
**ASX-110FR Autosampler
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 of twenty five (25) 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 rescission 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-110FR 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.

**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 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 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-001 édictée par le ministre des Communications.

Operator's Manual Addendum

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. | 3 Repeat step 2, using a towel dampened with clear water. |
| 2 Wipe the instrument exterior surfaces only using a towel dampened with a lab-grade cleaning agent. | 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.

ENVIRONMENTAL


Operating Temperature:	55°F to 85°F (13°C to 30°C)
Relative Humidity	0% to 60% non-condensing

Operator's Manual Addendum
Notices and Compliance Declarations


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

Title:
 Creator:
 CreationDate:

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

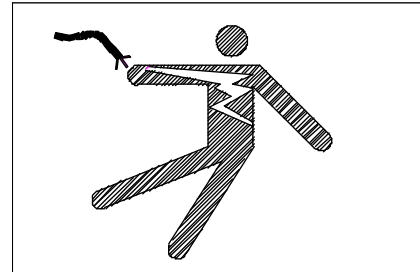
	⚠ WARNING THIS INSTRUMENT CONTAINS ELECTRICAL CIRCUITS, DEVICES, AND COMPONENTS OPERATING AT DANGEROUS VOLTAGES. CONTACT WITH THESE CIRCUITS, DEVICES, AND COMPONENTS CAN CAUSE DEATH, SERIOUS INJURY, OR PAINFUL ELECTRICAL SHOCK.
	OPERATORS AND OTHER UNAUTHORIZED PERSONNEL MUST NEVER OPEN THE MAIN COVER. 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.

	⚠ 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.
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PANNEAU NE DOIT ÊTRE ENLEVÉ QUE PAR UN RÉPARATEUR QUALIFIÉ.



⚠ 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.


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⚠ AVERTISSEMENT
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Operator's Manual Addendum

Notices and Compliance Declarations

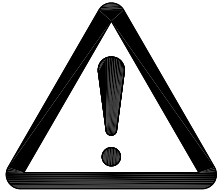
PANNEAU NE DOIT ÊTRE ENLEVÉ QUE
PAR UN RÉPARATEUR QUALIFIÉ.

⚠ WARNING
HIGH LEAKAGE CURRENT -
ENSURE PROPER GROUNDING

⚠ AVERTISSEMENT
COURANT DE FUITE ÉLEVÉ – FOURNIR
UNE MISE À LA TERRE EFFICACE.



Pinch point on X, Y, Z axis movement.



Attention – refer to the manual. This symbol indicates that information about usage of a feature is contained in the manual.

WARNING

If the autosampler is used in a manner not specified by CETAC Technologies, the protection provided the equipment may be impaired.

WARNING

The power switch on the rear panel is not the mains disconnect. Mains disconnect is accomplished by disconnecting the detachable power supply cord at the appliance coupler or at the mains plug. Ensure the power cord is easily accessible and removable, in the event of an emergency, which requires immediate disconnection.

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.

WARNING

This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket-outlet provided with a protective earth contact. Intentional interruption is prohibited.

Safety Maintenance

The operator should check the detachable power 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.

Safety and Regulatory Information

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

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.

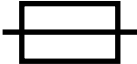
Notices and Compliance Declarations

WARNING
Ensure that power is disconnected before removal of any covers.

DC Voltage and Current
— — —
24V
3.33A

AC Voltage and Current
100-240V ~
47-63Hz 1.9A

™ of the European community 

Other Fuse(s) - The equipment uses one 2A 250V AC fuse which is not operator replaceable. 

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

WARNING
Pollution Degree - 1

WARNING
Do not operate in explosive atmosphere.

WARNING
All terminals allow a maximum current of 500MA @ 24VDC.

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Preface

Preface

The *ASX-110FR Autosampler Operator's Manual* explains the procedures for installing, using, and maintaining the CETAC ASX-110FR Autosampler. It also provides information about troubleshooting minor ASX-110FR problems and describes the design of the autosampler.

Who Should Read This Book

The primary audience for the *ASX-110FR Operator's Manual* consists of analytical chemists and lab technicians. To use this manual effectively, you should have a strong knowledge of chemistry, a basic knowledge of electronic sampling equipment, at least a beginning level of computer experience, and working knowledge of the analytical instrument used with the ASX-110FR.

How to Use This Book

The *ASX-110FR Autosampler 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 autosampler. Subsequent chapters detail the primary tasks associated with the ASX-110FR.

The *ASX-110FR Autosampler Operator's Manual* contains the following chapters:

Chapter 1, "Introduction," provides you with an overview of the ASX-110FR Autosampler's function and design.

Chapter 2, “Preparing for Installation,” discusses space and power requirements that must be met before the ASX-110FR is installed. It also provides instructions for unpacking the autosampler.

Chapter 3, “Installing the Autosampler,” provides step-by-step procedures for installing the ASX-110FR and connecting it to the analytical instrument.

Chapter 4, “Verifying Installation,” explains how to test the communications interface between the ASX-110FR and the host computer. It also explains how to check autosampler components and test the sample probe.

Chapter 5, “Using the Autosampler,” describes the tasks you perform during daily operation of the ASX-110FR.

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

Chapter 7, “Troubleshooting the Autosampler,” describes how to diagnose and correct ASX-110FR problems.

These chapters are followed by a glossary of related terms.

Conventions Used in This Manual

This manual 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 racks.**

Preface

Many numbered instructions are followed by more detailed explanations.

Menu Items

This manual 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 manual frequently uses the following terms:

ASX-110FR	The ASX-110FR Autosampler
ETFE	Ethylenetetrafluoroethylene (Tefzel®)
FEP	Fluorinated Ethylene Propylene
Host Computer	The computer that controls operation of the ICP-MS instrument to which the autosampler is attached.
Hz	Hertz.
ICP-MS	An Inductively Coupled Plasma Mass Spectrometer.
ID	Inside Diameter.
LED	Light-Emitting Diode.

PEEK	Polyetheretherketone.
PET	PolyEthylene Terephthalate
PFA	Perfluoroalkoxy
PTFE	Polytetraflouroethylene
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.

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.

Preface

Cautions

Cautions indicate situations that require immediate attention to prevent harm to the autosampler. 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-110FR Autosampler 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:
 - 1 (800) 369-2822
 - 1 (402) 733-2829
 - 1 (402) 733-1932 (Fax)
 - E-mail: custserv@cetac.com

Introduction

Introduction

The ASX-110FR Autosampler is designed to be sturdy, reliable, and easy to use. It provides automated sample introduction that enables you to perform other tasks while the autosampler runs. The ASX-110FR automatically introduces up to 96 samples when fully loaded. It contains a microprocessor that allows sequential or random sampling, providing flexibility.

The ASX-110FR is typically interfaced to and controlled by the instrument host computer using RS-232 serial, USB, or IEEE-488 parallel communications protocol.

The ASX-110FR offers a small footprint to conserve bench space, a short sample path to preserve valuable sample, and a protective cover to prevent sample contamination. The dual flowing rinse station prevents carry over to ensure sample integrity. The ASX-110FR is both contamination and corrosion resistant and offers a completely inert flow path.

Autosampler Configuration Options

The ASX-110FR is very configurable making it ideal for use in multiple applications. Three models are available. The standard model comes with a polypropylene rinse station controlled by a peristaltic pump. A second model comes with a polypropylene rinse station controlled by a gas displacement pump, which uses compressed gas to push the rinse through the rinse station. A third model is equipped with a PFA rinse station and a gas displacement pump for ultra-clean applications.

All three models have the option to be selected in either a tall or short configuration. The height configuration restricts the choice of racks to be either tall-BelArt half racks (with 7ml or 14 ml tube) or short-CETAC racks for small samples (with 0.5ml, 1.0ml, 1.5ml or 2ml vials). The rinse station is also configured in either a tall or short version.

Additionally, two probe sizes are offered: 0.010" ID and 0.035" ID. The 0.035" ID is expected to be the standard with the 0.010" ID designed for self-aspirating neb use.

Spares kits are available to convert a tall model into a short model, and vice versa. Optional rack kits are available as spares as well.

Autosampler Standard Components

Autosampler components are made of Ultra-High Molecular Weight Polyethylene (UHMW-PE) and Polyethylene Terephthalate. The base is made from a high-strength aluminum alloy with an epoxy powder coating finish. The sample racks are made from UHMW-PE or polypropylene and are protected from airborne contaminants and operator interference by a polycarbonate cover. Sample vial choices include PFA and polypropylene.

The ASX-110FR operates reliably under a wide variety of conditions. Components in the sample flow path are made FEP or PFA. 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, alcohols, ethyl acetate, Methylethylketone (MEK), petroleum oils and derived fuels, tetrachloroethylene, toluene, and xylene.

CAUTION

Introduction

Prolonged or repeated exposure to temperatures greater than 135°C and to the following substances can cause failure of the flow path components:

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

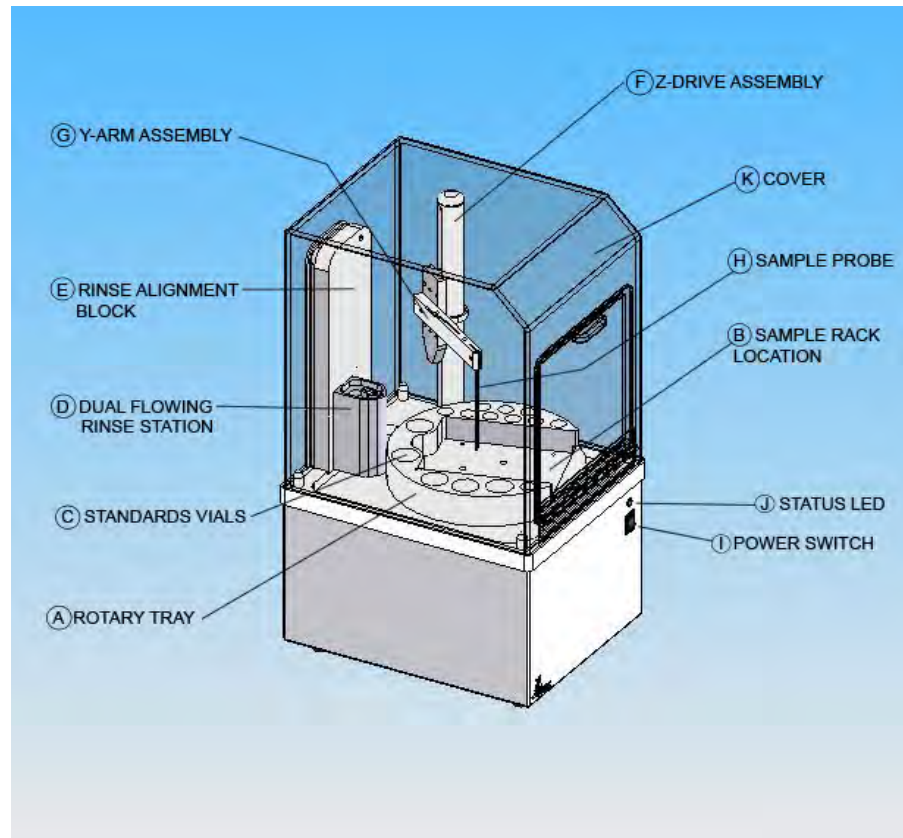


Figure 1-1. ASX-110FR Autosampler—Front View.

The following standard components are located on the ASX-110FR and are shipped with the autosampler. Each lettered item corresponds with a callout in Figure 1-1.

- A Rotary Tray.** The rotary tray has 14 standard positions and a rectangular center cavity, which holds one sample rack in place.
- B Sample Rack Location.** The ASX-110FR includes one sample rack. Rack choices include short or tall rack configurations. A keyed interface plate is required to use the short racks. The tall racks are placed directly in the rotary tray with no interface plate required. The appropriate sample vials must be used for each rack, and the host computer's software must be configured for that

Introduction

particular rack layout and number of positions. The identification designations are shown on the Operator's Reference – if a specific reference for ASX-110FR is not noted, a reference for the ASX-100 may be applicable with the ASX-110FR tray files.

Short – CETAC Racks:

- 24 position, 1.5ml or 2.0ml vials
- 48 position, 0.5ml vials
- 96 position, 1.0ml vials

Tall – Bel-Art Half Racks:

- 30 position, 14ml tubes
- 42 position, 7ml tubes

C Standards Vials. Up to 14 standards positions are available with the autosampler:

Short:

**9 – 4ml vials
5 – 20ml vials**

Tall:

**9 – 10ml vials
5 – 30ml vials**

D Dual Flowing Rinse Station. The dual rinse station is located directly behind the sample tray. It comes with tubing used to connect the rinse station to two separate rinse sources (de-ionized water pre-rinse and acid full rinse) and the waste container. The rinse station is provided in either a short or tall version to match the rack choice.

E Rinse Alignment Block.

F Z-Drive Assembly.

- G Y-Arm Assembly.** The Y-arm is attached to the Z-drive assembly in one of two mounting locations depending upon the choice for short or tall function.
- H Sample Probe.** Sample probes are constructed of Teflon® tubing reinforced with a carbon fiber tube to provide strength and maintain straightness. Available probe sizes include 0.010" ID and 0.035" ID.
- I Power Switch.** Rocker switch, single pole-single throw, 16 amp.
- J Power/Status LED.** Green light should be lit when the power is on and the autosampler is ready to work.
- K Cover.** The cover door may be opened during operation without interrupting the sampling sequence.

Introduction

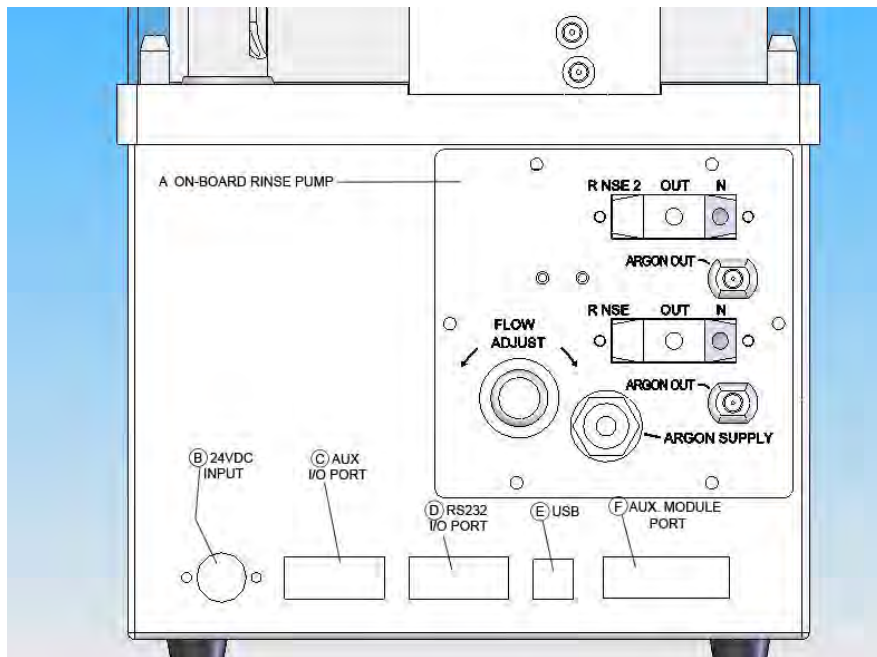


Figure 1-2. ASX-110FR Autosampler-Back View Gas Displacement Pump Model.

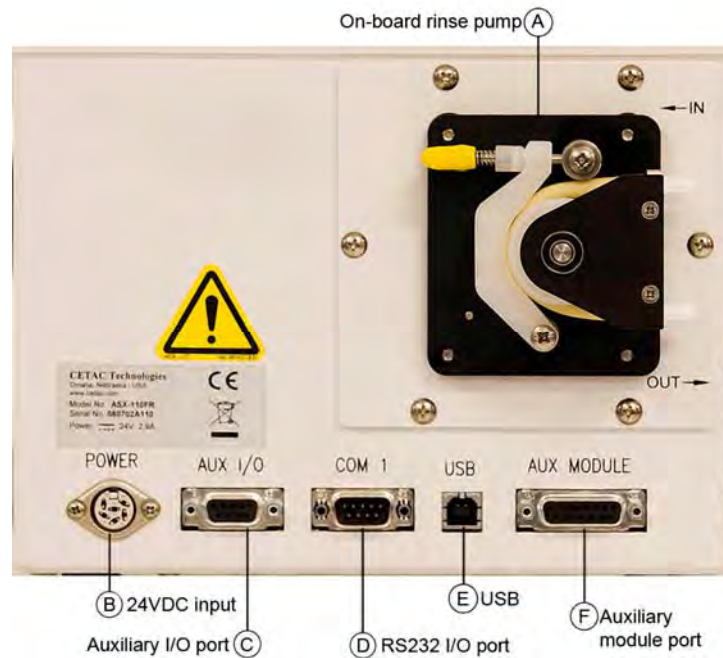


Figure 1-3. ASX-110FR Autosampler-Back View Peristaltic Pump Model.

The following standard components are located on the back of the ASX-110FR and are shipped with the autosampler. Each lettered item corresponds with a callout in either Figure 1-2 or Figure 1-3.

- A On-Board Rinse Pump.** The on-board rinse pump may be either a peristaltic pump or a gas displacement pump. In either configuration, the pump is located in the upper right-hand corner on the back of the autosampler. The pump moves the rinse solution from two rinses source through the flowing rinse station.
- B 24VDC Input.** The six-pin jack for 24VDC input from the power module.

Introduction

- C Auxiliary I/O Port.** The auxiliary I/O port detects switch closures or can trigger devices that can be operated from switch closure (TTL) event triggers. It can also be used to control external devices that require +24VDC.
- D One RS-232 Serial I/O Port-COM1.** The serial port is located in the center of the lower back of the autosampler. The COM1 port is the communications interface between the ASX-110FR and the analytical instrument's host computer.
- E USB Option.** The ASX-110FR comes standard with a USB port. This port can be used to interface the ASX-110FR with the host computer.
- F Auxiliary Module Port.** The auxiliary module port is included for possible addition of an external device that requires +24VDC.

There are two sets of dipswitches located on the bottom of the autosampler. The five-position dipswitch defines normal operating mode or rabbit programming mode. The first three switches of the eight-position dipswitch define the ICP interface and switch #6 controls whether the autosampler functions in the Tall or Short mode: 1 = Tall (Bel-Art racks), 0 = Short (CETAC racks).

The following standard components are also shipped with the ASX-110FR:

- **External Desktop Power Supply.** The input rating is AC 100V-240V, 1.9 A, with an output of DC 24V, maximum 3.3 A.
- **Serial Interface Kit.** The kit includes DB9F port adapters for host computers with normal AT-style DTE serial ports, and a 1.828-meter modular cable.

Optional Accessories

If you are doing a specialized type of analysis or are connecting the ASX-110FR 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. The following accessories are available for the ASX-110FR:

- **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.
- **Aspire PFA Micro-Concentric Nebulizer.** The Aspire PFA Micro-Concentric Nebulizer is designed for the introduction of small volume samples (< 1mL) to an ICP-AES or ICP-MS instrument for trace element analysis. The nebulizer consists of a PFA body and a Teflon® PTFE capillary for maximum chemical resistance (including hydrofluoric acid, (HF)) and low trace element blanks. The Aspire consists of a unique adjustable outer tip with standard 6mm dimensions and a replaceable capillary.
- **C-Flow Nebulizer.** The C-Flow Nebulizer is a molded, fixed-capillary style PFA concentric nebulizer for the introduction of low-volume (< 1mL) samples by ICP-AES or ICP-MS. The inert PFA construction allows the introduction of all acids (including hydrofluoric acid), alkalis and organic solvents. It features a standard 6mm diameter tip for easy installation to most spray chambers.
- **Alternate Rinse Height Kit.** Alternate rinse kits are available as spares to convert a short configuration into a tall and vice versa.
- **Alternate Sample Rack Kits.** Additional rack kits are available as spares to run samples of varying sizes.

Introduction

- **Alternate Sample Probes.** Alternate sample probes are available as spares.

Note:

Contact CETAC Technologies if you need additional accessories not listed, need added features to integrate the ASX-110FR Autosampler into your analytical system, or have unique requirements. Research and development of new features and accessories for the ASX-110FR Autosampler, often inspired by customer requests, is a continuing activity of CETAC Technologies.

Preparing for Installation

Preparing for Installation

Installing the ASX-110FR 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 for the autosampler. It also describes how to unpack the ASX-110FR before installation.

Choosing a Location

Choosing a location for the ASX-110FR involves evaluating the lab environment for the availability of space, water, and power. For the autosampler 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 autosampler close to the analytical instrument. The recommended minimum footprint for countertop installation of the ASX-110FR is an area of 25cm by 35cm and a height of 55cm.

Water Requirements

For most applications, deionized water is used as the primary rinse agent and an acid solution is used as the pre-rinse agent in the ASX-110FR. If a different rinse agent is routinely used, place the rinse agent source within two meters of the ASX-110FR.

Ensure that there is a liquid waste receptacle within two meters of the ASX-110FR. 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 drops directly into the waste receptacle with no coiling.

Power Requirements

Place the ASX-110FR within 1.2 meters of a power outlet. The ASX-110FR uses an external desktop power supply. The input rating is AC 110V-240V, 1.9 A with an output of DC 24V, maximum 3.3 A.

Ensure that you position the ASX-110FR so that the location where the power supply cord plugs into it is easily accessible (is not blocked) and it can be quickly disconnected if needed.

The power supply socket is on the back of the autosampler. Connect the power supply to the autosampler first and then connect a line cord to the power supply. Do not apply power to the power supply until ready to operate the autosampler.

WARNING

The ASX-110FR is intended to operate from 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.

Unpacking the ASX-110FR Autosampler

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.

Preparing for Installation

If the ASX-110FR 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 four to eight hours for this purpose.

CAUTION

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 on the autosampler.

Note:

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

Installing the Autosampler

Installing the Autosampler

The ASX-110FR Autosampler is designed for easy installation. Installation consists of two parts: assembling the autosampler and connecting it to the host analytical instrument.

For the most part, you can install the ASX-110FR without using tools. In fact, using tools such as screwdrivers or pliers to perform most installation tasks may result in a damaged or unusable instrument. Do not tighten thumb screws with anything other than your fingers.

To install the autosampler, 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. **Connect the rinse station.**
3. **Assemble and place the sample racks and standards vials.**
4. **Establish external connections.**
5. **Connect the ASX-110FR Autosampler to the host computer.**

WARNING

Ensure that AC power is off before proceeding with installation.

Mount the Sample Probe Assembly

Mounting the sample probe assembly on the autosampler is the first task in assembling the ASX-110FR. However, prior to mounting to the probe, the installation of the Y-arm should be confirmed to be compatible with the height of the racks intended for use. Figure 3-1 shows three sets of mounting holes provided for height options for the Y-arm. If the autosampler is intended to run with half Bel-Art racks and tall standards in the tall configuration, make sure the Y-arm is mounted in the top most mounting location. If the autosampler is intended to run with the CETAC short racks and short standards in the short configuration, make sure the Y-arm is mounted in the lowest mounting position. The center mounting position is not currently used.

ASX-110FR Autosampler Operator's Manual
Installing the Autosampler

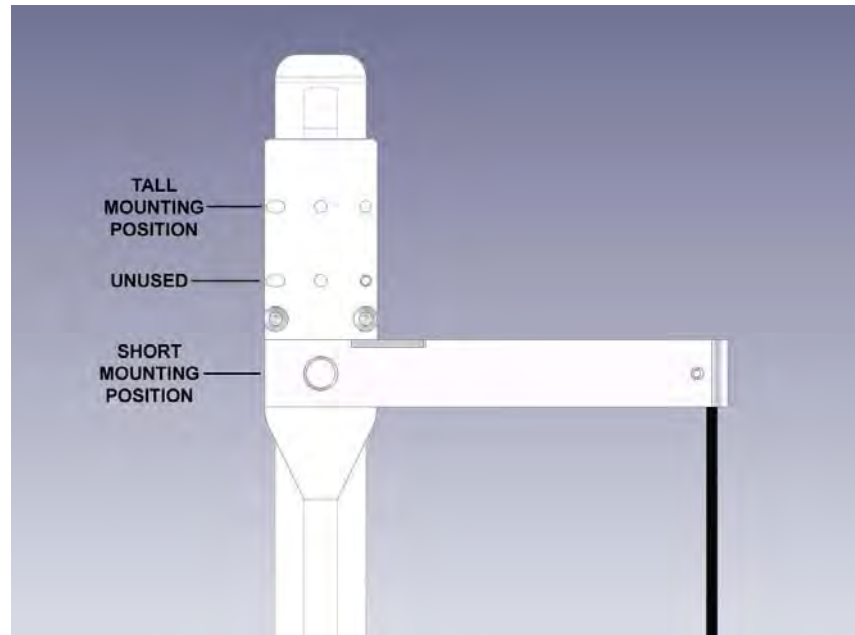


Figure 3-1. Y-Arm Mounting Positions.

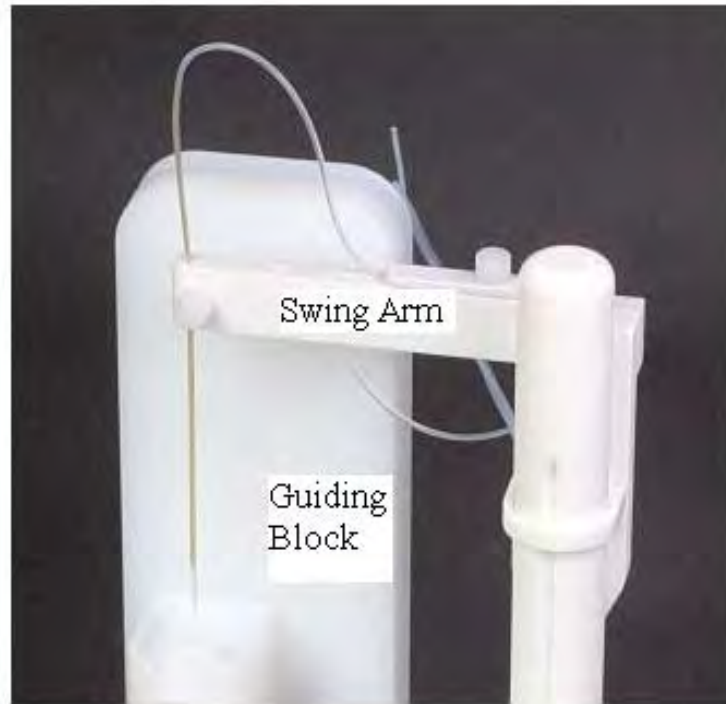


Figure 3–2. Sample Probe Assembly Installation.

Figure 3–2 illustrates the sample probe assembly installation.

1. Insert the probe into the Y-arm assembly and loosely tighten the thumbscrew on the front of the arm, leaving the probe set high until the position is checked.
2. Loosen the thumbscrew on top of the Y-arm assembly and slide the probe tubing into the groove.
3. Loosely tighten the thumbscrew to hold the probe tubing in place.
4. Loop the probe tubing down and around through the inner hole in the rinse alignment block and out the back.

Installing the Autosampler

Connect the Rinse Station

The cabinet-mounted rinse station is located at the back of the autosampler within the cover. The ASX-110FR provides the ability to use two separate rinse solutions in a dual flowing rinse station as shown in Figure 3-3. Typically, de-ionized water is used as a pre-rinse solution and an acid solution, such as 2% HNO_3 , is used as the primary rinse solution. The dual flowing rinse solutions may be pumped into the rinse station by either an on-board peristaltic pump or with a gas displacement pump.

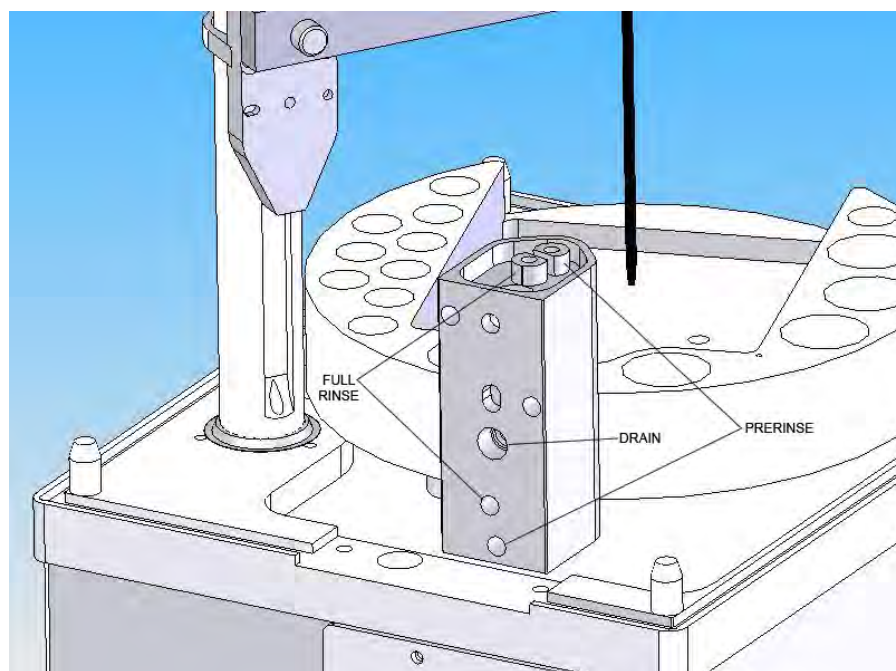


Figure 3-3. Dual Flowing Rinse Station.

Installing the Autosampler

The rinse solution is pumped into the rinse station through two ports at the bottom of the rinse station and is drained from the top of the rinse station. This up-flow rinsing is the most effective method for decontaminating the sample probe tube between samples.

The waste rinse solution drains from the top of the rinse station by means of gravity; it is therefore necessary to ensure the drain tube hangs straight and is unhindered in its path to the waste receptacle.

Peristaltic Pump Configuration

In the gravity drain arrangement, the rinse solution moves through both channels of the peristaltic pump to the dual inlets at the bottom of the rinse station. It then drains out a single gravity drain at the top of the rinse station. The rinse speed of the peristaltic pump is configurable through ICP command only. If the ICP does not have a command action to alter the pump speed, the speed can not be changed.

To connect the rinse station tubing to the rinse station, complete the following steps:

- 1 Remove the rinse station from the unit by gently pulling away from the support.**
- 2 Use two lengths of approximately six inches (15 centimeters) of the 1/8 inch (3-millimeter) I.D. Tygon® tubing provided for the rinse solution uptake. Insert one section of tubing onto each of the two lower fittings for the pre-rinse and main rinse inputs on the back of the rinse station as noted in Figure 3-3.**
- 3 Use one length of approximately 72 inches (1.8 meters) of the 3/16 inch (5-millimeter) I.D. Tygon® tubing provided for the rinse drain. Insert one end into the upper drain fitting on the back of the rinse station as noted in Figure 3-3.**

Installing the Autosampler

Insert the tubing carefully because the rinse station fitting grips the tubing tightly. If you apply too much force, the fittings can break off. The 5-millimeter Tygon® tubing may need to be stretched slightly on the end to allow insertion over the drain fitting.

- 4 **Replace the rinse station on the unit. First, thread the tubing through the guide holes on the rinse alignment block out the back of the unit. Then, align the guide posts on the rinse station with the alignment block and carefully push the rinse station into place. Ensure the rinse station is mounted tightly against the alignment block to ensure no rinse misalignment problems.**

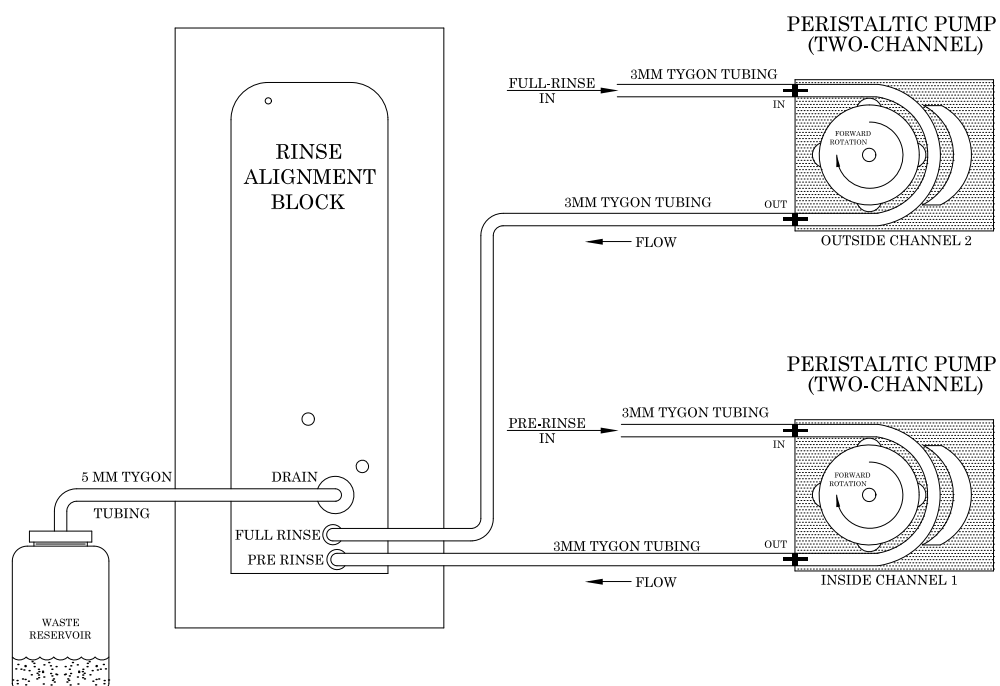


Figure 3-4. Peristaltic Pump Tubing Connections.

Installing the Autosampler

To connect the rinse station tubing to the peristaltic pump using a gravity drain, complete the following steps:

- 1 Rinse In – Use two lengths of approximately 72 inches (1.8 meters) each of the 1/8 inch (3-millimeter) I.D. Tygon® tubing. Insert one end of each length of tubing onto the two inlets at the top of the pump. Place the other end of each length of tubing into the two rinse solution sources.**
- 2 Rinse Out - Connect the peristaltic pump to the rinse station by completing the following steps:**
 - a) Take the free end of the Tygon® tubing protruding through the alignment block from the lower rinse station input and insert it onto the *inside channel* fitting on the bottom of the peristaltic pump as shown in Figure 3-4.**
 - b) Take the free end of the Tygon® tubing protruding from middle rinse station input and insert it onto the *outside channel* fitting on the bottom of the peristaltic pump as shown in Figure 3-4.**

Insert the tubing carefully because the peristaltic pump fitting grips the tubing tightly. If you apply too much force, the fitting can break off.

- 3 Drain - Connect the rinse station to the waste container by placing the free end of the 3/16 inch (5-millimeter) I.D. Tygon® tubing protruding from the rinse station outlet (on top) in a waste container.**

Ensure that the waste container is at least 30 to 60 centimeters (cm) lower than the rinse station outlet.

Ensure that the tubing outlet is placed in the waste container so that it will not be immersed in the waste solution. Immersion of the drain tube outlet may cause the waste solution to back up and overflow.

Installing the Autosampler

Gas Displacement Pump Configuration

In the gravity drain arrangement, the rinse solution flows through the dual inlets at the bottom of the rinse station. It then drains out a single gravity drain at the top of the rinse station.

The gas displacement pump pressure can be adjusted with the flow adjustment knob on the gas displacement pump panel. Pressure is adjustable from 0 to 5 psi. Higher pressure results in a faster rinse speed.

WARNING

CHEMICAL SPRAY HAZARD

Tighten the fittings "finger-tight." Do not use any tool other than your fingers to tighten the fittings. If the fitting is too loose, the tubing can leak or come out of the fitting. If the fitting is too tight, the tubing and seats will deform and leak.

To connect the rinse station tubing to the rinse station, complete the following steps:

- 1 Remove the rinse station from the unit by gently pulling away from the support.**
- 2 Use two lengths of approximately eight inches (20 centimeters) of the 0.020 inch (0.5-millimeter) PFA tubing provided for the rinse solution uptake. Insert one section of tubing onto each of the two lower fittings for the pre-rinse and main rinse inputs on the back of the rinse station (shown in Figures 3-3 and 3-5). Apply gentle pressure to the tubing while tightening the fittings. The fittings should be as tight as you can get them using just your fingers.**
- 3 Use one length of approximately 72 inches (1.8 meters) of the 3/16 inch (5-millimeter) I.D. Tygon[®] tubing provided for the rinse drain. Insert one end into the upper drain fitting on the back of the rinse station as noted in Figure 3-3.**

Installing the Autosampler

Insert the tubing *carefully* into the drain fitting because the fitting grips the tubing tightly. If you apply too much force, the fitting can break off. The 5-millimeter Tygon® tubing may need to be stretched slightly on the end to allow insertion over the drain fitting.

- 4 Replace the rinse station on the unit. First, thread the tubing through the guide holes on the rinse alignment block out the back of the unit. Then, align the guide posts on the rinse station with the alignment block and carefully push the rinse station into place. Ensure the rinse station is mounted tightly against the alignment block to ensure no rinse misalignment problems.**

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Installing the Autosampler

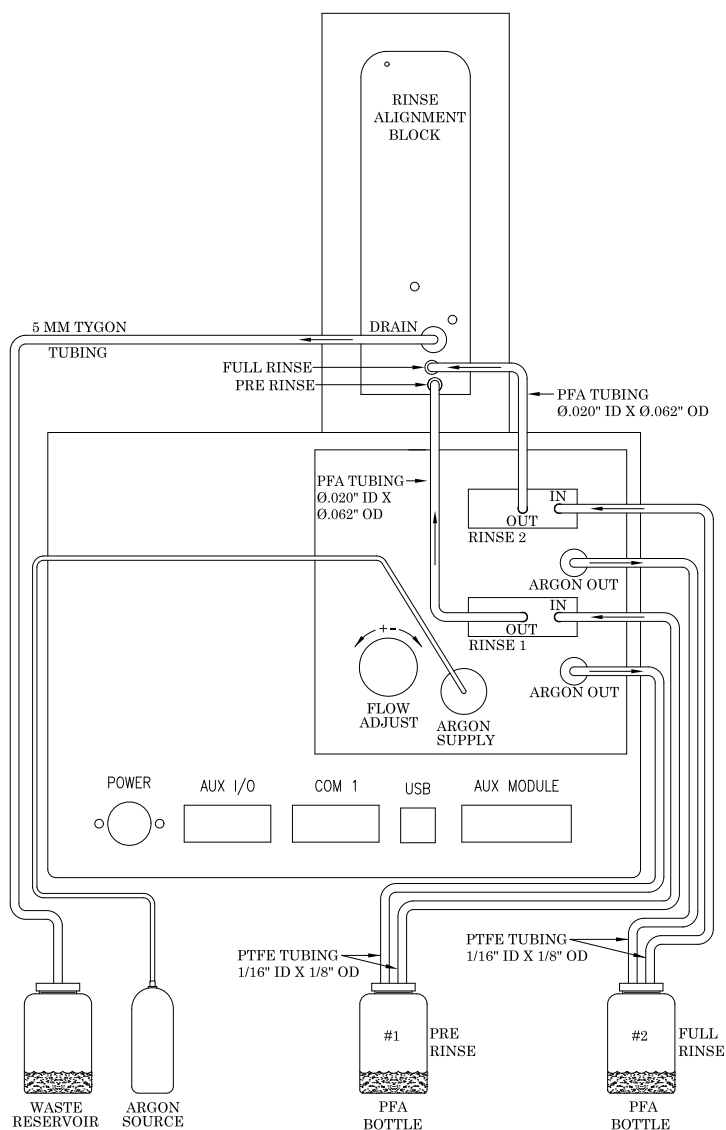


Figure 3-5. Gas Displacement Pump Tubing Connections.

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Installing the Autosampler

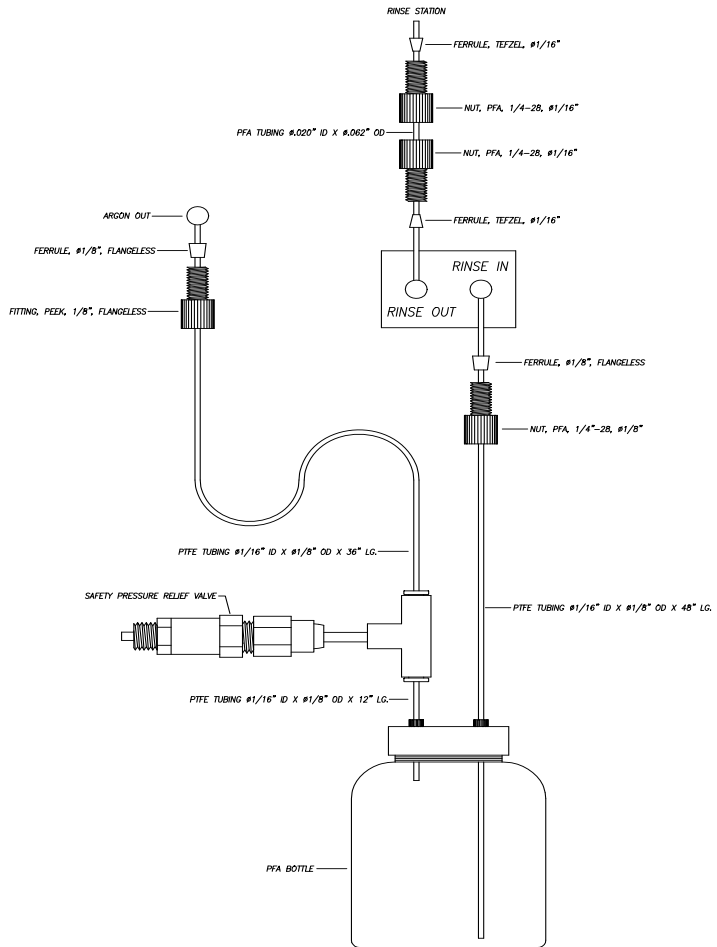


Figure 3-6. Gas Displacement Pump Fitting Connections.

To connect the rinse station tubing to the gas displacement pump using a gravity drain, complete the following steps referencing Figures 3-5 and 3-6:

Installing the Autosampler

1. **Rinse Bottle – Two PFA sealed bottles are provided for the rinse solutions. Ensure the caps are tightly sealed before running the rinse. Label the bottles with #1 and #2. Fill bottle #1 with a pre-rinse solution. Fill bottle #2 with a full rinse solution.**
2. **Bottle to Rinse In – Use two lengths of approximately 48 inches (1.2 meters) each of the 1/16 inch (1.5 millimeter) I.D. PTFE tubing. Insert one end of each length of tubing into the two “RINSE IN” fittings on the gas displacement pump panel. Place the other end of each length of tubing into a fitting on the two PFA rinse solution bottles. “RINSE 1 IN” should be connected to bottle #1 with the pre-rinse solution. “RINSE 2 IN” should be connected to bottle #2 with the full rinse solution.**
3. **Argon Out to Bottle - Use two lengths of approximately 48 inches (1.2 meters) each of the 1/16 inch (1.5 millimeter) I.D. PTFE tubing. Insert one end of each length of tubing into the two “ARGON OUT” fittings on the gas displacement pump panel. Place the other end of each length of tubing into a fitting on the two PFA rinse solution bottles. The “ARGON OUT” connection below the “RINSE 1 IN” should be connected to bottle #1 with the pre-rinse solution. The “ARGON OUT” connection below the “RINSE 2 IN” should be connected to bottle #2 with the full rinse solution.**
4. **Rinse Out - Connect the gas displacement pump to the rinse station by completing the following steps.**
 - a. **Take the free end of the PFA tubing protruding through the alignment block from the lower rinse station input and insert it into the fitting at “RINSE 1 OUT” on the gas displacement pump panel as shown in Figures 3-5 and 3-6.**
 - b. **Take the free end of the PFA tubing protruding through the alignment block from the middle rinse station input and insert it into the fitting at**

“RINSE 2 OUT” on the gas displacement pump panel as shown in Figures 3-5 and 3-6.

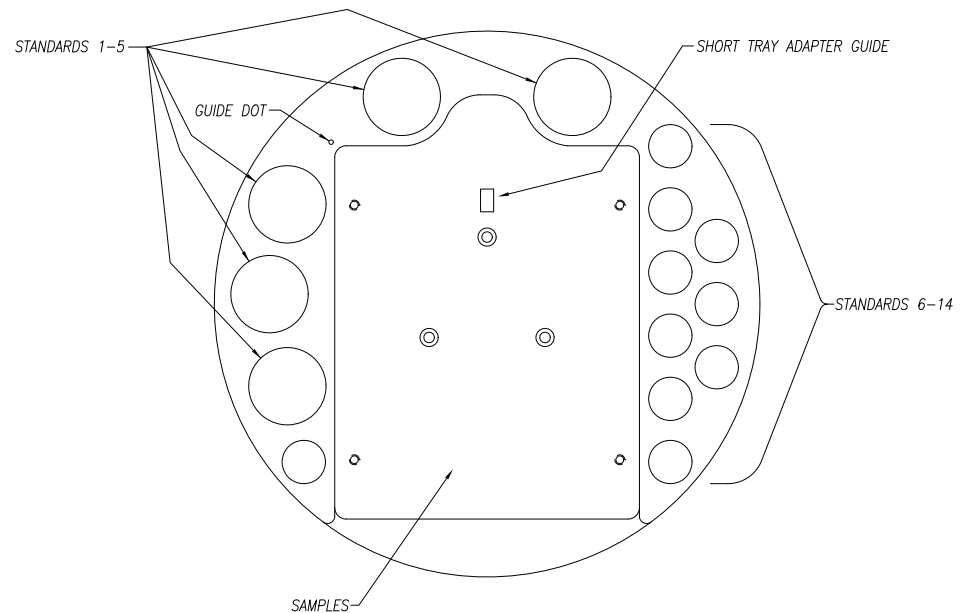
- 5. Drain - Connect the rinse station to the waste container by placing the free end of the 3/16 inch (5-millimeter) I.D. Tygon® tubing protruding from the rinse station outlet (on top) in a waste container.**

Ensure that the waste container is at least 30 to 60 centimeters (cm) lower than the rinse station outlet.

Ensure that the tubing outlet is placed in the waste container so that it will not be immersed in the waste solution. Immersion of the drain tube outlet may cause the waste solution to back up and overflow.

- 6. Argon Supply - Connect the lab argon supply to the “ARGON SUPPLY” inlet on the gas displacement pump panel.**

Assemble and Place the Sample Rack and Vials



Installing the Autosampler

Figure 3-7 Rotary Tray Layout

The ASX-110FR contains a rotary tray, shown in Figure 3-7, which holds both standards and samples. A variety of sample racks can be placed with the center cavity of the rotary tray. Sample racks are classified as short or tall, allowing the ASX-110FR to be configured in either a short or tall configuration. Standards vials also vary between the short and tall configurations. For the short configuration, standard positions 1 through 5 hold **20mL vials** and standard positions 6 through 14 hold **4mL vials**. For the tall configuration, standard positions 1 through 5 hold **30mL vials** and standard positions 6 through 14 hold **10mL vials**.

Short Rack Configuration

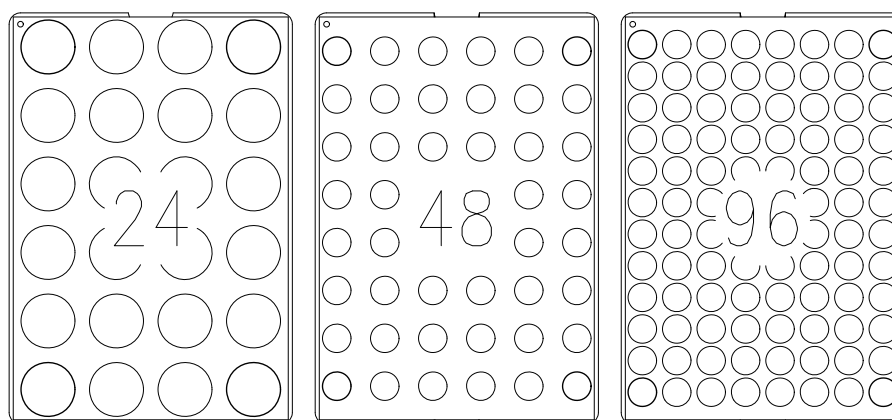


Figure 3-8. CETAC Sample Racks.

Three CETAC sample racks are available for the short configuration. These are shown in Figure 3-8.

To assemble and place the samples and standards for a short configuration, complete the following steps:

- 1. Ensure the short sample tray adapter plate is screwed into place in the center of the rotary tray. It should be placed so that the alignment guide is placed nearest the guide dot as shown in Figure 3-7. An ASX-110FR ordered in a short configuration will be shipped with the adapter plate in place.**
- 2. Place the standards in the rotary tray as shown in Figure 3-7.**
- 3. Load the sample vials in the sample tray and place the tray in the center of the rotary tray aligning the groove on the bottom of the tray with the alignment guide on the adapter plate. This should also align the two alignment dots on the corner of the sample tray and the rotary tray.**

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 autosampler.

- 4. Replace the cover by sliding it into the groove in the rinse alignment block.**

Installing the Autosampler

The cover on the ASX-110FR has a hinged door which can be opened and closed during operation without impacting the sampling sequence. The entire cover itself can also be fully removed during operation without impact to the sampling sequence; however, this is not recommended as the removal act could result in an impact to the Y-arm assembly causing an alignment error. In the case of a mechanically induced alignment error, the power to the unit would need to be cycled off and on to realign the Y-arm.

Tall Rack Configuration

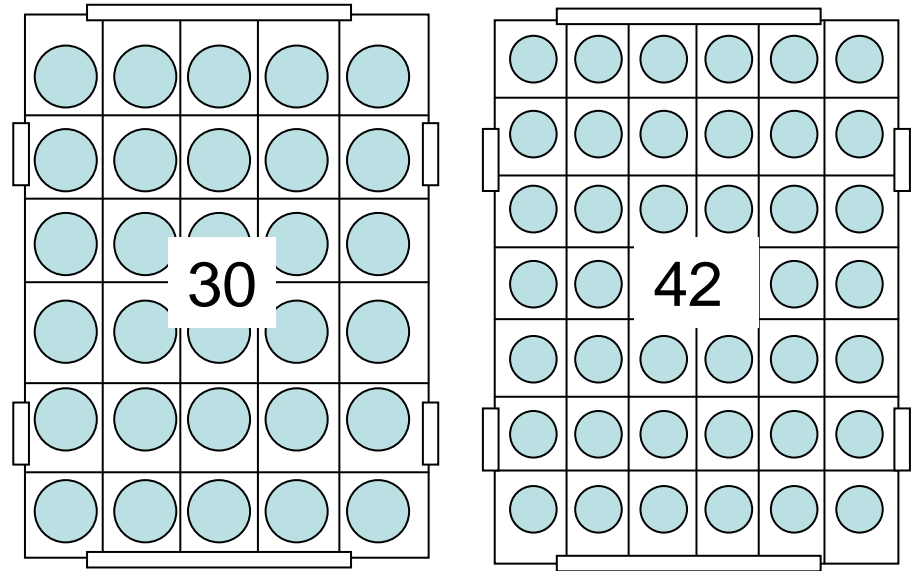


Figure 3-9. Bel-Art Sample Racks.

Two half Bel-Art racks are provided for the tall configuration. The tray layouts are shown in Figure 3-9.

To assemble and place the samples and standards for a tall configuration, complete the following steps:

1. Assemble the Bel-Art rack by snapping the middle and top sections to the bottom according to the instructions included with the rack.
2. Ensure the short sample tray adapter plate is not screwed into place in the center of the rotary tray. An ASX-110FR ordered in a tall configuration will be shipped without the adapter plate in place.
3. Place the standards in the rotary tray as shown in Figure 3-7.
4. Load the sample vials in the sample tray and place the tray in the center of the rotary tray.

Installing the Autosampler

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

5. Replace the cover by sliding it into the groove in the rinse alignment block.

The cover on the ASX-110FR has a hinged door which can be opened and closed during operation without impacting the sampling sequence. The entire cover itself can also be fully removed during operation without impact to the sampling sequence; however, this is not recommended as the removal act could result in an impact to the Y-Arm assembly causing an alignment error. In the case of a mechanically induced alignment error, the power to the unit would need to be cycled off and on to realign the Y-arm.

Establish External Connections

The next step in the installation process involves connecting the ASX-110FR Autosampler to the power source and to an analytical instrument. The following sections explain how to establish these connections.

Connecting the Autosampler to the Power Source

A voltage-specific external desktop power supply is supplied with each ASX-110FR Autosampler.

WARNING

Use only this external desktop power supply or an exact replacement.

Installing the Autosampler

To connect the autosampler to a power source, plug the external desktop power supply cord into the power connector located on the back panel of the autosampler. Then, plug the power supply's power cord into the power supply and into a 100–240-VAC $\pm 10\%$, 50/60-Hz utility power outlet.

Connecting the Autosampler to an Analytical Instrument

You can connect the autosampler directly to a sample introduction peristaltic pump and then to the ICP or to any sample introduction device, such as the CETAC Aridus II™ Desolvating Nebulizer System, the CETAC U-5000AT⁺ or the CETAC U-6000AT⁺ Ultrasonic Nebulizer. To do so, complete the following steps:

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

Determining the free length includes allowance for movement of the Y-arm in the X, Y, and Z axes. 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 analytical instrument's peristaltic pump tubing.**

The free end may be connected directly to the Aspire or C-Flow Nebulizer sample input.

Installing the Autosampler

Connect the ASX-110FR Autosampler to the Host Computer

You cannot operate the ASX-110FR 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 ASX-110FR Autosampler. Before connecting the ICP, ensure the correct dip switches are set for the ICP interface per definitions in Chapter one. The ASX-110FR Autosampler supports the following three communications protocols:

- The serial (RS-232C) protocol is the standard configuration. There is an RS-232C serial port on the ASX-110FR, and a serial interface kit is shipped with the autosampler.
- The USB protocol is an optional configuration.
- The parallel (IEEE-488) protocol is less common than the serial configuration or USB. An IEEE-488 interface kit is available as an optional accessory to the ASX-110FR. See Chapter 1, "Introduction," for more information about this kit.

Note:

Although the ASX-110FR supports serial, USB and IEEE 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. The following sections explain how to establish a communications interface using a serial protocol and using an IEEE protocol.

CAUTION

Installing the Autosampler

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 an RS-232 Serial Communications Interface

The serial interface kit provided with the ASX-110FR Autosampler 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 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 cable adapter.**

Installing the Autosampler

Note:

If a host computer serial port with a DB9F, a DB25M, or a DB25F connector (nine 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. 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.**

3. **Connect the other end of the cable to the ASX-110FR COM1 port.**

CAUTION

Ensure that you are connecting the adapter to the COM1 port. Connecting the adapter to the AUX I/O port on the autosampler will cause a malfunction. The autosampler AUX I/O port is used for communications to a device other than the host computer.

4. **Finger tighten both screws of the cable adapter.**

Establishing a USB Communications Interface

The serial interface kit provided with the ASX-110FR Autosampler does not include a USB cable. This cable may be obtained from any computer store. Complete the following steps for the USB interface:

1. **Power up both the computer and the autosampler.**
2. **Run the FTDI program on the CETAC Installation CD. A pop-up screen will read: “FTDI CDM Drivers have been successfully installed.” Click OK.**
3. **Plug one end of the cable into the host computer's USB port and the other end to the autosampler's USB port.**

Installing the Autosampler

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

Click the Start button, select:

Control Panel>>>Systems>>>Hardware>>>Device
Manager>>>+Ports(Com & LPT)

Establishing an IEEE Communications Interface

Before you can establish an IEEE 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 of the cable adapter.**
4. **Connect the other end of the cable to the ASX-110FR COM1 port.**

CAUTION

Ensure that you are connecting the adapter to the COM1 port. Connecting the adapter to the AUX I/O port on the autosampler will cause a malfunction. The autosampler AUX I/O port is used for communications to a device other than the host computer.

5. **Finger tighten both screws of the cable adapter.**

ASX-110FR Tray Files

Before the ICP can work with the ASX-110FR, the tray files may need to be loaded in the proper ICP program location. The tray files are provided on the CETAC Installation CD along with ICP specific instructions for loading the files.

Verifying Installation

Verifying Installation

Once installation of the ASX-110FR Autosampler is complete, it is important to verify that you have installed it correctly. Attempting to use it before ensuring that it is installed correctly may result in damage to the autosampler.

Verifying installation of the autosampler consists of two parts:

- Ensuring that the communications interface between it and the host computer is working.
- Ensuring that the sample probe functions properly.

This chapter explains how to test the above items before using the autosampler.

Note:

The procedures given in this chapter are for use in a Windows 95 or Windows NT environment.

Testing the Interface

If the communications interface between the autosampler and the host computer is not established correctly, the autosampler will not function. Before you test the interface, ensure that the communication port connectors are properly attached between the host computer and the autosampler.

Note:

The following procedures assume that you have opened Windows 95 or Windows NT and the Program Manager window is showing.

To test the communications interface, complete the following steps:

- 1 Start the host computer and go to the main Windows screen.**
- 2 Turn on power to the autosampler.**
- 3 Click the start button in the lower left corner of the Program Manager window.**

A selection list will appear.

- 4 Select Programs>>>Accessories>>>Communications>>>Hyperterminal and double-click.**

The Hyperterminal^{®1} window appears (Figure 4-1).

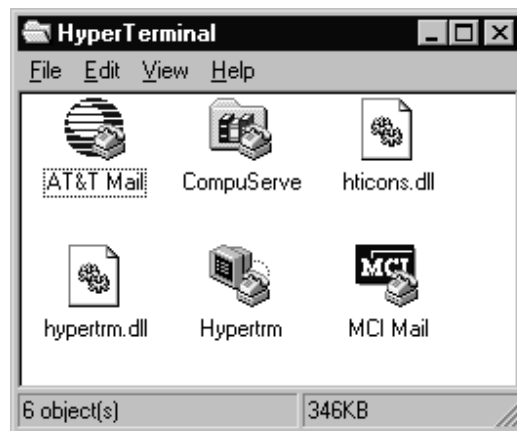


Figure 4-1. Example of Hyperterminal[®] Window.

¹ Hyperterminal is a registered trademark of Hilgraeve, Inc.

Verifying Installation

5 Double click on the Hyperterminal® icon.

The Connection Description box appears (Figure 4-2).

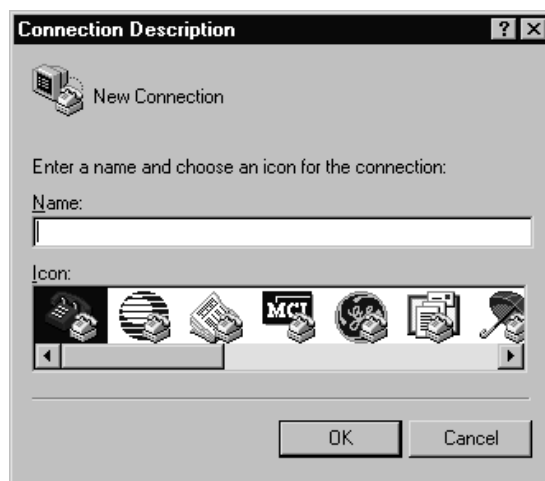


Figure 4-2. Connection Description Box.

6 Type the name COM1_test for the connection and choose an icon from the list given, and click OK. (If using a USB connection type the name of the COM port connected to the USB cable.)

The phone number box appears (Figure 4-3).



Figure 4-3. Phone Number Box.

- 7 Select Direct to COM1 or the COM port connected to the autosampler in the Connect Using box. Click OK.**

The COM Properties box appears (Figure 4-4).

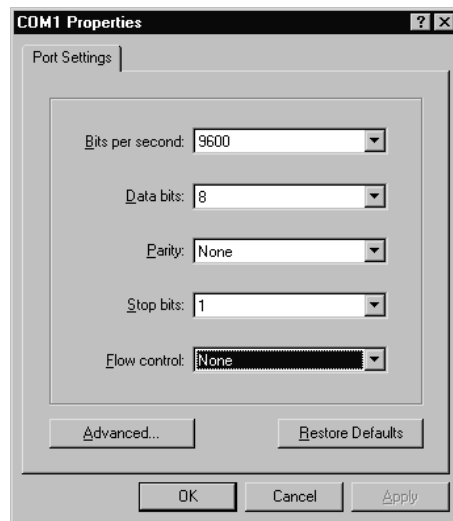


Figure 4-4. COM Properties Box.

Verifying Installation

8 Change the bits per second to 9600, set the data bits to 8, the parity to none, the stop bits to 1, the flow control to none, and click OK.

9 Select File>>>Properties in the Hyperterminal screen.

The COM_Test Properties box appears.

10 Select Settings on the COM_Test Properties box and click on the ASCII setup button on the lower right of the box.

The ASCII setup box appears (Figure 4-5).

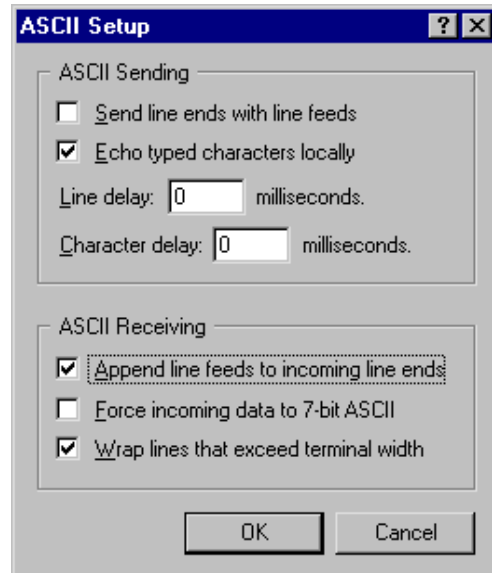


Figure 4-5. ASCII Setup Box.

11 In the ASCII Setup box, select the following items:

- a. Echo typed characters locally.
- b. Append line feeds to incoming line ends.
- c. Wrap lines that exceed terminal width.

Click OK.

- 12 **Click OK on the COM_Test Properties box.**
- 13 **If the probe is installed on the autosampler, remove the probe from the Y-arm while checking home and alignment.**
- 14 **Type HOME at the cursor in the upper left of the main Hyperterminal® screen and press Enter.**

The autosampler resets, with the sample probe moving out and back into the home position and the rotary tray moving out and back into home position. If the autosampler does not reset, see Chapter 7, "Troubleshooting the Autosampler."
- 15 **Type RINSE at the cursor and check that the probe dips first into the center of the pre-rinse location and then into the center of the full rinse location.**

Checking the Autosampler Components

It is unlikely that the liquid carrying components will be damaged during shipping; however, as part of standard operation procedure, you check the sample probe, the pump tubing, and the rinse station and tubing for damage before you operate the autosampler. To do so, complete the following steps:

1. **Visually inspect the sample probe, pump tubing, and rinse station and tubing for leaks or signs of damage. If using the gas displacement pump with PFA bottles, ensure that the bottles are sealed tightly.**

If you detect a leak or other damage to an autosampler component, you must replace it. For more information, see the appropriate section in Chapter 6, "Maintaining the Autosampler."

2. **Shut down and unplug the autosampler.**
3. **Install the sample probe in the Y-arm assembly as directed in Chapter 3.**

Testing the Sample Probe

The sample probe must descend into the center of each sample vial to ensure satisfactory sample uptake. Shipping or rough handling can disturb the autosampler's alignment. If it is incorrectly aligned, the sample probe will not function properly. It is therefore important to test the sample probe before you actually run samples with the autosampler.

Note:

Before testing the sample probe, ensure that you have installed all autosampler components correctly. Also, ensure that you have securely tightened all thumbscrews and connected the communications cable from the host computer to the COM1 port on 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 rotary tray with an empty sample rack.

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

For information about placing the sample rack, see Chapter 3, "Installing the Autosampler."

2. Turn the autosampler power switch on and verify that the LED power indicator is on.

The LED power indicator is green in color. The indicator will flash upon power up and will then remain lit when the unit is at the ready state. It is located on the front of the unit at the top right corner of the base, directly above the power switch.

3. Using the host computer control software, designate sample positions at the left rear, left front, right rear, and right front of the sample tray as noted in Figure 4-6.

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

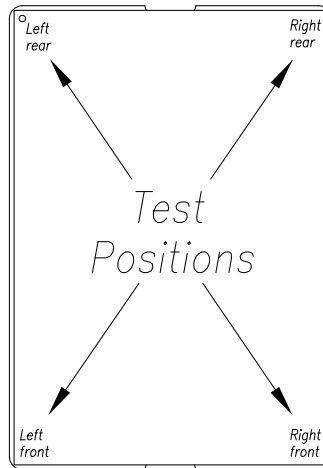


Figure 4-6. Sample Test Positions.

4. Command the autosampler to move the sample probe to the designated sample positions. Check that the sample probe correctly accesses each position.
5. Add sample vials to the rack and run the four corner check again ensuring that the probe descends into the center of each sample vial to the required depth.

Note:

If the autosampler alignment is not correct, contact CETAC Technologies Customer Service and Support or an authorized representative.

Using the Autosampler

Using the Autosampler

The ASX-110FR Autosampler is both reliable and easy to use. Before using it, however, ensure that your lab environment provides operating conditions that will prolong the life of the ASX-110FR Autosampler. Once the proper operating conditions are met, you can arrange the standard vials and the rack with sample vials and start the autosampler sequence run. When you finish using the autosampler, you may need to flush the rinse station and flow path before shutting the autosampler down.

This chapter explains how to create the proper operating conditions for using the ASX-110FR Autosampler. It also explains how to arrange the vials, start and shut down the autosampler, and flush the rinse station and flow path.

Establishing Optimal Operating Conditions

The ASX-110FR Autosampler 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 autosampler components that wear out under normal use, and purchase the appropriate supplies for use with the autosampler. 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:

- o Operate the ASX-110FR Autosampler in a conventional lab environment where the temperature is 55°F to 85°F (13°C to 30°C) the humidity is 0% to 60% non-condensing, and the unit is not exposed to excessive flammable or corrosive materials.
- o Avoid rough handling of the ASX-110FR Autosampler. If possible, do not expose the autosampler to vibration or shock.
- o 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.
- o 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 autosampler base or cabinet before performing any maintenance. Do not touch or short-circuit bare contacts, USB, or auxiliary ports.

- o Avoid using the ASX-110FR Autosampler if strong electromagnetic interference, radio frequency interference, or radioactivity is present. Interference fields can cause erratic operation of the autosampler. The autosampler will not function properly if the level of radioactivity is above background.

Using the Autosampler

Replacing Autosampler Components

The following ASX-110FR Autosampler components wear out under normal use and must be replaced periodically. These components are consumables and replacement is not covered under warranty.

- Peristaltic Pump
- Rinse Tubing
- Sample Probe

If you fail to replace these components when they deteriorate, the autosampler will not function properly. For information about replacing autosampler components, see Chapter 6, “Maintaining the Autosampler.”

Purchasing Supplies

Because the life-span of the sample and standards vials varies, you should maintain an adequate supply of spare vials. When you need to purchase additional supplies, it is extremely important that you choose the appropriate sizes and materials.

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

- The diameter of the sample or standards vial matches the rack size you are using.
- The height of the vials matches the height configuration of the unit. Be sure the Y-arm height setting, the sample rack, and standards are all short or all tall.
- 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.

WARNING

Use of mismatched sample vials and sample vial racks may result in malfunctions or sample spills. Be sure your vials meet the given requirements.

To order additional supplies, refer to the *CETAC Accessories and Supplies Catalog* for the ASX-110FR Autosampler.

Arranging the Sample Vial Racks

You can change the arrangement of the sample vial racks to meet your needs. The ASX-110FR Autosampler accommodates one sample rack. Multiple rack versions with multiple vial sizes are available.

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

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

CAUTION

Incorrectly defining the position count can result in sample spills and invalid analysis results.

Starting the Autosampler

Once you arrange the sample and standards vials in the rack and ensure that the arrangement is correctly defined in the software, you can start the autosampler and let it run until the sampling sequence is finished. To do so, complete the following steps:

Using the Autosampler

- 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 Autosampler."

- 2. Ensure that the rinse tubing is properly connected and the drain tubing is directed to a waste reservoir.**

For more information about proper connections, see Chapter 3, "Installing the Autosampler."

- 3. Turn the ASX-110FR Autosampler power switch on.**

The green LED indicator flashes, the autosampler homes, and when ready to receive a command, the LED indicator remains a solid green.

- 4. Purge air from the rinse system by running the rinse solutions through the rinse station.**

- 5. Ensure there are no air bubbles visible in the rinse uptake tubing before you run samples with the ASX-110FR Autosampler.**

- 6. Access the host computer's software and activate the autosampler program.**

Define and start the sampling sequence. The ASX-110FR Autosampler runs until it reaches the end of the sampling sequence.

Shutting Down the Autosampler

Shutting down the autosampler includes fully draining/evacuating the rinse system. To do so, complete the following steps:

- 1 ***(Peristaltic pump-equipped models)*** Drain the rinse system by removing the rinse solution uptake tubing from the rinse solution source. Allow the pump system to run until all solution drains from the tubing attached to the rinse station outlet.

If you use a rinse solution other than deionized water, flush the rinse system with deionized water before shutting down the ASX-110FR Autosampler. For more information, see the following section, “Flushing the Rinse Station and Flow Path.”

- 2 Turn off the ASX-110FR Autosampler power switch.
- 3 ***(Peristaltic pump-equipped models)*** After the rinse station has been pumped empty and the power turned off, place the uptake tubing into a clean waste container. Release the peristaltic pump pressure shoes from contact with the pump tubing by disengaging their latches, allowing any remaining rinse solution that may be trapped in the rinse system to drain to the waste container. (Be sure to re-engage the pressure shoe latches and return the rinse solution uptake and drain tubing to the proper vessel(s) before restarting and operating the autosampler.)

Flushing the Rinse Station and Flow Path

The rinse station and flow path should be flushed in the following two circumstances:

Using the Autosampler

- o During initial startup of the ASX-110FR Autosampler after installation and before use.
- o Following the use of strong bases, acids, or organic solvents as rinse agents.

Flushing the rinse system during initial startup of the ASX-110FR Autosampler removes any contaminants that could cause interference during sample analysis. Flushing the rinse system after using strong rinse agents prolongs the life of the flow path components.

To flush the rinse station and flow path, complete the following steps:

- 1 Insert the rinse uptake tubing into a deionized water source.**

Note:

If you are flushing the rinse system during initial startup, first use a 2% nitric acid solution as the rinse agent, followed by deionized water.

- 2 Run the rinse solution through the rinse station and flow path for 5 to 10 minutes.**

Once you flush the rinse system, you can proceed with the sampling sequence or drain the rinse system as part of the shutdown procedure. For information about running the sampling sequence, see “Starting the Autosampler” earlier in this chapter. For more information about draining the rinse system, see the previous section, “Shutting Down the Autosampler.”

Reconfigure the Autosampler Sample Height

The autosampler may be reconfigured from a short configuration to a tall configuration or vice versa.

To change the height configuration of the ASX-110FR Autosampler, complete the following steps:

- 1 Turn off the autosampler and open the larger of the two access panels on the bottom of the autosampler to reveal the eight-position dipswitch.**
- 2 Adjust the position of dipswitch number six to match the intended height configuration:**

Tall: Switch 6 = 1

Short: Switch 6 = 0

- 3 Change the rinse station from short to tall or vice versa.**

The ASX-110FR comes with a single rinse station, either a tall or short version. However, a secondary rinse station may be purchased if the customer has a need to run in both tall and short configurations.

Follow the steps for “Replacing the Rinse Station” in Chapter 6.

- 4 Move the Y-arm from the short position to the tall position or vice versa.**

Remove the thumbscrew and reposition the Y-arm in the desired location per the Y-arm Mounting Positions figure in Chapter One. Replace the thumbscrew.

- 5 Place the new set of standards and vials in the autosampler per instructions in Chapter 3, “Installing the Autosampler.”**

Maintaining the Autosampler

Maintaining the Autosampler

Routine maintenance of the ASX-110FR Autosampler consists of daily and weekly cleaning of specific autosampler components. Routine maintenance also includes checking ASX-110FR components for leaks or other damage. Additional periodic maintenance tasks may be required, including replacement of the following autosampler components: peristaltic pump tubing, rinse tubing, and sample probe.

This chapter explains how to clean the ASX-110FR Autosampler, inspect it for leaks, and replace damaged components.

WARNING

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

Cleaning the Autosampler

Cleaning the ASX-110FR 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 ASX-110FR Autosampler both daily and weekly 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. The following sections explain daily and weekly cleaning procedures.

Daily External Cleaning

Use of the ASX-110FR Autosampler often results in spills on autosampler components such as the rotary or spill trays. 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 Chapter 5, "Using the Autosampler."

2 Remove the cover.

3 Remove the sample and standards vials and the sample rack.

4 Wipe the rotary tray, spill tray, autosampler cabinet, autosampler arm, and cover using a damp clean-room wipe.

Dampen the clean-room wiper with deionized water.

For large spills, follow the Weekly/Thorough Cleaning process outlined below.

5 Repeat step 4 with a new clean-room wiper.

This process removes residual traces of contaminants.

6 Dry the rotary tray, spill tray, autosampler cabinet, autosampler arm, and cover using a new clean-room wipe.

Avoid scratching the cover while drying. The ASX-110FR must be thoroughly dry before you turn the power on again.

Maintaining the Autosampler

Monthly/Thorough Cleaning

Although cleaning it daily removes spills and contaminants from most of the autosampler components, it is necessary to clean the ASX-110FR autosampler more thoroughly once a month. It may also be necessary to perform a more thorough cleaning if a large spill is experienced. To do so, complete the following steps:

- 1 Shut down and unplug the autosampler.**
- 2 Remove the cover.**
- 3 Remove the sample and standards vials and the sample rack.**
- 4 Remove the rotary tray.**

For information about removing the rotary tray, see “Replacing the Rotary Tray” later in this chapter.

- 5 Remove the rinse station.**

For information about removing the rinse station, see “Replacing the Rinse Station” later in this chapter.

- 6 Wipe loose particles from the top of the autosampler cabinet and exposed parts of the mechanism with a dry, lint-free cloth.**

Clean the entire cabinet top surface area under the cover.

- 7 Do not allow liquids to run or drip inside the tray seal when the rotary tray is removed.**
- 8 Use a damp clean-room wiper to wipe the interior and exterior of the cover, the autosampler cabinet and spill tray, and all autosampler components 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, spill tray, Z-drive assembly, rinse station, and the rinse alignment block.

9 Dry all components before proceeding.

10 Replace the rinse station.

For information about replacing the rinse station, see “Replacing the Rinse station” later in this chapter.

11 Replace the rotary tray on the autosampler base.

For information about replacing the tray, see “Replacing the Rotary Tray” later in this chapter.

Checking for Leaks

Several of the autosampler components have a limited life and will wear out under normal use: the peristaltic pump tubing, rinse tubing, and sample probe. Standard maintenance procedures require that you periodically check these components for leaks. To do so, complete the following steps:

1 Shut down and unplug the autosampler.

2 Visually inspect the peristaltic pump tubing, rinse tubing, and sample probe for leaks or signs of deterioration.

Carefully inspect the tip of the probe looking for cracks, chipping, or other signs of deterioration. Inspect all tubing for signs of wear and obvious damage. Inspect all fluid fittings for signs of wear or damage.

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

Replacing the Rotary Tray

Cleaning the ASX-110FR Autosampler rotary tray each week extends its life and makes frequent replacement unnecessary. However, if the rotary tray needs to be replaced, complete the following steps:

- 1 Shut down and unplug the autosampler.**
- 2 Remove the cover.**
- 3 Remove all sample and standard vials and the sample rack.**
- 4 Move the autosampler arm over the rinse position by gently pushing it.**

Moving the autosampler arm ensures that the sample probe assembly will not be damaged while you replace the rotary tray.

- 5 Remove the short rack adapter plate (if using) by removing the four corner screws.**

Be sure to keep the screws with the adapter plate for reinstallation.

- 6 Remove the three screws holding the rotary tray in place and gently lift the rotary tray up and off the two placement pegs.**

Be sure to keep the screws with the rotary tray if planning to reinstall.

- 7 Wipe the spill tray clean before replacing the rotary tray.**
- 8 Replace the rotary tray by aligning the placement pegs with the two peg holes in the bottom of the rotary tray.**

- 9 Replace the three screws holding the rotary tray in place.**
 - 10 Replace the short rack adapter plate, if using short racks, with the four corner screws provided.**
-

Replacing the Rinse Station

Cleaning the ASX-110FR Autosampler rinse station and the rinse alignment block each week extends its life and makes frequent replacement unnecessary. However, if the rinse station requires replacement, complete the following steps:

- 1 Shut down the autosampler.**
- 2 Remove the cover.**
- 3 Remove all sample and standard vials and the sample rack.**
- 4 Restore power to the autosampler.**
- 5 Ensure that the rinse system is fully drained to prevent any solution spills that may be hazardous to personnel or may damage electronic components (See Chapter 5 “Shutting Down the Autosampler”).**
 - a. (*Peristaltic pump-equipped models*)**
 - i. Drain the rinse system by removing the rinse solution uptake tubing from the rinse solution source. Allow the pump system to run until all solution drains from the tube attached to the rinse station outlet.**
 - ii. After the rinse station has been pumped empty and the power turned off, place the uptake tubing into a clean waste container. Release the peristaltic pump pressure shoes from contact with the pump tubing by disengaging their latches, allowing any**

Maintaining the Autosampler

remaining rinse solution that may be trapped in the rinse system to drain to the waste containers. (Be sure to re-engage the pressure shoe latches and return the rinse solution uptake and drain tubing to the proper vessel(s) before restarting and operating the autosampler.)

b. *(Gas displacement pump-equipped models)*

- i. Drain the rinse system by raising the rinse solution uptake tubing to a position that is above the liquid level in each rinse vessel (Use caution to ensure that each rinse solution vessel is not pressurized while performing this operation). Reapply gas pressure to each vessel. Allow the pump system to run until all solution drains from tubing attached to the rinse station outlet.**
- ii. After the rinse station has been pumped empty, and while the rinse pump function is still operating, shut off the gas supply to the autosampler. Allow the rinse system to depressurize as it operates. This will allow the system to be fully evacuated. (Be sure to return the rinse uptake tubing to its proper position below the rinse solution vessel liquid level, ensure that drain tubing is properly placed/positioned, and to restore gas supply pressure to the system before restarting and operating the autosampler.)**

Note:

If using rinse solution other than deionized water, flush the rinse system with deionized water prior to removing the rinse station. For more information, see Chapter 5, "Flushing the Rinse Station and Flow Path."

- 6 Shut down and unplug the autosampler.**
- 7 Move the autosampler arm away from the rinse position by gently pushing it to the far side.**

Moving the autosampler arm ensures that the sample probe assembly will not be damaged while you replace the rinse station.
- 8 Remove the two thumb screws on the back of the rinse block guide to release the rinse station.**
- 9 Gently pull the rinse station away from the rinse block guide.**
- 10 Disconnect rinse tubing at the rinse station, using caution to prevent any remaining rinse solution droplets from contacting personnel or autosampler components not intended for this exposure.**
- 11 Wipe the rinse guide block and rinse station clean before reinstalling the rinse station.**
- 12 Attach the rinse tubing to the replacement rinse station.**
- 13 Align the pegs on the rise guide block with the holes in the rinse station, ensure the rinse tubing is in place and not impeded, and gently push the rinse block into place.**
- 14 Replace the two thumbscrews on the back of the rinse block guide to secure the rinse station in place.**
- 15 Check all rinse tubing to ensure it is properly attached.**
- 16 Restore power to the autosampler.**

Maintaining the Autosampler

For more information in proper tubing installation, see Chapter 3, "Installing the Autosampler."

Note:

Prior to removing the rinse station, it is important to **safely and fully** drain/evacuate the entire rinse system (See "Replacing the Rinse Station" above, and Chapter 5, "Flushing the Rinse Station and Flow Path"). Doing so prevents rinse solutions from coming into contact with personnel, and also from damaging any autosampler components (electronic or otherwise) not intended for such exposure.

Replacing the Peristaltic Pump Tubing

On units with a peristaltic pump, routine maintenance of the ASX-110FR Autosampler includes replacement of the peristaltic pump tubing. Because of the operating nature of peristaltic pumps, the tubing will probably be the most frequently replaced item on the autosampler.

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

- 1 Shut down and unplug the autosampler.**
- 2 Release the pressure shoe and remove the old tubing.**
Carefully pull or cut the old tubing and remove it.
- 3 Replace the pump tubing by pushing the new tubing onto the mounting block.**
Replace the new tubing carefully. Damage can result if you apply too much force.

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 is, complete the following steps:

1 Shut down and unplug the autosampler.

2 Remove the old sample probe and tubing.

Release the probe from the Y-arm by loosening the thumbscrew. Gently pull the probe up and out.

3 Install the new sample probe.

For more information about installing the sample probe, see Chapter 3, "Installing the Autosampler."

Replacing the Rinse Tubing

To replace the rinse tubing, complete the following steps:

1 Shut down and unplug the autosampler.

2 Remove the rinse station.

Follow the instructions in the "Replacing the Rinse Station" section of this chapter.

3 Release the tubing from the rinse station.

Apply only a linear force when removing the tubing to prevent the fittings from breaking.

Maintaining the Autosampler

- 4 Release the tubing from the pump and remove from the rinse sources and waste reservoir.**
- 5 Replace all tubing as necessary.**
See Chapter 3, "Installing the Autosampler" for more information on how to install the rinse tubing.
- 6 Reinstall the rinse station following the instructions in "Replacing the Rinse Station" in this chapter.**

Troubleshooting the Autosampler

Troubleshooting the Autosampler

When the autosampler does not function properly, isolate the problem to determine if it originates in the host computer, the analytical instrument, the RS-232 cable, USB cable or the autosampler. If you determine the problem is in the ASX-110FR, check the power system, the communications interface, or the sample probe assembly to find the cause of the problem and resolve it.

This chapter explains how to troubleshoot ASX-110FR Autosampler problems. If you cannot solve a problem using the steps given in this chapter, you should contact CETAC Technologies Customer Service and Support.

Power System Problems

A possible cause of ASX-110FR Autosampler malfunction is a problem in the power system. If the autosampler is not functional, it is possible that it is not receiving power. If this is the case, the green LED status indicator will be off. To troubleshoot this problem, complete the following steps in sequence until the problem is solved:

- 1 Check that the power cords are plugged in firmly between the power inlet on the autosampler and the external power supply and between the power supply and the wall outlet.**

Connect the cords if not already connected.

- 2 Check the external power supply. The green LED on the power supply should be illuminated.**
 - a. If the power supply LED is not illuminated, check the wall outlet.**

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

Troubleshooting the Autosampler

The power supply has a green LED which should be lit if the power supply is plugged into a wall outlet that is active.

- b. If the wall power is good, the cord is plugged in properly and the external power supply green LED is still not illuminated, unplug the external power supply from the autosampler, but leave it plugged into the wall.**

If the green LED is not lit, the power supply is bad and needs to be replaced.

If the green LED is lit when unplugged from the autosampler but turns off when plugged into the autosampler, the autosampler may have an internal short and requires repair.

- 3 If the external power supply LED is illuminated while plugged into the autosampler, 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.

Interface Problems

Operation of the ASX-110FR Autosampler is directed by the host computer. A malfunction of the autosampler can indicate a problem with the communication cable or with the configuration of the software on the host computer. The following sections explain how to troubleshoot these problems.

Communication Cable Problems

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

Troubleshooting the Autosampler

- 1 **Check the autosampler power switch to ensure it is on and that the autosampler has initialized (the front panel status LED should be illuminated to indicate a “ready” state.)**
- 2 **Check the RS-232 cable to ensure it is plugged in to the COM1 port on the autosampler or the USB cable is plugged into the USB port on the autosampler.**

If the cable is plugged in, ensure that it is tightened properly.

- 3 **Check the host computer to ensure that the RS-232 cable is connected to the appropriate COM port or that the USB cable is connected to a USB port.**

If the cable is plugged in, ensure that it is tightened properly. For more information about connecting the communication cable, see Chapter 3, “Installing the Autosampler.”

Software Configuration Problems

If the communication cable is connected properly and the autosampler 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.**
- 2 **Check the software configuration for the correct COM port selection and baud rate (9600, N, 8, 1).**
- 3 **If a USB cable is used, verify the COM port designation by selecting the following:**

**Start>>>Control Panel>>>Systems>>>Hardware>>>Device
Manager>>>+Ports(Com & LPT)**

A list of ports will be shown under +Ports(Com & LPT)

HyperTerminal® can also be used separately from the host software to verify the selection and operation of the COM port.

If the wrong port or baud rate is selected, change the configuration. For information about changing the software configuration, see Chapter 4, "Verifying Installation."

Alignment Problems

An ASX-110FR Autosampler alignment malfunction may be caused by bumping the Y-arm out of alignment during a sampling sequence. If the autosampler begins missing target vials or the rinse station during a sampling sequence, complete the following:

- 1 Cycle the power, and restart the sequence.**

The autosampler realigns to home with a power cycle.

If the alignment is not returned following a power cycle, check the host instrument software to ensure that the correct ASX-110FR tray configuration is being used.

If the correct tray configuration is being used and alignment problems persist, call CETAC Technologies Customer Service Support for alignment assistance.

Glossary

Glossary

This glossary defines the terms used in the *ASX-110FR Autosampler Operator's Manual*.

Analytical Instrument: The instrument, typically an ICP-MS, to which the autosampler is connected.

Autosampler Y-Arm: The arm that extends from the Z-drive assembly. It pivots about the Z-drive to allow access to all sample, standard, and rinse positions.

Dual Flowing Rinse Station: The autosampler component used to clean the sample probe with two separate rinse solutions.

Gas Displacement Pump: An optional on-board pump controlling the movement of the rinse solutions from sealed bottles to the rinse station.

I/O Ports: The connections used for establishing communication between the ASX-110FR and the host computer or other external devices.

Status LED: Light Emitting Diode on the front of the autosampler, which indicates readiness for operation.

Peristaltic Pump: An optional on-board pump controlling the

movement of the rinse solution to the rinse station.

Rinse Alignment Block: The support structure on the autosampler, which holds the autosampler cover in place and provides a mounting location to secure the rinse station.

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

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

Rotary Tray: The rotary tray holds the samples and standards in a fixed relative position.

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

Z-Drive Assembly: The Z-drive assembly governs the up-and-down travel of the sample probe.