure up to 1 µl.

- The peak areas of your chromatograms may show less differentiation between the low boiling and high boiling components.

  Without fast injection, the sample you introduce is richer in low boiling components than high boiling ones because of fractional distillation in the needle. Not only does residual sample in the needle enter the inlet, but the low boiling components boil off first. This is called needle fractionation or discrimination.

The following chromatograms compare manual injection with automatic fast injection from the automatic liquid sampler for a 1 µl sample of C10 to C40 in hexane.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

For more information on the performance of the automatic liquid sampler, order the following technical papers from your Agilent representative:

Publication No. 43-5953-1843: Snyder, W. Dale. Fast Injection with the HP 7673A Automatic Injector: Chemical Performance, Technical Paper 108, June 1985.

Publication No. 43-5953-1878: Snyder, W. Dale. Performance Advantages of the HP 7673A Automatic Injector Over Manual Injection, Technical Paper 109, August 1985.

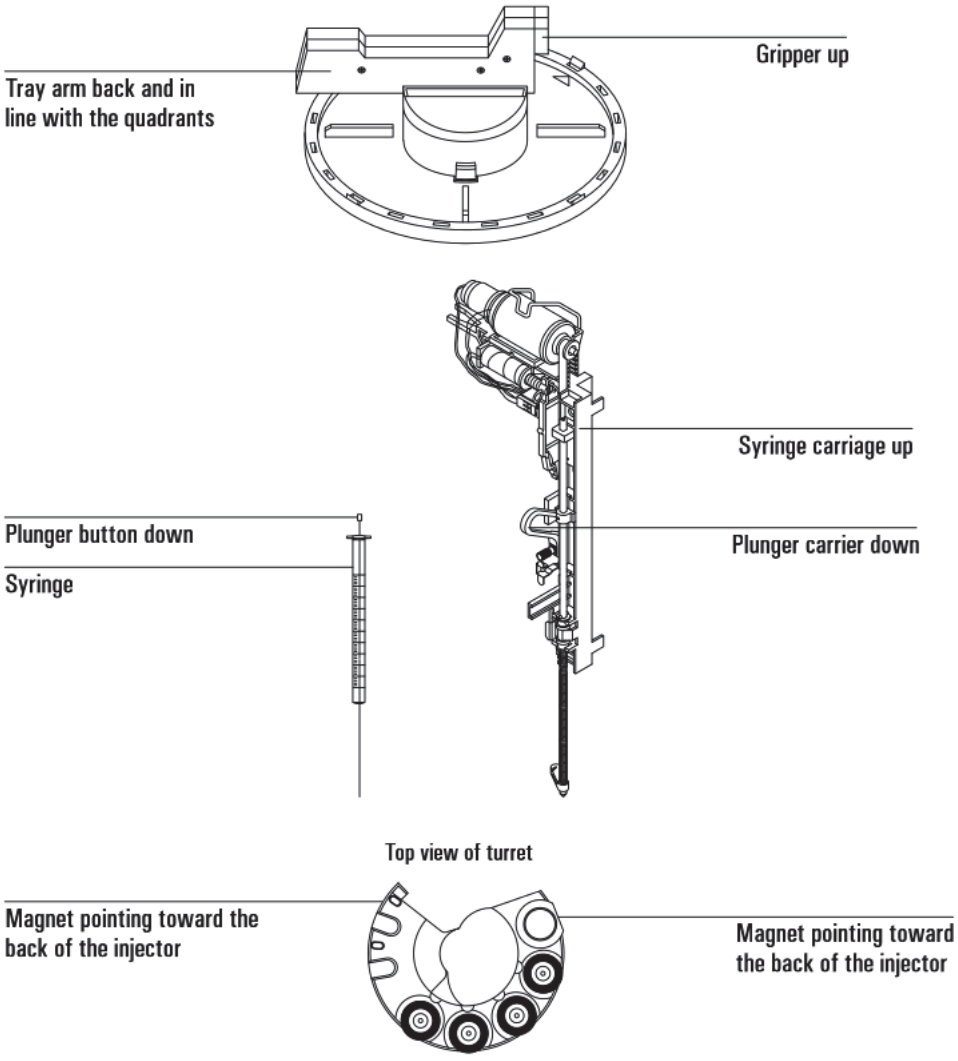
Publication No. 43-5953-1879: Kolloff, R. H. C. Toney, and J. Butler. Automated On-Column Injection with Hewlett-Packard 7673A Automatic Injector and HP 19245A On-Column Capillary Inlet - Accuracy and Precision, Technical Paper 110, August 1985.

gripper axis: the direction describing the vertical (up and down) movement of the tray's vial gripper, sometimes called the z-axis. The tray combines movement along the zeta axis and the theta axis to pick up and drop off vials to specific locations on the tray or injector turret. See also **home positions**.

ghost peaks: small peaks that usually indicate that contamination is entering the system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

home positions: each of the moving parts has a reference point from which it moves to pick up, deliver, or inject samples. The parts move to their home positions between each run, when power is turned on, and when a run is started. The following illustration shows the home positions.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

homing: the process of the turret, syringe carriage, syringe plunger, vial gripper, and tray arm moving to their home positions.

INET: an acronym which stands for *instrument network*.

injection: the injector motion that delivers the sample to the inlet or column of the gas chromatograph.

injection port: see **inlet**.

inlet: the terms **inlet** and **injection port** are used interchangeably in this manual.

interaction: the attraction or repulsion between two chemical species in a specific chemical environment. For example, some sample components interact with a glass inlet liner unless the liner is deactivated.

LED: an acronym which stands for *light-emitting diode*.

list: to present the contents of a program or file in readable form, often a printed copy or displayed on an integrator chart or computer screen.

nanoliter injection: an adapter to the injector that enables injection volumes from 0.1 µl to 4.0 µl.

needle fractionation: the boiling off of sample in the syringe needle during injection. Not only does residual sample in the needle enter the inlet, but the low boiling components boil off first. See **fast injection**.

parameter: an element, sometimes optional, that provides additional information to a command.

peak area discrimination: used to describe a chromatogram with peak areas that are not reproducible.

prompt: a message or symbol requesting you to enter information. For example, the run parameter prompts of the 3396A Integrator when you are editing a sequence.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

radial axis: a direction describing the horizontal (forward and backward) movement of the tray's arm. The tray uses this motion to position the vial gripper at the correct distance from the center of the tray. See also **home positions**.

retention time: the time it takes from the moment of injection until a compound elutes and is detected at the peak maximum.

run: a discrete analysis performed under a given set of conditions on one instrument.

run time: the time, during the run, that has elapsed from the initiation of data acquisition (or time of injection). For completed runs, this term refers to the total time from injection (or initiation of data acquisition) to the end of the run (or termination of data acquisition).

sample: a liquid, gas, solid, or heterogeneous portion of material that is representative of the whole.

sample carryover: any memory of the previous sample shown in the chromatogram.

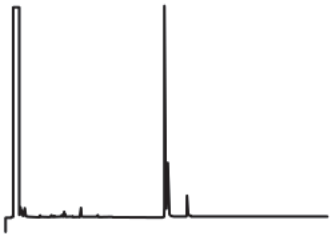
After an injection, the syringe retains a volume of sample in the needle and between the plunger and barrel that ranges from 0.6 to 1 µl. Normal laboratory practice requires washing the syringe with a solvent and/or the next sample to dilute and wash away the remaining sample.

The first two chromatograms show the effect of carryover when 1 µl from a vial of methanol is injected after 1 µl from a vial of a solute dissolved in methanol. The peaks in the second chromatogram are from the solute left in the syringe from the first injection.

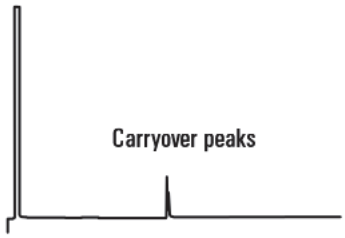
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The third chromatogram shows the result of washing the syringe with four solvent washes. The carryover peaks disappear.

Sample #1: 20 mg/ml of solute in methanol



Sample #2a: Methanol blank without washes



Sample #2b: Methanol blank after 4 washes



septum bleed: the inherent baseline noise level emanating from a column due to decomposition or volatilization of low molecular weight products mainly from the stationary phase. The septum is another source of volatiles that cause noise.

septum life: usually refers to the number of injections a septum survives before it begins to leak.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

sequence: a set of instructions that defines how a piece of equipment, for example an integrator, performs more than one automated run. These instructions usually include the automatic liquid sampler parameters, instrument equilibration time, method name, and a sample information table. Note that sequences can be recursive, that is, one sequence can contain another sequence.

solute: the components present within a given sample.

solvent: usually, the main component of a sample mix.

split injection: an injection technique which allows only a portion of the sample to be routed into the column. The rest of the sample is vented. This technique compensates for the low tolerance which high resolution capillary columns have for concentrated samples.

splitless injection: an injection technique which directs all of the sample onto the column after it has vaporized in the injection port.

standalone: the controlling method associated with using the injector's own electronics to set the run parameters and operate the automatic liquid sampler.

system: an aggregate of hardware and software organized to perform a function or functions.

tailing: a chromatographic peak which is skewed. Usually due to active sites in the column or the chromatographic system.

variability: used to describe a chromatogram with retention times and peak areas that are not reproducible.

vial: the 2 ml or 100 µl bottles used for holding samples. See **bottle**.

viscosity: a flow characteristic of a liquid that may influence the reproducibility of the injection volume.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

Numerics

250-µm/320-µm on-column injections, 151
3396 integrator, operating with a 5890 GC, 83
530-µm on-column injection, 55
6890 GC
    creating a sequence, 78
    examples, 74
    injector setpoints, 76
    on-column mode, 77
    storing setpoints, 77
6890 GC with 3396 integrator
    special considerations, 81

A

address switches
    GPIB, 19
air bubbles, 122
aligning the system
    septum nut, 250 µm/350 µm
        alignment, 155
angular axis, 182
asynchronous mode, 107

B

bent needle, 119, 167
bottle, 36
    definition, 182
    filling and placing, 37
bottle in gripper, 139
butt connectors, 159

C

cables
    injector cable, 21
    tray cable, 22
calculating the water bath temperature
    See water bath temperature
capillary column, 182
capping sample vials, 30
carriage speed
    See injection mode
carrier gas, impurities, 125
carryover
    See sample carryover, 128
ChemStation, example, 86
column
    capillary, 127
    contamination, 125
    packed, 127
column installation, 156
communication interface, 17
configuration, 182
configuration switches, 19
configure waste bottle
    6890 GC, 75
connecting
    cables, 21
    tray quadrants, 170
contamination, 124
control table, sequence definition, 78
controller
    description, 17
    installing, 18
cool on-column
    adapting injector, 55
    definition, 182
    mode, 6890 GC, 77
cool on-column, adapting the injector, 153
crimp cap, 30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

D

detector response, 128
drainage tube fitting, 169
dropped sample vial, 120
dual injectors
    description, 70
    mounting, 11
    standalone control, 106
    synchronous injection, 72
    with a tray, 70
    without a tray, 72

E

electrical power requirements
    See power source
environmental considerations
    relative humidity range, 5
    temperature range, 5
error messages
    bottle not found, 145
    configuration error, 145
    door open/not mounted, 146
    download not complete, 145
    incomplete injection, 145, 146
    injector memory error, 145
    injector reset, 146
    plunger error, 145
    syringe error, 145
    turret error, 145
estimating maximum number of sample vials
    equation method, 43
    table method, 44
examples
    estimating the maximum number of sample vials, 41, 43, 46
    standalone control, 100
    tray control commands, 178

F

fan, turning on/off, 34
fast injection
    description, 182
    See also injection mode, 63
fault lights
    fault light patterns, 136
    locations, 131

G

ghost peaks, 124, 184
GPIB address switches, 19
gripper axis, 184

H

handshake, 19
hard tray error, 140
home positions, 185
homing, 186

I

incomplete injection, 138
INET, definition, 186
injection
    parameter, 96

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

injection mode
    normal mode, 63
    on-column mode, 55, 63
injection parameters
    See run parameters
injection port
    See inlet
injection volume, 29, 60
injection, definition, 186
injections
    250-µm and 320-µm, 150
injections per vial, 59, 97
injector
    control switches, 9
    dual injectors, 70
    fan, 34
    installing, 7
    turret, 7
injector control switches
    injection, 96
    injections per vial, 97
    location, 94
    number of sample washes, 98
    number of solvent washes, 100
    on-column injection mode, 99
    sample size, 95
injector door open/not mounted, 134
injector error, 140
injector parameters
    6890 GC, 76
    ChemStation, 86
inlet
    cool on-column, 55
    definition, 186
    liners, 55
    sample discrimination, 127
    septum leaking, 121
    septum, giving off volatiles, 125
inlet septum, replacing, 54
inserts, inlet, 152
integrator
    See 3396 integrator
interaction, 186

L

leaks, 127
    See also inlet, 121
LED, definition, 186
LEDs
    See fault lights
liners, replacing or cleaning, 55
list, 186
low boiling sample, 48, 168

M

maintaining, inlet, 54
maintenance
    See preventive maintenance

N

nanoliter adapter, 51
nanoliter injection, 186
needle fractionation, 126, 186
needle guide replacement, 165
needle support
    installing 250 µm/320 µm, 162
needle support foot, 163
needle-to-column size
    inserts, needles, syringes, 152
no signal/no peaks, 129

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

O

on-column injection mode, 77
operation
    examples, 74
    starting, 69
    stopping or interrupting, 69

P

P6 jumper switch, 35
packed inlets, with 530-µm columns, 55
parameter, 186
Peak area discrimination, 126, 186
plunger error, 137
plunger speed, 62
position
    ChemStation, 87
    first vial, 59
    last vial, 59
power cord, 133
    connecting, 22
power error, 133
precolumns, 158
preparing
    sample vials, 26
    solvent and waste bottles, 36
preparing inlets, 153
press-fit connectors, 159
preventive maintenance, 114
priority samples, 61
prompt, 186
pumps, 60
purged connectors, 160

R

radial axis, 187
relative humidity range, 5
replace needle guide, 165
retention gaps, 158
retention time, 187
run, 187
run parameter
    description, 59
    injection, 96
    injections per vial, 59, 97
    number of solvent A and B washes, 60
    position
        first vial, 59
        last vial, 59
    pumps, 48
    sample washes, 48
    solvent washes, 47
    standalone control
        position of first vial, 93
    viscosity, 60
    volume, 60
run parameters
    injection mode, 63
    number of sample washes, 60
    on-column injection mode, 63, 99
    priority samples, 61
    range of values, 65
        instrument network(INET), 65
    sample washes, 98
    slow injection, 61
    slow plunger, 62
    solvent washes, 100
    volume
        standalone control, 95
run time, 187
running samples, 69

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

S

sample, 187
sample carryover, 47, 128
    definition, 187
sample insert, 102
sample size
    See injection volume
sample stability, 122, 125
sample tray setpoints
    6890 GC, 76
sample vial
    cap septum, 124
        ghost peaks, 124
    capping, 30, 122, 127
    contamination, 124
    controlling temperature
        injector fan, 34
        tray quadrant, 168
    crimp cap, 30
    dimensions, 28
    dropped sample vial, 120
    estimating maximum number, 42
    filling, 29, 122
    label, 27
    placing
        with a tray, 33
        without a tray, 32
    preparing, 26
    sample vial insert, 32
    screw-on cap, 31
    selecting, 26
    snap-on cap, 31
sample vial insert, 32
sample washes, 129
    controlling sample carryover, 48
    setting the run parameter, 60
septum
    See inlet septum
septum bleed, 188
septum life, 188
sequence, definition, 189
service, 147
setpoints
    sample tray,6890 GC, 76
shipping requirements, 148
slide, 163
slow injection, 61
slow plunger, 62
solute, 189
solvent, 189
solvent bottle
    limited volume, 128
    See also bottle, 36
solvent washes, 60
    controlling sample carryover, 47
    insufficient number, 128
space considerations, 5
specifications
    vial and inserts, 27
split injection, 189
splitless injection, 189
standalone, 189
standalone control
    description of run, 103
    dual injectors, 106
    example, 73
    injector control switches, 92
    starting a run, 103
    stopping a run, 104
starting a run or sequence, 69
Starting/running a sequence
    6890 GC, 80
stopping a run or sequence, 69
storage requirements, 148
storing injector setpoints
    6890 GC, 77

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

synchronous injection, 72
synchronous mode, 106
syringe
    bent syringe needle, 119
    injection volumes, 50
    inspecting, 51
    installing, 52
    installing into the foot, 163
    nanoliter injection, 51
    needle, 51
    sizes, 49
    wear, 48, 122, 129
syringe barrel, needle, 151
syringe error, 135
syringe latch, 163
syringe plunger, 129
system, 189

T

tailing, 189
TEE manifold, 170
temperature
    environmental considerations, 5
    sample vials, 34, 168
tower position, 6890 GC, 75
tracks, 162
tray
    alignment pin, 15
    control commands, 175
        auto sequence, 176
        example program, 178
        general rules, 174
        manual sequence, 176
        move, 175
        reset, 177
        return bottles, 176
        syntax and description, 175
        turret, 176
    controlling sample vial temperature, 168
    description, 13
    drainage tube fitting, 169
    installing, 13
    mounting, 15
    tray lock, 15, 16
    tray quadrant
        installing, 16
        placing sample vials, 33
        plumbing, 169
        temperature range, 172
troubleshooting, 114, 167
    bent syringe needle, 119
turret
    bottle locations, 38
    See also injector, turret
turret error, 136

V

vacuum, 30
variability, 189
vial, 189
vial cap septum, 28
    See also sample vial
viscosity, 60, 189
viscous sample, 129
    See also tray, controlling sample vial temperature
viscous samples, 34, 122
volume, 51, 60

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

W

washes
    ChemStation, 87
    waste bottle, limited volume, 40
waste bottle
    limited volume, 42
water bath
    pressure range, 172
    pump requirements, 173
    temperature range, 172
water bath temperature, 170

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP