
**ASX-100 Auto Sampler
Operator's Manual**

Product Warranty Statement

SD Acquisition, Inc., DBA CETAC Technologies (“CETAC”), warrants any CETAC unit manufactured or supplied by CETAC for a period beginning on the date of shipment and ending on the sooner to occur of: (a) the date that is twelve (12) months from the date of installation, or (b) the date that is thirteen (13) months from the date of shipment. Units found in the reasonable judgement of CETAC to be defective in material or workmanship will be repaired or replaced by CETAC without charge for parts and labor. CETAC reserves the right to change or improve the design of any unit without assuming any obligation to modify any unit previously manufactured.

This warranty does not cover any unit that has been subject to misuse, neglect, negligence, or accident. The warranty does not apply to any damage to the unit that is the result of improper installation or maintenance, or to any unit that has been operated or maintained in any way contrary to the instructions specified in the CETAC instruction and operation manual. Operation of the CETAC unit inside a laboratory fume hood is contra-indicated and will void the warranty. Any attempt to repair or alter any CETAC unit by anyone other than by CETAC authorized personnel or agents will void this warranty. If any non-CETAC component is installed in the CETAC manufactured unit without the approval of CETAC, the warranty will be voided. In addition, this warranty does not extend to repairs made necessary by the use of parts, accessories or fluids which are either incompatible with the unit or adversely affect its operation, performance or durability. CETAC’S obligation under this warranty is strictly and exclusively limited to repair or replacement of defective CETAC parts, and no claim of breach of warranty shall be cause for cancellation or recession of the contract of sale of any unit.

The foregoing express warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability and fitness for a particular purpose. CETAC shall not be bound by any representations or statements on the part of its employees or agents whether oral or in writing and including any made in catalogues and other promotional material including technical details and specifications except where such representations and statements are expressly made part of this contract. CETAC assumes no responsibility for incidental, consequential or other damages, even if advised of such a possibility, including but not limited to loss or damage of property, loss of revenue, loss of use of the unit, loss of time, or inconvenience. CETAC’s liability on any claim for loss or damage arising out of the

sale, resale or use of any of its products shall in no event exceed the selling price of the unit.

Purchaser shall indemnify CETAC against any claim or liability which may be asserted as relates to the following: (i) the use to which any product supplied hereunder is put infringes the patent, copyright or other intellectual property rights of any third party; or (ii) any liability resulting from the failure by Purchaser to observe the terms of this Warranty.

Returned Product Procedures

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. CETAC must be notified within ninety (90) days of shipment of incorrect materials. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from CETAC. No replacements will be provided nor repairs made for products returned without such approval. Any returned product must be accompanied by a return authorization number. The expense of returning the unit to CETAC for service will be paid by the buyer. The status of any product returned later than thirty (30) days after issuance of a return authorization number will be subject to review. Shipment of repaired products will generally be made forty-eight (48) hours after the receipt.

Products may not be returned which are contaminated by radioactive materials, infectious agents, or other materials constituting health hazards to CETAC employees.

Returned Product Warranty Determination

After CETAC'S examination, warranty or out of warranty status will be determined. If a warranted defect exists, the product will be repaired at no charge and shipped prepaid back to the buyer. If the buyer desires an air freight return, the product will be shipped collect. Warranty repairs do not extend the original warranty period.

If an out of warranty defect exists, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of repair and freight, or authorize the products to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number approval within fifteen (15) days of notification will result in the products being returned as is, at the buyers expense.

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REVISIONS

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.

CETAC Technologies reserves the right to revise this document and/or improve products described herein at any time without notice or obligation. Warranty registration entitles the named owner

exclusively to manual change pages/new editions as they are published.

SAFETY

Instruments, accessories, components or other associated materials **may not** be returned to CETAC Technologies if contaminated with biohazard or radioactive materials, infectious agents, or any other materials and/or conditions that could constitute a health or injury hazard to CETAC employees. Call Customer Service and Support if there is any question or doubt relative to decontamination requirements. CAUTION and WARNING statements, as applied in this document, shall be interpreted consistent with the following context: CAUTION applies only to potential property damage conditions; WARNING applies to potential personal injury conditions, in combination with or exclusive of potential property damage.

All user-serviceable components are specifically identified in this document as such; the balance shall be assumed to require the expertise of a factory service technician/engineer for adjustment, repair, replacement, modification, etc. Others not so qualified and performing these actions shall do so at their own risk. Furthermore, never operate the instrument without first reading and understanding the *ASX-100 Auto Sampler Operator's Manual* and ensuring that it is operated safely and properly.

ORIGINAL PACKAGING

Retain original factory packaging for moves and factory return shipments. Shipping in anything other than the original fitted foam and container can result in incidental damage from which the purchaser will not be protected under warranty.

WARNING

Under all conditions the user must observe safe laboratory procedures during the operation of this product.

Notices and Compliance Declarations

**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 own 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 CETAC Technologies, Inc. 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-003 of the Department of Communications.

AVIS CANADIEN

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par le ministre des Communications.

Notices and Compliance Declarations

POWER CORD SET REQUIREMENTS

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

If you use the instrument in another country, you must use a power cord set that meets the requirements of that country.

WARNING

This equipment is designed for connection to a grounded (earthed) outlet. The grounding type plug is an important safety feature. To reduce the risk of electrical shock or damage to the instrument, do not disable this feature.

CAUTION

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 CETAC Service Provider.

Protection provided by the equipment may be impaired if the equipment is used in a manner not specified by the manufacturer.

CLEANING INSTRUCTIONS

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

Do not allow any liquid to enter the instrument cabinet, or come into contact with any electrical components. The instrument must be thoroughly dry before you reconnect power, or turn the instrument on.

COOLING FAN OBSTRUCTION

The instrument cooling fan(s) shall remain unobstructed at all times. Do not operate the instrument if the cooling fan(s) are blocked or obstructed in any manner.

ENVIRONMENTAL


Operating Temperature:	10° to 30°C
Relative Humidity	0% to 95%

Notices and Compliance Declarations

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 AMPÉRAGE.


 **⚠ WARNING**
DO NOT REACH UNDER OR BEHIND OVEN HEAT SHIELDS. KEEP FRONT CABINET DOOR TIGHTLY FASTENED TO PROTECT AGAINST SKIN BURN.

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DO NOT REACH UNDER OR BEHIND OVEN HEAT SHIELDS. KEEP FRONT CABINET DOOR TIGHTLY FASTENED TO PROTECT AGAINST SKIN BURN.

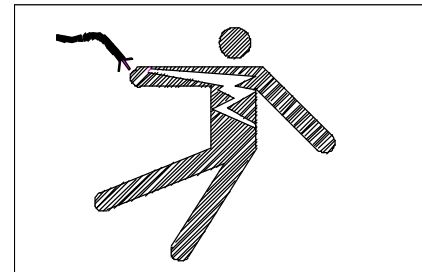
⚠ AVERTISSEMENT
NE PAS GLISSER LA MAIN SOUS OU DERRIÈRE LES ÉCRANS THERMIQUES DU FOUR. GARDER LA PORTE D'ACCÈS AU DEVANT DU BOÎTIER BIEN FERMÉE POUR ASSURER LA PROTECTION CONTRE LES BRÛLURES

 **⚠ WARNING**
THIS INSTRUMENT CONTAINS ELECTRICAL CIRCUITS, DEVICES, AND COMPONENTS OPERATING AT DANGEROUS VOLTAGES. CONTACT WITH THESE CIRCUITS, DEVICES, AND COMPONENTS CAN CAUSE DEATH, SERIOUS INJURY, OR PAINFUL ELECTRICAL SHOCK.
OPERATORS AND OTHER UNAUTHORIZED PERSONNEL MUST NEVER OPEN THE MAIN COVER. THE MAIN COVER OF THIS INSTRUMENT MUST ONLY BE OPENED BY TRAINED, QUALIFIED, OR APPROVED SERVICE ENGINEERS.

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

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⚠ WARNING
CONTACT WITH DANGEROUS VOLTAGES CAN CAUSE DEATH OR INJURY. COVER TO BE REMOVED ONLY BY TRAINED SERVICE PERSONNEL.

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

Notices and Compliance Declarations



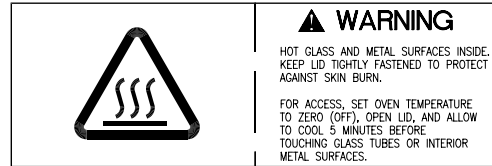
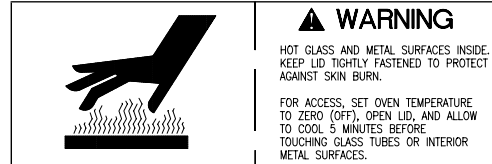
⚠️ AVERTISSEMENT

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



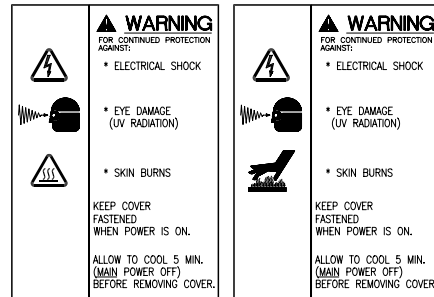
⚠️ AVERTISSEMENT

COURANT DE FUITE ÉLEVÉ — FOURNIR UNE MISE À LA TERRE EFFICACE.



⚠️ AVERTISSEMENT

SURFACES CHAUDES, LAISSER LE COUVERCLE HERMÉTIQUEMENT FERMÉ. POUR ACCÉDER, METTRE LA TEMPÉRATURE DU FOUR À ZÉRO, OUVRIR LE COUVERCLE ET LAISSER REFROIDIR 5 MINUTES AVANT DE TOUCHER LA VERRERIE OU TOUTE SURFACE MÉTALLIQUE INTÉRIEURE.



⚠️ AVERTISSEMENT

POUR LA PROTECTION PERMANENTE CONTRE UN CHOC ÉLECTRIQUE, UNE BRÛLURE DES YEUX (RADIATION UV) OU DE LA PEAU, LAISSER LE COUVERCLE HERMÉTIQUEMENT FERMÉ LORSQUE L'APPAREIL EST SOUS TENSION. LAISSER REFROIDIR 5 MINUTES (APPAREIL ÉTEINT) AVANT D'ENLEVER LE COUVERCLE.

Notices and Compliance Declarations

Note:

The following Notices and Compliance Declarations are applicable only to the CETAC LSX Laser series products.

**U.S. REGULATIONS - CLASS 1
LASER PRODUCT**

This instrument is certified to comply with laser product performance standards set by the U.S. Department of Health and Human Services as a Class 1 laser product.

This means that this is a class of laser product that does not emit hazardous

laser radiation; this is possible only because the laser beam is totally enclosed during all modes of customer operation.

The laser produces a beam that, if looked into, could cause eye damage. Service procedures must be followed exactly as written without change.

WARNING

Use of controls, adjustment or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

LASER SAFETY

This instrument complies with appropriate safety standards. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. It does not emit hazardous light; the beam is totally enclosed during all modes of customer operation and maintenance.

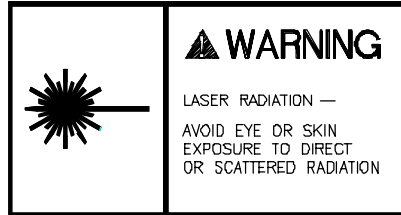
CDRH REGULATIONS

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. Compliance is mandatory for products marketed in the United States.

WARNING

Because the internal laser beam may cause eye damage, do not open the cabinet. Wearing glasses and contact lenses, etc., increases the hazard. All maintenance is to be performed by an Authorized CETAC Service Provider.

Notices and Compliance Declarations



⚠ AVERTISSEMENT

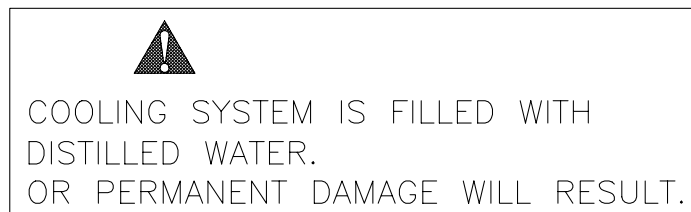
RAYONNEMENT LASER —
ÉVITER TOUTE EXPOSITION DES YEUX ET DE LA PEAU AU RAYONNEMENT DIRECT OU DIFFRACTÉ.

COOLANT
LEVEL

MAX



MIN



⚠ AVERTISSEMENT

LE SYSTÈME DE REFROIDISSEMENT EST
REPLI D'EAU DISTILLÉE. **ÉVITER LE GEL.**
OU L'APPAREIL SERA DÉFINITIVEMENT DÉTÉRIORÉ

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Preface

Preface

The *ASX-100 Auto Sampler Operator's Manual* explains the procedures for installing, using, and maintaining the CETAC ASX-100 auto sampler. It also provides information about troubleshooting minor ASX-100 problems and describes the design of the auto sampler.

Who Should Read This Book

The primary audience for the *ASX-100 Auto Sampler Operator's Manual* laboratory site-planners and owners of the ASX-100. To use this manual effectively, a basic knowledge of electronic sampling equipment is required.

How to Use This Book

The *ASX-100 Auto Sampler Operator's Manual* contains seven chapters. You should read the chapters sequentially the first time. Thereafter, refer to the chapters separately as needed. The first chapter provides an introduction to the auto sampler. Subsequent chapters detail the primary tasks associated with the ASX-100.

The *ASX-100 Auto Sampler Operator's Manual* contains the following chapters:

Chapter 1, "Introduction," provides you with an overview of the ASX-100 auto sampler's function and design.

Chapter 2, "Preparing for Installation," discusses space and power requirements that must be met before the ASX-100 is installed. It also provides instructions for unpacking the auto sampler.

Chapter 3, “Installing the Auto Sampler,” provides step-by-step procedures for installing the ASX-100 and connecting it to the analytical instrument.

Chapter 4, “Verifying Installation,” explains how to test the communications interface between the ASX-100 and the host computer. It also explains how to check auto sampler components and test the sample probe.

Chapter 5, “Using the Auto Sampler,” describes the tasks you perform during daily operation of the ASX-100.

Chapter 6, “Maintaining the Auto Sampler,” explains daily, weekly, and periodic maintenance tasks.

Chapter 7, “Troubleshooting the Auto Sampler,” describes how to diagnose and correct ASX-100 problems.

These chapters are followed by a glossary of related terms.

Conventions Used in This Book

This book uses certain conventions to distinguish different types of information easily. This section describes these conventions.

Instructions

All step-by-step instructions are numbered and in bold, as in the following example.

1 Replace the sample vial rack.

Many numbered instructions are followed by more detailed explanations.

Preface

Menu Items

This book uses the following format for referring to menu items:

Settings»Communication

The text before the arrow symbol is the name of the menu; the text after the arrow symbol is the menu choice. This example refers to the Communications menu choice in the Settings menu.

Terminology

This book frequently uses the following terms:

ASX-100	The ASX-100 auto sampler.
ETFE	ethylenetetrafluoroethylene (Tefzel).
FEP	fluorinated ethylene propylene.
ICP-AES	An inductively coupled plasma atomic emission spectrometer.
ICP-MS	An inductively coupled plasma mass spectrometer.
ID	Inside diameter.
LED	Light-emitting diode.
PEEK	Polyetheretherketone.
PTFE	polytetrafluoroethylene.
VAC	Volts alternating current.

VDC Volts direct current.

Z-axis The up-and-down axis of the auto sampler.

Notes

Notes contain a reminder about the effect of particular actions. They are indicated as follows:

Note:

This example shows how a note is displayed.

Cautions

Cautions indicate situations that require immediate attention to prevent harm to the auto sampler. Cautions are indicated as follows:

CAUTION

This example shows how a caution is displayed.

Warnings

Warnings indicate situations that could cause bodily harm. Warnings are indicated as follows:

WARNING

This example shows how a warning is displayed.

Where to Go for More Information

In addition to the *ASX-100 Auto Sampler Operator's Manual*, you can refer to the following resources:

- the software manual for the ICP instrument you are using
- CETAC Technologies Customer Service and Support:
Tel: 1 (800) 369-2822 (USA only)
Tel: 1 (402) 733-2829
Fax: 1 (402) 733-1932
Email: custserv@cetac.com

1

Introduction

Introduction

The ASX-100 is designed to be robust, reliable, and easy to use. The ASX-100 provides automated sample introduction that enables you to perform other tasks while the auto sampler runs. The ASX-100 automatically introduces up to 96 samples when loaded to maximum capacity. It contains a microprocessor that allows sequential or random sampling, providing flexibility.

The ASX-100 is typically interfaced to and controlled by the ICP-AES or ICP-MS host computer using RS-232C serial or IEEE-488 parallel communications protocol. You can also daisy-chain the auto sampler to another RS-232 device, such as a second auto sampler, or connect it to a TTL switch closure-activated device, such as the CETAC Microneb 2000 Direct Injection Nebulizer (DIN).

Auto Sampler Standard Components

Auto sampler components are made of plastics, corrosion-resistant stainless steel alloys and anodized aluminum. The enclosure and base are made from a high-strength aluminum alloy that is anodized and finished with an epoxy powder coating. The sample tray and sample racks are made from polyethylene and protected from airborne contaminants and operator interference by a hinged polycarbonate lid.

The ASX-100 operates reliably under a wide variety of conditions. Components in the sample flow path are made of polyimide-coated fused silica (standard) or Tefzel (HF-resistant). When these inert, non-metallic materials are used at temperatures less than 135 °C, they can withstand repeated exposure to the following substances:

- predominantly aqueous solutions of strong acids (less than 40%)
- common organic solvents such as acetone, alcohol, ethyl acetate, methylethylketone (MEK), petroleum oils and derived fuels, tetrachloroethylene, toluene, and xylene

CAUTION

Prolonged or repeated exposure to temperatures greater than 135°C or to the following substances may cause premature failure of the flow path components and/or deterioration of the auto sampler mechanism:

- solutions of concentrated acids (greater than 40%)
 - partially halogenated hydrocarbons or extremely aggressive organic solvents (chloroform, methylene dichloride, 1,1,2-trichloroethane)
-

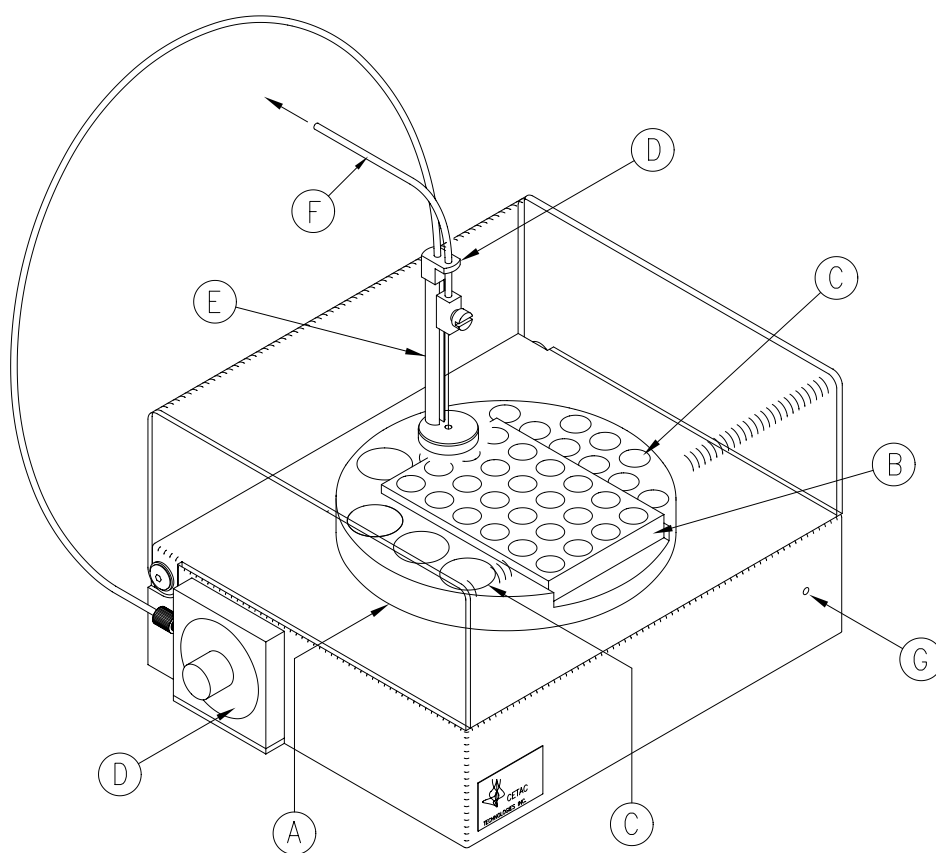


Figure 1-1. ASX-100 Design—Front View.

Introduction

The following standard components are located on the front of the ASX-100 and are shipped with each auto sampler. Each lettered item corresponds with a callout in Figure 1-1.

- A Sample tray.** The sample tray has up to 15 container positions and accommodates 1 sample vial rack. The rectangular center cavity holds one sample vial rack in place; a key and reference mark provide physical and visual orientation.
- B Sample vial racks.** The ASX-100 includes one sample vial rack; 24, 48 and 96 position racks are available. Each rack is interchangeable. The appropriate sample vials must be used for each rack, and the host computer's software must be configured for the rack layout and number of positions. The identification designations are shown on the Operators Reference.
- C Rinse/standards positions.** Up to fifteen rinse/standards positions are provided. Five positions accept 20ml vials, and up to ten positions accept 5ml vials. Typically, the first 20ml vial position is maintained as a rinse or home location, as well as a pre-rinse position next to the first 20ml vial position. All other positions are user-defined. The identification designations are shown on the Operators Reference.
- D Z-drive rotor.** The z-drive assembly attaches to the z-drive rotor.
- E Z-drive assembly.**
- F Sample probe.**
- G Power on LED.** Should be lit when the power is on.

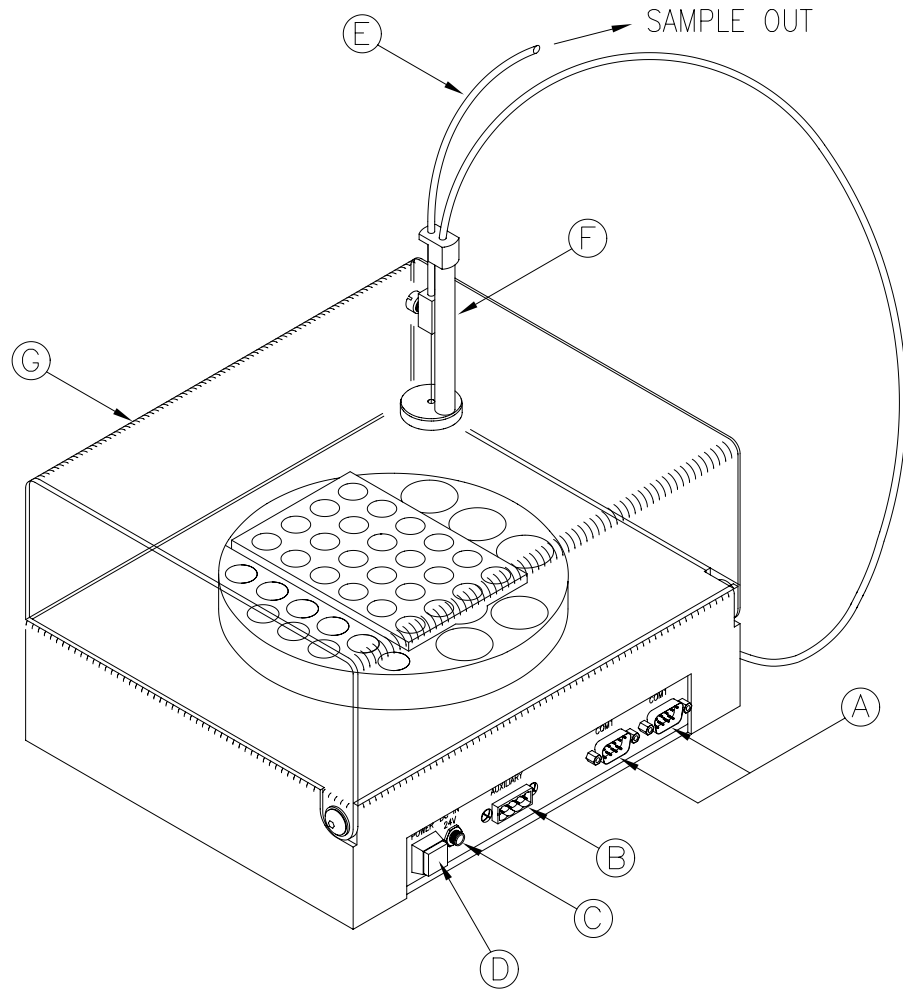


Figure 1-2. ASX-100 Design—Back View

The following standard components are located on the back of the ASX-100 and are shipped with the auto sampler. Each lettered item corresponds with a callout in Figure 1-2.

A Two RS-232 serial I/O ports (COM1 and 2). The serial ports are located on the right side at the back of the auto sampler. The

Introduction

COM1 port is the communications interface between the ASX-100 and the analytical instrument's host computer. The COM2 port connects the auto sampler to other external devices, such a second auto sampler.

- B Two-channel auxiliary port.** The auxiliary port detects switch closures or can trigger devices that can be operated from switch closure (TTL) event triggers.
- C 24VDC input.** The 5.5 millimeter coaxial jack for 24VDC input from the power module.
- D Power switch.** The push-on, push-off power control switch.
- E Sample probe.**
- F Z-drive assembly.**
- G Cover.**

The following standard components are also shipped with the ASX-100:

- **Sample probe kit.** The kit includes the fused silica and ETFE sample probes with sample tubing. The sample probe fits into the sample probe assembly.
- **Serial interface kit.** The kit includes DB9F port adapters for host computers with normal AT-style DTE serial ports. It also includes a 4.3-meter modular cable.

Optional Accessories

If you are doing a specialized type of analysis or are connecting the ASX-100 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 auto sampler. The following accessories are available for the ASX-100:

- **IEEE-488 interface kit.** The kit includes an RS-232/IEEE-488 converter box, an IEEE-488 cable, a power cord, and instructions. It is used to convert an IEEE communications protocol to a serial protocol.
- **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.
- **Microneb 2000 Direct Injection Nebulizer (DIN) interface kit.** The interface kit connects the auto sampler to the Microneb 2000 Direct Injection Nebulizer. It allows the auto sampler to trigger load/inject cycles.
- **MCN-100 Micro Concentric Nebulizer.** The MCN-100 is an efficient, low-flow pneumatic nebulizer which will replace most standard pneumatic nebulizers. The MCN nebulizes liquid samples at flow rates of 10 to 100 microliters/minute while maintaining high sensitivity.

Note:

Contact CETAC Technologies if you need additional accessories not listed, need added features to integrate the ASX-100 auto sampler into your analytical system, or have unique requirements. Research and development of new features and accessories for the ASX-100 auto sampler, often inspired by customer requests, is a continuing activity of CETAC Technologies.

Preparing for Installation

Preparing for Installation

To install the ASX-100, first prepare the site by evaluating the physical arrangement of the laboratory to choose a suitable location. Then carefully unpack the ASX-100 and begin the installation.

This chapter discusses what requirements must be met when you choose a location for the auto sampler. It also describes how to unpack the ASX-100 before installation.

Choosing a Location

Choosing a location for the ASX-100 involves evaluating the lab environment for the availability of space, water, and power. For the ASX-100 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 the shortest sample flow path. Therefore, you should place the auto sampler close to the analytical instrument. The recommended minimum footprint for countertop installation of the ASX-100 is 25 x 30 x 30 centimeters.

Power Requirements

Place the ASX-100 within 2 meters of a power outlet. The auto sampler's power module input requirements are 100–240 VAC $\pm 10\%$, 1 A, 50/60 Hz.

Unpacking the ASX-100

Inspect external packaging upon receipt for holes, tears, smashed corners, or any other outward signs of damage from rough handling or abuse during shipment. Inspect all items during unpacking and notify the carrier immediately of any concealed damage.

If the ASX-100 is shipped or removed from storage during cold weather, allow the packaged equipment to attain room temperature before opening and exposing to warm, humid air. It is usually sufficient to provide 4 to 8 hours for this purpose.

CAUTION

If condensation forms on or inside the auto sampler, allow it to dry thoroughly before connecting it to an AC power source and operating it. Failure to do so may cause equipment damage.

Auto Sampler Packaging

The shipping container unpacks in 3 layers from the top down :

- accessories and documentation
- sample vial racks and power module
- auto sampler

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 on the auto sampler.

Note:

Do not throw away the factory packaging. Keep it for possible future use. This is one of the warranty conditions.

Installing the Auto Sampler

Installing the Auto Sampler

The ASX-100 is designed for easy installation. Installation consists of two parts: assembling the ASX-100 and connecting it to the analytical instrument with which you will use it.

For the most part, you can assemble and install the ASX-100 without using tools. In fact, using tools to perform most installation tasks is likely to result in a damaged instrument.

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

- 1 Mount the sample probe assembly.**
- 2 Establish external connections.**
- 3 Assemble and place the sample racks and standards vials.**
- 4 Connect the auto sampler to the host computer.**

Mounting the Sample Probe Assembly

Mounting the sample probe assembly on the auto sampler is the first major task in assembling the ASX-100. The sample probe assembly must be attached to the auto sampler cover to correctly position the sample probe in relationship to the tray and sample rack. Figure 3-1 illustrates the sample probe assembly components.

Attaching the Sample Probe Assembly to the Cover

To attach the sample probe assembly to the auto sampler cover, complete the following steps:

Installing the Auto Sampler

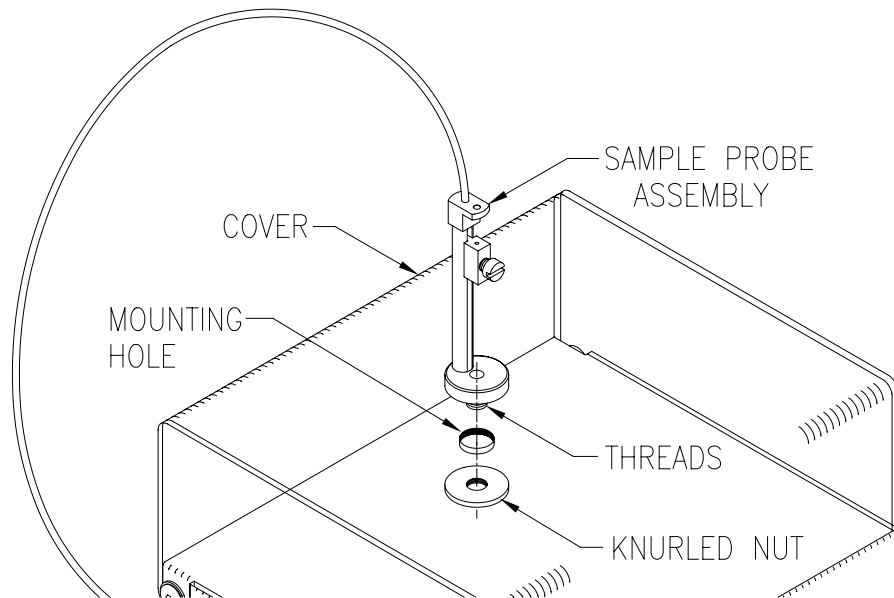


Figure 3-1. Attaching the Sample Probe Assembly.

- 1 Mount the sample probe assembly on the cover with the Z-axis slider pointing forward (Figure 3-1).**
- 2 Center the base of the sample probe assembly in the factory installed alignment sticker.**
- 3 Install the knurled nut inside of the cover on the sample probe assembly's threaded base.**

Finger-tighten the nut on the sample probe assembly base until there is no relative motion between the sample probe assembly and the cover. Do not overtighten the nut; overtightening may damage the sample probe assembly threads or crack the auto sampler cover.

Installing the Auto Sampler

Note:

The auto sampler will function poorly if the sample probe assembly is incorrectly mounted or adjusted. If the factory-installed alignment sticker or the auto sampler's cover has been removed, damaged or tampered with, the sample probe assembly must be aligned as described in Chapter 4, "Verifying Installation" and the sample probe function verified on all sample vial racks before operating.

Attaching the Sample Probe Assembly to the Z-axis Drive

Attaching the sample probe assembly to the Z-axis drive rotor is a simple process. To attach the sample probe assembly, complete the following steps.

1 Loosen the rotor clamp and thread the 1.5-millimeter PEEK push-pull tube into the Z-axis rotor groove (Figure 3-2).

Carefully thread the PEEK tube into the rotor. You can damage the push-pull tube if excessive force is applied.

2 Connect the sample probe assembly to the Z-axis drive housing.

Finger-tighten the PEEK fitting until the tubing covering the push-pull tube is secure. Loosen the fitting if the push-pull tube binds or drags. Do not tighten the rotor clamp at this time.

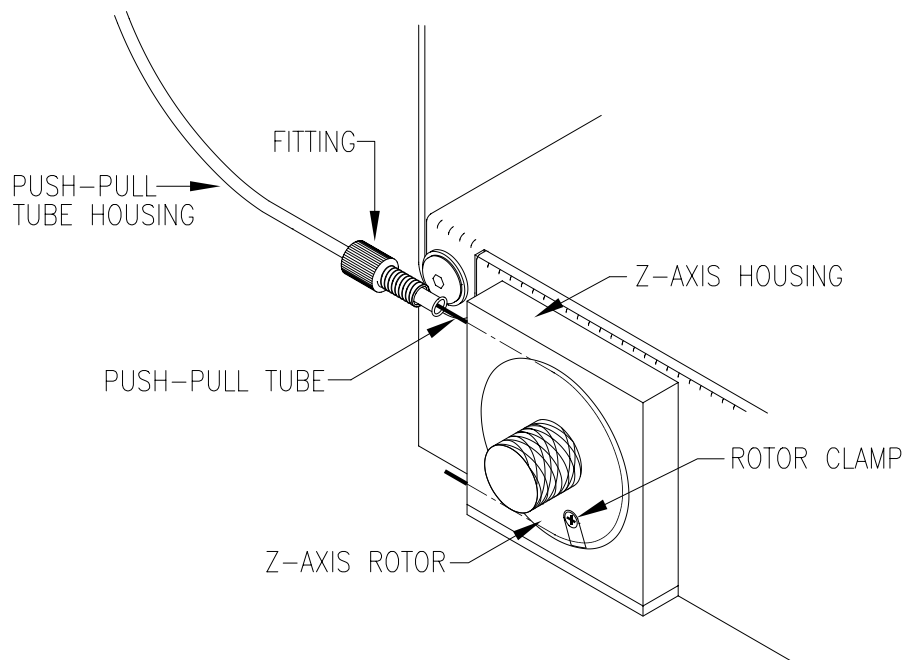
Installing the Auto Sampler

Figure 3-2. Side View of Auto Sampler Showing Z-Axis Rotor, Z-Axis Drive Housing and PEEK Fitting.

Installing the Sample Probe

To install the sample probe, complete the following steps:

1 Install the sample probe through the Z-axis cap, slider block and sample probe assembly

Retain the sample probe with the PEEK thumbscrew (Figure 3-3) and finger-tighten the thumbscrew. The coin slot is for removal only.

Set the sample probe height so the tip is flush with the bottom edge of the sample probe assembly base (maximum) to retracted up to 5 millimeters inside the sample probe assembly base (minimum) when the Z-axis slider is all the way up .

Installing the Auto Sampler

Setting the Z-Axis Travel

To set the Z-axis travel of the sample probe assembly, complete the following steps:

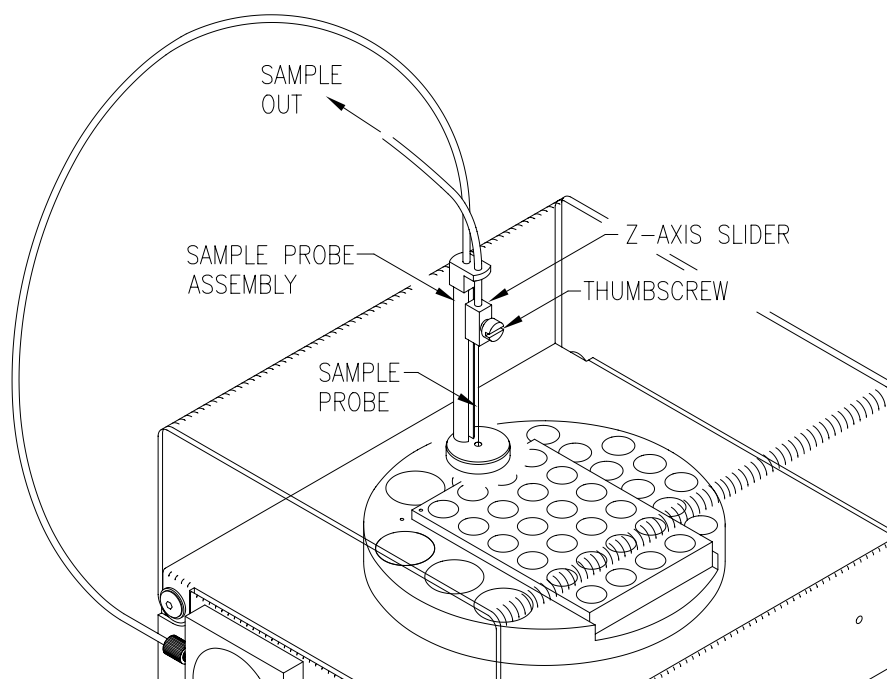


Figure 3-3. Sample Probe Assembly with Z-Axis Slider.

1 Gently move the Z-axis slider up to the top of its travel.

CAUTION

Do not maneuver the sample probe directly as damage to the sample probe or sample probe assembly push-pull tube may result.

2 Rotate the Z-axis rotor (Figure 3-2) until the clamp is located between 5:00 and 6:00, and carefully tighten the clamp screw.

Make sure that the push-pull tube is captured in the clamp groove, or erratic operation will result

3 Manually rotate the Z-axis rotor back and forth approximately one-quarter turn a few times while checking for binding and observing the action of the Z-axis slider (Figure 3-3).

4 At a minimum, visible clearance must exist between the top of the slider block and the top of the sample probe assembly (Figure 3-3).

Loosen the rotor clamp and readjust it as necessary until at least the minimum clearance is obtained..

5 Move the Z-axis to the full-up position and hold.

If the sample probe requires re-adjustment, loosen the PEEK thumbscrew and position the sample probe so that its tip is flush with the bottom of the sample probe assembly base or retracted up to 5 millimeters.

6 Finger-tighten the PEEK thumbscrew to hold the sample probe in position.

Note:

If the sample probe tip extends below the sample probe assembly base when fully retracted, the sample probe may be damaged.

Assembling and Placing the Sample Racks and Standards Vials

The sample vial rack(s) for the ASX-100 are shipped without sample vials or covers installed. Assemble and place a sample vial rack, rinse and standards vials in the sample tray before proceeding with the installation.

To assemble and place the sample vial racks, complete the following steps:

- 1 Load the sample vials into the sample vial rack.**
- 2 Remove caps and place the 20ml rinse/standards vials in their rotary tray positions.**
- 3 Remove caps and place the 5ml standards vials in their rotary tray positions.**
- 4 Open the cover and load a sample vial rack into the rotary tray.**

The rotary tray and sample vial rack are keyed to ensure proper fit. Align the reference mark (dot) at the corner of the rotary tray and sample vial rack for correct orientation.

A correctly placed sample vial rack will not move more than ± 0.2 millimeters unless lifted. A tilted sample vial rack or vials indicate an improperly placed rack or vials, which must be corrected before you operate the auto sampler.

CAUTION

Do not open the cover to interrupt the auto sampler during a sequence run. Do not attempt to load, unload, or reposition a sample vial rack or sample vial while the auto sampler is operating. Test the host computer software to determine if opening the auto sampler cover during operation causes it to lock-up, or if it will resume operation at the point of interruption. If host computer program lock-up occurs, opening the auto sampler cover during a sequence run may require the entire sequence to be re-run from the beginning.

Establishing External Connections

The next step in the installation process involves connecting the ASX-100 to the power source and to an analytical instrument. The following sections explain how to establish these connections.

Connecting the Auto Sampler to the Power Source

An AC/DC power module and voltage-specific power cord is supplied with each ASX-100.

WARNING

Use only the supplied AC/DC power module and power cord or an exact replacement.

To connect the auto sampler to a power source, plug the AC power cord receptacle into mating connector of the AC/DC power module. Next, plug the AC/DC power module's 24VDC coaxial plug into the auto sampler's 24VDC-IN jack and the AC power cord into a 100–240-VAC $\pm 10\%$, 50/60-Hz utility power outlet.

Connecting the Auto Sampler to an Analytical Instrument

You can connect the auto sampler directly to a sample introduction peristaltic pump and then to the ICP or any sample introduction device, such as the CETAC U-5000AT⁺ Ultrasonic Nebulizer, Microneb

Installing the Auto Sampler

2000 Direct Injection Nebulizer, or MCN-100 Micro Concentric Nebulizer. To do so, complete the following steps:

- 1 Determine the free length of the sample transfer tubing you need, add 10 centimeters, and cut the free end of the sample probe to length.**

Determining the free length includes an allowance for the cover to be opened and closed. The additional 10 centimeters provides a service loop for unrestricted sample probe motion.

Excessively shortened sample probe tubing is not repairable and must be replaced.

- 2 Connect the free end of the sample transfer tubing to the inlet of the instrument's peristaltic pump tubing.**

The free end may be connected directly to the MCN-100 sample inlet if used in the self-aspirating mode.

Connecting the ASX-100 to the Host Computer

You cannot operate the ASX-100 until you establish a communications interface between the auto sampler and the host computer. It is through this interface that the host computer directs the operation of the ASX-100.

The ASX-100 supports the following communications protocols:

- Serial (RS-232C) protocol is the standard configuration. There are two RS-232C serial ports on the ASX-100, and a serial interface kit is shipped with each auto sampler.
- Parallel (IEEE-488) protocol is much less common than the serial configuration. An IEEE-488 interface kit is included when interfacing to an IEEE-488 system is required, and is an optional accessory for all other ASX-100's. See Chapter 1, "Introduction," for more information about this kit.

Note:

The host computer, not the ASX-100, governs whether RS-232 or IEEE-488 communications is used. To determine which protocol is required by the analytical instrument you are using, refer to the hardware or software manual provided with the instrument.

The following sections explain how to establish a communications interface using an RS-232 serial protocol and using an IEEE-488 protocol.

CAUTION

When interconnecting any computing devices, keep the communications cables away from sources of electromagnetic or radio frequency interference (EMI/RFI), 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 Serial Communications Interface

The serial interface kit provided with the ASX-100 includes an interface cable equipped with two modular port adapters. 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 auto sampler communications.

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

2 Finger tighten both screws.**3 Connect the other end of the cable to the ASX-100 auto sampler COM1 port.**

Installing the Auto Sampler

4 Finger tighten both screws.

Note:

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, use the mating connector from the CETAC Technologies universal port adapter kit (optional). You can order the adapter kit from CETAC Technologies or purchase an adapter locally to convert the serial port to a DB9M. **Do not** use a "null modem" adapter.

CAUTION

Ensure that you are connecting the adapter to the **COM1** port. Connecting the adapter to the COM2 port on the auto sampler will cause the auto sampler (and possibly the host computer system) to malfunction. The auto sampler's COM2 port is used **only** for communications to devices other than the host computer and can not be user-reconfigured.

Establishing an IEEE-488 Communications Interface

Before you can establish an IEEE-488 communications interface with the host computer, you must have the IEEE-488 interface kit, which includes a converter box and an IEEE-488 cable. Use the IEEE-488 kit to establish a parallel interface with the host computer. To do so, complete the following steps:

1 Connect the converter box according to the manufacturer's instructions.

Manufacturer's instructions are provided with the kit.

2 Plug one end of the cable into the serial port on the 232/488 converter box.

3 Finger tighten both screws.

4 Connect the other end of the cable to the ASX-100 auto sampler COM1 port.

5 Finger tighten both screws.

CAUTION

Ensure that you are connecting the adapter to the **COM1** port. Connecting the adapter to the COM2 port on the auto sampler will cause the auto sampler (and possibly the host computer system) to malfunction. The auto sampler's COM2 port is used **only** for communications to devices other than the host computer and can not be user-reconfigured.

Verifying Installation

Verifying Installation

Once installation of the ASX-100 is complete, it is important to verify that you have installed the auto sampler correctly. Attempting to use the ASX-100 before ensuring that it is installed correctly may result in damage to the auto sampler.

Verifying installation of the ASX-100 consists of two parts:

- ensuring that the communications interface between the ASX-100 and the host computer is working
- ensuring that the sample probe is aligned and functions properly

This chapter explains how to test the interface and sample probe before using the auto sampler.

Note:

The procedures given in this chapter are for use in a Windows™ environment. If you are using a different operating system, you will need to use a compatible terminal emulator; that is, ST240, Procomm, or a UNIX-compatible equivalent.

Testing the Interface

If the communications interface between the ASX-100 and the host computer is not established correctly, the auto sampler will not function. Before you test the interface, ensure that the port connectors are correctly attached to the ASX-100 and the host computer as described in Chapter 3, “Installing the Auto Sampler”.

Note:

The following procedures assume that the auto sampler is powered-up, the cover is closed, you have started Windows and opened the Program Manager window.

To test the communications interface, complete the following steps:

1 Click the Accessories group Icon.

The Accessories window appears.

2 Double-click the Terminal icon.

The Terminal window appears (Figure 4-1).

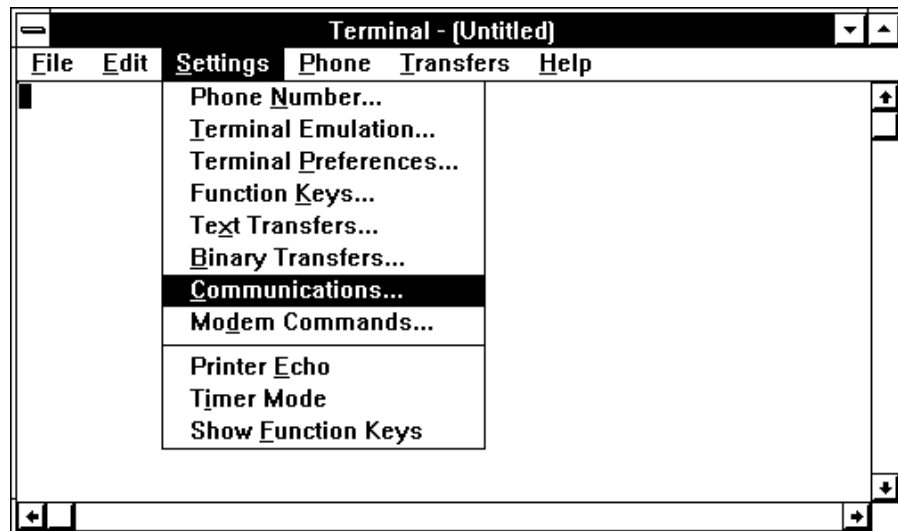


Figure 4-1. Terminal Window.

3 Select Settings»Communications.

The Communications dialog box appears (Figure 4-2).

Verifying Installation

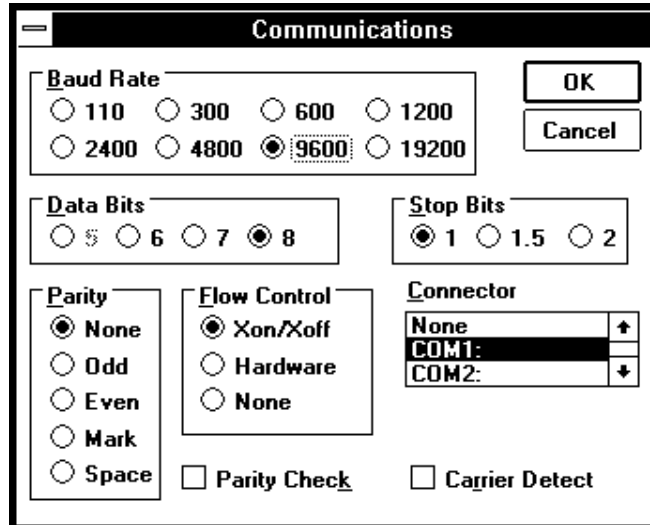


Figure 4-2. Communications Dialog Box.

4 Select the COM port, set the baud rate to 9600, and click OK.

The COM port you select must be the **host computer port** reserved for communication with the auto sampler. When you click OK, the cursor returns to the Terminal window.

5 Select Settings»Terminal Preferences.

The Terminal Preferences dialog box appears (Figure 4-3).

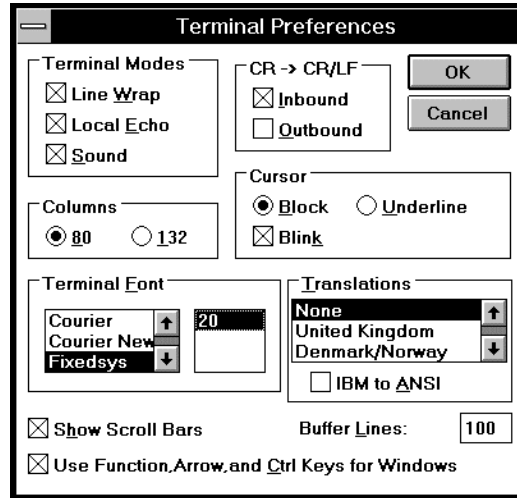


Figure 4-3. Terminal Preferences Dialog Box.

6 Click Local Echo, CR-> CR/LF Inbound, and OK.

The cursor returns to the Terminal window.

7 Type HOME and press Enter (Figure 4-4).

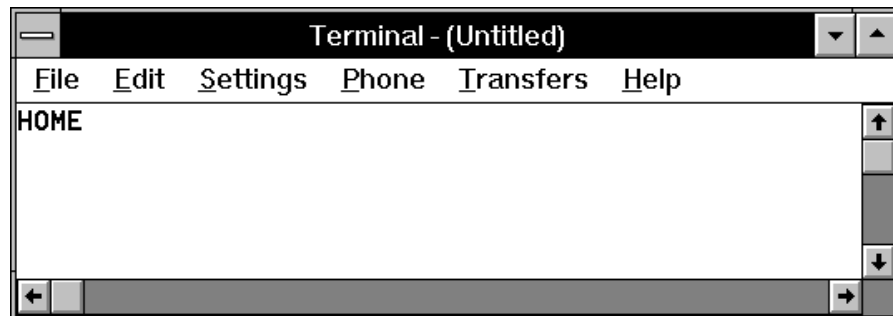


Figure 4-4. Terminal Window Sending HOME Command.

Verifying Installation

8 The auto sampler resets.

The sample tray moves to the starting position, the sample probe retracts (Figure 4-5), and the auto sampler sends an "OK" message back to the terminal window (Figure 4-6).

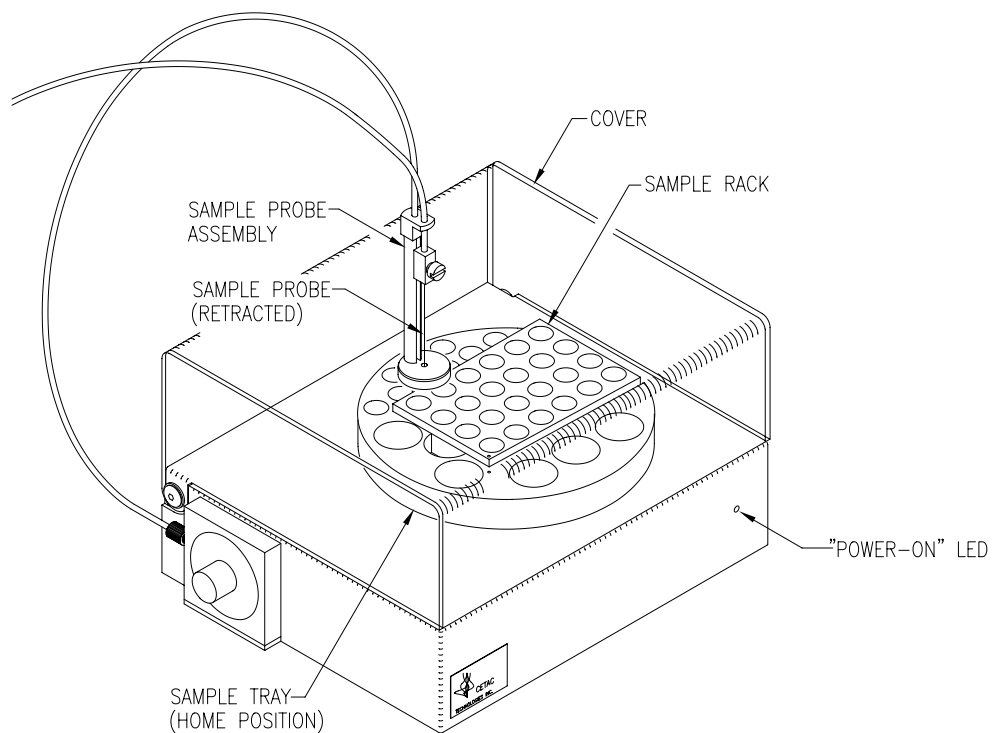


Figure 4-5. Auto Sampler Response to HOME Command.

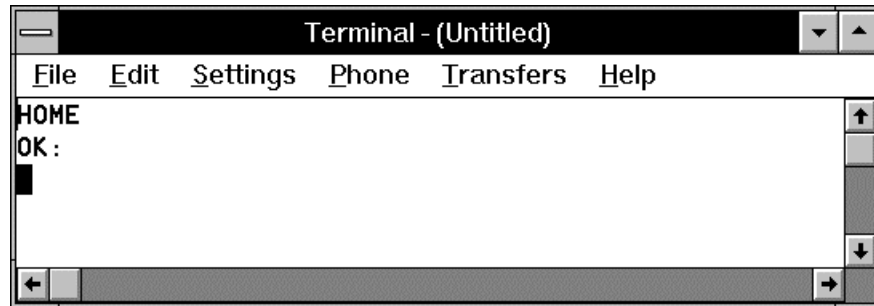


Figure 4-6. Terminal Window with OK Message.

If the auto sampler will not reset, see Chapter 7, “Troubleshooting the Auto Sampler.”

Checking the Auto Sampler Components

The following auto sampler components may be damaged by rough handling during shipping or installation: the sample probe, the sample probe assembly, and the cover. It is important that you check these components for damage before you operate the ASX-100.

To do so, complete the following steps:

- 1 Shut down and unplug the auto sampler.**
- 2 Visually inspect the sample probe, sample probe assembly, and cover for breakage, cracks or other signs of damage.**

If you find a damaged auto sampler component, it must be replaced before operating the auto sampler. For more information, see the appropriate section in Chapter 6, “Maintaining the Auto Sampler.”

Testing the Sample Probe

The sample probe must descend unobstructed into each sample vial to ensure satisfactory sample introduction. Shipping or rough handling during installation or normal use can disturb the auto sampler's cabinet-to-cover alignment and cause sample probe-to-sample vial collisions.

If the ASX-100 sample probe assembly, cover and sample tray are not correctly aligned, the sample probe **will not** function properly. It is therefore essential to test the sample probe, verify alignment and, if necessary, adjust the sample probe assembly as-required before the auto sampler is placed into service.

Note:

Before testing the sample probe, ensure that you have installed all ASX-100 components correctly. Also, ensure that you have securely tightened all thumbscrews and correctly connected the communications cable from the host computer COM port to the **COM1** port on the auto sampler as described in Chapter 3, "Installing the Auto Sampler".

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

1 Load the ASX-100 sample tray with an empty sample vial rack.

If multiple sample vial racks (different numbers of positions) will be used, select the sample vial rack containing the maximum number of positions for the initial verification run.

If you need more information about the sample vial rack, see Chapter 3, "Installing the Auto Sampler."

2 Cycle the ASX-100 power switch on-off-on and verify that the "Power-On" LED indicator is on.

3 Using the host computer control software, define the sample vial rack, designate sample positions at the left-rear, left-front, right-rear, and right-front of the sample vial rack (Figure 4-7).

If you need information about defining the sample vial rack, see Chapter 3, "Installing the Auto Sampler."

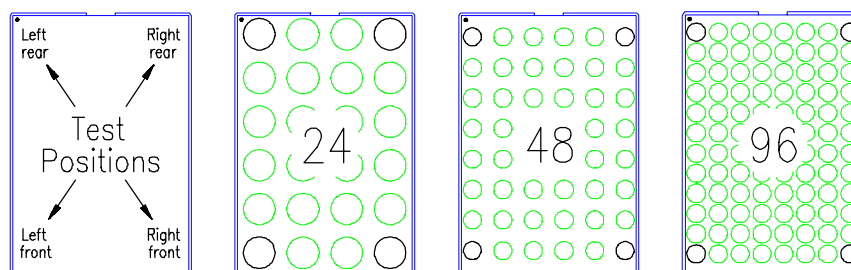


Figure 4-7. Sample Vial Racks.

4 Run the test sequence.

Record observations on a photocopy of Figure 4-7 to simplify alignment verification and adjustment.

Note the location of the sample probe relative to dead-center of the corner sample vial locations when the sample probe descends. Visual estimates of alignment error to the nearest millimeter are adequate.

5 Adjust the sample probe assembly.

After the alignment error is determined, loosen the nut on the bottom of the sample probe assembly approximately 1/8 turn and move the sample probe assembly in the **opposite** direction(s) of the observed alignment error.

Tighten the sample probe assembly nut after completing adjustment.

6 Repeat steps 1-5 with another size sample vial rack until all of the sizes that will be used have been verified.

If only one size sample vial rack will be used, sample probe testing is complete.

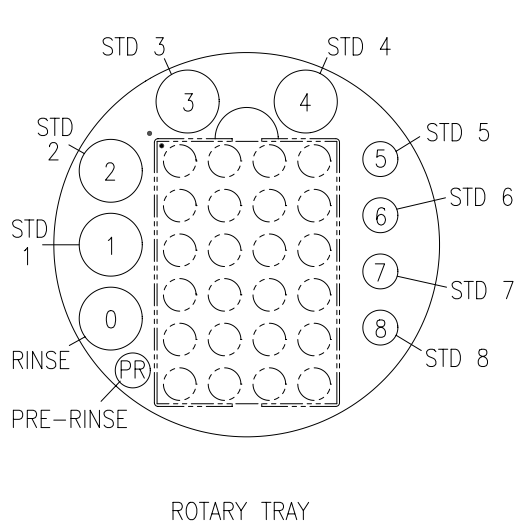
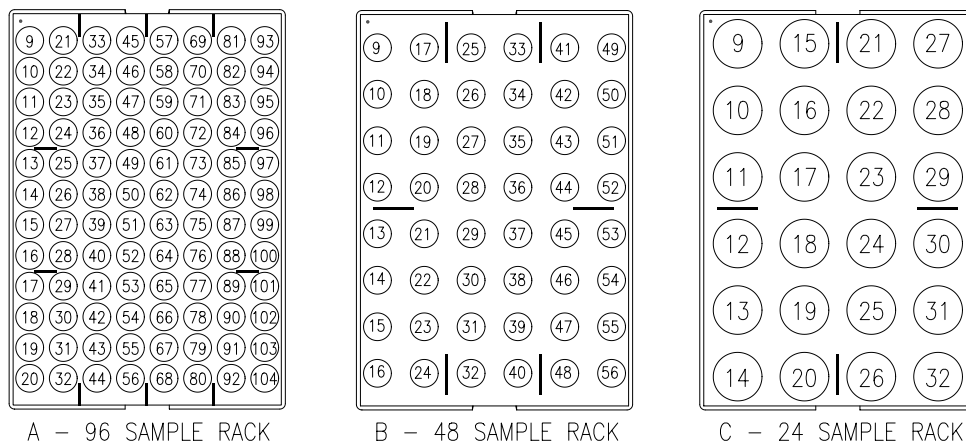
Verifying Installation

Remember to redefine the sample vial rack in the host computer's software when it is changed.

Note:

If satisfactory sample probe alignment cannot be achieved, contact CETAC Technologies Customer Service and Support or an authorized representative before attempting other adjustments.

Verifying Installation



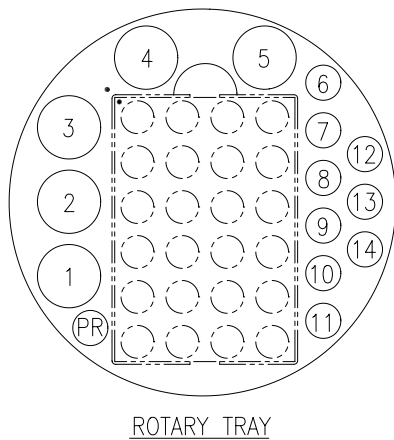
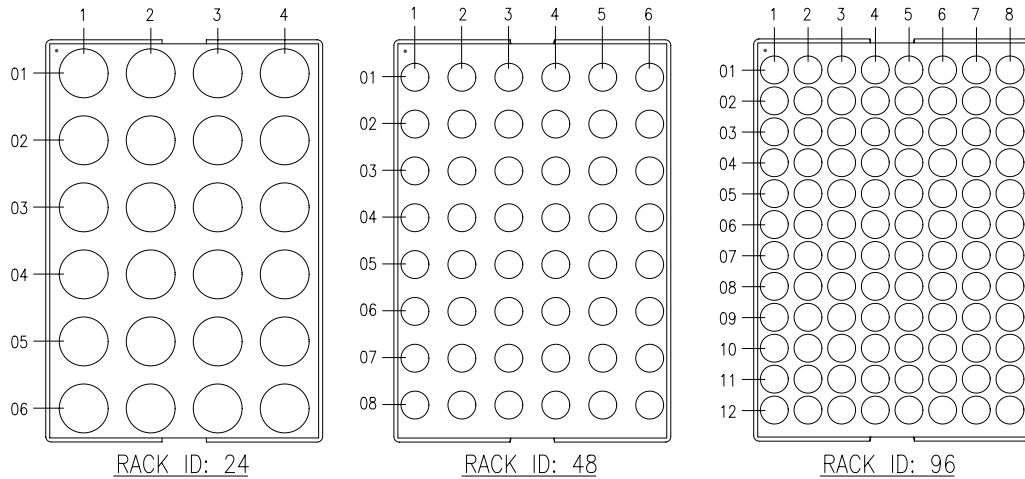
PERKIN-ELMER COMPATIBLE
(AS-90 EMULATION)

OPERATING INSTRUCTIONS:

- TURN ON POWER (PUSHBUTTON SWITCH ON REAR PANEL).
- OPEN COVER, ROTARY TRAY WILL MOVE TO LOAD/UNLOAD POSITION.
- FILL ROTARY TRAY PRE-RINSE (PR), RINSE (0), AND STANDARDS STATIONS (1 THRU 8).
- LOAD SAMPLES INTO SELECTED SAMPLE RACK, PLACE IN ROTARY TRAY AND CLOSE COVER. TRAY WILL MOVE TO START POSITION.
- PROGRAM COMPUTER SEQUENCE PARAMETERS. IF COVER IS OPENED WHILE AUTO SAMPLER IS OPERATING, SEQUENCE RUN WILL BE INTERRUPTED.

Figure 4-8. Perkin-Elmer Tray/Rack Configuration.

Verifying Installation



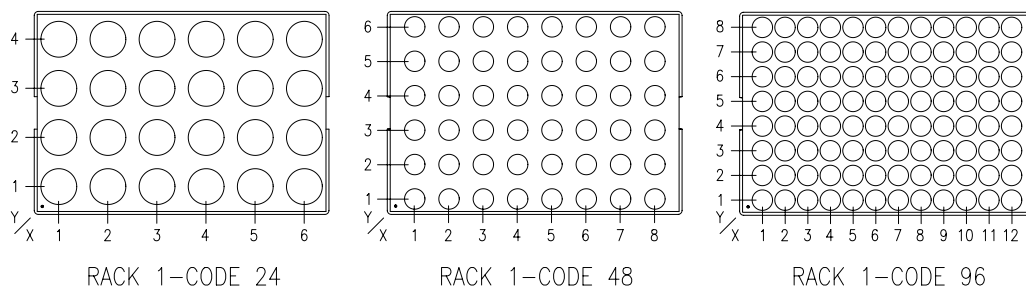
AGILENT 4500/7500 COMPATIBLE

OPERATING INSTRUCTIONS:

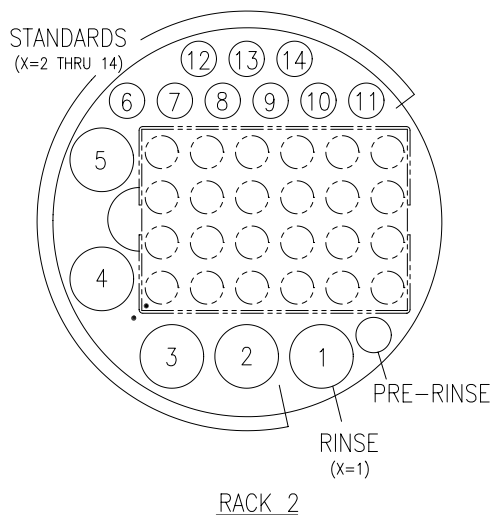
- TURN ON POWER (PUSHBUTTON SWITCH ON REAR PANEL).
- OPEN COVER, ROTARY TRAY WILL MOVE TO LOAD/UNLOAD POSITION.
- FILL ROTARY TRAY PRE-RINSE (PR), RINSE (1), BLANK, TUNING SOLUTION, ETC., AND STANDARDS STATIONS (2 THRU 14).
- LOAD SAMPLES INTO SELECTED SAMPLE RACK, PLACE IN ROTARY TRAY AND CLOSE COVER. TRAY WILL MOVE TO START POSITION.
- PROGRAM COMPUTER SEQUENCE PARAMETERS. IF COVER IS OPENED WHILE AUTO SAMPLER IS OPERATING, SEQUENCE RUN WILL BE INTERRUPTED.

Figure 4-9. Agilent Tray/Rack Configuration.

Verifying Installation



VG ELEMENTAL ICP-MS COMPATIBLE



OPERATING INSTRUCTIONS:

- TURN ON POWER (PUSHBUTTON SWITCH ON REAR PANEL).
- OPEN COVER, ROTARY TRAY WILL MOVE TO LOAD/UNLOAD POSITION.
- FILL ROTARY TRAY PRE-RINSE, RINSE (1) AND STANDARDS POSITIONS (STD 2-14). NOTE: Y=1, RINSE AND ALL STANDARDS.
- LOAD SAMPLES INTO SELECTED SAMPLE RACK, PLACE IN ROTARY TRAY AND CLOSE COVER. TRAY WILL MOVE TO START POSITION.
- PROGRAM COMPUTER SEQUENCE PARAMETERS. IF COVER IS OPENED WHILE AUTO SAMPLER IS OPERATING, SEQUENCE RUN WILL BE INTERRUPTED.

Figure 4-10. VG Elemental Tray/Rack Configuration.

Using the Auto Sampler

Using the Auto Sampler

The ASX-100 is both reliable and easy to use. Before using the ASX-100, however, ensure that your lab environment provides operating conditions that will prolong the life of the ASX-100. Once the proper operating conditions are met, you can load sample vials into a sample vial rack and start the auto sampler sequence run. When you finish using the auto sampler, you may need to remove and cap the rinse bottles and standards vials.

This chapter explains how to create the proper operating conditions for using the ASX-100. It also explains how to load the sample vial rack, start and shut down the auto sampler, and when to remove and cap the rinse bottles and standards vials.

Establishing Optimal Operating Conditions

The ASX-100 operates reliably even under less than ideal conditions. It is not, however, indestructible. Malfunction or damage can occur if specific operating conditions are not met. Meeting these conditions requires that you create the proper lab environment, replace auto sampler components that wear out under normal use, and purchase the appropriate supplies for use with the auto sampler. The following sections explain how to meet these conditions.

Note:

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

Creating the Lab Environment

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

- Operate the ASX-100 in a conventional lab environment where the temperature is 50–95 °F (10–35 °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 ASX-100. If possible, do not expose the auto sampler to vibration or shock.
- Protect the ASX-100 from long-term exposure to condensation, corrosive materials, solvent vapor, continual standing liquids, large spills into the bottom cabinet or operation inside an acid hood or glove box. Exposures of this type can corrode and damage the mechanical drive mechanisms as well as the electronics.
- 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.

WARNING

Discharge static buildup and ground to the auto sampler base or cabinet before performing any maintenance. Do not touch or short-circuit bare contacts or COM1, COM2, or auxiliary port.

- Avoid exposing the ASX-100 to high levels of electromagnetic or radio frequency interference (EMI/RFI), or radioactivity. EMI/RFI can cause erratic operation, high levels of radioactivity may cause electronic component failure and will prohibit factory repair if contaminated.
- Contact CETAC Technologies for assistance if the ASX-100 will be required to operate in a hostile environment.

Using the Auto Sampler

Replacing Auto Sampler Components

The following ASX-100 components wear out under normal use and must be replaced periodically.

- sample probe

If you fail to replace these components when they deteriorate, the auto sampler will not function properly. For information about replacing auto sampler components, see Chapter 6, "Maintaining the Auto Sampler."

Purchasing Supplies

Because the life-span of expendable containers will vary, you should maintain an adequate supply of spares. When you need to purchase additional supplies, it is important that you choose the appropriate sizes, shapes and materials.

When you purchase sample vials and standards tubes, make sure they meet the following requirements:

- The diameter of the sample vial matches the sample rack size.
- The material selected is compatible with the samples, standards and your analytical requirements. Ultra-high purity, ultra-trace applications are facilitated with polytetrafluoroethylene (PTFE), fluorinated ethylene propylene (FEP), perfluoralkoxy (PFA) or similar materials.

CAUTION

Use of unsuitable containers or inferior materials may result in auto sampler malfunctions, spills or invalid analysis results. Be sure all replacements meet the specified requirements.

To order additional supplies, refer to the *CETAC Accessories and Supplies Catalog* for the ASX-100.

Note:

All vials must be cleaned before use. At the minimum, new vials should be decontaminated by leaching overnight in a 5% nitric acid solution followed by three deionized water rinses. Vials used for ultra-high purity, ultra-trace analysis will require more rigorous preparation.

Defining the Sample Vial Rack

Sample vial racks containing 24, 48, or 96 positions are available for the ASX-100. The vial size appropriate for the selected rack must be used to ensure proper operation of the ASX-100.

For more information about placing sample vial racks in the sample tray, see Chapter 3, "Installing the Auto Sampler."

Define the number of sample positions for a sample rack through the host instrument software.

CAUTION

Incorrectly defining the position count (sample rack selected) can result in sample spills and invalid analysis results.

Starting the Auto Sampler

Once you have filled the rinse bottles, standards vials and arranged the sample vials in a sample vial rack, start the auto sampler. After the rinse, standards and samples have been loaded and the sampling parameters defined, the auto sampler will run under the host computer's control until the sampling sequence is finished.

To do so, complete the following steps (see Chapter 1, "Introduction", Figures 1-1 and 1-2 for the location of auto sampler components):

Using the Auto Sampler

1 Ensure that the 24VDC input connector, computer interface cable and sample probe tubing are properly connected.

For more information, see Chapter 3, "Installing the Auto Sampler."

2 Turn the ASX-100 power switch on.

The green "Power-On" LED indicator lights up when the power is on, and the sample tray moves to the start position.

3 Open the cover and load the autosampler with rinse bottles, standards vials and a sample vial rack.

The sample tray will automatically move to the load/unload position and remain there as long as the cover is open. Load the sample tray with filled rinse bottles, standards vials and a sample vial rack.

Remember to remove bottle and vial caps before closing the cover.

Note:

If you are conditioning a new sample probe or performing a routine flushing of the sample flow path, leach with 2-20ml of 2%-5% nitric acid solution followed by a thorough rinse with deionized water.

4 Access the host computer's software and activate the auto sampler program.

Define and start the sampling sequence. Refer to the "Operator's Reference" Diagrams (located in Chapter 4, pages 11-13). They will aid in correctly designating the sample positions selected when defining sequence parameters on the host computer.

The ASX-100 will operate under the host computer's control until it reaches the end of the sampling sequence run or it is interrupted.

Shutting Down the Auto Sampler

To shut down the auto sampler, complete the following steps:

1 Command the auto sampler to the RINSE position.

Drain the residual liquid from the sample probe and sample flow path.

If you used a rinse solution other than deionized water, thoroughly flush the sample probe and sample flow path with deionized water first.

2 Remove the sample vial rack, rinse bottles and standards vials.

Cover the sample vial rack and drain or cap rinse bottles and standard vials.

3 Turn the ASX-100 power switch off.

Interrupting a Sequence

Once you have started the auto sampler, you may wish to stop and restart a sampling sequence, change standards, rinse or sample vials, or the sample vial rack. Opening the ASX-100 cover will interrupt operation, but an error message will be sent to the host computer that may cause program lock-up, loss of the sampling parameters that were defined, and data already collected.

Stopping and restarting the auto sampler under host computer control is the appropriate method of interrupting a sequence. To do so, complete the following steps:

1 Access the host computer software and stop data acquisition.

Interrupt the auto sampler while the probe is in the rinse station. If the sequence is interrupted while the probe is in a sample position, the sample data may be lost. See the host computer software manual for specific information on stopping data acquisition.

Using the Auto Sampler

2 Open the auto sampler cover.

Change the standards, rinse or sample vials, or the sample vial rack.

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

Redefine the sampling sequence if necessary and start the sampling sequence. The ASX-100 will operate under the host computer's control until it reaches the end of the sampling sequence run or it is interrupted again.

Conditioning the Sample Probe and Flushing the Sample Flow Path

Normally, conditioning is only performed when a new sample probe is installed by acid leaching contaminants from the sample probe followed by flushing the entire sample flow path with deionized water. However, increased rinseout times or memory effects may indicate the need to repeat the leaching and flushing process.

To condition a new sample probe, complete the following steps:

1 Fill a 20ml bottle with leaching solution and place in the rotary sample tray.

Use a 5% nitric acid and deionized water solution. Place the filled bottle in the rinse position.

2 Access the host instrument software, send the auto sampler to the RINSE position and lower the sample probe.

Aspirate the nitric acid solution for 15-20 minutes.

3 Fill a 20ml bottle with deionized water and place in the rotary sample tray.

Replace the 5% acid-filled bottle at the rinse position with the deionized water-filled bottle.

4 Access the host instrument software, send the auto sampler to the rinse position and lower the probe.

Aspirate deionized water for 5-15 minutes.

5 Shut down the auto sampler.

See “Shutting Down the Auto Sampler” earlier in this chapter.

Maintaining the Auto Sampler

Maintaining the Auto Sampler

Routine maintenance of the ASX-100 auto sampler consists of daily and monthly cleaning of specific auto sampler components. Routine maintenance also includes checking the ASX-100 components for leaks or other damage. Additional periodic maintenance tasks may be required, including replacement of the following auto sampler components: sample probe and sample tray.

This chapter explains how to clean the ASX-100, inspect it for leaks, and replace damaged components.

WARNING

Discharge static buildup and ground to the auto sampler base or cabinet before performing any maintenance. Do not touch or short-circuit bare contacts or COM1, COM2, or auxiliary port.

Cleaning the Auto Sampler

Cleaning the ASX-100 is the primary maintenance task you perform. Failure to do so regularly will reduce the auto sampler's useful life. The following sections explain daily and monthly cleaning procedures.

It is especially important to clean up spills as they occur and remove contaminants, such as abrasives, to prevent them from entering the auto sampler's moving parts. It may also be necessary to chemically neutralize spills. Figure 6-1 illustrates the auto sampler components that need cleaning maintenance.

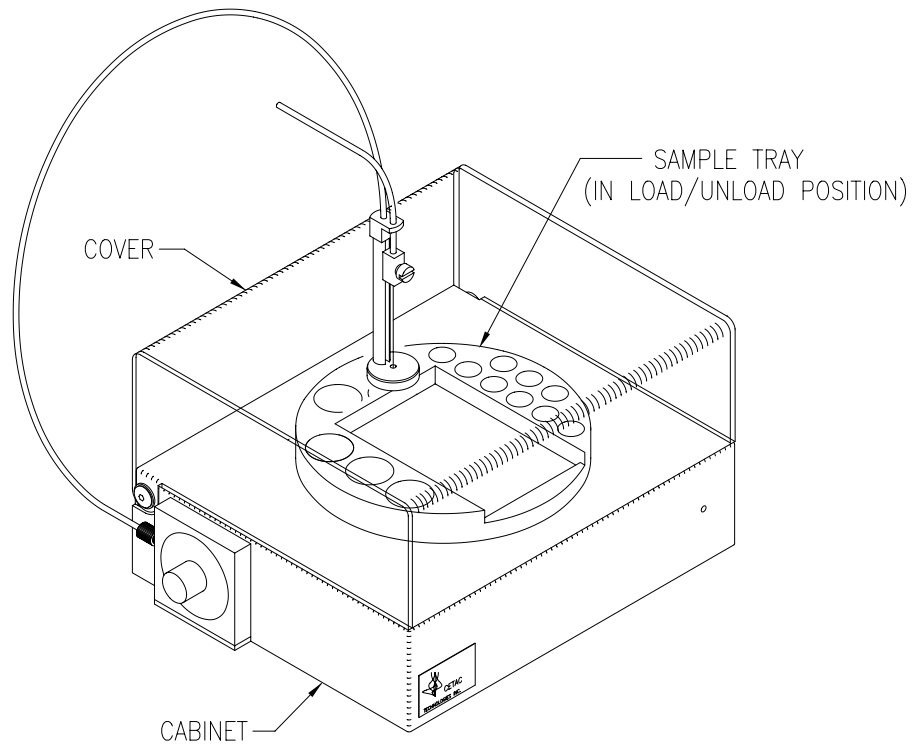


Figure 6-1. ASX-100 Auto Sampler - Front View.

Daily External Cleaning

Use of the ASX-100 will likely result in small spills on auto sampler components such as top of the cabinet and the sample tray. Good maintenance requires that you clean-up these spills as they occur. If the auto sampler becomes heavily contaminated, performing the monthly cleaning procedure may be required.

To perform routine daily cleaning , complete the following steps:

1 Shut down the auto sampler and disconnect the power module.

For information about shutting down the auto sampler, see Chapter 5, "Using the Auto Sampler."

Maintaining the Auto Sampler

2 Wipe the sample tray, auto sampler cabinet, and cover with a damp clean-room wiper.

Dampen the clean-room wiper with deionized water.

CAUTION

Do not allow cleaning solutions to run or drip inside the cabinet.

3 Repeat step 2 with a new clean-room wiper.

This process removes residual traces of contaminants.

4 Dry the sample tray, auto sampler cabinet and cover using a new clean-room wiper.

Avoid scratching the polycarbonate cover while drying. The ASX-100 must be thoroughly dry before you turn the power on again.

Monthly Cleaning

Although cleaning the ASX-100 daily removes spills and contaminants from most of the auto sampler components, it is necessary to clean the ASX-100 more thoroughly once a month. To do so, complete the following steps:

1 Shut down the auto sampler and disconnect the power module.

2 Clean or remove the sample tray.

Remove the sample tray if it cannot be acceptably decontaminated in-place. For information about removing the sample tray, see "Replacing the Sample Tray" later in this chapter.

3 Wipe loose particles from the top of the auto sampler cabinet and exposed parts of the mechanism with a dry, lint-free cloth.

Clean the entire cabinet top surface area under the cover.

CAUTION

Do not allow cleaning solutions to run or drip inside the cabinet.

4 Use a damp clean-room wiper to wipe the cover interior, exterior and the auto sampler cabinet until they are clean.

Dampen the clean-room wiper with deionized water or a 70% isopropyl alcohol/30% deionized water solution. Pay special attention to the inside of the cover, top of the lower cabinet, the area around the sample probe base, and the Z-axis slider

5 Wipe the sample tray until it is clean.

Dampen a new clean-room wiper with deionized water or a 70% isopropyl alcohol/30% deionized water solution. Remove all spills as soon and completely as possible.

6 Rinse the sample tray and then dry it.

Dampen a new clean-room wiper with deionized water to rinse and use a new clean-room wiper to dry the sample tray. Ensure that all contaminants and cleaning solution is removed from the sample tray and it is dry.

7 Replace the sample tray (optional).

Required only if the sample tray was removed at step 2. For information about replacing the tray, see "Replacing the Sample Tray" later in this chapter.

Checking for Leaks

Few of the auto sampler components have a limited life and will wear out under normal use:

- The sample probe

Standard maintenance procedures require that you periodically check these components for leaks and signs of deterioration . To do so, complete the following steps:

1 Shut down and unplug the auto sampler.

Maintaining the Auto Sampler

2 Visually inspect the sample probe for leaks or signs of deterioration.

Carefully inspect the first 75 millimeters of the sample probe, especially the tip, for cracks, chipping, or other signs of deterioration. The rest of the sample probe is encapsulated and requires only a general inspection for obvious damage. Inspect the pump tubing and connections, as well.

If you detect a leak or other damage to an auto sampler component, you must replace it. For more information, see the appropriate section in this chapter.

Replacing Peristaltic Pump Tubing

Replacement of worn out peristaltic pump tubing may be one of the most commonly neglected maintenance items in the laboratory. Due to the mechanical nature of peristaltic pumps, all pump tubing will gradually lose its elasticity, output stability will decline over time and the stability of analytical data will often parallel this decline. Worn-out pump tubing often exhibits no obvious signs of deterioration, yet its replacement can be directly correlated to restored instrument stability.

If you frequently analyze strong bases, acids, organic solvents or halogenated hydrocarbons, or use them as rinse agents or reference standards, pump tubing life may be notably brief when compared to the deterioration rate experienced with predominantly aqueous solutions.

Even though a sample introduction pump is not supplied with the ASX-100 (and no pump is required when the ASX-100 is used with the self-aspirating MCN-100), peristaltic pump maintenance can directly affect the stability of sample introduction and analysis.

To replace the peristaltic pump tubing, complete the following steps:

1 Shut down the auto sampler and unplug the peristaltic pump.

2 Release the pressure shoe tension and remove the old tubing.

Carefully pull or cut the old tubing off the free end of the sample probe to remove it.

3 Replace the pump tubing and reconnect it to the sample probe.

The sample probe can be damaged if you apply too much force, bend or kink it sharply. Softening the end of the new pump tubing in hot water will greatly reduce the effort required to reconnect it to the sample probe.

4 Reconnect the pressure shoe.

Replacing the Sample Probe

You must replace the sample probe if it is leaking or shows other signs of deterioration. To do so, complete the following steps:

1 Shut down the auto sampler and disconnect the power module.

2 Loosen the PEEK thumbscrew and remove the old sample probe and tubing.

Use the coin slot in the thumbscrew if necessary to facilitate its removal, but be careful not to use excessive force or you may damage the thumbscrew, Z-axis slider or the sample probe assembly.

3 Remove the old sample probe and replace it with a new sample probe.

For information about installing the sample probe, see Chapter 3, "Installing the Auto Sampler."

4 With the Z-axis in the full-up position, hold the Z-axis slider and move the sample probe tube up or down so that its tip is flush with the bottom edge of the sample probe assembly, or retracted up to 5 millimeters.

Any part of the sample probe tip that extends below the bottom of the sample probe assembly base when fully retracted may be broken-off during operation. For more information about installing the sample probe, see Chapter 3, "Installing the Auto Sampler."

Replacing the Sample Tray

Daily cleaning the ASX-100 sample tray greatly extends its useful life and reduces the potential for sample cross-contamination. Replacement should be a rare event unless the sample tray is damaged, or is soiled so severely it cannot be acceptably decontaminated. Thorough washing may restore a sample tray that is so severely contaminated it cannot be acceptably cleaned in-place.

If the sample tray needs to be removed for cleaning or replacement, complete the following steps:

1 Open the cover, shut down the auto sampler and disconnect the power module.

Allow the sample tray a 5-10 seconds to move to the load/unload position and stop before disconnecting the power.

2 Remove all bottles, standards vials and the sample vial rack.

3 Remove the screw at center of the sample tray and carefully lift the sample tray vertically.

Carefully raise the sample tray straight up by grasping the rim and lifting. **Do not** pry, rock the sample tray from side-to-side or use tools to remove it.

If the sample tray sticks on the shaft, one person may be needed to hold the auto sampler cabinet while a second removes the sample tray. When the sample tray comes free, take care so it does not strike the cover and break it, or drop the sample tray.

4 Discard or wash the sample tray.

Discard a damaged sample tray after removal.

Wash a contaminated sample tray by immersing in a warm detergent and water solution and vigorously scrubbing with a plastic-bristle glassware brush. Rinse repeatedly with deionized water and dry with a clean lint-free cloth or clean-room wiper.

If unacceptable contamination still remains, discard the sample tray and obtain a replacement.

5 Install the new or washed sample tray.

Temporarily reconnect the power module and repeat step 1 if there is any possibility the auto sampler could have been disturbed since the sample tray was removed. The sample tray is indexed and driven by the cross-pin that must be oriented correctly and mate with the recess in the bottom of the sample tray.

Gently replace the sample tray on the shaft with the sample vial rack cavity in the load/unload position (facing forward) and replace the hold-down screw. Take special care when tightening the plastic hold-down screw removed in step 3 or the screw head may be twisted off.

6 Replace the sample vial rack and verify sample probe alignment.

If the sample tray is not oriented correctly, temporarily reconnecting the power module and repeating step 1 before reinstalling was disregarded, or sample tray installation was performed improperly. Repeat steps 3 and 5.

For detailed information about verifying the sample probe alignment, see Chapter 4, "Verifying Installation."

**Troubleshooting the
Auto Sampler**

Troubleshooting the Auto Sampler

When the auto sampler does not function properly, isolate the problem to determine if it originates in the host computer, the analytical instrument, the RS-232 cable, or the auto sampler.

If you determine the problem is in the ASX-100, check the power system, the communications interface, the sample probe assembly, or the cover interlock to find the cause of the problem and resolve it.

This chapter explains how to troubleshoot minor ASX-100 problems. If you cannot solve a problem using the steps given in this chapter, contact CETAC Technologies Customer Service and Support or an authorized service representative.

Power System Problems

A possible cause of ASX-100 malfunction is a problem in the power system. If the auto sampler is dead, there may be no power getting to the ASX-100. If this is the case, the green "Power-On" LED indicator is off. To troubleshoot this problem, complete the following steps:

- 1 Check that the line cord connector is fully seated in the power module AC input and is connected to the AC outlet.**

Connect the cord if it is not already connected. If the cord is connected, continue troubleshooting with step 2.

- 2 Check that the power module's coaxial plug is fully seated into the auto sampler's 24VDC-IN jack.**

The 24VDC-IN jack is located on the back panel of the ASX-100 next to the POWER switch. If the auto sampler is still without power, continue with step 3.

3 Cycle the auto sampler POWER switch.

The POWER switch is the push-on/push-off type, and is located on the back panel of the ASX-100 next to the 24VDC-IN jack. If the auto sampler is still without power, continue with step 4.

4 Check the wall outlet.

Using a Volt-Ohm meter or equivalent, check the wall outlet for 100-240VAC, +/- 10%, 50/60 Hz.

5 Check DC output of the AC/DC power module.

Using a Volt-Ohm meter or equivalent, check the power module's DC output plug for 24VDC, +/- 1.5V. Ground (-) is on the ring, voltage (+) is in the socket.

CAUTION

Repeated breaker cut-outs indicate an abnormal condition and should not occur. Call Customer Service and Support if repeated breaker cut-out occurs.

WARNING

There are no fuses or user-serviceable overload protection devices in the power module or auto sampler. The power module is sealed and overload protected by a self-resetting circuit breaker, attempting to open it or bypass overload protection creates the risk of electrical fire or shock. If the power module input and output is within specifications and the auto sampler will not operate, call CETAC Customer Service and Support or an authorized representative; tampering with the auto sampler while troubleshooting power problems may void the warranty.

WARNING

Servicing or replacement of the supplied AC/DC power module with a non-approved unit without first consulting CETAC Technologies, or an authorized representative, will void the warranty.

Interface Problems

Operation of the ASX-100 is directed by the host computer. A malfunction of the auto sampler can indicate a problem with the RS-232 cable or with the software configuration of the host computer. The following sections explain how to troubleshoot these problems.

RS-232 Cable Problems

The first step in troubleshooting suspected interface problems is to check the RS-232 cable. To do so, complete the following steps:

- 1 Check the green "Power On" LED to ensure it is on.**
- 2 Check the RS-232 cable to ensure it is plugged in to the COM1 port on the auto sampler.**

If the cable is plugged in, ensure that the connector is properly oriented, fully seated, and the thumbscrews are fully and evenly tightened.

- 3 Check the host computer to ensure that the RS-232 cable is connected to the same COM port that has been selected.**

If the cable is plugged in, ensure that it is tightened properly. For more information about connecting the RS-232 cable, see Chapter 3, "Installing the Auto Sampler."

Software Configuration Problems

If the RS-232 cable is connected properly and the auto sampler is still not communicating with the host computer, ensure that the host software is configured correctly. To do so, complete the following steps:

1 Run the host software and ensure that the instrument is functioning properly.

Refer to the instrument manual for troubleshooting information.

2 Check the software configuration for the correct COM port selection and communications parameters (9600, N, 8, 1).

If the auto sampler is connected to a port other than the one defined, or the baud rate (9600), parity (N), number of data bits (8) or number of stop bits (1) selected is different, correct the configuration and save the changes.

If you are not sure which COM port the auto sampler is physically connected to, you can easily test the host computer by following the procedure for testing the communications interface. See Chapter 4, "Verifying Installation."

For specific instructions about how to access, change and save the communications configuration, refer to the instrument software manual.

Sample Probe Assembly Problems

An ASX-100 malfunction may be caused by a problem in the sample probe assembly. You can easily determine if a malfunction is related to the sample probe assembly if you hear a chattering noise when the ASX-100 power is turned on, or if the sample probe is not moving.

The auto sampler is shown in Figure 7-1. To troubleshoot sample probe assembly problems, complete the following steps:

Troubleshooting the Auto Sampler

1 Ensure that the sample probe assembly and sample probe are installed, and the Z-axis travel is set correctly.

If the sample probe assembly, sample probe or Z-axis travel are not installed or adjusted correctly, follow the instructions provided in Chapter 3, "Installing the Auto Sampler". If the sample probe assembly, sample probe and the Z-axis are correctly installed and set, continue with step 2.

2 Check the Z-axis rotor for binding, contamination or damage.

With the power off, manually rotate the knob approximately one-quarter turn back and forth. The knob should turn easily. If it does not, loosen the Z-axis rotor clamp and try rotating again.

If it moves freely, the sample probe assembly is binding. If it still turns hard, look for contamination on or around the Z-axis rotor, in the Z-axis rotor housing or for damaged components.

If the clamp is tightened, the Z-axis rotor turns easily and the sample probe assembly move freely, the clamp was overtightened or damaged.

3 Check that the Z-axis slider and sample probe assembly push-pull tube move freely.

If the sample probe assembly binds when the push-pull tube is connected to the Z-axis rotor but moves freely when disconnected, the Z-axis rotor clamp was severely overtightened.

If the sample probe assembly binds when the push-pull tube is disconnected from the Z-axis rotor and moved manually, check for contamination on the guides of the Z-axis slider (inside the sample probe assembly), or inside the push-pull tube cover.

Troubleshooting the Auto Sampler

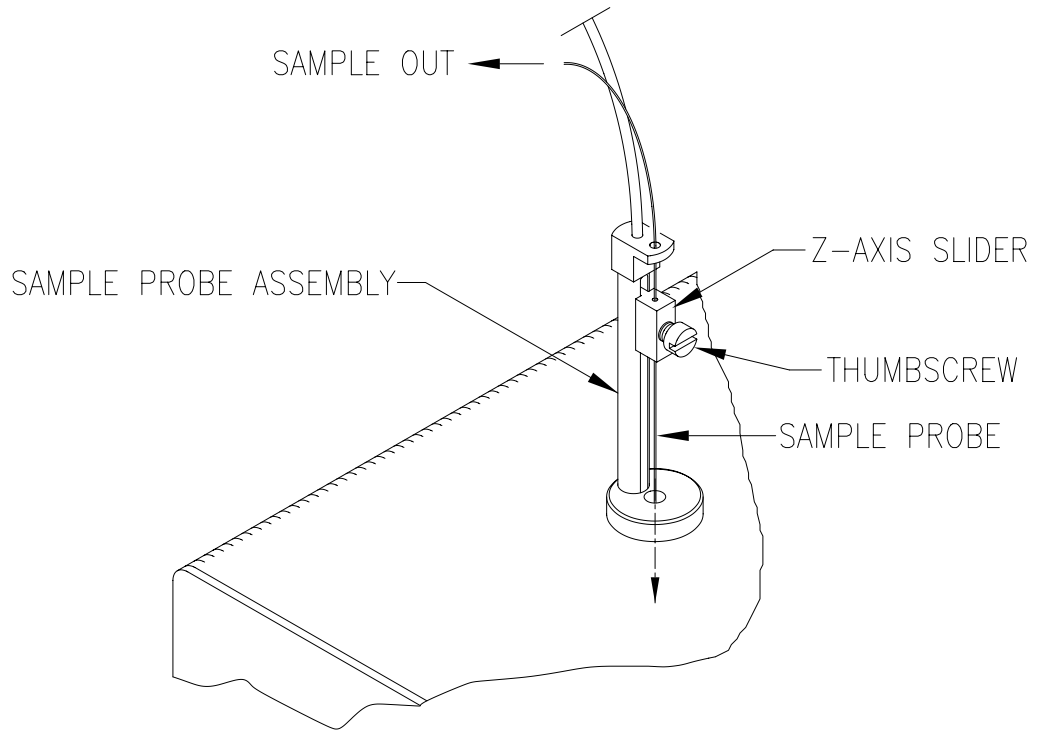


Figure 7-1. Sample Probe Assembly, Sample Probe, Z-Axis Slider, Z-Axis Rotor, and Z-Axis Rotor Housing.

If foreign material is found, remove and immerse the sample probe assembly in a hot detergent solution and scrub with a toothbrush. No lubrication is necessary after it is cleaned and dried.

Lubrication is not recommended, and common petroleum-based lubricants are especially unacceptable. Ordinary petroleum lubricants will react in the presence of acids to form a sticky, gummy residue that will eventually cause sample probe assembly malfunctions, and some petroleum based lubricants may even attack the plastic components.

Note:

If you cannot free the sample probe assembly, you will need to replace it. See Chapter 3, "Installing the Auto Sampler," for information about mounting a new sample probe assembly. You can order a new sample probe assembly from CETAC Technologies.

Cover Interlock Problems

This possible cause of ASX-100 malfunction is a problem in the interlock system that senses when the auto sampler cover is open. If the auto sampler has power, but will not respond to computer commands and the sample tray will not move from load/unload position, even if the power switch is cycled off-and-on, there are good indications that the problem may be related to the interlock system.

The green "Power-On" LED indicator must be on. To troubleshoot this problem, complete the following steps:

1 Check to make sure that the cover is completely closed.

A cover only slightly ajar is very easy to overlook. The sensor may detect a fault with the cover opened as little as 0.5 millimeters, and shock or vibration during operation may also open the cover enough to trip the interlock sensor. These type of shut-downs will end a sequence run.

2 Check to make sure the cover is properly installed and adjusted on the auto sampler cabinet.

All sides of the cover should be approximately even with the sides of the cabinet, and it must mate evenly with the top of the cabinet when closed. If worn-out or damaged, the cover or bushings must be replaced.

Also, since the sample probe assembly is mounted on the cover, cover misalignment caused by excess hinge wear or damage can also cause missed positions during sampling runs.

Stepper Motor or Electronics Problems

- Misuse such as severe liquid spills that go unattended, are allowed to drain inside of the cabinet, operation of the auto sampler inside an acid hood, or immersion of the auto sampler in liquid may cause corrosion of the electronics, Z-axis rotor or sample tray lock-up, or other failures in the stepper motor(s).
- Lightning strikes or other massive power surges can severely damage or destroy the AC/DC power module and auto sampler electronics.
- Electrostatic discharges (ESD) directly into the exposed contacts of either COM port will damage or destroy RS-232 communications or other components and render the auto sampler unusable.

Factory repairs and refurbishment, or factory-authorized service are recommended to repair major damage, failures or deterioration.

Glossary

Glossary

This glossary defines the terms used in the *ASX-100 Auto Sampler Operator's Manual*.

analytical instrument The instrument, typically an ICP-AES or ICP-MS, to which the auto sampler is connected.

auxiliary port The connection used to respond to an event signaled by sensing a switch closure or trigger an event by causing a switch closure.

cover The hinged plastic top that protects the samples from airborne contaminants, the moving sample tray from operator interference, and to which the sample probe assembly is attached.

I/O ports The connections used for establishing communication between the ASX-100 and the host computer or other external devices.

peristaltic pump The pump controlling the movement of the analyte to the analytical instrument.

rinse solution The solution, typically deionized water, used to decontaminate the sample probe.

rinse position The rotary sample tray position used to decontaminate the sample probe by dipping it in a container of a rinse solution.

sample probe The tube that is placed in the sample vial and

moves the analyte from the sample vial to the analytical instrument.

sample probe assembly The components that hold the sample probe in position and control its vertical motion.

sample vial rack The component that holds the sample vials and is placed into the sample tray for automated sample introduction and analysis.

Z-axis rotor The component that controls the movement of the Z-axis slider.

Z-axis slider The sample probe assembly component that governs the up-and-down travel of the sample probe.