TELEDYNE
CETAC TECHNOLOGIES
Everywhereyoulook™

# ASX-8000 Series Autosamplers


## Operator's Manual

Manual Part Number 480203 Rev 2a

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The product described in this manual is manufactured by

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**REVISIONS**

Teledyne CETAC Technologies strives to provide the scientific community with an unparalleled combination of effective technology and continuing value. Modular upgrades for existing instruments will continue to be a prime consideration as designs progress.

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# 1 Introduction

## Overview

The Teledyne CETAC ASX-8000 series autosampler is a small-footprint, versatile XYZ workstation designed to be sturdy, reliable, and easy to use. It provides automated sample introduction that can be applied to a wide range of applications including HPLC, UHPLC, Nano-LC, LC-MS, fraction collection, microsampling, buffer exchange, liquid handling and more. The ASX-8000 is designed for the introduction of small sample volumes. The ASX-8000 autosampler can automatically introduce up to 768 samples(384-well plates) when fully loaded. It contains a microprocessor that allows sequential or random sampling, providing flexibility.

The autosampler is typically interfaced to and controlled by the same computer which controls the analytical instrument.

The ASX-8000 can be configured with a variety of optional accessories such as temperature control via Peltier cooling/heating, injection valves, solvent selection/switching valves, dynamic wash and fraction collection.

## About This Book

**NOTICE**

The ASX-8000 is available with a variety of options. This version of the manual does not describe any specific configuration.

This document describes the procedures for installing, using, and maintaining the autosampler.

This manual covers the following products:

- ASX-8000

**WARNING**

**CHEMICAL INJURY HAZARD**
**The autosampler is intended for use only by qualified operators who have been trained in safe laboratory practices. Make sure you know the hazards associated with all of the chemicals you are using, and take the appropriate precautions. Exposure to laboratory chemicals may result in serious injury.**

## Where to Go for More Information

In addition to this manual, you can refer to the following resources:

- The manuals for the analytical instrument you are using
- The *ASX-8000 Series Autosamplers Software Developer's Manual*
- The Teledyne CETAC Technologies Website: www.cetac.com
- Teledyne CETAC Technologies Customer Service and Support:

  1 (800) 369-2822

  1 (402) 733-2829

  1 (402) 733-1932 (Fax)

  E-mail: custserv@cetac.com

## Autosampler Standard Components


**Figure 1-1** ASX-8000 Autosampler—Front View With Enclosure

The following components are located on the outside front of the autosampler:

- **Status Lights.** The POWER light indicates that the autosampler is connected to a power source and turned on. If a temperature control unit

is present, the TEMP light will illuminate when the sample tray has reached its target temperature. The LOAD light indicates that the sample injection valve is in the load position.

- **Drain.** A drain port allows waste to drain from the rinse station into a waste container outside of the enclosure.
- **Enclosure with door.** The removable enclosure includes one or more doors to access the samples and frequently-serviced components.

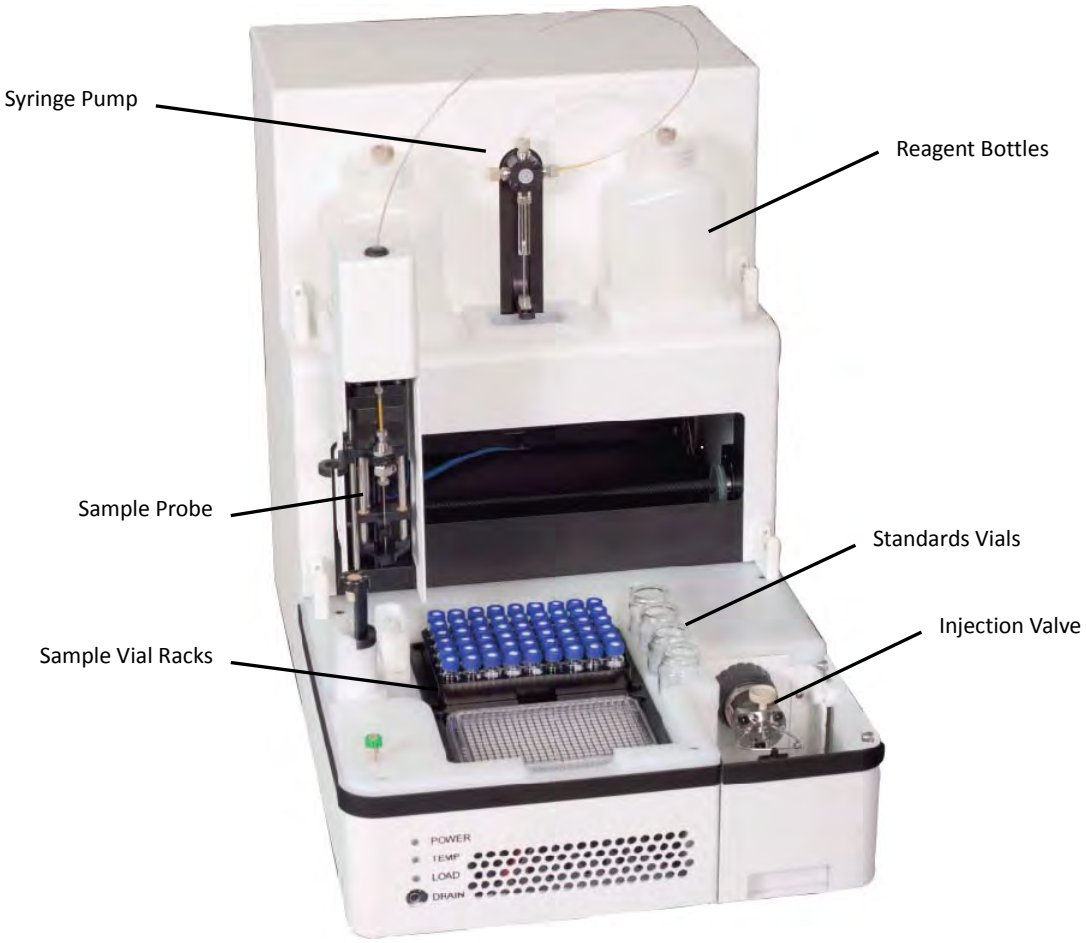


**Figure 1-2** ASX-8000 Autosampler—Front View Without Enclosure

The following components are located on the front of the autosampler and are shipped with the autosampler:

- **Sample Base.** The temperature-controlled sample base holds the sample vial racks in place.
- **Sample Vial Racks.** The number and type of vials depends on the application and on the version of the autosampler.
- **Standards/Reagents Vials.** The number and type of standards vials depends on the application and on the version of the autosampler.
- **Reagent Bottles.** Up to four reagent bottles can be mounted inside the enclosure. These bottles are typically used for rinse agents.

- **Rinse Station.** This is for rinsing the sample probe. An optional dynamic rinse feature is also available.
- **Sample Probe.** This assembly can include an autosampler probe, syringe needle, a fraction collector, or other devices. The autosampler can move the sample probe between standards, samples, injection valves and other locations.
- **Syringe Pump.** Most versions of the autosampler include one, two, or three pumps. The pumps draw the sample material up through the sample probe and direct it to its next destination. The syringe pump can be connected to an optional solvent selection valve.
- **Injection Valve.** Most HPLC and UPLC configurations include an injection valve for injecting the sample directly into a sample loop.

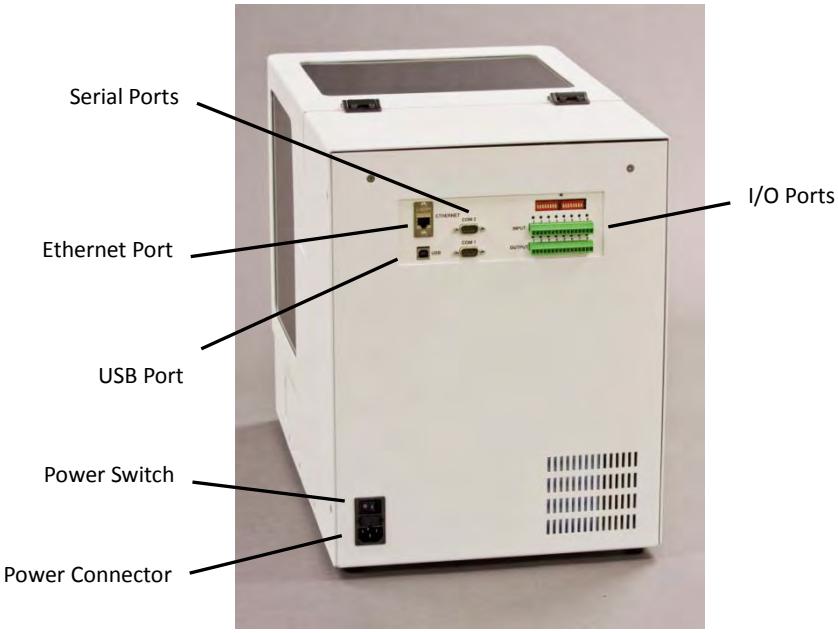


**Figure 1-3** ASX-8000 Autosampler—Back View.

The following components are located on the back of the autosampler and are shipped with the autosampler.

- **Two RS-232 Serial I/O Ports (COM1 and COM2).**
- **USB Port.** The USB port can be used to interface the autosampler with the host computer.
- **Ethernet Port.** The Ethernet port, and the associated LEDs, is disabled by default.
- **I/O Connectors**. Connectors to control accessories or to synchronize autosampler operation with other system components.

The following standard components are also typically shipped with the autosampler:

- **Sample Probe Kit.** The kit includes one or more sample probes appropriate for the application.

- **Communication Cables.** The type of cables shipped will vary based on the customer needs.
- **CD**. The CD contains:
  - C-Term software (terminal program)
  - USB device drivers
  - Firmware
  - This manual
  - Spare parts catalog
  - Other application-specific information

Supplied components depend on the application and the exact version of the autosampler. See the packing list in the shipping container to see exactly which components are supplied.

## Additional Equipment Required

In addition to the provided equipment, you will need:

- A host computer which has been configured with the instrument control software. This computer must have an additional free USB or serial port beyond the ports required to control the analytical instrument and other system components.

## Optional Accessories

If you are doing a specialized type of analysis or are connecting the autosampler to a host computer that uses a non-RS-232 communications protocol, you may need optional accessories in addition to the standard components included with the autosampler. Available accessories include:

- **Serial Interface Null Adapter.** The null adapter replaces one DB9F port adapter at the host computer. It is used for computers with DCE-AT style serial ports.
- **Serial Interface Special Adapter Kit.** The adapter kit replaces one or both standard serial port adapters with unwired DB9M, DB25M, and DB25F adapters for special applications or host computers with serial ports not conforming to the RS-232 standard.
- **Solvent Selection Valve.** This allows for the selection of up to 4 rinse or wash solvents. It is connected to the Syringe pump.
- **Temperature Control.** Temperature control of the samples is available using Peltier cooling/heating. Sample trays can be cooled or heated from 1˚ C to 70˚ C ± 0.5˚ C.
- **Fraction Collection.** A fraction collection kit is available. This allows for both sample injection and fraction collection on the autosampler. It is ideal for the fraction collection of small volumes into a microplate.
- **Dynamic Wash Pump.** The pump allows for more thorough rinsing of the outside of the sample probe and serves to reduce or eliminate sample carryover.

**NOTE:**

Contact Teledyne CETAC Technologies if you need additional accessories not listed, need added features to integrate the autosampler into your analytical system, or have unique requirements. Research and development of new features and accessories for the Autosampler, often inspired by customer requests, is a continuing activity at Teledyne CETAC Technologies.

## Key Features and Characteristics

The following are typical operating characteristics:

- Sample Volume: 0.1 - 5000 µl
- Minimal Injection Volume: 0.01 µL
- Sample Carryover: < 0.004%
- Injection Precision: < 0.5% (Total loop fill, 5µL loop, 25µL syringe)
- Available Syringes: 25µL, 50µL, 100µL, 125µL, 250µL, 1000µL, 2500µL, 5000µL
- Sample Viscosity: 0.2 – 10cP (with standard push injection)
- Injection Valves: Up to 1000 Bar (14,500 psi). Rheodyne and Valco valves are supported. Other valves available on request.
- Dimensions (H x W x D): 45.7 cm (18") x 33 cm (13") x 53.3 cm (21")
- Weight (includes cover, syringe pump, 2 valves): 47.3 lbs
- Temperature Control: 1 to 70˚C ± 0.5˚C
- Rack Options: 2 mL HPLC vials with total capacity of 108 vials, 2 x SBS microtiter plates (384-, 96- and 96 deep-well plates). Custom racks are available for other types of vessels
- Manufacturing standards: Meets applicable safety and EMC certification standards; CE certified; TÜV (SÜD) certified
- Environmental Conditions:
    - For Indoor Use
    - Temperature Range of 5˚C to 40˚C
    - Altitude up to 2000 m
    - Air pressure: 75 – 105 kPa
    - Pollution degree: 1 or 2, in accordance with IEC 66
    - Humidity: Maximum relative humidity of 80% for temperatures up to 31˚C, decreasing linearly to 50% relative humidity at 40˚C

## Chemical Compatibility

Autosampler components are made of corrosion-resistant stainless steel alloys or anodized aluminum. The enclosure and base are made from a high-strength aluminum alloy that is chromated and finished with an epoxy powder coating.

The autosampler operates reliably under a wide variety of conditions (see "Environmental Characteristics" on page 75). Components in the sample flow path will vary depending on the model of injection valve, syringe pump, tubing and sample probe chosen for a particular application.

**WARNING**

**CHEMICAL HAZARD**
**Do not use the autosampler with substances which could pose a hazard of serious injury to the operator if spilled or injected, such as biological substances or formic acid.**

**WARNING**

**Changes or modifications to the instrument that are not expressly approved by CETAC may constitute a safety hazard and could void the factory-authorized warranty.**

# 2 Preparing for Installation

Installing the autosampler requires preparation. Before you install the autosampler, you should evaluate the physical arrangement of the laboratory to choose a suitable location. Once you choose a location, you must carefully unpack the autosampler prior to beginning the installation.

This chapter discusses what requirements must be met when you choose a location. It also describes how to unpack the equipment before installation.

## Choosing a Location

Choosing a location for the autosampler involves evaluating the lab environment for the availability of space, liquid waste routing and power. For the system to function optimally, the location you select must meet specific requirements associated with each of these items. The following sections discuss space, water, and power requirements.

### Space Requirements

Most analytical applications benefit from utilizing the shortest sample flow path. Therefore, you should place the autosampler in close proximity to the nebulizer of the analytical instrument. The recommended footprint for the autosampler is as follows:

| | Autosampler Dimensions | Recommended Space Including Cables/Tubing |
|---|---|---|
| **Height** | 45.7 cm (18”) | 50 cm (20") |
| **Width** | 33 cm (13”) | 43 cm (17") |
| **Depth** | 53.3 cm (21.0") | 63 cm (25") |
| **Weight** | 16.3 kg (36 pounds) - 21.5 Kg (47.4 lbs) – Depends on configuration | |

**Table 2-1:** Physical Characteristics

The weight shown is that of the autosampler itself, without packaging, vials, bottles, or sample materials. The weight will vary depending on the configuration chosen (number of valves, syringe pump, cooling/heating, etc.).

Allow at least 5 cm behind the autosampler for cable egress, ventilation, and access to the power switches. Always position the equipment so that it is easy to disconnect the power cord.

Allow plenty of space to sit or stand in front of the autosampler to access samples, reagents, and components.

### Work Surface Requirements

The autosampler must be placed on a sturdy countertop or table. Do not place the autosampler on a wheeled cart or folding table.

During operation, the autosampler produces both vertical and horizontal forces. If the work surface is allowed to shake or wobble, the autosampler may "walk" across the surface, liquids may spill, or data quality may be affected.

The surface must be at a height which allows access to the sample vials and reagent bottles without excessive physical effort and with minimal chance of spilling valuable or hazardous materials.

## Rinse Solution Requirements

If a different rinse agent is drawn from a container outside of the autosampler enclosure, place the rinse agent source within two meters of the autosampler.

## Liquid Waste Routing Requirements

Ensure that there is a liquid waste receptacle within two meters of the autosampler. The waste receptacle inlet should be at least 30 to 60 centimeters lower than the autosampler rinse station outlet and set up so that the rinse drain tubing drops directly into the waste receptacle with no coiling and without being submerged below the liquid level of the waste receptacle. Ensure that the drain tubing is properly attached to the drain to prevent leaks.

## Power Requirements

Place the autosampler within 1.2 meters of a power outlet.

**WARNING**

**SHOCK AND FIRE HAZARD**
**The autosampler must be plugged into an outlet which has a protective ground connection.**

The autosampler must be powered through an AC power source that will not apply more than 240VAC between the supply conductors and ground. A protective ground connection by way of the grounding connector in the power cord is required for safe operation.

Ensure that you position the autosampler so that the location where the power cord plugs into it is easily accessible (is not blocked) and it can be quickly disconnected if needed. In case of hazard, the autosampler should be disconnected from the power source.

The power supply socket is on the back of the autosampler below the power switch. Do not apply power until ready to operate the autosampler.

## Unpacking the Autosampler

**WARNING**

**LIFTING HAZARD**
**Two people are required to lift the autosampler. Lifting should be done with a person situated on either side of the instrument.**

Inspect external packaging upon receipt for signs of shipping damage. Inspect all items during unpacking and notify the carrier immediately of any concealed damage.

If the system is shipped or removed from storage during cold weather, allow the packaged equipment to equilibrate to room temperature before opening and exposing to warm, humid air. It is usually sufficient to provide four to eight hours for this purpose.

**CAUTION**

**EQUIPMENT DAMAGE FROM CONDENSATION**
If condensation forms on or inside the autosampler, allow it to dry thoroughly before connecting it to a power source and operating it. Failure to do so may cause equipment damage.

Remove the packing checklist from the shipping container, and check off items against it. Leave accessories in the packing until you are ready to install them.

To unpack the instrument:

1 Place the box flat on the floor.

**Figure 2-1** Box in position for unpacking

2 Open the top of the box.

**Figure 2-2** Opening the box

3 Remove the foam insert (if present) from the top of the box.

**Figure 2-3** A foam insert may be present on top of the box

4 Remove the two accessory boxes.

**Figure 2-4** Removing the accessory boxes

5 Remove the foam insert which protects the top of the ASX-8000. If you will be using a cart, move it into position near the box.

**Figure 2-5** Box after removing the foam insert; cart in position

6 With the help of an assistant, grasp the straps and lift the unit out of the box and place it on the cart or work surface.

**WARNING**

**LIFTING HAZARD**
**Two people are required to lift the autosampler. Lifting should be done with a person situated on either side of the instrument. Lifting without assistance may cause injury.**

**Figure 2-6** Removing the ASX-8000 from its box

7 Carefully remove the plastic wrap which goes all the way around the autosampler. Be careful not to scratch the paint surface. A second layer of plastic wrap passes under the cover of the autosampler; you do not need to remove that plastic wrap yet.

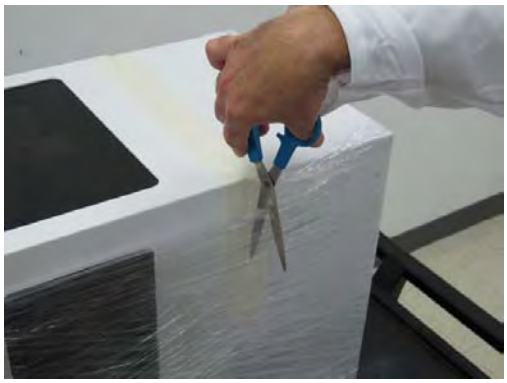

**Figure 2-7** Removing the outer plastic wrap

8 Open the two accessory boxes and locate the key.

**Figure 2-8** Accessory boxes

**9** Turn the key and open the door of the autosampler.


**Figure 2-9** A key is required to open the front door

**Figure 2-10** Front door open

**10** Use a Phillips screwdriver to loosen the screw at the side of the autosampler front cover, as shown.

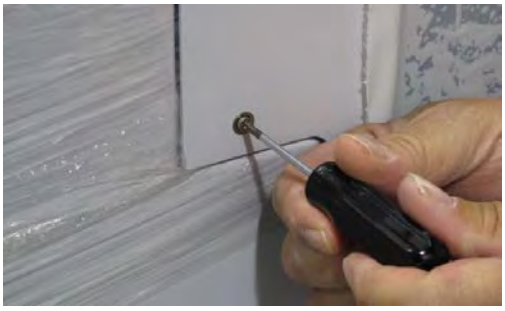

**Figure 2-11** Loosening the screw

**Figure 2-12** The screw does not need to be removed

**11** Carefully lift the front cover from the autosampler.


**Figure 2-13** Removing the front cover

**12** Carefully remove the plastic wrap that is holding the XYZ arm in place. Be careful when removing the wrap near the sample probe and arm.

**Figure 2-14** Removing the inner plastic wrap

**13** Remove the foam pad located behind the XYZ arm.

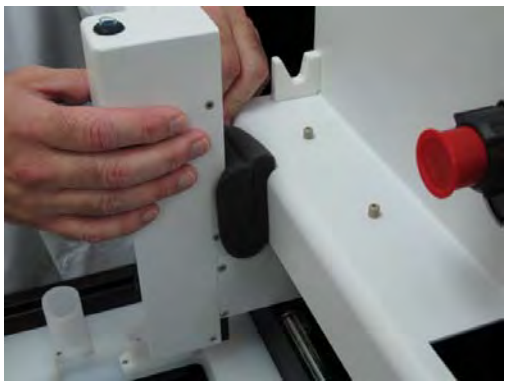

**Figure 2-15** Removing the foam pad

**14** Check the contents of the two accessory boxes. Verify against the checklist to ensure that all parts are present.

**NOTE**

Keep the factory packaging for use in case the product ever needs to be returned or shipped to another location.

**NOTE**

A separate pictorial guide that illustrates how to re-pack the ASX-8000 is available. Contact customer support or your representative for details.

# 3 Installing the Autosampler

The autosampler is designed for easy installation. The ASX-8000 is factory aligned prior to shipment and items such as sample probe, injection valve and solvent selection valve are installed at the factory. Installation primarily consists of making appropriate electrical connections, making plumbing/tubing connections, and establishing connections between the host computer and the autosampler.

## Tools Required

You may need the following tools depending on the configuration of the autosampler:

- Phillips head screwdriver
- Wrench, 5/16 inch – 1/4 inch
- Flat-blade screwdriver
- Ball-point Allen wrench set

## Overview

To install the autosampler, you must complete the following tasks. Each of these tasks will be discussed in detail later in this chapter.

- Autosampler placement
- Electrical connections
- Plumbing/Tubing Connections
- Connecting the ASX-8000 to the host computer
- Placing the sample racks

**WARNING**

**LIFTING HAZARD**
**Two people are required to lift the autosampler. Lifting should be done with a person situated on either side of the instrument. Lifting without assistance may cause injury.**

**WARNING**

**PINCH/PUNCTURE HAZARD**
**Ensure the AC power is off before proceeding with installation. If the power is left on, motors may move unexpectedly and cause injury.**

## Placing the Autosampler

See "Preparing for Installation" on page 15 to ensure that there is adequate space for the instrument and for appropriate electrical connections. See "Introduction" on page 7 and "Safety and Regulatory Information" on page 75 for appropriate environmental conditions. Make sure the instrument is placed on a stable non-moving surface.

If the autosampler is being used in conjunction with an HPLC or similar system make sure the injection valve is close to the detector and column/pump to reduce retention time delays and peak broadening.

## Connecting the Autosampler to a Power Supply

1. Turn the power switch on autosampler OFF. The power switch is located on the lower back panel.
2. Check the plug on the power cord to verify that it is of the correct type for your country.
3. Check the fuses to ensure that they are of the appropriate type for the mains supply voltage. See "Replacing the Fuse" on page 64.
4. Plug the power cord into a power outlet.
5. Plug the power cord into the back of the autosampler.
6. Turn the power switch on the autosampler ON.

   The autosampler will initialize and go to the home postion when the power switch is turned on.

   It is important to use the appropriate power cord for your country. See

   - "Power requirements" on page 76.
   - "Power Cord Set Requirements" on page 77.

## Connecting the Tubing

Note that portions of the tubing assembly may have been completed in advance at the factory. The sample probe will be factory installed.

Make sure that the appropriate drain tubing has been connected to the drain port on the front of the instrument. See "Liquid Waste Routing Requirements" on page 16 for information on placing the waste receptacle.

If the optional dynamic rinse station is available, the ports will be located on the back panel or the side of the autosampler. See the figure below. The rinse station uses a 1/16" flangeless fittings and ferrule such as Upchurch P-230, 1/16" flangeless fitting with P-221 ferrule.


**Figure 3-1** Rinse Ports

Tubing connections depend on the valves and syringes included with the autosampler, and on the intended application.

A couple of examples are found below.

### Tubing Example 1

The picture below shows an ASX-8000 configured with a 6-port injection valve.

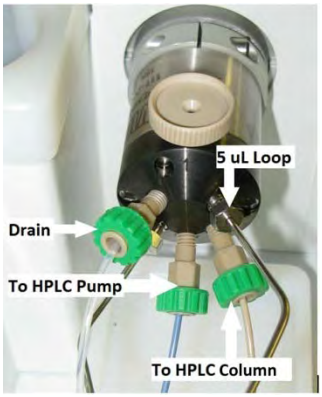


**Figure 3-2** 6-Port Valve

## Tubing Example 2

The pictures below show an ASX-8000 configured with a solvent/wash selection valve with syringe pump.

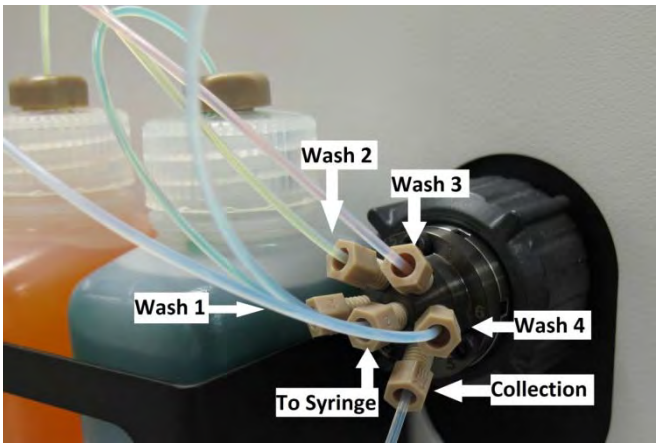


**Figure 3-3** Selection Valve

**Figure 3-4** Solvent Bottles and Syringe Pump

## Tubing Example 3

The pictures below show an ASX-8000 configured with a Valco solvent/wash valve.

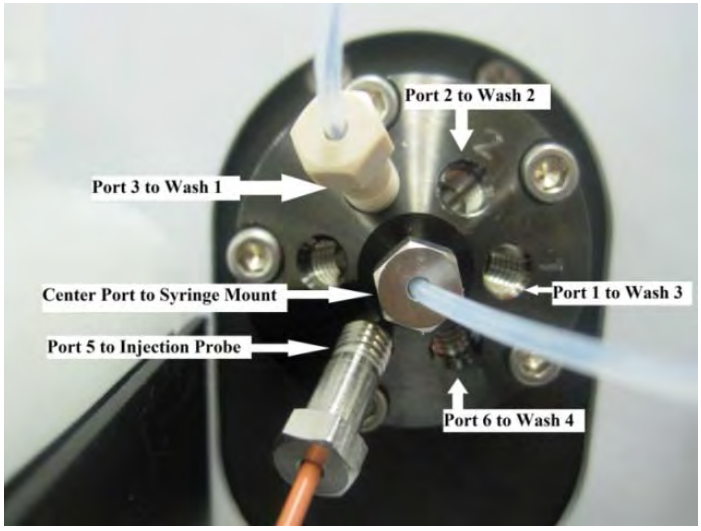


**Figure 3-5** Valco solvent selection valve

**CAUTION**

**PROPERLY TIGHTEN THE FITTING ON THE SYRINGE MOUNT**
When connecting the center port of the solvent selection valve to the syringe mount, finger tighten the fitting into the syringe mount and then carefully tighten with a wrench until snug, as shown below. Failure to tighten with a wrench may result in leaking or poor precision. Do not over-tighten: damage may occur if the fitting is forced.

**Figure 3-6** Finger tighten the fitting then carefully tighten with a wrench

## Connecting the Analytical Instrument

Connections vary depending on the application.

## Overview of Electrical Data Connections

Electrical connections are found on the back of the ASX-8000 as shown below:

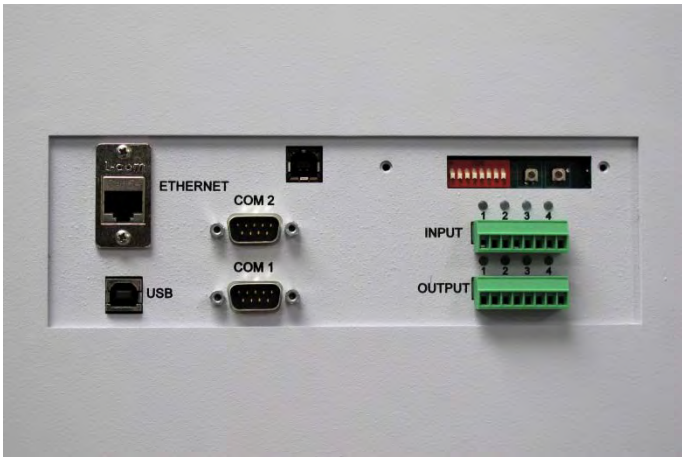


**Figure 3-7** Connectors on the back of the ASX-8000

See Figure 1-3 on page 10 for a complete back view of the instrument.

## Connecting the Autosampler to the Host Computer

Instrument control software on the host computer controls both the analytical instrument and the autosampler. You cannot operate the autosampler until you establish a communications interface between the autosampler and the host computer. It is through this interface that the host computer directs the operation of the autosampler. The autosampler supports the following communications protocols:

- The serial (RS-232) protocol is the standard configuration. There are two RS-232 serial ports on the autosampler, and a serial interface kit is shipped with the autosampler if appropriate.
- The USB interface is an optional configuration. A virtual COM port is created when using the USB and therefore, the connection looks like a standard RS-232 serial port to the host PC software.

**NOTE:**

Although the autosampler supports several communications protocols, the host computer governs which protocol is used. To determine which protocol is required for the analytical instrument you are using, refer to the hardware or software manual provided with the instrument.

## Establishing an RS-232 Serial Communications Interface

The serial interface kit provided with the autosampler includes a serial cable equipped with two male DB9 connectors. Use the interface kit to establish a serial communications interface with the host computer. To do so, complete the following steps:

1. Plug one end of the cable into the host computer's serial (COM) port selected for autosampler communications.

   Make sure that the COM port you select matches the port selected in the host computer's software.

2. Finger-tighten both screws of the connector.

3. Connect the other end of the cable to the autosampler's COM1 port.

4. Finger tighten both screws of the connector.

**NOTES**

If a host computer serial port with a DB9F, a DB25M, or a DB25F connector (9 pin D-submini receptacle or 25 pin D-submini plug or receptacle) must be used, an adapter is required to convert the serial port to a DB9M. **Do not use a "null modem" adapter.**

Ensure you are connecting the adapter to the COM1 port. Connecting the adapter to the COM1 port on the autosampler will cause a malfunction. The autosampler COM2 port is used for communications to accessories such as autodilutors.

When interconnecting any computing devices, keep the communications cables away from sources of electromagnetic or radio frequency (RF) interference, such as electric motors, transformers, fluorescent light ballasts, or RF energy sources. Limit cable runs for RS-232C to less than 16 meters. If these conditions cannot be satisfied, use low-impedance, fully shielded cables to provide satisfactory operation. The cables are available from many sources, but you will need to specify the correct mating connectors and "straight-through" (DTE-DCE) wiring.

## Establishing a USB Communications Interface

If the host computer does not have an available RS-232 port, you can use a USB port instead.

A USB cable is supplied. Alternatively, an "A-B" USB cable may be obtained from any computer store.

1. Power up both the computer and the autosampler.

2 Plug one end of the cable into the host computer's USB port and the other end to the autosampler's USB port.

The computer screen should display a "New Hardware Found" window. A USB driver must be installed to make the USB port emulate an RS-232 COM port, and the installation must be repeated for each USB connection.

The exact procedure for installing the driver depends on the version of the host computer's operating system. The instructions which follow show installation on the Windows XP operating system.

3 Allow the Windows Found New Hardware Wizard to use Windows Update to search for a driver.

In most cases, the driver will be found online and installed automatically. This process may take several minutes.

4 If a driver is not found, click Back to begin installation from the CD-ROM.

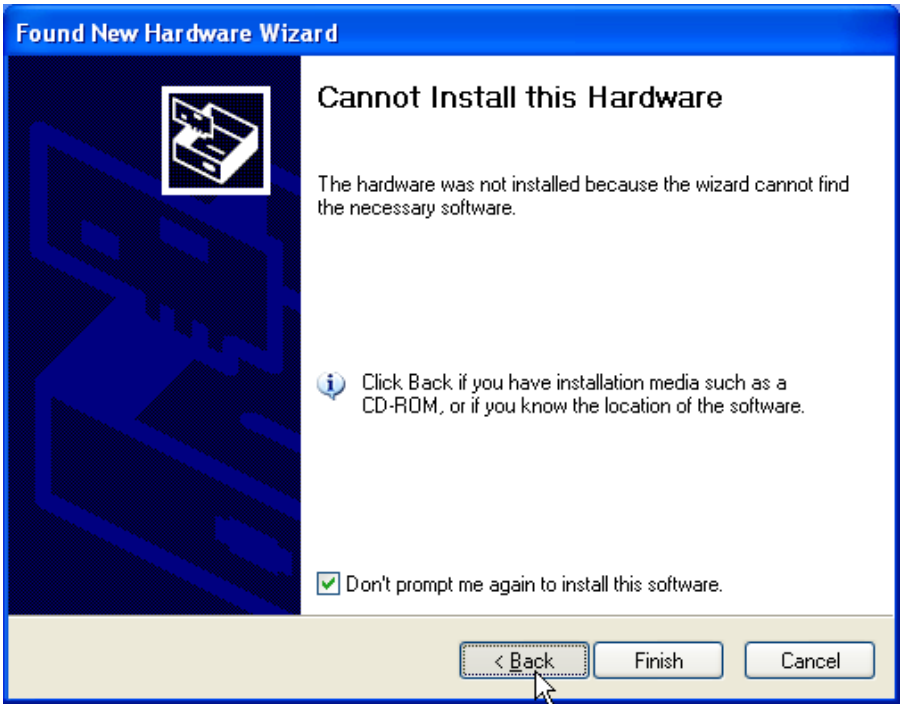


**Figure 3-8** Message showing that a driver was not found.

a. Insert the CD-ROM.

b. Select Install from a specific location and click Next.

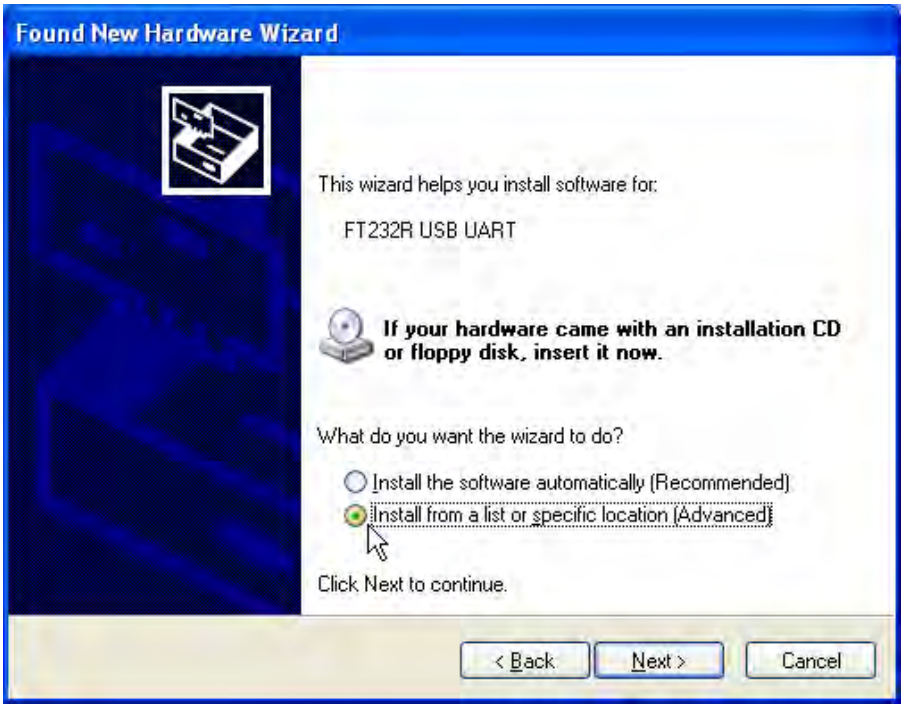


**Figure 3-9** Choosing to install USB driver from a CD

c. Select Search removable media.

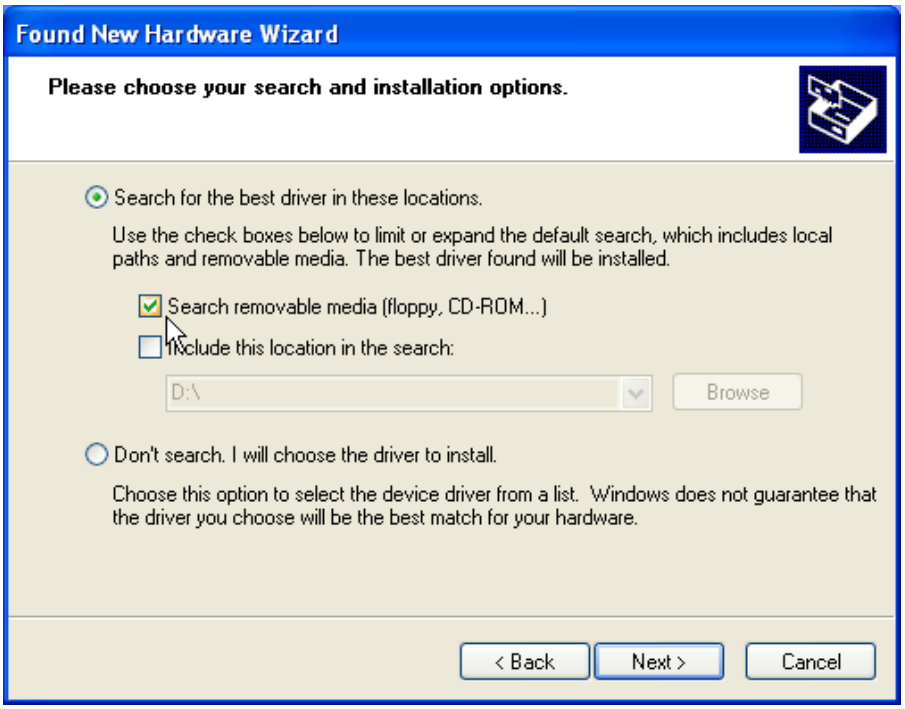


**Figure 3-10** Choosing to install USB driver from a CD

d. Wait while the computer searches the CD.


**Figure 3-11** Searching the CD

e. When the driver is found, select it and click Next.

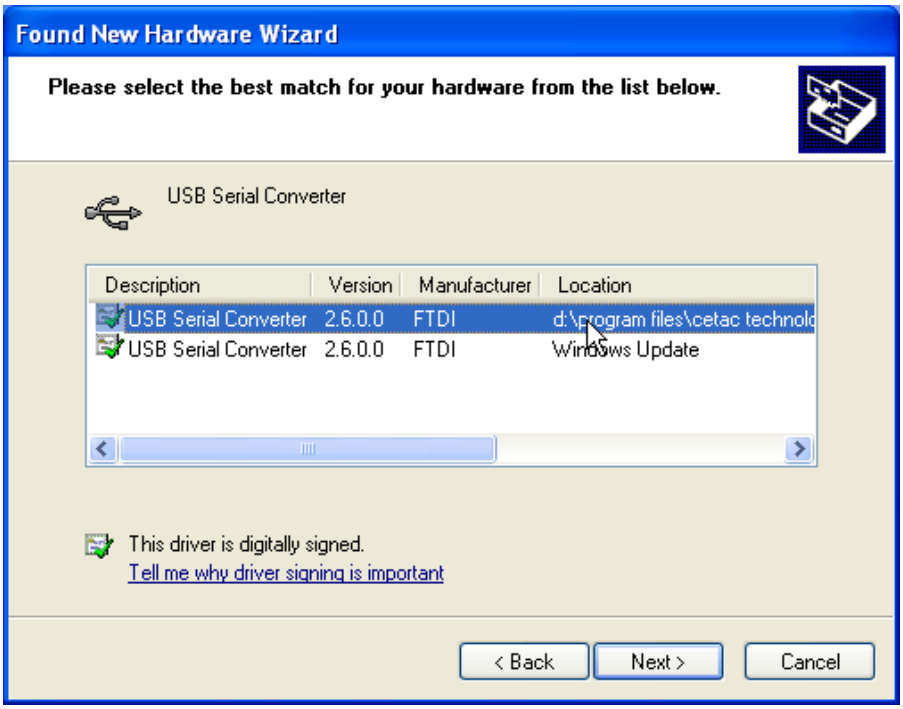


**Figure 3-12** Selecting the driver

f. The driver installation is complete.


**Figure 3-13** Driver installation is complete

If a message shows which COM port number was chosen (look for a "bubble" in the lower-right corner of the screen), make a note of it.

5 Confirm that the COM port selected for the USB matches the port selected in the host computer's software.

## Placing the Sample Vial Racks

**WARNING**

**PUNCTURE HAZARD**
**Never attempt to load, unload or reposition the sample vial rack or sample vial while the autosampler is operating. The sample probe may move unexpectedly and cause an injury.**

1 Before loading or unloading any sample vial racks on the sample tray, park the sampling arm and probe in the home position by cycling the power on and off. The home position is the initial position at power up.

2 Place the sample racks on the tray. There are two available positions for installation of racks on the sample tray. Ensure that the sample racks are fully seated on the tray.

### Insulated Racks

Thermally insulated racks which hold 2 mL HPLC vials are available for use. These racks are recommended when using the Peltier temperature control. Place racks in both tray positions to reduce/prevent condensation effects.

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# 4 Installing the ASX-8000 Fraction Collector Tool

## Equipment Required

### Tubing

The fraction collector tool is not delivered with tubing. The guide sleeve is designed for 1/16" OD tubing. Please refer to your HPLC vendor *User's Guide* for the appropriate tubing diameter (ID and OD). PEEK is highly recommended but fused silica or PEEKiSil can also be utilized.

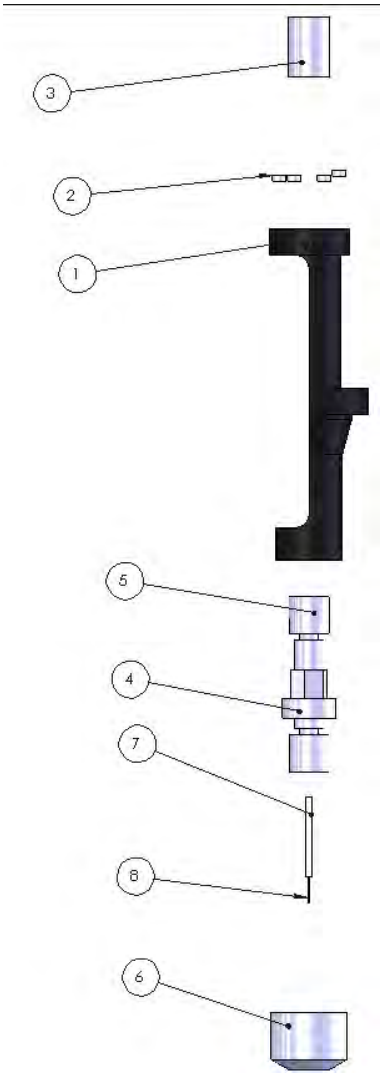
The illustrations in this chapter are shown with PEEK tubing.

### Tools

**Ceramic cutting tool.** The fraction collector tip is fused silica, 1 inch in length, 360 µM ID, 1/16" OD. The length of the tip can be adjusted by cutting the tip using a ceramic cutting tool (see page 41).

# Overview of the Fraction Collector Tool

**Figure 4-1** Fraction Collector Tool




**1** Fraction collector tool

**2** Magnets installed in the top of the tool

**3** Feed through for fraction collector tool

**4** Fraction union mount

**5** Nanotight union

**6** Fraction tip holder

**7** Sleeve for fraction collector fused silica tip

**8** Fused silica fraction Tip (1" length, 360 µm ID, 1/16" OD)

**Figure 4-2** Fraction Collector Tool Assembly

Portions of the tool are pre-assembled to aid in the appropriate installation of the tubing and to prevent the loss of parts.

## Installing the Fraction Collector Tool

**NOTE**

Improper tool connections can lead to leaks or to the formation of dead/delay volume which may result in poor performance.

Always use the ferrule supplied with the nanotight union (item 5 in Figure 4-2) to lock the sleeve and silica tip in place. Make sure the sleeve and silica are firmly seated in the union to minimize dead volume.

1 Remove the fraction collection tubing lockdown fitting from the autosampler by turning the fitting counterclockwise. The fitting is located at the front, left hand corner of the autosampler (see Figure 4-3).

**Figure 4-3** Lockdown Fitting

2 Guide the PEEK tubing (tubing not supplied with system) that is connected from the detector of your HPLC system through the fraction collector guide sleeve located on the lower right hand side of the autosampler, and then up through the hole where the tubing lockdown fitting was removed.

**Figure 4-4** Location of Guide Sleeve


**Figure 4-5** Inserting the Tubing through the Guide Sleeve

3 Place the lockdown fitting over the tubing and loosely screw the fitting into the anchor hole. Do not tighten completely.

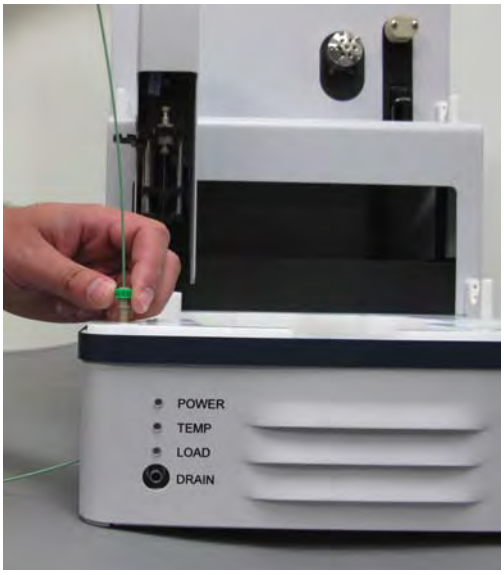



**Figure 4-6** Inserting the Tubing through the Guide Sleeve

4 Disassemble the fraction collector tip from the end of the faction collector tool.

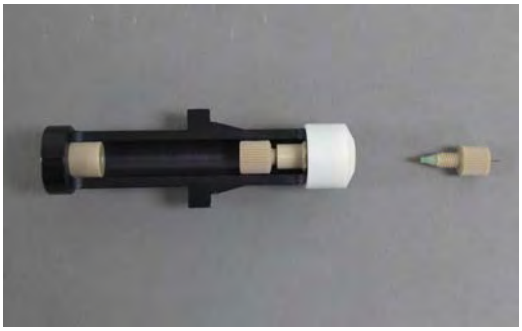


**Figure 4-7** Fraction Collector Tip

See page 41 for information on how to trim the fraction collector tip, if needed.

5 Remove the union and the finger-tight fitting from the tool.

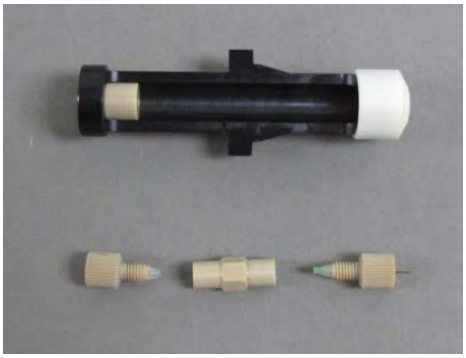


**Figure 4-8** Union and Finger-Tight Fitting

6 Thread the tubing through the top of the fraction collector tool (fraction collector tool feed through).

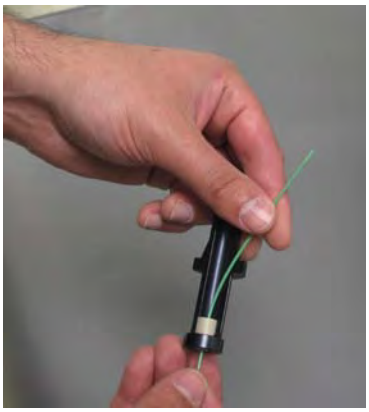


**Figure 4-9** Threading Tubing into the Tool

7 Slide the PEEK nano tight fitting with ferrule onto the fraction collection tubing.

**Figure 4-10** Installing Nano Tight Fitting

8 Attach the union to the finger tight fitting with ferrule.

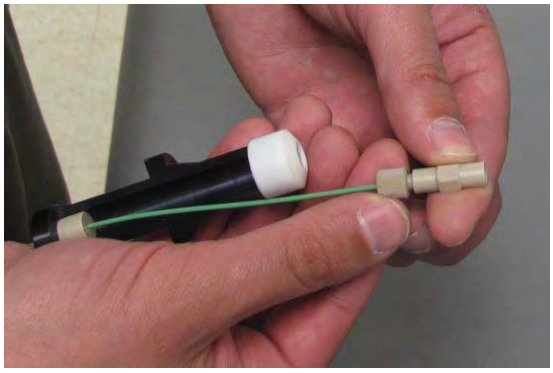


**Figure 4-11** Installing the Union

9 Slide tubing and fittings back in the fraction collector tool and attach the fraction collector tip.

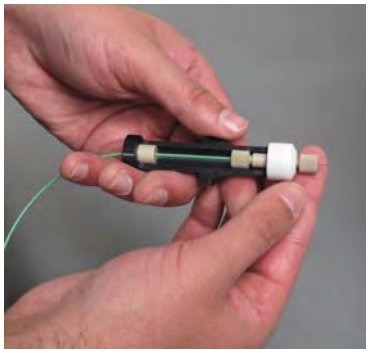


**Figure 4-12** Installing the Collector Tip

10 Use the ferrule supplied with the nanotight union (item 5 in Figure 4-2) to lock the sleeve and silica tip in place.

Make sure the sleeve and silica are firmly seated in the union to minimize dead volume.

**Figure 5.** Fraction Tool Showing PEEK Tubing Attached to Fused Silica Tip

**11** Place the fraction collector tool into the fraction collector mount.

Ensure that there is enough tubing to allow the fraction collector tool to reach the farthest vial or well. Note that too much play in the tubing could possibly cause the fraction collector tubing to catch and disturb alignment.

**12** Once the tubing length is adjusted, tighten the fraction collector lockdown fitting using your fingers.

It is not necessary to over-tighten this fitting. The fitting is designed to serve only as an anchor to hold the tubing in place


**Figure 5.** Tightening the Lockdown Fitting

## Adjusting the Fraction Collector Tip

The fraction collector tip is fused silica (ID = 75 µm) that is cut to a length of 2.5 cm. The probe tip is designed to allow for adjustment of the length of the fused silica. If adjusting the tip length, use a ceramic tool to cut the tubing and inspect the ends to make sure they are straight, clean, and free of burrs. Always check depth positions using the appropriate software after making any change to the length of the fused silica.

Custom tips with a different inner diameter to allow a different flow rate can also be used for fraction collection. When you select the tubing, make sure the *outer* diameter is the same (1/16" OD) and that cuts made to the tubing are clean. Check fraction collector alignment and depths before use.

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# 5 Operating the Autosampler

## Establishing Optimal Operating Conditions

In order to maintain and ensure the long life of the autosampler, it is important to observe the following guidelines:Creating the Lab Environment

To create satisfactory operating conditions in your lab environment, follow these guidelines:

- Operate the autosampler in a conventional lab environment where the temperature is 50–85 °F (10–30 °C), the humidity is 20–70% non-condensing, and the unit is not exposed to excessive flammable or corrosive materials.
- Avoid rough handling of the autosampler. If possible, do not expose the autosampler to vibration or shock.
- Protect the autosampler from long-term exposure to condensation, corrosive materials, solvent vapor, continual standing liquids, or large spills into the autosampler cabinet or arm. Exposures of this type can damage the drive mechanisms as well as the electronics. Prolonged exposure to some organic solvents may cause the paint to peel from the unit.
- Observe the same general electrostatic discharge precautions as with any other integrated circuit electronic devices. Low humidity environments, especially when combined with static-generating materials, require maximum care.

**CAUTION** Discharge static buildup and ground to the autosampler base or cabinet before performing any maintenance. Do not touch or short-circuit bare contacts, COM ports, USB, or I/O ports.

- Avoid using the autosampler if strong electromagnetic interference, radio frequency interference, or above normal radioactivity is present. These could possibly cause erratic operation of the Autosampler.

- Replace components that will wear out with normal use on a routine schedule. The following components will wear out with normal use and should be periodically replaced:
    - Sample probes (Needles)
    - Syringes
    - Tubing and Fittings
    - Injection ports
    - Injection valve components subject to wear (rotors, stator)
    - Solvent bottles
    - Drain tubing

If you fail to replace these components when they deteriorate, the autosampler will not function properly. For information about replacing autosampler components, see "Maintaining the Autosampler" on page 49.

**NOTE**

The above listed items are not covered under the autosampler's two-year warranty

**NOTE**

Damage or malfunction that results from unsatisfactory operating conditions may constitute misuse and abuse and be excluded from warranty coverage.

## Starting the Autosampler

**WARNING**

**PINCH HAZARD**
**Keep fingers, hair, and loose clothing away from the moving parts of the autosampler.**

1. Make sure the autosampler is connected to a power source and that the appropriate communications cables have been attached to the ASX-8000. (In other words, there should be a USB cable between the computer and the back of the autosampler.)

2. Turn the autosampler power switch on.

   The power switch is located on the lower rear panel of the autosampler (see Figure 1-3 on page 10).

   - When the power is turned on, the autosampler will perform a start-up sequence. The injection valve will be set to the "injection" position and the syringe pump will set to its home position. The autosampler will move the XYZ mechanism to the "Home" position. When the start-up sequence is complete, the blue Power LED on the front panel will illuminate.

- The instrument is now ready to accept commands from the instrument control software (see "Installing the Autosampler" on page 23).
- If a temperature controller unit is present on the autosampler, the TEMP light will illuminate when the sample tray reaches its target temperature. The default setting for the temperature control is 10° C.

3 Access the host computer's software and activate the autosampler program.

## Testing the Communications Interface

Check to ensure that communications have been properly established between the autosampler and the host computer software. If the communications interface between the autosampler and the host computer is not established correctly, the autosampler will not function.

1 Check that the communication cables are properly attached between the host computer and the autosampler.

2 Connect to the autosampler using the appropriate control software and follow directions provided by the appropriate software User's Guide.

3 A terminal emulator program such as C-Term can be used to test communication with the autosampler. See "Operating the Autosampler Using a Terminal Program" on page 69 for details. Communication can also be verified using the ASX-8000 Test Program Software. See "Troubleshooting the " on page 63 for details.

## Checking Alignment

The Autosampler is pre-aligned at the factory for appropriate needle positioning to the sample vials (or microplate wells), injection port, rinse stations and solvent vessels. It is recommended that the alignment be checked when the sample probe or injection port has been replaced or if the instrument has been moved to a new location. Shipping or rough handling could possibly disturb the autosampler alignment. If it is incorrectly aligned, the sample probe will not function properly resulting in poor data recovery. It is therefore important to test the sample probe alignment before you actually run samples with the autosampler.

**NOTE:**

Before testing the sample probe alignment, ensure that you have installed all autosampler components correctly and have established communication with the host computer and the autosampler.

Testing the sample probe involves observing the operation of the sample probe. To do so, complete the following steps:

1 Load the autosampler sample tray with the appropriate empty sample vial racks. If using temperature control, fill both rack positions on the tray.

2 Verify that the LED power indicator is on.

3 Using the appropriate instrument control software, designate the sample positions at the left rear, left front, right rear, and right front and middle of each sample tray.

4 Place sample vials at the designated positions.

5 Command the autosampler to move the sample needle to the designated sample positions. Visually inspect the vial or tray to make sure the sample needle is down far enough but not touching the bottom of the tray.

6 Command the autosampler to go to the rinse station and the injection port to verify positioning to those positions.

> **NOTE:**
>
> If the autosampler alignment is not correct, contact Teledyne CETAC Technologies Customer Service and Support or an authorized representative. An ASX-8000 alignment software tool with instructions is available.

## Flushing the Syringe and Checking for Leaks

A new syringe should be manually flushed with solvent and filled with fluid before use. This prevents air bubbles in the syringe barrel, syringe valve and tubing. All tubing and fittings should be tested for leaks prior to running samples. This is especially critical when using small volume syringes such as a 25µL syringe.

The flush procedure uses functions of the provided software, and will vary, depending on application and the software used.

### Example Flush Procedure

The procedure will vary depending on the software used and the hardware configuration. A typical **example** procedure is shown below. The example shows an ASX-8000 configured with a Rheodyne solvent selection valve and a syringe pump with PEEK syringe mount.

1 Lower the syringe pump plunger using the appropriate software. Detach the syringe plunger from the mounting screw and remove the syringe. Another option would be to remove the entire mount assembly with syringe attached and then remove the syringe.

**Figure 5-1** Autosampler Syringe Pump with PEEK Mount

2 Fill the detached syringe with appropriate mobile phase and purge any bubbles before remounting the syringe onto the PEEK syringe mount. Re-attach the syringe plunger to the mounting screw and move the plunger to the home position with appropriate control software.

**Figure 5-2** Priming and Removing Bubbles from the Syringe

3 Install the tubing:

a) Install appropriate size Teflon or FEP tubing from position 3 on the solvent selection valve to "Wash 1" bottle filled with appropriate mobile phase.

b) Install appropriate Teflon or FEP or PEEK tubing from the center position of the solvent selection valve to the top of the PEEK syringe mount.

c) Install appropriate tubing from position 6 on the solvent selection valve to the top of the injection probe/needle assembly.

Make sure you use appropriate fittings and ferrules. Use a PEEK Valco ferrule to connect with the injection probe/needle assembly and a PEEK Valco ferrule to attach to the top of the syringe mount.

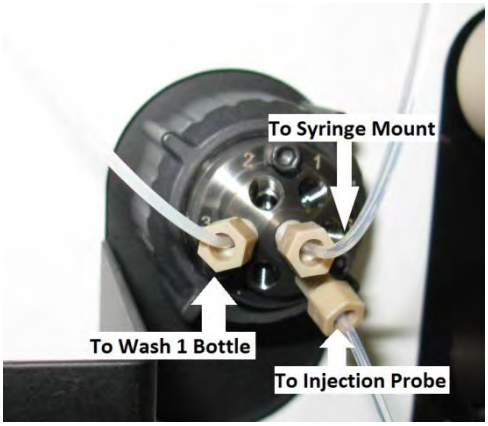



**Figure 5-3** Tubing connections for Rheodyne Solvent Selection Valve

4 Use the appropriate commands in the designated software to wash/rinse/purge the syringe. Check for leaks and continue the wash cycle to purge bubbles from the lines. If 5 cycles does not remove bubbles from the syringe then uninstall the syringe, purge manually and repeat.

## Shutting Down the Autosampler

To shut down the autosampler, complete the following steps:

1 If the autosampler will not be used for a while, or if you will be performing maintenance, use appropriate commands in the software to rinse and drain the system.

2 Turn off the autosampler power switch.

3 If you will be performing maintenance, unplug the power cord either at the back of the autosampler or at the wall outlet.

# 6 Maintaining the Autosampler

To obtain optimum performance from the ASX-8000 autosampler, it is important to keep the instrument well-maintained. Routine maintenance of the autosampler consists of daily cleaning of specific autosampler components. Routine maintenance also includes checking for leaks or other damage. Additional periodic maintenance tasks may be required, including replacement of the following autosampler components: any autosampler tubing and fittings, the syringe on the syringe pump, sample probe, reagent bottles, injection valve rotor and seals, drain tubing, injection valve port and seals, and injection valve loop.

**WARNING** **Always use appropriate personal protective equipment to prevent exposure to hazardous chemicals or biological fluids which may be present in or near the autosampler.**

**CAUTION** Discharge static buildup and ground to the autosampler base or cabinet before performing any maintenance. Do not touch or short-circuit bare contacts, COM1, Dilutor, or auxiliary ports.

**CAUTION** Never lubricate the lead screws. The lead screw nuts are compounded with a dry film lubricant. Oiling the lead screws will cause gumming, galling, and binding of the sample probe assembly.

## Cleaning the Autosampler

Cleaning the autosampler is the primary maintenance task you perform. Failure to do so regularly causes increased wear and reduces the autosampler's life.

You must clean the autosampler daily to prevent damage and extend its life. It is especially important to clean up spills and remove contaminants, such as abrasives, from the autosampler's moving parts. It may also be necessary to chemically neutralize spills.

### Daily External Cleaning

Use of the autosampler often results in spills on autosampler components such as the sample tray. Good maintenance requires that you clean the autosampler daily. To do so, complete the following steps:

1. Shut down and unplug the autosampler.

   For information about shutting down the autosampler, see page 48.

2. Wipe the sample tray, autosampler cabinet, and the outside of the autosampler arm using a towel dampened with a lab-grade cleaning agent.

**CAUTION** Do not allow the cleaning agent to come into contact with the lead screws. Also, never lubricate lead screws.

3. Repeat the previous step, using a towel dampened with clear water.

   This process removes any remaining contaminants.

4. Dry the sample tray, autosampler cabinet, and the outside of the autosampler arm using a dry towel.

   The autosampler must be thoroughly dry before you turn the power on.

### Flushing the Fluid Path

Depending on the use of the autosampler, it may be necessary to flush the entire fluid path. It is important to clean the fluid path if you will not be using the system for a while or you are using a solution with a high salt concentration for a needle wash or as a diluent. The use of cleaning protocols may vary depending on the application.

**CAUTION** To prevent equipment damage, always rinse organic solvents out of the drain system and make sure the drain tubing is properly attached. Leakage of organic solvents from poorly attached drain tubing may damage the paint on the autosampler cabinet.

### Cleaning Biological Fluids

If the surface of the autosampler comes in contact with biological fluids such as blood products, decontaminate using a 10% bleach solution by adding one part commercial bleach to nine parts water. Follow this by wiping the surface with a damp cloth and then a dry cloth.

## Managing Condensation Build-Up

Condensation build-up is directly related to the temperature and relative humidity in the ambient air (dew point). Cooling below ambient temperature may result in condensation on the autosampler tray.

CETAC recommends the following actions to minimize condensation build-up when the autosampler is to be utilized under environmental conditions where condensation may occur:

- Use thermally insulated racks placed in both tray positions.

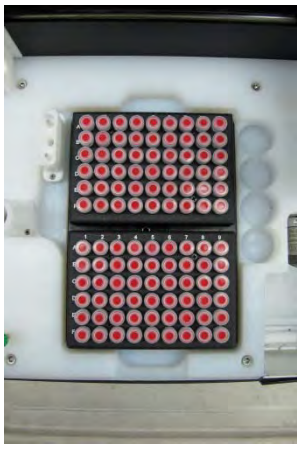


**Figure 6-1** Thermally Insulated Racks (part no. SP6913) Placed on the Autosampler Cooling Tray

- Check for condensation build-up on a regular basis.
- When changing samples, clean the inside of the tray compartment.
- Dry the sample tray with a lint-free cloth or paper towel at ambient temperature at regular intervals.
- If necessary, try decreasing the room temperature or using dehumidified air.
- Regularly inspect the condensation drain tube. If excessive condensation in the tray should occur, most of the excessive condensate should channel into the drain. Make sure the drainage tubing is not kinked and that the end of the condensation drain tube is always above the liquid level in the collection vessel.

## Checking for Leaks

Autosampler tubing and fittings have a limited life and will wear out under normal use. Visually inspect and check all tubing and fittings for leaks and deterioration on a daily basis.

If you detect a leak or other damage to an autosampler component, you must replace it. For more information, see the appropriate sections in this manual.

## Replacing the Syringe Needle Tubing

Replace the sample probe if it shows signs of deterioration or when changing the syringe to a different volume.

The tubing will vary depending on the application. It may be composed of Teflon, FEP, PEEK or fused silica. Follow the tubing manufacturer's guidelines when appropriate.

The tubing replacement procedure will also vary depending on the brand of solvent selection valve that is included as part of the autosampler. Hamilton, Rheodyne, and Valco Valves are currently supported. Follow the valve manufacturer's guidelines for appropriate ferrule. A couple of example illustrations are shown below.

1. Flush any hazardous materials from the needle and tubing.
2. Shut down and unplug the autosampler.
3. Loosen the nut which attaches the tubing to the bulkhead union as shown below.

**Figure 6-2** Loosening the Nut

4. Pull on the tubing above the Z- arm until it comes free of the nut and union.
5. Unscrew the nut completely and remove the nut, sleeve, and ferrule. Note that the ferrule used is a Valco ferrule. Always use a Valco ferrule.

**Figure 6-3** Disconnected Sleeve and Ferrule

6 Discard the sleeve and ferrule.

7 Loosen the nut on the valve. The valve brand may vary. The Rheodyne and Hamilton valves are shown below.

**Figure 6-4** Loosening the Nut on a Rheodyne Valve

**Figure 6-5** Loosening the Nut on a Hamilton Valve

8 Remove the tubing assembly and set it aside.

Leave the nut and ferrule attached to the valve end of the tubing. You can reuse the nut and ferrule if you use the tubing again. If the tubing or fittings are damaged replace as necessary. If you do replace the fittings, use the appropriate ferrule and fittings as recommended by the valve manufacturer.

9 Attach the new tubing to the valve. Use the appropriate ferrule. Screw in the nut finger-tight and then tighten further with a ¼" wrench.

**CAUTION** Do not over-tighten the nut.

Typically the needle tubing would be installed in position 5 on a Rheodyne solvent selection valve.

**Figure 6-6** Attaching Tubing to a Rheodyne Solvent Selection Valve

**Figure 6-7** Attaching Tubing to a Hamilton Valve

10 Insert the other end of the tubing through the hole in the top of the Z arm and grasp it with your fingers.

11 Place a ferrule (Valco) in the union above the needle, pointed end down.

12 Screw in a nut, finger tight.

13 Slide the sleeve over the end of the tubing until it bottoms out.

14 Place the tubing and sleeve into the open end of the nut.

15 Push down on the tubing and tighten the nut with a wrench.

**Torque guideline:** the torque required varies depending on the materials used.

**Figure 6-8** Tightening the Nut

## Replacing the Needle

Replace the needle if it is bent, leaking, or shows other signs of deterioration. The needle may be composed of stainless steel, Teflon-coated stainless steel or glass-coated stainless steel and has an approximate volume of 10 µL. The needle assembly is designed to be easy to replace. It uses a stainless steel nut and a Valco ferrule.

**Figure 6-9** Syringe

### Tools Required

- 1/4 inch wrench
- Adjustable crescent wrench or equivalent

### Parts Required

- Needle assembly

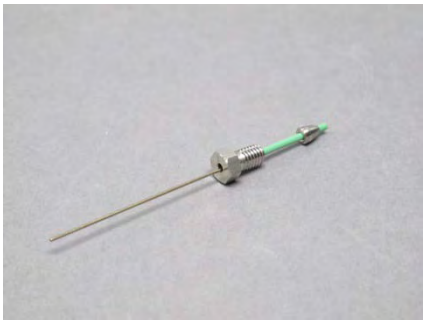


**Figure 6-10** Needle Assembly

## Procedure

1. Flush any hazardous materials from the needle and tubing.
2. Shut down and unplug the autosampler.

**WARNING**

**PUNCTURE HAZARD**
**Verify that the autosampler is unplugged to avoid any chance of unexpected movement.**

**WARNING**

**PUNCTURE HAZARD**
**Check that the tip of the needle is not exposed before proceeding. Use caution when handling the needle to prevent injury.**

3. Loosen the nut with the wrench until it is completely free as shown below. You may need to use a larger wrench on the hex portion of the union while loosening the ¼ inch nut as illustrated.

   You may need to gently pull down on the nut.

**Figure 6-11** Loosening the Nut (Top View)

**Figure 6-12** Loosening the Nut (Bottom View)

4 Remove the old needle assembly. The new needle assembly can now be installed.

**WARNING**

**PUNCTURE HAZARD**
**Dispose or store the old needle in an appropriate container. If there is any chance that the needle is contaminated with biological fluids or a hazardous substance, dispose of it in a designated sharps container.**

5 Insert the new needle assembly through the probe guide as illustrated below.

**Figure 6-13** Inserting the New Needle

6 Slide the nut and ferrule portion of the assembly into the union.

7 Push the needle, nut, and ferrule up into the union and tighten the nut with your fingers.

Make sure the needle is all the way up into the union. If a gap remains, the resulting dead volume will adversely affect measurement results.

8 While pushing the needle assembly upwards into the union, tighten the nut further with the ¼" wrench until tight. The needle should not fall out or be able to be removed with your fingers.

**Torque guideline:** the torque required varies depending on the materials used. If you pull on the needle with your fingers, it should not move. If necessary, use a larger wrench on the hex portion of the union and then tighten further with the ¼ inch wrench. Be careful not to over-tighten the nut.

**Figure 6-14** Tightening the Nut on the Needle

9 Check the needle alignment and depth using the appropriate software program.

## Replacing the Syringe

1 Lower the syringe using the appropriate software.

**Figure 6-15** Syringe in Lowered Position

2 Once the plunger is in the down position, unscrew the large knurled nut at the bottom of the syringe

3 Push the plunger up slightly and then unscrew the barrel attached to the syringe mount to remove the syringe. Note – you may want to remove the syringe with the syringe mount in place. If this is performed, be sure to remove the tubing attached to the top of the syringe mount and place the mounting screws in a safe area to prevent them from being lost.

4 Inspect the new syringe and make sure you have the Teflon washer that is included with the syringe.

5 Flush the syringe with appropriate solvent and then manually fill the syringe with solvent as illustrated below. This avoids trapped air in the syringe barrel and in the mounting block the syringe attaches into.

**Figure 6-16** Flushing the Syringe

6 Take the filled syringe and attach back into the syringe mounting block. If you have removed both the syringe and the mounting block, re-attach the syringe mount using the appropriate mounting screws.

7 Re-attach the plunger to the syringe locking nut. Make sure that the plunger is properly engaged into the locking nut. Tighten the nut finger-tight.

8 Use the appropriate software to push the syringe back into the ready position.

9 Place a small amount of appropriate solvent on the top of the syringe mount where the tubing attaches and then re-attached the tubing at the top of the mount. This will prevent air bubbles in the tube.

10 At this point it is a good idea to use the rinse or wash function in the appropriate software to make sure no bubbles remain in the system.

## Replacing Tubing

It is important to keep all tubing clean and free of crimps. Tubing that has become dirty, blocked or crimped can result in poor accuracy and precision, leakage and possible loss of sample.

Inspect tubing and fittings on a daily basis and replace as needed.

## Checking Alignment

The autosampler is aligned at the factory, and alignment is not typically needed for routine use.

Alignment can be adjusted using the included alignment software.

See the *How To Use The ASX-8000 Alignment Application* document (available from CETAC) for instructions.

# 7 Troubleshooting the Autosampler

In the event that the product does not function properly, isolate the problem to determine if it originates in the host computer, the analytical instrument, or the autosampler.

If you cannot solve a problem using the steps given in this chapter, you should contact Teledyne CETAC Technologies Customer Service and Support.

## Power System Problems

A possible cause of system malfunction is a problem in the power system. If the system is not functional, it is possible that it is not receiving power. If this is the case, the LED status indicator light on the front panel will be off. To troubleshoot this problem, complete the following steps in sequence until the problem is solved:

1. Check that the power switch on the autosampler is turned on.
2. Check that the power cord is plugged in firmly at the power input on the autosampler and at the the wall outlet.

   If the cable is plugged in, ensure that it is not damaged in any way.
3. Turn on the power switch and check that the green POWER light is illuminated.

   If the LED is not illuminated, check the wall outlet using a device approved for that purpose.
4. If the external POWER light is illuminated, cycle the autosampler power switch. The autosampler sample probe should move up and the autosampler should initialize. After initialization, the status LED on the front of the autosampler should light up.

   - If the cords are properly connected, power is available, the external power supply is good, and the unit still does not initiate, continue troubleshooting.

## Replacing the Fuse

**WARNING**

**FIRE AND SHOCK HAZARD**
**Replace only with the specified fuse. Using an incorrect fuse may cause fire or personal injury.**

Two fuses are located in the power supply, just above the power cord connector. Use a 3 A, 250 V, SLOBLO, 5x20 mm cylindrical fuse.

1. Disconnect the power cord.
2. Inspect all of the equipment which is plugged into the power supply for moisture or other conditions which might pose a hazard and cause the new fuse to blow.
3. Using your fingernails or a small, flat-blade screwdriver, squeeze the ends of the fuse holder.
4. Pull the fuse holder out.

**Figure 7-1** Removing the Fuse Holder

5. Replace the blown fuse with a new one of the same size, type, and rating.

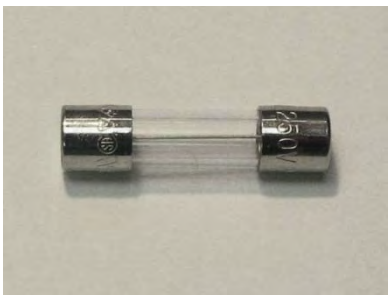


**Figure 7-2** Fuse

6. Press the fuse holder back in until it clicks into place.
7. Plug the power cord back in.

# Communications Interface Problems

Operation of the autosampler is directed by the host computer. A malfunction can indicate a problem with the RS-232 or USB cable (connected between the host computer and the autosampler) or with the configuration of the software on the host computer. The following sections explain how to troubleshoot these problems.

## RS-232 Cable Problems

The first step in troubleshooting communications interface problems is to check the RS-232 cable.

1. Check the RS-232 cable to ensure it is plugged in to the COM1 port on the autosampler.

   If the cable is plugged in, ensure that it is tightened properly and not damaged in any way.

   Note that the cable must be plugged into the COM1 port, not the COM2 port.

2. Check the host computer to ensure that the RS-232 cable is connected to the appropriate COM port.

   If the cable is plugged in, ensure that it is tightened properly and not damaged in any way.

3. Check the serial port settings (57600, N, 8, 1).

   If the wrong port or baud rate is selected, change the configuration.

## USB Cable Problems

The USB port located on the back of the autosampler is an alternate connection protocol option to the RS-232 port at Com 1. Either RS-232 or USB may be used, but not both at once.

1. Check that the USB cable to ensure it is plugged into the port on the autosampler.

2. Check the host computer to ensure that the USB cable is connected to the appropriate USB port.

3. Check that the USB cable is not damaged in any way.

4. Check the host computer to ensure that the USB drivers are installed for USB operation of the autosampler.

   Load the proper USB drivers to the host computer from the CD that was provided with the autosampler.

## Software Configuration Problems

If the cords are connected properly and the system is still not functioning, ensure that the software is communicating correctly with the autosampler. To

do so, verify proper operation of all manual functions by completing the following steps:

1. Connect to the autosampler using a terminal emulation program (see page Operating the Autosampler Using a Terminal Program69).

2. Enter some commands, such as HOME.

   If the commands have no effect, and a USB connection is being used, check that the autosampler is plugged into the *same* USB port as it was when the driver software was configured. Unlike many consumer devices, each USB port used as a "virtual" COM port must be individually configured.

3. If manual commands work, but the autosampler does not operate with the instrument control software, carefully check that the software is configured to use the COM port where the autosampler is plugged in.

   If a USB connection is used, and if the manual commands work, but the software fails to operate the autosampler, check that the same COM port number is configured in the software and in the USB device driver.

## ASX-8000 Error Codes

**Error: 003 Rack Configuration Undefined**

- Initialization failure
- No rack installed

**Errors: 010, 011 or 012 Attempt Home X, Y or Z Axis Failed**

- Sensor error
- wiring loose or failure
- issue with magnet in Z-arm

**Error: 016 Z-Movement Aborted (premature hit on tray, wrong rack)**

- Subcode 1, Plate surface was encountered below the specified limit
- Subcode 2, Stalled Syringe
- Subcode 4, Z-foot sensor tripped before movement started

**Error: 100 Syringe Failed**

- Syringe not initialized
- Syringe is overloaded (stalls)

**Error: 120 Valve Switch Failure**

**Error 510 miniSD Card Not Mounted**

- Card came loose

- Card missing

## Analytical Troubleshooting

A number of analytical issues such as poor reproducibility (precision), excessive carryover or leaks may occur with any HPLC system. It may be difficult to find the cause and you will want to isolate the problem to determine if the cause of the problem is related to the autosampler or some other portion of the HPLC system. If you are not certain whether the problem is due to the autosampler, the first step is to isolate the autosampler itself.

Some common sense tips to troubleshooting and isolating HPLC problems include:

- Follow the "Rule of 1" – only make one change at a time when troubleshooting
- Address reproducible problems – make sure the problem occurs at least twice
- Replace a suspect part with a known good part. This is the easiest and most powerful way to isolate the problem. Don't forget to place the proper working part back into the instrument.

Autosampler reliability and life can be improved and problems minimized by anticipating and preventing problems before they occur. Refer to Chapter 6, "Maintaining the Autosampler" for information related to instrument maintenance. Some basic recommended maintenance schedule is shown below:

| | |
|---|---|
| Inspect For Leaks | Daily |
| Check and Empty Waste Container | Daily |
| Clean-up spills/External cleaning | Daily |
| Replace Wash Solvents and Clean Reservoirs | Weekly |
| Replace Needles | 3 to 6 months or as needed |
| Replace Injection port & Tubing | 6 to 12 months or as needed |
| Replace Syringe | 6 to 12 months or as needed |
| Replace Valve Rotors | One year or as needed |

### Autosampler Problems That Can Cause Poor Reproducibility

- Air in Syringe
- Worn Syringe
- Incorrect needle depth into sample vial
- Incorrect needle depth into injection port (needle not seated correctly into port)
- Sample loading speed into injection port is too fast
- Damaged or worn injection port tubing
- Damaged or plugged needle
- Damaged or worn valve rotor
- Incorrect/Poor Injection Technique

### Common Problems That Can Cause Excessive Carryover

- Insufficient washing cycle between samples
- Insufficient strength or volume of wash solvent
- Problems with fittings – small gaps (void volumes) formed from poorly assembled fittings
- Insufficient flushing of the sample loop
- Worn injection valve rotor
- Insufficient seating of needle into injection valve
- Blocked column-inlet frits
- Adsorption of sample on surfaces of the HPLC system such as needle
- Injection of a very hydrophobic sample dissolved in a polar solvent

## Returning the Product for Service

Refer to the following information if you need to return the product for service.

CETAC has a two-year warranty covering defects in or failures of the autosampler as a result of normal use or manufacturing defect. The warranty does not cover defects or failures resulting from damage caused by accident, misuse, or abuse such as:

- Improper or unauthorized service or repair
- Failure to follow operating instructions provided by CETAC
- Improper or insufficient ventilation
- Exposure to corrosive compounds
- *Force Majeure*: No liability for events beyond the reasonable control of the manufacturer, such as fire, storm, flood, riots, earthquakes, labor disputes, etc.

The warranty does not cover parts exposed directly to liquids such as valves, valve rotors or other valve components, tubing, or syringes, or any other parts considered consumables and wear parts.

> **NOTE**
>
> Contact Teledyne CETAC Technologies or refer to the warranty card which came with your product for the exact terms of your warranty.

### Shipping the Product

Follow these guidelines when shipping the product:

- **Use the original packing materials.** If the original shipping materials are not available, contact Customer Support to order new shipping materials. Package the ASX-8000 according to instructions provided by the Customer Support Department. An instruction guide explaining the appropriate packaging of the autosampler prior to shipment is available from Customer Support. No responsibility is assumed by CETAC for damage caused by improperly packaged instruments.
- Contact the manufacturer before shipping the product. A case number will be assigned.

# 8 Operating the Autosampler Using a Terminal Program

The autosampler can be controlled using a serial communications protocol. You can use any terminal emulation program, such as the C-Term program which is provided on a CD or USB stick that is shipped with the ASX-8000 autosampler. C-Term runs on Microsoft Windows 2000 and later.

This chapter explains how to operate the autosampler using C-Term.

## Using C-Term™

C-Term is a simple terminal program developed to validate the installation and functionality of various devices. C-Term communicates through a serial (RS-232) port on the host computer. If the device is connected to a USB port, the device driver will create a virtual serial port.

C-Term is provided with the autosampler or can be downloaded from the CETAC Web site.

### Starting C-Term

1 Check that the communication port connectors are properly attached between the host computer and the device.

If the communications interface between the device and the host computer is not established correctly, the device will not function.

2 Double-click the C-Term icon.

### Overview of the C-Term Window

Once C-Term is loaded, the window shown in Figure 8-1 will open. The majority of C-Term's functions are available from this window.

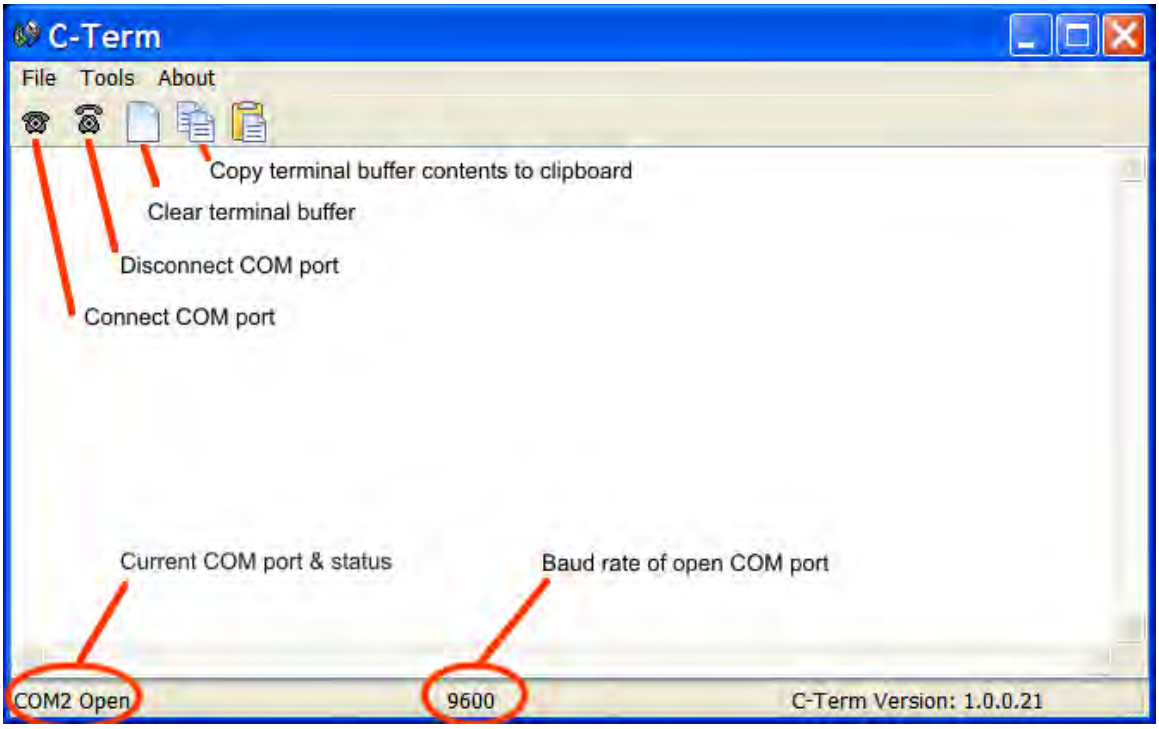



**Figure 8-1** C-Term Window

By default, typed commands are sent to the device connected to the opened port. The typed commands will appear in light green in the terminal buffer. Responses from the device will appear in red. Non-printing characters such as carriage returns will appear as ASCII hexadecimal numbers surrounded by square brackets, for example, **[0D]** is the carriage return character.

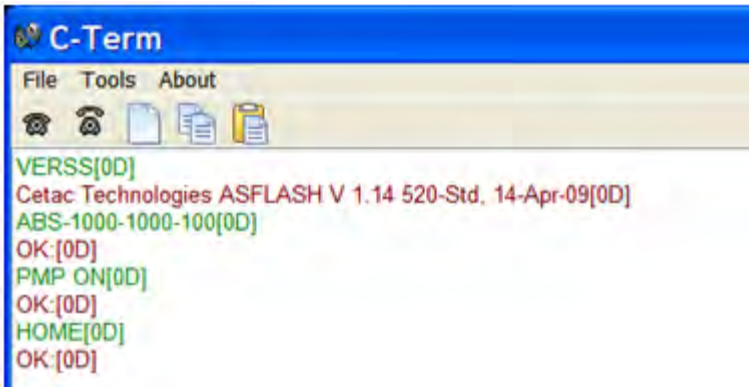



**Figure 8-2** Outgoing commands shown in green and incoming responses shown in red

## Configuring C-Term

By default, C-Term attempts to open COM1 the first time it is executed. If the COM port that the device is connected to is not the default (COM1), then it will be necessary to configure C-Term to use the desired port.

**NOTE**

If COM1 (or the currently selected COM port) is in use by another program or is otherwise unavailable, a warning dialog box will pop up when C-Term starts stating that the COM port could not be opened.

1 On the Tools menu, click Setup Serial Port.

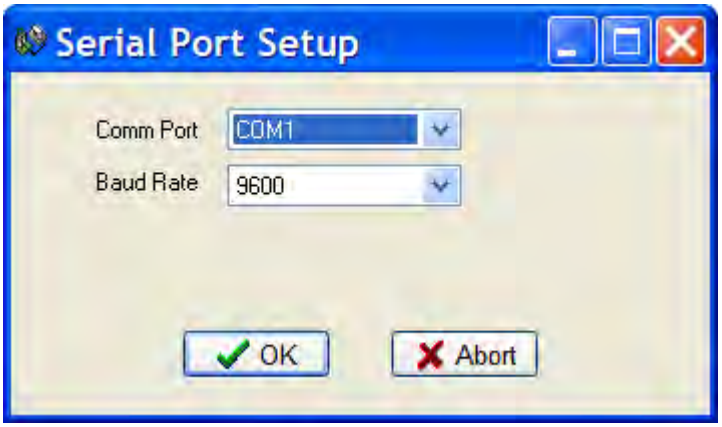



**Figure 8-3** Serial Port Setup Window

2 Select the desired COM port.

3 Change the Baud to 57,600 for use with the ASX-8000 autosampler, then click OK.

The window will close and the settings will be saved. These new settings will be applied immediately and used thereafter unless changed again.

**NOTE**

Most devices communicate at 9600 baud (which is the default). The ASX-8000 communicates at a Baud rate of 57,600. Remember to change the Baud rate.

**NOTE**

Only installed COM ports, including USB virtual COM ports, will appear in the **Comm Port** menu.

## Setting Preferences

If desired, the size of the scrollback buffer or the color of the outgoing and incoming texts can be changed (to work around color blindness, for example).

1 On the Tools menu, click Preferences.

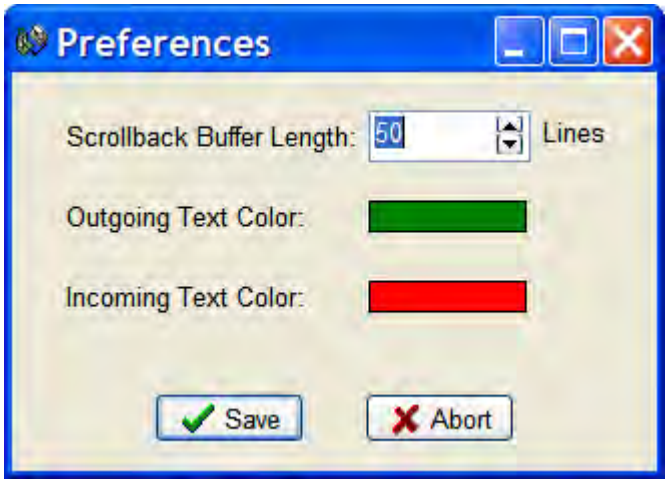



**Figure 8-4** Preferences Window

To change the Scrollback Buffer Length, either type the new value in the field or use the arrows adjust the value up or down.

To change text color, click on the color bar and a color selection dialog box will appear. Select the new color and click **OK.**

2 Click Save to apply your settings and close the window.

## Autosampler Commands

The following commands will produce various responses of the autosampler.

| Command | Description |
|---|---|
| **Ver** | Returns firmware version. |
| **STAT()** | Queries the state of the autosampler |
| **MOV_RINSE()** | Moves the probe to the sensor home position, then to the rinse position. If the probe is down it is lifted before executing the horizontal move. |
| **MOV_INJ([Depth])** | Move the probe to the injector position, and optionally, move the probe down (bracketed value). If the probe is down it is lifted before executing the horizontal move. |
| **LED_ON** | Turns the 3rd LED on the front of the instrument on |
| **LED_OFF** | Turns the 3rd LED on the front of the instrument off |

**Table 8-1** Autosampler Commands

You can use these commands to determine if the autosampler is communicating and functioning properly. If more assistance is needed, please contact customer service.

This page is intentionally blank.

# 9 Safety and Regulatory Information

Review this product and related documentation to familiarize with safety markings and instructions before you operate the instrument.

## Characteristics

### Environmental Characteristics

| | |
|---|---|
| **Operating Temperature** | +10° C to +30° C (+50° F to +85° F) |
| **Non-Operating Temperature** | +0° C to +55° C (+32° to +131° F) |
| **Operating Altitude** | Up to 3,048 m (10,000 ft) |
| **Relative Humidity** | 0% to 95% non-condensing |
| **Pollution Degree** | Pollution Degree 2<br>Normally no pollution or only dry, non-conductive pollution occurs. The pollution has no influence. Occasionally, however, a temporary conductivity caused by condensation may be expected. |

**Table 9-1** Environmental Characteristics

For indoor use only.

Avoid sudden, extreme temperature changes which could cause condensation on circuit boards in the product.

## Electrical Characteristics

### Power requirements

| | |
|---|---|
| **Autosampler** | **Input:**<br>AC Voltage, Frequency, and Current<br>100-240 V<br>50-60 Hz<br>3 A<br>Power Consumption (Maximum): 720 Watts at 240 V<br>Installation Category: CAT II (Line voltage in appliance and to wall outlet)<br>See page 64 for fuse ratings |

**Table 9-2** Power Requirements

### Input and output connectors

| | |
|---|---|
| **COM 1** | DB-9 RS-232 serial connection to a controller PC (max ±12VDC, 8mA) |
| **COM 2** | DB-9 RS-232 serial connection to accessories or instruments (max ±12VDC, 8mA) |
| **USB** | USB connection to a controller PC (max 5VDC) |
| **ETHERNET** | Ethernet connection. (Disabled by default. Max 5VDC.) |
| **AUXILIARY I/O Ports** | Outputs act as a mechanical switch and do not apply any voltage to an external device. 24V maximum.<br>Inputs are triggered by an external device acting as a mechanical switch. *Do not apply any current or voltage to the inputs.* |

**Table 9-3** Electrical Input and Output Connectors on the Autosampler

### Battery

**CAUTION**

**FIRE AND EXPLOSION HAZARD**
**Replace only with a battery of the same type. Using an incorrect battery may cause fire, explosion, or leakage, resulting in personal injury or equipment damage.**

Battery description: CR2032 (3.0V, non-rechargeable lithium coin cell)

The battery in the autosampler is used to store diagnostic data in SRAM memory. The battery does not need to be replaced for routine operation of the autosampler. Battery replacement should be performed by qualified service personnel, following instructions in the autosampler *Service Guide*.

Do not open battery, dispose in fire, heat above 100C (212F), expose contents to water, recharge, or put in backwards – battery may explode or leak and cause personal injury.

# Safety Notices

**WARNING**

**INJURY HAZARD**
**If the equipment is used in a manner not specified by the manufacturer, the protection provided the equipment may be impaired.**

Repair or service that this not covered in this manual should only be performed by qualified personnel.

## Power Cord Set Requirements

The power cord set supplied with your instrument meets the requirements of the country where you purchased the instrument.

## Power Cord Safety Maintenance

The operator should check the power/signal supply cord condition. The equipment should not be operated if the mains inlet is cracked or broken. Any obvious damage to the case (from a drop or fall) should be checked by service personnel for loose or damaged parts. See individual parts lists for approved replacement parts

## Mains Disconnect

The power switch on the rear panel is not the mains disconnect. Power mains disconnect is accomplished by unplugging the power cord at the back of the instrument or at the wall outlet. Ensure the power cord is easily accessible and removable, in the event of an emergency which requires immediate disconnection.

**WARNING**

**SHOCK HAZARD**
**Ensure that power cord is disconnected before removal of any covers.**

## Mechanical Hazards

If you insert any part of your body between the moving parts of the autosampler, you could be injured. Figure 9-1 shows the location of potential hazards.

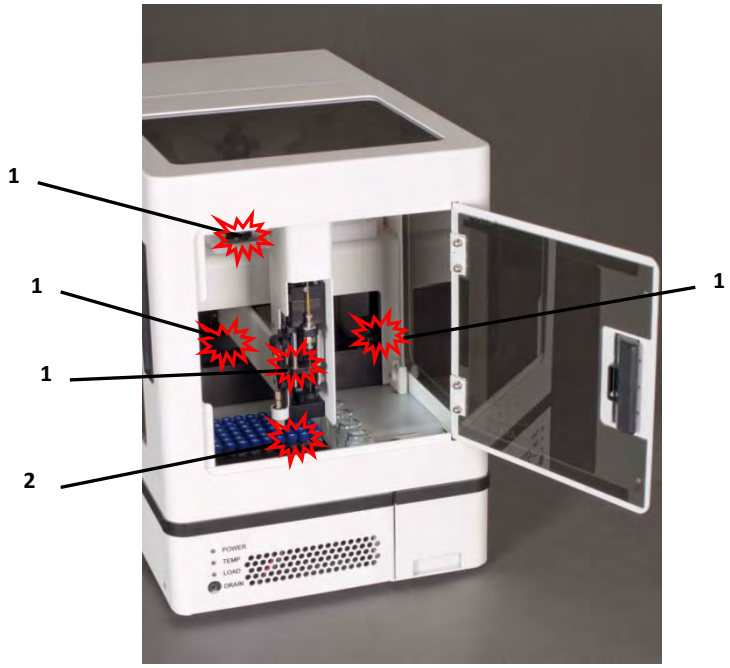



**Figure 9-1** Overview of the Mechanical Hazards of an Autosampler

**WARNING**

**1 - PINCH HAZARD**
**Keep fingers, hair, and loose clothing away from the moving parts of the autosampler.**
**2 - PUNCTURE/INJECTION HAZARD**
**Keep hands away from the probe while the autosampler is operating.**
**Do not operate the autosampler unless the enclosure is installed and the door is closed.**

## Operating Environment

**WARNING**

**SHOCK HAZARD**
**To reduce the risk of fire hazard and electrical shock, do not expose the unit to rain or humidity. To reduce the risk of electrical shock, do not open the cabinet. All maintenance is to be performed by an authorized service provider.**
**Protection provided by the equipment may be impaired if the equipment is used in a manner not specified by the manufacturer.**

**WARNING**

**SHOCK HAZARD**
**Equipment is not intended for wet locations. Miscellaneous liquids in the equipment could cause hazardous conditions.**

**WARNING**

**EXPLOSION HAZARD**
**Do not operate in an explosive atmosphere.**

## Cleaning Instructions

For additional cleaning information, see "cleaning" in the index.

To clean the exterior surfaces of the instrument, complete the following steps:

1. Shut down and unplug the instrument.
2. Wipe the instrument exterior surfaces only using a towel dampened with a lab-grade cleaning agent.
3. Repeat step 2, using a towel dampened with clear water.
4. Dry the instrument exterior using a dry towel.

**WARNING**

**SHOCK HAZARD**
**Do not allow any liquid to enter the instrument cabinet other than as intended through the specified tubing, or come into contact with any electrical components. The instrument must be thoroughly dry before you reconnect power, or turn the instrument on.**

## Explanation of Caution and Warning Notices

Warning symbol marked on equipment. This symbol means "Attention! Refer to the manual."

Crush Hazard / Pinch Point – Keep hands clear of moving parts**. X, Y, Z axis movement may crush hand.**

Puncture Hazard – Moving parts can cause severe injury. **Do not put hand under the probe assembly!**

Lifting Hazard – Single person lift could cause injury. Use assistance when moving or lifting.

| | |
|---|---|
| **WARNING** | **The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood** |

| | |
|---|---|
| **CAUTION** | The CAUTION notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met. |

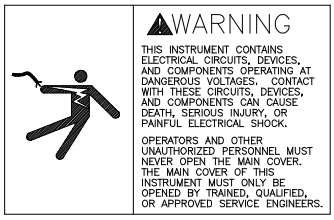
## Avertissements en Français

This section provides French translations of notices which may appear on the instrument or on other instruments used as part of the measurement system.

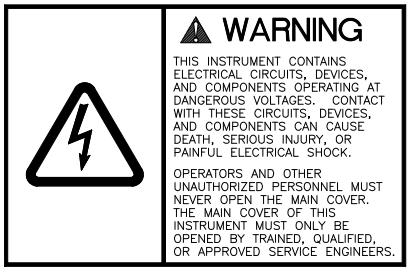
WARNING
FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED TYPE AND CURRENT RATING.

FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED TYPE AND CURRENT RATING.

⚠ AVERTISSEMENT
POUR UNE PROTECTION CONTINUÉ CONTRE LES RISQUES D'INCENDIE, REMPLACER UNIQUEMENT PAR DES FUSIBLES DE MÊME TYPE ET AMPÈRAGE.




⚠ AVERTISSEMENT
TOUT CONTACT AVEC LES HAUTES TENSIONS PEUT ENTRAINER LA MORT OU DES BLESSURES SÉVÈRES. CE PANNEAU NE DOIT ÊTRE ENLEVE QUE PAR UN RÉPARATEUR QUALIFIÉ.




⚠ AVERTISSEMENT
TOUT CONTACT AVEC LES HAUTES TENSIONS PEUT ENTRAINER LA MORT OU DES BLESSURES SÉVÈRES. CE PANNEAU NE DOIT ÊTRE ENLEVE QUE PAR UN RÉPARATEUR QUALIFIÉ.


⚠ AVERTISSEMENT
TOUT CONTACT AVEC LES HAUTES TENSIONS PEUT ENTRAINER LA MORT OU DES BLESSURES SÉVÈRES. CE PANNEAU NE DOIT ÊTRE ENLEVE QUE PAR UN RÉPARATEUR QUALIFIÉ.


⚠ AVERTISSEMENT
TOUT CONTACT AVEC LES HAUTES TENSIONS PEUT ENTRAINER LA MORT OU DES BLESSURES SÉVÈRES. CE PANNEAU NE DOIT ÊTRE ENLEVE QUE PAR UN RÉPARATEUR QUALIFIÉ.

⚠ WARNING
HIGH LEAKAGE CURRENT
ENSURE PROPER GROUNDING

⚠ AVERTISSEMENT
COURANT DE FUITE ÉLEVÉ — FORNIR UNE MISE À LA TERRE EFFICACE.

# Electromagnetic Interference

**FEDERAL COMMUNICATIONS COMMISSION (FCC) NOTICE**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential environment is likely to cause harmful interference, in which case the user will be required to correct the interference at his expense.

**MODIFICATIONS**

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

**CABLES**

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC Rules and Regulations.

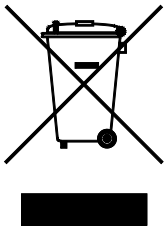
**CANADIAN NOTICE**

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus" ICES-001 of the Department of Communications.

**AVIS CANADIEN**

Cet appareil numerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Classe A prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-001 edictee par le ministre des Communications.

# Explanation of Regulatory Marks



**Do not dispose in domestic household waste.**

The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste, in compliance with the European Waste Electrical and Electronic Equipment Directive (WEEE, 2002/96/EC).

For instructions on how to return end-of-life equipment, producer-supplied electrical accessories, or auxiliary items for proper disposal please contact the supplier or importer. In the event a supplier cannot be reached, contact the manufacturer at the telephone number provided at the beginning of this manual.

CE

The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.

# 10 Glossary

**Analytical Instrument**: The instrument, such as an HPLC or LC-MS instrument, to which the autosampler is connected.

**Dynamic Rinse Pump:** In the context of this manual, usually refers to the pump controlling the movement of the rinse solution to the rinse station o the autosampler.

**ETFE:** Ethylenetetraflouroethylene (Tefzel®).

**FEP**: Fluorinated Ethylene Propylene.

**Host Computer**: The computer that controls operation of the analytical instrument to which the autosampler is attached, and through which the autosampler is controlled.

**Hz**: Hertz.

**ID:** Inside diameter.

**Instrument Control Software:** The measurement automation software on the host computer which controls the measurement system. In addition to controlling the instrument itself, this software sends commands to the autosampler so that samples are introduced at the right time.

**LED:** Light-Emitting Diode.

**PEEK:** Polyetheretherketone.

**PPS:** Polyphenylene sulphide.

**PTFE**: Polytetraflouroethylene.

**Rinse Solution:** The solution used to clean the sample probe.

**Sample Probe:** The tube that moves the analyte from the sample vial to the sample transfer tubing.

**Rinse Station:** The autosampler component used to clean the sample probe with a rinse solution.

**UHMW-PE:** Ultra-High Molecular Weight PolyEthylene.

**VAC**: Volts Alternating Current.

**VDC**: Volts Direct Current.

**X-Axis:** The left-to-right axis of the autosampler.

**Y-Axis:** The front-to-back axis of the autosampler.

**Z-Axis:** The up-and-down axis of the autosampler.

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