

Agilent G2399A Solvent Vapor Exit Accessory (SVE)

Installation and Operation



Agilent Technologies

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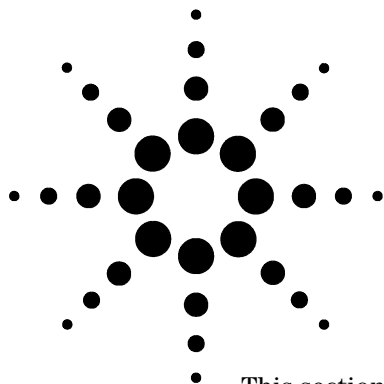
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1 Before You Begin

This section reviews the procedure for installing a Solvent Vapor Exit (SVE) in a 6890 Gas Chromatograph (GC).

Safety

Before proceeding, please refer to the safety information at the back of the manual.

Parts list

Table 1 Parts list for an SVE

	Description	Part Number	Qty
1	Machine screw, M4 x 0.7	0515-2755	1
2	Graphite ferrule (2 pk.)	5062-3505	1
3	320- μ m ferrule (graphite/vespel)	5062-9525	1
4	0.4-mm, 200, 250 ferrule	5062-9526	1
5	250- μ m ferrule (graphite/vespel)	5062-9527	1
6	Column nut (2 pk.)	5181-8830	1
7	Syringe, 50 μ L, removable, 23/26	5183-0315	1
8	Extractable mixture	8500-5937	1
9	Bleed restrictor column, 2 m \times 50 μ m id	G2399-20510	1
10	SVE tri-column assembly	G2399-60520	1
11	Valve jumper cable	G2399-60550	1



1 Before You Begin

Table 1 Parts list for an SVE (continued)

	Description	Part Number	Qty
12	SVE valve/fitting assembly	G2399-60570	1
13	SVE software kit	G2399-60580	1
14	SVE Installation and Operation Manual	G2399-90110	1

Required tools

The following tools are required to install the SVE kit:

- Electrostatic discharge (ESD) protective wriststrap
- T-20 Torx[®] screwdriver
- Diagonal cutters
- Open-end wrench (5/16 × 1/4-inch, Qty 2)
- X-ACTO[®] knife
- Column cutter
- Flow meter
- Electronic leak detector (optional but recommended)

Overview of installation steps

- 1** Prepare the GC.
- 2** Install the SVE valve fitting/assembly.
- 3** Install the tri-column assembly.
- 4** Restore the GC to operating condition.
- 5** Set up the operating conditions for checkout.
- 6** Run the checkout sample.

About the Solvent Vapor Exit accessory

The Solvent Vapor Exit (SVE) is an accessory for your GC that makes large volume injections possible, an important capability for environmental applications.

The SVE consists of the following major components (depicted in Figure 1):

- Cool on-column inlet
- Retention gap
- Retaining precolumn valve
- Solvent vent valve
- Analytical column

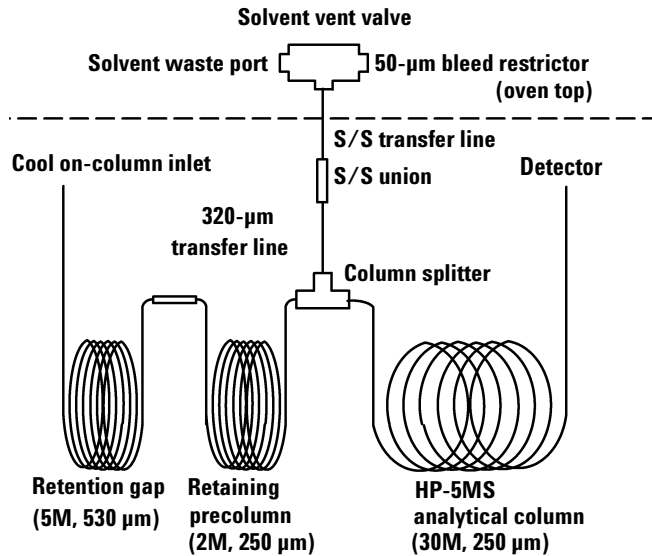


Figure 1 SVE diagram

1 Before You Begin

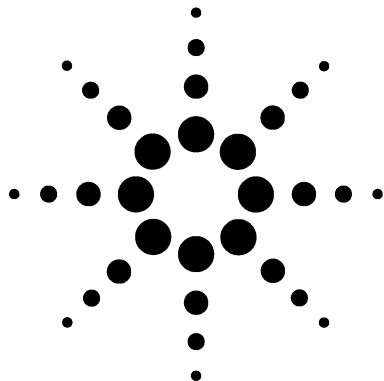
How it works

A large volume sample is injected into the COC inlet and moves into the retention gap. Most of the solvent is separated from the analytes by the precolumn and vented through the valve. At a time specified by the user to optimize the analysis, the valve closes, the oven temperature program begins, and the retained solvent and analytes move on to the analytical column for separation.

Applications

Some of the applications that the SVE is suitable are:

- trace analysis of volatiles and semi-volatiles
- trace analysis of pesticides
- complete solvent venting to prolong column and detector life



2 Installing a Solvent Vapor Exit (SVE) Accessory

WARNING

Hazardous voltages are present in the mainframe when the GC power cord is plugged in. Avoid a potentially dangerous shock hazard by unplugging the power cord before removing the side panels.

CAUTION

Prevent electrostatic voltages from damaging the GC by using precautions such as an ESD wriststrap.

Preparing the GC

- 1 Turn off the GC and unplug the power cord. Allow time for all heated zones to cool and then turn off supply gases at their sources.
- 2 Unsnap and lift off the pneumatics cover (see Figure 2).
- 3 Remove the GC right side cover by fully loosening two captive screws (T-20 Torx) at the top of the cover. Slide the cover slightly to the rear of the GC and lift the cover out of the slot in the bottom of the GC chassis.
- 4 Remove the detector cover to allow access to the top of the oven.
- 5 Remove the electronics carrier cover (located on the top right side of the GC) by reaching under the back of the cover and depressing the locking tab towards the front of the instrument. While depressing the tab, lift up on the back of the cover and slide the cover toward the back of the instrument.



2 Installing a Solvent Vapor Exit (SVE) Accessory

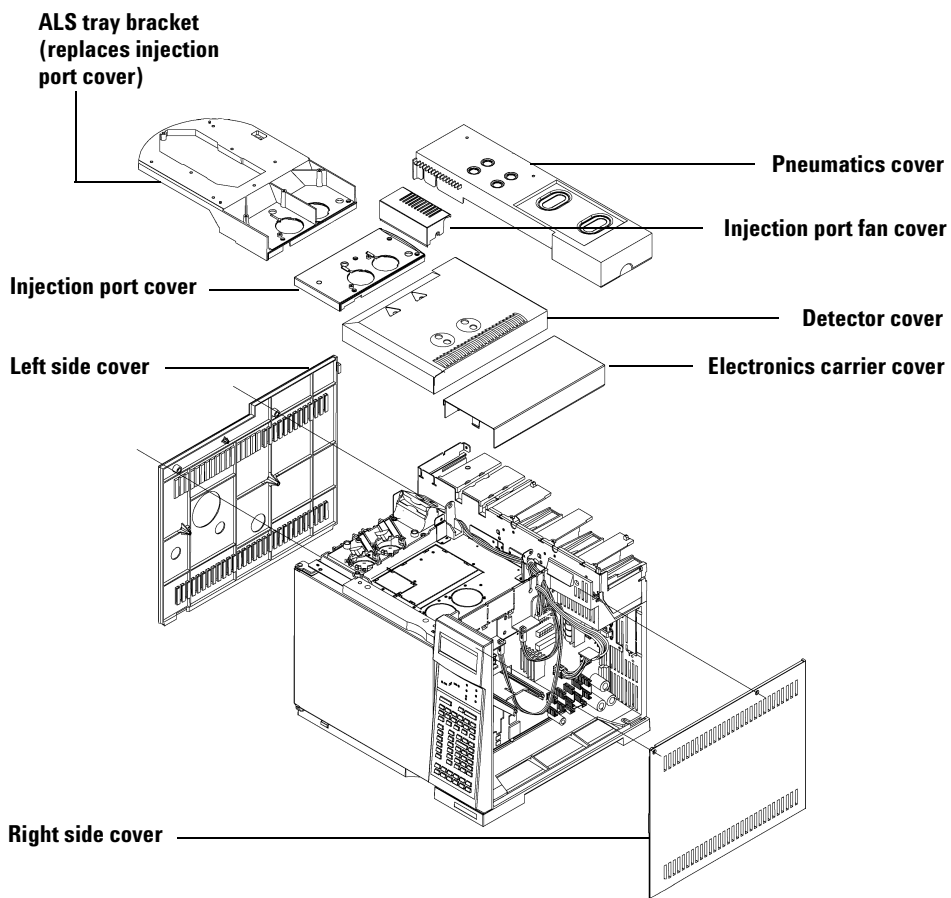


Figure 2 Exploded view of a 6890 printer

Installing the SVE valve fitting/assembly

- 1 Looking at the oven top (from the front of the GC), use diagonal cutters to remove the precut panel at the right of the front inlet (see Figure 3). Position and remove enough oven insulation to install the inlet.

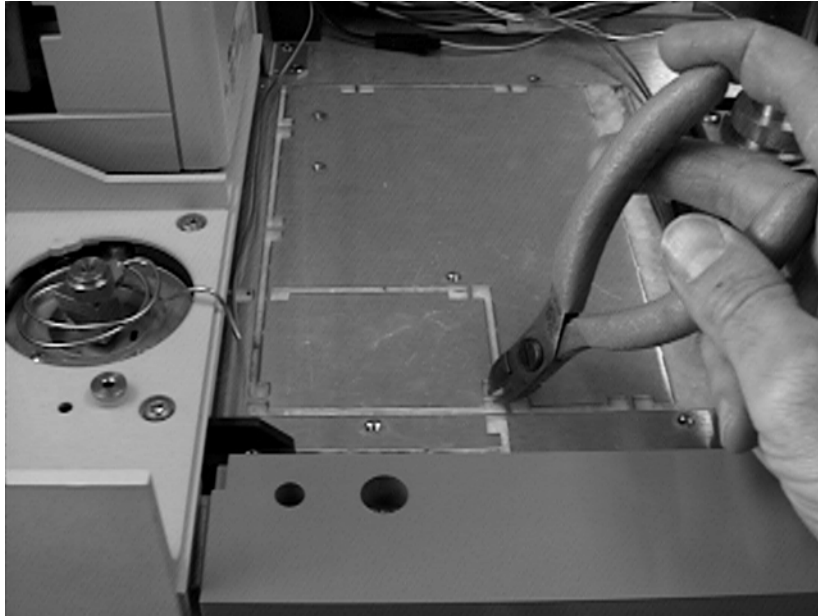


Figure 3 Removing the precut panel

2 Installing a Solvent Vapor Exit (SVE) Accessory

- 2 Gently cut and remove the top layer of soft insulation to expose the hard insulation below (see Figure 4).



Figure 4 Cutting and removing the top layer of insulation

- 3 Looking inside the GC oven, find the circular cutout located closest to the front inlet at the top of the inner oven (see Figure 5).

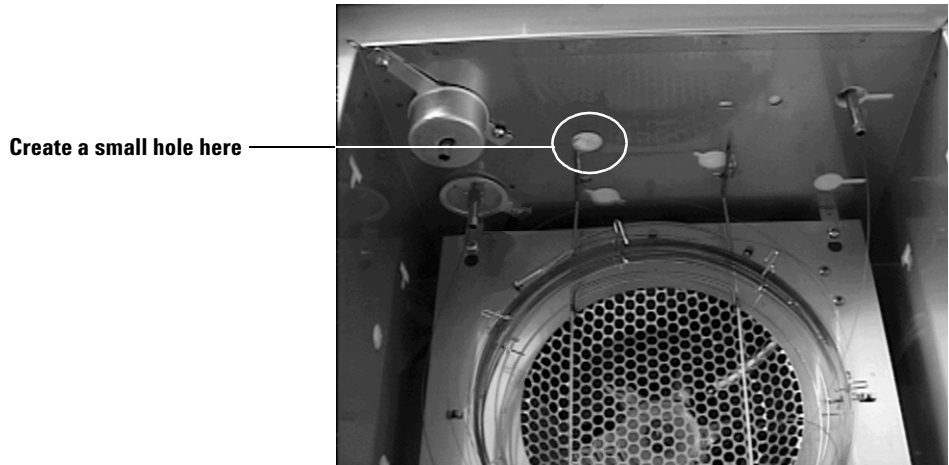


Figure 5 The circular cutout with a small hole

2 Installing a Solvent Vapor Exit (SVE) Accessory

- 4 Slide the 1/16-inch stainless steel tube from the SVE Valve/Fitting Assembly through the opening you just created in top of the GC oven (see Figure 6).

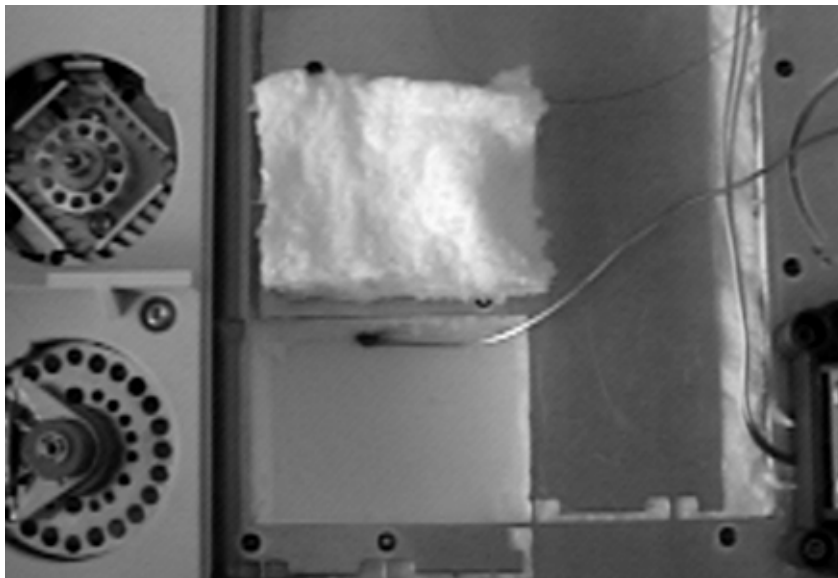


Figure 6 Sliding the stainless steel tube

- 5 Remove the male fitting and the associated front and back ferrules from port 3 of the SVE valve assembly. Cut a 0.5-m section of the 2.0 m \times 50 μ m bleed restrictor column. (see Figure 7).

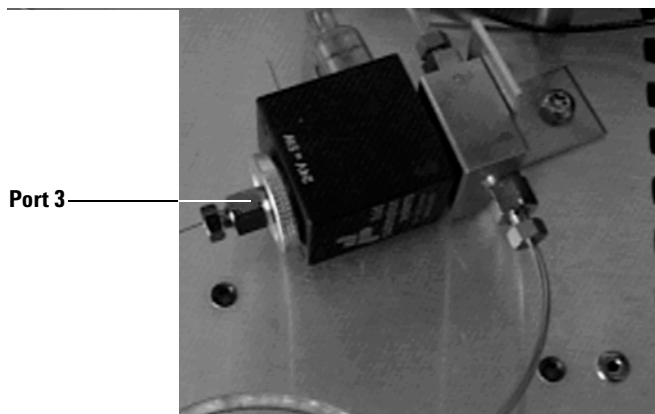


Figure 7 Adjusting port 3 of the SVE valve assembly

- 6 Connect the bleed restrictor to port 3 of the SVE valve by sliding the male fitting and the vespel/graphite ferrule onto the end of the column (see Figure 7).
- 7 Make a loop (or loops) in the excess column protruding from the valve and move it to an unobstructive position.

NOTE

Be sure to trim approximately 5 to 10 mm from the end of the column *after* sliding the fitting and ferrule into place.

- 8 Position the SVE valve assembly at the upper right corner oven top surface as shown in Figure 7 and mount it using the M4 \times 0.7 machine screw.

WARNING

Because a significant amount of solvent is vented through the SVE valve assembly, it is imperative that the bleed restrictor and the solvent vent are connected to an appropriate laboratory ventilation system.

2 Installing a Solvent Vapor Exit (SVE) Accessory

- 9 Inspect the GC main electronics board to determine if the valve driver assembly is installed (see Figure 8).

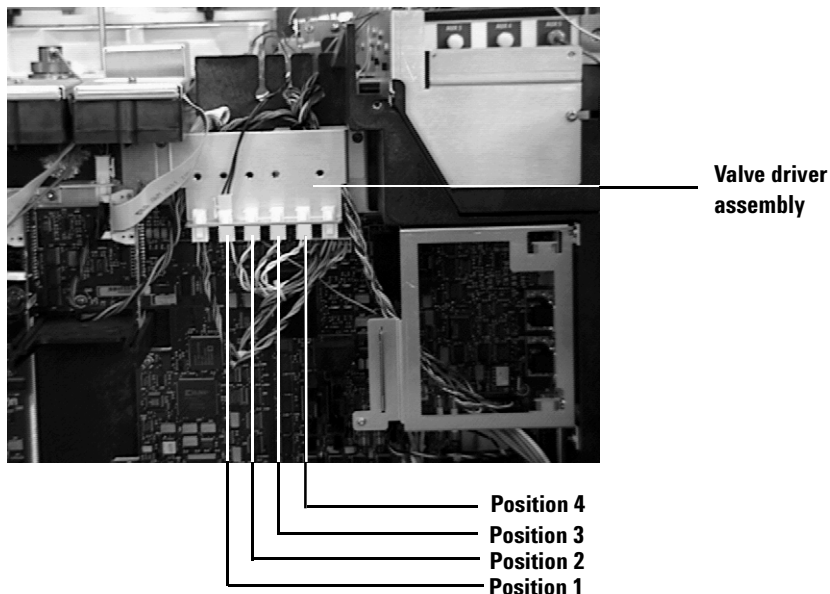


Figure 8 Valve driver assembly

If the valve driver assembly *is* already installed, plug the 2-pin connector from the SVE valve assembly into position 1 of the valve driver assembly (see Figure 8). If position 1 is already used, plug the connector into the next available position.

If the valve driver assembly *is not* installed, attach the valve jumper cable to P22 on the GC main electronics board (see Figure 9). Plug the 2-pin connector from the SVE valve assembly into the 2-pin connector of the jumper cable.

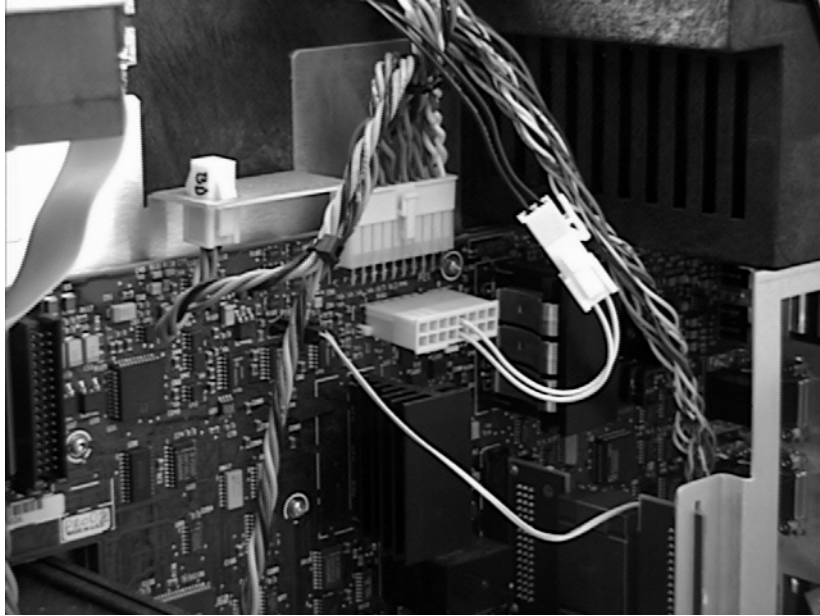


Figure 9 Installing the valve jumper cable

2 Installing a Solvent Vapor Exit (SVE) Accessory

- 10 Route the valve cabling through the appropriate cutouts in the electronics carrier. Replace the soft insulation removed earlier back into the small hole cutout of the oven top (see Figure 10).

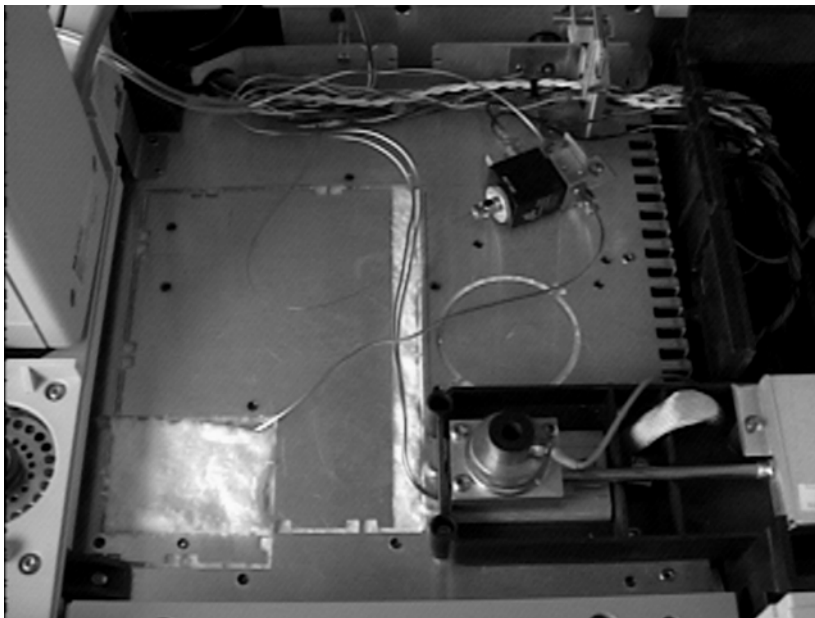


Figure 10 Finishing the SVE valve fitting/assembly installation

Installing the tri-column assembly

Before you continue, please note the following:

- Refer to the 6890 Installation Manual for detailed installation information for capillary columns for the following procedures.
- Use the septum nut (part number 19245-20670) and insert (part number 19245-20580) when installing 530 μm columns.

- 1 Install the SVE tri-column assembly onto a column hanger and hang the assembly inside the GC oven by positioning the column assembly so that the end of the retention gap (530 μm) is located under the COC inlet and the end of the analytical column (250 μm) is under the detector.

NOTE

Looking at the tri-column assembly, the retention gap is the thickest column (530 μm). To identify the remaining two columns, the transfer line (320 μm) is the 0.5 m retention gap that terminates at the splitter. The analytical column (250 μm) is 30 m in length.

- 2 Connect the retention gap to the COC inlet using the graphite ferrule and column nut.
- 3 If you will be using an MSD with the SVE, connect the analytical column (HP-5MS) to the MSD using the following hardware.
 - column nut (05988-20066)
 - graphite/vespel ferrule (5062-3508)

If you will be using any other type of detector with the SVE, connect the analytical column (HP-5MS) to the GC detector using the following hardware.

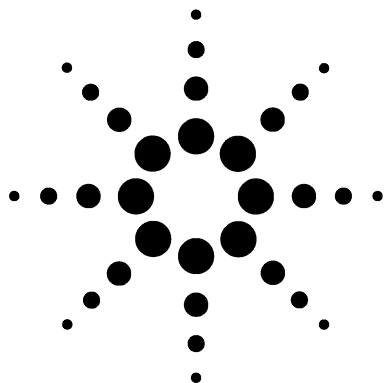
- column nut (5181-8830)
- graphite/vespel ferrule (5062-9527)

NOTE

Remove the stainless ferrules from the union before proceeding with step 4.

- 4 Use a graphite/vespel ferrule to connect the 0.5 m \times 320 μm transfer line from the quartz Y-splitter of the tri-column assembly to the unused end of the stainless union located inside the GC oven.
- 5 Check all of the connections using an electronic leak detector (if available).

2 Installing a Solvent Vapor Exit (SVE) Accessory



3 Restoring the GC to Operating Condition

- 1 Reinstall the left side cover and tighten the two screws.
- 2 Replace the fan cover.
- 3 Reinstall the detector cover.
- 4 Reinstall the upper-rear panel and tighten the screws.
- 5 Reinstall the RFI cover.
- 6 Replace the pneumatics cover (see Figure 11).

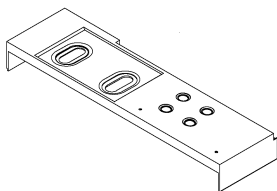
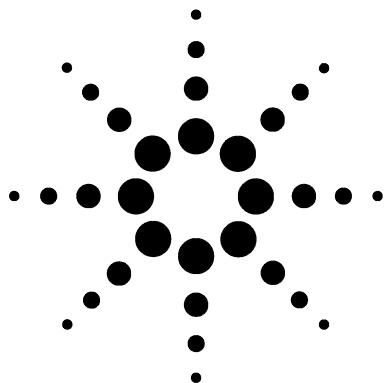


Figure 11 The pneumatics cover

- 7 Plug in the GC and turn it on.

3 Restoring the GC to Operating Condition



4 SVE Performance Verification with a Flame Ionization Detector

This chapter contains a typical example of a GC method and the test sample chromatogram using a flame ionization detector. It may be used as a general guide to evaluate instrument performance.

Checkout conditions

Table 2 Column and sample

Item	Description	Part Number
Column	32 m x 0.25 mm x 0.25 µm	G2399-60520
Sample	Extractables mixture	8500-5937
Syringe	50 µL	5183-0315
Injection volume	25 µL (25:1 dilution of the stock sample)	

NOTE

A (25:1) dilution of the stock sample was injected to get the chromatogram that follows (see Figure 12). Injecting 1 µL of the stock sample with the valve off can be used as a reference for determining recoveries of your peaks of interest.



4 SVE Performance Verification with a Flame Ionization Detector

Table 3 Inlet

Item	Description
Temperature	Oven track - cool on-column
Inlet flow	2 mL/min - constant flow

Table 4 Detector

Item	Value
Temperature	350 °C
H ₂ flow	40 mL/min
Air flow	400 mL/min
Makeup flow (N ₂)	45 mL/min

Table 5 Oven

Item	Value
Initial temperature	45 °C
Initial time	1.0 min
Rate 1	20 °C/min
Final temp	320 °C
Final time	2.0 min

Table 6 Valve

Item	Value
Valve 1	Other (off)

Table 7 Run time

Item	Description
Time (min)	0.00
Specifier	Valve
Parameter	If the valve driver assembly has been installed, enter the appropriate valve driver position used (see Figure 8). If the valve jumper cable has been installed, see Figure 9.
Setpoint	On
Time (min)	0.83 - (calculated from SVE calculator - see "Calculating the SVE Valve time")
Specifier	Valve
Parameter	1
Setpoint	Off

Table 8 Valve function during this run

Item	Description
Time = (0.00 min)	Valve is turned on, venting the solvent through port 1 (solvent vent).
Time = (0.83 min)	Valve is turned off, sample is sent to analytical column. Approximately 5–10% of column flow is directed through bleed restrictor to minimize ghosting and carryover from run to run. To change amount of flow through the bleed restrictor, shorten (more flow) or lengthen (less flow) the restrictor.

The valve time has been calculated using the SVE calculator (see "Calculating the SVE Valve time"). The purpose of the calculator is to provide a starting point for the valve time. The user supplies the necessary parameters and the calculator gives the appropriate valve time. For most injection volumes this time will be adequate to eliminate most of the solvent while retaining the volatile analytes.

4 SVE Performance Verification with a Flame Ionization Detector

If the solvent peak is too large, increase the valve time by 10% and rerun the standard ensuring that the first peak of interest is still quantitatively recovered. Continue increasing the time until the analysis goals are met. Conversely, if the first eluting component of interest is not quantitatively recovered, decrease the valve time by 10% until it is.

Chromatogram

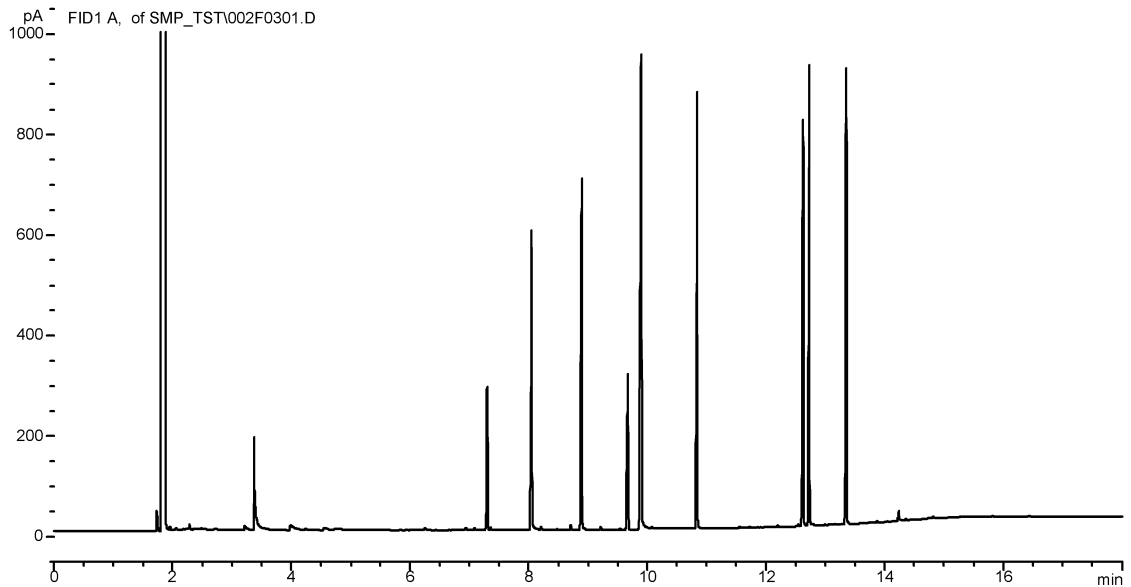
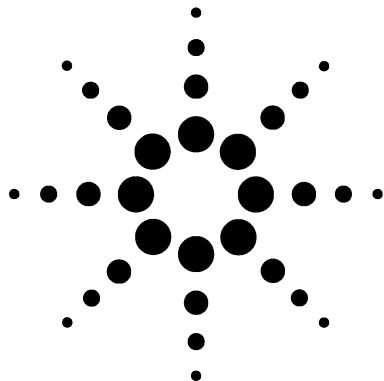


Figure 12 Sample chromatogram



5 Operating the SVE Accessory

Loading the SVE Software

- 1 Turn on your computer and start Windows®.
- 2 Access the Windows Program Manager and select Run... from the File menu.
- 3 Insert the SVE software disk 1 and type A:\Setup (or the appropriate drive letter) in the Command Line field and press **Enter**.
- 4 Follow the installation instructions on the screen until the software has been loaded.

Calculating the SVE Valve time

- 1 Start the SVE software by double-clicking its icon in the SVE Calculator program group window.
- 2 Enter the following parameters into the SVE calculator (see Figure 13):
 - Oven Temperature in the Oven Temp field
 - Inlet Pressure (bar), plus one (typical ambient pressure) in the Inlet Pressure field
 - Outlet Pressure (bar) in the Outlet Pressure field - (typically 1 bar)
 - Vent Flow (with SVE valve on, measure total flow from port 1) enter value into Vent Flow field
 - Amount of sample to be injected in the Amount Injected field
 - Solvent to be used - using the down arrow of the Solvent field



5 Operating the SVE Accessory

SVE Valve time

SVE Valve time

Elimination Rate	27.135	ul/min
Valve Time	0.92	min
Suggested Valve Time	0.83	min
Oven Temperature	45	C
Inlet Pressure	2.3	bar
Outlet Pressure	1	bar
Vent Flow	34	ml/min
Amount Injected	25	ul
Solvent	Acetone	

Calculate SVE Valve Time

Close

Figure 13 SVE calculator screen

3 Click **Calculate SVE Valve Time** to calculate the valve vent time.

NOTE

The Suggested Valve Time is 90% of the calculated Valve Time. This is to be used as a reference point for setting the vent time. Increasing the vent time will increase the amount of solvent vented, while decreasing the vent time will decrease the amount of solvent that is vented.



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G2399-90117

First edition, October 2004

Printed in USA

Agilent Technologies, Inc.
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Wilmington, DE 19808-1610 USA

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