DIONEX

AutoTrace® SPE Workstation
User's Manual

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January 2009

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PRINTING HISTORY

Revision 01, January 2009

Preface

Contents

The information in this manual may contain typographical errors or technical inaccuracies and is subject to change without notice. Modifications may also be made to the product described in this manual at any time.

Statement of Proper Use

The AutoTrace® SPE Workstation automates cartridge conditioning, rinsing, sample addition, and the cartridge elution steps of solid phase extraction (SPE). The workstation processes up to six samples through its unique fluid management system. It can be used for all solid phase extraction water methods.

WARNINGS

- *To reduce the risk of electric shock, do not remove the cover. No user-serviceable parts are inside. Refer to qualified service personnel.*
- *Use this product only in the manner described in this manual. When used in a manner other than specified, the safety precautions may be impaired.*

Contact Us

If you have a question about this product that is not answered in this manual, or if you need assistance regarding this product, please contact Dionex Technical Support. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Dionex office.

Before you call, you should have the following information available for the Technical Support Representative:

- Product serial number
- Software version (found by choosing **About** from the main Help menu)
- If applicable, the *error code reference number* shown on the product's LCD display or from the database event log

FCC

This device complies with part 15 of the FCC (United States Federal Communications Commission) Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

CE

This device complies with all CE rules and requirements.

NOTE

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Table of Symbols

Table 1 contains symbols that identify particularly important information and alert you to the presence of hazards. Some of these symbols may not appear in this manual or on the product it describes:

Table 1. Important Symbols

Symbol	Description
	**DANGER:** An imminently hazardous situation which, if not avoided, will result in death or serious injury.
	**WARNING:** Caution, risk of danger. Refer to the user documentation.
	**NOTE:** A cautionary statement; an operating tip or maintenance suggestion; may result in instrument damage if not followed.
	Hazardous voltage; risk of shock injury.
	Crush hazard. Risk of body parts, hair, jewelry, or clothing getting caught in a moving part.
	Risk of puncture injury.
	Risk of eye injury; wear safety glasses.
	Risk of fire.
	Risk of poison.
	Risk of explosion.
	Hazardous fumes.
	Hot surface; risk of burns.
	Laser light; avoid exposure. Risk of eye injury.
	Lifting hazard. May result in injury.

Table 1. Important Symbols (Continued)

Symbol	Description
	Protective ground symbol.
	Ground symbol.
	Fuse.
	Alternating current.
	On (supply).
	Off (supply).
	CE compliance mark.
	Signifies that the unit has passed safety tests for grounding, power line transience, and current leakage.
	Input.
	Output.
Equipment labels are color coded:	**Yellow** Caution, risk of danger **Red** Stop **Blue** Mandatory action **Green** Safe condition or information
☞	Helpful hints, additional information

Table of Contents

Installation

Parts Listing

The Dionex AutoTrace SPE Workstation is available in two versions: Cartridge and Disk. The workstation comes with the following parts:

- Workstation (Cartridge or Disk)
- Sample Rack, 6-position
- Waste Containers (2)
- Startup Kit

Unpacking

Unpack the shipping container and verify that all items listed above are present. If anything is damaged or missing, contact Dionex Technical Support (see “Contact Us” on page 3).

Record the Serial Number

Record the workstation's serial number. The serial number is on the back of the workstation. This information is required when you call Dionex Technical Support.

Installation Overview

Installing the AutoTrace Workstation involves the following steps:

1 Review the specifications.

2 If necessary, convert the workstation voltage.

3 Prepare the work area and position the workstation.

4 Make solvent connections.

5 Install the waste drain and tubing.

6 Connect the exhaust hose and gas supply.

7 Check compression screws for tightness.

8 Power up the workstation.

9 Provide access to a computer.

10 Install the AutoTrace software.

Tools Required

If you need to convert the workstation from 120 VAC, have available a small flat-blade screwdriver, a small Phillips screwdriver, and needle-nose pliers. If any of the tubing lengths need to be cut, you need wire cutters or scissors.

Review Specifications

Review “Specifications” on page 160 before you begin the installation.

Converting Voltages

If you need to convert your AutoTrace Workstation's voltage to a voltage other than the factory-configured 120 VAC, refer to “Voltage Conversion” on page 155.

Prepare the Work Area

WARNING

The appliance inlet is the disconnecting device. Place the device or equipment in a manner so that the disconnecting device is accessible at all times.

To prepare the work area for AutoTrace installation:

1. Provide a level, stable, and flat surface with enough room to accommodate the workstation's 23 in (57 cm) width, 27 in (69 cm) height, and 25 in (63.5 cm) depth.
2. Make sure there is enough room for the 12 x 14 in (30 x 36 cm) sample rack on the right side of the workstation.
3. Provide an additional 2 to 3 sq. ft. (1 sq. meter) of space on the left side of the workstation for the solvent reservoirs.
4. Provide an environment with the following:

Operating Temperature	50 to 104°F (10 to 40°C)
Relative Humidity	20-80%
Operating Altitude	-200 to 10,000 ft (-61 to 3048 meters)

Prepare the Work Area (Continued)

5 Using at least two people, carefully place the workstation on the work area. If necessary, refer to the unpacking slip for instructions on how to correctly lift the workstation.

WARNING

At least two people are required to lift the AutoTrace Workstation onto the work area.

Connect the Solvent Reservoirs

To connect the solvent reservoir bottles to the solvent tubing lines on the left side of the workstation:

1 Position the reservoir bottles to the left side of the AutoTrace Workstation, keeping the following in mind:

- You must position the reservoirs within reach of the tubing that extends from the left side of the workstation.
- The most precise liquid transfer occurs with the solvent reservoirs positioned slightly higher than the workstation's 12-port valve. Dionex recommends that you do not place the solvent reservoirs on the top of the workstation.

NOTE

You must provide up to five suitable containers for your solvents. The supplied plastic bottle should only be used for water. Do not use the bottle for solvents, or plastic may appear in your chromatogram.

2 Uncap the solvent reservoirs and fill them with the required solvents.

3 Remove the tubing weights and barbed fittings from the Startup Kit.

4 Insert the end of the tubing from solvent port #1 through the hole in one of the reservoir caps. Cut the tubing length, if necessary, to avoid slack or kinks in the solvent lines.

5 Push the tubing end through the small hole in the top of one of the tubing weights until the tubing extends through the opposite end, as shown in Figure 1.

Connect the Solvent Reservoirs (Continued)

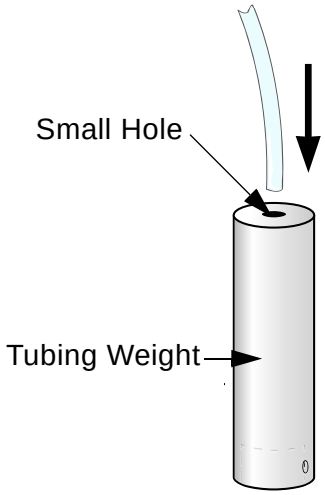


Figure 1. Tubing in Tubing Weight

6 Push a barbed fitting into the end of the tubing, as shown in Figure 2.

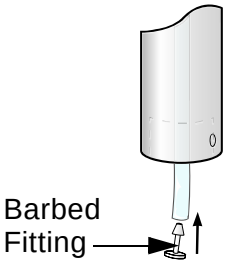


Figure 2. Barbed Fitting

NOTE

To hold the tubing in your fingers while installing the barbed fitting, grasp the tubing using a flat rubber band or piece of emery cloth.

7 Gently pull the tubing upward until the barbed fitting seats itself within the recess of the tubing weight, as shown in Figure 3.

Connect the Solvent Reservoirs (Continued)

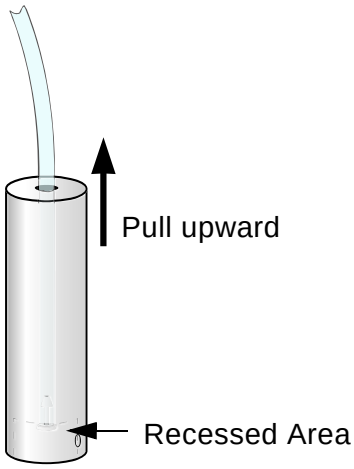


Figure 3. Pulling Tubing Upward

8 Cap the bottle and adjust the length of tubing until the weight touches the bottom surface of the reservoir, as shown in Figure 4.

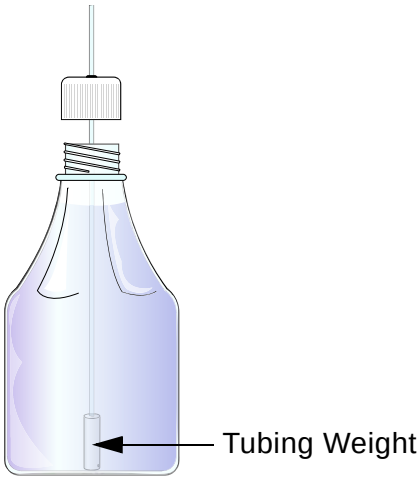


Figure 4. Tubing Weight in Reservoir

9 Repeat steps 4 through 8 for each reservoir to be used.

Install the Waste Drain and Tubing

To install and orient the waste drain, and connect the solvent and waste tubing:

1 Locate and remove the waste drain from its bubble-pack bag in the Startup Kit, as shown in Figure 5.

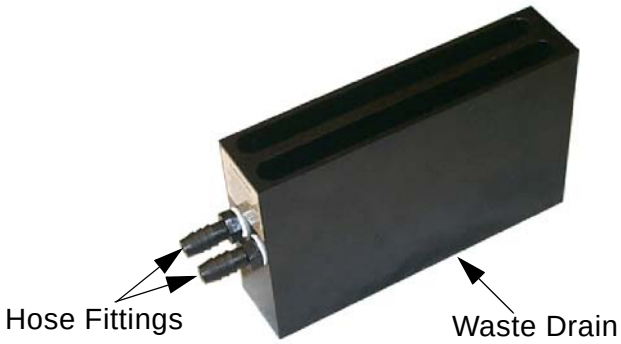


Figure 5. Waste Drain

2 Determine whether you want the waste tubing to extend from the workstation's left or right side, and then orient the waste drain's hose fittings to the appropriate side. Install the waste drain onto the elution station's two ball studs, making sure the waste drain snaps into place and sits flush on the base plate, as shown in Figure 6.

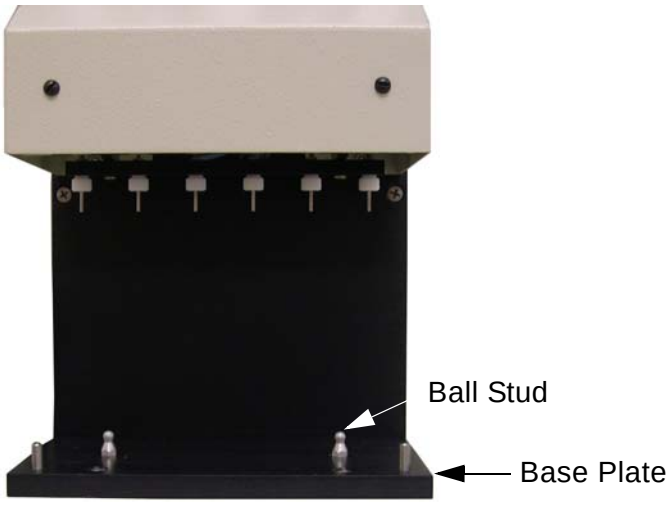


Figure 6. Ball Stud and Base Plate

3 Push the waste drain toward the back of the workstation. It only moves about 1/8 in (3 mm). This correctly positions the drain under the manifold.

Install the Waste Drain and Tubing (Continued)

4 Locate and remove the two 3-ft (0.9-m) pieces of waste tubing with caps provided in the Startup Kit. One is used for water waste, the other for solvent waste.

5 With one hand supporting the waste drain, install the water and solvent waste tubing onto the drain's hose fittings, as shown in Figure 7.

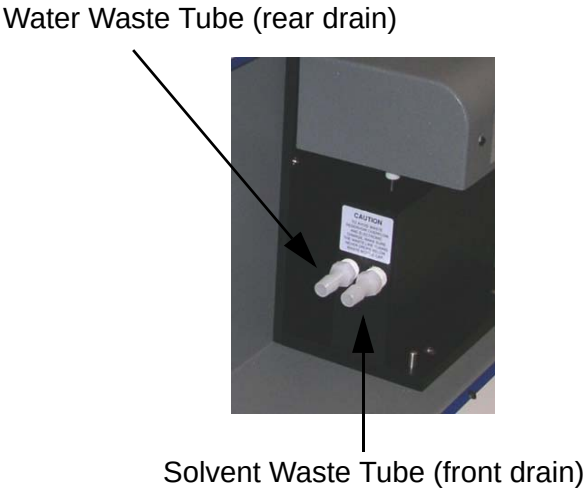


Figure 7. Waste Tubing Connections

6 Route the two waste lines as follows:

a Connect the cap of the solvent waste tubing (the tubing connected to the front drain trough) to one of the supplied waste containers, making sure the waste container tubing never drops below the level of the waste container cap.

b Connect the cap of the water waste tubing (the tubing connected to the rear drain trough) to the remaining waste container, making sure the waste tubing never drops below the level of the waste container cap. If you route the water waste tubing to a drain, make sure you follow the same tubing guidelines.

If necessary, cut the tubing to the desired length with wire cutters or scissors.

7 Locate the tubing port labelled “WASTE” found directly below the five solvent tubing lines on the left side of the workstation, as shown in Figure 8.

Install the Waste Drain and Tubing (Continued)

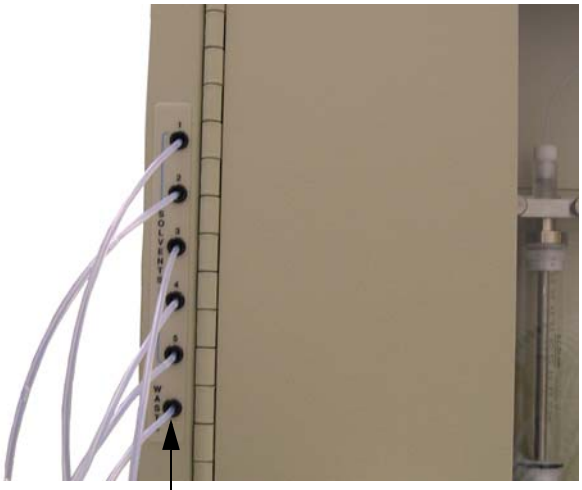


Figure 8. Waste Tubing Port

8 Insert the waste tubing from this port into one of the bottles supplied with the workstation, keeping the following in mind:

a Make sure the end of the tubing extends just below the top of the container.

b Avoid sharp turns and uphill pieces of tubing from the workstation to the container.

Connect the Exhaust Hose

If the eluted solvents need to be vented, use the workstation's internal fan to safely vent solvent vapors. To connect the workstation's exhaust hose:

1 Connect the exhaust hose to the workstation's exhaust port by sliding and rotating the hose onto the port, as shown in Figure 9.

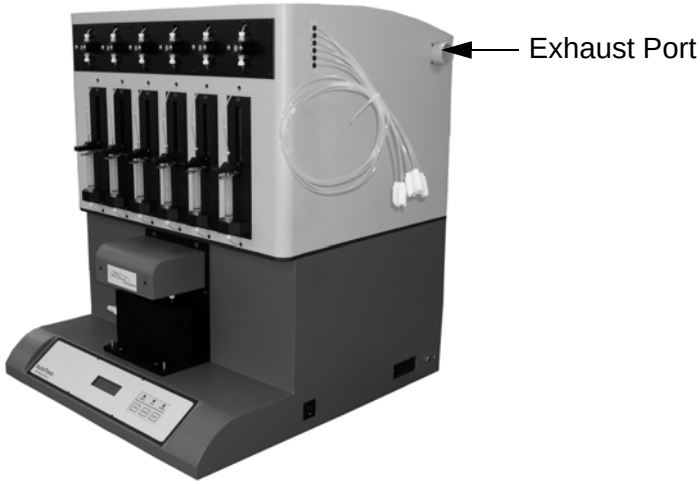


Figure 9. Exhaust Port

2 Route the hose to a suitable vent location. If necessary, use wire cutters or scissors to cut any excess hose as required.

Connect the Gas Supply

To connect the gas supply to the workstation's gas inlet:

1 Locate the 10-ft (3-m) length of 1/8-inch ID x 3/16-inch OD tubing pieces and the 1/8-inch Quick-disconnect fitting in the Startup Kit. Push the barbed end of the fitting into one end of the tubing, as shown in Figure 10.

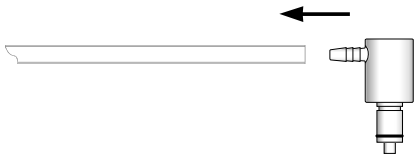


Figure 10. Barbed Fitting on Tubing

2 Connect the open end of the Quick-disconnect fitting (see Figure 11) to the gas inlet on the lower-left side of the workstation (see Figure 12).

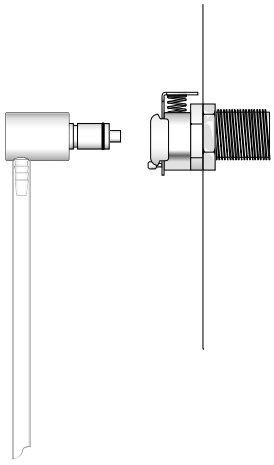


Figure 11. Quick-Disconnect Fitting

Connect the Gas Supply (Continued)

Figure 12. Gas Inlet

3 Using the supplied ¼-inch NPT x 1/8-inch barb fitting, connect the other end of the tubing to the gas supply.

4 Turn on the gas supply. The gas supply must be clean and filtered with an incoming pressure of no more than 100 psi (6.9 bars).

5 Before operating the AutoTrace Workstation, you need to set the workstation pressure to 10 psi (0.7 bars). Refer to “Operation” on page 97 for instructions.

Check the Compression Screws

To check the tightness of the workstation's compression screws:

1 Open the workstation's side door and locate the white compression screws on the 3-way valve, 12-port valve, switching valves, and syringes, as shown in Figure 13.

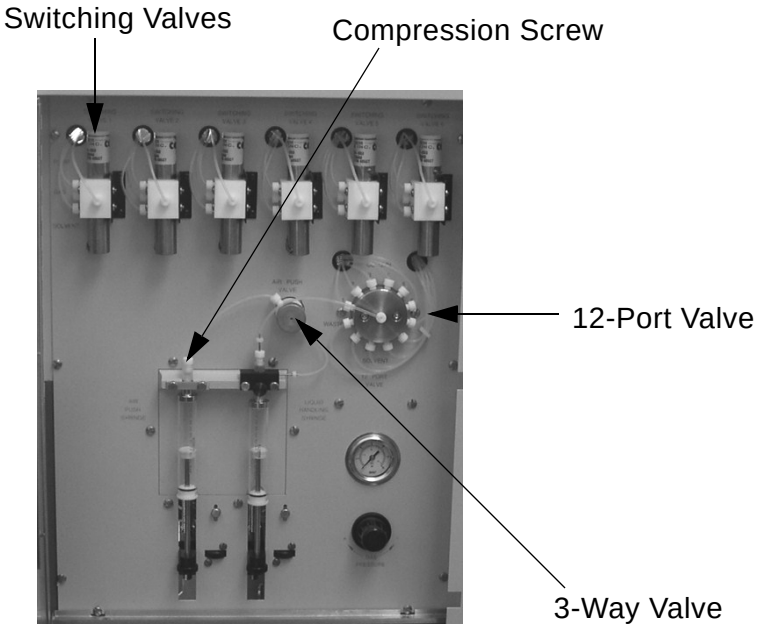


Figure 13. AutoTrace Left Side View

2 Make sure each screw is finger tight.

3 Perform the same check for the compression screws on the pumps and column holders on the front of the workstation.

Power Up the Workstation

To power up the workstation:

1 Plug the AC power cord securely into the receptacle on the right side of the workstation.

2 Plug the 3-pronged end of the power cord into an appropriate AC power source.

WARNING

- *Only plug the AC power cord into a properly grounded outlet.*
- *Only use a standard IEC 320-style power cord appropriate for your country.*
- *The AutoTrace Workstation does not require a dedicated AC line. However, you should provide a clean AC source similar to one used for computers and other equipment. A UPS is recommended where power outages or brownouts frequently occur (see ordering information in "Ordering Supplies" on page 163).*

3 Turn on the AutoTrace Workstation.

Computer Access

While a computer is not required for AutoTrace control, you must have access to a computer to write AutoTrace methods and download AutoTrace methods. The computer must have the following specifications:

- Compatible with Microsoft® Windows 2000® SP4 and Windows XP® SP1 Professional operating systems, including the latest released service packs.
- Follow Microsoft's recommendation for the computer specification, with the following minimum hardware specifications:

  Windows 2000

  — CPU = 400MHz

  — RAM = 128M

  Windows XP

  — CPU = 650MHz

  — RAM = 192M

Computer Access (Continued)

You can also install the AutoTrace software on a local area network (LAN).

Software Installation

NOTES

- *To install this software, you must be assigned to the Windows Administrator group.*
- *An operator must be assigned to the Windows Power User group in order to use the software.*

To install the AutoTrace software on your computer:

1 Start Windows and insert the CD in the CD drive.

2 From the Microsoft Windows operating system Start menu, select **Run...** and click the **Browse** button.

3 Navigate to the CD drive.

4 Select the **setup.exe** file and click the **Open** button.

5 Click the **OK** button. Follow the on-screen instructions. The software is installed in the default directory of C:\Program Files\Dionex\AutoTrace SPE Workstation.

NOTE

If the software is installed in a directory other than C:\Program Files\Dionex\AutoTrace SPE Workstation, the INI file has to be modified as described in "INI File" on page 25.

6 Open the AutoTrace software by choosing from the Windows Start menu **Programs→Dionex→AutoTrace SPE Workstation**.

7 Close the AutoTrace software.

INI File

The AutoTrace software program uses a file named AT.INI which is loaded by starting the program. AT.INI must always be in the working directory (the default is C:\Program Files\Dionex\AutoTrace SPE Workstation). Modifications can be made using an ASCII editor (such as Windows Notepad).

NOTE

Blank spaces are not allowed in the AT.INI file to the left of an equal sign and before the first letter to the right of an equal sign.

The AT.INI file contains specifications concerning path name of the necessary data bases [DATABASES] and the language adjustment [AUTOTRACE]. An example of an AT.INI file follows:

```
[DATABASES]
Database_Data=ATDATA.MDB
Data_Dir=C:\Program Files\Dionex\AutoTrace SPE
Workstation\data\
[AUTOTRACE]
ATDrive=A
Language=1
Version=1 (See Note below)
Comm_Port=1
```

NOTE

The “Version” option identifies whether you are running a Cartridge (Version=1) or Disk (Version=2) AutoTrace Workstation. If you have both types of units, you can run the AT software for either unit by:

- *Changing the Version option to the correct value in the INI file,*
- *Saving the INI fil, and*
- *Starting the AutoTrace software.*

If the program is installed in a directory other than C:\Program Files\Dionex\AutoTrace SPE Workstation, you must modify the following entries:

Database_Data=C:\<*DIRECTORY_NAME*>\ATDATA.MDB

Data_Dir=C:\<*DIRECTORY_NAME*>\

where <*DIRECTORY_NAME*> identifies the directory where the files reside.

Overview

This section provides a general description of the workstation capabilities, parts and functions, and liquid flow.

Description

The AutoTrace SPE Workstation performs large-volume solid phase extraction using a variety of manufacturers' 1 mL, 3 mL, 6 mL, or glass (6 or 8 mL) syringe-type SPE columns or 47 mm disks.

Automate the method by using the workstation to:

- Condition the column or disk
- Load sample onto the column or disk
- Rinse the column or disk
- Dry the column or disk
- Elute the sample

Menu Software

Easy-to-use software is provided with the workstation for setting the operational parameters and writing the specific method steps that automate the method. Descriptions of the parts of the software are provided in “Software” on page 58.

The software includes diagnostic methods run on the workstation to assist in maintaining optimal performance. More details on diagnostics are provided in “Diagnose Problems” on page 113.

Solvent Selection

When writing an AutoTrace method using the menu software, up to five solvents may be designated for the liquid sequences used in column precondition, sample loading, column rinsing, and elution.

Flow Rate Control

Through setup parameters, the workstation controls the flow rates of solvent and sample in each solid phase extraction step of the written method.

Standard Operations

The standard solid phase extraction operation steps used in a method are described briefly below.

Operation	Description
Conditioning the Column or Disk	Use CONDITION COLUMN or CONDITION DISK to pass the solvent through the column or disk and direct the effluent to waste.
Loading the Sample	Use LOAD SAMPLE to pump sample from the sample container to the column or disk for extraction.
Rinsing the Column or Disk	Use COLUMN RINSE or DISK RINSE after loading the sample path and column or disk, and direct the effluent to waste.
Washing the Syringe Solvent	Use WASH SYRINGE to prewash the liquid handling syringe with the next solvent of choice to waste.
Eluting the Sample	Use ELUTE TO COLLECT to pass solvent through the column or disk and direct eluent into the collection container.

Optional Operations

These optional operation steps can be used in a method.

Operation	Description
Rinsing the Sample Container	Use RINSE SAMPLE CONTAINER to manually add solvent and swirl the sample container before continuing.
Drying with Gas	Use DRY WITH GAS to flow gas through the column, clearing the path of residual water.
Pausing Operation	Use PAUSE to delay operation, or stop operation and signal manual intervention.
Increasing Absorption Time	Use ELUTE TO SOAK before an ELUTE TO COLLECT step to allow sample to soak the column.
Performing Multiple Elution Steps	Use ELUTE TO COLLECT, 2nd TUBE, or multiple ELUTE TO SOAK or ELUTE TO COLLECT steps as required by the method.
Cleaning the Sample Path	Use CLEAN SAMPLE PATH method steps between sample batches to prevent cross-contamination.
Concentrating the Sample	Use CONCENTRATE SAMPLE for automated concentration of the eluent.

Workstation Diagram - Front View

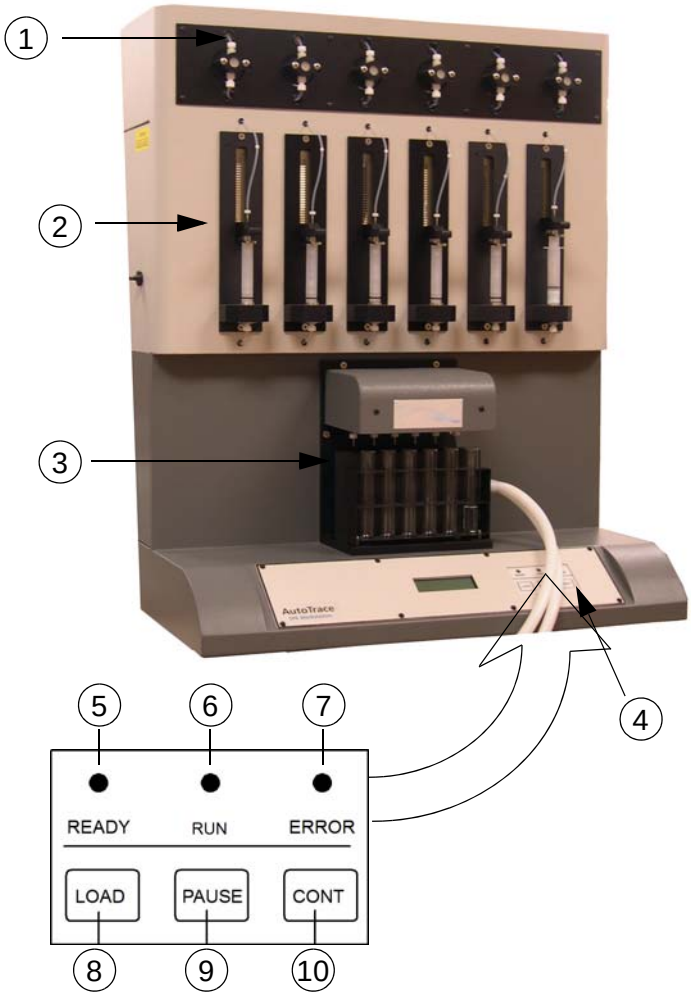


Figure 14. Front View

Parts and Functions - Front View

#	Part	Function
1	Sample Pumps	Pumps sample from sample containers to switching valves.
2	Column/Disk Holders	Holds the SPE columns or disks (depending on the workstation's type) for the extraction process.
3	Elution Station	Collects aqueous effluent, solvent effluent, or sample effluent on the elution station. These components are shown in detail in the next view.

#	Part	Function
4	Front Panel	Communicates workstation status to the operator.
5	**READY** Light	A steady light indicates power is ON to the unit; a flashing light indicates a system error.
6	**RUN** Light	Indicates a method is running.
7	**ERROR** Light	Indicates that operation has stopped due to an error condition.
8	**LOAD** Button	Used to download a method from the PC.
9	**PAUSE** Button	Used to stop the workstation after it completes the step it is performing.
10	**CONT** Button	By pressing **CONT *twice slowly***, downloads a method from the PC.

Workstation Diagram - Left Side View

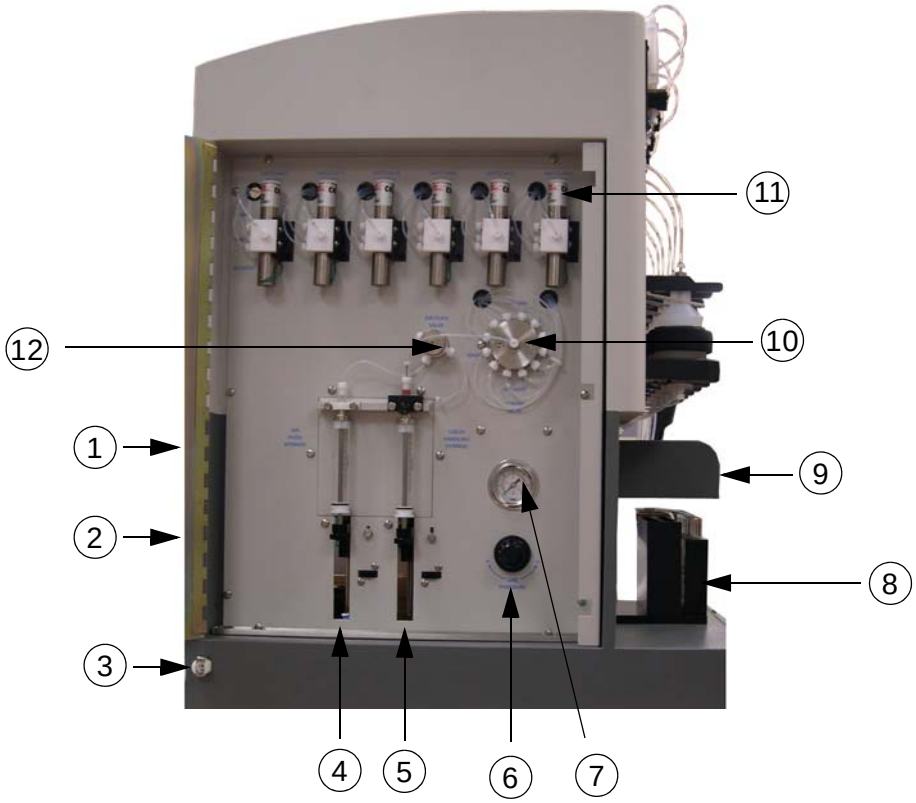


Figure 15. Left Side View

Parts and Functions - Left Side View

#	Part	Function
1	Solvent Ports	(Behind door, not shown) Input ports for five solvents.
2	Waste Port	(Behind door, not shown) Output port for system waste from purging solvent lines and/or washing the liquid handling syringe.
3	Gas Inlet	Input for the clean gas supply.
4	Air Syringe	Draws in and delivers air that follows sample or solvent transfer (to assure transfer is complete).
5	Liquid Handling Syringe	Draws in and dispenses solvent through the workstation.

#	Part	Function
6	Gas Regulator Knob	Regulates gas pressure in the workstation that is used for the drying column and sample concentration.
7	Gas Pressure Gauge	Indicates the gas pressure set by the knob.
8	Elution Rack	Holds tubes or vials for collection of eluent.
9	Elution Station	Collects effluent to one of two waste positions or collects eluent into collection container by moving into the appropriate position.
10	12-Port Valve	Controls the flow of air, solvent, and waste - whatever is specified by the method step.
11	Switching Valves	Directs the flow of gas, solvent, or sample to the column holders.
12	Air Valve (3-Way Valve)	Draws in air for the air syringe.
	Aqueous Waste Tubing (not shown)	Routes aqueous effluent to waste.
	Solvent Waste Tubing (not shown)	Routes sample and solvent effluent to waste.

Workstation Diagram - Right Side View

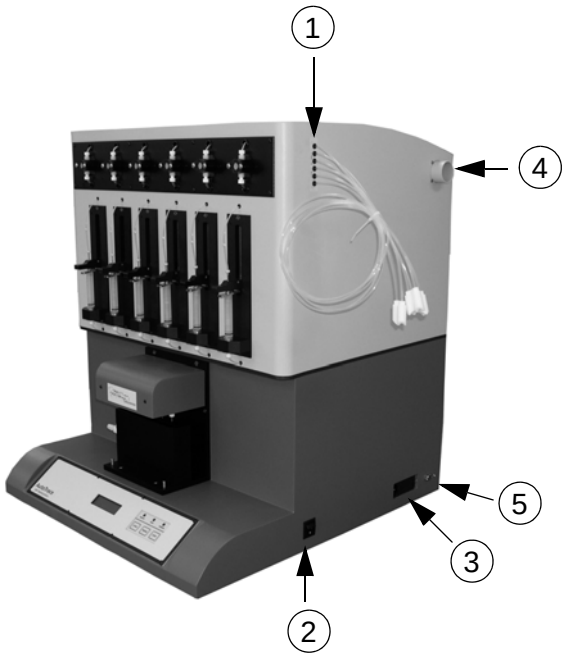


Figure 16. Right Side View

Parts and Functions - Right Side View

#	Part	Function
1	Sample Input Lines	Connects the workstation to sample containers.
2	Power Switch	Turns the workstation On and Off.
3	Power Entry Port	Provides a power connection and holds fuses. **WARNING** *The appliance inlet is the disconnecting device. Place the device or equipment in a manner so that the disconnecting device is accessible at all times.*
4	Exhaust Port	Outlet for routing solvent vapors to a suitable vent location.
5	Communications Port	Connects the communication cable from the AutoTrace Workstation to the PC.

Software Diagram

The AutoTrace software diagram is shown in Figure 17.

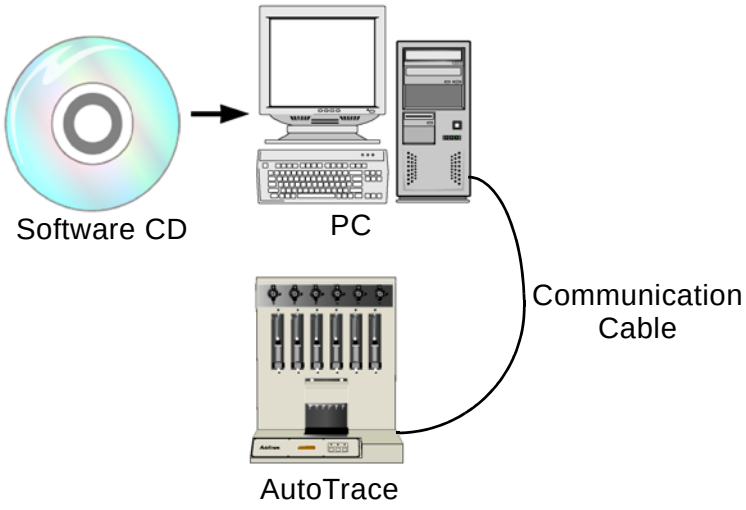


Figure 17. AutoTrace Software Diagram

Software Files and Functions

Software files and functions are listed in Table 2.

Table 2. Software Files and Functions

Files	Function
Software CD Files	Installs the AutoTrace software on the computer.
Doc Folder	Contains the user's guide.

Workstation Interconnection Diagram

Figure 18 shows a simplified view of the main AutoTrace components and their connections.

NOTE

The dashed box shows the pump, switching valve, column, and sample container for position #1 only. Refer to the flow charts and diagrams that follow for details on the SPE process.

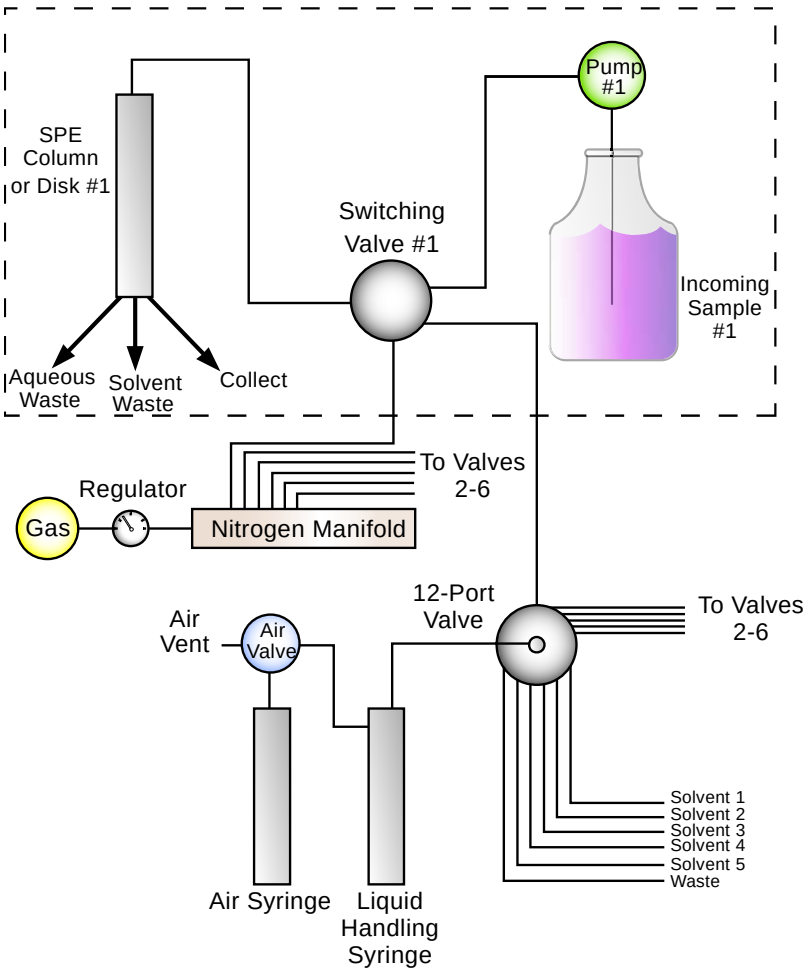


Figure 18. Interconnection Diagram

SPE Process

The flow charts and associated diagrams that follow show how the AutoTrace Workstation processes a typical SPE method.

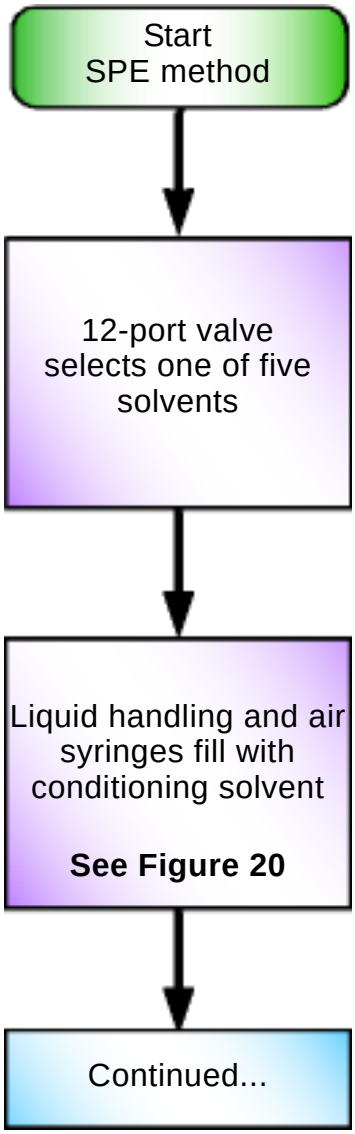


Figure 19. Condition Column: Liquid Handling and Air Syringes Fill Flow Chart

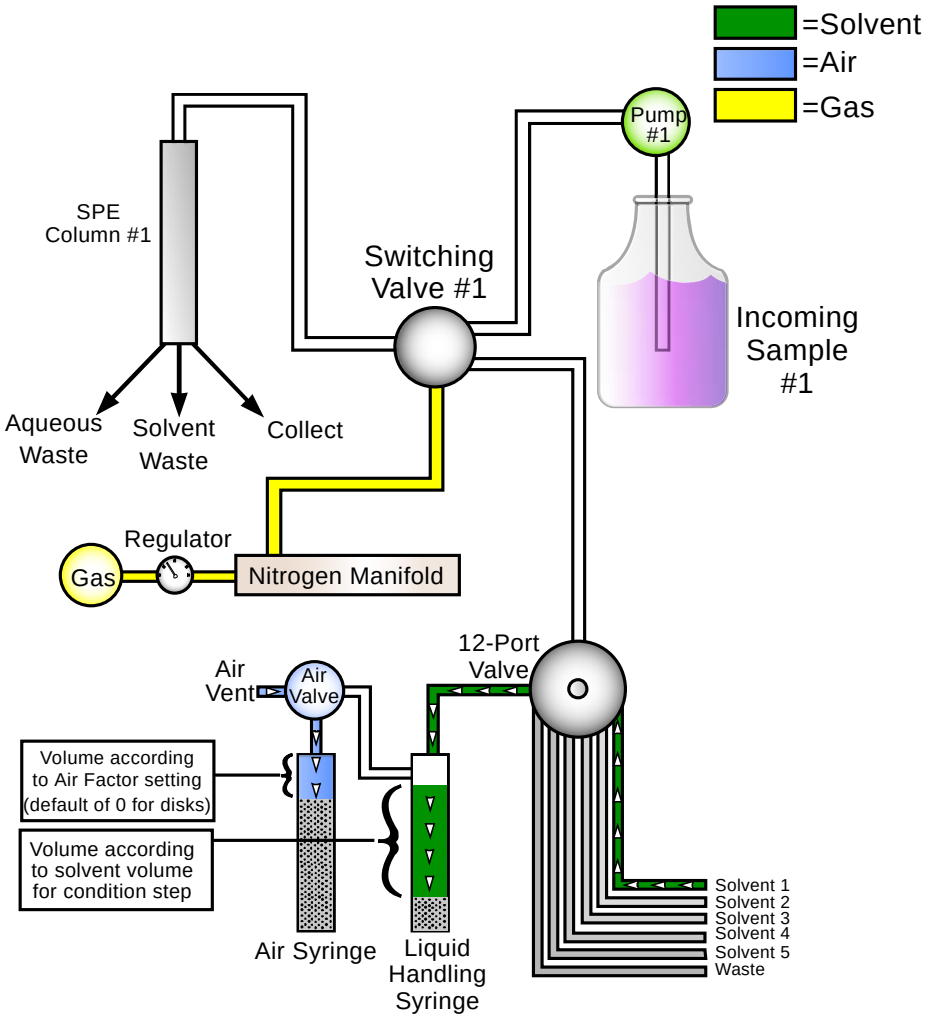


Figure 20. Condition Column: Liquid Handling and Air Syringes Fill Diagram

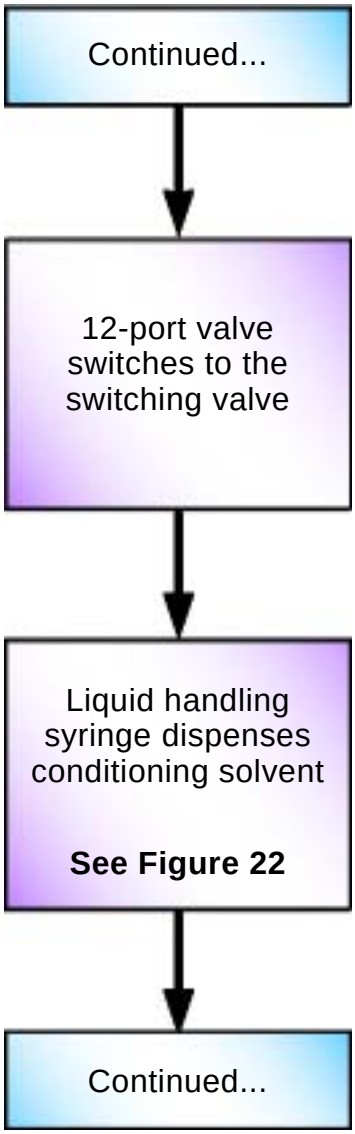


Figure 21. Condition Column: Liquid Syringe Dispenses Solvent Flow Chart

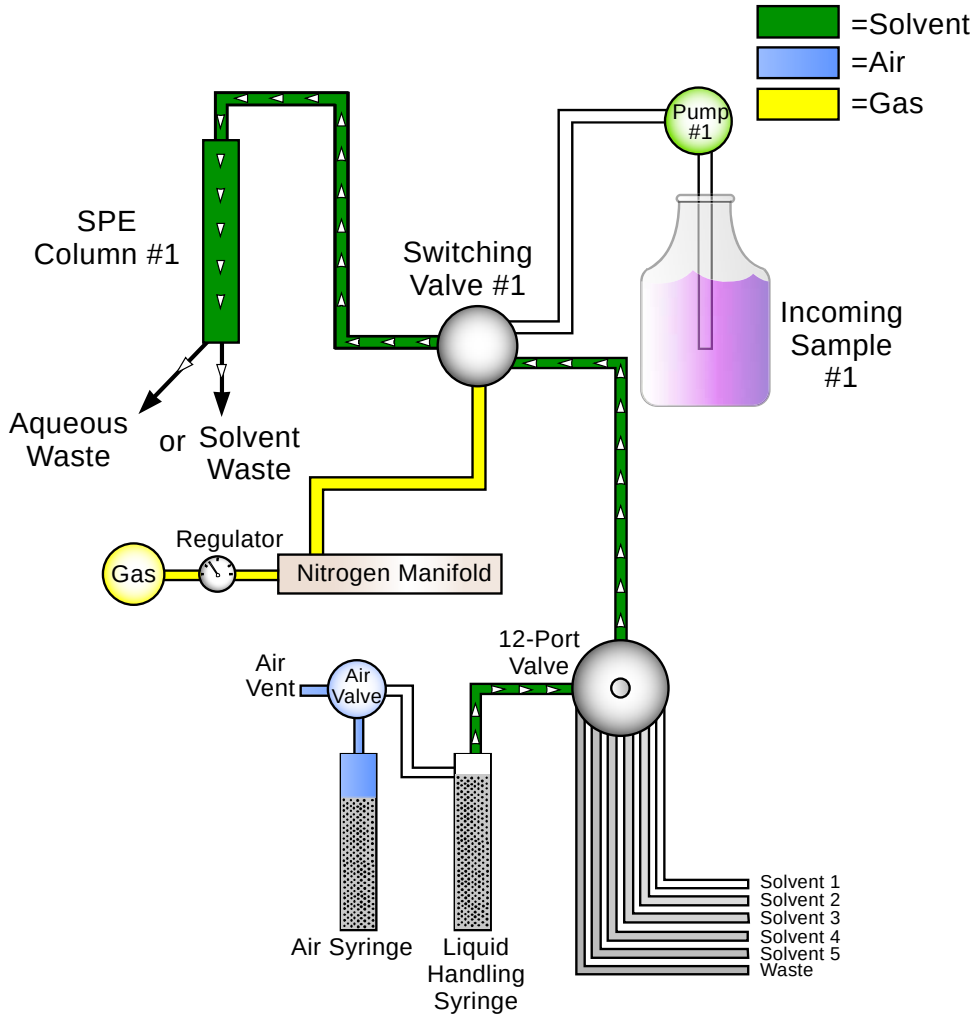


Figure 22. Condition Column: Liquid Syringe Dispenses Solvent Diagram

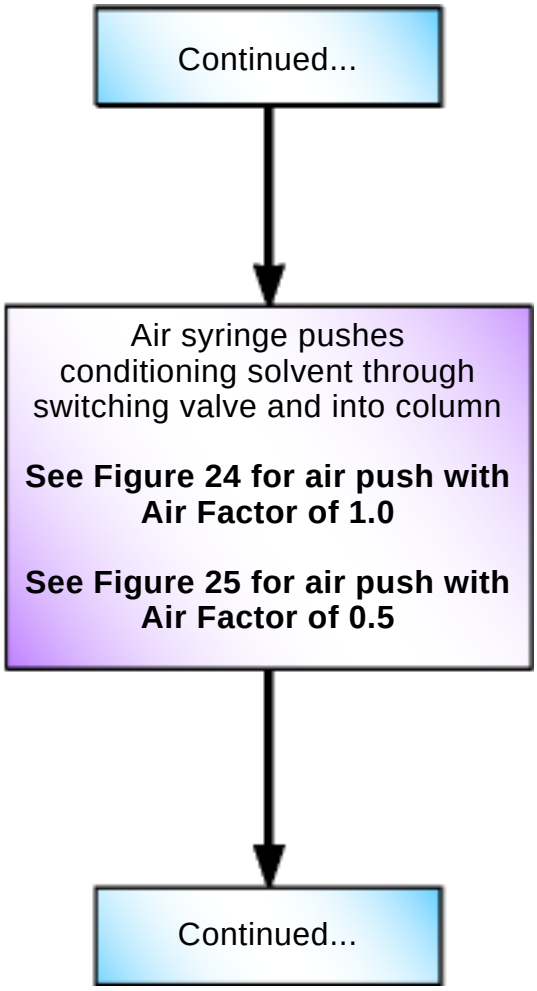


Figure 23. Condition Column: Air Push Flow Chart

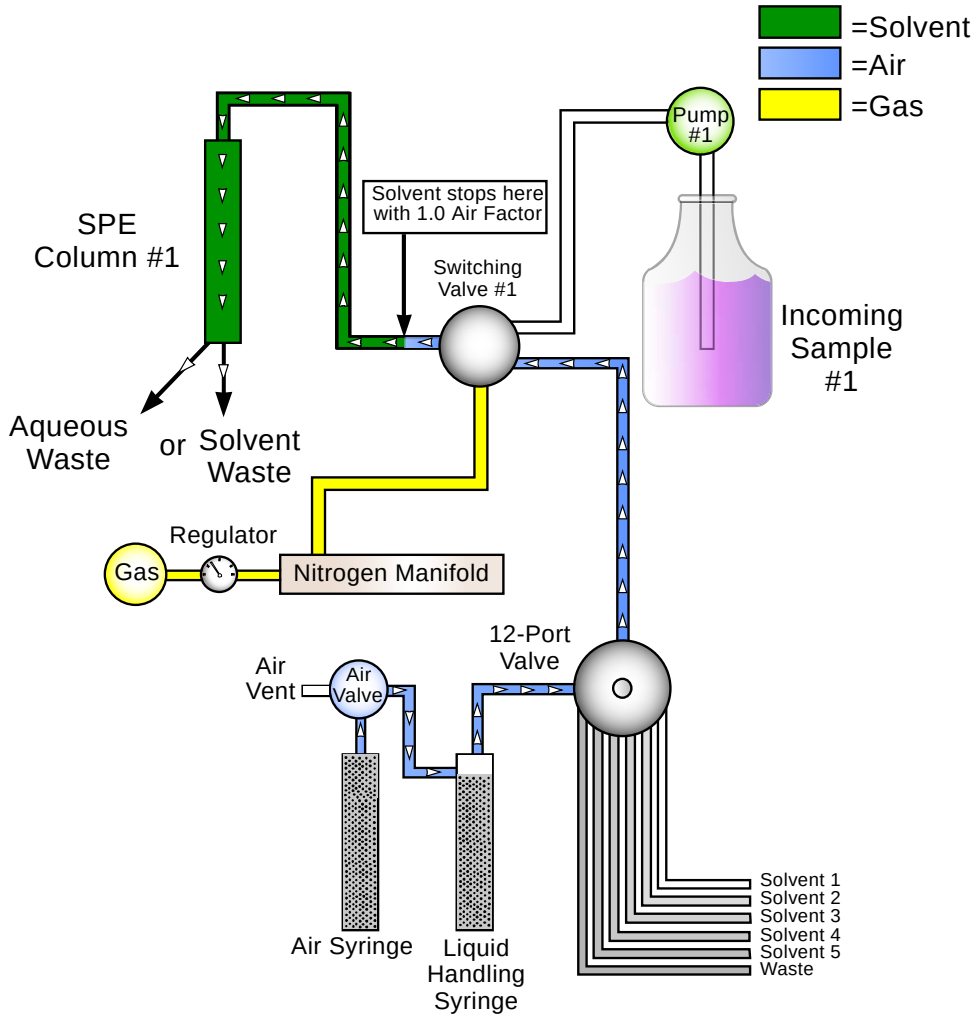


Figure 24. Condition Column: Air Push with Air Factor of 1.0 Diagram

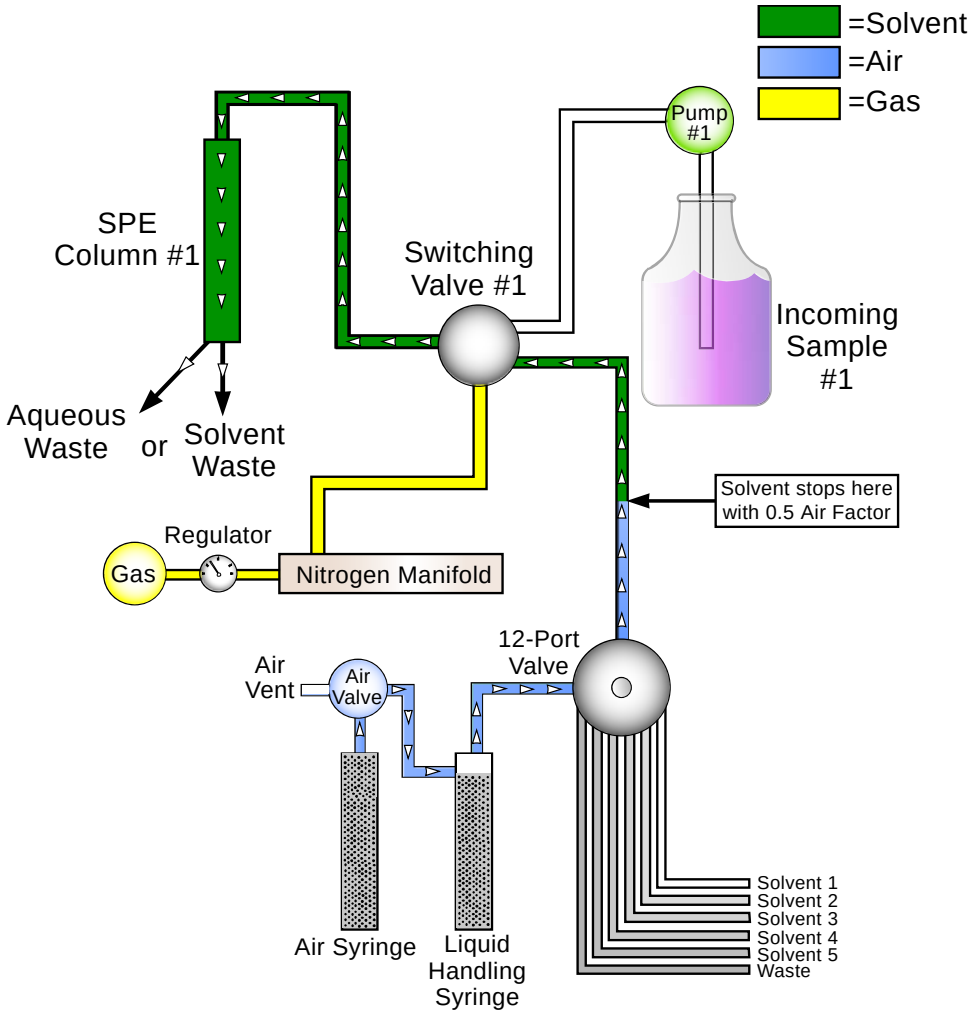


Figure 25. Condition Column: Air Push with Air Factor of 0.5 Diagram

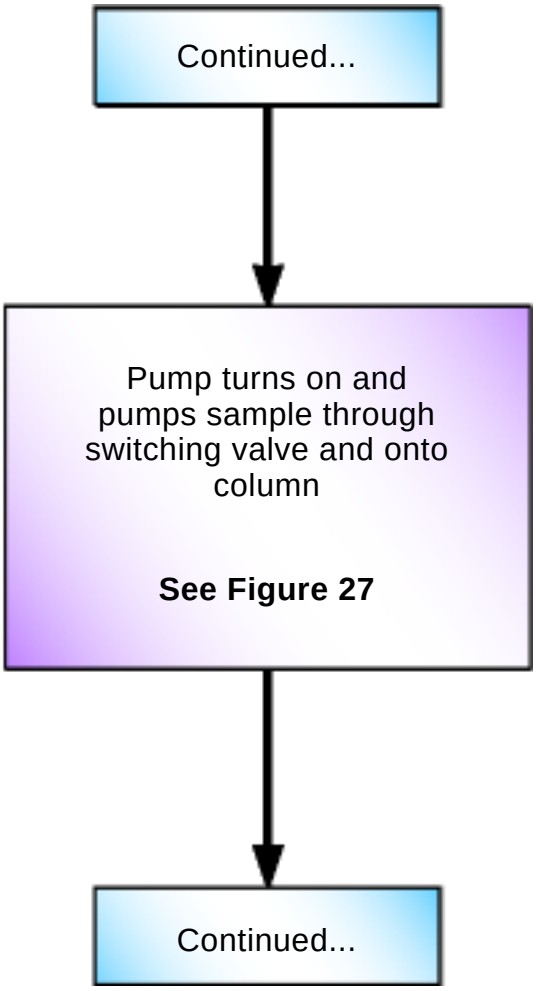


Figure 26. Load Sample Flow Chart

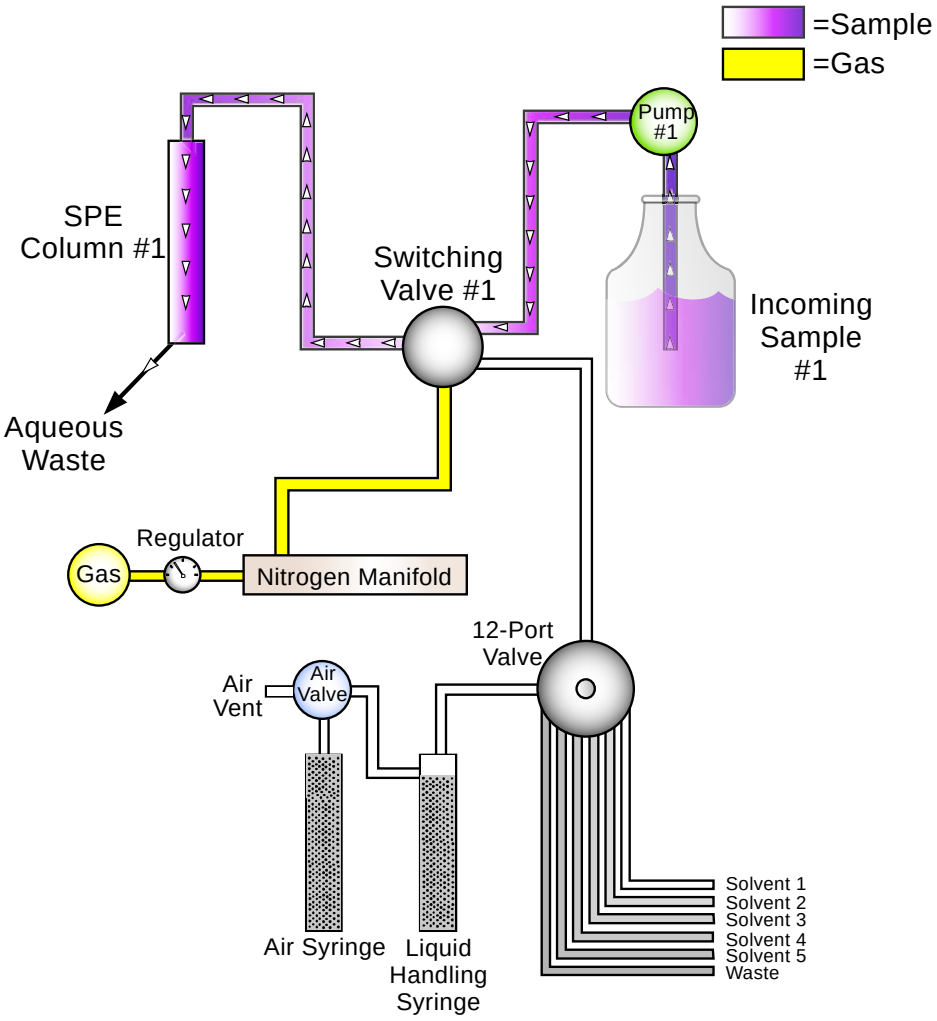


Figure 27. Load Sample Diagram

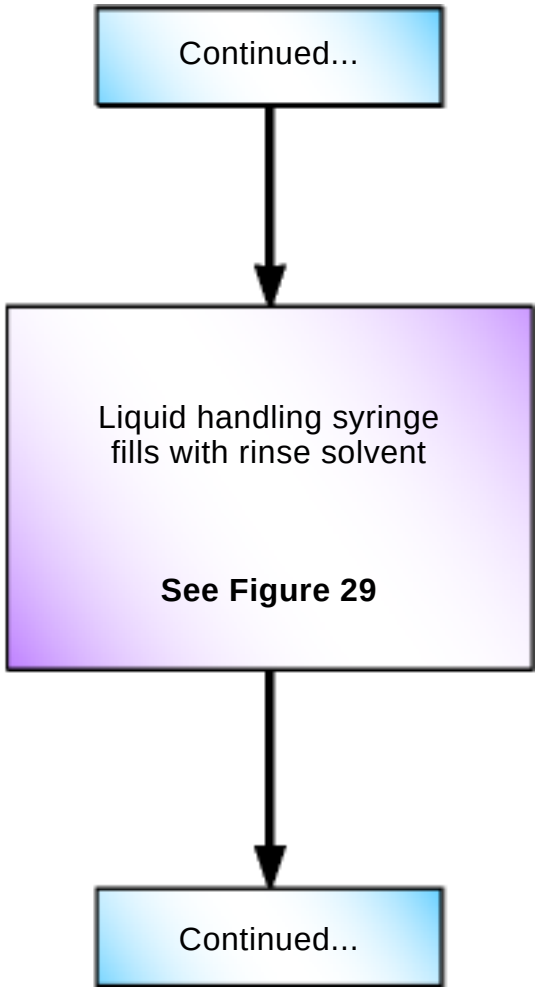


Figure 28. Column Rinse: Liquid Handling and Air Syringes Fill Flow Chart

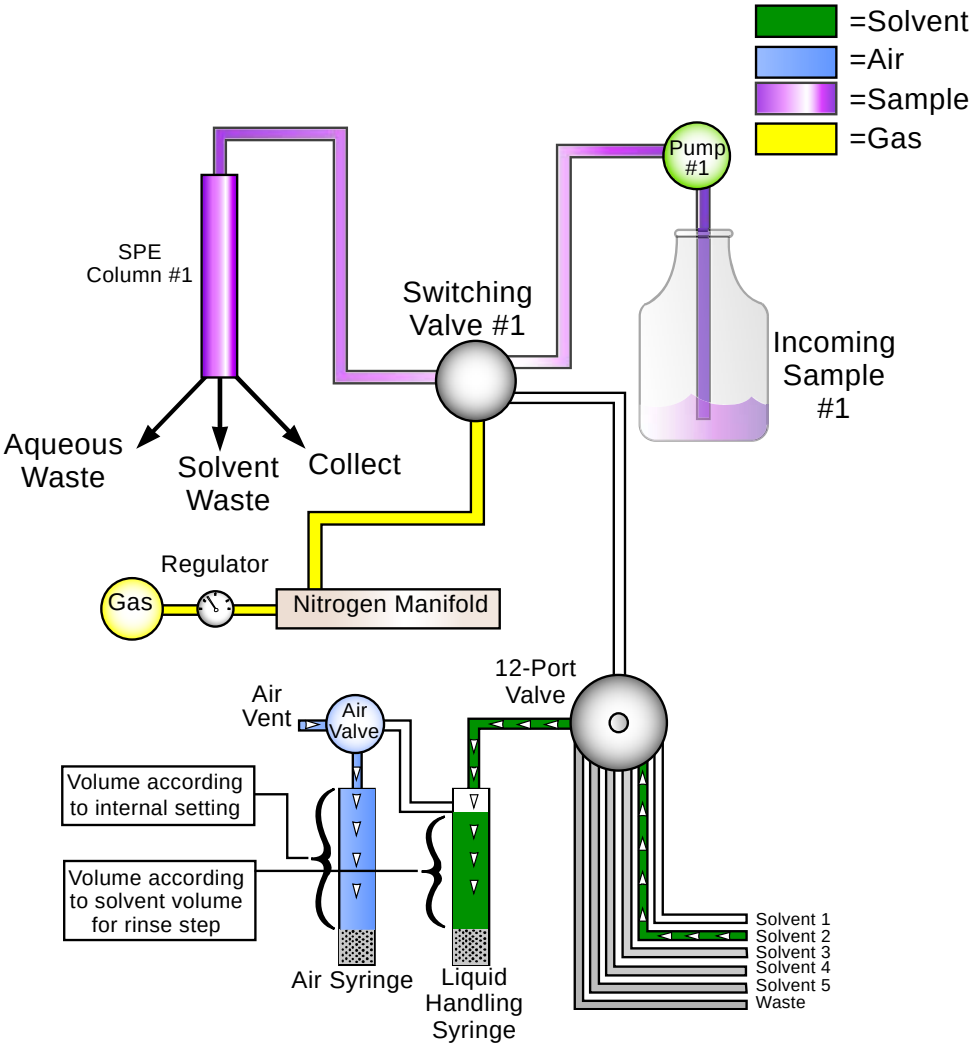


Figure 29. Column Rinse: Liquid Handling and Air Syringes Fill Diagram

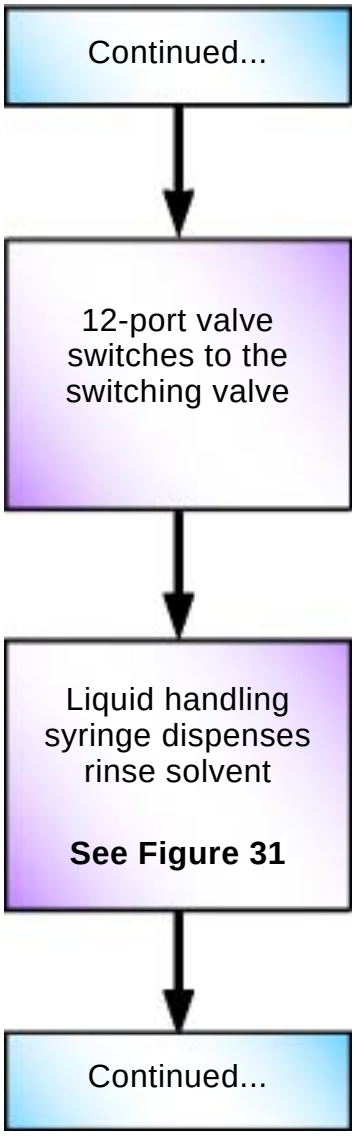


Figure 30. Column Rinse Liquid Handling Syringe Dispenses Solvent Flow Chart

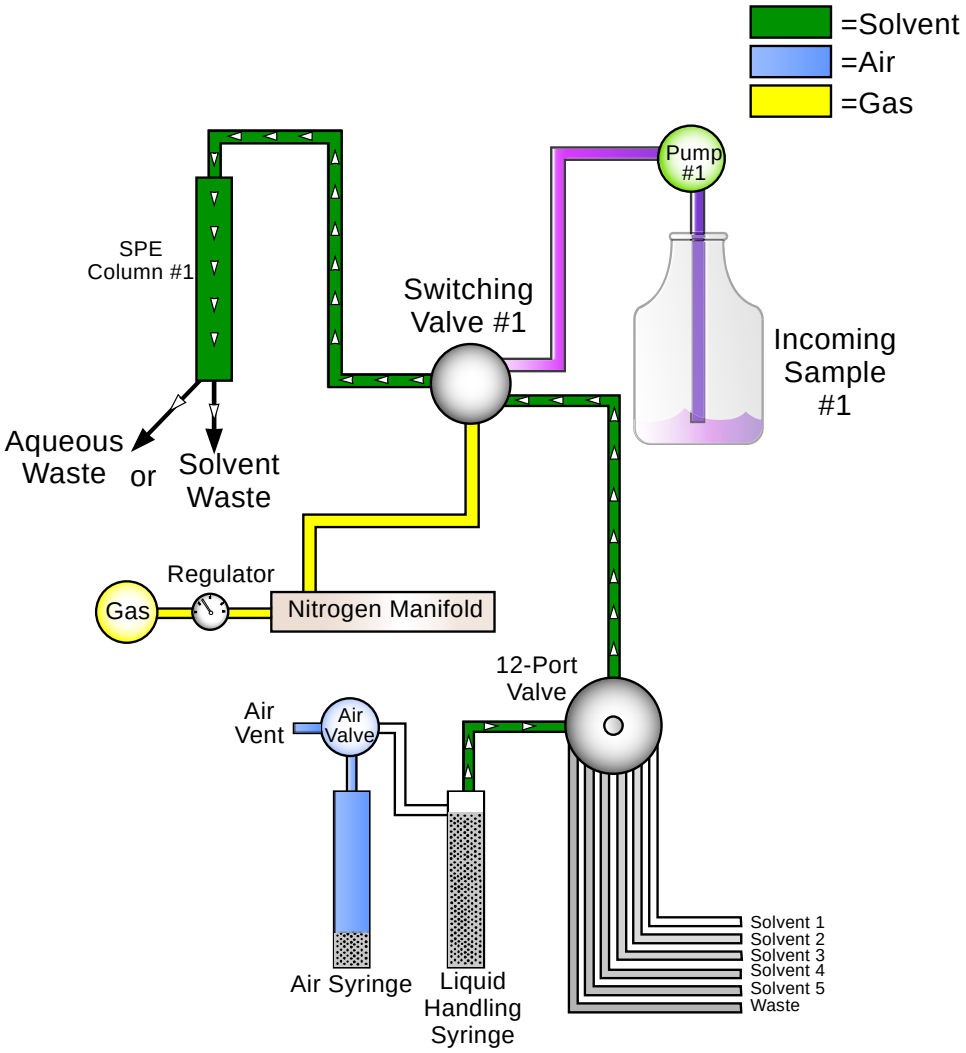


Figure 31. Column Rinse: Liquid Handling Syringe Dispenses Solvent Diagram

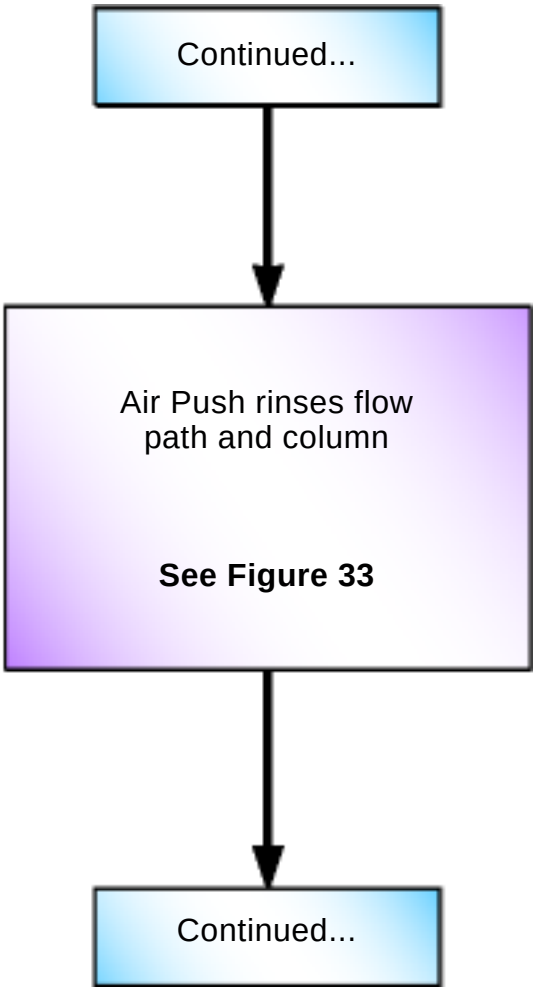


Figure 32. Column Rinse: Air Push Flow Chart

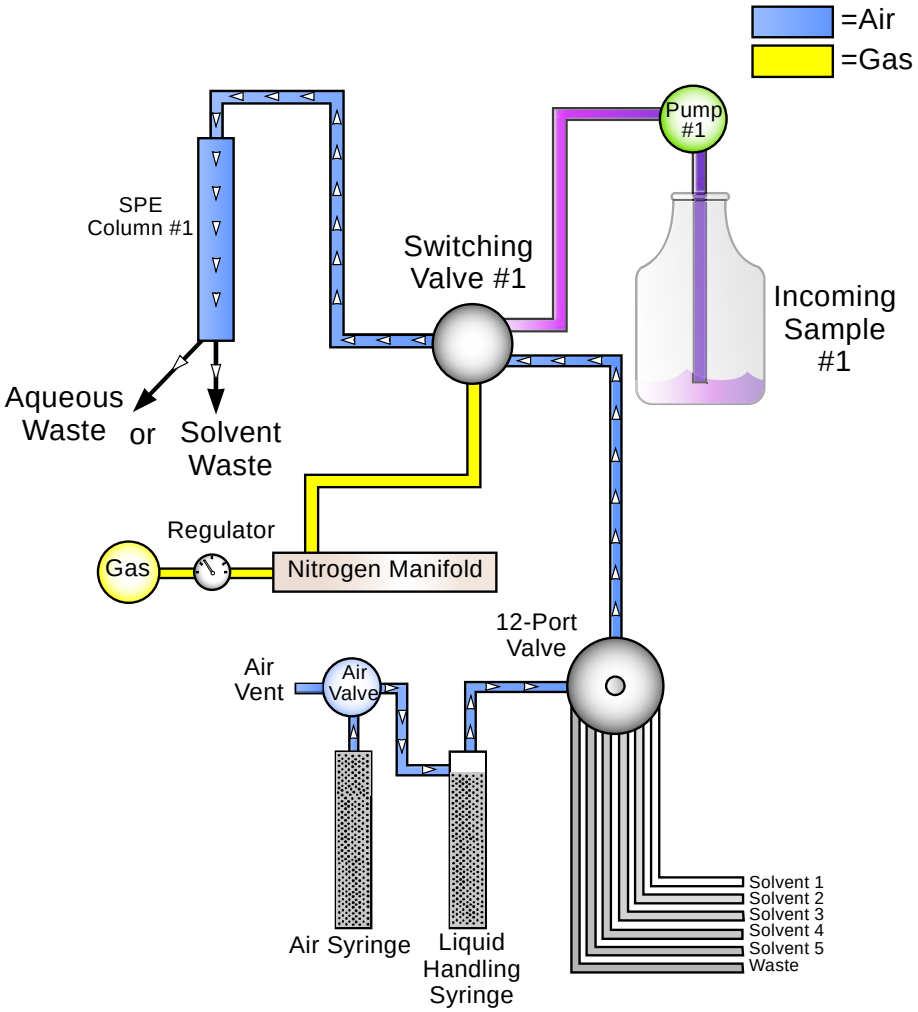


Figure 33. Column Rinse: Air Push Diagram

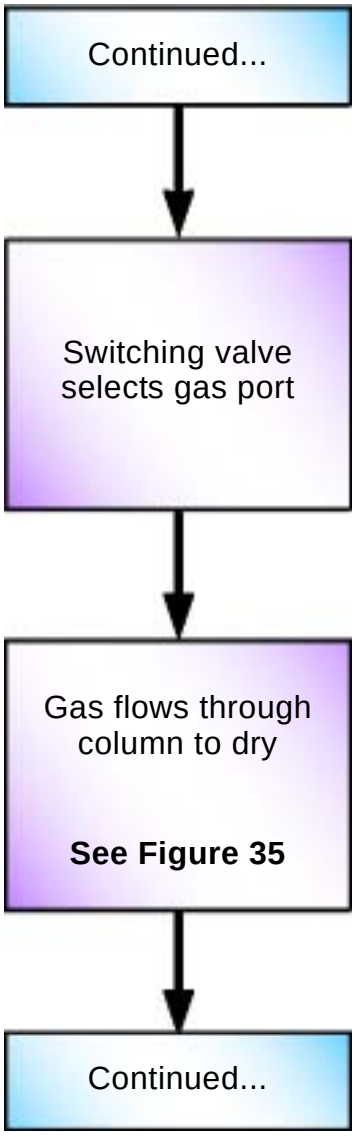


Figure 34. Dry with Gas Flow Chart

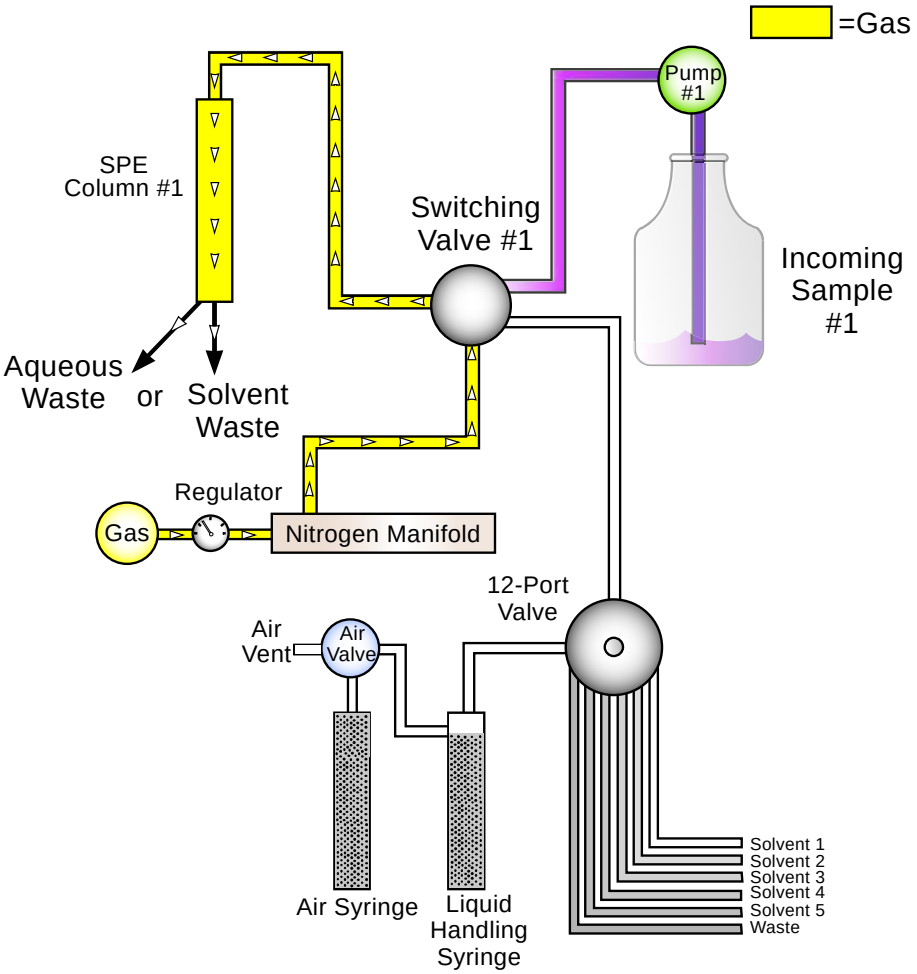


Figure 35. Dry with Gas Diagram

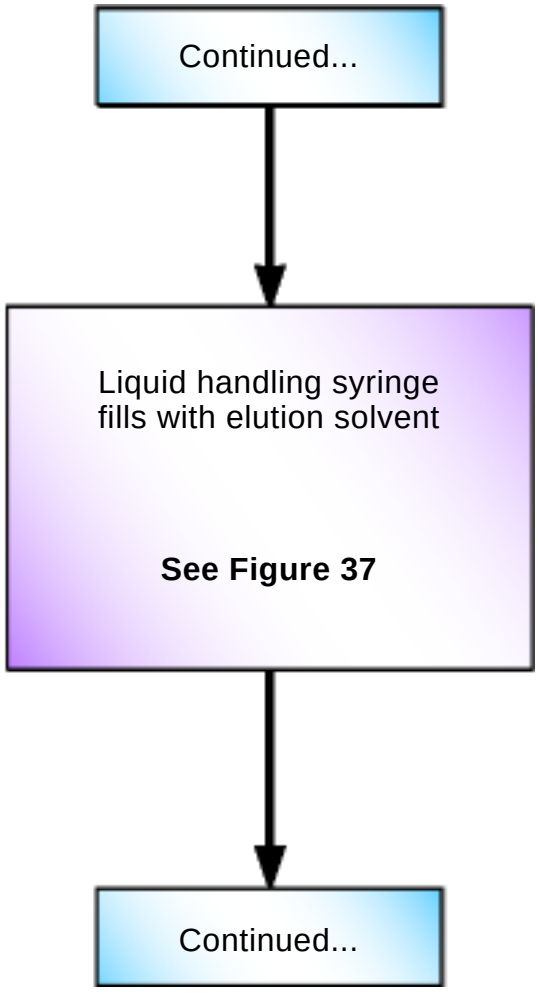


Figure 36. Elute to Collect: Liquid Handling and Air Syringes Fill Flow Chart

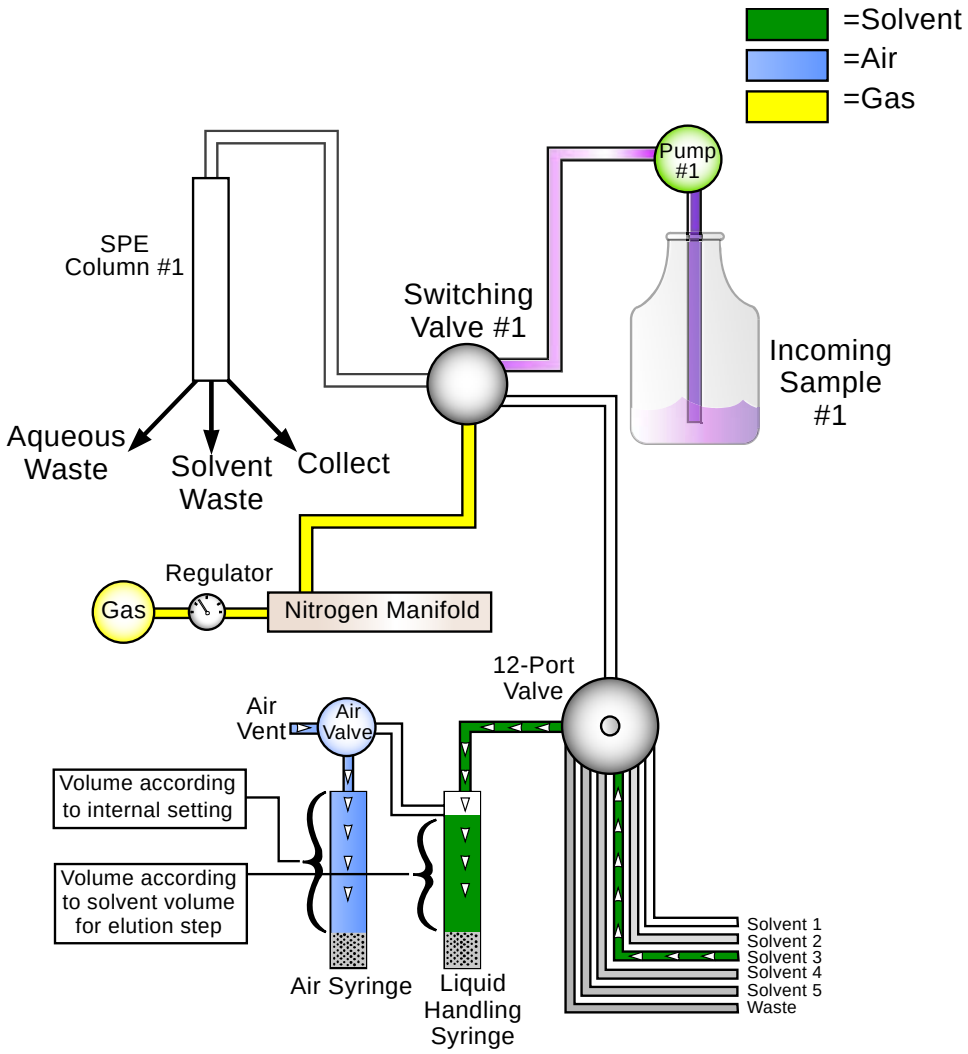


Figure 37. Elute to Collect: Liquid Handling and Air Syringes Fill Diagram

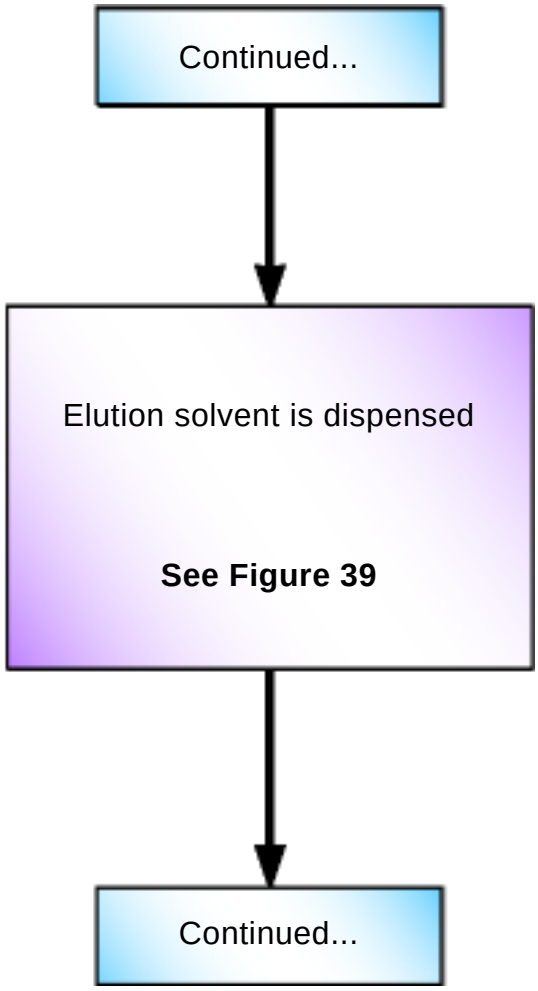


Figure 38. Elute to Collect: Liquid Handling Syringe Dispenses Solvent Flow Chart

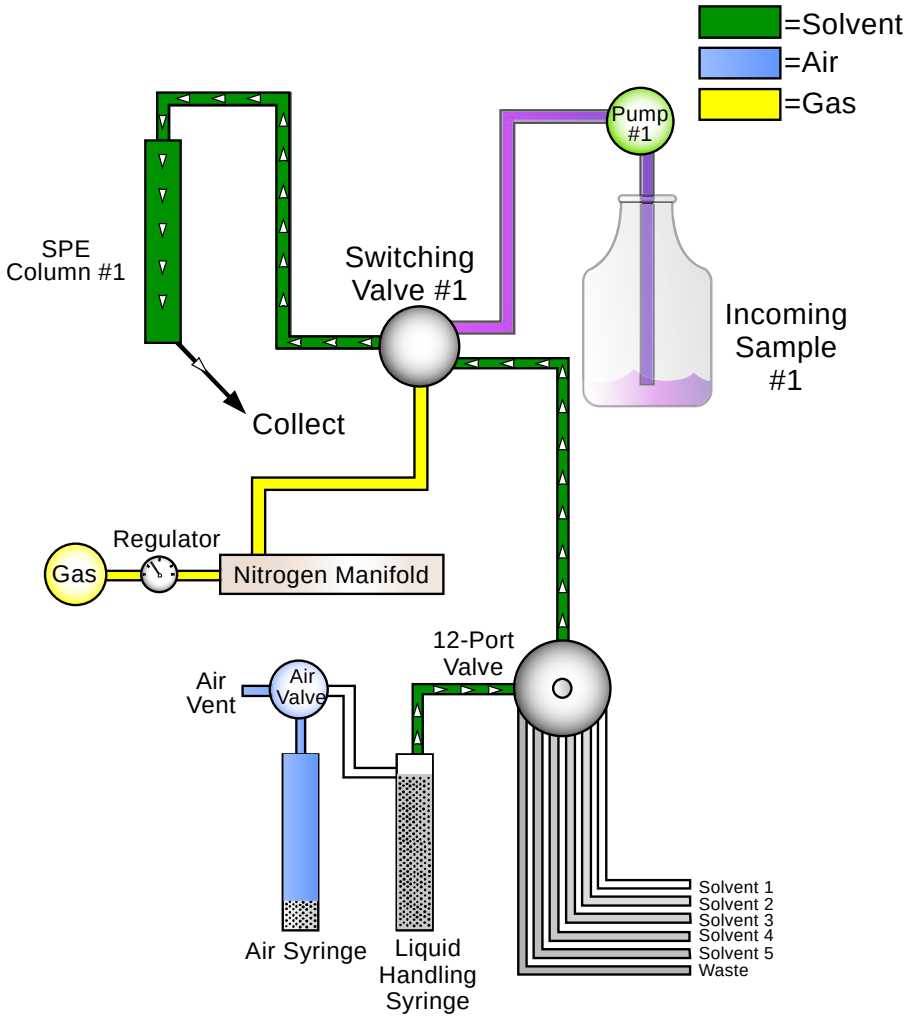


Figure 39. Elute to Collect: Liquid Handling Syringe Dispenses Solvent Diagram

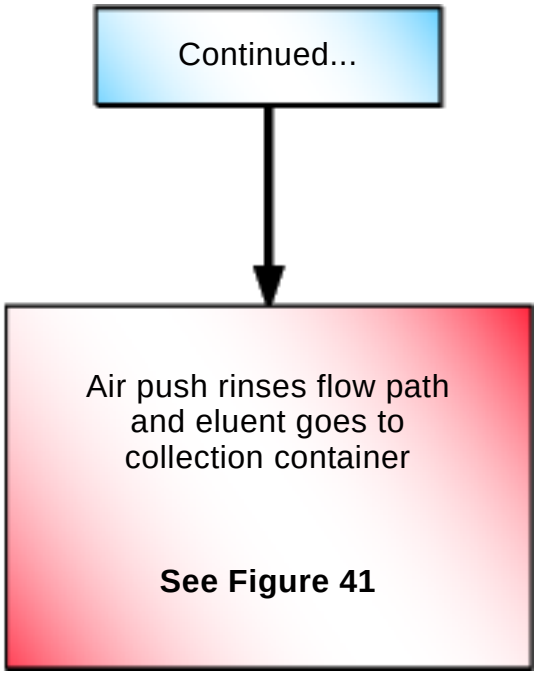


Figure 40. Elute to Collect: Air Push Flow Chart

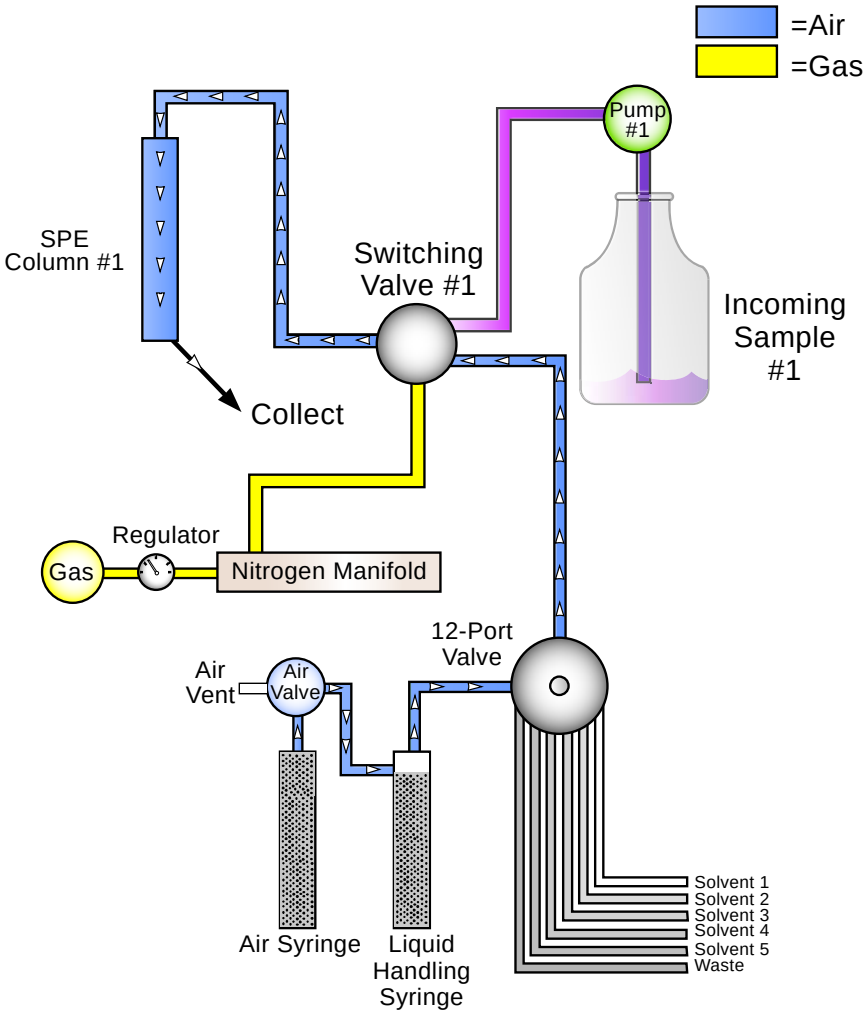


Figure 41. Elute to Collect: Air Push Diagram

Software

This section of the manual describes how to use the software supplied with the AutoTrace SPE workstation, provides a method example, and lists some application tips.

Once you install the AutoTrace software, follow these general steps to automate a method:

1 Open the AutoTrace (AT) software.

2 Specify the parameter and solvent information.

3 Write a method.

4 Save the method.

5 Download the method to the AutoTrace unit.

6 Print the method.

Using the AutoTrace (AT) Program

To start the menu software, click the Windows Start button, and then choose **Programs→Dionex→AutoTrace SPE Workstation**. If available, you can click the AUTOTRACE icon on the desktop, instead.

The copyright window now appears. Close the window or wait 5 seconds for the window to close.

The AutoTrace main window is shown in Figure 42. The main menu and its options are discussed in this section.

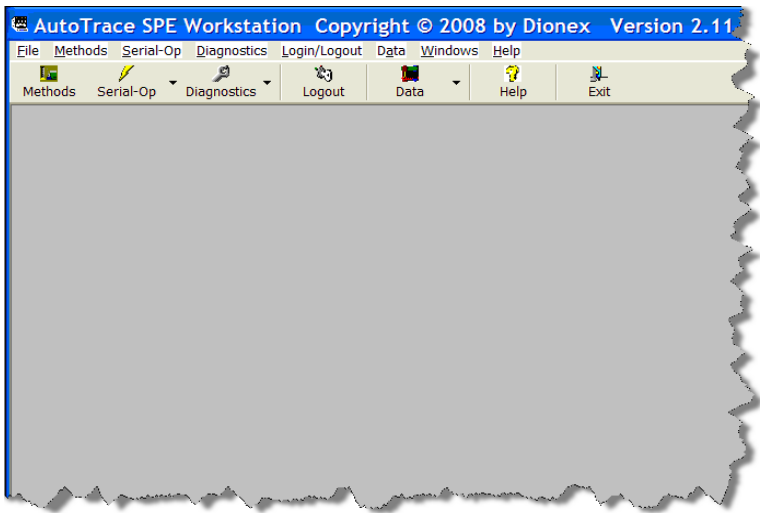


Figure 42. AutoTrace Main Window

File Menu

The File menu contains the options shown in Figure 43.

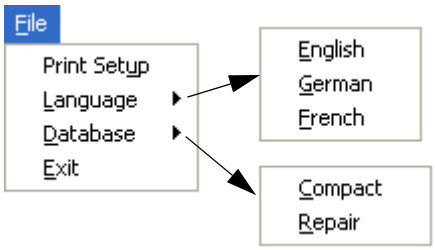


Figure 43. File Menu

Print Setup

Change printer settings such as the standard printer, page size, and format.

Language

Change the language between English, German, and French.

Database

Compact - As data changes in the database, the database file can become fragmented and use more disk space than necessary. Periodically, compact the database to defragment the database file. The compacted database is usually smaller.

Repair - This method attempts to repair a database that was marked as possibly corrupt by an incomplete write operation. This can occur if an application is closed unexpectedly because of a power outage or computer hardware problem. The database won't be marked as possibly corrupt if the application is closed in the usual way.

Exit

Quit the AT program. Click the **Yes** button to close the software. If there is any window open in editing mode, make sure that you first save the data.

Methods Menu

Selecting **Methods** from the main menu opens the Setup Methods window. This allows you to write a new method and edit values, as well as print the method steps and the parameter or solvent settings. For more details, refer to “Writing a Method” on page 76.

Serial-Op Menu

The Serial-Op menu contains the options shown in Figure 44.

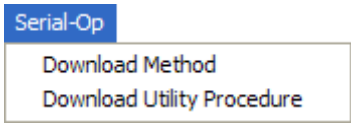


Figure 44. Serial-Op Menu

Use the Serial-Op menu to download AutoTrace methods and utility methods.

NOTE

Code 8192 means that the method or utility file downloaded successfully. Refer to page 125 for a list of other codes.

Download Method

Downloads an AutoTrace method to the AutoTrace Workstation.

- If the editing window for methods is open, the current method is downloaded to the AutoTrace.
- If the method window is not open, the Find Method window opens. Choose the method to download by double-clicking it.

  A DOS window opens, indicating the method is being downloaded. The download takes a few minutes to complete, depending on the size of the method and if other files are needed during the download process. After the method is downloaded, either press the **CONT** button or power-cycle the AutoTrace and follow the on-screen instructions on the AutoTrace to run the method.

Download Utility Procedure

Downloads one of four utility methods to the AutoTrace Workstation:

- **Purge Solvents** (purges the AutoTrace solvent lines)
- **Benchmark Test** (tests general AutoTrace operation)
- **Calibrate Pump** (calibrates the AutoTrace sample pumps)
- **Set Date and Time** (sets the AutoTrace date and time)

Diagnostics Menu

The Diagnostics menu contains the options shown in Figure 45. Use this menu to copy a diagnostic file onto the AutoTrace Workstation. For more details, refer to “Diagnose Problems” on page 113.

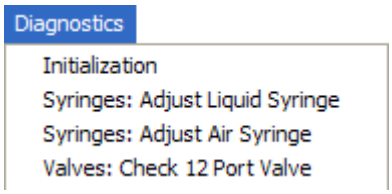


Figure 45. Diagnostics Menu

Initialization

Diagnose the reason for an AutoTrace failing to initialize properly.

Syringes: Adjust Liquid Syringe

Check the integrity of the liquid handling syringe drive mechanism.

Syringes: Adjust Air Syringe

Check the integrity of the air syringe drive mechanism.

Valves: Check 12-Port Valve

Confirm the positioning integrity of the 12-port valve.

Valves: Purge Solvents

Prime or drain the liquid lines.

Login/Logout Menu

The Login/Logout menu contains the options shown in Figure 46.

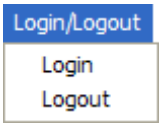


Figure 46. Login/Logout Menu

Login

Register as a user, with access rights given by the system supervisor. Selecting **Login** from the menu opens the User Identification window (see Figure 47). Type a **User ID** and **Password**, and then click the **OK** button. The default User ID is ADMIN and the default password is ADMIN.

Login/Logout Menu (Continued)

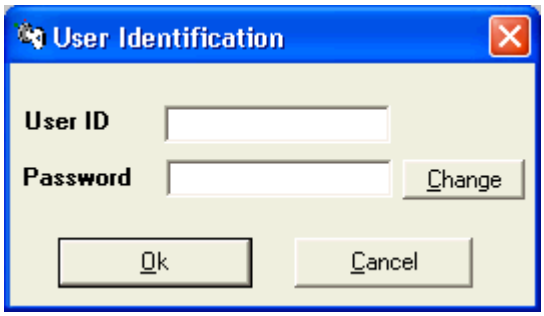


Figure 47. User Identification Window

If the registration is successful, your User ID displays in the status bar at the bottom of the window.

Change Password

To change a password, open the User Identification window and click the **Change** button. The Change Password window opens, as shown in Figure 48. Type the **old password**, the **new password**, repeat the **new password**, and click the **OK** button.

Figure 48. Change Password Window

Logout

Log out of the software by selecting **Logout** from the menu. Your access rights are changed to READ-ONLY mode. The status bar shows “No user logged in”.

Data Menu

The Data menu contains the options shown in Figure 49.

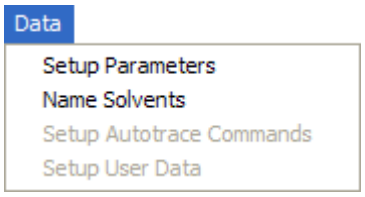


Figure 49. Data Menu

Setup Parameters

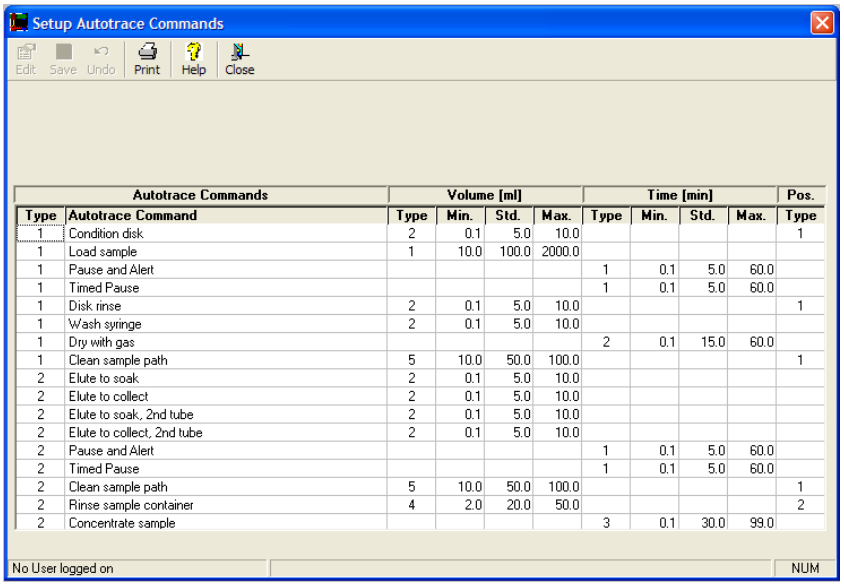
Set parameters to meet method specifications. For more information, refer to "Specifying Parameter and Solvent Information" on page 69.

Name Solvents

Specify solvent information. For more information, refer to "Specifying Parameter and Solvent Information" on page 69.

Setup AutoTrace Commands

Change standard options for method steps. Only the values in the Std. column can be changed. The Setup AutoTrace Commands window is shown in Figure 50. (This menu option is available only if the user type selected in the Setup User Data window (see Figure 51) corresponds to Service.)



Autotrace Commands		Volume [ml]				Time [min]				Pos.
Type	Autotrace Command	Type	Min.	Std.	Max.	Type	Min.	Std.	Max.	Type
1	Condition disk	2	0.1	5.0	10.0					1
1	Load sample	1	10.0	100.0	2000.0					
1	Pause and Alert					1	0.1	5.0	60.0	
1	Timed Pause					1	0.1	5.0	60.0	
1	Disk rinse	2	0.1	5.0	10.0					1
1	Wash syringe	2	0.1	5.0	10.0					
1	Dry with gas					2	0.1	15.0	60.0	
1	Clean sample path	5	10.0	50.0	100.0					1
2	Elute to soak	2	0.1	5.0	10.0					
2	Elute to collect	2	0.1	5.0	10.0					
2	Elute to soak, 2nd tube	2	0.1	5.0	10.0					
2	Elute to collect, 2nd tube	2	0.1	5.0	10.0					
2	Pause and Alert					1	0.1	5.0	60.0	
2	Timed Pause					1	0.1	5.0	60.0	
2	Clean sample path	5	10.0	50.0	100.0					1
2	Rinse sample container	4	2.0	20.0	50.0					2
2	Concentrate sample					3	0.1	30.0	99.0	

Figure 50. Setup AutoTrace Commands Window

Data Menu (Continued)

Setup User Data

The Setup User Data window (see Figure 51) allows you to edit user data such as user name, User ID, Password, user type, and access rights. This menu option is available only if your user type corresponds to Administrator.

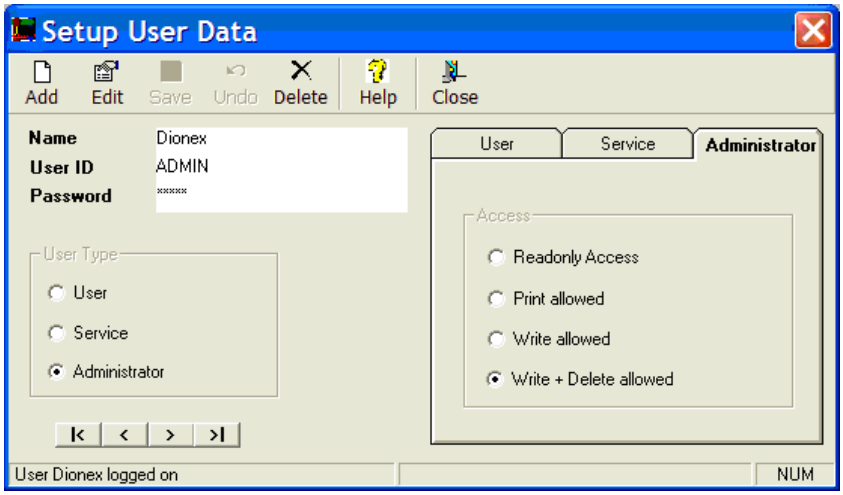


Figure 51. Setup User Data Window

To change the user type, choose the **user type** in the User Type box on the left. After choosing the user type, the corresponding tab on the right switches to User, Service, or Administrator.

User - Manage methods, parameter and solvent settings, serial operations, and diagnostics.

Service - Manage additional command settings (in the Setup Commands menu option).

Administrator - Manage additional user data.

The access rights for the user type are displayed on the right of the Setup User Data window:

- Read-only mode
- Print mode
- Write mode
- Delete mode

Windows Menu

The Windows menu contains the options shown in Figure 52.

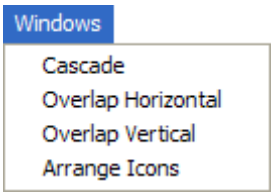


Figure 52. Windows Menu

Cascade

Stack and overlap the windows diagonally. Cascade allows the entire top window to be visible, but only the title bars of the remaining windows are visible.

Overlap Horizontal

Stack and overlap the windows horizontally.

Overlap Vertical

Stack and overlap the windows vertically.

Arrange Icons

If any windows are minimized, use Arrange Icons to arrange the icons neatly at the bottom of the main window.

Help Menu

The Help menu contains the options shown in Figure 53.

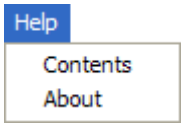


Figure 53. Help Menu

Contents

Shows the Help contents and the index. While working with the program, open the Help window by pressing the **F1** key.

About

Opens the About window, which contains additional information about the AutoTrace system.

Running AutoTrace Utility Methods

A number of utility methods are provided by the AutoTrace software. These utilities are used for:

- Purging the AutoTrace solvent lines
- Setting the AutoTrace date and time
- Testing general AutoTrace operation
- Calibrating the AutoTrace sample pumps

To run a utility method:

1 From the AutoTrace main menu, choose **Serial-OP→Download Utility Procedure**.

2 Click **one of the four buttons** (see Figure 54) to select an AutoTrace utility.

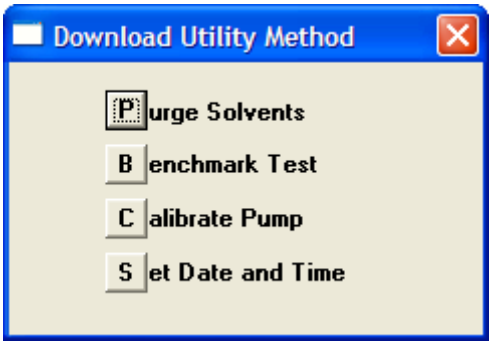


Figure 54. Download Utility Method Window

3 The selected utility will be downloaded to the AutoTrace. Press the **CONT** button **twice slowly** on the AutoTrace to run the utility. *Allow at least 2 seconds between presses.*

Purging the Solvent Lines Utility

Purge the entire length of the solvent lines any time they are dry. (For example, when the workstation is being used for the first time each day or whenever the solvent supply runs out.) To purge the solvent lines, download the Purge Solvent utility method provided or write your own purge method. Purging the sample lines is described in “Customizing a Method to Purge Less than Five Solvent Lines” on page 67.

Customizing a Method to Purge Less than Five Solvent Lines

To save a method to purge the solvent lines when you will not be using all five solvent ports, do the following. For more details, refer to “Writing a Method” on page 76.

1 From the AutoTrace main menu, choose **Methods**.

2 Click the **New** button.

3 Name the method “Purge Solvent Path - Custom”.

4 Specify the **maximum number of samples** that can be run.

   a Select **WASH SYRINGE** once for each solvent port being used. Specify a volume of 5 mL.

   b For example, when using three solvent ports, the purge method would consist of these steps:
   - Process “3” samples using the following method:
   - Step 1: WASH SYRINGE with 5 mL of SOLVENT 1
   - Step 2: WASH SYRINGE with 5 mL of SOLVENT 2
   - Step 3: WASH SYRINGE with 5 mL of SOLVENT 3

5 Click the **Save** button.

6 From the AutoTrace main menu, choose **Serial-OP→Download Method**.

Setting the Date and Time Utility

The AutoTrace clock is factory-set at USA Eastern time. If your time zone differs, save and run this method to reset the real-time clock in the workstation as follows:

1 From the AutoTrace main menu, choose **Serial-OP→Download Utility Procedure**.

2 Click the **Set Date and Time** button. The system date and time (+ 2 minutes) of your computer is written to the AutoTrace Workstation.

3 After about one minute, a beep signals that the workstation is ready to update its date and time using the values from the method.

Setting the Date and Time Utility (Continued)

4 Press the **CONT** button on the workstation's front panel display. The workstation's date and time are immediately updated.

Once set, the time is maintained even when power to the workstation is turned off.

Testing General Operation (Benchmark Test) Utility

1 From the AutoTrace main menu, choose **Serial-OP→Download Utility Procedure**.

2 Click the **Benchmark Test** button.

NOTE

Refer to "Benchmark Test Utility" on page 141 for instructions on how to run this utility.

Calibrating the Sample Pumps Utility

1 From the AutoTrace main menu, choose **Serial-OP→Download Utility Procedure**.

2 Click the **Calibrate Pump** button.

NOTE

Refer to "Calibrating Sample Pumps" on page 139 for instructions on how to run this utility.

Creating a Method to Clean the Sample Lines with Solvent and DI Water

Before beginning routine operation with the AutoTrace SPE Workstation, a method is needed for cleaning the sample lines. If the method does not end with CLEAN SAMPLE PATH steps (see "Clean Sample Path" on page 87), run this method between sample runs to clean the lines. Also, whenever the workstation is idle for a period of time, run this method to clean the lines and leave the lines filled with DI water. To create the method, perform the following steps. For more details, refer to "Writing a Method" on page 76.

1 From the AutoTrace main menu, choose **Methods**.

2 Click the **New** button.

3 Name the method "Clean Sample Path - Solvent & Water".

Creating a Method to Clean the Sample Lines with Solvent and DI Water (Continued)

4 Specify the maximum number of samples that can be run.

5 Choose **Clean Sample Path**. Specify a volume of 25.0 mL and select **Solvent Waste** as the Waste Position.

6 If the solvent used for the first Clean Sample Path step is immiscible in water, repeat the Clean Sample Path selection. Specify a volume of 25.0 mL and choose **Solvent Waste** as the Waste Position. Otherwise, skip to step 7.

7 Repeat the Clean Sample Path selection. Specify a volume of 25.0 mL and choose **Aqueous Waste** as the Waste Position.

For each CLEAN SAMPLE PATH step, the workstation pauses for the sample lines to be placed in a beaker of:

- Solvent for the first step
- Intermediate solvent for the second step, if necessary
- Water for the last step

8 Choose **Dry With Gas** and specify a time of 0.5 minutes to remove the water from the solvent path. This step is very important because it removes the water between the switching valve and the column.

WARNING

Only inert gases such as nitrogen, argon, or compressed air (free from oil) should be used.

9 Click the **Save** button.

10 From the AutoTrace main menu, choose **Serial-OP→Download Method**.

Specifying Parameter and Solvent Information

Specify the parameter and solvent information, using the two choices available from the DATA program option.

Default Entries

The two choices from the DATA program option are SETUP PARAMETERS and NAME SOLVENTS, beginning with default entries.

Default Setup Parameter Entries

If the method does not specify flow rates[1], begin with the default setup parameters. Observe workstation operation and examine the recovery data to determine if any modifications need to be made.

Additional Parameter Information

For tips on parameter settings, refer to the Help screens by pressing the **F1** key. Also review the “Application Tips” on page 93.

Default Solvent Names

You can choose to keep the default solvent names (SOLVENT 1, SOLVENT 2, etc.) or specify the actual names of the solvents to be used. Specify “Not Used” for any solvent ports that do not have solvents connected.

These names appear in a selection list whenever you write a method step requiring solvent. The name of the selection appears in the method step display and printout.

Recalling Default Entries

You can recall global default entries at any time by pressing the **Default** button on the Setup Parameters window that is accessed from the Data menu. Global default parameters include flow rates, SPE parameters, and workstation parameters. See Figure 55.

1. Contact the column or disk manufacturer for their recommended flow rates.

Recalling Default Entries (Continued)

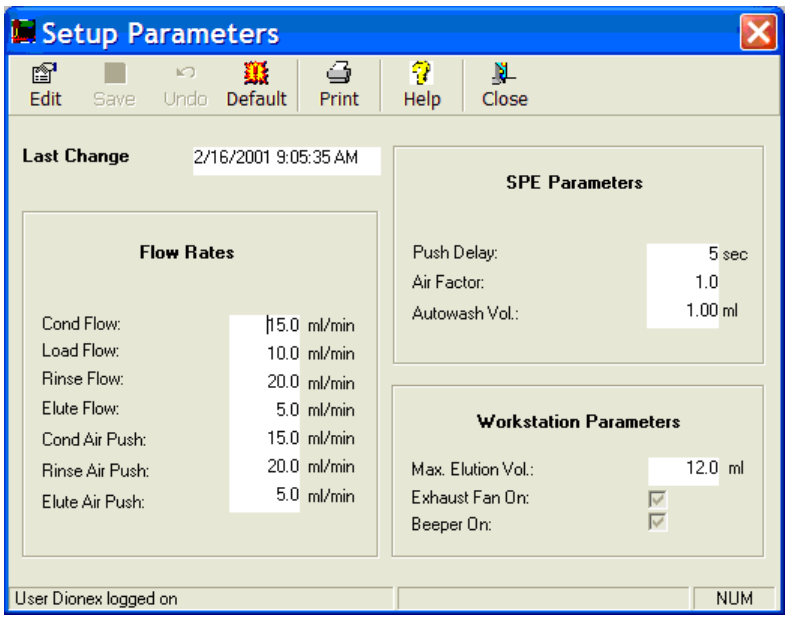


Figure 55. Global Setup Parameters Window

NOTE

*This window is not the same as the local Setup Parameters window (which contains parameters that are local to the specific method) that can be opened from within the Setup Methods window. The **Default** button does not appear on the local Setup Parameters window.*

Changing Setup

A brief description of each setup parameter is included in:

- Table 3:Flow Rate Definitions on page 73
- Table 4:SPE Parameters on page 74
- Table 5:Workstation Parameters on page 74
- Table 6:Maximum Elution Volumes on page 75

To change the setup parameters:

1 From the AutoTrace main menu, choose **Data→Setup Parameters**.

2 Click the **Edit** button. The Setup Parameters window opens, as shown in Figure 56.

Use the arrow keys to move to the field that requires changing and specify the new value. The window displays the minimum and maximum values allowed.

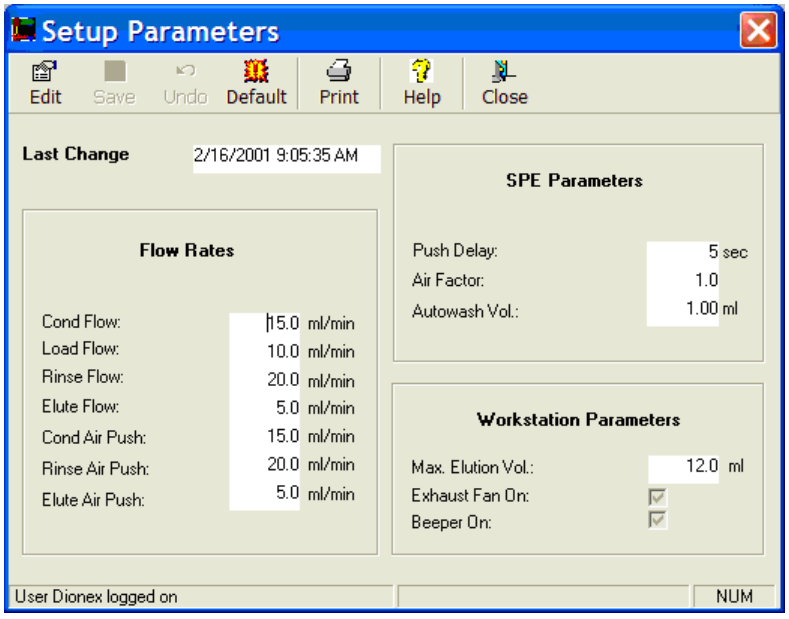


Figure 56. Setup Parameters Window

3 Click the **Save** button.

To recall the default entries, click the **Default** button.

Values shown in Table 3 are for both the Column and Disk versions of the AutoTrace Workstation, unless otherwise specified.

Changing Setup (Continued)

Table 3. Flow Rate Definitions

Flow Rate	Definition	Range
Cond Flow	Flow rate at which the syringe will push conditioning solvent through the column.	0.6 to 40.0 mL/min.
Load Flow	Flow rate at which the pump will push sample through the column.	1.0 to 30.0 mL/min. (Cartridge version) 2.0 to 60.0 mL/min. (Disk version)
Rinse Flow	Flow rate at which the syringe will push rinse solvent through the column.	0.6 to 40.0 mL/min.
Elute Flow	Flow rate at which the syringe will push elution solvent through the column.[a] [b]	0.6 to 40.0 mL/min.
Cond Air Push	Flow rate when the air syringe clears liquid from the syringe and tubing after a conditioning step.	0.6 to 40.0 mL/min.
Rinse Air Push	Flow rate when the air syringe clears liquid from the syringe and tubing after a column rinse step.	0.6 to 40.0 mL/min.
Elute Air Push	Flow rate when the air syringe clears liquid from the syringe and tubing after an elution step.[c] [d]	0.6 to 40.0 mL/min.
Push Delay	Time delay after liquid is pushed into the column path before the next operation begins. It allows time for pressure in the column to dissipate.[e]	0 to 999 seconds

a. If any flow rate is set too high, excessive pressure will result and the syringe may stall.

b. Most applications show higher recoveries at slower flow rates.

c. Air Pushes are used to evacuate the lines and ensure solvent delivery.

d. Air Push rates should initially be set equal to their corresponding flow rate. For example, if the Rinse Flow rate is set to 18, set Rinse Air Push to the same. Then, if either can be increased for better throughput without negative effects, your final Air Push rate may differ from its corresponding flow rate.

e. This parameter is useful when transferring viscous liquids.

Changing Setup (Continued)

Values shown in Table 4 are for both the Column and Disk versions of the AutoTrace Workstation, unless otherwise specified.

Table 4. SPE Parameters

SPE Parameter	Definition	Range
Air Factor	Sets the distance that liquid is pushed beyond the 12-port valve in CONDITION COLUMN (or CONDITION DISK) and ELUTE TO SOAK method steps. [a] [b]	0.3 to 5.0 (Cartridge version) 0.0 to 5.0 (Disk version)
Autowash Vol	Allows the workstation to automatically prewash the liquid handling syringe with the next solvent during operations such as CONDITION COLUMN (or CONDITION DISK), RINSE COLUMN (or RINSE DISK), and ELUTE.[c] [d] [e]	0 to 10 (zero turns Autowash Off)

a. Reduce this factor to decrease the amount of air between multiple conditioning steps.

b. Increase this factor to advance solvent and avoid soaking of the column.

c. **Alternative:** Place a WASH SYRINGE step in the method where needed.

d. When going between immiscible solvents in your method, use the WASH SYRINGE method step with an intermediate solvent.

e. Occurrence of Autowash steps appear on the front panel display during operation but do not appear in the method printout. Therefore, for auditing purposes, we suggest that you turn off Autowash (set to zero) and use WASH SYRINGE steps where needed.

Table 5. Workstation Parameters

Workstation Parameter	Definition	Range
Max Elution	Maximum volume that can be eluted onto the collection container for safe handling, as listed in Table 6.	See Table 6
Exhaust Fan On	Enable or disable the exhaust fan for solvent vapor removal during operation.	Y or N
Beeper On	Enable or disable the workstation's beeper.	Y or N

Changing Setup (Continued)

Table 6. Maximum Elution Volumes

Container	Maximum Volume
16 x 100 mm tube	12 mL
17 x 60 mm vial	7 mL
11 mm GC vial	1.5 mL
4 mL screw cap vial	4 mL
15 mL conical tube	20 mL

Change Solvent Names

To change the solvent names:

1 From the AutoTrace main menu, choose **Data→Name Solvents**. The Edit Solvent Sets window opens, as shown in Figure 57.

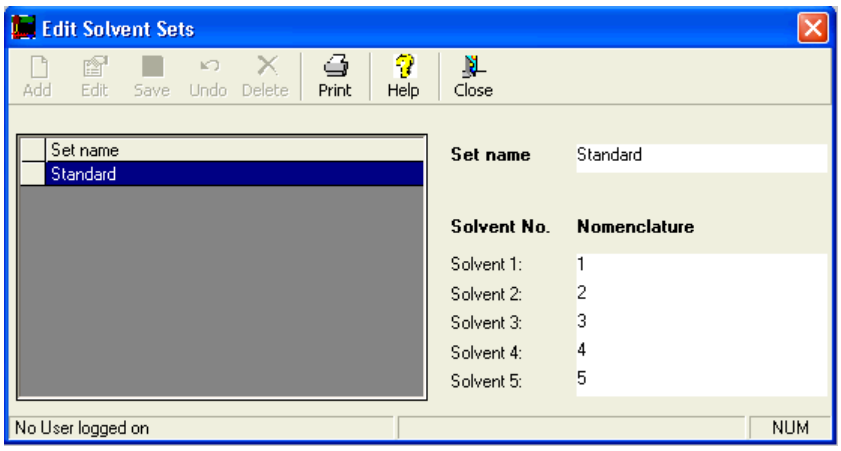


Figure 57. Edit Solvent Sets Window

2 Select **one item** in the list of the available solvent sets on the left side, and then click the **Edit** button or click the **Add** button to create a new solvent set. Each solvent set can be named (Set name) and has five solvents. Up to 25 characters are allowed for the Set name.

Use the arrow keys to move to the field that requires changing and specify the name of the solvents used in your method. Up to 15 characters are allowed for each solvent name.

NOTE

Type “Not Used” for any unused solvent port.

Change Solvent Names (Continued)

3 Click the **Save** button.

4 To delete a complete solvent set, click the **Delete** button.

Writing a Method

Choose **Methods** from the main menu to manage the methods. The Setup Methods window opens, as shown in Figure 58.

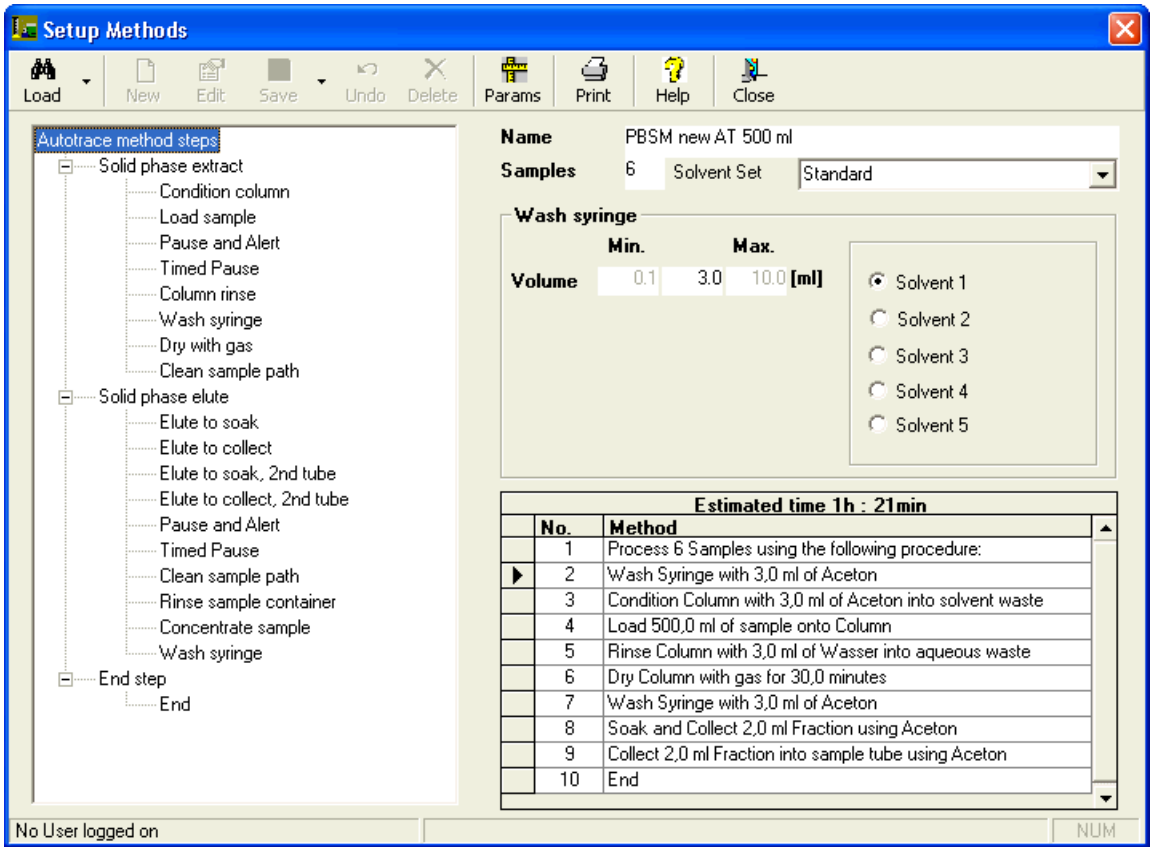


Figure 58. Setup Methods Window

The last method opened displays in the Setup Methods window. To choose a different method, click the **Load** button to open the Find Method window (see Figure 59) and double-click the method that you want to open. The selected method is loaded in the Setup Methods window.

Writing a Method (Continued)

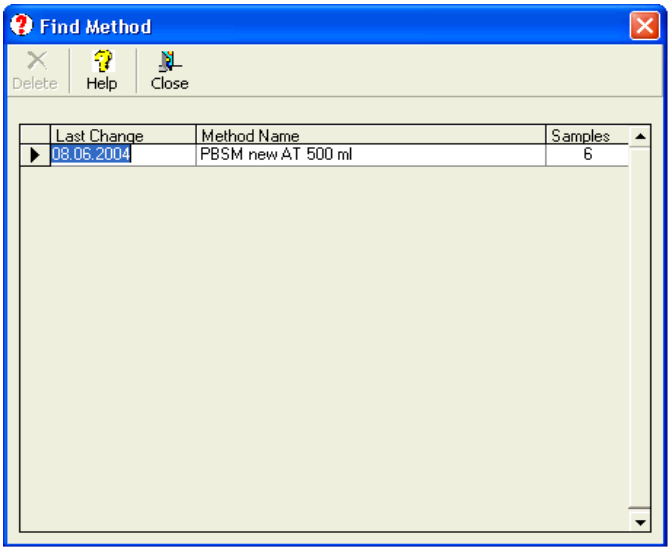


Figure 59. Find Method Window

Buttons in Setup Methods Window

See Figure 58 on page 76.

Load Button

Loads an archived method from the database.

New Button

Allows you to write a new method.

The Method window prompts for the method name, the number of samples to be run, and the selections for defining the method steps.

Method Name - Type a name for the method, up to a maximum of 38 characters. Spaces and any characters can be used.

Samples - Type the **number of samples to process** when the method runs. This information is used for time-estimating purposes only. Specifying the number of samples causes the first line of the method to change.

Example for only two samples:

Step 1: Process 2 samples, using the following method steps:

Default value: 6

Solvent set - Select a solvent set with up to five solvents by clicking the **button next to the solvent** in the solvent box.

Writing a Method (Continued)

Edit

Edit mode for the method. Any data can be changed. For details, refer to the New function description.

Save

Save data being changed after the New or Edit functions.

Undo

Recall the last entries before starting edit mode.

Delete

Delete a method. Before deleting, you are asked if you want to delete the method. After deleting the method, the method is obsolete and cannot be recalled.

Params

Change the setup parameters of the method. Each method has its own set of parameters. Parameters are initially set at default values. For more details, refer to “Changing Setup” on page 72.

Print

Print the method. The printout includes:

- The AutoTrace SPE software version and the method title
- A listing of the method steps
- A record of the setup parameters

Help

Press the **F1** key to open the Help window.

Close

Close the Setup Methods window.

Writing a Method (Continued)

Adding a Method Step

To add a new method step:

1. In the AutoTrace commands list on the left side of the Setup Methods window, double-click a step under either the **Solid Phase Extract** or **Solid Phase Elute** heading.

   The step will be inserted in the line below the arrow.

2. Specify the **volume or time** in the box above the method steps.

3. If applicable, choose a **waste position**.

4. If applicable, choose a **solvent**.

Deleting a Method Step

Double-click the method step to be deleted in the list of method steps on the right side of the Setup Methods window.

NOTE

The first step (“Process x samples using...”) and the last step (“End”) can't be deleted.

Writing a Method (Continued)

Solid Phase Extract Commands

The Solid Phase Extract commands (found on the left side of the Setup Methods window) specify the steps prior to sample elution. The solid phase extract menu is shown in Figure 60. An example method is provided in “Method Example” on page 90.

NOTE

Figure 60 shows commands for the Column version of the AutoTrace Workstation. The Disk version of the AutoTrace Workstation will display the word “Disk” instead of “Column”.

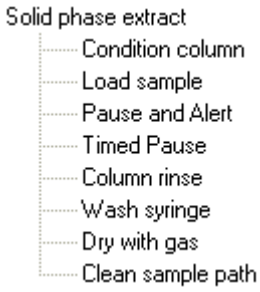


Figure 60. Solid Phase Extract Menu

Condition Column or Condition Disk

To activate the SPE column or disk, specify a volume and solvent to be passed through the column or disk, with the effluent directed to a solvent or aqueous waste position.

For more than one solvent, repeat this selection as many times as necessary.

NOTE

After this step is performed, a small volume of air (affected by the Air Factor parameter setting) is used to push solvent past the 12-port and switching valves. The air push clears the lines between the switching valve and column or disk of any remaining solvent prior to the next conditioning, column or disk rinsing, or sample loading step.

Solid Phase Extract Commands (Continued)

Load Sample

To load sample onto the SPE column or disk, specify a volume of sample to be transferred from the sample container to the SPE column or disk. Sample is passed through the column or disk and the effluent directed to aqueous waste.

NOTES

- *To get the entire sample and/or compensate for the pump's ±2.5% accuracy, adjust the column or disk entry.*
- *With samples containing large amounts of solids, it is advisable to over-pump sample onto the column or disk by 5% to 7%. For example, if the desired sample volume for the LOAD SAMPLE step is 1000 mL, specify 1050 mL.*
- *If the sample contains volatile compounds, avoid sample evaporation during the conditioning steps by placing a PAUSE AND ALERT step before the LOAD SAMPLE step. See a description of the steps below.*

Pause

To add a pause in workstation operation, select either a timed delay step (in minutes) or a “pause and alert” step that signals the operator until the **CONT** button is pressed.

Examples:

PAUSE AND ALERT - Use this step to alert the operator for sample container introduction when the workstation is done with the column or disk conditioning. This is useful when a sample contains volatile compounds.

TIMED PAUSE - After conditioning, this step introduces a time delay to increase contact time between solvent and column or disk packing material.

Solid Phase Extract Commands (Continued)

Column Rinse or Disk Rinse

To clear the lines before eluting, specify a volume and solvent (usually DI water) to be passed through the column or disk and specify whether the effluent is directed to the solvent or aqueous waste position.

For more than one solvent, repeat this selection as many times as necessary.

NOTES

- *In contrast to a CONDITION COLUMN (or CONDITION DISK) step, when a COLUMN RINSE (or DISK RINSE) step is performed, a larger volume of air is used to push solvent through the entire solvent path. Therefore, it is advisable to use this step to rinse the column or disk with solvent after loading the sample onto the column or disk.*
- *If the manual method requires a "rinse with water" without allowing the water to leave the column or disk, use a CONDITION COLUMN (or CONDITION DISK) step rather than a COLUMN RINSE (or DISK RINSE) step so that a smaller air push is used.*
- *Always rinse the column or disk after sample loading to clear the lines of conditioning solvent before eluting, especially if the Air Factor is less than 1.*

Solid Phase Extract Commands (Continued)

Wash Syringe

Whenever the next step requires a solvent different from the previous step, perform this operation. Specify a solvent and volume to be used to wash the liquid handling syringe.

NOTES

- *At least 2 mL of solvent is a recommended starting point.*
- *Alternative: Use the Autowash feature, instead. For details, see the description in "Setup Parameters" on page 94.*
- *You must insert a WASH SYRINGE step with an intermediate solvent when going between steps that use immiscible solvents (even if Autowash is being used). For example:*

•
•

Rinse column with 10 mL of water into aqueous waste.

Added Wash Syringe Step --> Wash syringe with 2 mL of isopropyl alcohol.

Wash syringe with 2 mL of MeCl (or by Autowash).

Collect 5 mL fraction into sample tube, using MeCl.

•
•

Dry With Gas

To eliminate residual water, specify a time period (in minutes) during which gas passes from an external source through the SPE column. This is important when the elution solvent is not miscible in water.

NOTES

- *A recommended time is 15 minutes at 10 psi (0.7 bars) using zero-grade nitrogen with an in-line scrubber.*

Solid Phase Extract Commands (Continued)

- *This step is also used in "Creating a Method to Clean the Sample Lines with Solvent and DI Water" on page 68 to clean the sample path between batches of samples. The DRY WITH GAS step removes the liquid from the lines between the switching valve and column, leaving only water in the sample lines before the switching valve.*

Clean Sample Path

Use this selection at the beginning of the SPE method, at the end of the SPE method, or in a method of its own to flush and prime the sample lines and pumps between sample batches. Specify a volume and an effluent waste position of either aqueous waste or solvent waste.

NOTES

- *The CLEAN SAMPLE PATH step should be selected at least twice[1]. When the first CLEAN SAMPLE PATH step runs, the workstation pauses to place the sample lines into a beaker containing the elution volume. The workstation then pauses again to place the lines into a beaker of water when the second CLEAN SAMPLE PATH step runs.*
- *It is advisable to use CLEAN SAMPLE PATH steps in a separate method that is run between sample batches and at the end of a day. See "Creating a Method to Clean the Sample Lines with Solvent and DI Water" on page 68. If you prefer, use the steps from the method disk as the last steps in the method, instead.*

WARNING

Do not use acetone as a solvent to clean the sample path because it is harmful to the sample pumps.

1. If an intermediate solvent is required between the elution solvent and water, insert a third CLEAN SAMPLE PATH step using this solvent between these two steps.

Solid Phase Elute Commands

The Solid Phase Elute commands (found on the left side of the Setup Methods window) specify the steps that perform and follow sample elution. The solid phase elute menu is shown in Figure 61. An example method is provided in “Method Example” on page 90.

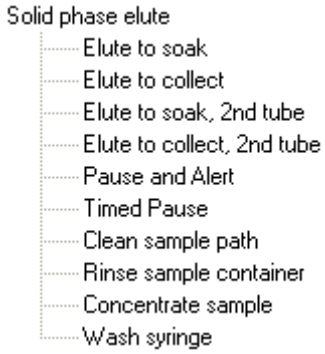


Figure 61. Solid Phase Elute Menu

NOTE

Before eluting, perform a COLUMN RINSE (or DISK RINSE) or DRY WITH GAS step to clear the lines.

Elute to Soak

Soak the column or disk with elution solvent or perform multiple elution steps with a minimal air push between them. Specify the solvent and volume to be introduced onto the column or disk, with any eluent directed to the collection container.

NOTES

- *Soaking the column or disk sometimes helps in the extraction of analytes by increasing the contact time between solvent and packing material, therefore maximizing elution efficiency.*
- *Using a minimum amount of air when performing multiple elution steps prevents column or disk drying.*

Solid Phase Elute Commands (Continued)

- *For a single ELUTE TO SOAK step, or for the first of multiple ELUTE TO SOAK steps, use a solvent volume of at least 3 mL to ensure that the elution solvent reaches the column or disk packing material. The tail end of the elution solvent is positioned in the flow path according to the air factor parameter - a higher air factor will position the end of the solvent closer to the column. Any subsequent elution steps can have smaller volumes.*
- *If the automated method doesn't require soaking or multiple elution steps, use the following ELUTE TO COLLECT step.*
- *An ELUTE TO SOAK step must be followed by an ELUTE TO COLLECT step. ELUTE TO COLLECT is ended by a larger air push that will push any remaining eluent into the collection container.*

Elute to Collect

To perform a sample elution, specify a solvent and a volume to be passed through the column or disk with the eluent directed to the collection container.

NOTES

- *In contrast to CONDITION COLUMN (or CONDITION DISK) and ELUTE TO SOAK, when ELUTE TO COLLECT is performed, a larger volume of air is used to push the sample through the entire path of liquid lines.*
- *Performing multiple ELUTE TO COLLECT steps is allowed as long as the maximum elution volume for the collection container is not exceeded, and the larger air push between each step is not a concern.*

Elute to Collect Second Tube

To elute up to double the volume allowed for the collection container, specify a solvent and volume to be passed through the same column or disk, with the eluent directed to a second sample container. This step causes the workstation to pause for the operator to change collection containers.

Solid Phase Elute Commands (Continued)

Pause

To add a pause in workstation operation, select either a timed delay step (in minutes) or a “pause and alert” step that signals the operator until the **CONT** button is pressed.

Examples:

PAUSE AND ALERT - Use this step to alert the operator for sample container introduction when the workstation is done with the column conditioning. This is useful when a sample contains volatile compounds.

TIMED PAUSE - After conditioning, this step introduces a time delay to increase contact time between solvent and column packing material.

Clean Sample Path

Use this selection at the beginning of the SPE method, at the end of the SPE method, or in a method of its own to flush and prime the sample lines and pumps between sample batches. Specify a volume and an effluent waste position of either aqueous waste or solvent waste.

NOTES

- *The CLEAN SAMPLE PATH step should be selected at least twice[1]. When the first CLEAN SAMPLE PATH step runs, the workstation pauses to place the sample lines into a beaker containing the elution volume. The workstation then pauses again to place the lines into a beaker of water when the second CLEAN SAMPLE PATH step runs.*
- *It is advisable to use CLEAN SAMPLE PATH steps in a separate method that is run between sample batches and at the end of a day. See “Creating a Method to Clean the Sample Lines with Solvent and DI Water” on page 68. If you prefer, use the steps from the method disk as the last steps in the method, instead.*

1. If an intermediate solvent is required between the elution solvent and water, insert a third CLEAN SAMPLE PATH step using this solvent between these two steps.

Solid Phase Elute Commands (Continued)

WARNING

Do not use acetone as a solvent to clean the sample path because it is harmful to sample pumps.

Rinse Sample Container

To rinse the sample container and elute to one of the three elution stations, specify the solvent volume that you will add to the sample container for rinsing and designate the elution station position.

This step causes the workstation to pause for you to add the solvent and swirl the sample container before it pumps the container's solvent through the column and into the solvent waste, aqueous waste, or collection containers.

Concentrate Sample

To concentrate the final eluent, specify the time in minutes for gas to flow into the collection containers.

This step causes the workstation to pause for you to replace the SPE columns with empty columns before gas flows into the collection containers.

Solid Phase Elute Commands (Continued)

Wash Syringe

Whenever the next step requires a solvent different from the previous step, perform this operation. Specify a solvent and volume to wash the liquid handling syringe.

NOTES

- *At least 2 mL of solvent is a recommended starting point.*
- *Alternative: Use the Autowash feature, instead. For details, see the description in "Setup Parameters" on page 94.*
- *You must insert a WASH SYRINGE step with an intermediate solvent when going between steps that use immiscible solvents (even if Autowash is being used). For example:*

•

•

Rinse column with 10 mL of water into aqueous waste

Added Wash Syringe Step --> Wash syringe with 2 mL of isopropyl alcohol.

Wash syringe with 2 mL of MeCl (or by Autowash).

Collect 5 mL fraction into sample tube, using MeCl.

•

•

End Method

This selection completes the entry of your method steps. This step is required for all methods.

Method Example

To give you a better idea of how to transfer a method into an AutoTrace method, a method example follows.

Manual Steps

The steps summarized below have been taken from a nitrogenous herbicide method as a demonstration of how to transfer a method to the AutoTrace Workstation.

1 Condition the SPE cartridge with two 10 mL aliquots of methanol.

2 Add 10 mL of reagent water to the SPE cartridge.

3 Pass 1 liter of prepared water sample through the SPE cartridge.

4 Wash the sample reservoir with 10 mL of reagent water and pass through the SPE cartridge to waste.

5 Dry the SPE cartridge under vacuum for 10 minutes.

6 Elute the SPE cartridge with 5 mL of ethyl acetate to collect.

7 Elute the SPE cartridge with 5 mL of methylene chloride to collect.

AutoTrace Method Example

The following AutoTrace method printout example shows how to automate the manual steps listed on the previous page.

Dionex AutoTrace Extraction Workstation 2.11.2

AutoTrace Extraction Method: Nitrogenous Herbicide Method

Step 1:	Process six samples using the following method	
Step 2:[a]	Wash syringe with 2 mL MeOH	
Step 3:	Condition column with 10 mL of MeOH into SOLVENT WASTE	1st part of manual step #1
Step 4:	Condition column with 10 mL of MeOH into SOLVENT WASTE	2nd part of manual step #1
Step 5:[a]	Wash syringe with 2 mL of WATER	
Step 6:	Condition column with 10 mL of WATER into AQUEOUS WASTE	manual step #2
Step 7:	Load 1000 mL of sample onto column	manual step #3
Step 8:	Rinse column with 10 mL of WATER into AQUEOUS WASTE	manual step #4
Step 9:	Dry column with gas for 10 minutes	manual step #5
Step 10:[a]	Wash syringe with 2 mL of EtOAc	
Step 11:	Collect 5 mL fraction into sample tube using EtOAc	manual step #6
Step 12:[a]	Wash syringe with 2 mL of MeCl	
Step 13:	Collect 5 mL fraction into sample tube using MeCl	manual step #7
Step 14:	END	

a. To eliminate all traces of the previous solvent before using the next solvent.

AutoTrace Method Example (continued)

SETUP PARAMETERS

AutoTrace Extraction Workstation

FLOW RATES		SPE PARAMETERS	
Cond Flow:	10.0 mL	Push Delay:	5 sec.
Load Flow:	10.0 mL	Air Factor:	1.0
Rinse Flow:	10.0 mL	Autowash Vol:[a]	0.00 mL
Elute Flow:	2.0 mL		
Cond Air Push:	10.0 mL	WORKSTATION PARAMETERS	
Rinse Air Push:	10.0 mL		
Elute Air Push:	10.0 mL	Max Elution Vol:	12.0 mL
		Exhaust Fan on: Y	Y=Yes, N=No
		Beeper On: Y	Y=Yes, N=No

a. Specifying 2 mL for the Autowash Volume allows the elimination of steps 2, 5, 10, and 12 in the method.

NAME SOLVENTS

Solvent 1: MeOH[a]

Solvent 2: WATER[a]

Solvent 3: EtOAc[a]

Solvent 4: MeCl[a]

Solvent 5: not used[a]

a. The corresponding solvent names are specified.

Application Tips

Once the method is written, it may require some fine-tuning to optimize sample recovery and/or sample throughput. The need for changes may be evident when first running the method, or when examining the recovery data from the sample run. If the recovery data looks good, test higher flow rates, shorter times, etc. to achieve a higher sample throughput.

Optimizing

When making changes to optimize the method, make them one at a time to evaluate the effect of the change.

The next few pages provide recovery data, setup parameter, and method step considerations for optimizing the automated method.

Sample Recovery

Table 7 describes three areas that can cause unacceptable recovery and should be investigated when optimizing sample recovery.

Table 7. Sample Recovery Optimization

Breakthrough[a]	Elution[b]	Internal Loss[c]
Conditioning steps	Solvent type	Sample path
Conditioning flow and air push rates	Solvent miscibility	Sample container
Solvent type	Solvent volume	
Solvent volume	Elution flow and air push rates	
Loading rate		

a. Can be determined by collecting aqueous waste and manually analyzing it for target compounds.

b. Sample retention - still on column or disk.

c. Sample adsorption.

NOTE

Sometimes sample recovery is optimized at the expense of sample throughput (e.g., slower flow rates and longer times).

Setup Parameters

Table 8 lists some considerations for setting the parameters in the automated method.

Table 8. Setup Parameters

If...	Then...
you need to improve recovery	decrease the flow rate(s)
you need to improve throughput	increase the flow rate(s)
the liquid handling syringe stalls	decrease the flow rate(s)
you are using viscous liquids	adjust the Push Delay
you need to decrease the amount of air between multiple conditioning steps	reduce the Air Factor[a]
you need syringe washing to appear in your method printout for auditing purposes	disable Autowash and use the WASH SYRINGE method steps where needed

a. When using an Air Factor less than 1, always perform a COLUMN RINSE (or DISK RINSE) after loading the sample.

Method Steps

Table 9 lists some considerations for designating the steps in the automated method.

Table 9. Method Step Considerations

If...	Then...
the sample contains volatile compounds	introduce samples to the workstation only when ready for them by placing a PAUSE AND ALERT step between conditioning and loading steps
the manual method requires a “rinse with water” step without allowing the water to leave the column or disk	use a CONDITION COLUMN (or CONDITION DISK) step rather than a COLUMN RINSE (or DISK RINSE) step, so that a smaller air push is used
you need an extended contact time between solvent and packing material	introduce a TIMED PAUSE step
the sample contains a large amount of solids	add 5% to 7% to your volume entry for the LOAD SAMPLE step
you are going between immiscible solvents in the method	perform a WASH SYRINGE step with an intermediate solvent before performing the next step (even if Autowash is being used)
you need syringe washing to appear in your method printout for auditing purposes	disable Autowash and use WASH SYRINGE method steps where needed
you are running with the Air Factor parameter set to less than one	you must perform a COLUMN RINSE (or DISK RINSE) step between sample loading and elution
the elution solvent is immiscible in water	eliminate channeling by performing a DRY WITH GAS step to remove all water from the column
you are not drying the column or disk after loading sample	you must perform a COLUMN RINSE (or DISK RINSE) step before elution
there is water in your extract	increase the pressure and/or time of the DRY WITH GAS step
the elution solvent is not reaching the packing material in the first ELUTE TO SOAK step	use a volume of 3 mL or greater in the elution step
you need to increase the contact time between solvent and packing material for extraction of analytes	use an ELUTE TO SOAK step before ELUTE TO COLLECT

Table 9. Method Step Considerations (Continued)

If...	Then...
you need to keep the amount of air introduced between multiple elution steps to a minimum	use an ELUTE TO SOAK step before ELUTE TO COLLECT
you need to collect more than the maximum elution volume of your collection container	use an ELUTE TO COLLECT, 2nd TUBE step to double the collection volume
you need to improve throughput	decrease times wherever possible
you need to improve recovery	refer to the Sample Recovery table
you need to run a solvent through the sample path (from sinkers, through the sample lines, sample pumps, switching valves, and columns, to a designated collection position) For example, in a conditioning step requiring 40 mL of water, rather than using four CONDITION COLUMN (or CONDITION DISK) steps of 10 mL, you can save time by using a single 40 mL CLEAN SAMPLE PATH step to aqueous waste. Follow with a PAUSE AND ALERT step for moving the lines from the water container to the sample containers.	use a CLEAN SAMPLE PATH step to designate either of the waste positions or use a RINSE SAMPLE CONTAINER step to designate either of the waste positions or the collection container position

Operation

This section describes the steps involved in operating the AutoTrace SPE Workstation. The information is divided into three major topics:

- Preparing the AutoTrace SPE Workstation for operation
- Running the AutoTrace SPE method
- What to do after running the method

Also see the “Method Development Checklist” on page 111 and the “Daily Operation Checklist” on page 112.

Preparing the AutoTrace SPE Workstation

To prepare the AutoTrace SPE Workstation for operation:

1 Turn on the workstation, using the power switch located on the right of the unit, toward the middle. After power-up, the workstation goes through a brief initialization.

NOTE

We recommend that you leave the workstation running unless it will not be used for an extended period of time.

2 To perform a DRY WITH GAS or CONCENTRATE SAMPLE method step, turn on the gas supply. Set the pressure no greater than 100 psi (6.9 bars). The gas supply should have sufficient reserve for the sample run.

3 Adjust the workstation's output gas pressure to the proper setting for running the method. A recommended operating setting is 10 psi (0.7 bars). Adjust the gas pressure, using the regulator knob provided on the left side of the unit.

4 Check that the solvent reservoirs are full and the tubing is fully submerged in reservoirs (use the tubing weights provided).

5 Check that all waste containers (side port, elution station solvent, and elution station aqueous waste) are empty.

6 Download the Purge Solvent method or run your customized purge method (see “Customizing a Method to Purge Less than Five Solvent Lines” on page 67). The method draws a sufficient amount of solvent from each port to prime the liquid lines.

Preparing the AutoTrace SPE Workstation (Continued)

7 Place a collection container in each elution rack position. Install the elution rack onto the two pins on the front of the elution station.

NOTE

The rack is symmetrical and can be positioned either way.

8 **Optional Step:** When using the AutoTrace Cartridge version, manually rinse the columns with MeCl or water. This prevents leakage around the column holder O-ring due to the presence of packing debris on the inside walls of the SPE column.

9 **For the AutoTrace Cartridge version:** Place columns in each holder to be used by sliding a column upward onto the bottom of the column holder's plunger. Push down on the lever until the assembly “clicks” into place and the holder's LED comes on. See Figure 62.

For the AutoTrace Disk version: Place disks in each holder to be used by opening the disk holder (by unscrewing the locking collar), squeezing the clip and moving it up toward the lever, and sliding the holder up. Push down on the lever until the assembly “clicks” into place and the holder's LED comes on. See Figure 63.

Preparing the AutoTrace SPE Workstation (Continued)

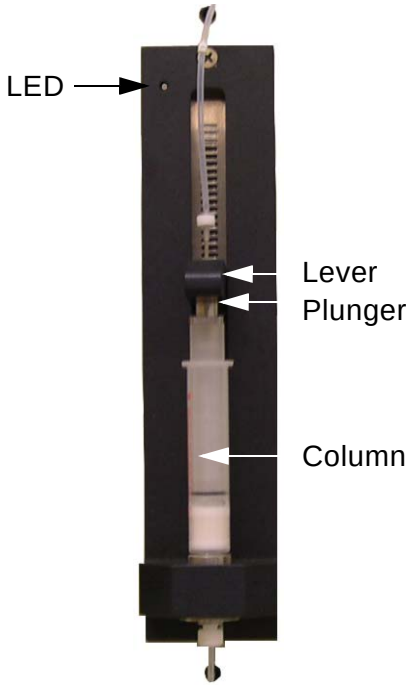


Figure 62. Column Holder Front View

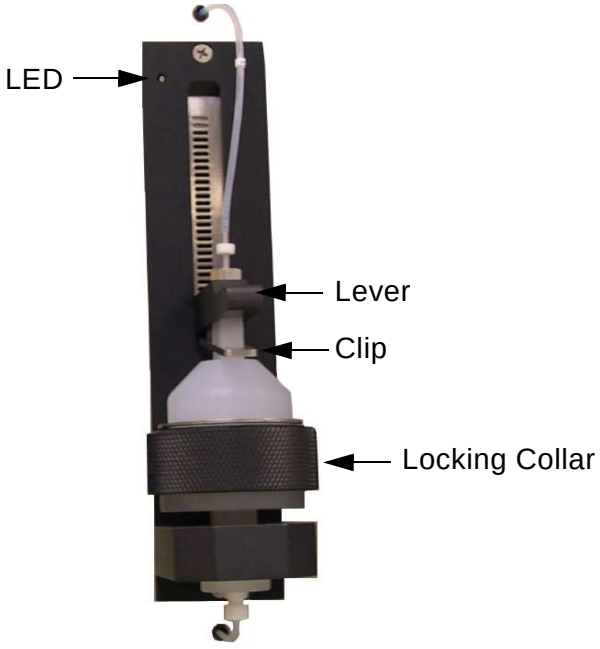


Figure 63. Disk Holder Front View

Preparing the AutoTrace SPE Workstation (Continued)

10 Place a sample container in each rack position to be used and insert the sample line with tubing weight into the appropriate container. Each sample line and each rack position is numbered to correspond to the numbered positions on the right side of the AutoTrace Workstation, as shown in Figure 64.

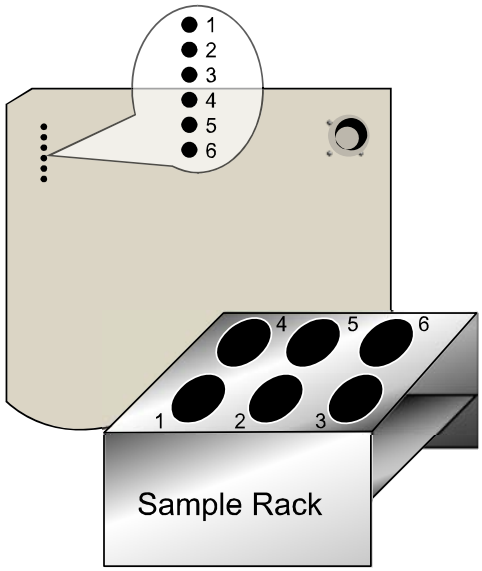


Figure 64. AutoTrace Workstation Right Side and Sample Rack

Running an AutoTrace SPE Method

The front panel controls are displayed in Figure 65 and their functions are described in Table 10.

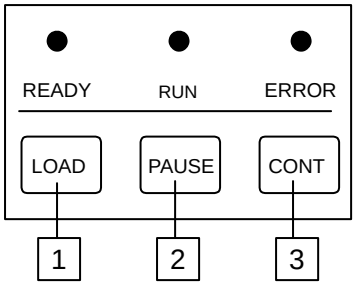


Figure 65. Front Panel Controls

Table 10. Front Panel Controls

#	Part	Function
1	**LOAD** button	Downloads software and a method when held down during power-up.
2	**PAUSE** button	Stops the workstation after it completes the step it is performing.
3	**CONT** button	Continues operation after using the **PAUSE** button, responding to the **ERROR** light, or after manual intervention. Also used to start a method or download a method.

There are two ways in which you can run an AutoTrace method:

- Pressing the **LOAD** button when the unit is turned on.
- Pressing the **CONT** button for subsequent runs of a previously loaded method.

LOAD Button Operation

To refresh all files on the unit's CPU board and load a method at power-up, press the **LOAD** button.

This initiates an "automatic startup sequence" that loads the operating software, "initializes" the workstation, and begins running the method.

LOAD Button Operation (Continued)

The workstation's automatic startup sequence that is initiated after pressing the **LOAD** button causes:

- The operating files and method to be loaded
- The workstation to beep and the front panel display to remind you to check for columns and tubes, to check the waste container, and prompt you to press **CONT** to acknowledge the reminders and continue
- The **RUN** light to come on
- The valves to click
- The sample processing to begin

CONT Button Operation

To start processing a new batch of samples after all samples from the prior run have been processed, press the **CONT** button ***twice slowly***.

This begins running the method without loading the operating system first.

NOTE

*Use caution when using the **CONT** button to start a method. If all steps haven't been run (the **PAUSE** button has been pressed), pressing the **CONT** button continues operation where it was before processing was interrupted - not at step #1.*

Front Panel Display During Operation

While the method runs, the front panel reports each step as it is performed and the time left for the operation, if applicable. For example, while a sample is being loaded (pumped) onto the column, the front panel displays:

LOADING SAMPLES
ONTO COLUMNS
@ 10 MLS/MIN
5 MINUTES LEFT

Front Panel Display During Operation (Continued)

NOTE

The Disk version of the AutoTrace Workstation will display "Disk" instead of "Column" on the front panel.

The display also reports when manual intervention is required and when the sample run is finished.

Front Panel Display Messages

Some method steps cause the workstation to pause operation and wait for manual intervention. When this happens, the workstation beeps (if the Beeper On parameter is set to YES) and the front panel displays a message prompting that an action is required. Table 11 lists the front panel messages.

NOTE

The Disk version of the AutoTrace Workstation will display "Disk" instead of "Column" in the messages.

Table 11. Front Panel Messages

Method Step	Front Panel Display
Rinse Sample Container	RINSE SAMPLE CONTAINER WITH xx ML PRESS CONT TO RESUME
Elute to Collect, 2nd Tube	SECOND ELUTION STEP REPLACE TUBES WITH NEW TUBES PRESS CONT TO RESUME
Concentrate Sample	CONCENTRATION STEP PLACE EMPTY COLUMNS IN THE HOLDERS PRESS CONT TO RESUME
Clean Sample Path	TO CLEAN SAMPLE PATH PLACE SAMPLE INPUT LINES INTO A BREAKER PRESS CONT TO RESUME

Table 11. Front Panel Messages (Continued)

Method Step	Front Panel Display
Pause and Alert	SYSTEM PAUSED PRESS CONT TO RESUME

When you complete the manual steps, press the **CONT** button so the workstation can proceed running the method.

Pausing Operation

To pause the method at any time, press the **PAUSE** button. The workstation stops and pauses after it completes the operation it was performing when the **PAUSE** button was pressed.

Continuing Operation

To resume the method from where it paused, press the **CONT** button.

Aborting

If you do not wish to continue workstation operation, abort the operation as follows:

1. Turn the power off.
2. Release the column or disk holders from the fully down position by squeezing the holder's lever and clipping them together, as shown in Figure 66.

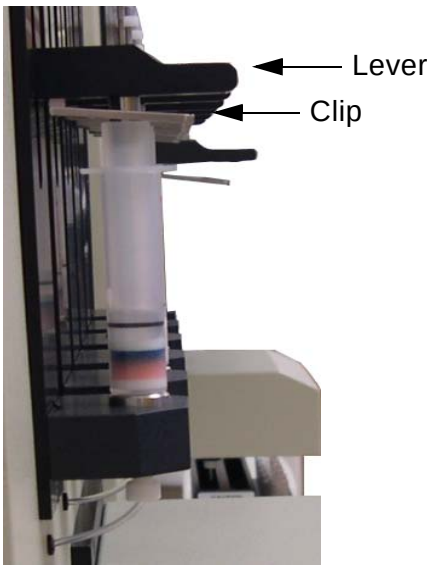


Figure 66. Column Holder - Side View

Aborting (Continued)

WARNING

Never leave the column or disk holders in the down position without the columns or disks in place because this can deform the O-ring.

3 Turn the power on.

Columns Leaking

If liquid is leaking through the O-ring of the column holder, fix the leak as follows:

1 Interrupt operation for that sample by releasing the column holder (refer to the "Aborting" method). This will turn off the sample pump.

2 Create a seal around the O-ring by using an up and down motion to lift up and reseat the holder.

3 The workstation will resume operation on that sample when the lever is pushed back into the down position and the holder's LED comes on.

NOTE

A small loss of sample will result when step #3 is performed.

Observe Operation

While the workstation runs the method for the first few times, observe operation and make note of any procedural changes that are desired (for example, changing flow rates or volumes). The need for changes may not be evident until the examination of the recovery data for the sample run. If necessary, refer to "Application Tips" on page 93.

Detecting Errors

The AutoTrace operating software detects hardware and system errors. Hardware errors pause operation[1], write a message to the display, and light the **ERROR** light. System errors pause operation and cause the **READY** light to flash.

Error Light Response

If the **ERROR** light comes on, check the front panel display for a message describing the error. Correct the error and resume operation by pressing the **CONT** button.

Flashing Ready Light Response

In the uncommon event of a system error (flashing **READY** light), follow the steps below:

1. Turn the power off and wait 15 seconds.
2. Press and hold the **LOAD** button while turning the power back on, and then release the **LOAD** button.
3. If the condition persists, the file may be bad. Download the method again.
4. If the condition still persists, contact Dionex Technical Support (see “Contact Us” on page 3).

Sample Run Completion

If the Beeper On parameter is set to YES, the workstation beeps every 60 seconds to alert you to the end of the sample run.

To...	You...
Silence the alarm	Press the **CONT** or **PAUSE** button.
Run the same method on another batch of samples	Press the **CONT** button after performing the necessary preparatory steps.

1. **Exception:** If a column or disk gets clogged and the sample pump stalls, the workstation stops processing that sample but continues processing all others. An error message (THESE DISK ARE BAD X X X X X X) is displayed on the screen, and the **ERROR** light comes on at the end of the sample run.

After Running the Method

After running your method:

- Make any necessary procedural changes (during method development)
- Test the changes
- Remove the used columns or disks
- Prepare to run the next batch of samples
- Clean up, if done for the day

Determine Required Changes

Based on the recovery data and operation observations during method development, changes may be needed in the AutoTrace SPE method. The Elute Flow and Load Flow parameters are usually the most critical settings. Refer to the method development guide published by the manufacturer of your SPE columns or disks for additional assistance. Also, use the AutoTrace online Help and refer to “Application Tips” on page 93.

NOTE

When making changes to optimize the method, make them one at a time to evaluate the effect of the change.

Make the Necessary Changes

To make changes:

1. Start the AutoTrace software.
2. From the AutoTrace main menu, choose **Methods**.
3. Press the **LOAD** button.
4. Double-click the desired method from the list.
5. Close the Find Method window.
6. Edit the method.
7. After making changes to the method, choose **Save Method**.

Test the Changes

To test the changes, run the method to evaluate the outcome of the changes.

Removing Used Columns

Remove the used columns (see Figure 67) by squeezing the holder's lever and clip together to release the column from the holder.

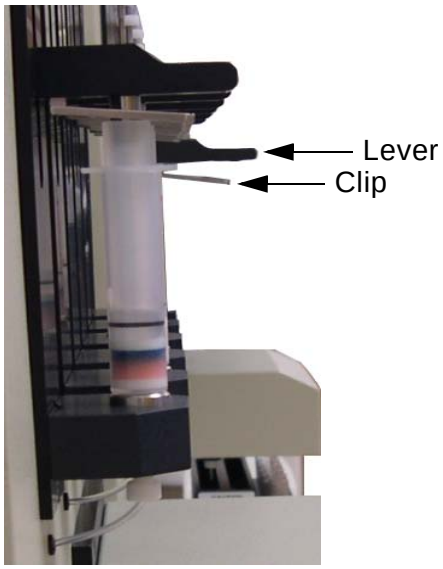


Figure 67. Column Holder - Side View

WARNING

Never leave the column holders in the down position without the columns in place because this can deform the O-ring.

Removing Used Disks

Remove the used disks by unscrewing the locking collar (see Figure 68), squeezing the clip and moving it up toward the lever, and sliding the holder up.

Removing Used Disks (Continued)

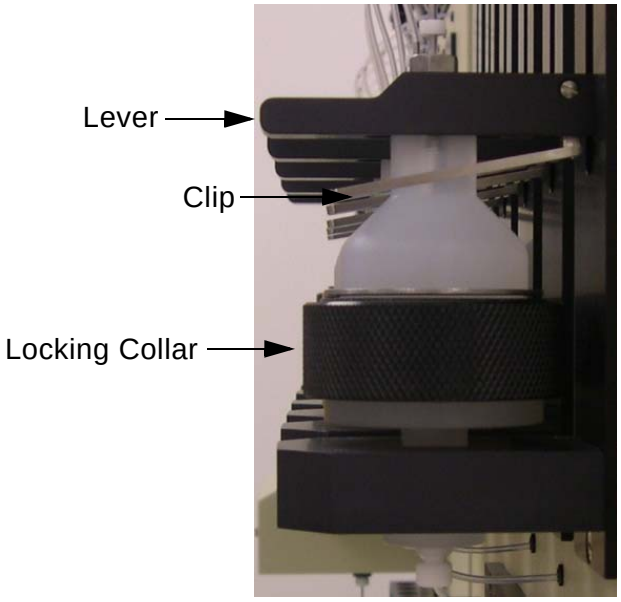


Figure 68. Disk Holder - Side View

Next Sample Batch Preparation

Unless the last steps of the method were CLEAN SAMPLE PATH steps, you need to clean the sample lines between batches of samples.

1 Place an empty column or disk in each holder and make sure each holder is in the fully down position, with the holder LED on.

2 Download the Clean Sample Path method that was saved to the database.

3 When the workstation pauses the first time, insert the sample lines into a clean container filled with a solvent.

Next Sample Batch Preparation (Continued)

WARNING

Do not use acetone as a solvent to clean the sample path because it is harmful to the sample pumps.

4 If the solvent used in step 3 is immiscible in water: When the workstation pauses the second time, remove the sample lines and insert them into a clean container filled with an intermediate solvent. Press the **CONT** button when ready. Otherwise, skip to step 5.

5 When the workstation pauses the last time, remove the sample lines and insert them into a clean container filled with deionized water. Press the **CONT** button when ready.

Daily Cleanup

When done using the workstation for the day:

- Empty the waste reservoirs
- Flush the solvent lines
- Flush the sample lines

Flushing the Solvent Lines

When using samples that tend to crystallize, or corrosive solvents that could attack valves or other AutoTrace parts over time, flush the solvent and sample lines with water or an inert, soluble solution whenever the workstation will not be processing samples. To flush the solvent lines:

1 Fill the solvent reservoirs with the solvent of choice for flushing and fully submerge the tubing.

2 Swirl the solvent in the containers to rinse the outside surface of the tubing and weights.

3 Download the method (created in either “Purging the Solvent Lines Utility” on page 66 or “Customizing a Method to Purge Less than Five Solvent Lines” on page 67) and press the **CONT** button ***twice slowly***.

4 When the workstation pauses, press the **CONT** button.

Flushing the Sample Lines

To flush the sample lines, refer to “Next Sample Batch Preparation” on page 109.

Method Development Checklist

Specify Your Method

- ❑ Run the AutoTrace software.
- ❑ Specify the parameter and solvent information.
- ❑ Write the method.
- ❑ Print and save the method.

Prepare the Workstation

- ❑ Turn on the workstation.
- ❑ Turn on and check the gas supply and set gauge (if applicable).
- ❑ Check the solvent reservoirs.
- ❑ Check/empty the waste containers.
- ❑ Purge the solvent lines.
- ❑ Load the elution rack.
- ❑ (Optional) Clean the columns or disks.
- ❑ Load the SPE columns or disks.
- ❑ Load the sample container rack.

Run the Method

- ❑ Load the method.
- ❑ Observe operation.
- ❑ Press the **CONT** or **PAUSE** button to silence alarm for end-of-run.

After Running the Method

- ❑ Based on recovery data and observations during operation, make any necessary procedural changes, using the METHODS program option.
- ❑ Remove the used columns or disks.
- ❑ Prepare to run the next batch of samples by cleaning the sample lines.

- ❑ If done for the day, clean up by emptying the waste reservoirs and flushing the solvent and sample lines.

Daily Operation Checklist

Prepare the Workstation

- ❑ Turn on the workstation.
- ❑ Turn on and check the gas supply and set gauge (if applicable).
- ❑ Check the solvent reservoirs.
- ❑ Check/empty the waste containers.
- ❑ Purge the solvent lines.
- ❑ Load the elution rack.
- ❑ (Optional) Clean the columns or disks.
- ❑ Load the SPE columns or disks.
- ❑ Load the sample container rack.

Run Your Method

- ❑ Load the method or press the **CONT** button to rerun a method on a different batch of samples.
- ❑ Intervene as required.
- ❑ Press the **CONT** or **PAUSE** button to silence alarm for end-of-run.

After Running the Method

- ❑ Remove the used columns or disks.
- ❑ Prepare to run the next batch of samples by cleaning the sample lines.
- ❑ If done for the day, clean up by emptying the waste reservoirs and flushing the solvent and sample lines.

Diagnose Problems

This section of the manual describes how to diagnose AutoTrace Workstation problems. This information is divided into:

- Error Messages
- AutoTrace Diagnostics
- Troubleshooting Guide

If you have any additional questions about diagnosing workstation problems, contact Dionex Technical Support (see “Contact Us” on page 3). When calling, please have the information recorded in the front of the manual ready for the Technical Support Representative.

Error Messages

Hardware errors pause operation, write a message to the front panel display, and light the **ERROR** LED. If the **ERROR** LED comes on, look at the front panel display for a message describing the error. After correcting the error, resume operation by pressing the **CONT** button.

Descriptions follow of the error messages displayed on the AutoTrace Workstation’s front panel display.

Front Panel Error Message

An example error message displayed on the front panel is shown below. Messages that appear for method steps and require manual intervention are described in “Front Panel Display Messages” on page 103.

Message	Action
METHOD FILE DID NOT APPEND CORRECT THE PROBLEM PRESS CONT TO RESUME	Download the method from the PC.
THESE DISK ARE BAD X X X X X X	Inspect the columns or disks for plugging. Inspect sample pumps for correct operation.

AutoTrace Diagnostics

The **Diagnostics** menu option in the AutoTrace software contains diagnostic routines that can be downloaded and run on the workstation. If there is a need to test, adjust, or replace AutoTrace components, and an AutoTrace diagnostic method needs to be run, refer to the "Downloading and Running an AutoTrace Diagnostic Method" on page 115.

Diagnostic List

The tables below list when various diagnostics are useful. Consult the **Diagnostics** online Help windows for the current selections and most up-to-date information and recommendations on how to save, run, repeat, and advance when using the diagnostic facility.

NOTE

You must read all online Help information before running any AutoTrace diagnostic.

Table 12. Diagnostic List

	When you want to...	Run the diagnostic...
Syringes	Check the integrity of the liquid handling syringe drive mechanism	Adjust Liquid Syringe
	Check the integrity of the air syringe drive mechanism	Adjust Air Syringe
Valves	Confirm the positioning integrity of the 12-port valve	Check 12-port valve
	WARNING *Do not run the valves diagnostic if the solvent lines have not yet been purged.*	
	Prime or drain the liquid lines[a]	Purge Solvents

Table 12. Diagnostic List (Continued)

	When you want to...	Run the diagnostic...
Initialization	Diagnose the reason for an AutoTrace failing to initialize property	Initialization

a. In most cases, writing your own purge method does a better job of purging the lines. A customized purge routine can save time and conserve solvent.

Downloading and Running an AutoTrace Diagnostic Method

To download a diagnostic and run it on your workstation:

1 From the AutoTrace main menu, choose **Diagnostics**.

2 Select the appropriate diagnostic from the listing.

NOTE

Press the F1 key to access online Help and get detailed information about the diagnostic selected.

3 The diagnostic is automatically downloaded to the AutoTrace workstation.

When you want to...	Perform this action...
Run the diagnostic	Press the **CONT** button twice... ***slowly*** (2 seconds between presses)
Repeat the diagnostic	Press the **CONT** button twice... ***rapidly***
Stop continuous routines	Press the **PAUSE** button[a]

a. To run a subsequent method or diagnostic, select another diagnostic from the drop-down menu, and then press **CONT *twice slowly***.

Troubleshooting

This section provides troubleshooting information for the AutoTrace SPE Workstation. The section is divided into the following topics:

Refer to the appropriate section and locate the symptom in the left-hand column that describes the problem. Then refer to the probable cause and solution listed to the right of the symptom.

Symptoms experienced may not indicate a problem with the workstation; they may be related to a parameter setting or method step selection. Refer to "Application Tips" on page 93.

Replace Parts

If the solution is to replace a part, refer to "Ordering Supplies" on page 163. The AutoTrace Replacement Kits include detailed instructions on part replacement.

WARNING

Unplug the AC power from the workstation before servicing the unit.

Additional Assistance

If after following this manual you need additional help, contact Dionex Technical Support (see "Contact Us" on page 3). When calling, please have the information recorded in the front of the manual ready for the Technical Support Representative.

General Operation Troubleshooting

Table 13. General Operation

Symptom	Probable Cause	Solution
1. **READY** light not ON.	1a. Power switch is OFF.	1a. Turn power switch on left side of workstation ON.
	1b. AC power cord is unplugged.	1b. Connect the AC power cord.
	1c. Fuse is blown.	1c. Replace the fuse. Refer to “Replacing Fuses” on page 137.
	1d. No voltage at power outlet.	1d. Check the outlet voltage with another component, such as a desk lamp.
2. **READY** light flashing.	2a. Internal CPU error condition (system error).	2a. Turn AC power OFF. Wait 15 seconds. Press the **LOAD** button while turning AC power on, and then release the **LOAD** button.
	2b. CPU is bad.	2b. Replace the CPU. Refer to “Ordering Supplies” on page 163.
3. When AC power is turned on, syringe motors make a chattering sound (with syringes fully emptied).	3. Limit switch on the syringe drive needs adjustment.	3. Adjust the syringe(s) according to the program's syringe diagnostics or as described in “Maintenance” on page 126.
4. **RUN** light fails to turn on after the **LOAD** button is pressed or the method does not run.	4a. Files missing from download.	4a. Run the program’s Initialization diagnostic, referring to the Help screens. If the problem continues, contact Dionex Technical Support.
	4b. Loose connection on the control board.	4b. Run the “Benchmark Test Utility” on page 141 and contact Dionex Technical Support.
	4c. Column or disk holder not fully down – holder's green LED is Off.	4c. Push down on the holder lever until it “clicks” and the holder's green LED comes On. Press the **LOAD** button.

ERROR Light Troubleshooting

Table 14. Error Light

Symptom	Probable Cause	Solution
The **ERROR** light comes on during, or at the end of, a method.	Hardware error.	Error message displays. Contact Dionex Technical Support.

Computer Troubleshooting

Table 15. Computer

Symptom	Probable Cause	Solution
Unable to download a method.	Communication error.	Check the communication cable and the COM port setting.

Liquid Handling Troubleshooting

Table 16. Liquid Handling

Symptom	Probable Cause	Solution
1. Syringe makes a clicking sound while moving.	1a. Syringe speed is too fast.	1a. Adjust the flow rates.
	1b. Syringe not securely mounted.	1b. Check the syringe mounting.
	1c. Defective syringe.	1c. Replace the syringe according to “Replacing and Adjusting the Liquid Handling Syringe” on page 128. Refer to “Ordering Supplies” on page 163 for ordering information.
	1d. Fluid path blocked at valve, SPE column, or tubing.	1d. Inspect the fluid path and correct the problem.
2. Incorrect solvent dispensed.	2. Solvent lines placed in wrong reservoirs.	2. Reinsert solvent lines into appropriate reservoirs and purge lines.
3. Syringe stalls	3a. Flow rate is too high.	3a. Adjust the flow rate.
	3b. Bad SPE column.	3b. Replace the SPE column.
	3c. 12-port valve problem.	3c. Run the CHECK 12-PORT VALVE diagnostic. Refer to “Diagnostics Menu” on page 61 and the online Help. Do not run the diagnostic until all solvent lines have been purged. If the problem continues, contact Dionex Technical Support.
4. Valves leak.	4a. Flow rate is too high.	4a. Adjust the flow rate.
	4b. Valve fitting loose.	4b. Tighten the valve fitting.

Table 16. Liquid Handling (Continued)

Symptom	Probable Cause	Solution
5. Liquid volumes delivered are incorrect.	5a. Flow rates are too high, causing gas bubbles to form.	5a. Reduce the flow rates.
	5b. Restricted or leaking solvent inlet tubing.	5b. Inspect for kinks or cracks in the tubing. If necessary, replace the tubing. Refer to “Ordering Supplies” on page 163 for ordering information.
	5c. Solvent outgassing.	5c. Degas or sparge reagents with helium before use.
	5d. Loose valve fittings or loose coaxial fitting.	5d. Make sure all fittings are finger tight.
	5e. Defective valve fittings.	5e. Contact DionexTechnical Support.
	5f. Syringe leaking.	5f. Run the Syringe Diagnostic. Refer to “Diagnostics Menu” on page 61 and the online Help. If necessary, replace the syringe. Refer to “Ordering Supplies” on page 163 for ordering information.
	5g. 12-port valve is partially blocked or out of alignment.	5g. Run the CHECK 12-PORT VALVE diagnostic. Refer to “Diagnostics Menu” on page 61 and the online Help. Do not run the diagnostic until all solvent lines have been purged. If the problem continues, contact Dionex Technical Support.
	5h. Steps using immiscible solvents.	5h. Wash the syringe with intermediate solvent between steps.

Table 16. Liquid Handling (Continued)

Symptom	Probable Cause	Solution
6. Liquid buildup in 10 mL air syringe.	6a. Excessive pressure built up in unit due to blocked line, or excessive solids in column.	6a. Inspect and correct the problem.
	6b. Syringe speed too fast.	6b. Adjust the flow rates.
	6c. Air valve leaking.	6c. The valve needs replacement. Contact Dionex Technical Support.
7. Incorrect volume removed from the sample container.	7a. Samples with large amounts of suspended solids.	7a. Increase the sample volume specified in the LOAD SAMPLE step (refer to "Solid Phase Extract Commands" on page 80) by 5% to 7%. For example, specify 1050 mL instead of 1000 mL.
	7b. Sample pump is out of calibration.	7b. Perform CLEAN SAMPLE PATH with deionized water, and then run the CALIBRATE PUMP utility as described in "Calibrating Sample Pumps" on page 139.
	7c. Fittings are loose at the sample pump.	7c. Tighten the fittings.
8. Uneven volumes in elution containers. For example, 10 mL is expected and one container has 8 mL, while the other has 12 mL.	8. Loose fitting at 12-port valve or switching valve.	8. Check the tightness of the fittings.

Solid Phase Extraction Troubleshooting

Table 17. Solid Phase Extraction

Symptom	Probable Cause	Solution
1. LED on column or disk holder fails to light.	1a. Column or disk deformed or size incorrect.	1a. Discard and replace the column or disk.
	1b. Defective column or disk holder.	1b. Contact Dionex Technical Support.
	1c. The column or disk is missing.	1c. Install the column or disk.
2. Leakage around the O-ring of the column or disk holder.	2a. Packing material debris may exist on the inside walls of the column or disk, causing a poor seal.	2a. Clean out the columns or disks before use. Refer to Cleaning the SPE Columns in “Preparing the AutoTrace SPE Workstation” on page 97.
	2b. Dirty O-ring.	2b. Clean the O-ring with a wipe and solvent.
	2c. Cracked O-ring.	2c. Replace the O-ring. When replacing the O-ring for glass column units, replace the whole plunger assembly. Refer to “Ordering Supplies” on page 163.
3. Low recovery of volatile compounds.	3a. Sample evaporates while column or disk conditioning occurs.	3a. Use a PAUSE AND ALERT step to introduce sample when needed by the method.
	3b. The gas pressure is set too high.	3b. Decrease the gas pressure.
4. Low recovery.	4. Varies.	4. Refer to the list in “Sample Recovery Optimization” on page 93.

Table 17. Solid Phase Extraction (Continued)

Symptom	Probable Cause	Solution
5. Water coming off with eluent.	5a. Method is missing a step to clear the lines.	5a. Add a COLUMN RINSE (or DISK RINSE) or DRY WITH GAS step before elution.
	5b. The gas pressure is too low.	5b. Increase the gas pressure.
	5c. The drying time is too short.	5c. Increase the dry time specified in the DRY WITH GAS step.
	5d. None of the above.	5d. Run eluent through a drying column or disk before analysis.
6. Cross-contamination.	6. The sample path was not cleaned between sample passes.	6. Use “Creating a Method to Clean the Sample Lines with Solvent and DI Water” on page 68 between each batch of samples.
7. Incorrect volume removed from the sample container.	7a. Samples with large amounts of suspended solids.	7a. Increase the sample volume specified in the LOAD SAMPLE step (refer to “Solid Phase Extract Commands” on page 80) by 5% to 7%. For example, specify 1050 mL instead of 1000 mL.
	7b. Sample pump is out of calibration.	7b. Perform CLEAN SAMPLE PATH with deionized water (refer to “Creating a Method to Clean the Sample Lines with Solvent and DI Water” on page 68), and then run the CALIBRATE PUMP utility as described in “Calibrating Sample Pumps” on page 139.
8. Sample pump fails to start.	8. Bad electronics board or pump.	8. Contact Dionex Technical Support to determine the faulty part and replace. See “Ordering Supplies” on page 163.

Table 17. Solid Phase Extraction (Continued)

Symptom	Probable Cause	Solution
9. Nothing comes out of an elution manifold nozzle.	9. Clogged nozzle.	9. Clean the nozzle with a fine piece of wire. If the problem persists, replace the manifold. See “Ordering Supplies” on page 163.
10. Elution station does not move into the correct position.	10. Bad stepper motor or loose connection on control board.	10. Run the “Benchmark Test Utility” on page 141 and contact Dionex Technical Support.

Error Codes

This section describes the error codes that may appear when downloading either methods or utility procedures.

Error Code	Description	Action
-1073741510	File Download Terminated	Repeat the download and let all the download windows close automatically.
4096	INI File Not Found	Close the software and verify that the AT.INI file exists in the directory.
4100	COM port not set in INI file	Close the software and verify that the COM port is set in the AT.INI file.
8192	File Download Completed	N/A
16385	Port Control Error	Check COM port communications.
16896	No Response time-out	Check the connection with the AutoTrace and verify that the correct COM port is set in the AT.INI file.

Maintenance

This section of the manual describes how to maintain, adjust, and replace components in the AutoTrace SPE Workstation, including:

- Routine Maintenance
- Replacing and Adjusting the Liquid Handling Syringe
- Replacing and Adjusting the Air Syringe
- Replacing Fuses
- Calibrating Sample Pumps
- Running the Benchmark Test

Establish an appropriate schedule for performing routine maintenance according to how often the workstation is run. Perform any of the other methods indicated by the solution steps in “Troubleshooting” on page 116.

In order to test, adjust, or replace components other than what is covered in this section, run the diagnostics. Information on running the diagnostics can be found in “Diagnose Problems” on page 113. Also refer to the detailed instructions that come with the AutoTrace Replacement Kits. Refer to “Ordering Supplies” on page 163 to order Replacement Kits.

Contact Dionex Technical Support (see “Contact Us” on page 3) with any questions about maintaining the workstation.

Routine Maintenance

This section reviews the routine maintenance to be performed on the AutoTrace Workstation. Regularly observing AutoTrace operation and following the limited number of methods in Table 18 will ensure optimum workstation performance.

Table 18. Routine Maintenance

Task	Description
Clean	Periodically clean column holders, racks, and other workstation surfaces with warm, soapy water.
Flush Lines	Flush the workstation’s solvent and sample lines if not using the workstation for an extended period. Refer to “Operation” on page 97.

Table 18. Routine Maintenance (Continued)

Task	Description
Check for Leaks	Routinely check for tubing and syringe leaks. If a tubing leak is found, replace the tubing as necessary. If liquid is below the plunger-tip level inside any syringe, replace the syringe.
Check for Fitting Tightness	Make sure all syringe and valve fittings are finger tight.
Check for O-ring Wear	Check the O-rings at the bottom of the column holder for cracking or wear, and replace any O-rings as required.
Check Overall Performance	Check the overall workstation performance by running the utility method (see “Testing General Operation (Benchmark Test) Utility” on page 68). This utility checks the operation of the workstation front panel, elution station, syringes, pumps, and valves, and is described in detail at the end of this section.

Replacing and Adjusting the Liquid Handling Syringe

This section explains how to replace and adjust the 10 mL liquid handling syringe.

Parts

The following item is required to complete this method:

- 10 mL replacement syringe

Purge the Solvent Lines

Follow these steps to purge the liquid handling syringe and its tubing.

1 Download a **Purge Solvents** procedure as described in “Purging the Solvent Lines Utility” on page 66.

2 Remove the solvent lines from their reservoirs.

3 Run the purge method to air-purge the liquid handling syringe and its tubing.

Center the Syringe Plunger

Follow these steps to center the syringe plunger and prepare the syringe for removal in the next method.

1 Run the **Diagnostics** menu option and download an Adjust Liquid Syringe diagnostic as described in “AutoTrace Diagnostics” on page 114.

2 Press the **CONT** button ***twice slowly***.

Remove the Defective Syringe

To remove the defective syringe:

1 Remove the two screws from the mounting bracket that secure the syringe to the housing, as shown in Figure 69.

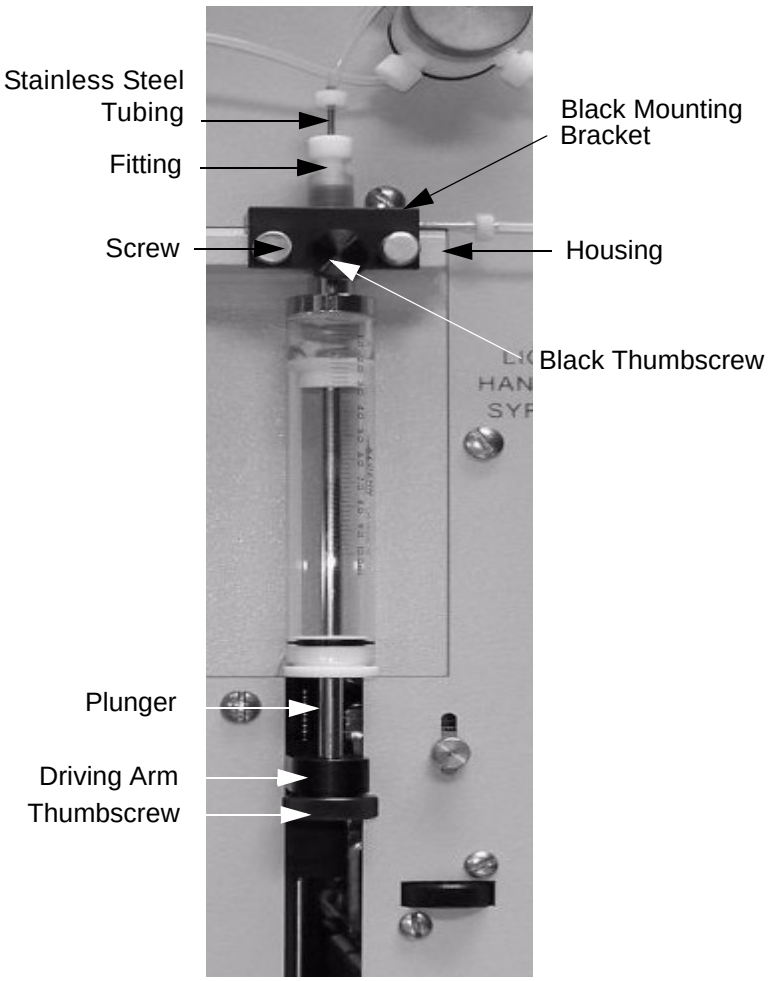


Figure 69. Syringe Screws and Mounting Bracket

2 Remove the black thumbscrew from the bottom of the syringe plunger.

3 Gently slide the syringe assembly out of the housing.

4 Loosen the small black thumbscrew on the mounting bracket.

5 Holding the black mounting bracket in your left hand and the syringe in your right hand, turn the syringe counterclockwise until it disengages from the fitting.

6 Separate the syringe from the fitting.

Mount the New Syringe

To mount the new syringe:

1. Slide the new syringe into the fitting. When aligned, turn the syringe clockwise to secure it in the fitting.
2. Tighten the small black thumbscrew on the mounting bracket.
3. Slide the syringe assembly into the housing and secure the mounting bracket, using the two screws previously removed.
4. Gently pull the syringe plunger down until it contacts the top of the driving arm.
5. Secure the plunger to the arm with the black thumbscrew previously removed.

Adjust the New Syringe

To adjust the new syringe:

1. Loosen the knurled thumbscrew approximately two turns, as shown in Figure 70.

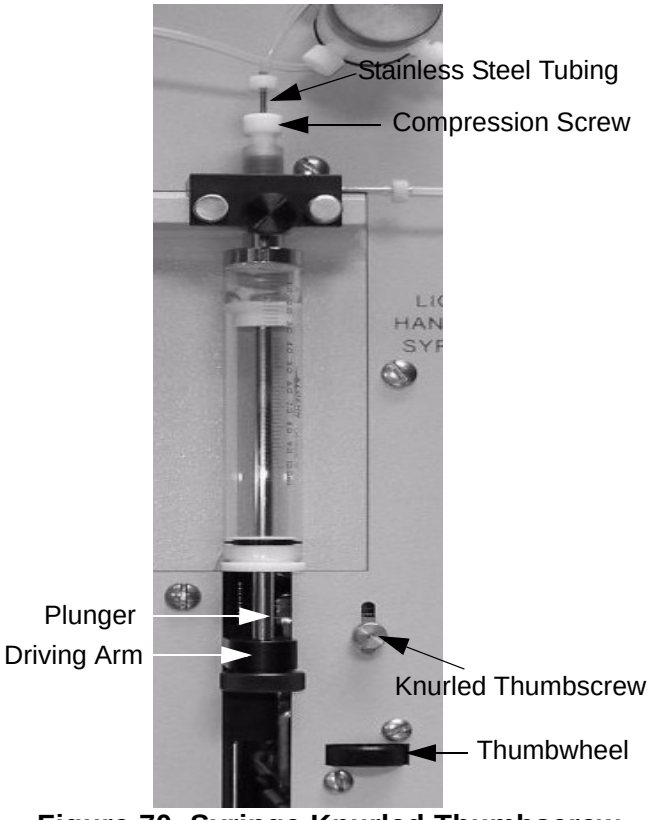


Figure 70. Syringe Knurled Thumbscrew

Adjust the New Syringe (Continued)

2 Turn the thumbscrew to the left until the knurled thumbscrew moves to its upper limit of travel.

3 Loosen the white compression screw at the top of the syringe one to two turns.

4 Press the **CONT** button twice quickly to rerun the ADJUST LIQUID SYRINGE diagnostic. As the plunger moves up, you should hear a “clicking” sound.

5 Turn the thumbwheel to the right until the “clicking” just stops. Then turn it one more partial turn, as shown in Figure 71.

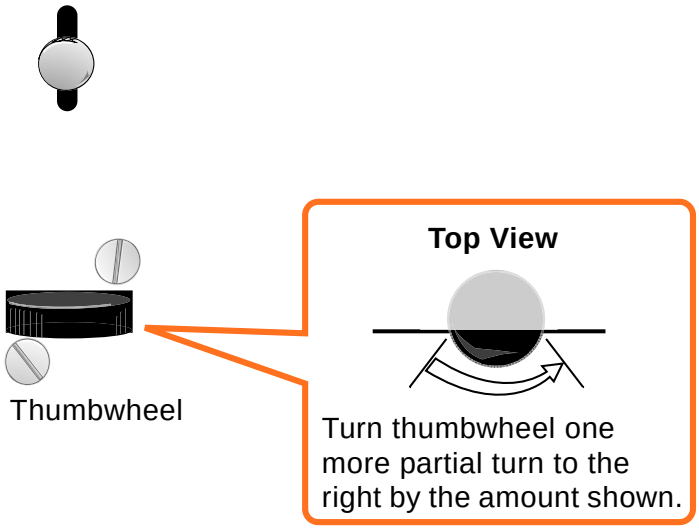


Figure 71. Thumbwheel Rotation

6 Tighten the knurled thumbscrew to secure the position.

7 Slide the stainless tubing down into the syringe as far as it will go. Press the **CONT** button twice to rerun the diagnostic.

8 Check that, as the plunger moves to the top, it moves the stainless tubing to the correct height.

9 After the plunger has pushed the stainless tubing to the correct height, tighten the white compression screw.

Replacing and Adjusting the Air Syringe

This section explains how to replace and adjust the 10 mL air syringe.

Parts

The following item is required to complete this method:

- 10 mL replacement syringe

Center the Syringe Plunger

Follow these steps to center the syringe plunger and prepare the syringe for removal in the next method.

1 From the AutoTrace main menu, choose **Diagnostics→Syringes: Adjust Air Syringe** and download the Adjust Air Syringe diagnostic as described in “AutoTrace Diagnostics” on page 114.

2 Press the **CONT** button ***twice slowly***.

Remove the Defective Syringe

To remove the defective syringe:

1 Loosen the knurled knobs on both sides of the syringe clamp. Pivot the open end of the syringe clamp out of the way, as shown in Figure 72.

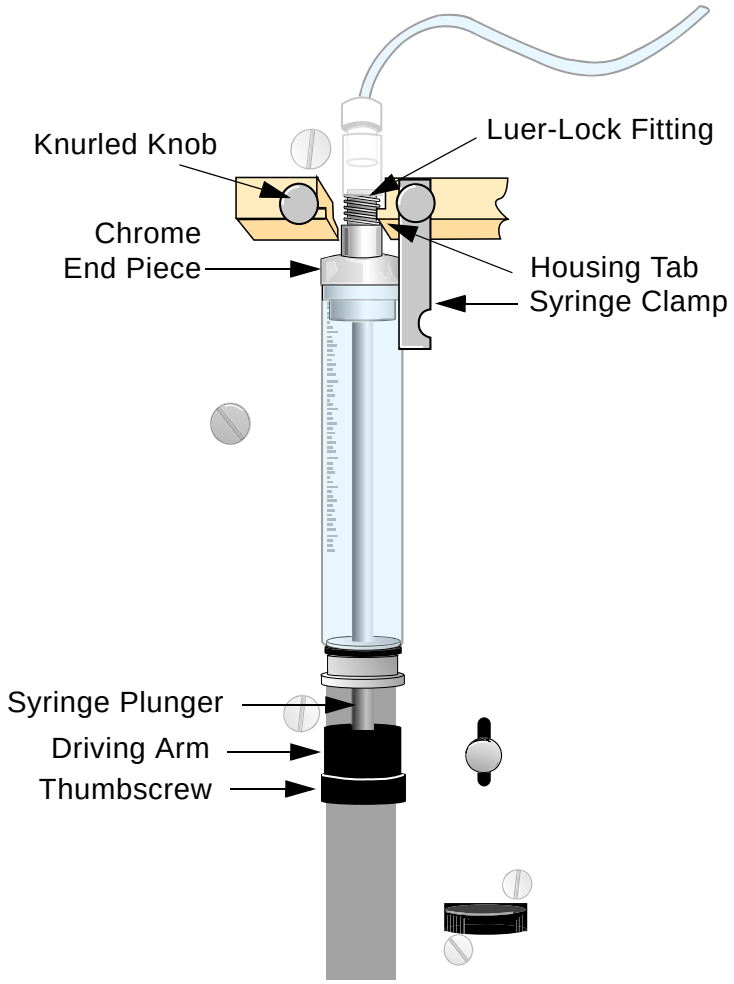


Figure 72. Syringe Clamp Knurled Knobs

2 Remove the black thumbscrew from the bottom of the syringe plunger.

3 Gently slide the syringe assembly out of the housing.

4 Loosen the Luer-Lock fitting between the tubing and the syringe by turning the lower fitting counterclockwise approximately ½ turn. Now, turn the syringe and remove it from the fitting.

Mount the New Syringe

To mount the new syringe:

1. Insert the Luer-Lock fitting into the chrome end piece of the new syringe and turn the fitting clockwise until secure.
2. Align the grooves in the chrome end piece with the tabs in the housing.
3. Gently push the syringe into place.
4. Position the syringe clamp across the chrome end piece and secure it in place by tightening the knurled knob.
5. Gently pull the syringe plunger down until it contacts the top of the driving arm.
6. Secure the plunger to the arm with the black thumbscrew previously removed.

Adjust the New Syringe

To adjust the new syringe:

1. Loosen the knurled thumbscrew approximately two turns, as shown in Figure 73 on page 135.

Adjust the New Syringe (Continued)

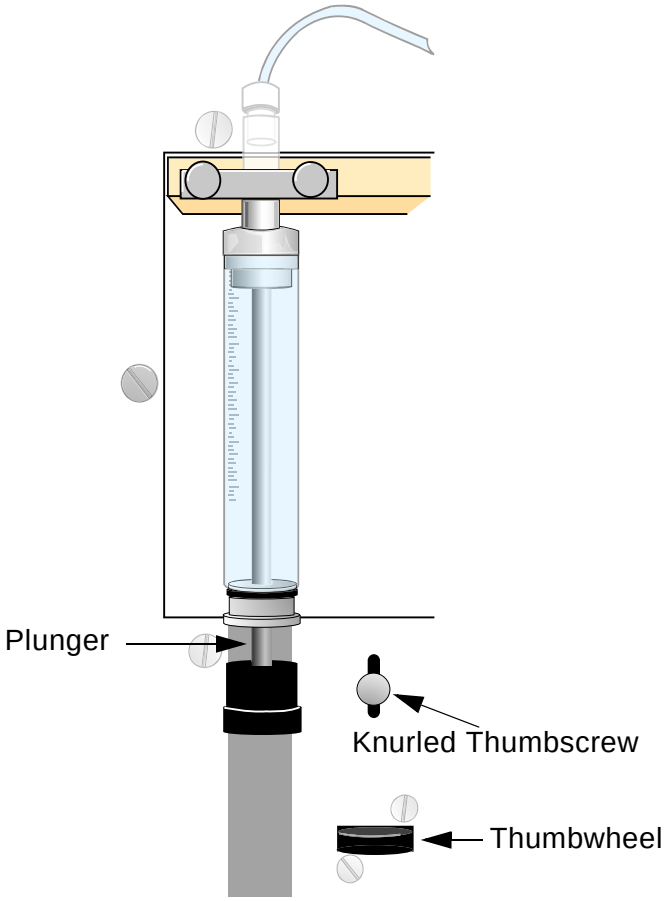


Figure 73. Syringe Knurled Thumbscrew

2 Turn the thumbscrew to the left until the knurled thumbscrew moves to its upper limit of travel.

3 Press the **CONT** button twice quickly to rerun the ADJUST AIR SYRINGE diagnostic. As the plunger moves up, you should hear a “clicking” sound.

4 Turn the thumbwheel to the right just until the “clicking” stops. Then turn it one more partial turn, as shown in Figure 74.

Adjust the New Syringe (Continued)

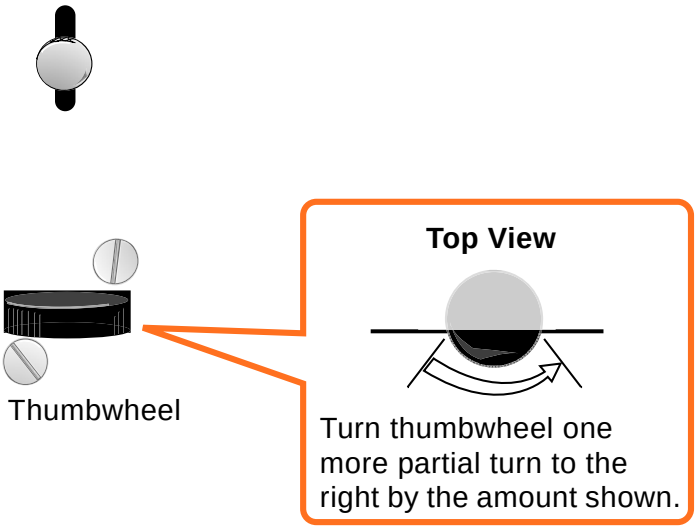


Figure 74. Thumbwheel Rotation

5 Tighten the knurled thumbscrew to secure the position.

6 Press the **CONT** button twice quickly again to rerun the diagnostic. Confirm that the syringe drive mechanism is operating correctly.

Replacing Fuses

This section explains how to replace the fuse(s) in the workstation's power entry port. The port is located on the right side of the unit. The method applies to single North American or single/dual international fuse configurations.

Parts and Tools

The following parts and tools are required to complete this method:

- Two 1.6A 220/240V fuses *or* one 3A 100/120V fuse
- Small flat-blade screwdriver

Refer to Figure 75 as required.

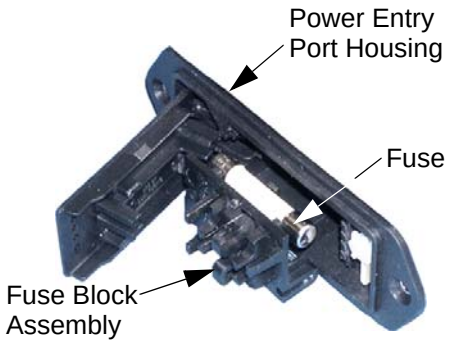


Figure 75. Fuse Replacement Details

Remove the Fuse Block Assembly

Follow these steps to remove the fuse block assembly.

NOTE

Power off the AutoTrace and unplug the AC power cord before beginning this method.

1 Turn the workstation's power off and unplug the AC power cord.

2 Using the small screwdriver, place the screwdriver blade in the right side of the AC power socket. Now push the screwdriver blade to the right to pry the door open.

3 Swing the power entry port door outward, toward you.

4 Hold the fuse block assembly and pull it out from the power entry port housing.

Replace the Fuse(s)

Follow these steps to replace the fuses.

1. Remove the fuse(s) from the fuse block assembly.
2. Press the new fuse(s) into place. Make sure the new fuse(s) are identical to the old fuse(s).
3. Slide the fuse block assembly into the power entry port housing and snap it into place.
4. Close the power entry port door.
5. Plug the AC power cord into an AC power outlet.

WARNING

Only plug the AC power cord into a properly grounded outlet. Only use a standard IEC 320-style power cord appropriate for your country.

6. Turn the workstation on.
7. Verify that the **READY** light comes on and the workstation operates normally.

Calibrating Sample Pumps

This section explains how to run the CALIBRATE PUMP utility method. This method should be run only if the volume removed from the sample container does not match the sample volume requested in the method's LOAD SAMPLE step.

Parts and Tools

The following parts and tools are required to complete this method:

- Allen wrench, 3/32-inch
- Sample container with approximately 120 mL of water/pump being calibrated
- Balance
- 1/16-inch ID tubing provided in Startup Kit

Calibration Method

Perform the following steps on each sample pump that requires calibration.

1 Perform a single-step CLEAN SAMPLE PATH method (as discussed in "Creating a Method to Clean the Sample Lines with Solvent and DI Water" on page 68), using DI water.

2 Download a **Calibrate Sample Pumps** procedure:

a From the AutoTrace main menu, choose **Serial-OP→Download Utility Procedure**.

b Click the **Calibrate Pump** button.

c Read the online Help for this utility before continuing.

3 Press the **CONT** button ***twice slowly*** and follow the prompts on the front panel display.

4 As instructed, weigh the collection vessel before and after pumping. Determine the percentage difference between the expected volume of 100 mL and the delivered volume.

Example:

If the volume of water that the utility pumps is 103 mL rather than the expected 100 mL, the volume is off by 3%.

5 Locate the pump's calibration screw in the hole on the right side of the pump, as shown in Figure 76.

Calibration Method (Continued)

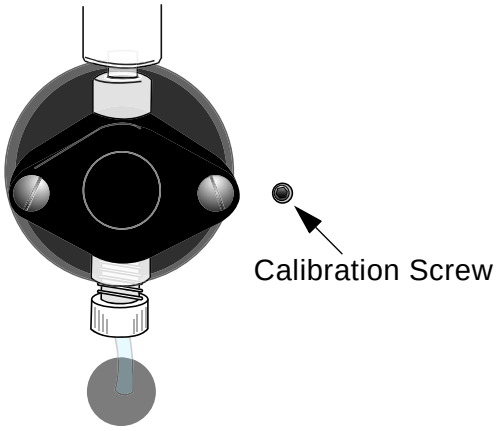


Figure 76. Pump Calibration Screw

6 Use the Allen wrench to adjust the screw as follows:

a ¼ turn clockwise to decrease the volume 2.5%

b ¼ turn counterclockwise to increase the volume 2.5%

Example:

For the example above, you would turn the adjustment screw clockwise approximately ¼ of a turn.

7 Rerun the calibration utility to test the change and make any further adjustments that are needed.

8 Repeat steps 3 through 7 for each sample pump to be calibrated.

Benchmark Test Utility

This section explains how to run the Benchmark Test Utility method. Run this utility if there is any indication of trouble with the workstation, or if any of the following workstation components have been replaced: PC boards, tubing, valves, syringes, keypad, or column holder.

Parts

The following parts are required to complete this method:

- Six 16 x 100 mm test tubes and elution rack (for optional wet test)
- Sample container with at least 100 mL of water (for optional wet test)
- Solvent containers filled with colored water (for optional wet test)

Running the Benchmark Test

Perform the following steps to verify workstation operation.

1 Download a Benchmark Test procedure:

a From the AutoTrace main menu, choose **Serial-OP→Download Utility Procedure**.

b Click the **Benchmark Test** button.

c Read the online Help for this utility before continuing.

2 Press the **CONT** button ***twice slowly*** and follow the prompts on the front panel display to verify that the:

a Front panel **RUN** light turns on.

b Front panel **ERROR** light turns on.

c Elution shuttle moves to its three different positions.

d Exhaust fan turns on.

e Holder's LEDs are lit.

Running the Benchmark Test (continued)

3 Perform the following wet test whenever tubing, valves, or syringes have been replaced. Follow the display's prompts and do the following:

a Place empty tubes in the 16 x 100 mm elution rack.

b Place the workstation's five solvent lines in containers holding water solutions of different colors.

c Observe that the tubes are filled with water as follows:

Tube #1 fills with 10 mL from **solvent container #1**.

Tube #2 fills with 10 mL from **solvent container #2**.

Tube #3 fills with 10 mL from **solvent container #3**.

Tube #4 fills with 10 mL from **solvent container #4**.

Tube #5 fills with 10 mL from **solvent container #5**.

Tube #6 fills with 10 mL from **solvent container #1**.

d With the gas turned on, verify gas valve operation by placing a finger under the elution manifold's nozzles and sensing the gas flow.

e Place all sample lines in a container of water.

f Verify that all pumps direct sample to aqueous waste.

4 If you need to repeat the Benchmark Test, press the **CONT** button twice quickly.

Column Holder Conversion

This section describes how to convert a column holder on an AutoTrace Cartridge version unit to work with a different size column.

Parts

To convert your column holder, obtain the appropriate plunger assembly for the column size to be converted. See “Ordering Supplies” on page 163.

Remove the Plunger Assembly

Follow these steps to remove the existing plunger assembly for all column holders to be converted.

1 Slide the tubing clamp up so that it is no longer over the stainless steel tubing, as shown in Figure 77.

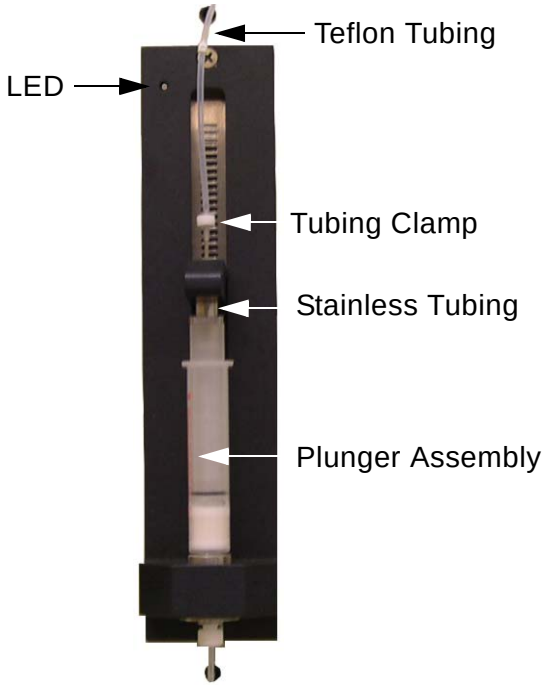


Figure 77. Tubing Clamp Movement

2 Grasp the bottom of the Teflon tubing and carefully pull it upward until it slides off the top end of the stainless tubing.

3 Unscrew the plunger assembly (see Figure 77) and pull it down to remove it from the column holder.

Remove the Plunger Assembly (Continued)

4 Set the plunger assembly aside.

5 Repeat steps 1 through 4 for each column holder you need to convert.

Install the New Plunger Assembly

Follow these steps to install the new plunger assembly for each column holder to be converted.

1 Screw the new plunger assembly into position on the column holder.

2 Carefully, without developing kinks in the tubing, push the Teflon tubing end downward, over the top of the stainless tubing, as shown in Figure 78.

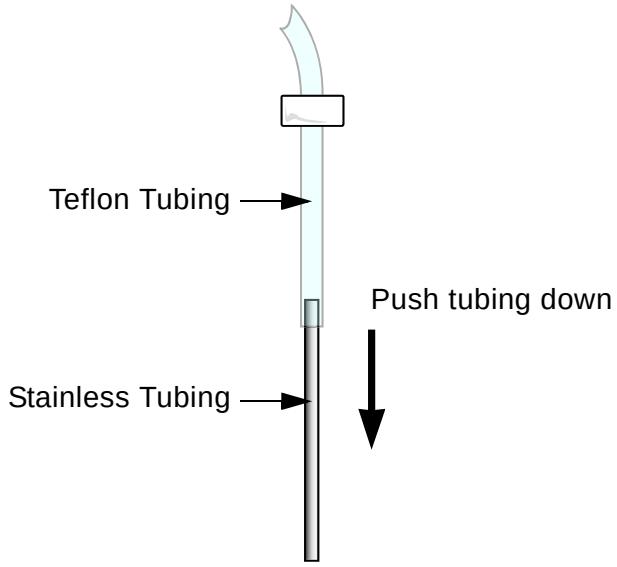


Figure 78. Teflon Tubing Installation

3 Now push the tubing clamp down until it is positioned as shown in Figure 79.

Install the New Plunger Assembly (Continued)

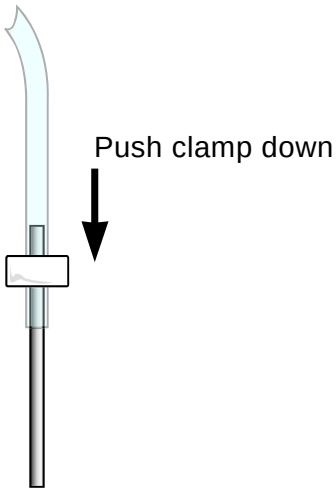


Figure 79. Tubing Clamp Positioning

Changing Between Column and Disk Versions

Procedure Scope

This procedure describes how to change the AutoTrace configuration from either Column to Disk or Disk to Column.

Tools Required

- Phillips screwdriver
- Slotted screwdriver

Parts Required

- Replacement SPE column holder
- Replacement SPE disk holder

Procedure Overview

1 Remove the existing column or disk holder.

2 Install the new column or disk holder.

3 Change the sample pump.

4 Reconfigure the AutoTrace software.

Remove the Existing Column or Disk Holder

1. Turn the AutoTrace power off and unplug the power cord.
2. Slide the tubing clamp up so that it is no longer over the stainless steel tubing.

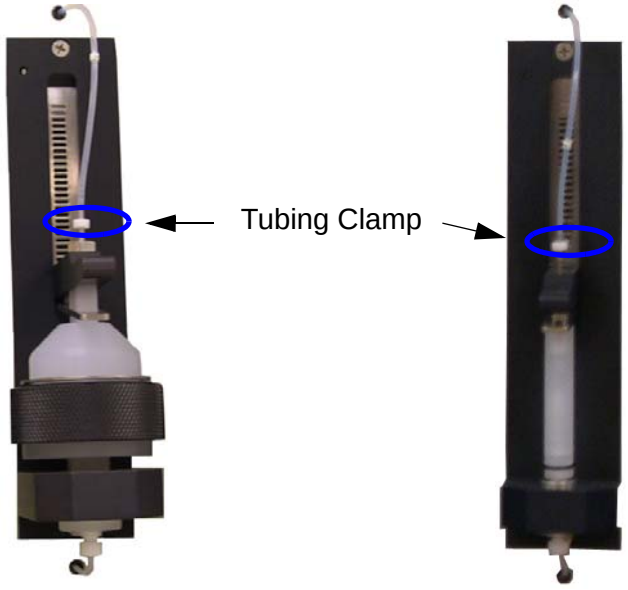


Figure 80. Disk or Column Holder

3. Grasp the bottom of the Teflon tubing and carefully pull it upward until it slides off the top end of the stainless tubing.
4. Disconnect the Teflon tubing from the lower end of the column or disk holder by unscrewing the compression screw.
5. Remove the screws that secure the rear cover. Set the cover and screws aside.
6. Locate the back of the holder you are replacing.
7. Follow the two sets of wires that lead from the back of the holder to the AutoTrace Column Interface board. Unplug the holder's two connectors from the board.
8. Carefully undo the cable attachments that secure the holder wires to the back of the workstation.
9. Remove the two top screws from the static strap. The static strap is on the back side of the column holder.
10. Remove the two Phillips screws from the front of the workstation, and remove the holder.

Install the New Column or Disk Holder

1. Insert the column or disk holder into the workstation and secure it in place with the two Phillips screws previously removed.
2. Carefully, without developing kinks in the tubing, push the Teflon tubing end downward, over the top of the stainless tubing, until there is a 1/8-inch gap between the bottom of the tubing and the top of the slider.
3. Now push the tubing clamp down until it is positioned as shown.
4. Connect the tubing to the lower end of the holder by finger tightening the compression screw in place.
5. Replace the two screws on the static strap.
6. Plug the two new holders' connectors into the appropriate receptacles on the AutoTrace Column Interface board.
7. Secure the wires to the back of the workstation, using the supplied cable attachments.

Changing the Sample Pump

Prior to removing the pump, follow the steps below to create and run a procedure that will dry the line that runs from the pump to the switching valve. This prevents leaking during the replacement.

1. Open the AutoTrace software.
2. Log in to the AutoTrace software.
3. Click the **Methods** button on the toolbar to open the Setup Methods window.
4. Click the **New** button.
5. In the Name text box, type **Dry Lines**.
6. Double-click the **AutoTrace Method Steps** line in the left pane.
7. Expand the Solid Phase Extract option, double-click **Load Sample**, and set the volume to **10.0** mL.
8. Double-click **Dry with Gas** and set the time to **0.5** mins.
9. Save the method.

10 From the main menu, choose **Serial-Op→Download Method**, choose the **Dry Lines** method, and click **Yes** when asked to download the method to the AutoTrace.

11 Place the sample lines in an empty, clean container.

12 Run the Dry Lines method.

13 When finished, turn off the AutoTrace's power and unplug the power cord.

Removing the Defective Pump

1 One piece at a time, unscrew the pump's compression screws and secure the tubing to the front of the workstation with a piece of tape.

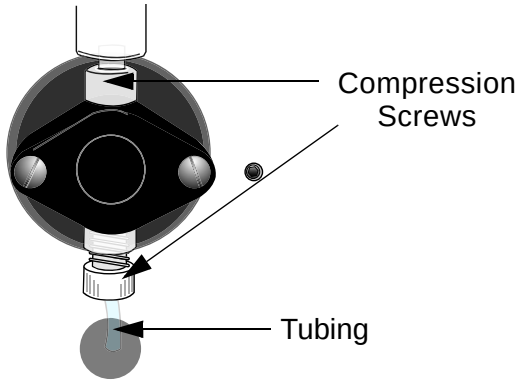


Figure 81. Pump, Front View

2 Remove the screws that secure the rear cover of the workstation. Set the rear cover and screws aside.

3 Locate the back of the defective pump and follow the pump's wires to the white connector that connects the pump to the wiring harness.

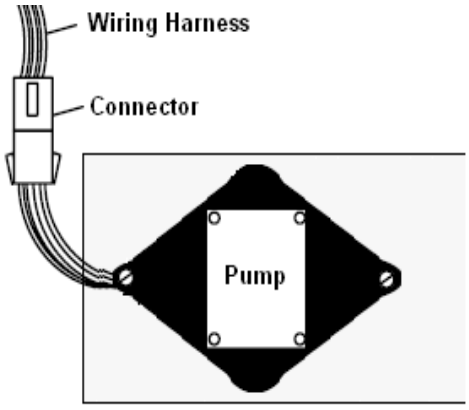


Figure 82. Pump, Back View

4 Squeeze the locking tab on the connector and separate the two connector halves.

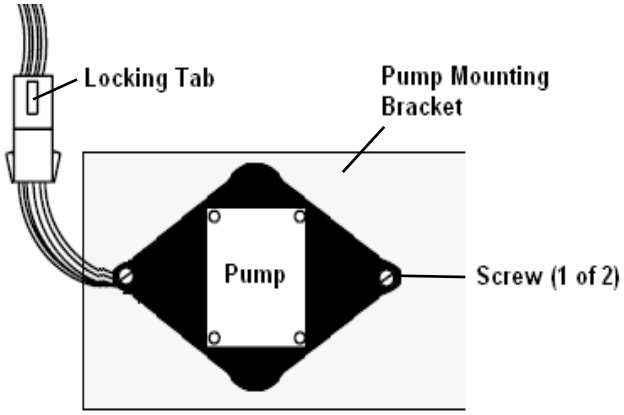


Figure 83. Pump, Rear View

5 Remove the two screws that secure the pump to the pump mounting bracket. Set the screws aside.

6 Carefully pull the pump through the hole in the mounting bracket, angling the back of the pump downward to allow the tab on the front of the pump to clear the hole.

Installing the New Pump

1 Install the new pump by carefully placing it through the hole in the mounting bracket, angling the back of the pump downward to allow the tab on the front of the pump to clear the hole.

2 Replace the two screws that secure the pump to the pump mounting bracket.

3 Reconnect the two connector halves and check the wiring.

4 Replace the screws that secure the rear cover of the workstation.

5 Reconnect the pump's compression screws and tubing.

6 Reconnect the power cord and turn on power to the AutoTrace.

7 From the main menu, choose **Serial-Op→Download Utility Procedure** and choose **Calibrate Pump**.

8 Follow the instructions in the Help screens to run the calibration utility.

Reconfigure the AutoTrace Software

To reconfigure the AutoTrace software after converting the unit from Column to Disk or Disk to Column, you need to perform three steps:

- Erase the AutoTrace Dictionary.
- Edit the AutoTrace INI file (AT.INI) to reflect the disk or column version.
- Download the proper files and dictionary to the AutoTrace unit.

Erasing AutoTrace Dictionary

1 Close the AutoTrace software on the PC.

2 Open the HyperTerminal communication software.

3 Establish communication with the AutoTrace Workstation.

4 Type "Erase". When the software asks if you are sure, answer "Y".

5 Type "Dir" to make sure that the dictionary is empty.

6 Close the HyperTerminal software.

Changing the AutoTrace INI file

1 Locate the AT.INI file. The default path is:

C:\Program Files\Dionex\AutoTrace SPE Workstation

2 Open the AT.INI file, using Windows Notepad.

3 Find the following line:

Version = (x) [Where x = 1 (column) or 2 (disk)]

4 Change the version number to reflect your new configuration.

5 Save the AT.INI file and close it.

Downloading the New Dictionary to AutoTrace

1 Open the AutoTrace software.

The title bar should display the proper version (Cartridge or Disk).

2 From the main menu, select **Diagnostics→Initialization**.

A DOS window opens. The window should state that the proper ZYOS file, and then the proper dictionary file, are downloading:

- BMAT133.BMD for column
- BMATD103.BMD for disk

This download will take several minutes to complete because the entire dictionary, files, and method are being downloaded.

Configuring HyperTerminal to Communicate with AutoTrace

In some cases, it may be necessary to communicate with the AutoTrace Workstation directly. HyperTerminal can be used to reconfigure the software when changing from Column to Disk versions of the AutoTrace. If there are conflicting dictionaries that have been downloaded onto the unit, HyperTerminal will need to be used to remove the extra files from the AutoTrace. HyperTerminal is a Microsoft Windows software accessory typically installed with Windows. The user should be familiar with this software to perform the following steps. Refer to Microsoft's documentation for information on HyperTerminal.

Parameters

1 Follow the steps in HyperTerminal to set up a new connection by selecting a name and an icon.

2 In the connect to screen, select COM1. The COM1 Properties window opens, as shown in Figure 84.

3 In the COM1 Settings screen, select the parameters shown in Figure 84:

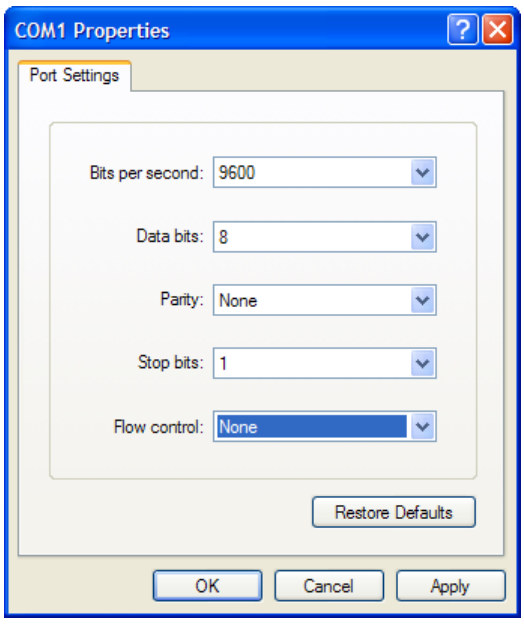


Figure 84. COM1 Properties Window

4 Click the **OK** button.

5 From the main menu, select **File→Properties**. The Properties window opens, as shown in Figure 85.

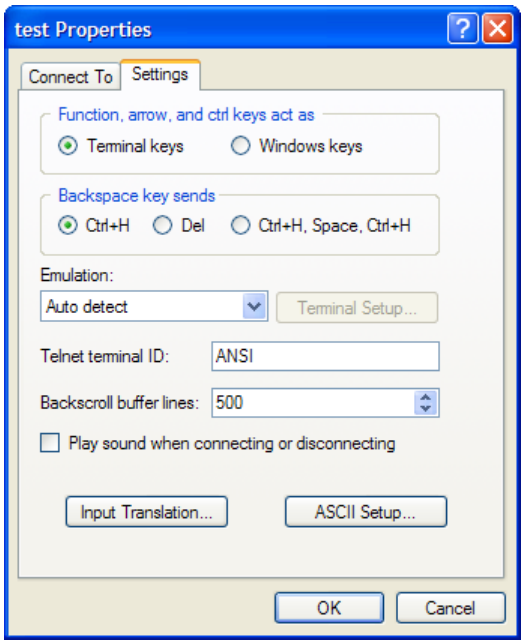


Figure 85. Properties Window

6 Click the **ASCII Setup...** button.

7 Select the parameters shown in Figure 86:

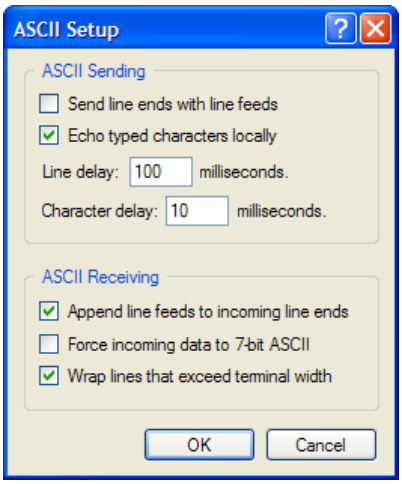


Figure 86. ASCII Setup Window

8 Click the **OK** button.

9 At the prompt, type **DIR**.

10 The following files should be listed:

- Zyos.zos
- BMAT133.BMD (for Cartridge version) or BMATD103.BMD (for Disk version)
- Method.BMD

If ERROR comes up on the screen, type DIR again. It may take several attempts to communicate. If communication still fails, check the parameter settings and COM port and try again.

11 Close HyperTerminal and reopen the AutoTrace software.

NOTE

Only one dictionary file should be listed (either BMAT133.BMD or BMATD103.BMD). If both files are on the AutoTrace, type ERASE to delete all the files. Close HyperTerminal and open AutoTrace software. Make sure the correct version is listed on the AutoTrace software title bar and download either a utility or diagnostic method.

Voltage Conversion

This section of the manual describes how to set up the AutoTrace Workstation's power entry port to correspond with the AC power source. *The AutoTrace Workstation comes factory-configured for 120V AC.*

NOTE

Follow these steps only to convert the workstation's voltage selection to a new voltage.

Power Entry Port

The power entry port contains a fuse holder compatible with dual 220/240V fuses or a single 100/120V fuse. A voltage selector is also present that allows the voltage to be set to one of four configurations: 100, 120, 230, or 240 volts.

Parts and Tools

The following parts and tools are required to complete this procedure:

- Small flat-blade screwdriver
- Small Phillips screwdriver
- Needle-nose pliers
- Two 1.6A 220/240V fuses *or* one 3A 100/120V fuse

Refer to Figure 87 as required.

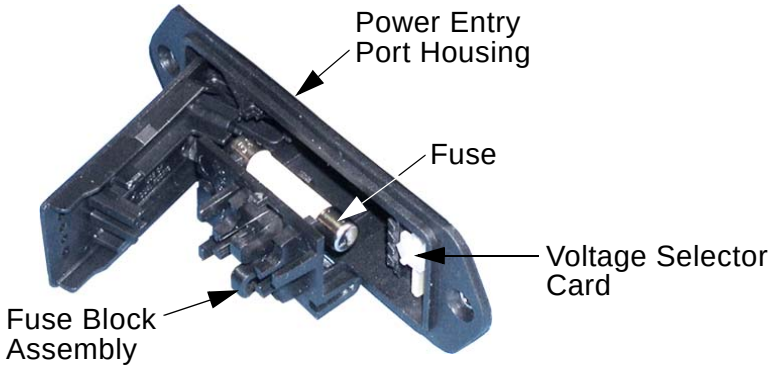


Figure 87. Fuse Block Assembly Removal

Remove the Fuse Block Assembly

Follow these steps to remove the fuse block assembly.

NOTE

Turn off the AutoTrace power and unplug the AC power cord before beginning this procedure.

1. Turn the workstation's power off and unplug the AC power cord.
2. Using the small screwdriver, place the screwdriver blade in the right side of the AC power socket. Now push the screwdriver blade to the right to pry the door open.
3. Lift and swing the power entry port door outward, toward you.
4. Hold the fuse block assembly and pull it out from the power entry port housing.

Select the New Voltage

Follow these steps to select a new voltage.

1. Using the needle-nose pliers, grasp the voltage selector card (located on the far right of the power entry housing) and pull it straight out.
2. Orient the voltage selector card so that the numbers indicating the desired voltage are positioned at the bottom of the card, as shown in Figure 88.

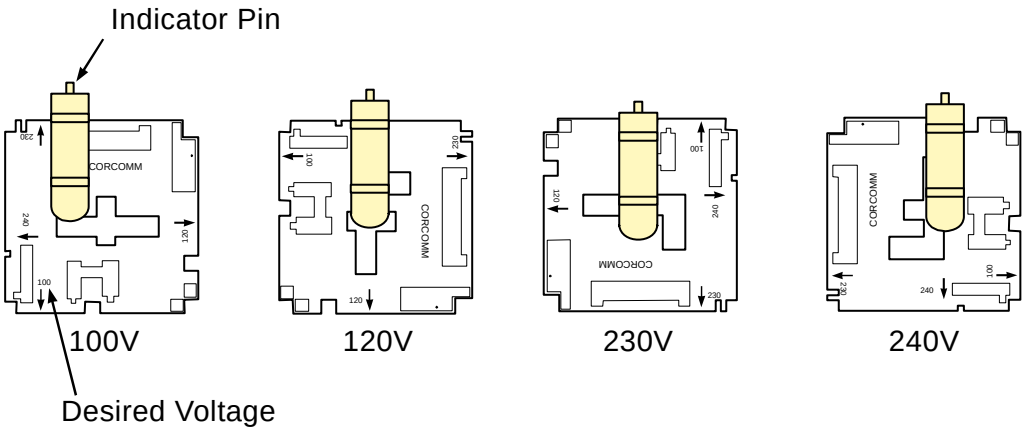


Figure 88. Voltage Selector Card

Select the New Voltage (Continued)

3 Move the indicator pin so that it is positioned up when the card is held in the above position.

NOTE

When the indicator pin is fixed, each successive voltage is selected by rotating the card clockwise.

4 Reinstall the card in the housing with the printed side of the card facing toward the center of the housing and the pin facing out. The arrow on the pin will face the small arrows on the divider to the fuse housing.

Converting from 100/120V to 220/240V

Follow these steps to convert from a single 100/120 volt (3A) fuse to dual 220/240 volt (1.6A) fuses.

1 Remove the single 100/120V fuse, as shown in Figure 89.

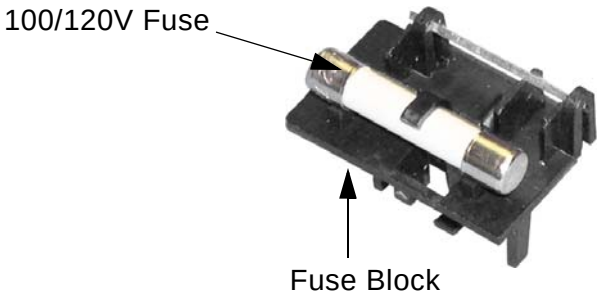


Figure 89. 100/120V Fuse Removal

2 Invert the fuse block and install the two 220/240V fuses into place, as shown in Figure 90.

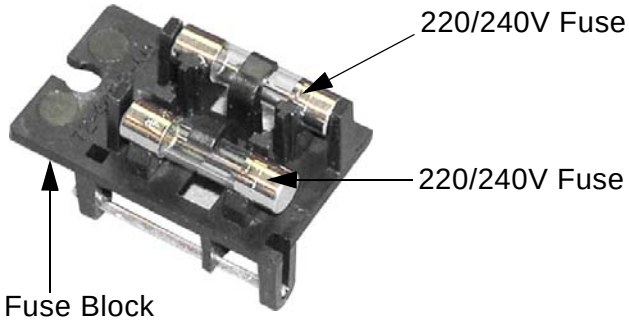


Figure 90. 220/240V Fuse Installation

Converting from 100/120V to 220/240V (Continued)

3 Slide the fuse block assembly into the power entry port housing and snap it into place.

4 Change the voltage on the voltage selector card.

5 Close the power entry port door and verify that the indicator pin shows the desired voltage.

Converting from 220/240V to 100/120V

To convert from dual 220/240 volt (1.6A) fuses to a single 100/120 volt (3A) fuse, do the following.

1 Remove the dual 220/240V fuses, as shown in Figure 91.

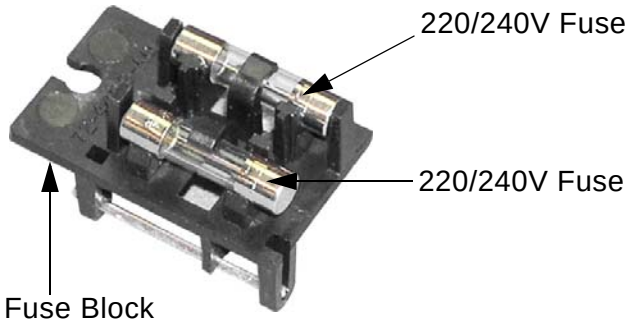


Figure 91. 220/240V Fuse Removal

2 Invert the fuse block and install the single 100/120V fuse into place, as shown in Figure 92.

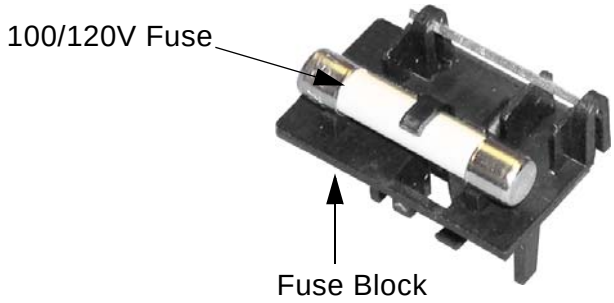


Figure 92. 100/120V Fuse Installation

3 Slide the fuse block assembly into the power entry port housing and snap it into place.

4 Change the voltage on the voltage selector card.

5 Close the power entry port door and verify that the indicator pin shows the desired voltage.

Verify Operation

Follow these steps to verify a successful voltage conversion.

1 Plug the AC power cord into an AC power outlet.

WARNING

Only plug the AC power cord into a properly grounded outlet. Only use a standard IEC 320-style power cord appropriate for your country.

2 Turn the workstation on.

3 Verify that the **READY** light on the workstation's front panel is on.

Specifications

Table 19 lists the specifications for the AutoTrace Workstation.

Table 19. Workstation Specifications

Dimensions	Workstation:	23 in (57 cm) wide x 25 in (63.5 cm) deep x 27 in (69 cm) high
	Sample Rack:	12 in x 14 in (30 x 36 cm)
Weight		150 lbs (68.1 kg)
Electrical	Voltage:	100, 120, 220, or 240 V (± 10%)
	Frequency:	47 to 63 Hz
	Power:	150 VA maximum
Liquid Management	Air Syringe:	One 10 mL air syringe
	Liquid Handling Syringe:	One 10 mL liquid handling syringe
	12-Port Valve:	Rotary, sliding Rulon™ seal
	Valves:	3-way, Teflon
	Nozzles:	Stainless steel
	Tubing:	TFE, 1/16-in ID, *most lengths critical*
	Solvent Reservoir:	1 liter (2 total supplied)
	Waste Reservoir:	10 liter (2 total supplied)
Solid Phase Extraction	SPE Columns:	1 mL syringe-compatible columns
		3 mL syringe-compatible columns
		6 mL syringe-compatible columns
		6 mL glass syringe-compatible columns
		8 mL glass syringe-compatible columns
	Column Plunger:	Adapters available for four column types
	Extraction Disks:	47 mm

Table 19. Workstation Specifications (Continued)

Collection Container Racks	Tube Racks:	16 x 100 mm stainless steel
	Vial Racks:	11 mm GC, 17 x 60 mm, 4 mL screw cap
	Conical Racks:	15 mL
Sample Pumps	Displacement:	Positive
	Accuracy:	±2.5%
	Tube Fitting:	Kynar™
	Piston and Liner:	Ceramic
	Restrictions:	Not for use with acetic acid and acetone
Gas Regulator	Output:	0 to 20 psi (0 to 1.4 bars)
	Input:	100 psi (6.9 bars) maximum

WARNINGS

- *Do not use acetone as a solvent to clean the sample path or rinse the sample container because it is harmful to the sample pumps.*
- *Do not run pumps dry. Always leave DI water in the sample lines when the workstation is not in use.*

Table 20 lists lengths and volumes for tubing in the AutoTrace Workstation.

Table 20. Tubing Lengths and Volumes

Tubing from:	Tubing to:	Tubing Length:	Volume:
12-port valve	Solvent waste	7 ft (2.2 m)	3.36 mL
	Solvent #1	7 ft (2.2 m)	3.36 mL
	Solvent #2	7 ft (2.2 m)	3.36 mL
	Solvent #3	7 ft (2.2 m)	3.36 mL
	Solvent #4	7 ft (2.2 m)	3.36 mL
	Solvent #5	7 ft (2.2 m)	3.36 mL
	Switching valve #6	20 in (51 cm)	0.8 mL
	Switching valve #5	20 in (51 cm)	0.8 mL
	Switching valve #4	20 in (51 cm)	0.8 mL
	Switching valve #3	20 in (51 cm)	0.8 mL
	Switching valve #2	20 in (51 cm)	0.8 mL
	Switching valve #1	20 in (51 cm)	0.8 mL
Air syringe	Air valve (com)	5 in (13 cm)	0.2 mL
LH syringe (top)	12-port valve (com)	6 in (15 cm)	0.24 mL
LH syringe (side)	Air valve (NC)	3.25 in (8.3 cm)	0.13 mL
Gas manifold	Switching valve	10 in (25.4 cm)	0.24 mL
Switching valve	Pump	34 in (86 cm)	1.36 mL
	SPE cartridge	38 in (97 cm)	1.52 mL
SPE cartridge	Elution station or elution manifold	24 in (61 cm)	0.96 mL
Pumps	Sample containers	54 in (137 cm)	2.16 mL

Ordering Supplies

To order more supplies for your workstation, use the part numbers listed in Table 21.

Table 21. Supplies List

Item	Part #
12-port Valve and Motor Replacement Kit	070293
12-port Valve Rotor Replacement Kit	070623
12-port Valve Stator Replacement Kit	071055
15 mL Conical Tubes (Case of 12)	071056
3 mL O-ring Kit (6)	071057
3-way Valve Replacement Kit	071058
47 mm O-ring Kit (6)	071059
6 mL O-ring Kit (6)	071060
Air Push Syringe Replacement Kit	071061
Column Holder Replacement Kit	071063
CPU Replacement Kit	071064
Disk Holder Replacement Kit	071065
Electronics Board Replacement Kit	071066
Elution Manifold Replacement Kit	071067
Elution rack for 11 mm GC vials	071068
Elution rack for 15 mL conical tubes	071069
Elution rack for 16 x 100 mm test tubes	071070
Elution rack for 17 x 60 mm vials	071071
Elution rack for 4 mL screw cap vials	071072
Front Panel Replacement Kit	071073
Glass O-ring Kit (6)	071074
Liquid Handling Syringe (Bag of 5)	071075
Liquid Handling Syringe Replacement Kit	071076
Module Adapter Board Replacement Kit	071077
Plunger assembly for 1 mL columns	071078
Plunger assembly for 3 mL columns	071079
Plunger assembly for 6 mL columns	071080
Plunger assembly for 6 mL or 8 mL columns	071081

Table 21. Supplies List (Continued)

Item	Part #
Sample input lines – column model (set of 6)	071082
Sample Pump Replacement Kit – cartridge model	071083
Sample Pump Replacement Kit – disk model	071084
Switching Valve Replacement Kit	071087
Teflon Tubing Kit (all tubing other than sample and waste)	071088
Waste Tubing Kit	071089

Glossary

Table 22 lists the glossary terms and definitions.

Table 22. Glossary Terms

Term	Definition
Air Factor	The adjustable factor that determines the distance liquid is pushed beyond the 12-port valve and switching valves. The air push factor is used in solvent conditioning and elute to soak steps and pushes the liquid partially through the column path so that the column bed is not dried out. The number (from 0.3 to 5) increases or decreases the standard 1.2 mL amount of air that follows the liquid being sent through the solid phase extraction column by a factor of 0.3 to 5 times. If volumes of greater than 5 mL are required, the dry with gas step in "Creating a Method to Clean the Sample Lines with Solvent and DI Water" is recommended.
Air Push	A flow of air generated by the air syringe that clears liquid from the liquid handling syringe and tubing lines after conditioning, rinsing, eluting, and syringe washing steps.
AT	A program that runs the AutoTrace menu software in the computer, allowing the download, setup, and writing of AutoTrace methods. This program also runs the diagnostic software that supplies a series of special diagnostic and service programs.
AutoTrace Method	Created when the method is entered into the AutoTrace menu software. This method is then used by the AutoTrace operating software to run the samples. (Earlier versions of software referred to "Procedure" instead of Method, but the terms have the same meaning.)
AutoTrace Software	Software that provides *menu software* for *setting up* the method in the computer, and *operating software* for *running* the method in the AutoTrace SPE Workstation.

Table 22. Glossary Terms (Continued)

Term	Definition
Flow Rates	The speed (in mL/min.) at which to run the AutoTrace syringes. Flow rates for solid phase conditioning, loading, rinsing, and eluting operations are designated on the Setup Parameters screen.
Maximum Elution Volume	The maximum volume that can be eluted into the collection container, based on the container size.
Menu Software	The portion of the AutoTrace software on the computer that is used to set up, write, and review AutoTrace methods.
Method	The list of steps used for implementing a laboratory application. (Earlier versions of software referred to “Procedure” instead of Method, but the terms have the same meaning.)
Operating Software	The portion of AutoTrace software that runs a method in the AutoTrace Workstation.
Procedure	*See* “AutoTrace Method”
Push Delay	The time (in seconds) to pause after liquid has been sent through the column, allowing the pressure to equilibrate.
Setup Parameters	The screen display of all changeable AutoTrace parameters. Every parameter listed begins with a default value.
SETUP Program	The program used to install the AutoTrace software on the computer hard drive.

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