TELEDYNE TEKMAR
A Teledyne Technologies Company

Atomx

USER MANUAL

Part # 15-0000-074

TELEDYNE TEKMAR
A Teledyne Technologies Company

UPDATED INFORMATION

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DOCUMENT

Atomx User Manual
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TELEDYNE TEKMAR
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Warranty Information

Teledyne Tekmar (TEKMAR) warrants this product to be free from defects in material and workmanship under normal use and care for a period of twelve (12) months from the date of initial installation or eighteen (18) months from the date of invoice, whichever period comes first. Consumables, spare parts, accessories, and services are warranted for ninety (90) days from the date of shipment or completion of the services. If the Buyer identifies any defects in material or workmanship, Buyer will promptly notify TEKMAR in writing of the defective goods and the specific nature of the defect. Prior to placing a service request, Buyer may be required to run diagnostic tests as determined by TEKMAR. If warranty service is rendered for a malfunction caused by application contamination, devices not manufactured by TEKMAR, defective gases or samples, or if warranty service efforts to isolate the cause of a malfunction are increased as a result of the aforementioned, TEKMAR will charge the Buyer on a time and material basis for additional services. TEKMAR at its sole discretion will repair or replace any such goods found by TEKMAR to be defective. If TEKMAR authorizes the return of defective goods, Buyer will return the defective goods, transportation and insurance prepaid, in accordance with instructions issued by TEKMAR including a Return Authorizations (RMA) number. TEKMAR's warranty does not apply to any goods that have been subjected to improper installation, misuse, alternation, repair, neglect, accident, inundation, fire, or the like. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, user induced contamination, improper installation, modification, repair, storage or handling, or any other cause not the fault of TEKMAR are not covered by this limited warranty, and shall be at Buyer's expense. This warranty specifically excludes the following parts: supply items and mechanical wear parts such as bearings, seals, traps, trap heaters, syringes, septa, glassware, fittings, frits, batteries, fuses and light bulbs. TEKMAR shall not be obligated to pay any costs or charges incurred by the Buyer or any other party except as may be agreed upon in writing in advance by an authorized TEKMAR representative. All costs of dismantling, reinstallation and freight and the time and expense of TEKMAR's personnel for site travel and diagnosis under this limited warranty clause shall be borne by the Buyer unless accepted in writing by TEKMAR. Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period, or ninety (90) days, whichever is longer.

This warranty, including remedies, is exclusive and is in lieu of any and all other warranties, express or implied. No warranty of merchantability or fitness for a particular purpose is intended or given. TEKMAR shall not be liable for any indirect or consequential damages. In the case of goods other than those of TEKMAR's own manufacture, TEKMAR makes no warranties, express, statutory or implied, including the implied warranties of merchantability, freedom from patent infringement and fitness for a particular purpose. Such goods shall carry only the warranty extended by the original manufacturer of such goods.

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TELEDYNE TEKMAR
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Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Chapter 1: Introduction

Essential Instructions

IT IS IMPORTANT THAT YOU READ THIS PAGE BEFORE PROCEEDING!

Teledyne Tekmar designs, manufactures, and tests its products to meet many national and international standards. The Atomx is a sophisticated technical product and must be properly installed, used, and maintained to ensure that it operates within normal specifications. You must adhere to and integrate the following instructions into your safety program when installing, using, and maintaining the Atomx. Failure to follow the proper instructions may invalidate the warranty.

- Read all instructions prior to installing, operating, and servicing the product. Follow all warnings, cautions, and instructions marked on, and supplied with the product and this manual. If you do not understand any of the instructions, contact your Teledyne Tekmar representative for clarification.
- Educate your personnel in the proper installation, operation, and maintenance of the product. Only qualified personnel should install, operate, update, program, and maintain the product.
- Install your equipment as specified in *Chapter 2: Installation & Setup* of this manual and according to applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Only trained service personnel should replace blown fuses, and only after identifying and correcting the problem which caused the fuse(s) to blow. For continued protection, replace only with same type and fuse rating of fuse.
- When replacement parts are required, ensure that qualified individuals use replacement parts specified by Teledyne Tekmar. Unauthorized parts and products can affect the product's performance and jeopardize safety. Using look-alike substitutions may result in fire, electrical hazards, or improper operation.

Ensure that all equipment doors are closed and protective covers are in place (except when maintenance is being performed by qualified personnel) to prevent electrical shock and personal injury.

Warnings

Never use a flammable gas (such as hydrogen) as the sample gas for the Atomx. Venting of this gas creates an explosion hazard.

The interior of the instrument is an electrical shock hazard. Turn off the instrument and unplug the power cord before removing the protective covers.

It is recommended that safety glasses be worn at all times in the presence of pressurized gasses.

This instrument contains heating elements. Touching any heated zone during the operation could cause a burn. The system's heaters will activate when their setpoints are above actual temperatures. Keep all instrument panels fastened when operating the Atomx.

When accessing the trap or valve oven area, be certain that the trap is cool before opening the cover.

Be alert for environmental, shock, or other hazards in the event that tubing or any other liquid bearing object in the instrument bursts on the inside of the instrument. Before cleaning up, unplug the instrument and determine the nature of the liquid that was spilled. Use extreme caution and apply the appropriate clean-up procedures.

Pinch Point Hazard! Keep hands and other appendages away.

Introduction

ATOMX AUTOTRAP WITH METHANOL EXTRACTIONS DESCRIPTION

Atomx is a microprocessor-controlled purge and trap system, combining automation and concentration into one system for the analysis of solid and liquid samples. The system prepares purge and trap (P&T) samples, including drinking water, waste water, soils, and sludges. Atomx completely automates sample preparation and purge and trap steps including vial handling, sample volume measurement, standard injections, dilutions, rinsing, purging, desorption and baking.

The Atomx single needle design transfers liquid sample aliquots from the vial to the sparger. Low -level solid samples are purged directly in the vial, transferring to the trap. High-level solid samples can be automatically extracted via Methanol and diluted prior to transfer to the sparger for analysis.

Atomx offers all the capabilities you need for compliance with EPA Method 5035 for the analysis of volatile organics in soil samples, including a true closed-system technique for sample handling. The closed-system sampling technique ensures the integrity of the sample during the sample preparation process, greatly minimizing volatile organics loss.

PURGE AND TRAP BACKGROUND

When using a concentrator system, it is not essential to understand how it works. However, a good grasp of the fundamentals helps you prevent problems and assists you when you are faced with tasks such as method development and troubleshooting. This section is not intended to be a full theoretical evaluation of P&T gas chromatography. The main purpose is to help you develop an understanding of how and why compounds are concentrated.

While gas chromatography is a very powerful analytical tool, it does have several limitations. Many different techniques have gradually developed to overcome these limitations. These techniques are for a wide variety of sample types. The limitations, which P&T concentration is designed to overcome, include:

1. Lack of Sensitivity

GC detectors provide remarkable sensitivity. However, there are a number of areas where greater sensitivity is necessary. These include:

a. Environmental Analysis - Many pollutants must be measured at low levels; sometimes, in the sub-part-per-billion (ppb) range.

b. Flavor and Fragrance Analysis - The human nose is one of the most sensitive detectors in existence. To provide an analytical system with comparable sensitivity, some method of concentration is required.

2. Inability to tolerate water injections

Many GC columns and detectors do not perform well in the presence of water. Water may drastically reduce the lifetime of the column and adversely affect the detector performance.

3. The sample must be in vapor or vaporizable form

Gas chromatography operates as an interaction between vapor and liquid phases. The sample must start out as a vapor. For this reason, there are many samples, such as pollutants in soil or flavors in solid food, that cannot be directly introduced into a GC. The ability to analyze VOCs is a vital part of environmental monitoring, outgassing studies, flavor or fragrance analysis, among others. P&T is a technique that separates the VOCs from a matrix. After separation, the VOCs are then concentrated and injected into the GC for separation.

Brief History

In the 1960's, P&T was used in the study of bodily fluids. In the mid-to-late 1970's, P&T became a technique that was well-known and widely applied due the need to monitor VOCs in drinking water. Using this technique, it was possible to detect sub-ppb level VOCs of a wide variety. Today, P&T is routinely applied in the environmental area for the analysis of VOCs in soil and water. The arrival of microprocessor-driven systems allows the concentrator to be more precise and automated, giving the operator more time for other projects.

PURGE AND TRAP OPERATION OVERVIEW

A measured amount of sample is placed in a sealed vessel. The sample is purged with inert gas, causing VOCs to be swept out of the sample. The VOCs are retained in an analytical trap, which allows the purge gas to pass through to vent. The VOCs are then desorbed by heating the trap, injected into the GC by backflushing the trap with carrier gas, and separated and detected by normal GC operation.

Purging

In the section above it states, "The sample is purged with an inert gas, causing VOCs to be swept out of the sample." This is a very simple-sounding way of describing what is in reality a rather complex process. Purging a sample to extract analytes is a gas extraction. There are many factors that effect the efficiency of this extraction. The amount of each compound purged is proportional to both its vapor pressure and its solubility in the sample. Both of these are, in turn, effected by the sample temperature.

Consider the case of a sample sealed in a closed vial. Above the sample is a vapor space, which is usually referred to as the headspace. If you allow the sample sufficient time, VOCs in the sample will migrate into the vapor space. After a certain period of time an equilibrium will be established; the concentration of the volatile compounds in each phase will be stabilized.

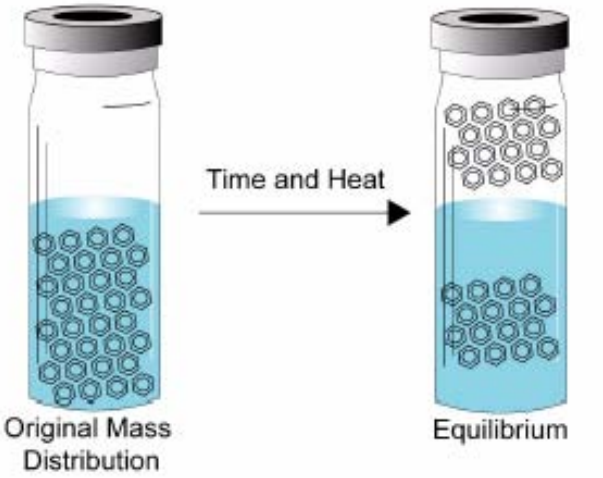


Figure 1-1: Headspace Equilibrium Diagram

At this point a portion of the headspace can be removed and injected into the GC for analysis. The technique is known as Equilibrium Analysis or Static Headspace Analysis. The amount of material in the vapor phase is explained by Dalton's Law of Partial Pressure, mass in the vapor phase is proportional to the partial pressure of the component times the mole fraction.

When purging a sample, the system is no longer at equilibrium. This is because the VOCs that move into the vapor phase are constantly being removed by the purge gas. Under these circumstances, there is no migration of components from the vapor to liquid phase. This means that the partial pressure of any individual component above the sample at any time is essentially zero. This encourages even greater migration of the VOCs into the vapor phase, maximizing the extraction efficiency. Purging a sample for 10 minutes with helium (at a flow rate of 50mL/min) results in a more efficient extraction of volatiles than Static Headspace Analysis, using 500mL headspace. This purging technique is called Dynamic Headspace Analysis. For aqueous matrices, the increase in efficiency can be upwards of 100 fold, using dynamic versus static headspace analysis.

Extraction efficiency increases with an increase in sweep volume. Sweep volume, a function of sweep time and flow rate, is the amount of purge gas used to extract the analytes. Since the analytes are being trapped on a sorbent bed, there are limitations to the sweep times and flow rates that can be used. These limitation are determined by the compounds of interest in the sample and the sorbent material used in the trap.

Trapping and Adsorption

An analytical trap is similar to a short gas chromatograph column. Compounds adsorbed onto the trap will slowly elute with a measurable volume of gas. This is commonly referred to as the "Breakthrough" volume. Retention volume is the amount of purge gas that passes through the trap before elution of the analytes begins to occur.

The requirements of a trap are as follows:

1. At low temperatures, it must retain the analytes while allowing oxygen and water to pass through unimpeded.
2. Upon heating, it must release the analytes quickly and efficiently.
3. When heated, it must show stability and not contribute to volatiles.
4. It must operate without causing any catalytic reactions.
5. It should have a reasonable price and lifetime.

At lower trap temperatures, retention volumes are high. At higher desorption temperatures, retention volumes are much lower, allowing rapid transfer to the GC.

When elution does occur, it is usually referred to as breakthrough, and the retention volume, at which breakthrough occurs, is often referred to as the breakthrough volume. Sorbent materials are usually chosen so that the breakthrough volume is high for analytes and low for water. Care must be taken that the sorbent chosen does not retain the analytes too strongly or efficient desorption may not be possible. Traps containing combinations of sorbents are often used to enhance performance.

The trap is packed with the weaker sorbent on top. The stronger sorbent is placed below the weaker sorbent. Less volatile analytes that are not effectively desorbed by the stronger sorbent are retained by the weaker sorbent. Therefore, the less volatile analytes fail to reach the stronger sorbent. Only the more volatile analytes reach the stronger sorbent; and because of their volatility, these analytes can be efficiently desorbed. The desorption is carried out by backflushing the trap, ensuring that the heavier analytes never come in contact with the stronger sorbent.

SYSTEM SPECIFICATIONS

Automation	
Sample Types	Liquid samples, including drinking water and wastewater; Liquid samples containing up to 15mm of sediment when measured from the bottom of an upright 40mL vial; Low-level solid samples, including all types of soils and sediments. Sampled via direct purge in the vial USEPA 5035 low-level soil methodology. High-level solid samples, including all types of soils and sediments. Sampled via automated Methanol Extraction and subsequent dilution in accordance with USEPA 5035 high-level soil methodology.
Sample Capacity	80-positions for 40mL VOA vials.
Vial Size	Nominal 40mL capacity, single hole cap with Teflon®-faced silicone septum, per EPA specifications; 3 3/4" (9.5 cm) high without cap and septum; 1 1/16" O.D.; 24mm ID cap for water sampling
Vial Transport Device	Carousel/Elevator design using, stepper motors, and optical encoders for accurate positioning.

Liquid Handling	
Sample Liquid Handling	Sample syringe dispenses variable volumes of water from 1mL to 27mL in 1mL increments.
Sample Precision	< 1% RSD (n=7 @ 5mL delivery volume measured by weight)
Sample Liquid Path	Glass, PEEK™, and Teflon® for syringe handling. 1/16" (0.16cm) O.D. PEEK tubing for liquid transfer
Water Supply	Requires use of a blank water reservoir (included)
Methanol Supply	The system requires a supply of Purge & Trap grade methanol if the Methanol Extraction methods or the Extractasol™ *(patent pending)* cleaning technique are to be used. (optional)
Cleaning	The entire liquid pathway can be rinsed using a combination of the Extractasol™ (patent pending) and the High Temperature OptiRinse™ cleaning techniques. The Extractasol™ allows for the entire liquid pathway to be rinsed with Methanol prior to the High Temperature OptiRinse™, which uses two internal reservoirs to heat blank water up to 90°C for rinse. User defined rinse volume and number of rinses for the needle and glassware. Water Heater Patent US 6280688.

Gas Handling	
Electronic Mass Flow Controller	System is capable of controlling flow rates between 5 ml/min to 500 ml/min, variable between each mode of operation (Patent Pending).
Electronic Pressure	Ability to record purge and bake pressure for each sample.
Sample Gas Pathway	1/16" (0.16cm) OD Siltek™ tubing; Siltek™ treated fittings including sample needle; Sample pathway temperature variable from 35 to 250°C.
Gas Supply	Ultra-high Purity (99.999%) pure helium or nitrogen; Incoming Pressure: 65-100 psi, (100 psi max)

Standard Injection	
Standard Injection System	Three standard injection systems utilizing 2-way dosing valves mounted on a 3-position valve manifold.
Capacity	Up to 20µL in 1µL, 2µL, 5µL, 10µL & 20µL increments.
Precision	< 10% RSD measured by GC/FID for Fluorobenzene and Bromofluorobenzene, (n=7).
Accuracy	1µL ± 0.1µL.
Consumption	1µL per 1µL injection.
Standard Vessels	Three 15mL standard vessels, UV-protected for added standard stability; Standard vessels sealed under pressure for standard concentration integrity.

Liquid Samples	
Sample Glassware	The system is capable of operation with 5 or 25mL frit or fritless U-shaped sparge vessels. 5mL frit comes standard.
Sample Dilutions	Programmable automatic aqueous sample dilutions of 1:100, 1:50, 1:25, 1:10, 1:5, 1:2.
Sparge Vessel Heater (optional)	The system can be equipped with an optional sparge vessel heater that will allow for the sample to be heated from 35°C to 100°C.
Blanks	Automatic blanks can be pulled from the blank water reservoir and spiked with standard allowing all autosampler positions to be used for samples.
Vial Cooling (optional)	Cools samples to 4°C (requires an external recirculating cooling bath).
Cooling Bath Connection	Inlet and outlet hose connections require 1/4" (0.64cm) ID rubber tubing.

Low-level Solid Samples	
Sample Needle	A patented 3-stage needle (US 6706245) allows for DI water and standards to be directly added to the vial where the solid sample will subsequently be purged.
Vial Heater	Variable Heat Control from 35°C to 100°C.
Mixing	The solid sample can be mixed via a stir bar using three variable speeds.

High-level Solid Samples	
Extraction	Methanol can be added directly to the vial containing a solid sample, where it is mixed and allowed to settle. The methanolic extract is then pulled from the vial and diluted for automated Purge & Trap analysis on the system. If high-level solid were sampled in the field with the extraction solvent, the sample can be mixed and allowed to settle prior to the methanol being pulled and diluted. The extraction method offered complies with USEPA Method 5035 for high-level soil samples.
Matrix Spike	The system is configured to allow a standard spike to be added directly to the solid sample when the methanol is added for the exaction.
Extraction Dilutions	Programmable automatic dilutions of Methanolic extract of 1:100 or 1:50, 5mL sample volumes.

System Control	
Instrument Control	TekLink™ software in a Windows® XP or greater environment via RS-232 or USB converter (optional).
Language	TekLink™ can easily be translated into any language via single file modification.
Method Storage	Infinite method storage including pre-programmed methods.
Method Scheduling	Soil or water samples can be run from any position in the sample sequence. Up to three standards can be added to any user-specified position. Multiple runs can be made from the same vial (not recommended).
GC Communication	GC handshaking through relay contact closures; TTL Logic;
System History	The system records a complete history of all sample, schedule and method information.
Revision Control	The system records and saves changes to methods, schedules and configurations.
21 CFR Part 11 Compliance Tools	TekLink™ can be configured to allow for full 21 CFR Part 11 compliance tools to be available to the end user.

Heaters	
Transfer Line	Variable Heat Control from 35°C to 250°C.
6-port Valve	Variable Heat Control from 35°C to 250°C.
Sample Mount	Variable Heat Control from 35°C to 100°C.
Condensate Trap	Variable Heat Control from 40°C to 250°C.
Analytical Trap	Variable Heat Control from 40°C to 350°C.
Analytical Trap Ramp Rate	Heats from ambient to 250°C in less than 20 seconds.
Analytical Trap Control	Overshoot within 15% and Undershoot 5% (@250°C)
Vial Heater	Variable Heat Control from 35°C to 100°C (soil methods) and 35°C to 60°C (water methods).
Soil Valve	Variable Heat Control from 35°C to 125°C.
Hot Water Heater	Variable Heat Control from 35°C to 90°C.
Sparge Vessel	Variable Heat Control from 35°C to 100°C.

Valving	
Solenoid Valves	9 (standard configuration) or 11 (optional configuration) 24 VDC rocker style valves.
Soil Valve	On/Off heated solenoid, 24 VDC
6-port Valve	2-position, heated 6-port valve actuated with a 24 VDC motor with encoder feedback
Standard Addition Valves	Three 24 VDC dosing valves

Service	
Electronic Leak Check	Ability to leak check the entire sample pathway of the system via an automated system leak check process.
Benchmark Test	The system has a mode that will allow for full electromechanical testing including; valving, heaters, vial handling systems, liquid delivery system, inputs and outputs
Diagnostics	The system offers independent control of all valves, vial handling mechanisms and syringe drive for troubleshooting.
E-mail Alert	The system can be configured to send an E-mail to alert the user of schedule completion or stoppage.
Warranty	1 year from installation. 18 months from shipment.

General Specifications	
Dimensions	26.5" H x 32.7" W x 23.3" D (67.31cm x 83.06cm x 59.18cm)
Weight	Unit weight: 95lbs (43.09kg); Shipping weight: 155lbs (70.31kg)
Power Requirements	100/120/240 VAC factory configured, 50/60 Hz, 10.0/5.0 A, 1200VA
Environmental Specifications	Operating Temperature: 10° to 30°C; Storage Temperature: - 20° to 60°C; Relative Humidity: 10% to 90%
Corrosion Resistance	The front cover and carrousel tray are corrosion resistant to waters with a pH range of 1 to 10.
Certifications	CE, CETL, CSA, ETL

System Accessories	
Cryofocusing	The system can be configured with an optional Cryofocusing Module and will allow for reconcentration of the sample on the head of the GC column to improve peak shape. The Cryofocusing Module is capable of trap at temperatures down to -190°C (based on 75psig of LN2).
Sparge Vessel Heater	The system can have an optional sparge vessel heater added that will allow liquid samples to be heated during the purge mode to temperatures between 35°C and 100°C.
Vial Cooling	Optional vial chilling allows for sample vials to be held at temperatures down to 4°C until they are sampled.
Foam Eliminator	The system can be equipped with an optical foam sensor that will sense any foaming during purge. The sensor can be configured to add antifoam agent to the sample so that the sample can be completed, if these attempts to control the foaming do not work the sample will be a aborted and drained to minimize the risk of physical damage to the system.
Guardian™ Foam Sensor (Optional)	The Guardian™ uses a photo sensor mounted on the outside of the sparger. When foaming occurs, the foam blocks the sensor, prompting the Atomx to shut off the purge flow and drain the sample. • The unit gives an error message. • Upon completion of drainage the unit steps to the next program mode. This prevents communication errors between the GC and the Atomx. **Note:** *There is an option to halt the schedule when an error message occurs due to foaming.* ***Click Tools*** | ***Configurations*** | ***Options*** *to select the conditions that will halt the schedule.*

Component Overview

This Chapter describes and illustrates the internal and external parts of the Atomx.

Figure 1-2: Atomx Component Overview

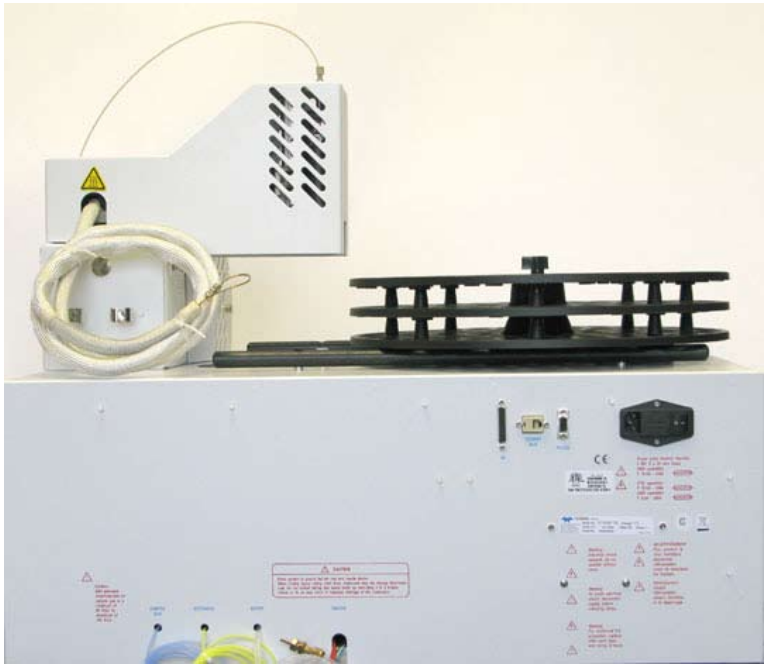


Figure 1-3: Rear of Atomx

UNIT STATUS LIGHT

The name plate on the front of the instrument will act as a mode indicator. The color of the name plate will change depending on what mode the instrument is in. Table below correlates the relationship of color to mode.

Color	Mode(s)
Blue	Standby
Green	Purge Ready
Cyan	Preheat/Prepurge/Purge
White	Dry Purge/Desorb ready
Purple	Desorb Preheat/Desorb
Yellow	Bake
Red	Error

Figure 1-4: Stratum PTC - Unit Status Light

VIALS

The standard USEPA-approved 40mL glass vial is commonly used for environmental samples.

Note: *Vials cannot exceed 1.115" (2.83cm) O.D. including labels.*

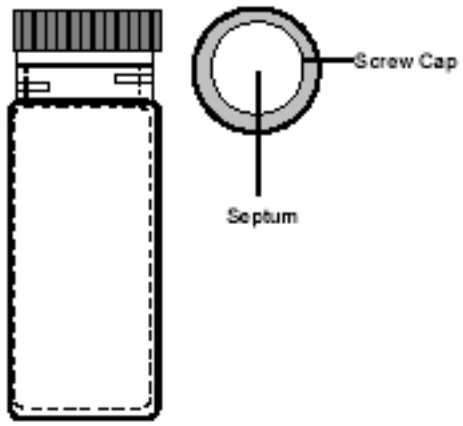


Figure 1-5: Vial

STANDARD PRESSURE REGULATOR

Atomx has a Standard Pressure Regulator located directly inside the front access door. The Standard Pressure Regulator regulates pressure to the IS Vessels. The Internal Standard Pressure Regulator also regulates the pressure sweep modes (i.e. Presweep A&B).

STANDARD VESSELS

Standards are stored in 15mL amber glass vessels. The amber color prevents transmission of UV radiation, preserving standard integrity. They are sealed with a PEEK cap to prevent adsorption and contamination of the standard solution.

Atomx is equipped with three standard vessels. Each vessel holds a maximum standard volume of 15 mL. From left to right the standard vessels are referred to as ST1, ST2, and ST3.

Each standard vessel is pressurized to 7 psi and can deliver spikes of 1µL, 2µL, 5µL, 10µL, or 20µL to each sample. Each standard has a maximum volume of 20µL. A maximum of 60µL can be added to each sample if all three standards are used. You can use any combination of the three standards.

SYRINGE DRIVE WITH SWEEPABLE 27ML SYRINGE

The Atomx has a 27mL Sweepable Sample Syringe the system accurately dispenses 1 to 27 mL of liquid at 1 mL increments (1%). The syringe has a pressurized gas source connected to a sweep port via an inline check valve. This sweep port allows that syringe to be swept between samples and between moves to improve the precision and accuracy of the delivery volume and to prevent contamination.

SAMPLE NEEDLE

The Atomx uses a Patented (US Patent 6,706,245) 3-Stage Sample Needle to displace sample from the vial, purge in the vial and complete Methanol Exactions. The multistage needle displaces liquid samples from the vial vs. aspirating per USEPA methodologies.

Figure 1-6: Standard Vessels

Figure 1-7: Syringe

VIAL GUIDE TUBE

The Vial Guide Tube directs the sample vials onto the 3-Stage Sample Needle. The Vial Guide Tube is also a heated zone that can be used to heat solid samples for direct purge in the vial or to equilibrate water samples to room temperature prior to the aliquot being removed.

CAROUSEL DRIVE ASSEMBLY

The carousel drive is an electronically controlled mechanism that positions sample vials at the sample elevator assembly for sampling. The carousel positions the sample vials by rotation of the carousel and indexing (side to side actuation), the combination of these movements allow any of 80-sample positions to be positioned directly over the sample elevator. The 80-position carousel tray is removable from the carousel drive assembly, in the standard configuration (Non-chiller) the tray can be removed with the vials.

ELEVATOR ASSEMBLY

The elevator assembly is used to transport the sample vials to the sample needle for analysis. The elevator assembly moves between four positions "Home" the down position, "Sample" the position in which the vials are pierced and "Drain" the highest position in which the needle enters into the guide rod for rinsing and"Mix" a position slightly lower than "Sample" to allow for the most efficient mixing during methanol extraction.

VIAL CHILLER (OPTIONAL)

An optional Vial Chiller can be added to the Atomx that will allow the samples to be held at temperatures as low as 4°C until sampling. This accessory requires the use of a new sample tray (allows vials to be placed directly onto the chiller surface).

Figure 1-8: Vial Guide Tube

Figure 1-9: Carousel Drive Assembly

ELECTRONIC CONNECTIONS

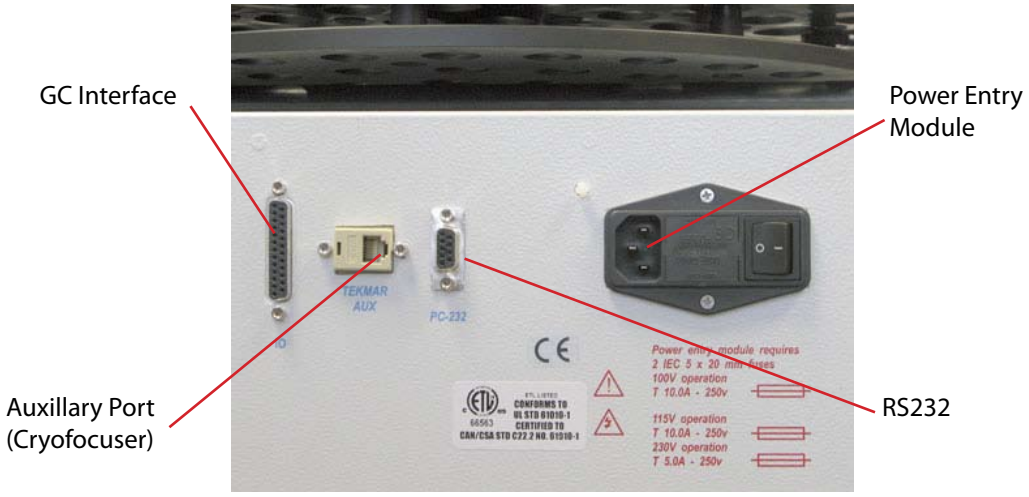


Figure 1-10: Power Entry Module

Power Entry Module

The Power Entry Module is the black plate on the right in Figure 1-10. There is a switch to turn the unit on and off, a port for a power cord, and a fuse compartment.

RS232

The RS232 port is a 9-pin connection for interfacing the unit with a computer.

Auxilliary

The Auxilliary port is an ethernet port that allows the unit to be interfaced with options such as the Cryofocuser.

GC Interface

The GC Interface is a 25-pin connection for interfacing the unit with a GC.

Heaters	
Transfer Line	Variable Heat Control from 35°C to 250°C.
6-port Valve	Variable Heat Control from 35°C to 250°C.
Sample Mount	Variable Heat Control from 35°C to 100°C.
Condensate Trap	Variable Heat Control from 40°C to 250°C.
Analytical Trap	Variable Heat Control from 40°C to 350°C.
Analytical Trap Ramp Rate	Heats from ambient to 250°C in less than 20 seconds.
Analytical Trap Control	Overshoot within 15% and Undershoot 5% (@250°C)
Vial Heater	Variable Heat Control from 35°C to 100°C (soil methods) and 35°C to 60°C (water methods).
Soil Valve	Variable Heat Control from 35°C to 125°C.
Hot Water Heater	Variable Heat Control from 35°C to 90°C.
Sparge Vessel	Variable Heat Control from 35°C to 100°C.

Valves	
Solenoid Valves	9 (standard configuration) or 11 (optional configuration) 24 VDC rocker style valves.
Soil Valve	On/Off heated solenoid, 24 VDC
6-port Valve	2-position, heated 6-port valve actuated with a 24 VDC motor with encoder feedback
Standard Addition Valves	Three 24 VDC dosing valves

Solenoid Valves:

- Purge Valve (A)
- Bake Valve (B)
- Vent Valve (C)
- Drain Valve (D)
- Purge Select Valve (E)
- Soil Valve (F)
- Syringe Valve (G)
- Liquid Transfer Valve (H)
- Syringe Flush (I)
- Defoamer Valve (Optional) (J)
- Eliminator Rinse (Optional) (K)
- Water Valve (L)

PCB BOARDS

The printed circuit boards provide various voltages, receive and transmit signals, store programs, allow communication with the GC, and monitor time and temperature.

- Motor Control Board
- Temperature Control Board
- DC Output Board
- DC Expansion Board
- Power Supplies

Refer to board pictures and diagrams in Preventive Maintenance & Troubleshooting should you need to replace a board or cable.

MIXER ASSEMBLY

The Atomx Mixer assembly allows for a magnetic stir bar (Pill shape recommended) to be added to the sample vial of a solid sample. The Atomx has the ability to spin a magnet beside the vial when it is in the sampling station to mix the soil during the purge process, or to mix a soil for a Methanol Extraction. The mixer has four selectable speeds slow, medium, high, and agitate (back and forth).

GUARDIAN™ FOAM SENSOR (OPTIONAL)

The Guardian™ uses a photo sensor mounted on the outside of the sparger. When foaming occurs, the foam blocks the sensor, prompting the Atomx to shut off the purge flow and drain the sample.

- The unit gives an error message.
- Upon completion of drainage the unit steps to the next program mode. This prevents communication errors between the GC and the Atomx.

Note: *There is an option to halt the schedule when an error message occurs due to foaming.*
Click Tools | Configurations | Options *to select the conditions that will halt the schedule.*

GUARDIAN™ AND ELIMINATOR (OPTIONAL)

When foam is sensed, the unit shuts off the purge gas. The purge clock is stopped and the Foam Transfer Valve is activated to add antifoam agent for a specified period of time.

Upon completion, the purge gas and purge clock are reactivated, if the foam has subsided. If the sensor does not trip again, everything proceeds in sequence.

The foam line is rinsed during Desorb.

- If the sensor is tripped a second and third time the above procedure repeats.
- If the sensor is tripped a fourth time, the system gives an error that is written to the History and the sample or schedule is aborted depending on the configuration selected.

Note: *There is an option to halt the schedule when an error message occurs due to foaming.*
Click Tools | ***Configurations*** | ***Options*** *to select the conditions that will halt the schedule.*

CRYOFOCUSING MODULE (OPTIONAL)

If your GC has a capillary column with an ID of 0.32 or less, and you are not splitting the sample at the injection port, Teledyne Tekmar recommends installing a Cryofocusing Module to improve chromatographic resolution. Cryofocusing or cold trapping ensures efficient trapping and injection. The Cryofocusing Module is an optional accessory to the Atomx.

Principles of Operation

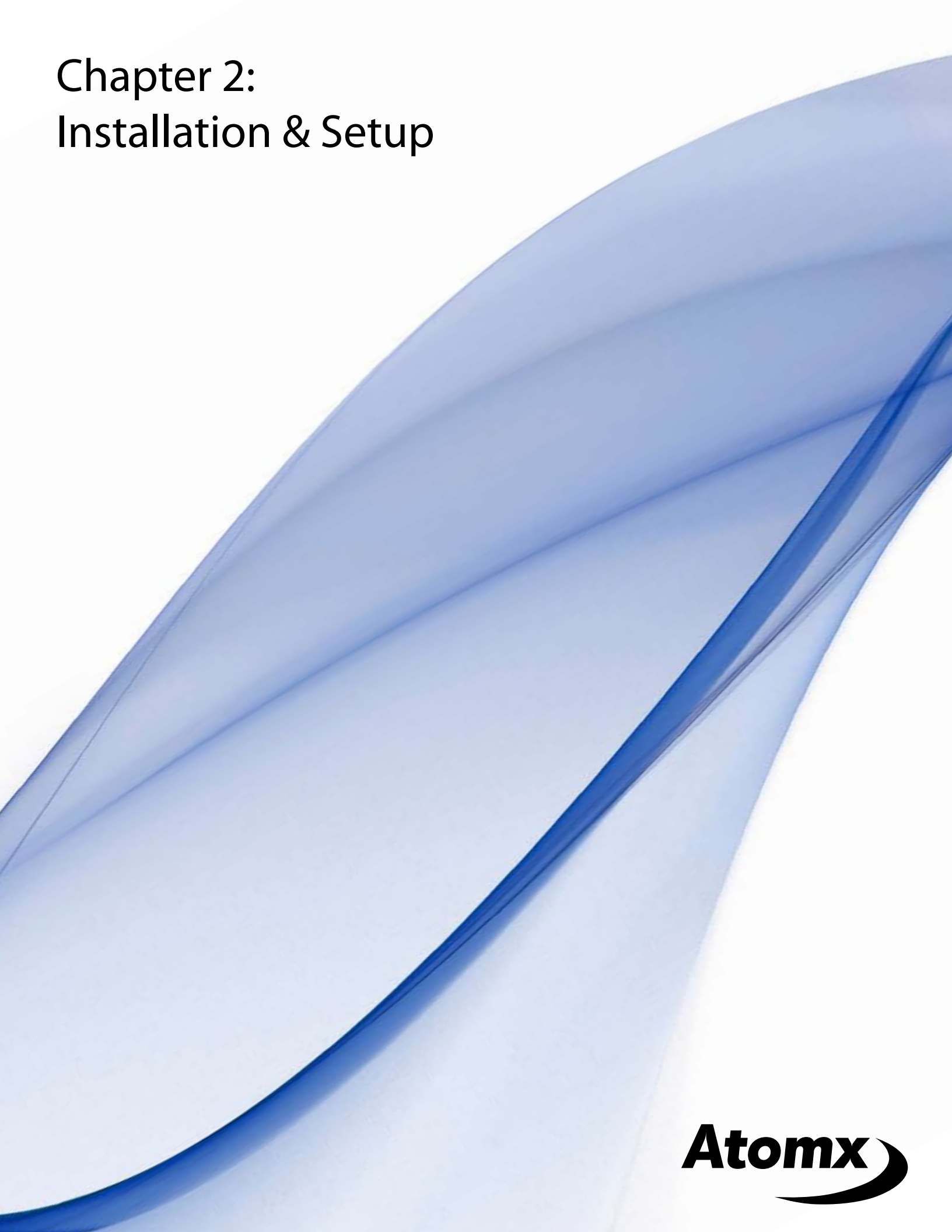
Below is a breakdown of the operations that occur during analysis with the Atomx and the Cryofocusing Module:

1. Using liquid nitrogen (LN2), the cryogenic trap, located inside the Cryofocusing Module, is typically cooled to between -50°C and -180°C.
2. The sample components (analytes) are desorbed from a trap.
3. During the Desorb mode, the sample components are condensed and refocused as carrier gas passes through the cooled area. The sample components form into a narrow band on the first section of the GC column. The carrier gas continues to flow through the GC column and on the detector.
4. The heater in the cryogenic trap is used to inject the sample components by rapidly heating under a stream of carrier gas.

Cryofocusing Specifications

Cryofocusing Specifications	
Column Interface	Cryofocus on column (fused silica, 0.18 - 0.53) via: o 1/32" (0.031cm) Zero Dead Volume Glass Union or o 1/16" (0.16cm) Stainless Steel Union
Mounting	Universal position adjustable bracket (compatible with any GC) over an unused injection port or the Agilent 6890 mounting bracket
Cryofocus Trap	90mm long
Trap Temperature Range	-190°C to 300°C gradient heated, with a rise rate of 300°C/min.
Valving	Electrically actuated LN2 valve (12V)
Control	Atomx electronics interface
Unit Dimensions	Cryofocus Module 12cm W x 10.5cm D x 30cm H (4.7" x 4.13" x 11.81")
Average Weight	3.4lbs / (1.54kgs)
Utility Requirements	115/230VAC ± 5%, 50/60Hz, 4A, 460watts LN2 coolant at 22-75psig (75psig recommended for optimum performance)

Chapter 2:
Installation & Setup



Pre-Installation

OVERVIEW

This chapter describes:

- Operating Environment
- Power Requirements
- Gas Supply Requirements
- Computer Requirements
- Tool Requirements
- Unpacking and checking for damage during shipping and missing items.

Equipment installation and operation is easier if you use the illustrations to identify and locate the described components on the instrument.

OPERATING ENVIRONMENT

The Atomx operates at temperatures between 10°C and 30°C (50°F and 86°F) with humidity levels between 10% and 90%. These temperatures and humidity levels are consistent with a standard lab environment and should pose no difficulty.

If the equipment is used in a manner not specified herein, the protection provided by the equipment may be impaired!

The Atomx is 26.5" (67.31cm) high, 23.3" (59.18cm) deep, 32.7" 83.06cm) wide, and weighs 95 lbs (43.09kg). Make sure the surface where you place the Atomx is capable of supporting the unit's weight, has a clear surface area with no shelves or overhanging obstruction, and allows the unit to sit firmly and evenly on the surface.

POWER REQUIREMENTS

After selecting and clearing a location for the Atomx, check the availability of the required grounded outlets. The Atomx uses:

- 100V/115V/230V power at 50/60 Hz. 10A/5Amps.
- One grounded, three-pronged receptacle for the main power cord.
- Additional accessories may also require one or more grounded outlets.

GAS SUPPLY REQUIREMENTS

Atomx operation requires the availability of ultra high purity nitrogen or helium (as sample gas). Verify that the following items are in compliance:

1. Nitrogen or Helium purity must be 99.999%, and < 0.5ppm hydrocarbon tested.
2. Gas pressure at the source must be high enough to:
   - Allow at least a 50psi pressure drop at every flow or pressure regulator
   - Travel the distance from the source to the Atomx
   - Provide the required gas pressure at the unit. Operation of the Atomx requires helium or nitrogen at an incoming (supply) pressure of 65 to 100 psig.
3. The diameter of the tubing that supplies the gas depends on the maximum pressure drop allowable for your setup.
   - If the gas supply is close to the Atomx, use the pre-installed 1/8" (0.32cm) blue tubing.
   - If any of the following circumstances are present you may want to reduce pressure by replacing the supply line from the gas source with 1/4" (0.64cm) tubing:
     a. The gas supply is a significant distance from the Atomx
     b. A single source supplies several instruments
     c. A single source is subject to high demand for gas
4. Gas supply tubing lengths must be adequate. Be generous when cutting lengths of tubing for local supply lines. A relatively long coil of tubing between the supply and the Atomx allows you to move the instrument without disconnecting the plumbing. The system is supplied with 6' (1.83m) of tubing. Additional tubing can be added to increase the length as needed.
5. It is essential that gas line fittings and regulators are the correct size and type. Consult your local gas supplier for type and size of cylinder valves, then select compatible pressure regulators based on the required valves. Keep these considerations in mind:
   - Use good quality pressure regulators with stainless steel diaphragms. This reduces high source pressures to that required by the Atomx. Teledyne Tekmar recommends using a single, two-stage regulator rather than two single-stage pressure regulators to meet the Atomx's pressure specifications.
   - ON/OFF valves, while not essential, are very useful when mounted on the outlet fitting of a two-stage regulator.
   - If pipe thread connections are required in your gas supply lines, seal them with instrument-grade Teflon® tape.

Always use instrument-grade Teflon® tape to seal thread connections. Do not use pipe dope or lower grades of Teflon® tape. Volatile materials in the dope and/or low grade tape will contaminate the tubing!

MINIMUM COMPUTER REQUIREMENTS

Make sure that you connect the Atomx to a computer that meets or exceeds these specifications.

Component	Specification
Processor	300MHz Pentium II (Or Equivalent)
Memory	512MB
Hard Drive Space	14MB
Display	VGA
Drive	4x CD-ROM
Operating System	Windows XP Pro
Mouse	Mouse
Devices	Compatible speakers and sound system

REQUIRED TOOLS AND SUPPLIES FOR INSTALLATION

The following tools and supplies will be required for the installation of the Atomx:

- Tubing Cutters
- 7/16" (1.11cm) wrenches (2)
- 5/16" (0.79cm) wrenches (2)
- Waste Container (Not supplied with the Atomx Unit)
- Ultra Pure Helium or Nitrogen supply regulated prior to the Atomx to 65-100 psi
- Gas Tight Syringes (10µL)
- Volumetric Flasks
- P&T Grade Methanol
- VOC Standards
- GC/IO Cable (Not supplied with the Atomx Unit)
- Phillips and Flat head Screwdrivers

UNPACKING THE ATOMX

Upon unpacking the Atomx, optional components, and accessories, inspect for any damage or missing items. Claims for loss or shipping damage should be promptly filed with the carrier. Refer to the Atomx Parts List for part numbers and further information.

1. Preferably using a pallet jack move the Atomx carton to the area of installation.
2. Cut the banding holding on the corrugated box. Lift the corrugated box off exposing the unit and its shipping content.
3. Remove the Kit Box, 10L Reservoir and envelop containing cables and software from the packaging. Remove the packaging foam from the box. With the assistance of another individual remove the Atomx unit from the package and place on a flat surface, preferably to the right of the GC, capable of handling a minimum of 95lbs (43.09kg) that is within 5' (1.52m) of the GC in which the Atomx is to be installed.
4. Compare the contents of the shipping carton against the list below. Check for each listed item.

Shipping Container Packing List	
Description	**Quantity**
Atomx Unit	1
10 Liter Water Reservoir	1
I/O CABLE, 2000 9 PIN - IBM PC 9 PIN	1
Power Cord	1
Atomx Kit Box Assembly	1
Atomx TekLink Software	1

5. Compare the contents of the Kit Box against their location specified by the diagram on the inside of the Kit Box lid. Check for each listed item. See inside cover of Kit box supplied with unit for part numbers and descriptions.

Notify the Teledyne Tekmar Customer Support Center with any shortage or packing errors:

U.S.A.: (800) 874-2004

Outside the U.S.A.: Country Code + 1 (513) 229-7000

Installation

ELECTRONIC CONNECTIONS

Once the Atomx has been placed on the lab bench in a position that allows the heated transfer line to reach the inlet of the GC system, the electrical connections can be made. The standard installation has three cable connections that need to be completed.

- Connect the power cable to the back of the Atomx system. Do not overload a circuit make sure the breaker has enough amperage to supply all equipment on the drop.
- Connect the GC/IO cable between the Atomx and the GC System. The 25-pin connector connects to the back of the Atomx, refer to the GC/IO cable instruction sheet that was supplied with your cable for specific instructions on how to connect to your specific GC model.
- Connect the RS232 cable that was included in you shipment between the "RS232" connection on the back of the Atomx and an RS232 COM port of the PC that will be used to control the Atomx unit. If the PC does not have and RS232 COM port you can use a USB to RS232 conversion cable (Part #15-0290-086).

If the Atomx is going to be used with a Cryofocusing Module then there are several additional electronic connection that will need to be made to operate the system, refer to the Cryofocusing Module installation in this section of the manual for further assistance.

ROUTING THE DRAIN TUBING

Run the two 1/8" (0.32cm) red and 1/4" (0.64cm) blue drain tubing (wired together) to a sink or waste bottle. Make sure the drain tubing is not crimped or blocked in any way.

Note: *The Drain is a gravity feed; make sure that the drain or waste container is located below the Atomx unit. Also make sure the drain tubing allows for a straight drop to the collection area.*

WARNING!

Drainage may contain toxic compounds. Follow applicable regulations and Good Laboratory Practices when handling waste.

LIQUID CONNECTIONS

The Atomx requires a source of DI water for system rinsing, auto-blanks and dilutions. The Atomx is supplied with a 10L reservoir for the DI water supply. The unit has the option to be equipped with a Methanol reservoir; this will allow for Methanol Rinsing and enable the system to automate the analysis of high level solids via Methanol Extraction and subsequent dilution.

DI Water

The rinse water reservoir holds the water for system flushing, blanks, and dilutions. To avoid contamination problems use blank (organic-free) water, Teledyne Tekmar recommends using deionized (DI) water. Several methods for preparing blank water are listed below.

- Pass distilled water through a column of activated carbon at least 12" (3.66m) deep. Locate the supply vessel at a higher elevation than the collection vessel, with the supply line entering the column at the bottom.
- Boil water, then purge it at 80° - 90° C with helium or nitrogen for at least one hour.
- Pass water through a freshly charged Millipore Super Q water purifier.

Follow the instructions below to make the water connection:

1. Fill the 10L reservoir with DI water.
2. Slide the two clear water in-lines through the top of the 10L reservoir and allow the lines to rest at the bottom of the reservoir.
3. Place the reservoir as close to the unit as possible. If possible place the water source above or level to the Atomx,
4. Refer to the TekLink™ section of the manual to prime the water.

Note: *Do not locate the water reservoir more than 4' (1.22m) below the Atomx unit. Height differentials larger than 4' (1.22m) can cause damage to the syringe due to the siphon affect.*

Methanol

Follow the instructions below to make the optional Methanol connection:

Note: *Using a 4L bottle of P&T Grade Methanol is recommended.*

1. Drop the line into the Methanol supply.

2. Place the reservoir as close to the unit as possible. If possible place the methanol source above or level to the Atomx.

3. Refer to the TekLink™ section of the manual to prime the Methanol.

Note: *Do not locate the methanol reservoir more than 4' (1.22m) below the Atomx unit. Height differentials larger than 4' (1.22m) can cause damage to the syringe due to the siphon affect.*

CONNECTING THE SAMPLE GAS LINE

Sample gas is usually supplied through a tee union from the GC carrier gas supply tank.

- Connect the 1/8" (0.32cm) brass tee found in the Kit Box to the carrier gas supply line and the GC as shown in Figure 2-1
- Run the 1/8" (0.32cm) blue sample gas line from the Atomx to the tee

Note: *The Atomx defaults to helium. If you wish to use nitrogen, refer to the Configuring the Atomx with TekLink section.*

CONNECTING TO THE GC AND CARRIER GAS SUPPLY

When you connect the Atomx to the gas chromatograph you have the following options:

1. Connect to the GC carrier gas inlet and leave the injection port free for direct injections.
2. Make a direct column connection.

Note: *If you plan to use a Cryofocusing Module, you must make a direct column connection to the GC. Refer to the Cryofocusing Module for additional Installation instructions.*

Using GC Regulated Carrier Gas

When you make the connections illustrated in Figure 2-1, the GC supplies and controls carrier gas flow to the Atomx. Using this configuration keeps the GC injection port free for direct sample injections. Generally speaking, you cannot use a Cryofocusing Module with the configuration shown in Figure 2-1.

Follow the instructions below to make the connections:

1. Select an injection port. You may have to remove the covers around the injection port to expose the line that supplies the carrier gas.

Allow the injection port to cool prior to beginning work on the transfer line installation.

Some injection ports have multiple pieces of tubing connecting to the Injection Port. Do not cut any lines until you are certain that you know which line is the carrier gas inlet line.

2. Open the line at a point one inch from the injector housing. If a union connects tubing from the carrier gas supply to the injector port inlet, disconnect the union. If there is no union, cut the line and install the 1/16" (0.16cm) -1/16" (0.16cm) union from the Kit Box. (Reference Figure 2-1)

Note: *Some GC manufacturers use 2mm carrier lines. In this case a 2mm -1/16" (0.16cm) union should be purchased (part # 14-7076-016)*

3. Connect to the line coming from the GC control pneumatics to a 1/16" (0.16cm) union.
4. Connect the piece of 1/16" (0.16cm) Siltek tubing to the union located on the outer edge of the transfer line.

5. Connect the tubing going to the injection port inlet to the tubing in the center of the transfer line using a 1/16" (0.16cm) Swagelok Union.

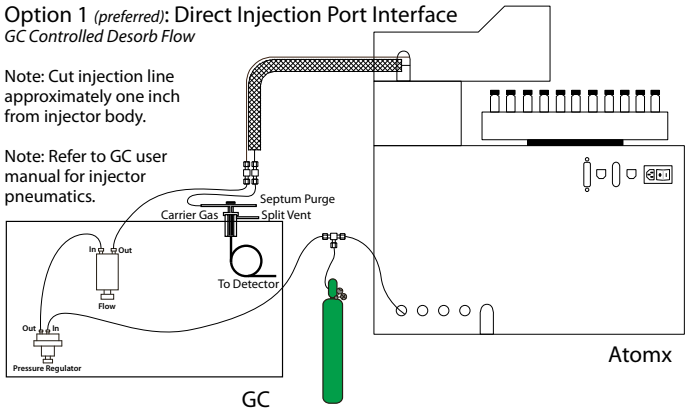


Figure 2-1: Connecting to a Sample Gas Supply

Making a Direct Column Connection Using an External Pressure Regulator

Figure 2-2 shows the connections required to make a direct column connection to the GC. You must use an External Pressure Regulator (EPR) (Part # 14-3938-000) with all direct column or Cryofocusing Module installations.

Follow the directions below to make a direct column connection:

1. Allow the GC to cool to room temperature.
2. Connect the GC Carrier Gas to the "In" on the EPR.
3. Connect the outlet of the regulator to the carrier gas inlet line on the outside of the Atomx transfer line. A 1/16" (0.16cm) or 1/8" (0.32cm) union may need to be installed to route 1/8" (0.32cm) tubing to the EPR.

Note: *This configuration removes carrier gas flow from the GC pneumatic control. It is necessary to install an EPR between the gas supply source and the carrier gas line on the outside of the Atomx transfer line.*

4. Find an opening in the GC to route the transfer line into the GC oven to make the connection to the column (i.e. an unused injection port).
5. Using a zero dead volume union, connect the column to the transfer line from the Atomx return line (the center of the transfer line).

Note: *Be sure that the heater assembly on the transfer line is as close to the injection port as possible to minimize cold spots. As an alternative, the transfer line can pass through the injection port with the union in the GC oven.*

Note: *If you use the Atomx with a Cryofocusing Module, connect the transfer line at the Cryofocusing Module, not directly to the GC. Please refer to the Cryofocusing Module Instruction manual for installation instructions.*

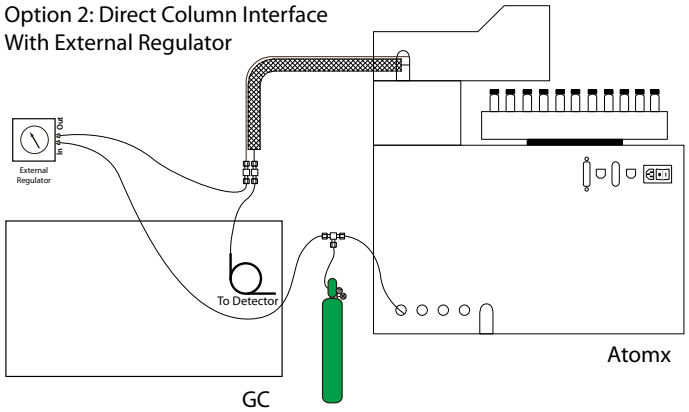


Figure 2-2: Direct Column Connections to the GC

Teklink™ Installation

Your system should have at least 14 megabytes of free space and a CD-ROM drive. See the *Minimum Computer Requirements* section for further requirements.

1. Start Windows and insert your TekLink™ CD into the drive. All other programs should be shut down during installation.

   Note: *If you do not have a CD drive, copy the contents of the CD to a USB drive and install from there.*

2. If the program does not automatically start, double-click the TekLink icon and follow the screen prompts. The first screen that appears is the **Installation Selection Screen**:

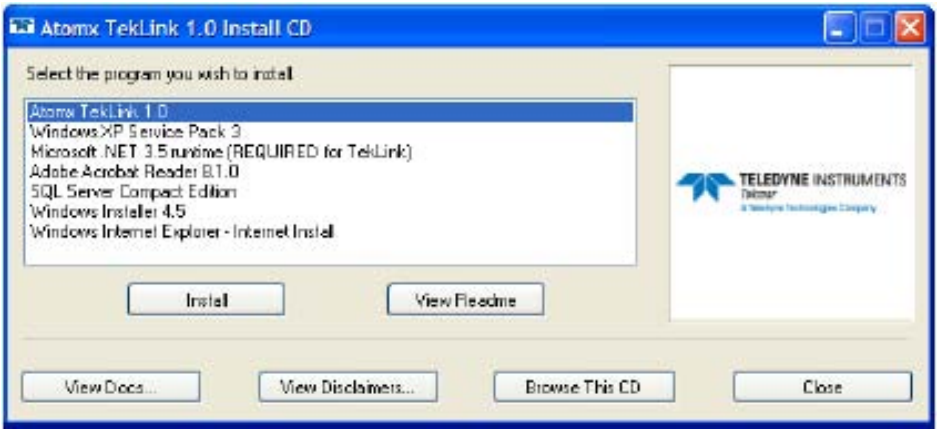


Figure 2-3: Installation Selection screen

Note: *If you do not have Internet Explorer and/or Acrobat Reader installed, you can install them by choosing the fourth and/or seventh selection.*

Note: *Microsoft .NET 3.5 runtime is require for the Atomx TekLink™ software to operate properly.*

3. Select **Atomx TekLink™** and click "Install", this will start the TekLink™ Setup Wizard.

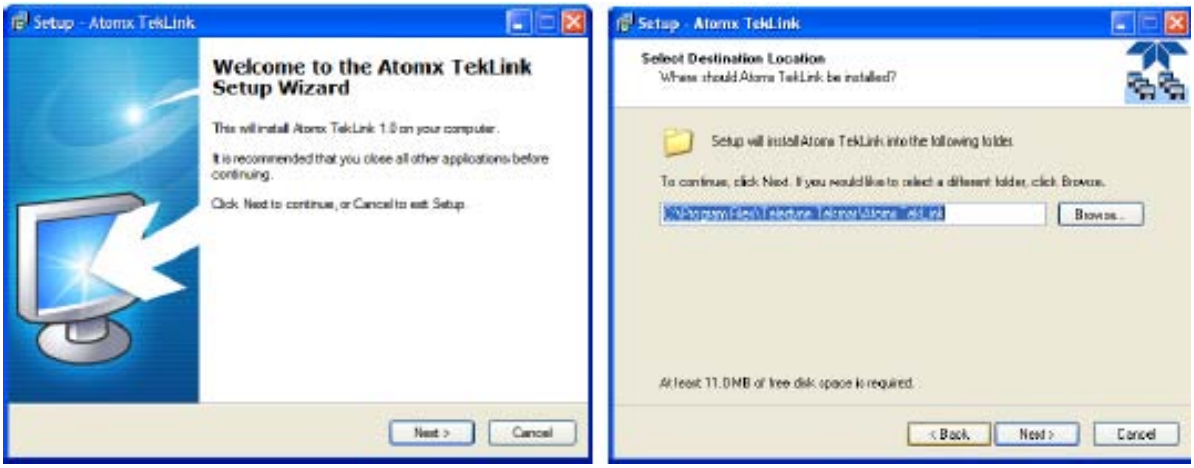


Figure 2-4: Step 3 and 4

4. Click the **Next** button. A screen appears that contains the Software License Agreement. Read the agreement and, if you agree to the terms of the license, select the **I accept the agreement** radio button and click **Next** to proceed with the installation.

5. Choose the destination directory for TekLink™ and click Next. The default directory is displayed below:

C:\Program Files\Teledyne Tekmar\Atomx TekLink\1.X

6. In the next screen, choose to select **Full Installation** or **Client Files Only**.

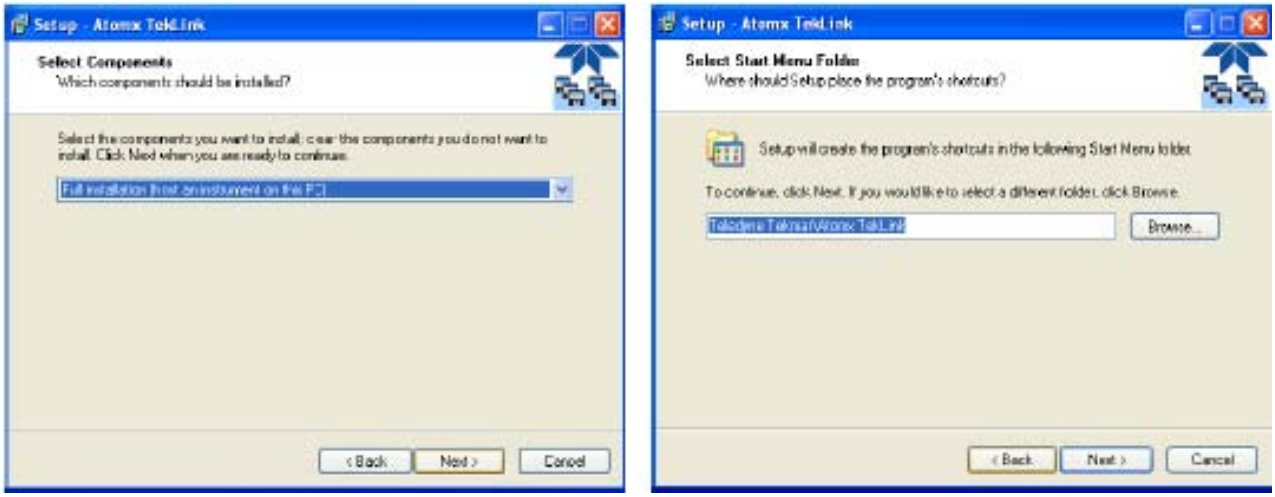


Figure 2-5: Step 6 and 7

7. Select the folder in which to create the program's shortcuts, then click the **Next** button.
8. The next screen that appears allows you to select additional tasks to be performed during the install. These are outlined on the screen below:

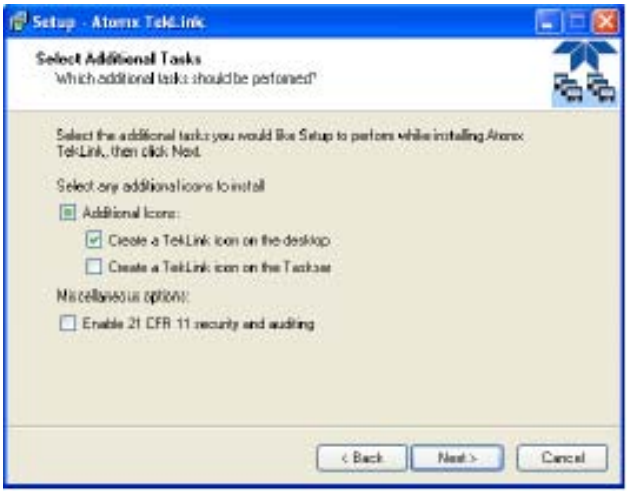


Figure 2-6: Step 8

Note: *Select the 21 CFR Part 11 tools if you want or require the features for your Atomx TekLink™. See Chapter 5: 21 CFR 11 for more information.*

9. Click the **Install** button to continue with the installation or the **Back** button if you want to review or change any settings.
10. When the installation is complete, the screen below appears. In this screen, you can select to view the Readme.txt and/or launch TekLink™ automatically after the **Finish** button is clicked. Make your selections and click the **Finish** button.

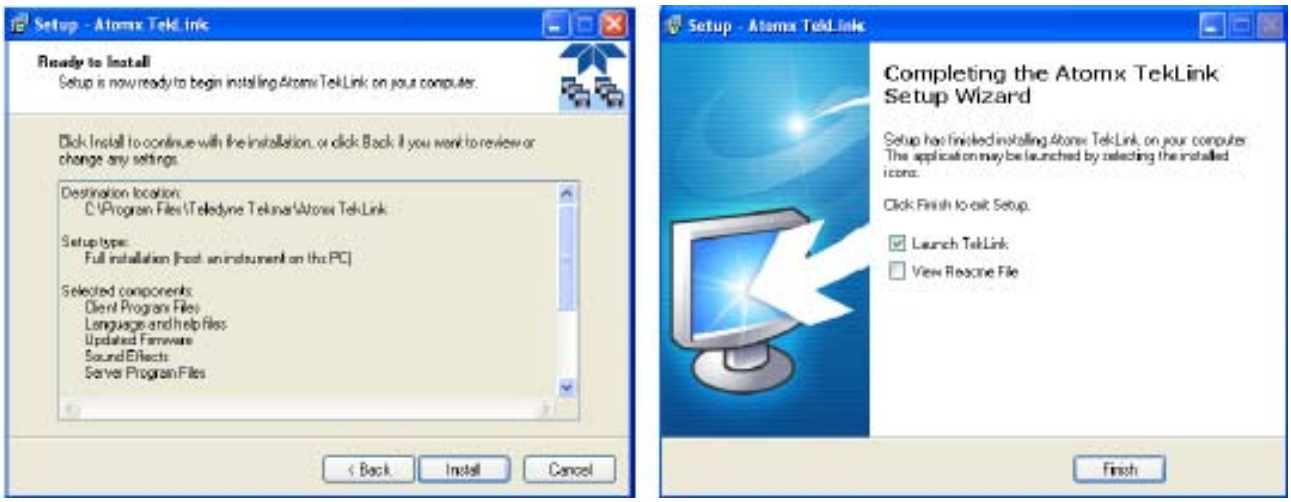


Figure 2-7: Step 9 and 10

11. If you checked the box to launch TekLink™, the program will start. The TekLink™ icon is in the **Start | Programs | Teledyne Tekmar | Atomx TekLink X** program folder and, if you selected the option to place an icon on the desktop, you can double-click it to start the program.

Figure 2-8: Login screen

12. After login, a screen appears and asks you to select an instrument to work with TekLink™. Click the Add button to view the selections.
13. Clicking the Add button causes the Add Instrument screen to appear. From this screen, shown below, you must specify a unique name for the instrument and select one of the available ports that the instrument will use for communication. The software auto-senses the available ports for communication. This process can be repeated for each additional instrument connected to your PC.

Figure 2-9: Add New Instrument

14. To specify the configuration of the unit, click the **Options** tab. From this screen, shown below, the user can configure the following options: Enable the Beeper, Enable the Cryofocusing Module (optional), Enable the Guardian Foam Sensing (optional) and select its functionality, Configure the system to function with Helium of Nitrogen as the Purge gas supply and configure the GC communication requirements as noted in the instruction sheet supplied with the GC/IO cable.

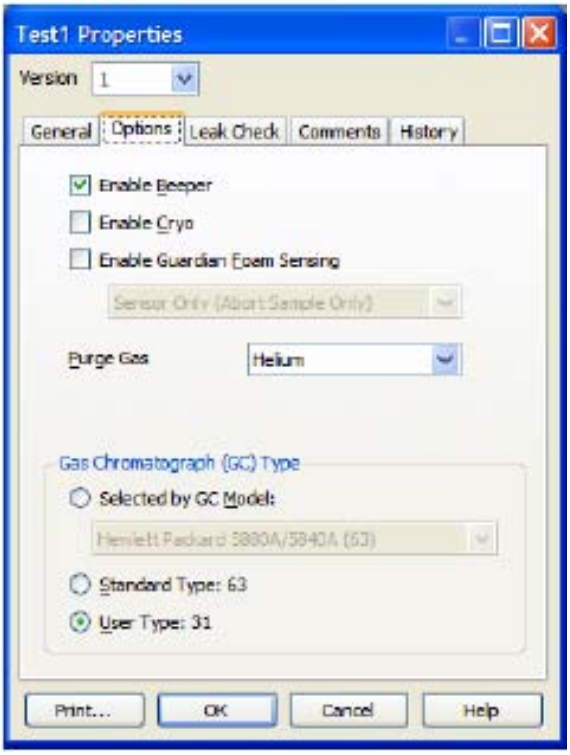


Figure 2-10: Configuration screen - Options tab

15. From the **Leak Check** tab the parameters used to test can be adjusted. These parameters should not require any changes unless the Atomx is equipped with 25mL glassware, in this case the **Leak Check Pressurize Time** should be increased from 1 to 2 minutes.

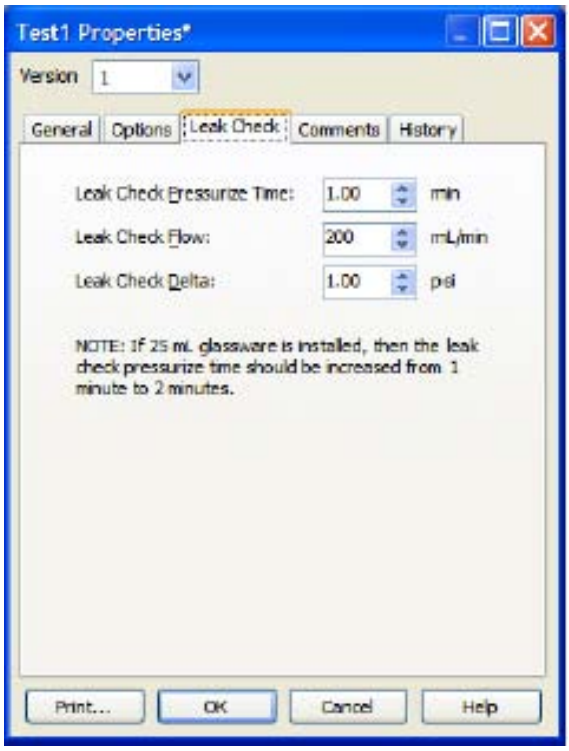


Figure 2-11: Configuration screen - Leak Check tab

16. Power the Atomx on.
17. Connect to the unit that has just been setup.
18. To verify the name and status of the active unit, view the Instrument Status window of the **Main** screen.

SYSTEM SETUP

1. Once the software is installed and the system is configured, go to **Tools | Check Standard Pressure** and follow the procedure indicated on the screen to verify. If needed adjust the IS pressure. The set value will be recorded to the System History.
2. Once the Standard Pressure is set, go to **Tools | Initialize/Change Syringe**, follow the procedure indicated on the screen to initialize and set the home position for the 27mL sample syringe.
3. Go to **Tools | Leak Check** and Leak Check the Atomx. If the Atomx fails the leak check use the subsystem leak checks to isolate the cause of the failure and correct the issue, refer to the troubleshooting section of this manual for additional leak check assistance.
4. Go to **Tools | Prime | Water**, this will remove the air from the cold and hot water supplies lines.
5. If Methanol is going to be used with the Atomx go to **Tools | Prime | Methanol**, this will remove the air from the Methanol line.
6. Fill the standard vessels with fresh IS solution. Refer to the *Preparing Standards* section on the next page for information on how to prepare standards.

7. Go to **Tools | Prime/Change Standard | Internal Standard X** or **All Standards**. The system will prime the standard lines for the selected vessel or vessels.
8. Go to **Mode | Bake** or click the **Bake** button on the toolbar.

Note: *It is recommended to bake the trap for at least 30 minutes prior to use. Use the recommend bake and rinsing parameters for the trap installed and for your configuration.*

PREPARING STANDARDS

Commercially available standards, in various mixtures and concentrations, are available for volatile analysis. These standards should be kept at 0° C with a minimum of headspace. The longevity of the standard is generally defined by the manufacturer, or the specific analytical method.

In order to use the Internal Standard Vessels and the automatic spiking capability, a working solution must be created. This requires dilution of the stock standard and final concentration calculation.

SAMPLE CALCULATION

General

X = Stock standard injected into the volumetric flask (mL)
A = Final concentration desired (ppb)
B = Sample Volume (mL)
C = Internal standard injection volume (µL)
D = Volumetric flask volume (mL)
E = Stock standard concentration (ppm)

$$(A)\left(\frac{B}{C}\right)\left(\frac{D}{E}\right) = X$$

$$X = \frac{A \cdot B \cdot D}{C \cdot E}$$

Example

A = 5ppb
B = 25mL
C = 2µL
D = 10mL
E - 2000ppm

$$\left(\frac{5 \cdot 25 \cdot 25}{2 \cdot 2000}\right) = 0.3125 mL = 312.5 \mu L$$

Cryofocusing Module Installation

To avoid electrical shock, turn off the instrument and unplug the power cord before removing panels.

The 3-wire power cord is a safety feature. Plug the cord into a properly grounded outlet. Do not use an extension cord!

Some Cryo and Atomx components heat to high temperatures. To avoid being burned, allow the instruments to thoroughly cool before removing the panels.

Before starting your installation, please check to make sure you have the all items listed on the packing list located inside the Cryofocusing Module shipping container.

MOUNTING AND PNEUMATIC CONNECTIONS

1. Remove the outer cover of the Cryofocusing Module by loosening the fastener on the front cover and carefully sliding the front cover forward.
2. Mount the Cryofocusing Module onto the GC.
   - Align the mounting bracket over the GC's injection port, arranging the slotted holes on the mounting bracket over the tapped holes on the GC.
   - Secure the bracket to the GC with (2) M4 x 0.7 x 8mm long pan head screws.
3. Locate the (2) 6-32 x 1/2 standoffs. Fasten the Cryofocusing Module over the unused GC port with the standoffs.
4. Insert the transfer line through the grommet on the top of the Cryofocusing Module.
5. Connect the 1/16" (0.16cm) Siltek transfer line (brown tubing running down the center of the transfer line heater) to the 1/16" to 1/16" (0.16cm to 0.16cm) stainless steel union supplied in the Kit Box.
6. Feed the analytical column or precolumn through the cryofocusing trap heater.
7. Connect the column or precolumn to the bottom side of the 1/16" to 1/16" (0.16cm to 0.16cm) union using the appropriate graphite Vespel ferrule supplied with your unit.

Note: *If you are using a precolumn, use the zero dead volume union, and the appropriate ferrules supplied with the Cryofocusing Module to connect the precolumn to the analytical column.*

COOLANT CONNECTIONS

Vented coolant can harm nearby people and equipment! Route the line described in step 2 into a hood or into an area where the vented coolant cannot cause harm.

1. Locate the bottom bulkhead union on the rear of the Cryofocusing Module. Connect the 1/4" (0.64cm) foam insulated copper transfer line to this union.
2. The top bulkhead union on the Cryofocusing Module is a coolant vent. Connect the cryo vent line to the top of the bulkhead union.
3. Connect the other end of the copper line to the outlet fitting on the cryogenic valve.
4. Place the cryogenic valve as close to the coolant supply tank as possible. The closer the cryogenic valve is to the coolant supply, the more coolant you save. **Do not place the valve more than 5' (1.52m) away from the coolant supply tank.**

5. Connect a line from the valve inlet fitting on the cryogenic valve to the coolant supply tank. Use the LN_2 tank adapter that came with your Kit Box. **To reduce LN_2 consumption, minimize the distance between the LN_2 tank and the Cryofocusing module.**
6. The Cryofocusing Module has a relief valve that vents excess pressure. **Do not connect the cryogenic valve at this time.** Proceed to the next section *(Electronic Connections)*.

Tank to the valve should not be more than 20' (6.1m) long. Using a pressure lower than 20psi may cause the unit to fail to cool the cryo trap to the desired setpoint.

Coolant delivery pressure must be 20 to 75psi to ensure proper cooling. The higher the pressure, the more coolant you save. However, to avoid damage to the Cryofocusing Module, DO NOT set the coolant delivery pressure above 75psi. If you use low coolant pressure (20psi), it will be very difficult or impossible to achieve temperatures below -180°C.

ELECTRONIC CONNECTIONS

1. Connect the DC power supply to the rear of the Cryofocusing Module.
2. Connect the AC Cable from the Power Entry Module to an outlet.
3. Connect the AC "Out" Cable from the rear of the Cryofocusing Module to the DC power supply.
4. Connect the cryo valve cable to LN2 on the cryogenic valve.
5. Connect the 9-Pin Tekmar AUX cable to the rear of the Atomx Tekmar AUX port.

CARRIER GAS CONNECTIONS

1. Attach the gas line from the gas supply to the INLET of the gas regulator.
2. Connect one end of the large bore Siltek Tubing to the OUTLET of the gas regulator and the other end to Port #5 of the 6-port Valve.
3. Refer to Figure 2-2 for additional information.

Chapter 3:
System Operation
& Optimization

Atomx

Mode Descriptions

The Atomx performs a programmed series of operating steps. These steps are referred to as modes and vary depending on type of methodology being completed. Basic mode descriptions are provided below. For more specific descriptions based on your method selection, refer to the valve output charts with mode descriptions.

Mode	Description
Standby	This mode indicates that the system is waiting for all temperature zones and flow rates to reach their set points.
Purge ready	This mode indicates all method set points are at equilibrium and the system is ready to analyze samples.
Sample Fill	This mode allows an aliquot to be removed from the sample vial by the syringe.
Standard Dispense	This mode allows standard to be added to the sample pathway for transfer to the sparge vessel with the sample. The standards can also be dispensed to the vial for soil purges or used as a Matrix Spike prior to a Methanolic extraction.
Sample Transfer	This mode indicates that a liquid sample is being introduced into the sparging vessel.
Prepurge	When the Atomx is working in conjunction with an external sample heater, this mode directs purge gas to the vessel to remove excess oxygen prior to heating and subsequent purging.
Preheat Purge	When the Atomx is working in conjunction with an external sample heater, this mode allows the sample to reach a uniform programmed temperature prior to sample purging.
Rinse Needle	This mode is the VOC extraction mode in which the inert gas (such as helium) is dispersed through the sample matrix in the sparger, or in the sample vial if a soil, for a preset time and flow. The gas containing the analytes is directed to an analytical trap for concentration. **Note:** *The gas passes through the trap, deposits the analytes, and is vented to the atmosphere.*
Sweep Needle	This mode allows time for the sample needle to be purged with Helium or Nitrogen (optional).
Dry Purge	This mode is used to drive excess water from the analytical trap. The inert gas is directed to the analytical trap without passing through the sample glassware. This process ensures that no additional moisture is added to the trap.
Desorb Ready	This mode indicates that the concentrator is waiting for a GC ready signal to allow it to step to **Desorb**.
Desorb Preheat	This mode heats the analytical trap to a preset temperature in a static state, allowing the analytes to release from the sorbent.
Desorb	This mode heats the analytical trap to its final point and rotates the 6-port valve so that the carrier gas is backflushed through the trap and over to the GC for separation and detection. This mode will also start the GC column program and, depending on your election, drain the sample from the glassware.
Bake Rinse	This mode allows hot water to be introduced into the sparger for syringe, glassware and line rinsing, to clean the system between samples.
Bake Drain	This mode drains the water, introduced to the sample glassware during the **Bake Rinse** mode, from the system.
Bake	This mode sweeps the sample pathway and the analytical trap, which is being held at a high temperature, with dry purge gas to clean the system between samples.
Methanol Rinse	This mode allows methanol to be introduced into the sparger for syringe, glassware and line rinsing, to clean the system between samples.
Methanol Rinse Drain	This mode drains the methanol, introduced to the sample glassware during the **Methanol Rinse** mode, from the system.

Soils

Mode	Valves																		Mechanisms			
	1 Purge	2 Bake	3 Vent	4 Drain	5 Purge Select	6 Soil	7 Syringe	8 Liquid Transfer	9 Syringe Flush	10 Defoamer	11 Eliminator Rinse	12 Water	IS #1	IS #2	IS #3	5-port	5-port Direction	6-port	MFC	Carousel	Index	Elevator	Mixer
Standby	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stby flow	home	home	home	off
Purge Ready	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stby flow	home	home	home	off
Pre Sweep A	off	off	on	off	on	off	on	off	on	off	off	off	off	off	off	B	cw	A	50	home	home	drain	off
Pre Sweep B	off	on	on	off	on	on	on	off	on	off	off	off	off	off	off	H	ccw	A	50	home	home	drain	off
Rotate and index	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	stby flow	position	load	home	off
Raise Vial	off	off	on	off	on	on	off	off	off	off	off	off	off	off	off	A	na	A	0	position	load	sample	off
Prepurge	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	na	A	pre purge flow	position	load	sample	off
DI Fill	off	off	on	off	on	on	off	off	off	off	off	off	off	off	off	G	ccw	A	0	position	load	sample	off
DI Dispense Waste	off	off	on	off	on	on	off	off	off	off	off	off	off	off	off	A	cw	A	0	position	load	sample	off
Std Dispense	off	off	on	off	on	on	off	on	off	off	off	off	on	on	on	A	na	A	0	position	load	sample	off
DI Transfer	off	off	on	off	on	on	off	off	off	off	off	off	off	off	off	H	ccw	A	0	position	load	sample	off
DI Sweep Waste	off	off	on	off	on	on	on	off	on	off	off	off	off	off	off	A	cw	A	0	position	load	sample	off
DI Sweep	on	off	on	off	on	on	on	off	off	off	off	off	off	off	off	H	ccw	A	di swp flow	position	load	sample	off
Sample Preheat	off	off	on	off	off	on	off	off	off	off	off	off	off	off	off	A	cw	A	0	position	load	sample	off
Purge	on	off	on	off	on	on	on	on	off	off	off	off	off	off	off	B	cw	A	purge flow	position	load	sample	on
Dry Purge	off	off	on	off	on	off	off	off	off	off	off	off	off	off	off	A	ccw	A	dry purge flow	position	load	sample	off
Lower Vial	off	off	on	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	n/a	position	load	home	off
Raise to Drain Position	off	off	on	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	n/a	home	home	drain	off
Desorb Ready	off	off	off	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	0	home	home	drain	off
Desorb Preheat	off	off	off	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	0	home	home	drain	off
Desorb	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	A	cw	B	desorb flow	home	home	drain	off
MeOH Rinse Syinge Fill I	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	C	cw	A	desorb flow	home	home	drain	off
MeOH Rinse Dispense I	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	B	ccw	A	desorb flow	home	home	drain	off
MeOH Rinse Syinge Fill II	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	C	cw	A	desorb flow	home	home	drain	off
MeOH Rinse Dispense II	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	H	ccw	A	desorb flow	home	home	drain	off
Rinse Syinge Fill I	on	off	off	on	off	off	off	off	off	off	off	on	off	off	off	G	ccw	A	desorb flow	home	home	drain	off
Rinse Syinge/Needle Dispense I	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	B	cw	A	desorb flow	home	home	drain	off
Rinse Syinge Fill II	on	off	off	on	off	off	off	off	off	off	off	on	off	off	off	G	cw	A	desorb flow	home	home	drain	off
Rinse Syinge/Needle Dispense II	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	H	cw	A	desorb flow	home	home	drain	off
Sweep Syringe/Needle I	on	off	off	on	off	off	on	off	on	off	off	off	off	off	off	B	cw	A	desorb flow	home	home	drain	off
Sweep Syringe/Needle II	on	off	off	on	off	off	on	off	on	off	off	off	off	off	off	H	cw	A	desorb flow	home	home	drain	off
Bake	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	A	cw	A	bake flow	home	home	down	off

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Water

Mode	Valves																			Mechanisms			
	1 Purge	2 Bake	3 Vent	4 Drain	5 Purge Select	6 Soil	7 Syringe	8 Liquid Transfer	9 Syringe Flush	10 Defoamer	11 Eliminator Rinse	12 Water	IS #1	IS #2	IS #3	5-port	5-port Direction	6-port	MFC	Carousel	Index	Elevator	Mixer
Standby	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stdby flow	home	home	home	off
Purge Ready	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stdby flow	home	home	drain	off
Pre Sweep A	off	on	off	on	on	off	on	off	on	off	off	off	off	off	off	B	cw	A	stdby flow	home	home	drain	off
Pre Sweep B	off	on	off	on	on	on	on	off	on	off	off	off	off	off	off	H	ccw	A	stdby flow	home	home	drain	off
Rotate and index	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	stdby flow	position	load	drain	off
Raise Vial	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stdby flow	position	load	sample	off
Sample Equilibrate	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stdby flow	position	load	sample	off
Prime Sample Fill	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	B	cw	A	stdby flow	position	load	sample	off
Prime Sample Dispense	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	ccw	A	stdby flow	position	load	sample	off
Sample Fill	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	B	cw	A	stdby flow	position	load	sample	off
Sample Dispense-Waste1	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	ccw	A	0	position	load	sample	off
Std Dispense	off	off	on	on	on	off	off	on	off	off	off	off	on	on	on	A	na	A	0	position	load	sample	off
Sample Dispense-Glassware	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	position	load	sample	off
Sample Dispense-Waste2	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	A	cw	A	0	position	load	sample	off
Sweep Waste	off	off	on	off	on	off	on	on	on	off	off	off	off	off	off	A	na	A	0	position	load	sample	off
Sweep Sample	on	off	on	off	on	off	on	on	off	off	off	off	off	off	off	H	ccw	A	swp smpl flow	position	load	sample	off
Prime Sample Fill (Dil)	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	B	cw	A	stdby flow	position	load	sample	off
Prime Sample Dispense (Dil)	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	ccw	A	stdby flow	position	load	sample	off
Sample Fill (Dil)	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	B	cw	A	stdby flow	position	load	sample	off
Sample Dispense-Waste1 (Dil)	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	ccw	A	0	position	load	sample	off
IS Dispense (Dil)	off	off	on	on	on	off	off	on	off	off	off	off	on	on	on	A	na	A	0	position	load	sample	off
Sample Dispense-Glassware (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	position	load	sample	off
Sample Dispense-Waste2 (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	A	cw	A	0	position	load	sample	off
Sample Sweep Waste (Dil)	off	off	on	off	on	off	on	on	on	off	off	off	off	off	off	A	na	A	0	position	load	sample	off
Sweep Sample (Dil)	on	off	on	off	on	off	on	on	off	off	off	off	off	off	off	H	ccw	A	swp smpl flow	position	load	sample	off
DI Rinse Fill (Dil)	off	off	on	off	on	off	off	on	off	off	off	on	off	off	on	G	ccw	A	0	position	load	sample	off
DI Rinse Dispense (Dil)	off	off	on	off	on	off	off	off	on	off	off	off	off	off	off	A	ccw	A	0	position	load	sample	off
DI Fill (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	G	cw	A	0	position	load	sample	off
DI Dispense waste (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	A	ccw	A	0	position	load	sample	off
DI Transfer (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	position	load	sample	off
DI Sweep Waste (Dil)	off	off	on	off	on	off	on	on	on	off	off	off	off	off	off	A	cw	A	0	position	load	sample	off
Sweep DI (Dil)	on	off	on	off	on	off	on	on	off	off	off	off	off	off	off	H	ccw	A	swp smpl flow	position	load	sample	off
Sample Prepurge	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	swp smpl flow	position	load	sample	off
Purge/lower vial	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	purge flow	position	load	home	off

Water Cont'd

Mode	Valves																			Mechanisms			
	Purge	Bake	Vent	Drain	Purge Select	Soil	Syringe	Liquid Transfer	Syringe Flush	Defoamer	Eliminator Rinse	Water	IS #1	IS #2	IS #3	5-port	5-port Direction	6-port	MFC	Carousel	Index	Elevator	Mixer
	1	2	3	4	5	6	7	8	9	10	11	12											
Raise to Drain Position	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	na	A	purge flow	home	home	drain	off
MeOH Rinse Syringe Fill I	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	C	cw	A	purge flow	home	home	drain	off
MeOH Rinse Syringe/Needle Dispense I	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	B	ccw	A	purge flow	home	home	drain	off
MeOH Rinse Syinge Fill II	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	C	cw	A	purge flow	home	home	drain	off
MeOH Rinse Syringe/Needle Dispense II	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	H	cw	A	purge flow	home	home	drain	off
Rinse Syringe Fill I	on	off	on	off	off	off	off	off	off	off	off	on	off	off	off	G	cw	A	purge flow	home	home	drain	off
Rinse Syringe/Needle Dispense I	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	B	ccw	A	purge flow	home	home	drain	off
Rinse Syringe Fill II	on	off	on	off	off	off	off	off	off	off	off	on	off	off	off	G	cw	A	purge flow	home	home	drain	off
Rinse Syringe/Needle Dispense II	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	H	cw	A	purge flow	home	home	drain	off
Sweep Syringe/Needle I	on	off	on	off	off	off	on	off	on	off	off	off	off	off	off	B	cw	A	purge flow	home	home	drain	off
Sweep Syringe/Needle II	on	off	on	off	off	off	on	off	on	off	off	off	off	off	off	H	ccw	A	purge flow	home	home	drain	off
Dry Purge	off	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	dry purge flow	home	home	drain	off
Desorb Ready	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	A	na	A	0	home	home	drain	off
Desorb Preheat	off	off	off	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	0	home	home	drain	off
Desorb	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	A	na	B	desorb flow	home	home	drain	off
MeOH Rinse glass Fill	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	C	cw	A	20	home	home	drain	off
MeOH Rinse glass Transfer	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	home	home	drain	off
MeOH Rinse Sweep	on	off	on	off	on	on	on	on	off	off	off	off	off	off	off	H	na	A	bake rinse flow	home	home	drain	off
MeOH Rinse Drain	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	bake rinse flow	home	home	drain	off
Bake Rinse Fill	off	on	off	on	on	off	off	off	off	off	off	on	off	off	off	G	ccw	A	bake flow	home	home	drain	off
Bake Rinse Transfer	off	off	on	off	on	on	off	on	off	off	off	off	off	off	off	H	cw	A	50	home	home	drain	off
Bake Rinse Sweep	on	off	on	off	on	off	on	on	off	off	off	off	off	off	off	H	na	A	bake rinse flow	home	home	drain	off
Bake Rinse Drain	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	bake rinse flow	home	home	drain	off
Bake	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	bake flow	home	home	drain	off

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Methanol Extractions

Mode	Valves: 1 Purge	2 Bake	3 Vent	4 Drain	5 Purge Select	6 Soil	7 Syringe	8 Liquid Transfer	9 Syringe Flush	10 Defoamer	11 Eliminator Rinse	12 Water	IS #1	IS #2	IS #3	5-port	5-port Direction	6-port	MFC	Mechanisms: Carousel	Index	Elevator	Mixer
Standby	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stby flow	home	home	drain	off
Purge Ready	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	na	A	stby flow	home	home	drain	off
Pre Sweep A	off	on	off	on	on	off	on	off	on	off	off	off	off	off	off	B	cw	A	stby flow	home	home	drain	off
Pre Sweep B	off	on	off	on	on	on	on	off	on	off	off	off	off	off	off	H	ccw	A	stby flow	home	home	drain	off
Rotate and index	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	C	ccw	A	stby flow	position	load	home	off
Methanol Prime	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	C	ccw	A	0	position	load	home	off
Methanol Prime Dispense	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	0	position	load	home	off
Methanol Fill	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	C	ccw	A	0	position	load	home	off
Methanol Dispense Waste	off	off	on	offf	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	0	position	load	home	off
Matrix Spike Dispense	off	off	on	off	on	off	off	on	off	off	off	off	off	off	on	A	na	A	0	position	load	vial	off
Methanol Dispense-Vial	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	H	ccw	A	150	position	load	vial	off
Methanol Dispense Waste II	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	150	position	load	vial	off
Sweep Waste	off	on	off	on	on	off	on	off	on	off	off	off	off	off	off	A	na	A	150	position	load	vial	off
Sweep Methanol	off	on	off	on	on	on	on	off	on	off	off	off	off	off	off	H	ccw	A	150	position	load	vial	off
Mix Extract	off	on	off	on	on	off	off	on	off	off	off	off	off	off	off	A	cw	A	stdby flow	position	load	vial	on
Settle time	off	on	off	on	on	off	off	on	off	off	off	off	off	off	off	A	na	A	stdby flow	position	load	vial	off
Prime Extract Fill (Dil)	off	on	off	on	on	on	off	on	off	off	off	off	off	off	off	B	cw	A	50	position	load	vial	off
Prime Extract Dispense (Dil)	off	on	off	on	on	on	off	on	off	off	off	off	off	off	off	A	ccw	A	50	position	load	vial	off
Extract Fill (Dil)	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	B	cw	A	50	position	load	vial	off
Extract Dispense-Waste1 (Dil)	off	on	off	on	on	off	off	on	off	off	off	off	off	off	off	A	ccw	A	0	position	load	vial	off
Std Dispense (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	on	on	off	A	na	A	0	position	load	vial	off
Extract Dispense-Glassware (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	position	load	vial	off
Extract Dispense-Waste2 (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	A	cw	A	0	position	load	vial	off
Extract Sweep Waste (Dil)	off	off	on	off	on	off	on	on	on	off	off	off	off	off	off	A	na	A	0	position	load	vial	off
DI Rinse Fill (Dil)	off	off	on	off	on	off	off	on	off	off	off	on	off	off	off	G	ccw	A	0	position	load	vial	off
DI Rinse Dispense (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	A	ccw	A	0	position	load	vial	off
DI Fill (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	G	cw	A	0	position	load	vial	off
DI Dispense waste (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	A	ccw	A	0	position	load	vial	off
DI Transfer (Dil)	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	position	load	vial	off
DI Sweep Waste (Dil)	off	off	on	off	on	off	on	on	on	off	off	off	off	off	off	A	cw	A	0	position	load	vial	off
Sweep DI (Dil)	on	off	on	off	on	off	on	on	off	off	off	off	off	off	off	H	ccw	A	extract swp flow	position	load	vial	off
Pre Purge (Dil)	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	pre purge flow	position	load	vial	off
Purge /Lower Vial	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	purge flow	home	home	home	off

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Methanol Extractions Cont'd

Mode	Valves																			Mechanisms			
	Purge 1	Bake 2	Vent 3	Drain 4	Purge Select 5	Soil 6	Syringe 7	Liquid Transfer 8	Syringe Flush 9	Defoamer 10	Eliminator Rinse 11	Water 12	IS #1	IS #2	IS #3	5-port	5-port Direction	6-port	MFC	Carousel	Index	Elevator	Mixer
Raise to Drain Position	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	A	na	A	purge flow	home	home	drain	off
MeOH Rinse Syinge Fill I	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	C	cw	A	purge flow	home	home	drain	off
MeOH Rinse Syinge/Needle Dispense I	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	B	ccw	A	purge flow	home	home	drain	off
MeOH Rinse Syinge Fill II	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	C	cw	A	purge flow	home	home	drain	off
MeOH Rinse Syinge/Needle Dispense II	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	H	cw	A	purge flow	home	home	drain	off
Rinse Syinge Fill I	on	off	on	off	off	off	off	off	off	off	off	on	off	off	off	G	cw	A	purge flow	home	home	drain	off
Rinse Syinge/Needle Dispense I	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	B	ccw	A	purge flow	home	home	drain	off
Rinse Syinge Fill II	on	off	on	off	off	off	off	off	off	off	off	on	off	off	off	G	cw	A	purge flow	home	home	drain	off
Rinse Syinge/Needle Dispense II	on	off	on	off	off	off	off	off	off	off	off	off	off	off	off	H	cw	A	purge flow	home	home	drain	off
Sweep Syringe/Needle I	on	off	on	off	off	off	on	off	on	off	off	off	off	off	off	B	cw	A	purge flow	home	home	drain	off
Sweep Syringe/Needle II	on	off	on	off	off	off	on	off	on	off	off	off	off	off	off	H	ccw	A	purge flow	home	home	drain	off
Dry Purge	off	off	on	off	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	dry purge flow	home	home	drain	off
Desorb Ready	off	off	off	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	0	home	home	drain	off
Desorb Preheat	off	off	off	off	on	off	off	off	off	off	off	off	off	off	off	A	na	A	0	home	home	drain	off
Desorb	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	A	na	B	desorb flow	home	home	drain	off
MeOH Rinse glass Fill	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	C	cw	A	bake rinse flow	home	home	drain	off
MeOH Rinse glass Transfer	off	off	on	off	on	off	off	on	off	off	off	off	off	off	off	H	ccw	A	0	home	home	drain	off
MeOH Rinse Sweep	on	off	on	off	on	on	on	on	off	off	off	off	off	off	off	H	na	A	bake rinse flow	home	home	drain	off
MeOH Rinse Drain	off	on	off	on	on	off	off	off	off	off	off	off	off	off	off	A	cw	A	bake rinse flow	home	home	drain	off
Bake Rinse Fill	off	on	off	on	on	off	off	off	off	off	off	on	off	off	off	G	ccw	A	bake fill	home	home	drain	off
Bake Rinse Transfer	off	off	on	off	on	on	off	on	off	off	off	off	off	off	off	H	cw	A	50	home	home	drain	off
Bake Rinse Sweep	on	off	on	off	on	off	on	on	off	off	off	off	off	off	off	H	na	A	bake rinse flow	home	home	drain	off
Bake Rinse Drain	on	off	off	on	off	off	off	off	off	off	off	off	off	off	off	A	cw	A	bake rinse flow	home	home	drain	off
Bake	off	on	off	on	on	on	off	off	off	off	off	off	off	off	off	A	na	A	bake flow	home	home	drain	off

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Water Method Parameters					
Tab	**Variable**	**Maximum**	**Minimum**	**Default**	**Unit**
Purge	Valve Oven Temp	250	20	140	°C
	Transfer Line	250	20	140	°C
	Sample Mount	100	20	90	°C
	Water Heater	90	20	90	°C
	Sample Vial Temp	125	20	20	°C
	Sample Equilibrate Time	299.99	0	0	min
	Soil Valve Temp	125	20	100	°C
	Standby Flow	500	0	10	mL/min
	Purge Ready Temp	350	20	40	°C
	Condensate Trap Standby	250	20	45	°C
	Presweep Time	299.99	0	0.25	min
	Prime Sample Fill Volume	27	0	3	mL
	Sample Volume	27	0	5	mL
	Sweep Sample Time	299.99	0	0.25	min
	Sweep Sample Flow	500	0	100	mL/min
	Sparge Vessel Heater	ON	OFF	OFF	N/A
	Sparge Vessel Temp	100	20	20	°C
	Prepurge Time	299.99	0	0	min
	Prepurge Flow	500	0	0	mL/min
	Purge Time	299.99	0	11	min
	Purge Flow	500	0	40	mL/min
	Purge Temp	350	0	20	°C
	Condensate Purge Temp	250	20	20	°C
	Dry Purge Time	299.99	0	0.5	min
	Dry Purge Flow	500	0	100	mL/min
	Dry Purge Temp	350	20	20	°C
Desorb	MeOH Needle Rinse	ON	OFF	OFF	N/A
	MeOH Needle Rinse Volume	27	0	3	mL
	Water Needle Rinse Volume	27	0	7	mL
	Sweep Needle Time	299.99	0	0.25	min
	Desorb Preheat Temp	350	20	245	°C
	GC Start Signal	None, Start, End or Both		Start of Desorb	N/A
	Desorb Time	299.99	0	2	min
	Drain Flow	500	0	300	mL/min
	Desorb Temp	350	20	250	°C
Bake	MeOH Glass Rinse	ON	OFF	OFF	N/A
	Num of MeOH Glass Rinses	5	0	1	N/A
	MeOH Glass Rinse Volume	27	0	3	mL
	Num of Water Bake Rinses	5	0	1	N/A
	Water Bake Rinse Volume	27	0	7	mL
	Bake Rinse Sweep Time	299.99	0	0.25	mL/min
	Bake Rinse Sweep Flow	500	0	100	mL/min
	Bake Rinse Drain Time	299.99	0	0.4	min
	Bake Time	299.99	0	2	min
	Bake Flow	500	0	200	mL/min
	Bake Temp	350	20	280	°C
	Condensate Bake Temp	250	20	200	°C
Cryo	Focus Temp	300	-190	-150	°C
	Inject Time	299.99	0	1	min
	Inject Temp	300	-190	180	°C
	Standby Temp	300	-190	100	°C

Soil Method Parameters					
Tab	**Variable**	**Maximum**	**Minimum**	**Default**	**Unit**
Purge	Valve Oven Temp	250	20	140	°C
	Transfer Line	250	20	140	°C
	Sample Mount	100	20	90	°C
	Water Heater	90	20	90	°C
	Sample Vial Temp	125	20	20	°C
	Sample Equilibrate Time	299.99	0	0	min
	Soil Valve Temp	125	20	100	°C
	Standby Flow	500	0	10	mL/min
	Purge Ready Temp	350	20	40	°C
	Condensate Trap Standby	250	20	45	°C
	Presweep Time	299.99	0	0.25	min
	Prime Sample Fill Volume	27	0	3	mL
	Sample Volume	27	0	5	mL
	Sweep Sample Time	299.99	0	0.25	min
	Sweep Sample Flow	500	0	100	mL/min
	Sparge Vessel Heater	ON	OFF	OFF	N/A
	Sparge Vessel Temp	100	20	20	°C
	Prepurge Time	299.99	0	0	min
	Prepurge Flow	500	0	0	mL/min
	Purge Time	299.99	0	11	min
	Purge Flow	500	0	40	mL/min
	Purge Temp	350	0	20	°C
	Condensate Purge Temp	250	20	20	°C
	Dry Purge Time	299.99	0	0.5	min
	Dry Purge Flow	500	0	100	mL/min
	Dry Purge Temp	350	20	20	°C
Desorb	MeOH Needle Rinse	ON	OFF	OFF	N/A
	MeOH Needle Rinse Volume	27	0	3	mL
	Water Needle Rinse Volume	27	0	7	mL
	Sweep Needle Time	299.99	0	0.25	min
	Desorb Preheat Temp	350	20	245	°C
	GC Start Signal	None, Start, End or Both		Start of Desorb	N/A
	Desorb Time	299.99	0	2	min
	Drain Flow	500	0	300	mL/min
	Desorb Temp	350	20	250	°C
Bake	MeOH Glass Rinse	ON	OFF	OFF	N/A
	Num of MeOH Glass Rinses	5	0	1	N/A
	MeOH Glass Rinse Volume	27	0	3	mL
	Num of Water Bake Rinses	5	0	1	N/A
	Water Bake Rinse Volume	27	0	7	mL
	Bake Rinse Sweep Time	299.99	0	0.25	mL/min
	Bake Rinse Sweep Flow	500	0	100	mL/min
	Bake Rinse Drain Time	299.99	0	0.4	min
	Bake Time	299.99	0	2	min
	Bake Flow	500	0	200	mL/min
	Bake Temp	350	20	280	°C
	Condensate Bake Temp	250	20	200	°C
Cryo	Focus Temp	300	-190	-150	°C
	Inject Time	299.99	0	1	min
	Inject Temp	300	-190	180	°C
	Standby Temp	300	-190	100	°C

Methanol Method Parameters					
Tab	**Variable**	**Maximum**	**Minimum**	**Default**	**Unit**
Purge	Valve Oven Temp	250	20	140	°C
	Transfer Line	250	20	140	°C
	Sample Mount	100	20	90	°C
	Water Heater	90	20	90	°C
	Soil Valve Temp	125	20	100	°C
	Standby Flow	500	0	10	mL/min
	Purge Ready Temp	350	20	40	°C
	Condensate Trap Standby	250	20	45	°C
	Presweep Time	299.99	0	0.25	min
	MeOH Volume	27	0	10	mL
	Sparge Vessel Heater	ON	OFF	OFF	N/A
	Sparge Vessel Temp	100	20	20	°C
	Prepurge Time	299.99	0	0	min
	Prepurge Flow	500	0	0	mL/min
	Sample Mix Speed	Fast	OFF	Med	N/A
	Sample Mix Time	299.99	0	2	min
	Sample Mix Settle Time	299.99	0	2	min
	Sample Sweep Time	299.99	0	0.25	min
	Sample Sweep Flow	500	0	100	mL/min
	Purge Time	299.99	0	11	min
	Purge Flow	500	0	40	mL/min
	Purge Temp	350	0	20	°C
	Condensate Purge Temp	250	20	20	°C
	Dry Purge Time	299.99	0	0.5	min
	Dry Purge Flow	500	0	100	mL/min
	Dry Purge Temp	350	20	20	°C
Desorb	MeOH Needle Rinse	ON	OFF	ON	N/A
	MeOH Needle Rinse Volume	27	0	2	mL
	Water Needle Rinse Volume	27	0	7	mL
	Sweep Needle Time	299.99	0	0.5	min
	Desorb Preheat Temp	350	20	245	°C
	GC Start Signal	None, Start, End or Both		Start of Desorb	N/A
	Desorb Time	299.99	0	2	min
	Drain Flow	500	0	300	mL/min
	Desorb Temp	350	20	250	°C
Bake	MeOH Glass Rinse	ON	OFF	ON	N/A
	Num of MeOH Glass Rinses	5	0	1	N/A
	MeOH Glass Rinse Volume	27	0	3	mL
	Num of Water Bake Rinses	5	0	1	N/A
	Water Bake Rinse Volume	27	0	7	mL
	Bake Rinse Sweep Time	299.99	0	0.25	mL/min
	Bake Rinse Sweep Flow	500	0	100	mL/min
	Bake Rinse Drain Time	299.99	0	0.4	min
	Bake Time	299.99	0	2	min
	Bake Flow	500	0	200	mL/min
	Bake Temp	350	20	280	°C
	Condensate Bake Temp	250	20	200	°C
Cryo	Focus Temp	300	-190	-150	°C
	Inject Time	299.99	0	1	min
	Inject Temp	300	-190	180	°C
	Standby Temp	300	-190	100	°C

Optimization: Overview

Recommended methods were created by Teledyne Tekmar that cover the vast majority of P&T applications that the Atomx has been design to complete. These methods have been installed during the TekLink™ installation. The supplied methods have been optimized to enhance system throughput without jeopardizing analytical performance. In most cases the supplied methods will not need to be modified to give satisfactory results, in rare cases subtle changes to the method can be made, as with any method development trade offs can be made to improve analytical performance at the cost of throughput or vice versa. This section will discuss some of the factors and practical recommendation to method development.

Optimization: General Parameters

TEMPERATURES

Temperature settings are common to all modes of operations. Therefore, when developing a method, determine temperature settings first.

The temperature range for the Atomx transfer line and valve oven is 20-250°C. These temperatures control the temperature of the transfer line to the GC and the valve oven area, respectively. For environmental samples, the most common temperature for the Atomx transfer line and valve oven is 140°C. Flavor and fragrance samples are usually run at higher line and valve temperatures.

The temperature range for the Atomx mount is 20-100°C. This temperature controls the heated zone where the glassware connects to the Atomx mount. The typical mount temperature is 90°C. In some cases the mount will be set to ambient temperature to allow for condensation of water prior to entering the sample pathway.

STANDBY

The Standby mode allows the temperatures of the analytical trap and the condenser to cool to a "ready state". The Atomx will not automatically advance from Standby to Purge Ready if the trap & condenser temperatures are above the Purge Ready and Condensate Ready temperature set points. The temperature range is 20-350°C for the trap and 20-250°C for the condenser. However, the typical setting is between 40-45°C for the trap. This is to prevent a sample from purging on to a hot trap, which may result in incomplete trapping and also allow the sample to begin to move on the sample needle slightly before the trap reaches ambient temp. This results in faster cycle times. The typical temperature setting for the condenser is 40-45°C when using the condenser for water removal. If the condenser is not being used as a condensate trap, it is typical to set the temperature the same as the transfer line and valve oven temperature. The condenser works most efficiently with lower temperatures. However, you may use higher temperatures to reduce the possibility of removing highly polar compounds such as ethanol.

The Standby Flow can be set on the Atomx to allow the system to have continual gas flow while the unit is sitting idle. This flow keeps the Atomx under positive pressure, which prevents lab air contamination to the system, and prevents oxygen from being introduced to the trap and tubing, which can result in deterioration. Typical Standby Flows are set between 5-10mL/min.

PURGE READY

Purge Ready tells the user that the trap & condenser have cooled below their respective set Standby temperatures and all other temperature set points have been reached. Once the unit has reached this mode, the user can initiate the run or the schedule will proceed to the next line.

PREPURGE

Prepurge Mode is only operational when the sample heater is installed. **Prepurge** allows the glassware to be swept with purge gas to remove oxygen in the headspace prior to heating the sample. Usually, **Prepurge Time** allows the volume of the glassware to be swept three times.

> **Note:** *Prepurge Flow should not exceed Purge Flow.*

The volumes of a 5mL and 25mL sparger are 11mL and 34mL, respectively.

SAMPLE VIAL TEMP AND SAMPLE EQUILIBRATE TIME

The user may choose to warm the sample to room temperature before taking an aliqout of water. This could be useful in units that have the chiller option installed. For soil analysis the sample vial temperature is usually set to 40°C for purging in the vial.

SPARGE VESSEL TEMPERATURE

Sparge Vessel Temperature is not used unless the sample heater is installed. The sample temperature range is 20-90°C. For environmental samples, the typical range is ambient-60°C. Flavor and fragrance analysis may have much higher temperatures. The heater remains at this setpoint during all modes of the method.

PURGE

During **Purge**, gas is passed through the sample. This causes volatiles to be removed for analysis. **Purge** has two controlling factors: the duration of purging and the flow rate of the gas, this determines the total amount of gas passed through the sample referred to as the **Purge Volume**. In most applications, the **Purge Volume** should not exceed 600mL.

The recommended flow rate is 40mL/min. There are some applications where slower flow rates are helpful. For example, if you are looking for very light compounds, a slower flow rate will improve trapping efficiency. Faster flow rates can be used to increase efficiency. However, this increased linear velocity increases breakthrough potential for some absorbent traps.

The **Purge Volume** for most applications should be between 400-500mL. To deliver the correct **Purge Volume**, you must determine the correct **Purge Time**.

The recommended setting for the **Trap Purge Temperature** is 20°C. This disables the heater and allows the trap to cool to ambient temperature. A higher temperature decreases water absorption, but can also significantly decrease trapping efficiency for some of the target compounds.

The typical temperature setting for the condenser during **Purge** is 20°C when using the condenser for water removal. If the condenser is not being used as a condensate trap then it is typical to set a temperature the same as the transfer line and valve oven temperature. The condenser works most efficiently with lower temperatures. However, you may use higher temperatures to reduce the possibility of removing highly polar compounds such as ethanol.

DRY PURGE

Dry Purge causes "dry" purge gas to pass through the trap, pushing water off the trap and out to vent. In this mode the trap is already loaded with the compounds of interest, so purging for too long, too fast, or at too high of a temperature may result in a lower response due to breakthrough. Usually, the duration of **Dry Purge** is 0.5 to 6 minutes. A 0.5 to 2 minute **Dry Purge Time** should be used to achieve the highest efficiency. The **Dry Purge Flow** range is 5-500mL/min.; however, it is not recommended to exceed 300mL/min. The recommended **Trap Temperature** is ambient. This is referred to as **Dry Purge Temperature**. A higher temperature will improve water removal, but will reduce the volumeof purge gas that can be passed through the trap before significant loss of target compounds occurs.

Dry Purge is used to remove water from the trap. It should always be utilized when using a #1,#7,#8,#9, Vocarb 3000, or Vocarb 4000 trap since they are hydrophobic. It should, also, be utilized anytime the condenser is being used as a condensate trap.

Analytical trap specifications are displayed on page 3-16.

DESORB READY

Desorb Ready lets the user know that the trap has been loaded with VOCs and the Atomx is ready to desorb. If the GC is not ready, the Atomx will wait for the GC during this mode. While the Atomx is in this mode, there is no flow through the trap; the Atomx is in a static state.

CRYO COOLDOWN

Cryo Cooldown is not functional unless an optional cryofocusing module is installed. When the concentrator receives the **GC Ready** signal in **Desorb Ready**, the Atomx advances to **Cryo Cooldown**. During this mode, the cryotrap cools to allow refocusing during **Desorb**. The cryo is typically set anywhere between -180 and -50°C. The temperature is selected by considering column capacity and the analyte with the lowest boiling point.

The **Focus Temperature** is the low temperature maintained by the cryofocusing trap during desorb. The temperature you choose may vary from one analysis to another, depending on the following:

- The lightest compound in the sample
- Column flow rate
- If you are using an uncoated precolumn
- The column you are using (considering diameter, stationary phase, and film thickness). The higher the capacity of the column, the higher you can set the temperature. Lower capacity columns require lower temperatures for quantitative trapping. The table below lists recommended starting values.

Column Internal Diameter	Film Thickness	Cooldown Temperature
0.20mm	0.25µm	-130°C
0.32mm	1.00µm	-110°C
0.53mm	3.00µm	-95°C

When setting the **Focus Temperature**, keep the following in mind:

- The temperature you choose greatly depends on column type, as well as the compound's concentration and volatility.
- The lighter the compounds and the higher the concentration, the cooler you should set the temperature.
- Use the highest temperature possible to conserve coolant while maintaining good peak shape.

DESORB PREHEAT

Desorb Preheat is used to heat up the trap, without flow, to release the analytes from the sorbents. This is done to get a very tight "slug" or band of analytes to the GC. The goal is to make the "slug", as closely as possible, resemble a direct injection. A typical **Desorb Preheat Temperature** is 5°C below the **Desorb Temperature**. The Atomx will hold in this mode for 0.33min to ensure full heat transfer to the center of the trap. Analytical trap specification are displayed on page 3-16.

DESORB

In **Desorb**, the 6-port valve rotates to backflush analytes from the analytical trap to the GC. You must select time and temperature values for **Desorb**. The temperature should be selected on the basis of what type of trap you are using. The **Desorb Temperature** range is 20-350°C. Typical values range between 180-260°C. The duration of **Desorb** must be selected with column I.D. and flow rate in mind. You must consider flow rate because the trap is desorbed with carrier gas flow. Allow enough time to fully desorb the compound with the highest boiling point. Time values range from 0.5-8 minutes, depending on flow rates.

The **Drain Flow Rate** should be set to 200-300mL/min. This flow rate is regulated by the MFC to allow the sample to be drained from the glassware prior to stepping to **Bake**. The **Drain Flow Rate** should be set high enough to ensure that the sample is completely drained during the mode. If the sample is not fully removed, it will continue to drain during **Bake**.

Analytical specifications are displayed on page 3-16.

INJECT

Inject is functional only when an optional Cryofocusing Module is installed. The temperature range is 20-300°C. **Inject Time** can range from 0-99.99 minutes. In this mode, the cryotrap is heated to release the analytes into the GC column. The temperature chosen must be high enough to drive the least volatile component out of the cryofocusing area, yet not so high as to break down the coating of the column. Set the temperature to the same value as the final temperature of the oven temperature program. The time value chosen is not as critical as the temperature value. It must be sufficiently long enough to allow the cryotrap time to reach the temperature setpoint. The cryotrap heats at a rate of approximately 500°C per minute. Typical time values are 0.75-2 minutes.

The **Inject Temperature** is the temperature to which the Cryofocuser is heated to release sample components (analytes) onto the GC column. The temperature you choose may vary from one analysis to another based on the following:

- The heaviest compound in the sample
- Column flow rate
- The column you are using (considering the diameter, stationary phase, and film thickness)

Set the **Inject Temperature** high enough to rapidly drive the least volatile component out of the cryofocusing trap. The higher the capacity of the column, the higher the temperature can be set.

Note: *As a general rule, the maximum temperature of the GC temperature program is adequate for the inject temperature.*

Do not set the inject temperature too high. Excessive heat will break down the stationary phase or the polymide coating of the column.

The **Inject Time** is the duration (in minutes) of the inject step. During the inject step the Cryofocuser is maintained at its high temperature to release analytes onto the GC column.

Set the inject time so that it is long enough for the cryofocus trap to reach the desired temperature. Add at least 0.25 minutes longer than necessary to reach the desired temperatures. Typical values are 0.50 to 1.00 minute.

WATER RINSING

A water source must be supplied to the unit to allow the system to rinse the applicable sample pathway with Hot Water prior to a subsequent inert gas flush. The rinse defaults to 7mL for the glassware rinse and 7mL for the needle rinse, this accomplishes two requirements; drastically lower cross contamination and limits the water usage to less than 10L per 80 water samples. Note the method also allow the user to select the number of rinses to be completed. To optimize this parameter a high concentration standard such as the high point of your calibration curve, should be completed followed by two blanks, the percent carryover can be calculated by dividing the area count for a compound in the blank by the area count for the standard and multiplying by 100. Repeat this test varying the volume ofwater used or the number of rinses to determine the optimal carryover to water usage for the application.

METHANOL RINSING

Turning the Methanol Rinse "On" will allow the system to rinse the applicable sample pathway with Methanol prior to rinsing with water and subsequent inert gas flush. This option can only be used when a source of Methanol is connected to the system. It is recommended to use a minimum amount of Methanol to reduce the solvent usage. The rinse defaults to 3mL for both the glassware rinse and the needle rinse, this accomplishes two requirements; drastically lower cross contamination and limits solvent usage. Note the method also allow the user to select the number of Methanol rinses to be completed. To optimize this parameter a high concentration standard such as the high point of your calibration curve, should be completed followed by two blanks, the percent carryover can be calculated by dividing the area count for a compound in the blank by the area count for the standard and multiplying by 100. Repeat this test varying the volume of Methanol used or the number of rinses to determine the optimal carryover to Methanol usage for the application.

BAKE

Bake is used to regenerate the trap and condenser for the next run. This removes any volatiles remaining on the trap and any water in the system. During **Bake**, flow is passed through the sample pathway with temperatures for the analytical trap and the condenser elevated to help clean the system. **Trap Bake Temperatures** should be selected based upon the type of trap being used in the Atomx; typical **Trap Bake Temperatures** can range from 180-300°C. If the condenser has been used as a condensate trap, the temperature will typically be set to between 150-200°C for **Bake**. If the condenser is not being used to remove water, it will be held steady with the transfer line and valve oven temperatures. Flow rates for bake can range between 5-500mL/min. If cycle time is being minimized, a flow rate of 200-400mL/min is recommended for 2-4 minutes. Too short of **Bake Time** can result in higher carryover. Analytical trap specification are displayed in the section below.

ANALYTICAL TRAP SPECIFICATIONS

Description	Part #	Standby Temp	Dry Purge Flow	Dry Purge Time	Dry Purge Temp	Desorb Preheat Temp	Desorb Temp	Bake Temp
(#1) Tenax	12-0083-403	35	100	0.5	20	220	225	230
(#2) Tenax/Silica Gel	12-0084-403	35	0	0	N/A	220	225	230
(#3) Tenax/Silica Gel/Charcoal	14-0124-403	35	0	0	N/A	220	225	230
(#4) Tenax/Charcoal	14-1457-403	35	100	0.5	20	220	225	230
(#5) OV-1/Tenax/Silica Gel/Charcoal	14-2366-403	35	0	0	N/A	220	225	230
(#6) OV-1/Tenax/Silica Gel	14-1755-403	35	0	0	N/A	220	225	230
(#7) OV-1/Tenax	14-3347-403	35	100	0.5	20	220	225	230
(#8) Carbopak B/Carbosieve S-III	14-3928-403	35	100	0.5	20	245	250	260
(#9) Trap (Proprietary)	14-9908-403	35	100	0.5	20	245	250	280
(#10) Tenax/Silica Gel/Carbosieve S-III	14-9909-403	35	0	0	N/A	220	225	230
VOCARB 3000	14-5864-403	35	100	0.5	20	245	250	280
VOCARB 4000	14-5865-403	35	100	0.5	20	245	250	280
BTEX	14-5866-403	35	100	0.5	20	245	250	280
BTEX + MTBE	14-9333-403	35	100	0.5	20	245	250	280

Table 3-1: Analytical Trap Specifications

SPECIFIC OPTIMIZATION FOR METHANOL EXTRACTION METHODS

Sample Volume:
Solid samples should not exceed 10 grams in most cases, if larger sample sizes are used there is a high probability that the solid sample can be pulled into the 3-stage needle. The weight is dependent on the density and density variation of the solid sample. Soil samples in particular have widely varying densities thus a sample size needs to be selected that will limit the potential of solid material being introducing into the system via the 3-stage needle. We recommend a 5g sample for optimum performance.

Matrix Spike:
To monitor the efficiency of the extraction a matrix spike could be added to the solid sample when the methanol is introduced to the vial. This can be automatically done be way of standard position number 3 on the Atomx unit. In many cases the methanol and matrix spike will be added by the user manually at the time the sample is measured and transferred to the vial.

Methanol Volume:
When completing Methanol extractions a minimum of 12mL of total volume (sample & Methanol) needs to be in the vial to allow for the methanol extract to be decanted off for analysis. A 5g sample and 10mL of methanol or a 7g sample and 7mL methanol are the recommended parameters for optimum performance.

Settle Time:
The settle time should be determined to allow the solid to settle to the bottom of vial prior to decanting the Methanol extract out of the vial. The settle time is used for two reasons, first to allow adequate time for the VOC to equilibrate between the solid and the methanol and secondly to reduce the chance of solid material being introduces into the 3-needle and subsequent sample pathway.

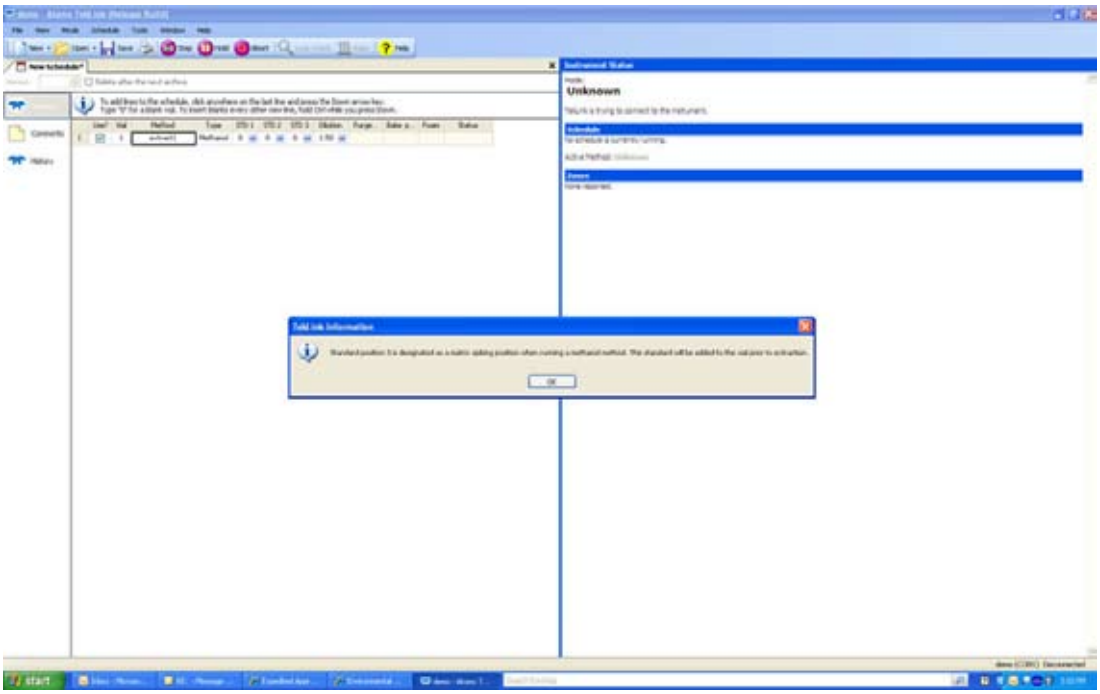

Figure 3-1: Atomx spiking

When using spiking position #3, the Atomx adds the spike to the methanol stream prior to dispensing it into the vial for the extraction. Therefore, a higher concentration is needed due to the dilution that occurs in the methanol during extraction and again in the final dilution in water prior to purging in the sparge vessel.

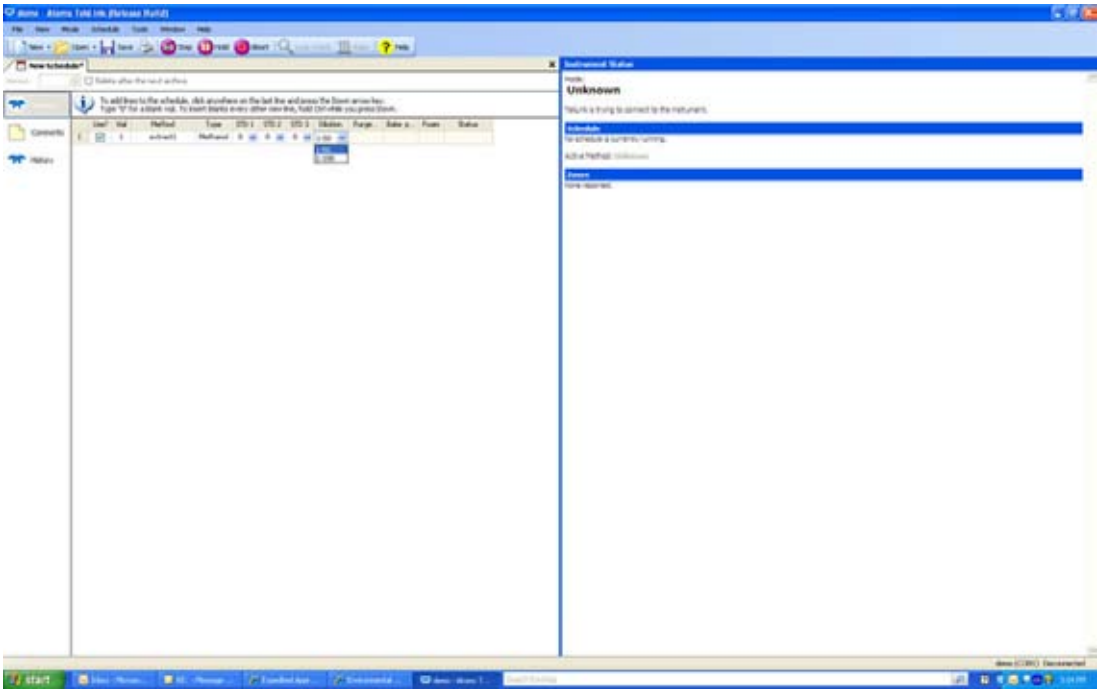

Figure 3-2: Dilution factor

Note: *The dilution factors are based on a 5mL final sample volume, therefore a dilution factor of 50 will equal 100µL of extract used and a factor of 100 will use 50µL of extract.*

Chapter 4:
Teklink™

Software Configuration

The Atomx uses gas chromatography to analyze samples. Operating under microprocessor control, it processes a discrete sample, or multiple samples loaded from the integrated autosampler. When programmed with custom methods, this system is capable of operating at different time and temperature parameters and running different analytical sequences on specified samples.

Using a personal computer, running Microsoft Windows XP Pro or higher, TekLink™ enables you to program, monitor, schedule, and control custom operating sequences for up to four instruments.

Before setting up methods and running samples, familiarize yourself with the TekLink™ software. To run properly, TekLink must recognize and be configured correctly with the Atomx.

LOGGING IN

When you start TekLink™, the first screen that appears is the **Login** screen. Enter your user name and password, then click the **Login** button to continue.

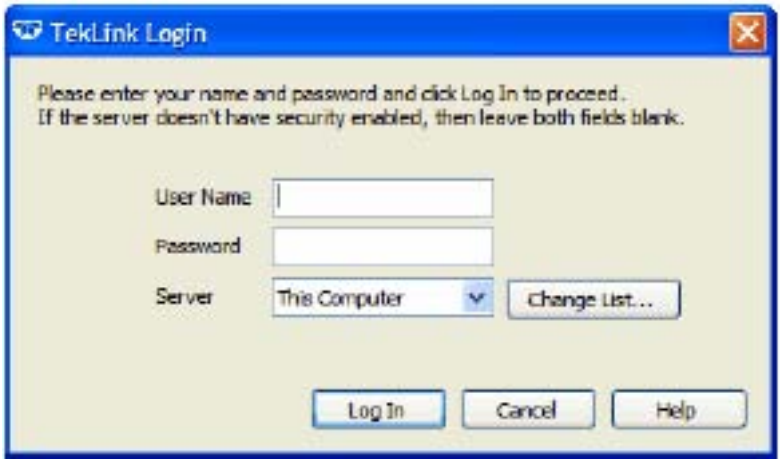

Figure 4-1: Login screen

SELECTING AN INSTRUMENT TO WORK WITH TEKLINK™

After you log in, the **Connect to Instrument** screen appears. You must select an instrument to work with TekLink™.

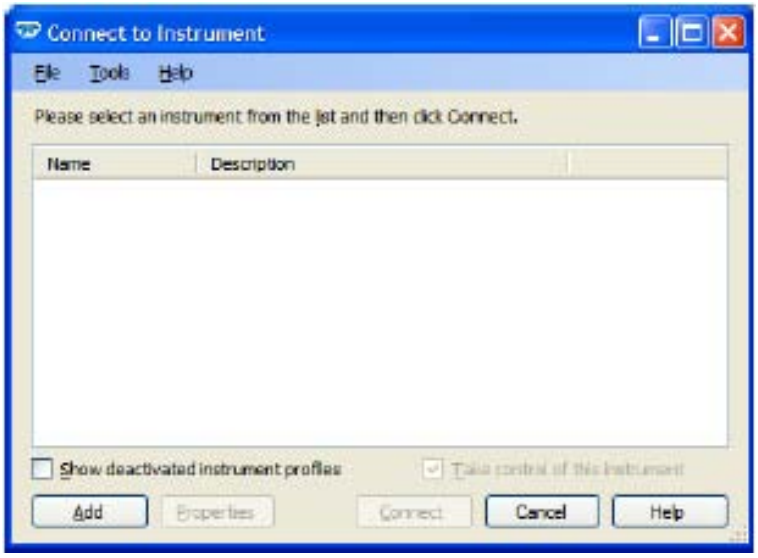

Figure 4-2: Connect to Instrument Screen

Clicking the **Add** button causes the **Add Instrument** screen to appear. From this screen you can select, from the drop list, one of the available ports that the instrument will use for communication. You must specify a unique name for the instrument. This process can be repeated for each additional instrument or autosampler connected to your PC. TekLink™ can only support a maximum of four instruments.

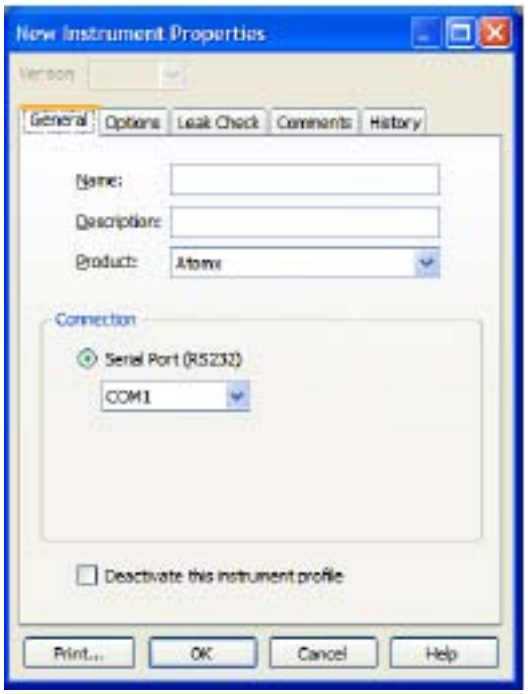

Figure 4-3: Add Instrument Screen

To specify the configuration of the unit, click the **Options** tab. From this screen, shown below, the user can configure the following options: Enable the Beeper, Enable the Cryofocusing Module, Enable the Guardian Foam Sensing and select its functionality, Configure the system to function with Helium of Nitrogen as the Purge gas supply and configure the GC communication requirements as noted in the instruction sheet supplied with the GC/IO cable.

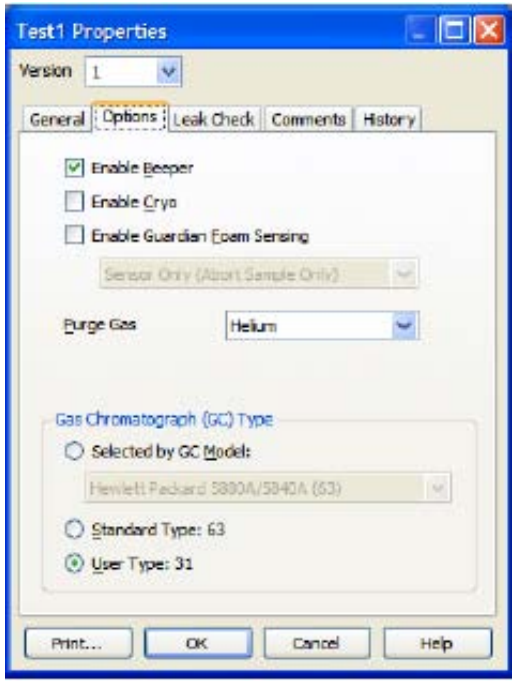

Figure 4-4: Configuration screen - Options tab

From the **Leak Check** tab the parameters used to test can be adjusted. These parameters should not require any changes unless the Atomx is equipped with 25mL glassware, in this case the **Leak Check Pressurize Time** should be increased from 1 to 2 minutes.

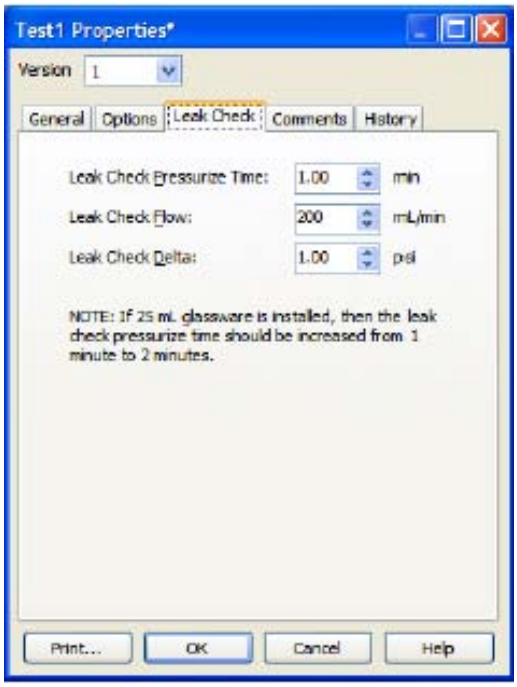

Figure 4-5: Configuration screen - Leak Check tab

To verify the name and status of the active unit, view the **Instrument Status** window of the **Main** screen.

CONFIGURING THE ATOMX WITH TEKLINK™

To specify the configuration of an active unit, click **Tools | Configuration**.

The subsections below describe the contents of the **General**, **Options**, and **Leak Check** tabs in the **Configuration** screen. The **Comments** tab contains a text box in which comments can be placed and has no other function. The **History** tab displays the history of the instrument profile.

Configuration - General Tab

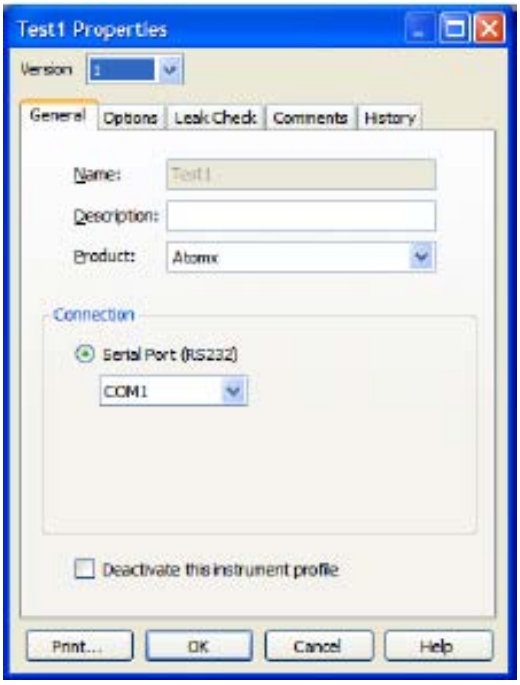

Figure 4-6: Configuration - General Tab

Name - name of the active or selected instrument.

Description - A user-defined, brief set of text indentifying the instrument.

Product - defaults to the Atomx.

Connection - displays the connection options. A COM port must be selected from the dropdown menu when connecting via serial port.

Deactivate the Instrument Profile - disables the instrument profile.

Configuration - Options Tab

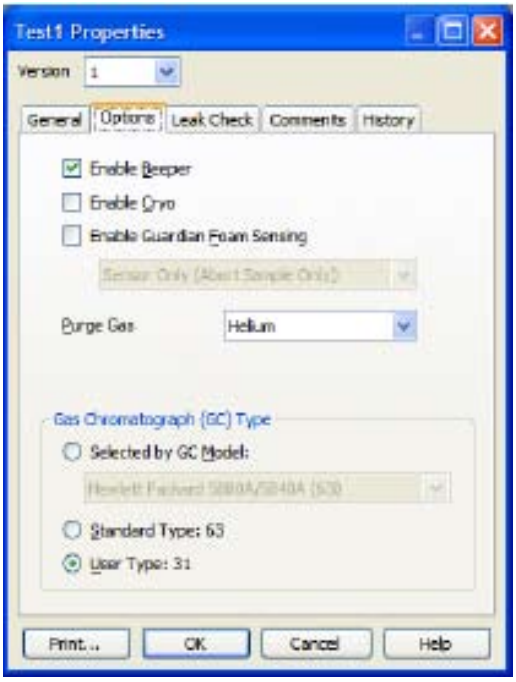

Figure 4-7: Configuration - Options Tab

Enable Beeper - toggles the associated feature ON or OFF. When ON, it allows the instrument to use an onboard speaker to create audible alarms in the event of an error.

Enable Cryo Option - toggles the associated feature ON or OFF. This should only be turned on if the Cryo accessories are installed.

Enable Guardian Foam Sensing - toggles the associated feature ON or OFF. This should only be turned on if the foam sensing accessories are installed. When this feature is on, you must select a configuration setting from the drop-down menu directly below it. There are four options available from the drop-down menu:

- Sensor Only (Abort Sample Only)
- Sensor Only (Abort Schedule)
- Eliminator (Abort Sample Only)
- Eliminator (Abort Schedule)

See the *Guardian Foam Sensor* and *Guardian and Eliminator* sections in Chapter 1 for more information.

Purge Gas - Specifies the type of carrier gas. You can specify to use either ultra high purity helium or nitrogen, the system defaults to helium. If this configuration is made incorrectly the gas flow from the Mass Flow Controller will not be accurate.

Gas Chromatograph (GC) Type - specifies the type of gas chromatograph system. To change the type, follow the directions below.

1. Select the **Selected by GC Model** radio button and attempt to find and select your GC from the drop list.
2. If you cannot find your GC on the predefined list, follow the GC/IO cable instructions or reference the table below to determine whether you need to select the **Standard Type** or **User Type** radio button.

The input/output characteristics of the GC, as it interacts with the Atomx, determine the GC type classification. Refer to your GC User Manual or I/O cable diagram for information on GC configuration.

GC/IO Cable & GC Type Reference		
Part #	**GC System**	**GC Type**
14-2372-000	Shimadzu 9A	31
14-3171-000	HP 5890	31
14-3172-000	Perkin-Elmer Sigma Series	31
14-3176-000	Tracor 540/800 Series MS	63
14-3312-000	HP5890 with RTE and HP-1000 GC/MS software with 5970MSD or 5988 MS	63
14-3316-100	Varian 3700	63
14-3319-000	HP 5995 GC/MS with Chemstation/Quicksilver software	63
14-3320-000	General HP GC/MS with RTE Software	31
14-3335-000	Perkin-Elmer 8000 Series or 9000 Autosystem/Clarus	63
14-3569-000	Varian 3300, 3400, and 3600 Series without Serial I/O	63
14-4188-074	HP 5890 with 5970 MSD or 5988 MS with Unix or Pascal based Chemstation	63
14-4610-074	Shimadzu 14A, 15A, and 17A	63
14-4652-074	HP 5890 with 5971 MSD (MS/DOS) or HP Engine GC	63
14-4938-074	Carlo Erba Vega/Mega or 8000	63
14-5044-074	1 or 2 units to a Varian 3400/3600/Data System/Integrator (with Serial I/O)	63
14-5397-074	2 units to a Perkin-Elmer 8000 Series or 9000 Autosystem	63
14-6689-074	HP 6890/7890	31
14-7396-086	Varian 3800/430/431	63

Table 4-1: GC Type Quick Reference

Configuration - Leak Check Tab

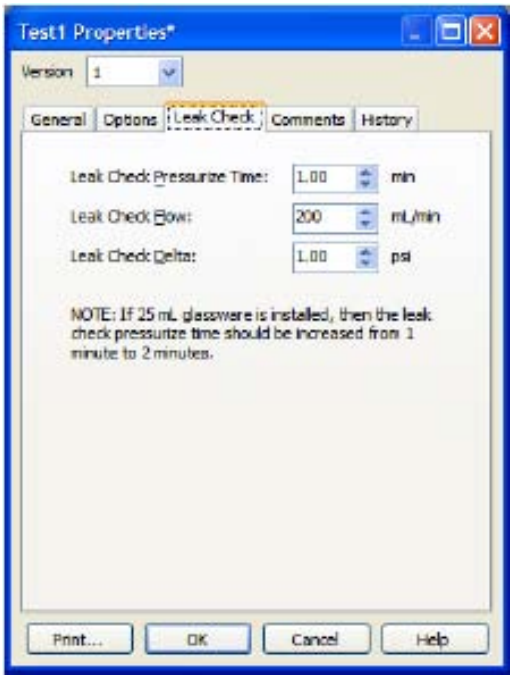

Figure 4-8: Configuration - Leak Check Tab

Leak Check Pressurize Time - the amount of time that the system waits after fully pressurizing before taking the leak check pressure reading.

> **Note:** *If you are using the 25mL glassware, change the **Leak Check Pressurize Time** to 2 minutes.*

Leak Check Flow - the flow rate for the pressurization of the system during leak check.

Leak Check Delta - the allowable difference in the pressure setting and the pressure reading after the leak check pressurize time has expired.

TekLink™ Icons and Menus

Situated below the TekLink™ Menu is a bar containing icons. These icons allow you easier access to some of the more commonly used menu items and commands.

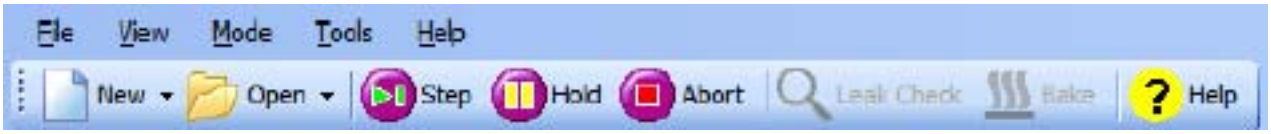

Figure 4-9: Atomx Toolbar Icons

FILE MENU

From the **File** menu you can access the options for opening, saving, printing, and accessing methods and schedules. The menu on the left is the menu that is displayed when there are no methods or schedules open. The menu on the right is the menu that is displayed when there is a method and/or a schedule open.

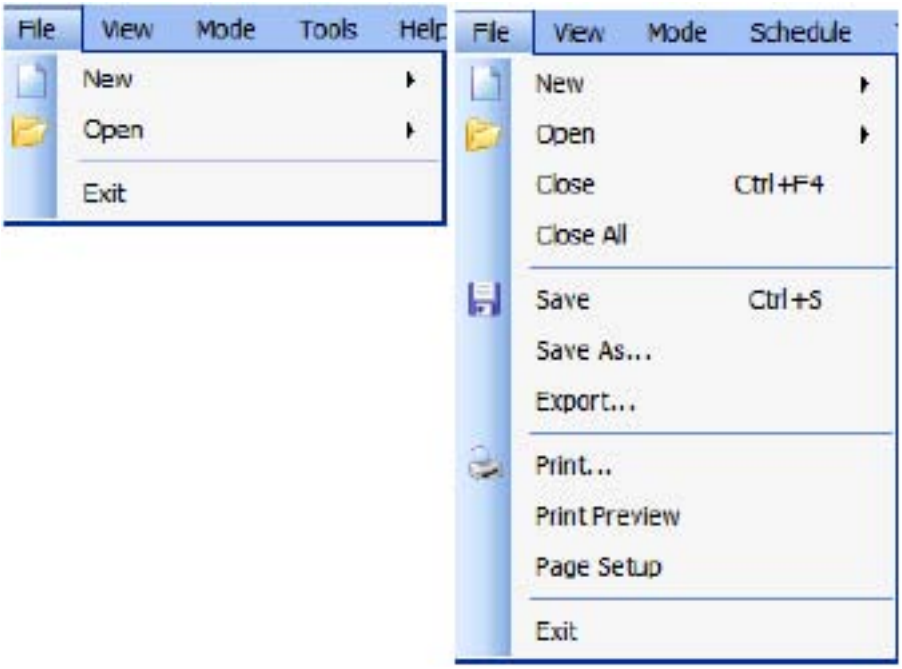

Figure 4-10: File Menu

New - Opens another menu where you can choose to create a new schedule or method.

Open - Opens another menu where you can choose to open an existing schedule, method, or import CSV files.

Close - Closes the active window.

Close All - Closes all open windows.

Save - Saves the active window.

Save As - Opens the Save As screen where the user can create or modify the name or location of the file of the active window.

Export - Exports the data.

Print - Prints the active window.

Page Setup - Opens the Page Setup screen.

Print Preview - Opens a preview of the printout.

Exit - Exits Teklink™.

VIEW MENU

From the **View** menu you can select whether to display the **Toolbar, Status Bar**, and **Unit Status** pane. A checkmark next to the menu item indicates it is being displayed. Also, you can select to show the Active Schedule, Active Methods, and the System History Log.

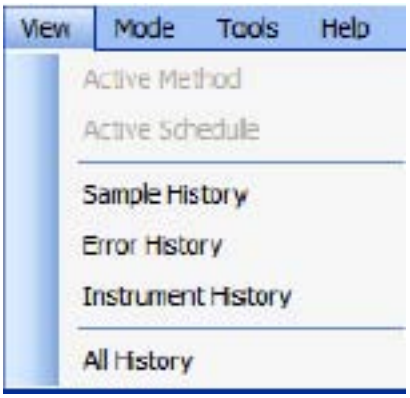

Figure 4-11: View Menu

Active Method - Displays the active method.

Active Schedule - Displays the active schedule.

Sample History - Displays the Sample History Log.

Error History - Displays the Error History Log.

Instrument History - Displays the Instrument History Log.

All History - Displays the All History Log.

MODE MENU

From the **Mode** menu, you can access the functions featured below. These commands put the unit in the selected mode, and also give the user the option to perform other functions. Functions are available depending on your system configuration. Items that are inaccessible are not relevant to your current configuration.

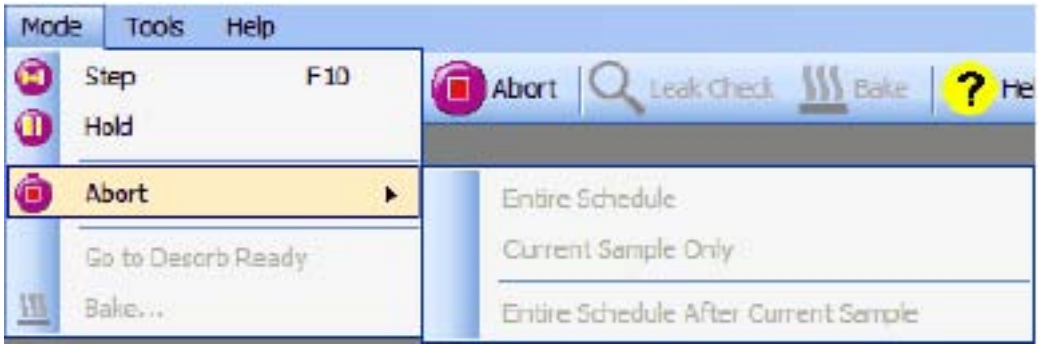

Figure 4-12: Mode Menu

Step - Moves the unit to the next mode.

Hold - Pauses the unit in its current mode.

Abort | Entire Schedule - Aborts the current schedule, steps the Atomx to **Bake**, drains the contents of the glassware, then steps to **Standby** for the first scheduled method.

Abort | Current Sample - Aborts the current sample, steps the Atomx to **Bake**, drains the contents of the glassware, then continues to the next scheduled sample.

Abort | Entire Schedule After Current Sample - Finishes the current sample, aborts the rest of the schedule, and then goes to **Standby**.

Go to Desorb Ready - Sets the unit to the **Desorb Ready** mode.

Bake - Heats the analytical trap and condenser as directed in the **Bake** mode parameters.

TOOLS MENU

The functions available through the **Tools** menu vary according to your configuration. Menu functions that are inaccessible cannot be accessed due to your connection status or the current mode of operation. Most diagnostic tools can only be accessed in **Standby** mode.

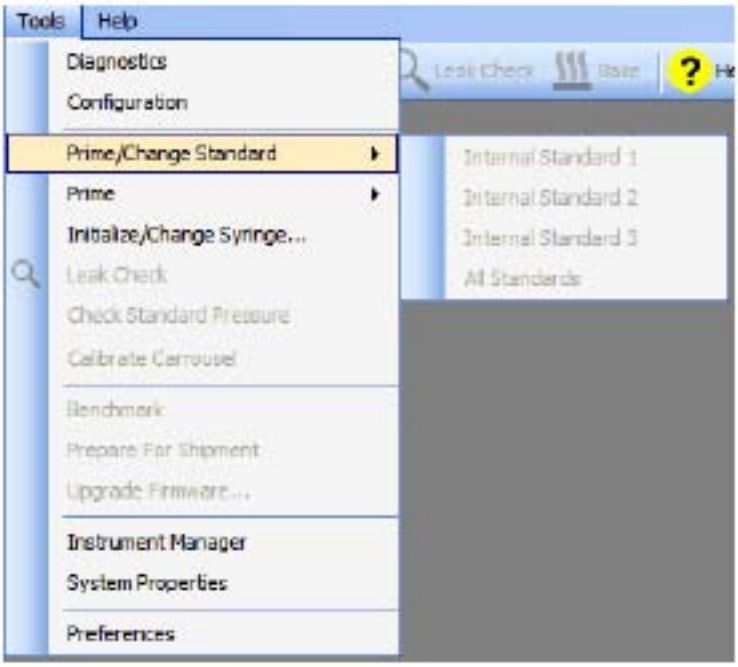

Figure 4-13: Tools Menu

Diagnostics - Displays the Diagnostics screen.

Configuration - Displays the Configuration screen.

Prime/Change Standard | Internal Standard 1 - Removes air bubbles present in the lines so that the proper volume of standard can transfer to the injection valve.

Prime/Change Standard | Internal Standard 2 - See Internal Standard 1.

Prime/Change Standard | Internal Standard 3 - See Internal Standard 1.

Prime/Change Standard | All Standards - See Internal Standard 1, but for all Standards.

Prime | Water - Removes air bubbles from the lines after changing the water reservoir.

Prime | Methanol - Removes air bubble from the lines after changing the methanol reservoir.

Initialize Syringe - Starts the Initialize Syringe Wizard, which will guide the user through the step to reinitialize the syringe.

Leak Check - Checks the system for leaks.

Check Standard Pressure - Checks the pressure in the internal standard vessels.

Calibrate Carousel - Recalibrates the carousel.

Benchmark - Displays the Benchmark screen.

Prepare For Shipment - Initiates a series of commands to prepare the unit for shipment.

Upgrade Firmware - Displays the Upgrade Firmware screen.

Instrument Manager - Displays the Instrument Manager screen.

System Properties - Displays the System Properties screen.

Preferences - Displays the Preferences screen.

METHOD AND SCHEDULE MENUS

These menus are only available when you have a method or schedule open in TekLink™.

Figure 4-14: Method and Schedule Menus

Creating and Using Methods

After you have installed and configured the Atomx, you can create customized methods (operating sequences) that meets your analytical requirements.

After connecting the required instruments and configuring your PC's COM ports to recognize the connected units, you can click **Open | Water/Soil/Methanol Method** to review and edit methods.

USING THE METHOD EDITOR

The **Method Editor** is broken into several selections in a side window showing parameters that effect specific areas of a sample analysis. First, click on the appropriate icon to display the parameter of interest (see Figure 4-15, 4-16, 4-17, and 4-18). The right hand side of the **Method Editor** will give a brief description of the method variable as well as the maximum and minimum values that can be selected.

To make changes to the method:

1. Select the parameter that you wish to edit by clicking your cursor in the appropriate box beside the parameter.
2. Use the number keys to change the parameter value.
3. Press Enter, Tab, or click another cell to save the change.
4. Once the method has been appropriately changed, save the method by clicking **File | Save** or the **Save** button in the toolbar.

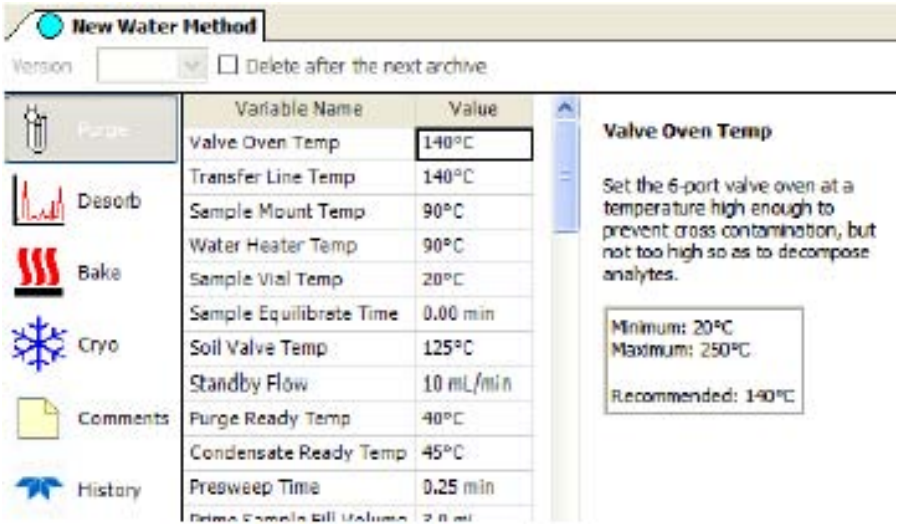

Figure 4-15: Method Editor - Purge

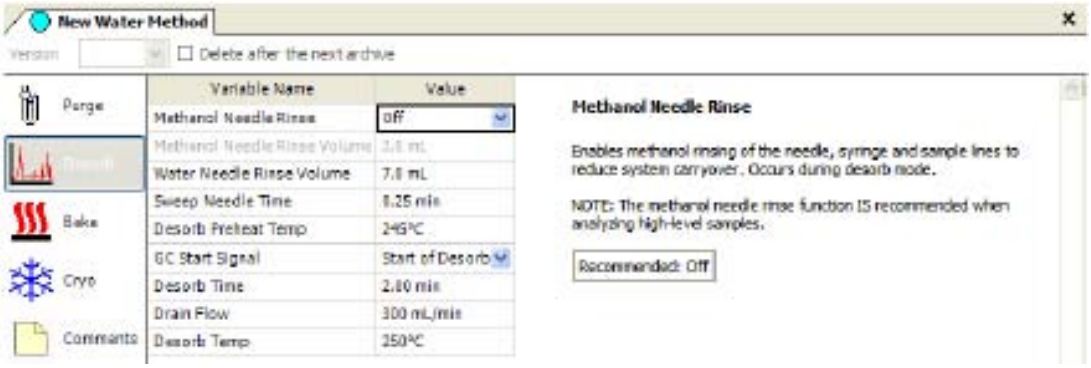

Figure 4-16: Method Editor - Desorb Tab

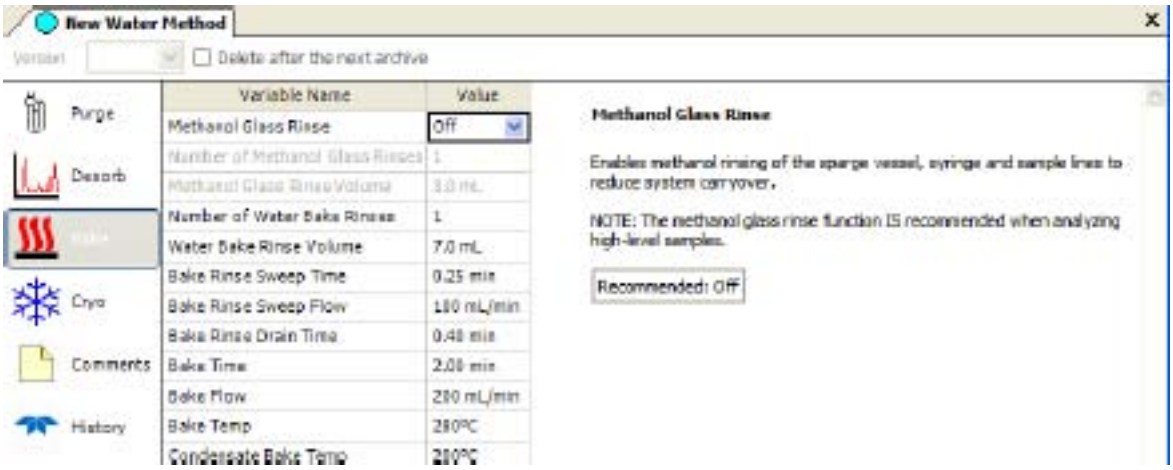

Figure 4-17: Method Editor - Bake Tab

Figure 4-18: Method Editor - Cryo Tab

UPDATING AN ACTIVE METHOD

To change a method:

1. Click the active method in the **Instrument Status** pane.
2. Make the desired changes to the **Purge, Desorb, Bake**, or **Cryo** screens.
3. Once changes are made, click the **Update and Save** button on the right-hand, top-corner of the screen to update the active method.

Building and Editing Schedules

After creating customized methods, you can define method schedules that specify samples, operating sequences, and the order in which they run. You can build a new schedule using **File | New | Schedule** or by clicking the **New** button then selecting **Schedule** from the drop-down menu.

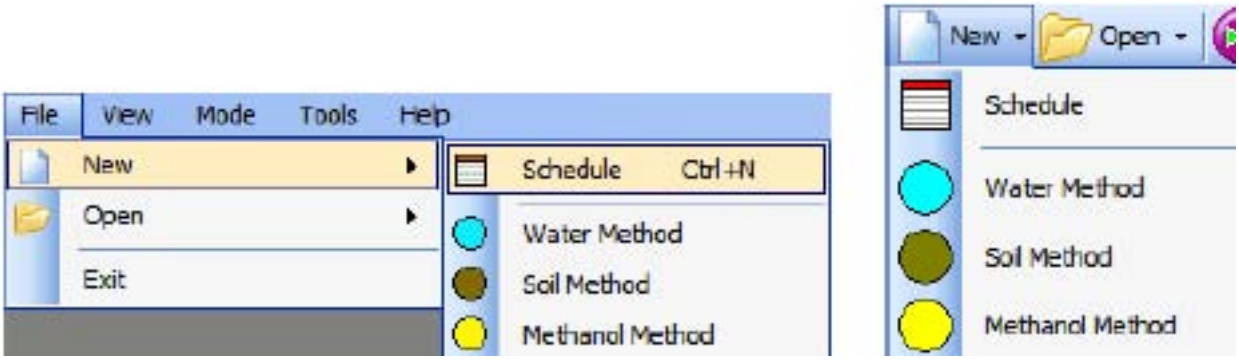

Figure 4-19: Creating a New Schedule

When you click **New | Schedule**, a screen similar to the one below appears:

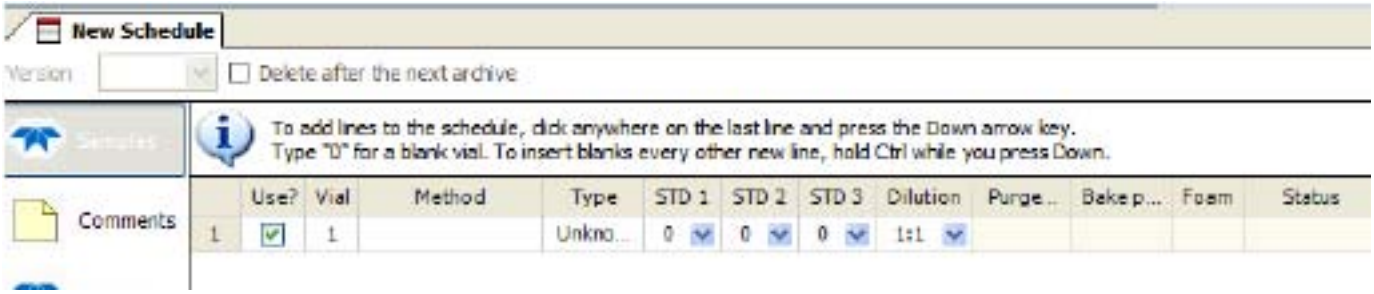

Figure 4-20: New Schedule

The schedule window displays a section with the selections: **Samples, Comments**, an **History**. The default selection is **Samples**, which displays the sample schedule. Clicking on **Comments** will change the sample schedule section to a comments section where comments can be placed for the sample schedule. Clicking on **History** will display the history of the sample schedule.

Method Selection

Click in the **Method** field to open the directory where your methods are stored. The file name of the methods you select appears in that field.

SCHEDULE EDITOR

An existing chedule can also be edited by clicking **File | Open**. Browse to the folder where you store your schedules and open the desired schedule.

Note: *You can make schedule changes while the Atomx is running, but you cannot change a line of the schedule that is currently running, or has completed. Changes can only be made to the lines of the schedule that have not yet executed.*

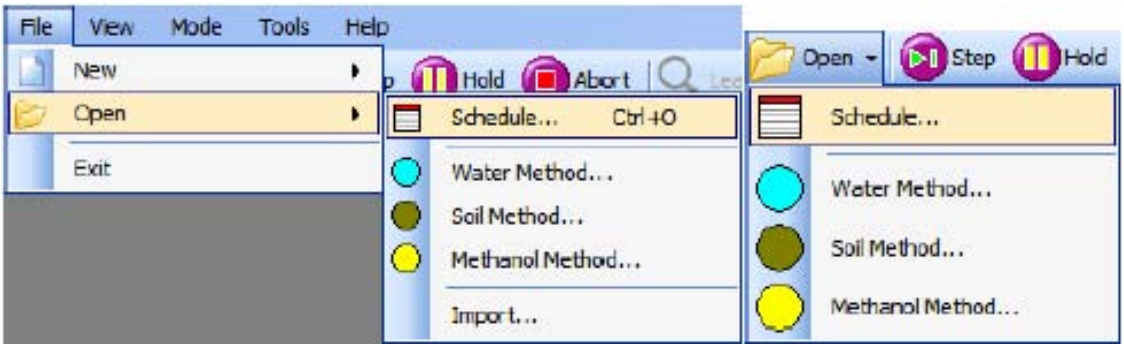

Figure 4-21: Opening an Existing Schedule

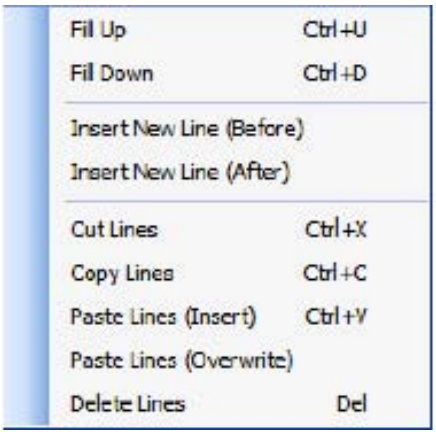

Figure 4-22: Right-Click Menu

To edit a schedule, click on the line number you wish to change.

To add, delete, cut, copy, or paste a line of the schedule, right-click with the mouse and select from the menu. Select the line where you want the action to occur.

Save and Upload

Select **Save and Upload** to save the method and load the schedule to the Atomx.

Start

Allow the system to reach the set temperatures for all zones then click the **Step** button to start the schedule.

UPDATING THE ACTIVE SCHEDULE

There are several ways to open or view the active schedule shown below:

- Click **View | Active Schedule**.
- Clicking the active schedule displayed in the **Instrument Status** pane.

Software Features

DIAGNOSTICS

Use of the Diagnostics screen by untrained users can cause damage to the Atomx.

The **Diagnostics** screen can be accessed by clicking **Tools | Diagnostics**. In this screen you can run individual diagnostics for specific components.

Note: *The Diagnostics screen is only accessible from Standby or Purge Ready.*

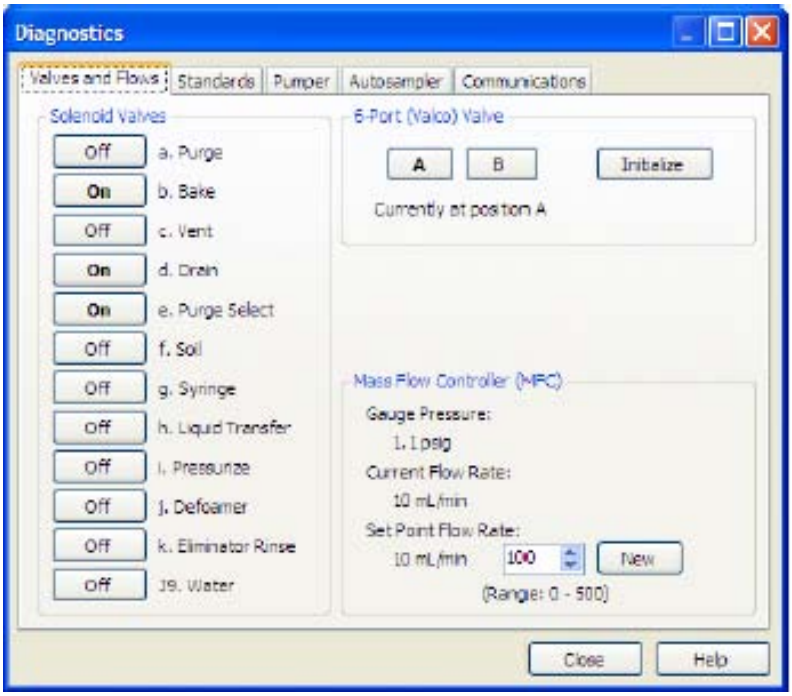

Figure 4-23: Diagnostics - Valves and Flows Tab

The **Valves and Flows** tab in **Diagnostics** allows the user to toggle valves **ON** and **OFF** to test them individually. The 6-port valve can be toggled to its two positions or initialized. The Mass Flow Controller (MFC) can also be tested. The flow rate can be manually set and the actual flow and pressure can be observed.

Standards Tab

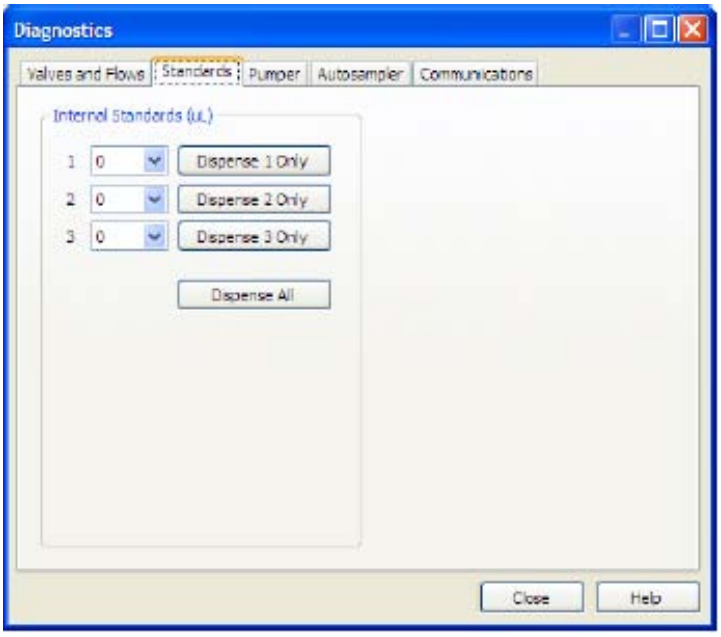

Figure 4-24: Diagnostics - Standards Tab

The **Standards** tab allows the user to dispense a designated amount of internal standard individually or as a group the volumes are 1, 2, 5, 10, and 20µL.

Pumper Tab

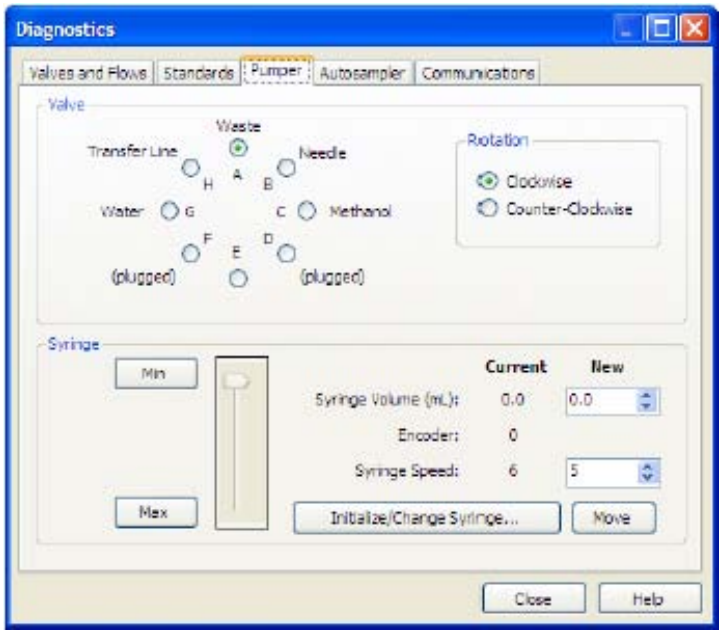

Figure 4-25: Diagnostics - Pumper Tab

The **Pumper** tab displays a **Valve** field, a **Syringe** field, and a **Rotation** field.

The **Valve** field displays the current position of the valve pictorially, a set of radio buttons with which to set the valve positioning.

The **Rotation** field displays a **Clockwise** and **Counter-Clockwise** option. Choose which way you want the valve to rotate with these options.

The **Syringe** field displays a slider bar, series of buttons, and text boxes with which to manipulate the position and speed of the syringe. It also displays the current status of the **Syringe Volume** and **Syringe Speed**.

The slider bar shows the current absolute position of the syringe relative to the maximum and minimum positions. It also allows for real-time manipulation of the syringe volume.

The **Min** button to the left of the slider bar moves the syringe to the minimum or zero position.

The **Max** button to the left of the slider bar moves the syringe to the maximum position.

The **Initialize** button starts the Initialize/Change Syringe Wizard.

The **Move** button moves the syringe volume and syringe speed to the values entered in the text boxes above.

Autosampler Tab

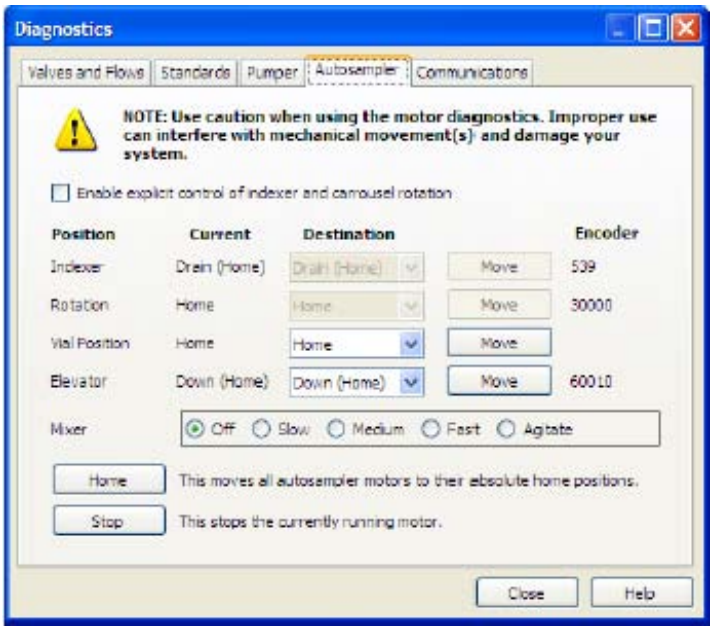

Figure 4-26: Diagnostics - Autosampler Tab

Use caution when using the motor diagnostics. Improper use can interfere with mechanical movement(s) and damage your system.

The **Autosampler** tab displays the current positions of the indexer, carousel, and elevator along with their encoder values.

The **Enable explicit control of indexer and carousel rotation** box, when selected, allows for independent selections for the indexer and carousel rotation. If it is not selected the destination droplists and **Move** buttons for the separate **Indexer** and **Rotation** components will be greyed-out and unusable.

The **Position** field lists the components that can be manipulated.

The **Current** field lists the current position for the corresponding component.

The **Destination** field displays a droplist containing valid destinations for each component.

The **Move** button causes the corresponding component to move to the position designated in the **Destination** field.

The **Home Motors** button commands the Atomx to move all of the autosampler parts to their home locations.

The **Mixer** field displays a series of radio buttons with which the mixer speed can be manipulated.

The **Stop** button stops the current running motor.

Communications Tab

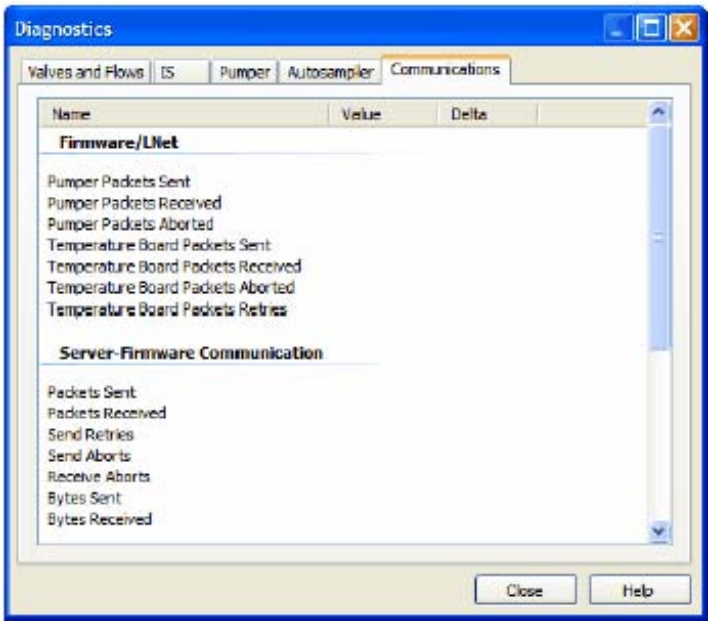

Figure 4-27: Diagnostics - Communications Tab

The **Communications** tab provides data on system communications between the boards in the Atomx and between TekLink™ and the Atomx itself. It records signals sent, received, aborted, and retried.

BENCHMARK

The **Benchmark** screen can be accessed by clicking **Tools | Benchmark**. The **Benchmark** screen contains an interactive program that tests heaters, LEDs, and the continuity of inputs and outputs on the CPU board. Enter your name in the area provided. Click the **Start Benchmark** button to start the **Benchmark Test**. During the test, the system will present a series of questions to the user.

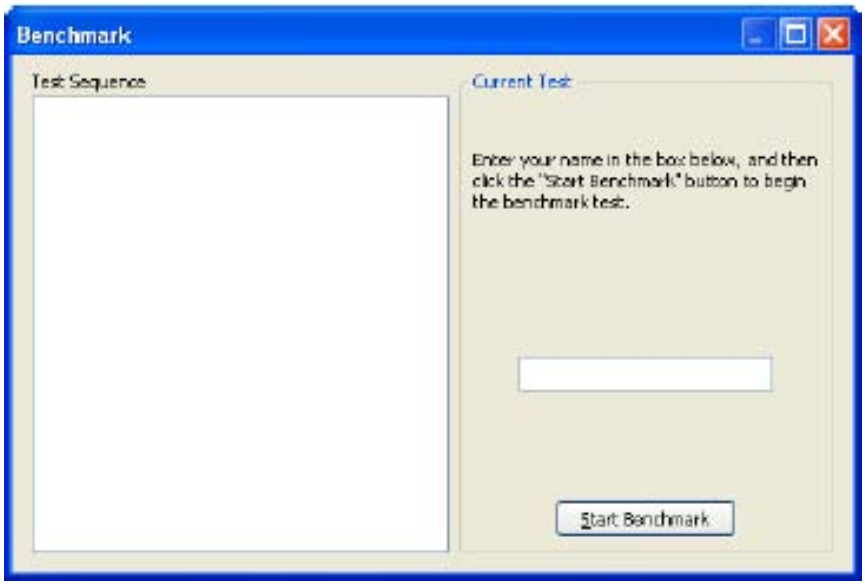

Figure 4-28: Benchmark Screen

The results of the **Benchmark Test** are saved in the **History Log** under the name entered before starting the benchmark. To access a saved **Benchmark Test** select **View | All History**.

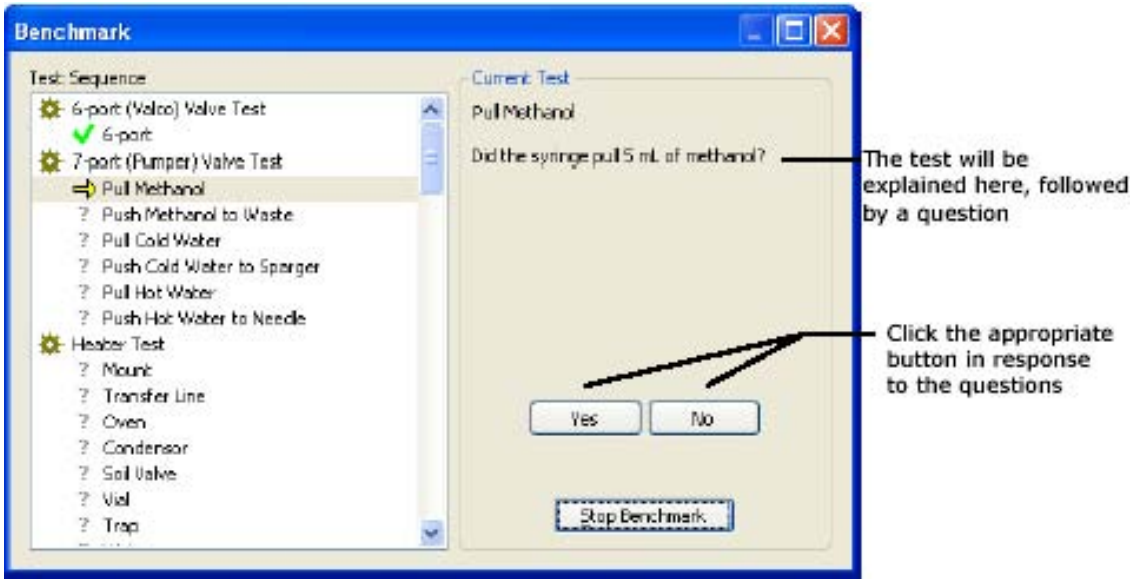

Figure 4-29: Benchmark in Progress

If you only want to test a specific function you can jump to any Header and begin testing.

HISTORY LOGS

The History screen can be accessed by clicking **View | All History**. The **All History** log is a filterable log of all the events that have occurred in the system. To adjust the event filter click the link "Click here to adjust the event filter" at the top of the **History** screen. After choosing the desired filter options, click **OK** to view the filtered log.

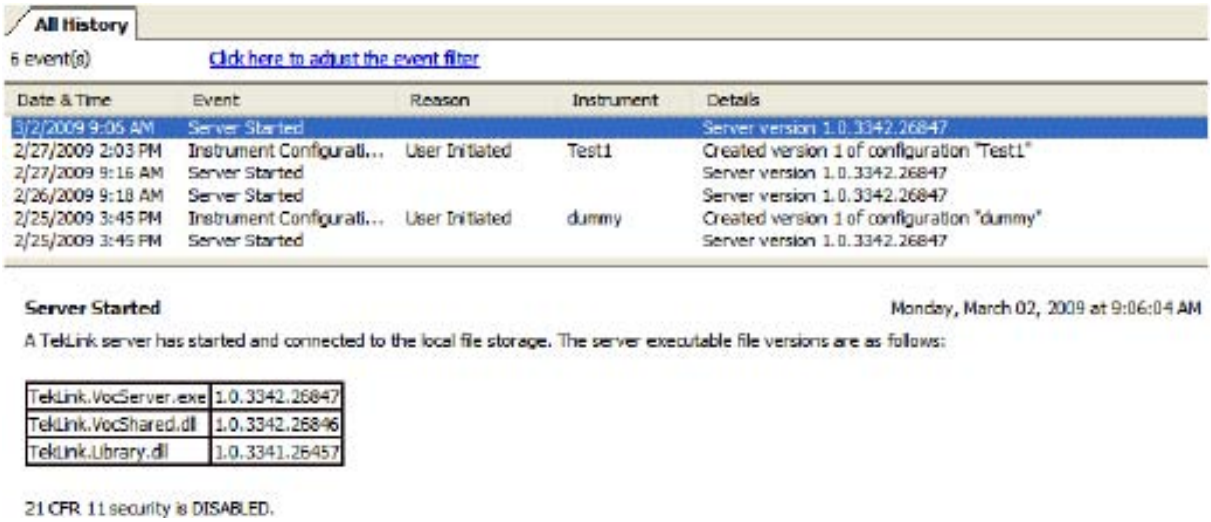

Figure 4-30: History Screen

The top pane of the **History** screen displays the time and date, event type, event reason, the instrument connected while the event occurred, and brief details of the events that have occurred and have not been filtered out by the criteria set by the user in the **History Filter** screen shown in the next figure.

The bottom pane of the **History** screen displays more detail about the event.

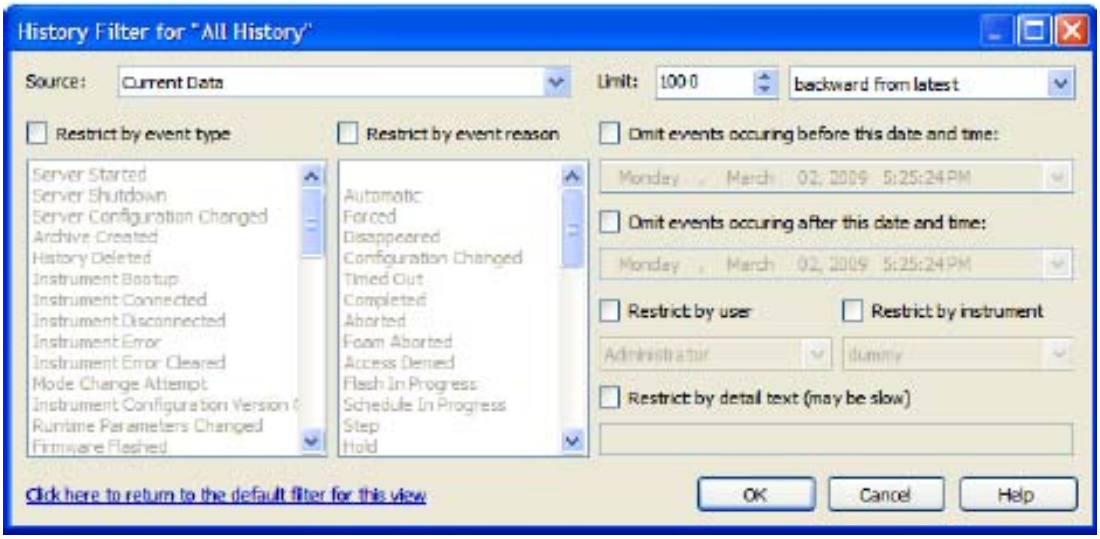

Figure 4-31: History Filter Screen

The **Source** drop-down menu displays selections for the source of the event history data (current date or an archive file).

The **Limit** text box displays the amount of events to be displayed. The arrows change the number by 1000 positively or negatively depending on the arrow.

The **Limit** drop-down menu after the text box displays selections for the ordering of the events to be listed.

The **Restrict by event type** check box will restrict the events displayed by the event types selected in the menu below the check box when the check box is selected. You do not need to hold shift or control to select multiple event types.

The **Restrict by event reason** check box will restrict the events displayed by the event reasons selected in the menu below the check box when the check box is selected. You do not need to hold shift or control to select multiple event reasons.

The **Omit events occurring before this date and time** check box will restrict the events displayed if they have occurred before the time and date selected in the text box below. Clicking the down arrow will display a calendar from the which the date can be selected. To edit the time simply input the time desired in the text box.

The **Omit events occurring after this date and time** check box will restrict the events displayed if they have occurred after the time and date selected in the text box below. Clicking the down arrow will display a calendar from the which the date can be selected. To edit the time simply input the time desired in the text box.

The **Restrict by user** check box will restrict the events displayed to the events that occurred when the user, selected in the drop-down menu below the check box, was logged into the system.

The **Restrict by instrument** check box will restrict the events displayed to the events that occurred when the instrument, selected in the drop-down menu below the check box, was connected to the system.

The **Restrict by detail text** check box will restrict the events displayed to the events containing the text indicated in the text box below the check box.

The **Click here to return to the default filter for this view** link will return all the selections to the default filter settings.

SYSTEM PROPERTIES

The **System Properties** screen can be accessed by clicking **Tools | System Properties** from the **Connect to Instrument** screen and the menu bar. The **System Properties** screen displays options and selections for the configuration of the atomx server.

System Properties - E-mail

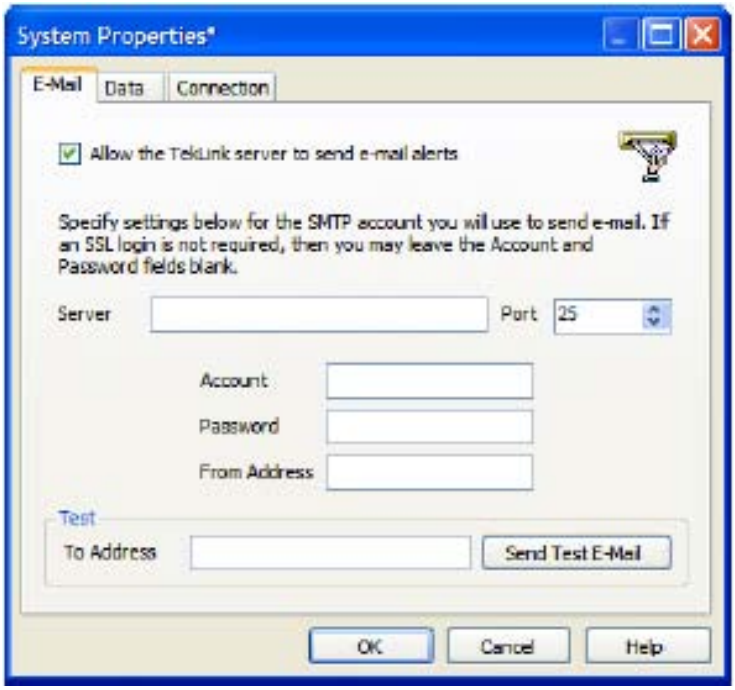

Figure 4-32: System Properties - E-mail Tab

The **E-mail** tab contains an option to allow the TekLink™ server to send e-mail alerts. If the option is selected, the greyed-out text, and text boxes. Enter the desired server address, appropriate port, account, password, and originating e-mail address in the appropriate text box to set up e-mail alerts. To test the e-mail alerts system, enter the recipient e-mail address in the **To Address** text box and click the **Send Test E-mail** button.

System Properties - Data

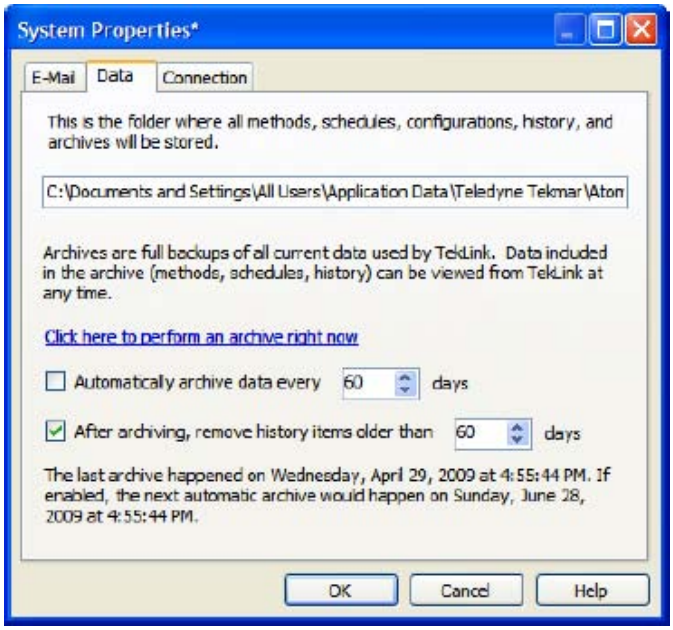

Figure 4-33: System Properties - Data Tab

The **Data** tab contains options for manipulating the system archiving. The text box at the top of the screen displays the filepath for the all method, schedule, configuration, history and archive files and can be changed by inputing a new file path.

The **Click here to perform an archive right now** link allows the user to initiate the archiving function manually.

The **Automatically archive data every...** check box, when selected, instructs the system to automatically initiate the archiving function at intervals indicated in the text box next to the check box.

The **After archiving, remove history items older than...** check box, when selected, instructs the system to automatically remove files older than the period of time indicated in the text box next to the check box.

System Properties - Connection

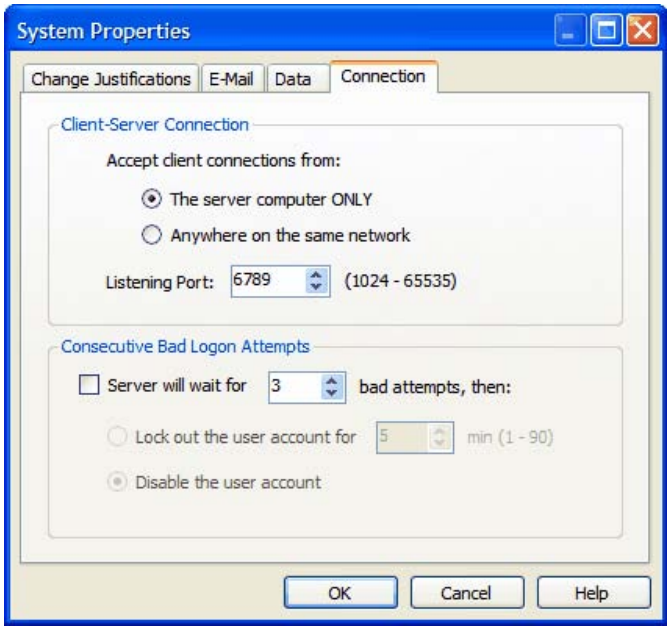

Figure 4-34: System Properties - Connection Tab

The **Connection** tab contains communication options for manipulating the connections to the system. The two radio buttons designate whether the system will accept connections from other computers on the same network or only from the server computer itself. If the system allows connections from computers on the same network a **Listening Port** must be indicated.

INITIALIZE SYRINGE WIZARD

In the event that the Atomx system needs the syringe changed for any reason, it is recommended that the instrument follow the necessary steps using the "Syringe Change Wizard", to insure that proper installation, reinitialization and recalibration prior to use.

1. From the tool bar go to "Tools" and scroll down to "Initialize/Change Syringe…".

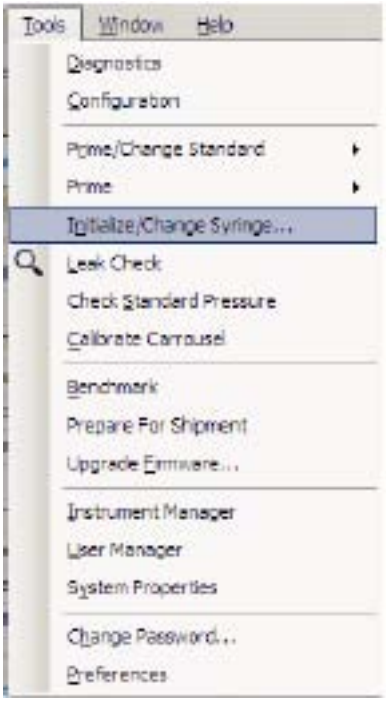

Figure 4-35: Tools Menu - Initialize/Change Syringe

2. The Change Syringe Wizard screen will appear and prompt you through the necessary steps to insure proper installation using a step-by-step visual process.

Figure 4-36: Initialize/Change Syringe Wizard Step 1

3. If you are changing the syringe, check "yes". If you are only rehoming the syringe, select "no" to be taken through the proper instructions. Please follow the steps in the order in which they appear and follow the directions.

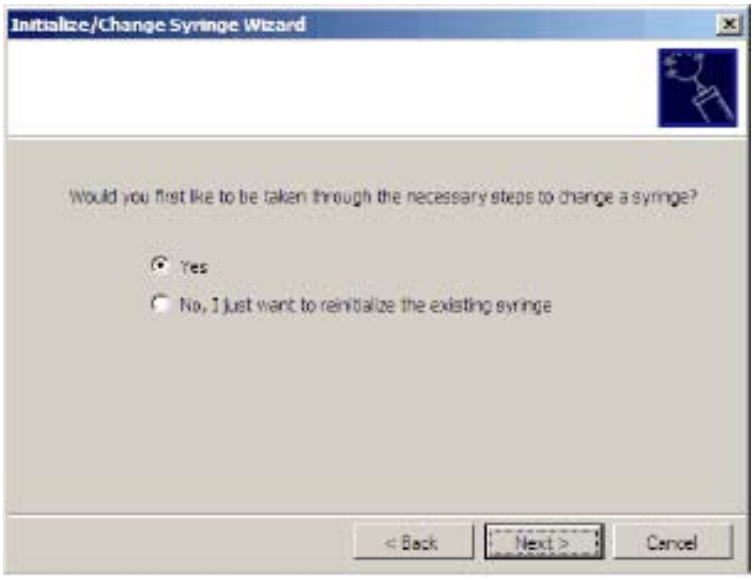

Figure 4-37: Initialize/Change Syringe Wizard Step 2

4. Through the use of Teklink™ the system will automatically move the syringe plunger to the proper volume positions. When ready the system will prompt you to select "Next" to continue on to the next step.

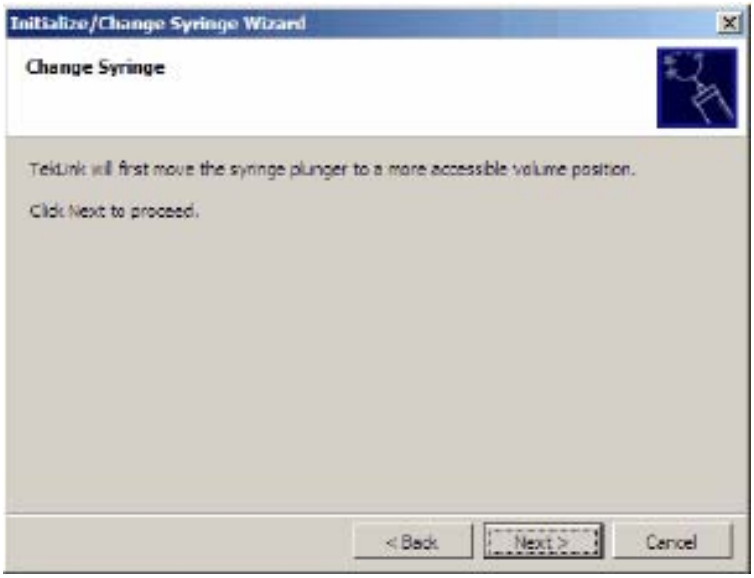

Figure 4-38: Initialize/Change Syringe Wizard Step 3

5. A series of step-by-step screens will begin to appear. It is recommended that you pay close attention to detail when following the directions. Do not skip steps. When each step is completed as instructed the system will prompt you to select "Next" to continue on to the next step.

Figure 4-39: Initialize/Change Syringe Wizard Step 4

6. Once all of the step-by-step instructions are completed a screen will appear indicating the Syringe Change Wizard will now begin to reinitialize and recalibrate the syringe pumper. A prompt will appear to select "Next" to continue on to the next step.

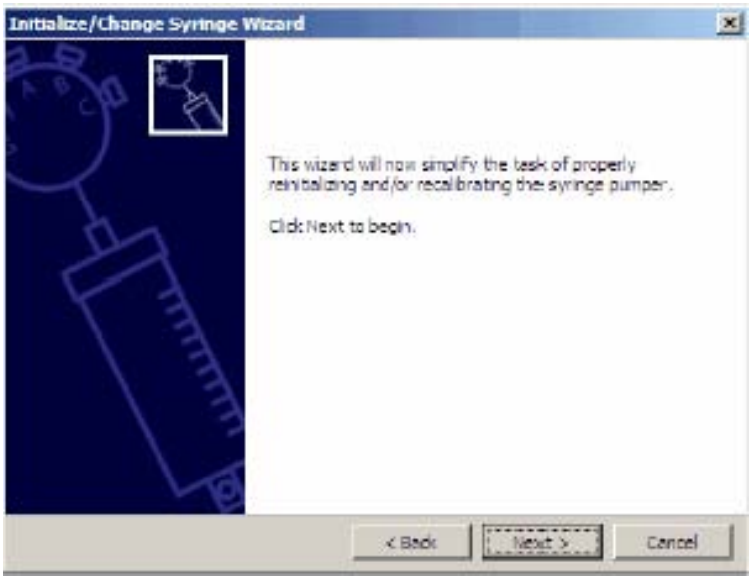

Figure 4-40: Initialize/Change Syringe Wizard Step 5

7. Teklink™ will initialize the pumper and prompt you to select "Next" to continue.

Figure 4-41: Initialize/Change Syringe Wizard Step 6

8. The Syringe Change Wizard will now ask that some observations and steps be taken to insure proper alignment.

Figure 4-42: Initialize/Change Syringe Wizard Step 7

9. Teklink™ will now force the pumper to the home position. This will help the instrument to memorize the new home position set in the previous step. The system will prompt you to select "Next" to continue.

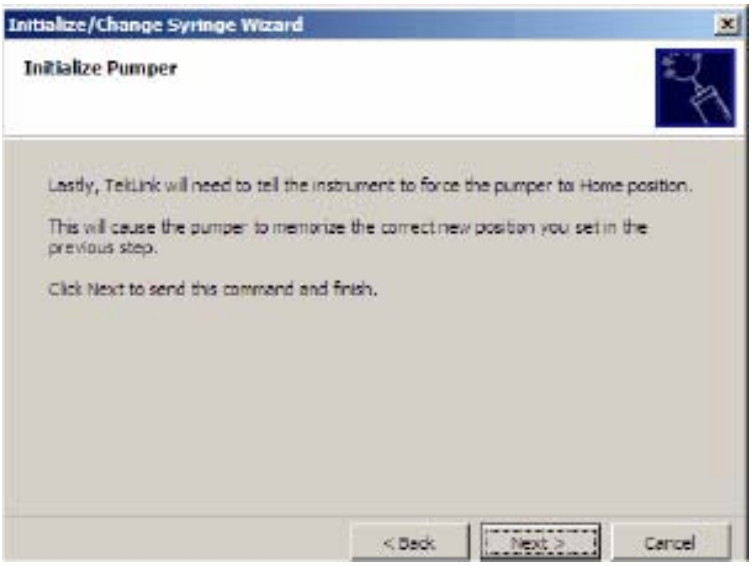

Figure 4-43: Initialize/Change Syringe Wizard Step 8

10. The syringe pumper is now ready for use. A prompt will appear to select "Finish".

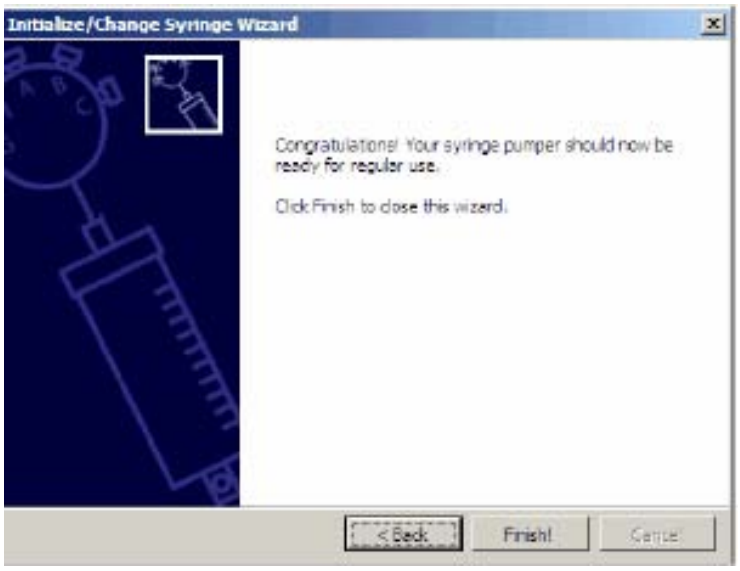

Figure 4-44: Initialize/Change Syringe Wizard Step 9

UPGRADE FIRMWARE

To upgrade the Atomx firmware, follow the directions below:

1. Click this hyperlink: *Software Downloads* (http://www.teledynetekmar.com/resources/downloads/)
2. Under **VOC Firmware and Software**, find the appropriate firmware or software upgrade and click on it.
3. Follow the installation instructions on the next webpage.
4. Once the firmware has be obtained, click **Tools | Upgrade Firmware**.

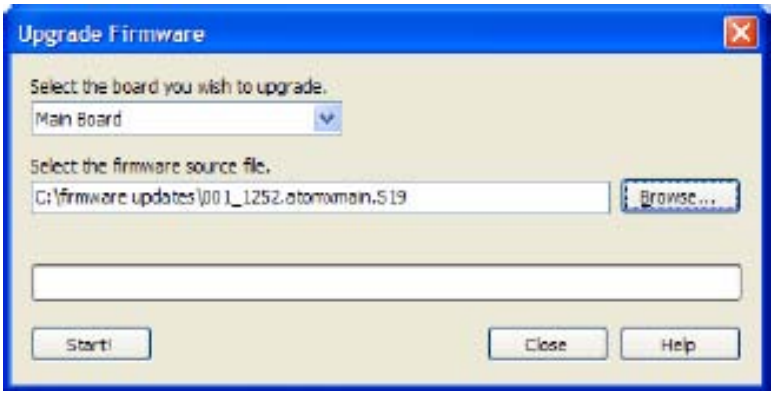

Figure 4-45: Upgrade Firmware screen

5. Click **Upgrade Firmware**.
6. Follow the instructions on the screen. Do not power down during the flash process.
7. Reboot unit upon completion.

PREFERENCES

Preferences - General

The **Preferences** screen contains miscellaneous options for the software. The first option, when selected, will display a **Save As** screen when an existing method or schedule is changed and then saved. The second option, when selected, will display a warning about standard position 3 is designated for as a matrix spiking position for methanol methods.

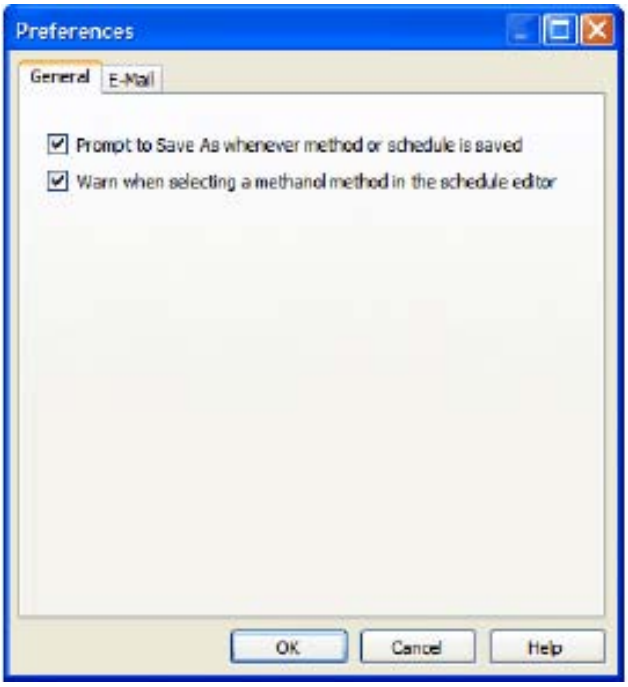

Figure 4-46: Preferences - General Tab

Preferences - E-mail

Note: *E-mail alerts should be set up in the System Properties screen before email alert preferences are set.*

The **E-mail** tab contains an option to receive e-mail alerts when certain events occur. If the option is selected, the grey-out text, text box, link, and button below will become accessible. Enter the desired e-mail address(es) in the text box to have e-mails sent to that address. The **Send Test E-mail** button, when clicked, will send a test e-mail to the address(es) designated in the text box.

Clicking the link will open up the **E-mail Event Filter** screen.

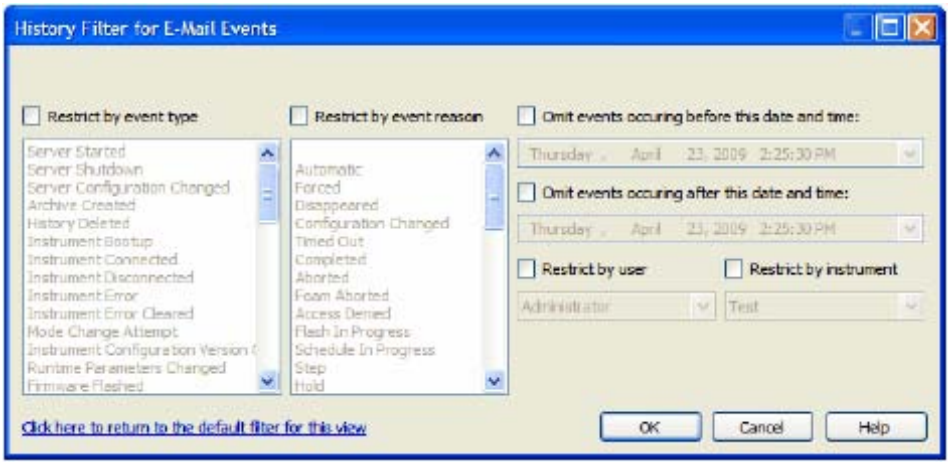

Figure 4-47: E-mail Event Filter screen

The **Restrict by event type** check box will restrict the e-mails generated to the event types selected in the menu below the check box when the check box is selected. You do not need to hold shift or control to select multiple event types.

The **Restrict by event reason** check box will restrict the e-mails generated to the event reasons selected in the menu below the check box when the check box is selected. You do not need to hold shift or control to select multiple event reasons.

The **Omit events occurring before this date and time** check box will restrict the e-mails generated to events that occur after the time and date selected in the text box below. Clicking the down arrow will display a calendar from the which the date can be selected. To edit the time simply input the time desired in the text box.

The **Omit events occurring after this date and time** check box will restrict the e-mails generated to events that occur before the time and date selected in the text box below. Clicking the down arrow will display a calendar from the which the date can be selected. To edit the time simply input the time desired in the text box.

The **Restrict by user** check box will restrict the e-mails generated to the events that occurred when the user, selected in the drop-down menu below the check box, was logged into the system.

The **Restrict by instrument** check box will restrict the e-mails generated to the events that occurred when the instrument, selected in the drop-down menu below the check box, was connected to the system.

The **Restrict by detail** text check box will restrict the e-mails generated to the events containing the text indicated in the text box below the check box.

The **Click here to return to the default filter for this view** link will return all the selections to the default filter settings.

EXPORT FEATURE

The Atomx offers the exportation of methods, schedules, instrument parameters, screen shots, etc. The following are the steps necessary to export desired information to another source.

Once the appropriate screen, Method Schedule etc. has been selected and you are ready to export, from the tool bar, select **File | Export**.

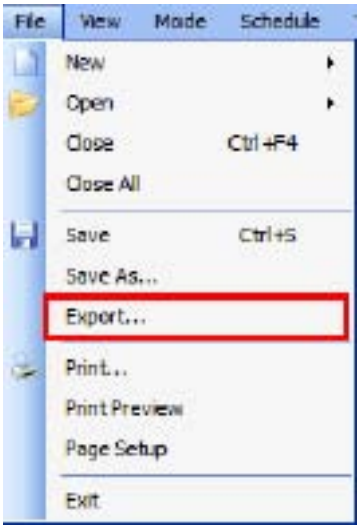

Figure 4-48: File - Export

Once the Export tab has been selected the "Save As" screen will open. Here you will use the pull down tab to select the correct pathway and file for your information. Once the correct pathway and file is selected press the "Save" button at the lower right corner to save your selections.

Note: *By utilizing the "Save as type" pull down menu you can additionally select the format in which you desire the document to be saved i.e. .csv, .jpg, etc.*

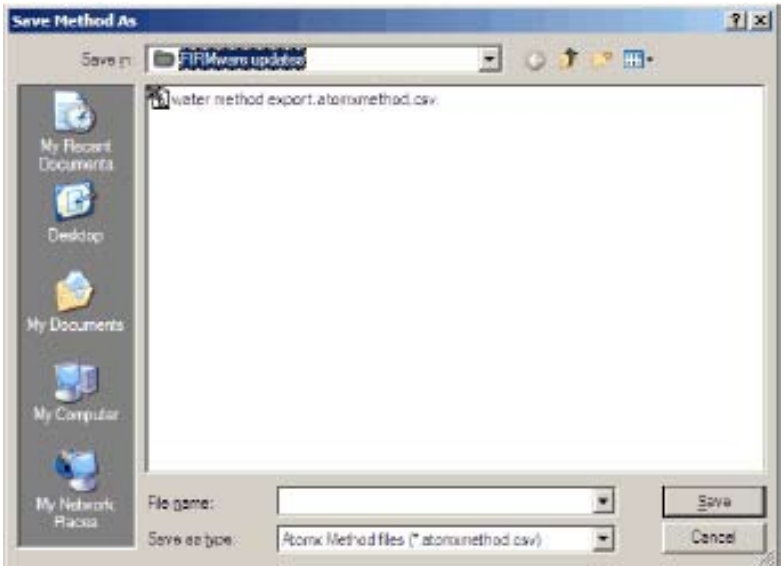

Figure 4-49: Export Save As screen

Chapter 5:
21 CFR Part 11 Compliance

21 CFR Part 11 Features and Compliance Tools

Atomx TekLink™ is a 21 CFR Part 11 compliance tool. This means that:

- User accounts and access privileges are secure.
- Methods and schedules are all versioned and archived.
- View/Print System, Error, and Sample History Logs.

Features:

- System History retention
- Viewing and printing error logs
- Automatic back-up of methods used and automatic restore if the current method gets corrupted
- Program File Integrity Validation
- Change Justification

NOTE: *21 CFR Part 11 software modifications will not be present or visible if the software is not installed with the 21 CFR Part 11 protection enabled.*

FIRST LOGIN

Atomx TekLink™ has a default administrator account that is used when the application is run for the first time. The user must login using the administrator's username and password and then, for security reasons, change the initial password.

1. Type "Administrator" for the **User Name** text box.

   Note: *The username and password are case-sensitive.*

2. Type "ABC123" for the password.
3. Click the **Login** button and the **Change Password** screen appears.

Figure 5-1: Administrator Login

CHANGE PASSWORD

1. Type "ABC123" for the old password.
2. Choose a password to use in case access to the default administrator's account is needed in the future. As an example "123abc" would be a usable password.
3. Type the new password into both the **New Password** and **Confirm Password** text boxes.
4. Click the **OK** button.

   Note: DO NOT FORGET THIS NEW PASSWORD!

   Note: *The Administrator cannot connect to any intruments. A new user MUST be created.*

Figure 5-2: First Login Password Change

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USER MANAGER

The User Manager screen can be accessed by clicking **Tools | User Manager**. This screen allows the Administrator and users, with the appropriate permissions, to create user accounts and set up privileges for each account.

Accounts Tab

Beneath the **Name** field is the list of all user names created in Atomx TekLink™.

Beneath the **Description** field is the description (if any) of the user name.

The **New User** button is used to create a new user, as described in the next section.

The **Properties** button is used to edit or view the properties of a specific user. The button is greyed-out and unusable until a user is selected.

Connections Tab

The Connections tab displays all of the connections made to the server. A user with proper permissions can click the **Force Disconnect** button and disconnect the selected connection.

Setting Up User Accounts

From the **User Manager** screen, click the **New User** button and the **New User Properties** screen will appear as shown:

1. Enter a Username that you wish to use the next time you login to Atomx TekLink™.
2. Enter at least two characters in the **Fullname** text box. This entry will be displayed next to the Username in the System History and Reports. The **Description** text box is optional.
3. If you wish to give the user a password, click the "Click here to set a new password" link. If a new password is not set, the new user may simply hit enter in an empty password text box to log in.
4. Uncheck the **Change At Next Login** option box unless you wish force the user to change the password at next login.
5. Click **OK**.

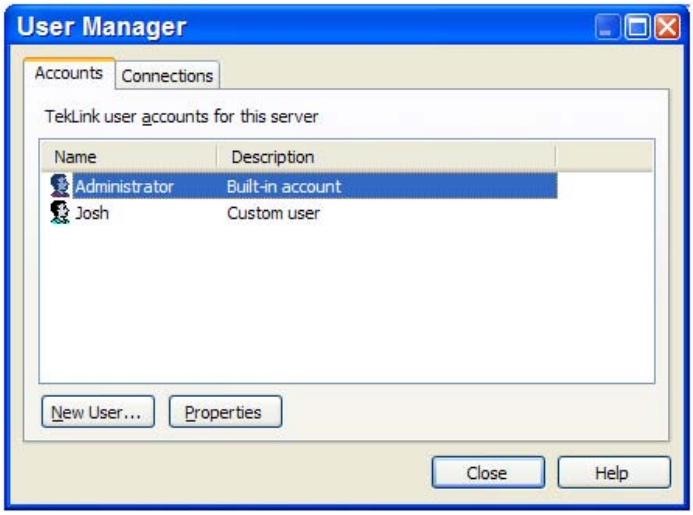


Figure 5-3: User Manager Screen

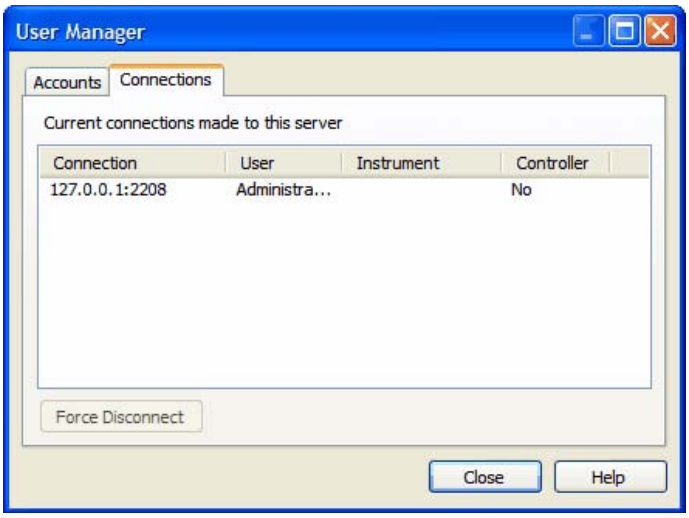


Figure 5-4: User Manager - Connections

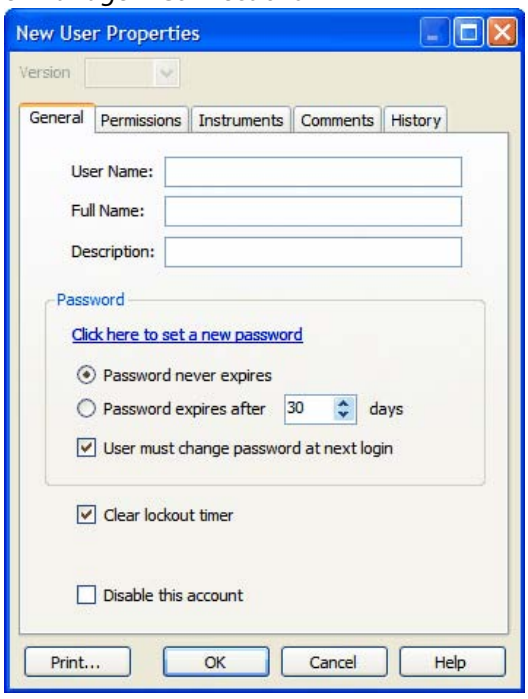


Figure 5-5: New User Properties screen

User Permissions

User permissions can be edited by selecting the desired user, accessing the **New User Properties** screen, and selecting the **Permissions** tab. Using the option boxes, the user permissions can be individually allowed or disabled. A user that has restricted permissions will either not be able to select the restricted option or will receive a message when they attempt to perform a restricted action.

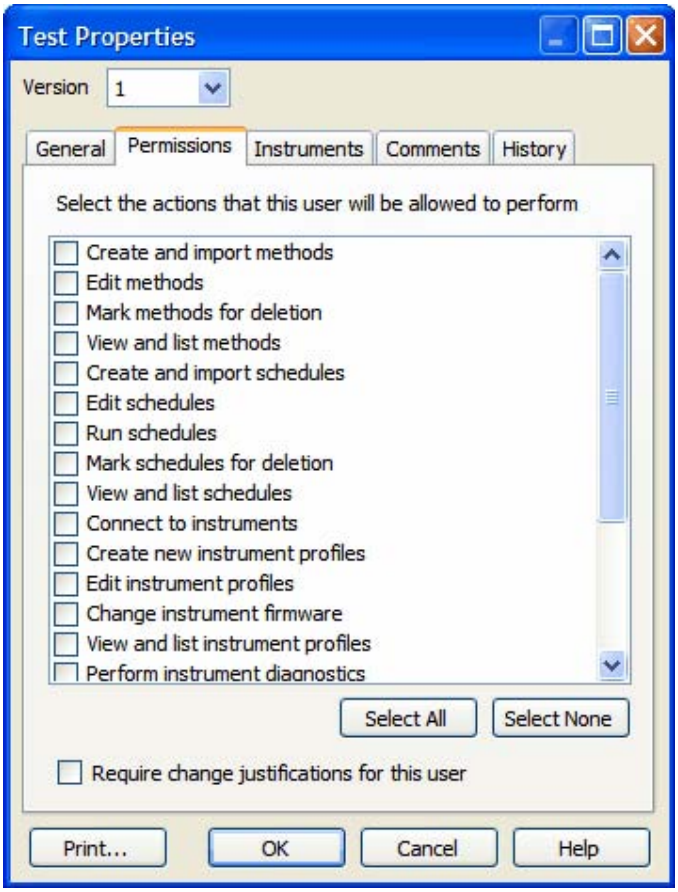


Figure 5-6: User Properties - Permissions Tab

The **Require Change Justification for this user** check box, when selected forces the user to give justification for changes.

Add Instrument: User can add a new instrument.

Change Instrument Firmware: User can update firmware.

Create Archives: User has access to the archiving functions.

Create New Methods: User can create new method files or import existing ones.

Create New Schedules: User can create a new schedule and/or import a schedule file.

Disable Instruments: User can enable/disable instruments.

Edit Instrument Config: User has access to the Instrument Configuration screen.

Edit Methods: User can edit standard parameters in an existing method file.

Edit Schedules: User can edit existing schedule files.

Edit System Properties: User has access to the System Properties screen.

Instrument Diagnostics: User has access to the diagnostics screen.

Perform Maintenance: User can run the maintenance tasks.

Run Schedules: User can run existing schedule files.

Step Hold Button: User has access to the Step and Hold buttons.

User Add: User can create new users.

User Disable: User can enable/disable users.

User Edit: User can edit existing user in the database.

User List: User can read the user list.

Some Permissions are inter-dependant. Instrument permission also requires that instruments are permitted on the Instruments tab.

Edit an Existing Account Permissions

Note: *Users cannot edit their own permissions.*

1. Select the User Account from the **User Manager** screen.
2. Click the **Properties** button, then the **Permissions** tab. The screen should display the current permissions for that user.
3. Select the appropriate boxes.
4. Click **OK**.

Lockout

Users can be locked out after a set number of bad logon attempts using the **System Properties** screen. You can activate this function by following the directions below:

1. Click **Tools | System Properties.**
2. Select the **Connections** tab.
3. Select the **Server will wait for...** check box.
4. Enter the number of bad attempts to allow before action is taken.
5. Select the action to be taken. There are two available actions:
   - Lockout the user for a set amount of time.
   - Disable the user account.
6. Click **OK**.

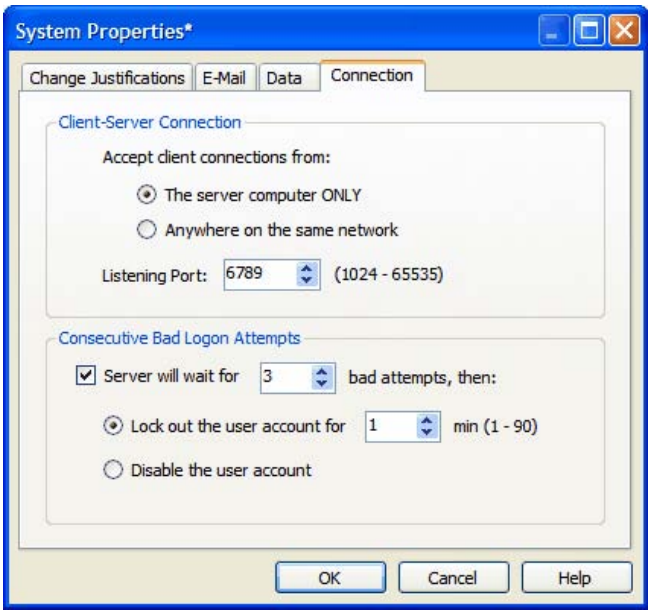


Figure 5-7: System Properties Screen

When a user is locked out, the screen below will appear when they try to log in.

Figure 5-8: System Lockout: Time-out

When a user is disabled, the screen below will appear when they try to log in.

Figure 5-9: User Disabled

Note: *If a disabled account is selected, either the Administrator or a user with use edit permissions must enable the users account or create a new one.*

DATA VERSIONING, HISTORY, AND ARCHIVE

Version – Each method and schedule has a version component built into the file. Anytime that file is changed or modified it will version itself. From the **Version** tool bar, a drop list shows the latest Version Number with the ability to call the entire list of previous versions.

History – Each time the version is changed a History Event is created that records the Version Number, Creation Date Time Stamp, Username, and Change Justification.

Archive – When archiving is initiated, the file is copied into the Archive Directory designated in the **System Properties** screen. After archiving, the file is deleted from the current file directory if the **Delete This File After Next Archive** option box is selected.

VIEW/PRINT SYSTEM HISTORY AND ERROR LOGS

The **History** screen can be accessed by clicking **View | All History**. The **All History** log is a filterable log of all the events that have occurred in the system. To adjust the event filter click the link "Click here to adjust the event filter" at the top of the **History** screen. After choosing the desired filter options, click **OK** to view the filtered log.

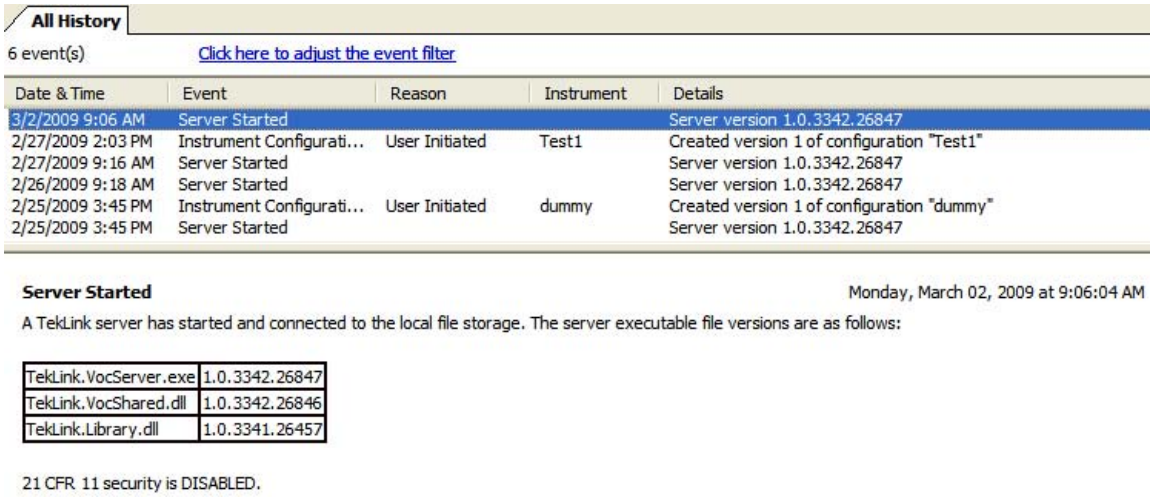


Figure 5-10: History Screen

The top pane of the **History** screen displays the time and date, event type, event reason, the instrument connected while the event occurred, and brief details of the events that have occurred and have not been filtered out by the criteria set by the user in the **History Filter** screen shown in the next figure.

The bottom pane of the **History** screen displays more detail about the event.

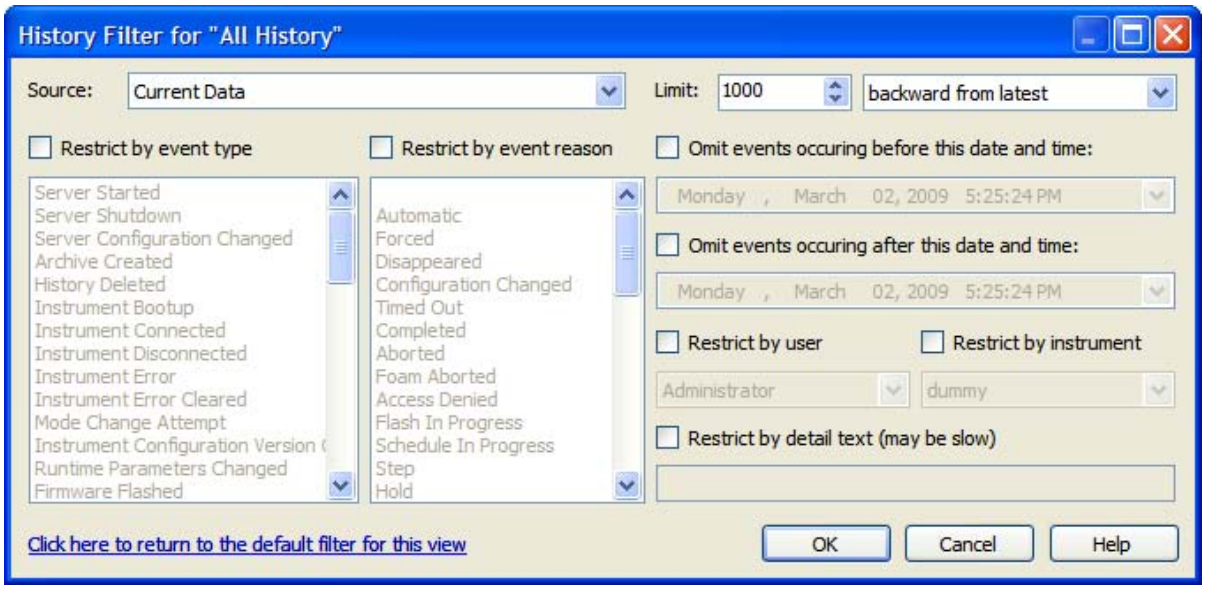


Figure 5-11: History Filter Screen

The **Source** drop-down menu displays selections for the source of the event history data (current date or an archive file).

The **Limit** text box displays the amount of events to be displayed. The arrows change the number by 1000 positively or negatively depending on the arrow.

The **Limit** drop-down menu after the text box displays selections for the ordering of the events to be listed.

The **Restrict by event type** check box will restrict the events displayed by the event types selected in the menu below the check box when the check box is selected. You do not need to hold shift or control to select multiple event types.

The **Restrict by event reason** check box will restrict the events displayed by the event reasons selected in the menu below the check box when the check box is selected. You do not need to hold shift or control to select multiple event reasons.

The **Omit events occurring before this date and time** check box will restrict the events displayed if they have occurred before the time and date selected in the text box below. Clicking the down arrow will display a calendar from the which the date can be selected. To edit the time simply input the time desired in the text box.

The **Omit events occurring after this date and time** check box will restrict the events displayed if they have occurred after the time and date selected in the text box below. Clicking the down arrow will display a calendar from the which the date can be selected. To edit the time simply input the time desired in the text box.

The **Restrict by user** check box will restrict the events displayed to the events that occurred when the user, selected in the drop-down menu below the check box, was logged into the system.

The **Restrict by instrument** check box will restrict the events displayed to the events that occurred when the instrument, selected in the drop-down menu below the check box, was connected to the system.

The **Restrict by detail text** check box will restrict the events displayed to the events containing the text indicated in the text box below the check box.

The **Click here to return to the default filter for this view** link will return all the selections to the default filter settings.

CHANGE JUSTIFICATION

Change Justification notices are used anytime a change is made for any reason on any field within the Teklink™ software if the Change Justification has been selected for that user within their "Preferences" tab. If the need arises to create (add) or delete current Change Justification selections the following steps will guide you through the proper process.
If you do not want to utilize the Change Justification notice for a particular user(s) it will be necessary to see the "Permissions" section of User Properties.

Note: *Default Change Justifications are provided when a user is initially required to give change justifications.*

To Add/Delete Change Justifications from the tool bar go to "Tools" and from the drop down menu select the "Preferences" tab.

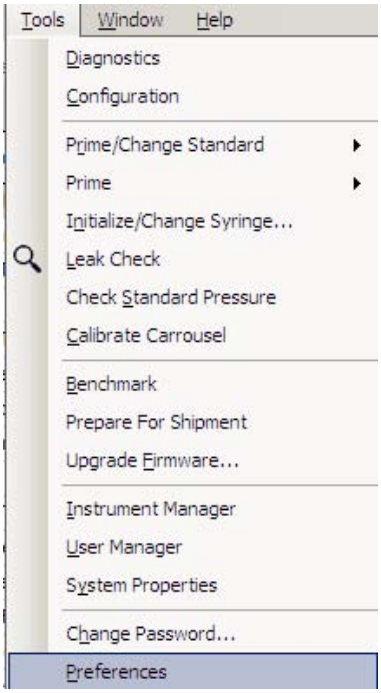


Figure 5-12: Tools Menu - Preferences

A "Preferences" box will appear on the screen. Select the "Change Justifications" tab. If you wish to add a new Change Justification it will be necessary to type in the name of the justification you will use for future reference. Once you have named the new justification, select the "Add" button form the lower right hand corner of the screen and then select "OK".

To delete a current Change Justification the menu will appear with all current justifications available. Select the justification to be deleted by clicking on the name. Select the "Delete" button from the top right hand portion of the screen and click the "OK" button.

You may wish to verify that your task was completed properly. To do so, from the tool bar go to "Tools" and using the pull down menu select "System Properties". The "System Properties" screen will appear with a "Change Justifications" tab. Scroll through the justifications to insure that the addition or deletion step performed previously has taken place. If it has not, it is possible to Add/Delete a justification at this time.

Note: *Change Justifications added or subtracted in the System Properties screen will be applied globally, while it is user specific if they are changed in the Preferences screen.*

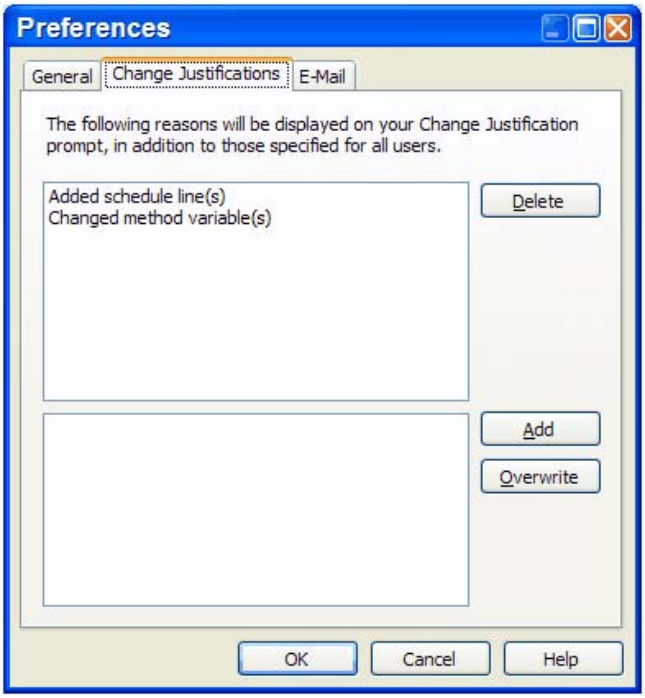


Figure 5-13: Preferences - Change Justifications

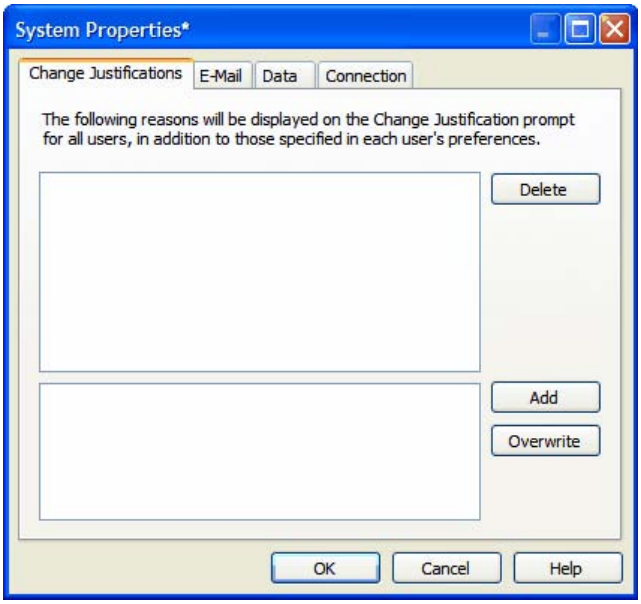
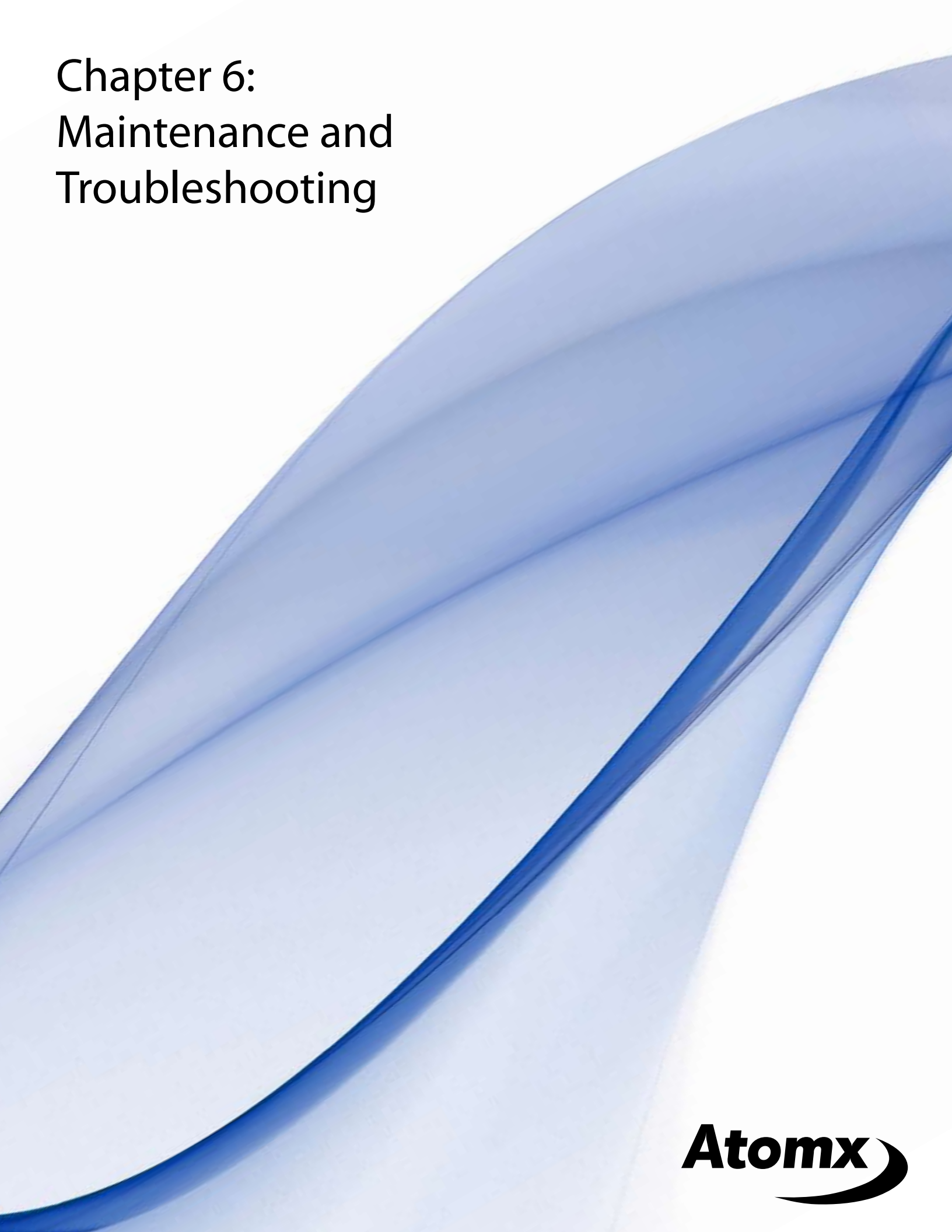


Figure 5-14: System Properties - Change Justifications

Chapter 6: Maintenance and Troubleshooting



Service Contact Info

If any parts are missing, if you wish to order replacement parts, need technical support, or want an instrument serviced, call the Teledyne Tekmar Customer Support Center at the number below:

U.S.A. **(800) 874-2004**

OUTSIDE THE U.S.A. **COUNTRY CODE + 1 (513) 229-7000**

Routine Procedures

SPARGER

1. Turn the unit off and allow the Sample Mount and surrounding areas to cool.
2. Remove the Mount Guard Assembly by gently pushing upward, lifting it off the holding screws.
3. Disconnect the 1/4" (0.64cm) to 1/16" (0.16cm) reducing union that connects the purge gas line to the small side of the U-shaped glassware. Loosen the 1/4" (0.64cm) nut and slide the union off of the U-shaped glassware.
4. Locate the 1/2" (1.27cm) nut just above the bubble on the glassware closest to the front panel. Support the glassware in one hand while loosening the nut. When the nut is loose, slide the glassware out of the Sample Mount.
5. Install the new Sparger by sliding it through the loosened 1/2" (1.27cm) nut attached to the bottom of the sample mount. Insert the glassware completely and tighten the nut just enough to allow it to hold the glassware without manual support. Twist the glassware so that it backs out approximately 2-3mm. Finger-tighten the nut then gently use a wrench to tighten further with no more than 1/2 turn.
6. Replace the union on the small side of the U-shaped glassware. Finger-tighten the nut then use a wrench to tighten further with no more than a 1/2 turn.
7. Turn the unit on and perform a Leak Check.

Figure 6-1: Glassware Connections

CLEANING GLASSWARE

Clean glassware is essential for trouble-free analyses. This glassware includes samplers, flasks, cylinders - anything used in handling samples, standards, or blank water. To keep clean glassware, Teledyne Tekmar recommends using the following:

- Dedicated glassware
- Ultrasonic bath
- Muffle furnace

Dedicated glassware is glassware that is used for concentrator work only. Glassware used for other procedures, such as extractions, is usually not clean enough to use for trace applications.

An ultrasonic bath saves labor. A light scrubbing, followed by an ultrasonic bath, is more effective and efficient than manual washing. The ultrasonic bath can clean frits in frit samplers and other places where brushes cannot reach. It is acceptable to use any glassware detergent that is recommended for use in an ultrasonic bath.

SIDE COVER REMOVAL

Remove the Phillips screws holding the cover to the chassis. After taking the screws out, lift up on the handle located at the top of the side cover and gently pull away from unit.

FRONT DOOR ACCESS

Open the door guarding the internal standards. Lift up on the door to remove it. Loosen the 2 captive screws on the right side of the front cover. Lift up and pull away to remove the front cover. Remove the screw at the top of the front door. Open the door.

SAMPLE STATION COVER REMOVAL

Remove the PEEK nut from the top of the Needle. Loosen the two captive thumbscrews on the front of the Sample Station Cover. Slide the cover to the left and lift up to remove.

ANALYTICAL TRAP

1. Turn the unit off, remove the power cord, and allow the analytical Trap, Condenser, and Oven to cool to room temp.

The trap and surrounding areas can be extremely hot. Allow adequate time to cool.

2. Loosen the captive thumbscrew and open the oven cover and trap cover.
3. Remove the brass screw and Oven Side Insulation Assembly.
4. Just below the Trap Manifold, loosen the two nuts on the larger, U-shaped Analytical Trap (See Figure 6-2).
5. Remove the left nut and ferrule from the Analytical Trap and slide the Trap Heater off taking care to avoid damage to the RTD or Trap Heater wires.
6. Slide the Trap Heater, RTD side first, onto the new Analytical Trap and attach it to the Trap Manifold. The RTD cable should be towards the front of the instrument.
7. Turn the unit on and perform a Leak Check to ensure proper performance of the unit.
8. Replace the Oven Side Insulation Assembly, trap panel, and close the oven cover.
9. Condition the Analytical Trap as directed by the manufacturer.

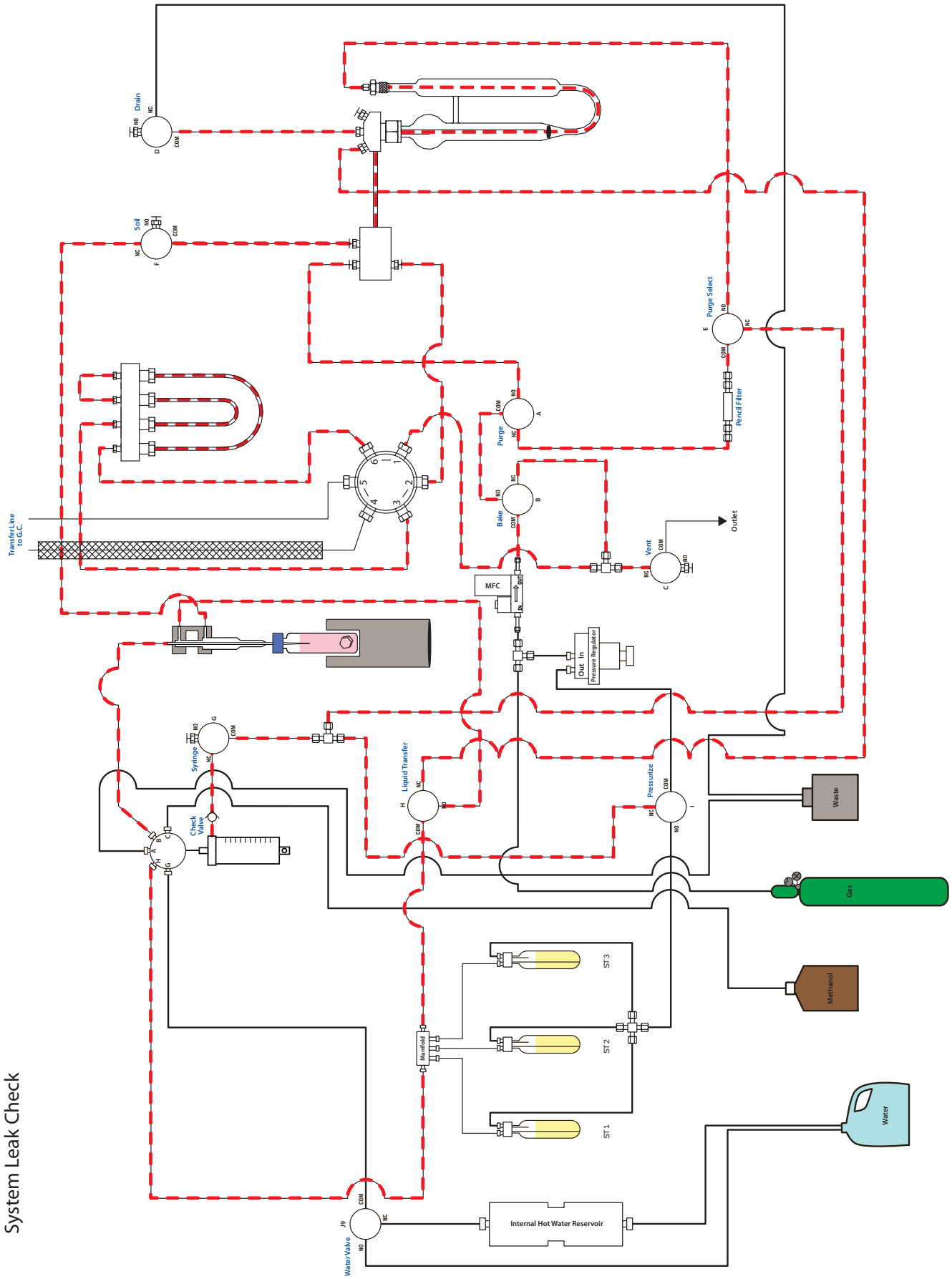
Figure 6-2: Trap Compartment

Note: *The Trap Cover must be installed to allow the Trap Heater to heat.*

LEAK CHECK

Click **Modes | Leak Check** to initiate the automated leak checking system. The diagrams in the following sections give a visual reference to the flowpaths involved during leak check.

SYSTEM LEAK CHECK DIAGRAM



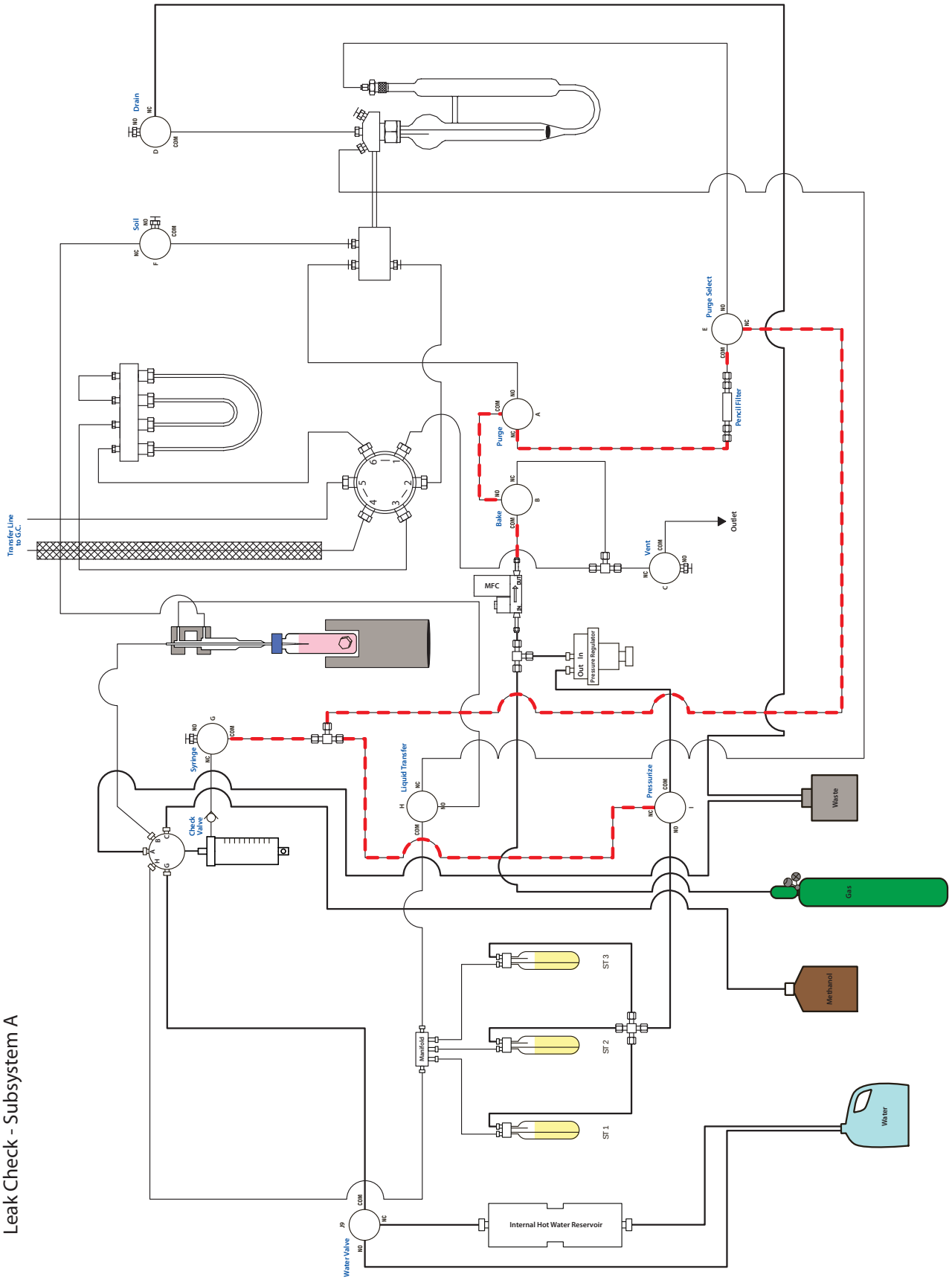
If leak check fails, the system automatically steps to check Subsystem A. Flow will be routed through bake valve, through purge valve, through purge select valve and stopped at the purge select valve and the pressurize valve. Subsystem A components include:

- MFC
- Bake Valve (B)
- Purge Valve (A)
- Pencil Filter
- Purge Select Valve (E)
- Syringe Valve (G)
- Pressurize Valve (I)

If the leak is in subsystem A the most sources of the leak are:

- MFC outlet fitting
- COM and NO ports of valve (B)
- COM and NC ports of valve (A)
- Fittings of Pencil filter
- COM and NC ports of valve (E)
- Tee fittings connecting NC of valve (E), COM of valve (G), and NC of valve (I)
- COM of valve (G)
- NC of valve (I)

SUBSYSTEM A LEAK CHECK DIAGRAM



Leak Check - Subsystem A

If Subsystem A passes, the system is vented and re-pressurized to begin check of Subsystem B. This test is similar to Subsystem A however valve (G) is actuated; the 7-port valve is rotated to the transfer line (H) to allow the vial to be pressurized. This test will essentially check subsystem A but also include the syringe, 7-port valve, needle fittings, and soil valve.

To isolate a syringe, 7-port, or check valve-fitting leak, place plug in port H of 7-port valve and pressurize system. If this passes, the problem is that the sample vial is leaking, the sample needle fittings are leaking, or there is a leak at the soil valve.

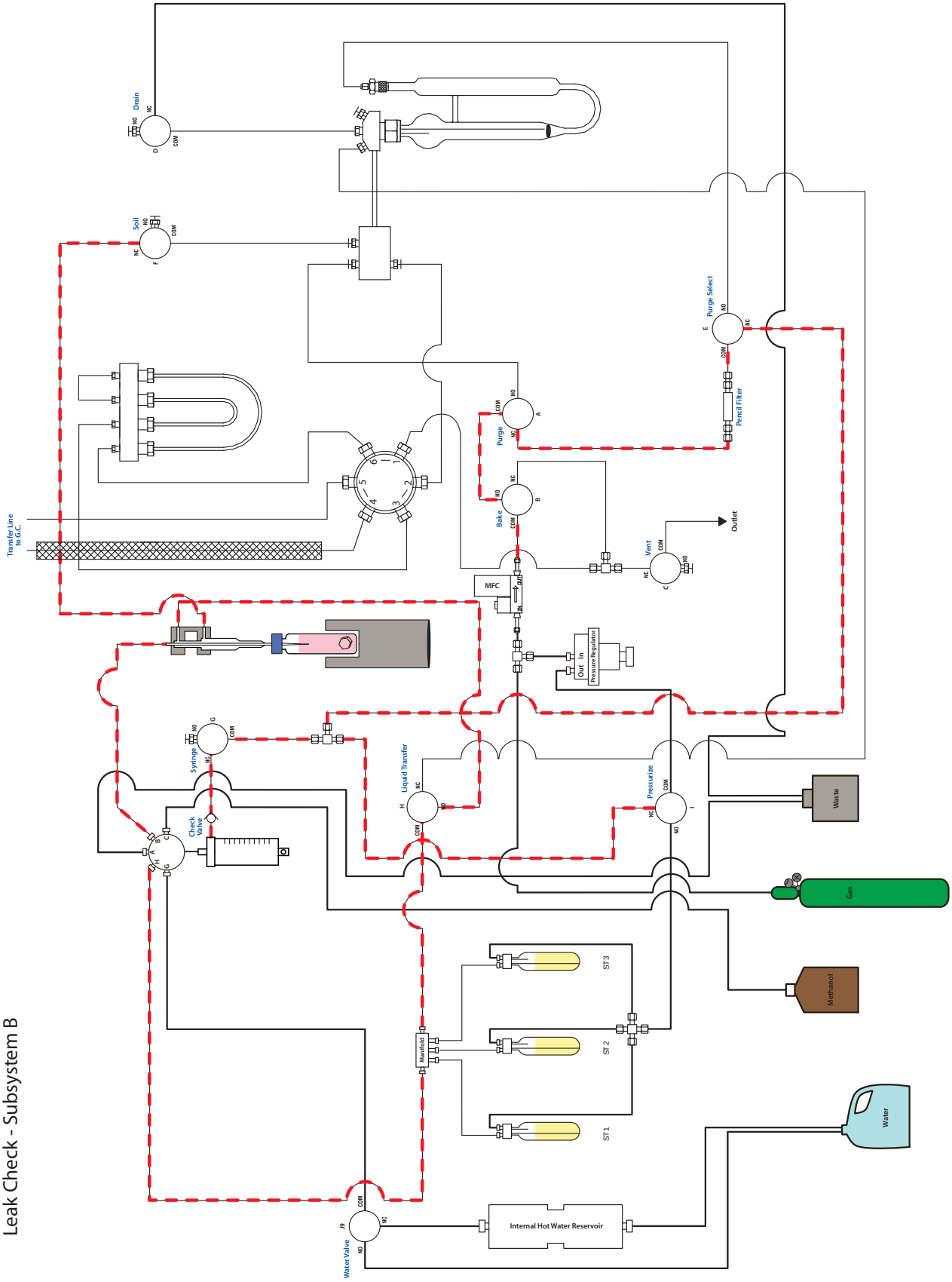
Subsystem B components include:

- All subsystem A components
- Syringe
- 7-port valve
- Transfer valve (H)
- Sample needle
- Soil valve

If the leak is in subsystem B the most likely places are:

- Threaded connection between 7-port valve and syringe
- Check valve port
- COM or NO port of valve (H)
- Fittings of needle
- COM, NO, and NC port of soil valve
- Sample vial not leak tight.
- STD manifold

SUBSYSTEM B LEAK CHECK DIAGRAM



Leak Check - Subsystem B

If Subsystem B passes, the system is vented again and re-pressurized to begin check of Subsystem C. This is a cumulative test, which will include Subsystem A and Subsystem B, but also will include the sparge vessel and the 6-port Valco valve. In this test the soil valve is actuated to allow pressure to flow through the valve oven mount tee, into the glassware and through the 6-port valve.

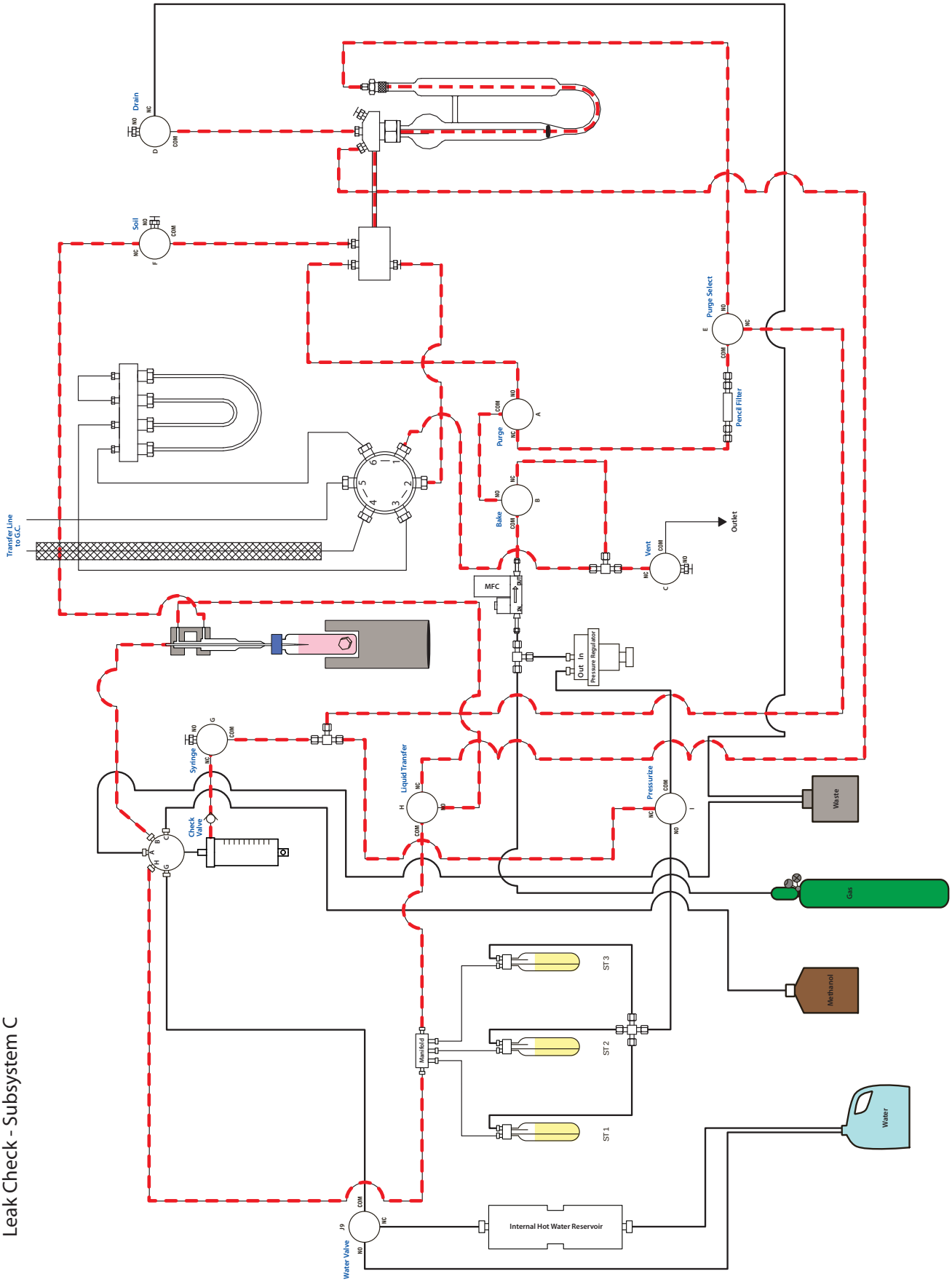
Subsystem C components include:

- All Subsystem A components
- All Subsystem B components
- Sample mount
- Sparge vessel
- Drain valve (D)
- Vent valve (C)
- 6-port Valco

If the leak is in subsystem C the most likely places are:

- Sparge vessel fittings
- COM or cross-port leak of valve (D)
- COM or cross-port leak of valve (C)
- Sample mount fittings (plug, drain line, transfer line)
- Sample mount Tee fittings
- Sample mount weldments
- 6-port Valve (cross-port leak, loose fitting, loose rotor)

SUBSYSTEM C LEAK CHECK DIAGRAM



Leak Check - Subsystem C

If all subsystems pass leak check and you fail the whole system leak check then the leak can be isolated to the following areas:

- Trap fittings
- Condenser fittings
- Loose fittings in 6-port valve
- Potential cross-port leak in 6-port valve

PENCIL FILTER

The Pencil Filter removes impurities from the sample purge gas. A common symptom that the Pencil Filter needs to be replaced is when ghost peaks start appearing in the chromatograms.

1. Turn the unit off.
2. Open the right side cover of the unit and locate the Pencil Filter.
3. Using two 7/16" (1.11cm) wrenches, unscrew both sides of the Pencil Filter.
4. Remove the old Pencil Filter and replace with a new Pencil filter, making sure that the flow direction indicator points towards the Purge Select Valve "E" (See Figure 6-3).
5. Tighten the nuts, turn the unit on, and perform a Leak Check.

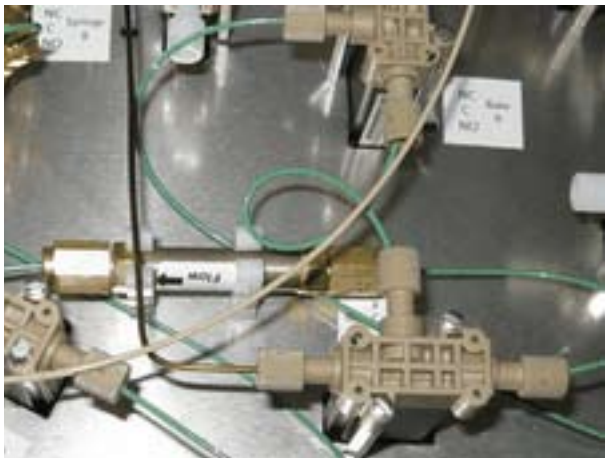


Figure 6-3: Pencil Filter

UPGRADE FIRMWARE

To upgrade the Atomx firmware, follow the directions below:

1. Click this hyperlink: *Software Downloads* (http://www.teledynetekmar.com/resources/downloads/)
2. Under **VOC Firmware and Software**, find the appropriate firmware or software upgrade and click on it.
3. Follow the installation instructions on the next webpage.
4. Once the firmware has be obtained, click **Tools | Upgrade Firmware**.

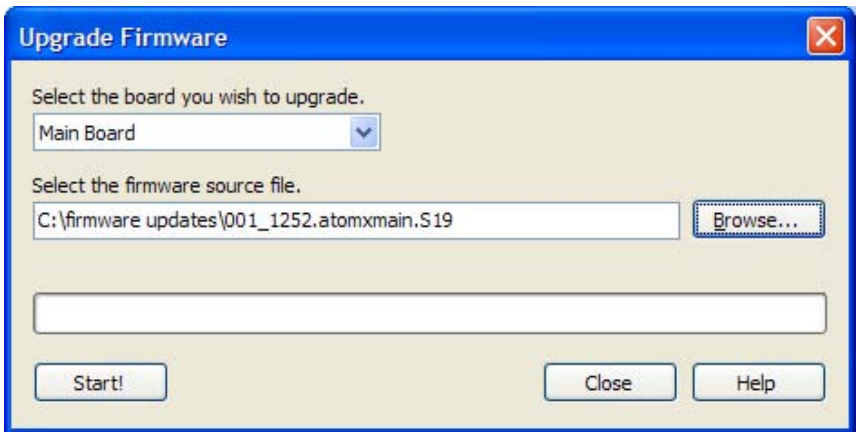


Figure 6-4: Upgrade Firmware screen

5. Click **Upgrade Firmware**.
6. Follow the instructions on the screen. Do not power down during the flash process.
7. Reboot unit upon completion.

SETTING/CHECKING STANDARD PRESSURE

To set or check the standard pressure, click **Tools | Check Standard Pressure** and follow the instructions in the **Instrument Status** pane.

Checking the Standard Pressure

1. After clicking **Tools | Check Standard Pressure**, click the **Step** button.
2. Allow the system to depressurize, then click **Step** again.
3. The standard pressure will then be displayed as the system pressure, under the Zones field in the **Instrument Status** pane. Click **Step** again to return to normal operations.

Setting the Standard Pressure

1. After clicking **Tools | Check Standard Pressure**, adjust the pressure regulator to 0.0psi by turning the knob all the way counterclockwise. Click **Step**.
2. Allow the system to depressurize, then adjust the pressure regulator until the pressure reading under the **Zones** field in the **Instrument Status** pane reads 7.0psi.
3. Click **Step** and allow the system to record the pressure in the System History. Normal operation of the instrument can then be resumed.

PREVENTATIVE MAINTENANCE

A carefully designed and faithfully executed Preventative Maintenance program is the best method for maintaining your Atomx. Adherence to scheduled maintenance in the areas of cleaning, checking of parts, and lubrication will help maintain the performance standards of your unit and decrease the chances of down time.

The Preventative Maintenance schedule (below) lists procedures that can be performed without the assistance of a Tekmar service representative. The more familiar you become with these procedures, the less time it will take to complete them.

Daily Maintenance Checks

- **Gas Supply** - Verify the gas source is supplying an input pressure of 50-100psi to the Atomx. If you are using a gas cylinder, verify the cylinder is at 500+psi. If not, replace the cylinder.
- **Waste** - Verify that the waste container has sufficient volume to contain the waste generated. Empty if necessary.
- **DI Water Supply** - Replace the DI water supply with fresh DI water. Make sure the DI water supply is sufficient for sample analysis.
- **Methanol Supply** - Make sure the methanol supply is sufficient for sample analysis.
- **Leak Check** - Run a leak check to ensure that the unit is leak tight.
- **Clean Vial Holes** - Check tray vial holes for foreign particles. Clean if necessary.

Weekly Maintenance Checks

- **Perform Daily Checks**
- **Purge Pressure Stability** - Scan through the sample log to verify that the purge pressures are staying consistent throughout the daily runs.
- **Check Standard Pressure** - Use the software to check the standard pressure.
- **Clean Needle** - Inspect the needle for particles or calicification build up. Clean if necessary.

Monthly Maintenance Checks

- **Perform Daily and Weekly Checks**
- **Inspect Glassware** – Inspect for damage and/or discoloration that could restrict flow or cause contamination. Replace as necessary.
- **Drain Tubing** - Inspect the drain tubing for clogging. Replace drain line if necessary.

Quarterly Maintenance Checks

- **Lubricate the Atomx Carousel Drive** - Lubricate the points indicated in the diagram on page 6-25 with DuPont Krytox lubrication

- **Lubricate the Atomx Elevator** - Lubricate the points indicated in the diagram on page 6-32

Note: *The Kit Box includes most of the items needed for routine maintenance of the Atomx.*

Preventive Maintenance Chart

Rate	Action	Check When Completed						
Daily	Carrier Gas: 500+ psi from tank							
	Verify stage 2 pressure: 50-100psi							
	Waste container has sufficient volume							
	DI Water: fresh and ample supply							
	Check Methanol supply							
	Leak Check							
	Clean Vial Holes							
	Initials & Date							
Weekly	Daily Maintenance Items							
	Purge Pressure Stability							
	Check Standard Pressure							
Monthly	Daily & Weekly Maintenance Items							
	Inspect Glassware							
	Drain Tubing							
	Initials & Date							
Quarterly	Daily, Weekly, & Monthly Maintenance Items							
	Lubricate the Atomx Carousel Drive							
	Lubricate the Atomx Elevator							
	Initials & Date							

Troubleshooting

The benchmark test is a general troubleshooting tool. It is designed to test the components and software routines to ensure that the instrument is in working order. If any part of the benchmark test fails, the failure should be addressed before analysis of samples is attempted.

The Benchmark Self Test is accessible by clicking **Tools | Benchmark** tab. For screenshots and further information, see the Benchmark Tab section. To start the Benchmark Self Test, click the Start Benchmark button. Some tests will be completed automatically, while others will require user intervention. If user intervention is required, read the directions and answer accordingly, via the Yes or No button. Make sure to give the instrument the necessary time to complete the task as directed by the Benchmark Self Test. You may stop the Benchmark Self Test at any time by clicking the Stop Benchmark button.

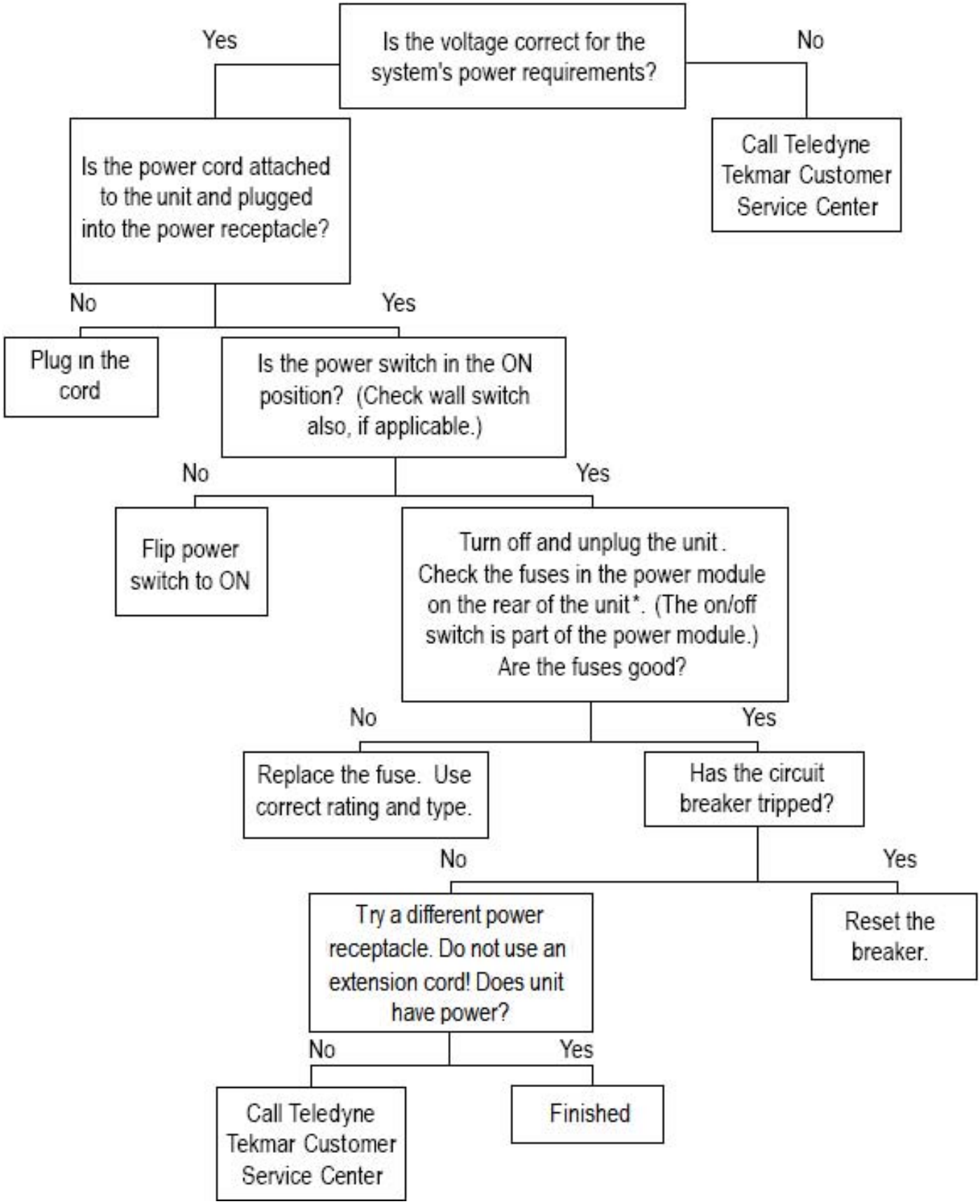
If you need assistance solving a problem, follow these steps:

1. Write down the model name, model number, and serial number of the instrument.
2. Note the type of problem you are having. Write down the conditions under which the problem occurred, the display, activity, or result that indicated the presence of a problem.
3. Make all pertinent information, including the manual, available before you call. Your service representative may refer to diagrams or other information contained in your manual.
4. Call Teledyne Tekmar:

    Teledyne Tekmar Customer Support Center:

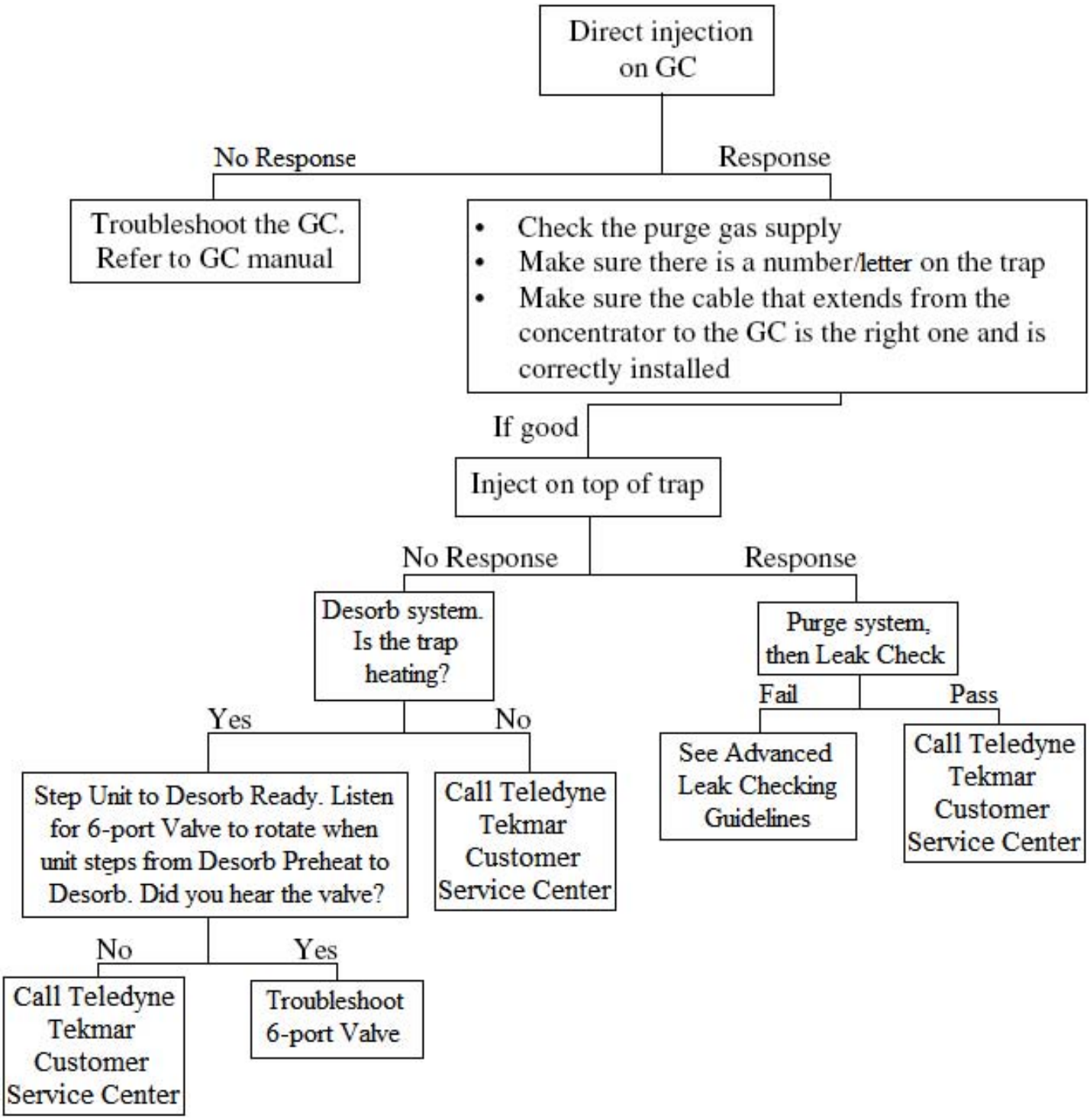
    - **(800) 874-2004 in the U.S.A. and Canada**
    - **Country Code +1 (513) 229-7000 Outside the U.S.A. and Canada**

NO POWER FLOW CHART

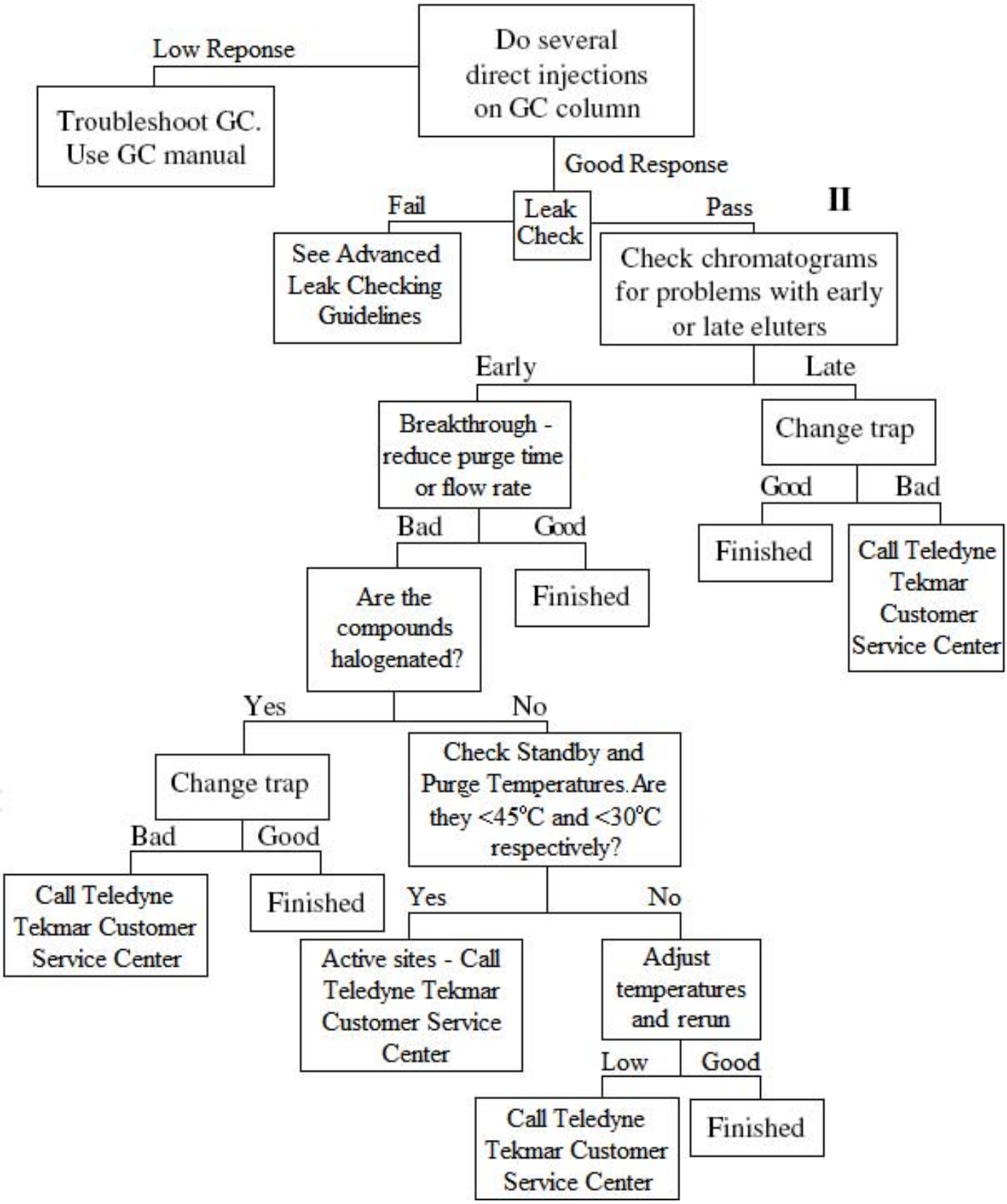


* See page 6-22 for instructions on accessing the fuses.

NO RESPONSE FLOW CHART



LOW RESPONSE FLOW CHART



Replacement of Parts

CONDENSER

1. Turn the unit off, remove the power cord, and allow the Analytical Trap, Condenser, and Oven to cool to room temp.

The condenser and surrounding areas can be extremely hot. Allow adequate time to cool.

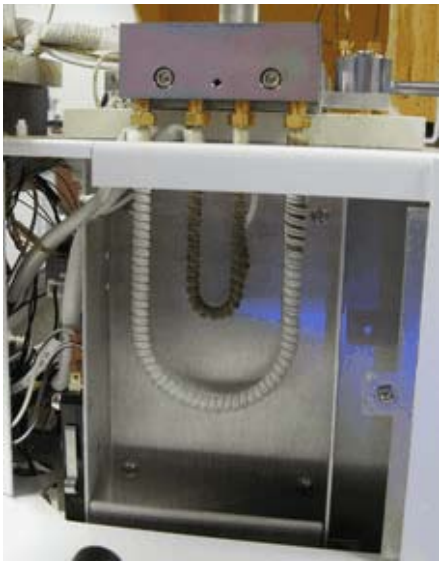


Figure 6-5: Trap Manifold

2. Loosen the captive thumbscrew and open the oven cover and trap cover.
3. Remove the brass screw and Oven Side Insulation Assembly.
4. Just below the Trap Manifold, remove the two nuts on the smaller, U-shaped Condenser.
5. Disconnect RTD and power from the Temperature Control PCB (connections ff and FF).
6. Remove the Condenser.
7. Attach the new Condenser to the Trap Manifold with the RTD and Condenser Heater wires on the left side.
8. Attach the RTD and power connections to the Temperature Control PCB (connections ff and FF) for the new Condenser.
9. Turn the unit back on and perform a Leak Check to ensure proper performance of the unit.

MASS FLOW CONTROLLER (MFC)

1. Turn the unit off, unplug the power cord, and turn off the gas supply to the unit.
2. Take off the right side panel of the unit and locate the MFC.
3. Disconnect the gray cable.
4. Disconnect the gas supply line using a 7/16" (1.11cm) wrench and the out gas line using a 5/16" (0.79cm) wrench.
5. Remove the three mounting screws at each corner of the base plate and remove the MFC.
6. Remove the three mounting screws at the corner of the base plate and remove the MFC.
7. Remove the screws from the bottom of the base plate and remove the MFC.
8. Install the new MFC to the base plate and attach the four screws, the two gas lines, and the two cables.
9. Turn the gas supply on at the source, plug in the power cord, turn the unit on, and perform a Leak Check.

Figure 6-6: MFC

6-PORT VALVE

1. Turn the unit off, unplug the unit, and allow the Oven to cool to room temp.
2. Loosen the captive thumbscrew and open the oven cover.
3. Use a 1/4" wrench to disconnect the 6 Valco nuts from the 6-port Valve and mark each line, referencing the port it was attached to, to ensure proper reinstallation.
4. Use an Allen wrench to take out the two Allen screws and gently lift the 6-port Valve while observing the under side so that proper alignment can be achieved later.
5. Install the new 6-port Valve so that the under side alignment matches that of the old 6-port Valve that was taken out. Port 1 of the 6-port Valve must face the front of the instrument (Sparge Tube).
6. Reattach the 6 Valco nuts, previously labeled above, to their respective port.
7. Plug in the power cord and turn the unit on.
8. Perform a Leak Check and verify proper flow rate.

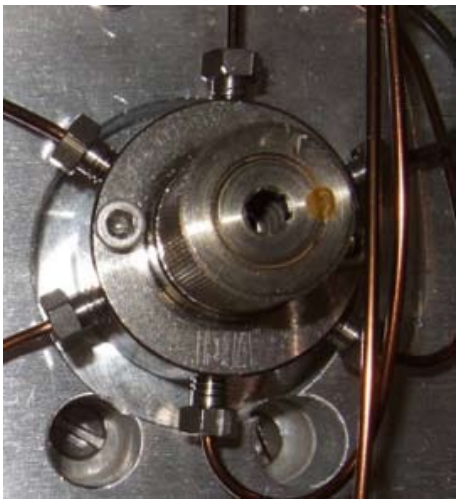


Figure 6-7: 6-port Valve

7-PORT VALVE

1. Click **Tools | Diagnostics | Pumper tab**.
2. Select **Valve A: Waste**, then turn the unit off.
3. Rotate the thumb wheel at the bottom of the pumper counterclockwise to lower the plunger of the syringe.
4. Note the orientation of the fittings attached to the 7-port Valve then disconnect them.
5. Remove the Check Valve Assembly and Gas Sweep Line from the side of the Syringe.
6. Disconnect the Syringe Drive Pin Screw.
7. Unscrew the Syringe from the 7-port Valve.
8. Remove the two hex screws from the face of the 7-port Valve.
9. Connect the Syringe the new 7-port Valve and orient the valve by hand so that when the Syringe is operated air moves through port A.
10. Connect the new 7-port Valve to the Pumper. Make sure the new valve is flush against the Pumper.
11. Replace the two hex screws on the face of the valve and the Syringe Drive Pin Screw.
12. Connect the fittings removed in step 4.
13. Turn the unit on and reinitialize the Syringe.

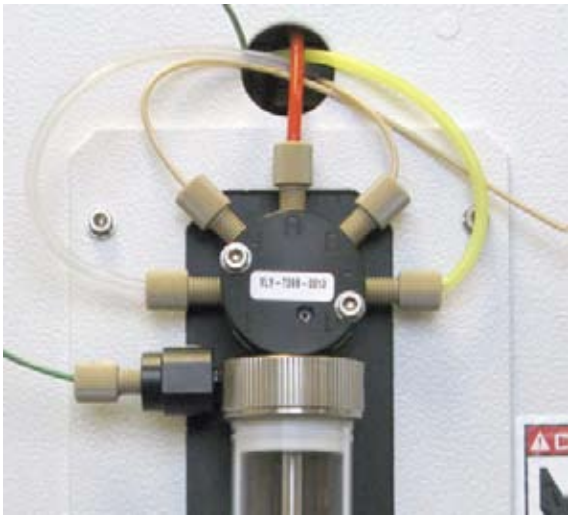


Figure 6-8: 7-port Valve

SOIL VALVE

1. Turn the unit off and remove the power cord.
2. Remove the Sample Station Cover as indicated in the Sample Station Cover Removal section.
3. Locate the Soil Valve and loosen the two fittings with a 5/16" (0.79cm) wrench.
4. Note the order of them remove the hex screw, washer, and grounding wire from the Soil Valve.
5. Gently lift the Soil Valve out of the retention block.
6. Remove the screws from the wire clips and remove the yellow Soil Valve power wire.
7. Note the routing of the Soil Valve power wire and disconnect the black Molex connector below the Valve Plate in the front-right of the instrument.
8. Route the new Soil Valve's power wire in the same manner then reconnect the wire clips.
9. Place the new Soil Valve into the retention block and replace the hex screw, washer, and grounding wire from step 4.
10. Reinstall the two fittings removed in step 3.
11. Replace the Sample Station Cover.

CHECK VALVE

1. Locate the Check Valve on the Syringe.
2. Remove the PEEK nut from the side of the Check Valve.
3. Using a 1/2" (1.27cm) wrench, remove the old Check Valve and replace with a new Check Valve.
4. Confirm that the Teflon washer was installed.
5. Tighten the Check Valve and perform a Leak Check.

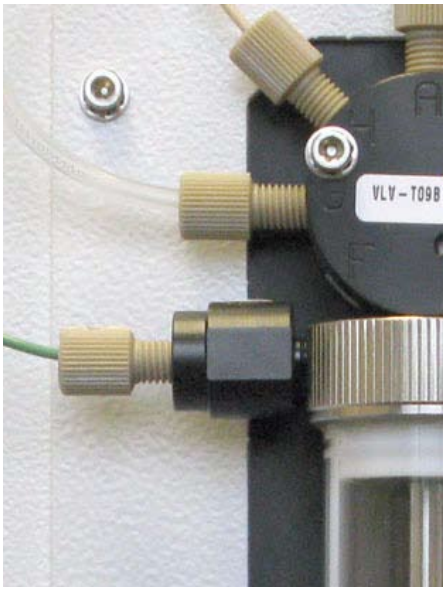


Figure 6-9: Check Valve

THREE-STAGE CONCENTRIC NEEDLE

1. Turn the unit off and remove the power cord.
2. Remove the Sample Station Cover as indicated in the Sample Station Cover Removal section.
3. Remove the two fittings from the 2nd and 3rd stage of the needle.
4. Remove the wire tie without damaging the wire.
5. Remove the two hex screws from the top of the needle.
6. Remove the needle by lifting up gently.

Note: *Be sure that when the needle is replaced that the wire leads are routed up through the slots in the new needle as well as in the guide tubes vertically. Damaged wires must be replaced!*

7. Insert the new needle. If the elevator is up, make sure that the needle goes inside the drain port.
8. Insert and tighten the hex screws from step 5 in the top of the new needle.
9. Replace the wire tie and make sure the wires are routed around the vial extraction guide block. **Unsecured wires may cause unit damage!**
10. Insert and tighten the two fittings from step 3 in the new needle.
11. Replace the Sample Station Cover.

STANDARD SYSTEM VALVE

Note: *If standards are present in the standard vessels, vent the standard vessels by unscrewing the cap and then retightening it when the pressure has been equalized.*

Note: *Do not cut the standard valve or vessel lines. They are required to be a certain length.*

1. Turn the unit off and remove the power cord.
2. Unscrew the appropriate valve from the manifold.
3. Remove the metal fitting at the bottom of the valve.
4. Remove the power wire from the back of the valve.
5. Install the metal fitting to the bottom of the new valve.
6. Install the new valve to the manifold.
7. Install the power wire to the new valve.

STANDARD SYSTEM MANIFOLD

Note: *If standards are present in the standard vessels, vent the standard vessels by unscrewing the cap and then retightening it when the pressure has been equalized.*

1. Turn the unit off and remove the power cord.
2. Remove the PEEK™ fittings from the sides of the manifold.
3. Remove the two screws on the face of the manifold.
4. Remove the power wires from the three Standard System Valves.
5. Unscrew the three Standard System Valves from the bottom of the manifold.
6. Remove the old manifold.
7. Install the three Standard System Valves into the bottom of the new manifold.
8. Install the two screws removed in step 3 to the new manifold.
9. Install the power wires removed in step 4 to the Standard System Valves.
10. Install the PEEK™ fittings removed in step 2 to the new manifold.

POWER ENTRY MODULE (PEM) FUSES

To avoid electrical shock, turn off the instrument and unplug the power cord before removing the side panels.

To replace the fuses, follow the steps below using the figure below as a reference. The fuses are rated 5A for 230V and 10A for 115V. **Do not use a fuse of any other rating.**

1. Turn off power to the unit and remove the power cord.
2. Insert the end of a small, flat-blade screwdriver into the notch that is next to the power cord connection.
3. **Carefully** pry the fuse compartment out of the PEM.
4. Replace the blown fuse(s). The correct fuse ratings and specifications are listed on the back panel of the instrument.
5. Align the fuse compartment so that the arrow on the fuse compartment and the arrow on the PEM are pointing at each other.
6. Push the fuse compartment back into the PEM.
7. Plug in the power cord and turn the unit on.

Figure 6-10: PEM with Fuse Compartment Removed

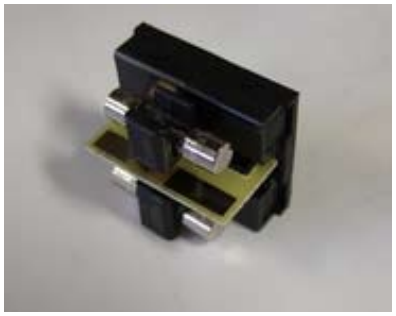


Figure 6-11: Fuse Compartment

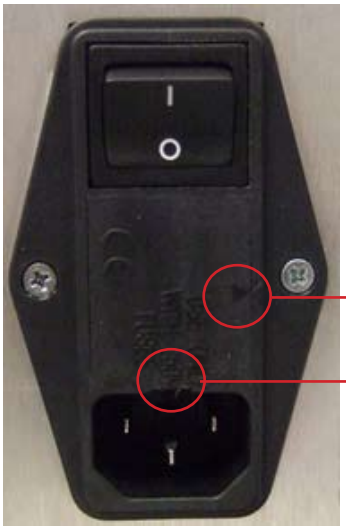


Figure 6-12: PEM

PRINTED CIRCUIT BOARDS (PCBS)

The connections to the PCBs are unique unless otherwise noted. If you feel it is necessary you may label the connections.

Motor Board

1. Turn the unit off and remove the power cord.
2. Remove the left side panel and locate the PCB. Remove front cover and open door.
3. Put on an anti-static wrist band and connect it to a proper ground on the unit's chassis before handling the PCB to prevent Electrostatic Discharge (ESD) damage.
4. Disconnect all cables from the PCB, remove the single screw holding the board in place, and gently pull the PCB from the stand offs.
5. Install the new PCB, the cable mounting hex nuts, and reattach all cables to the appropriate receptacles.
6. Plug in the power cord and turn the unit on.

Temperature Control Board

1. Turn the unit off and remove the power cord.
2. Remove the right side panel and locate the PCB.
3. Put on an anti-static wrist band and connect it to a proper ground on the unit's chassis before handling the PCB to prevent ESD damage.
4. Disconnect all cables from the PCB, remove the single screw holding the board in place, and gently pull the PCB from the stand offs.
5. Install the new PCB and reattach all cables to the appropriate receptacles.
6. Plug in the power cord and turn the unit on.

DC Output Board

1. Turn the unit off and remove the power cord.
2. Open the front cover and locate the PCB.
3. Put on an anti-static wrist band and connect it to a proper ground on the unit's chassis before handling the PCB to prevent ESD damage.

   Note: *There are multiple identical connections on this board. The connectors are labeled on a diagram in the unit near the board.*

4. Disconnect all cables from the PCB and gently pull the PCB from the stand offs.
5. Install the new PCB and reattach all cables to the appropriate receptacles.
6. Plug in the power cord and turn the unit on.

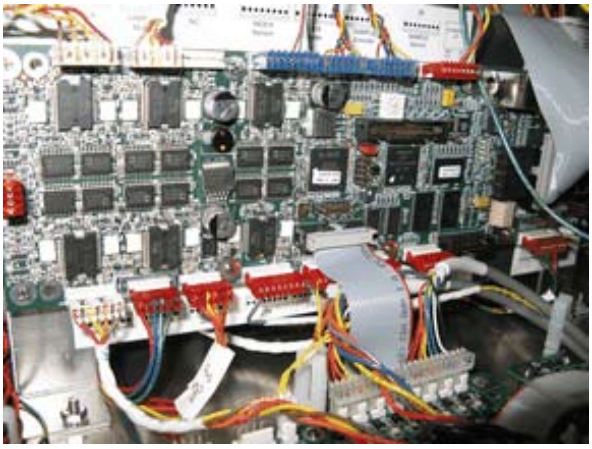


Figure 6-13: CPU Board

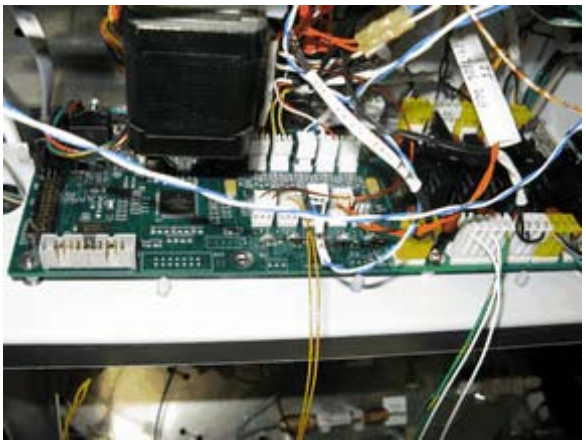


Figure 6-14: Temperature Control Board

Figure 6-15: DC Output Board

24V Power Supply

1. Turn the unit off and remove the power cord.
2. Remove the left side panel and locate the PCB.
3. Put on an anti-static wrist band and connect it to a proper ground on the unit's chassis before handling the PCB to prevent ESD damage.
4. Remove the two screws holding the board in place, and gently pull the PCB from the stand offs.
5. After removal, disconnect all cables from the PCB.
6. Attach all cables to the new PCB based on the connection diagram located on the interior of the instrument, near the PCB.
7. Install the new PCB.
8. Plug in the power cord and turn the unit on.

Figure 6-16: 24V Power Supply

25W Power Supply

1. Turn the unit off and remove the power cord.
2. Remove the left side panel and locate the PCB.
3. Put on an anti-static wrist band and connect it to a proper ground on the unit's chassis before handling the PCB to prevent ESD damage.
4. Disconnect all cables from the PCB, remove the single screw holding the board in place, and gently pull the PCB from the stand offs.
5. Install the new PCB and reattach all cables to the appropriate connectors.
6. Plug in the power cord and turn the unit on.

Figure 6-17: 25W Power Supply

CAROUSEL CALIBRATION

In the event a carousel drive, carousel encoder, or rotational stepper motor is to be replaced or if the carousel tray is found in a random location, the following calibration procedures are to be performed.

Course Adjustment

1. Disconnect the Atomx from the computer and turn the power ON to the Atomx.
2. The carousel encoder will seek the electrical home position. Once rotational movement has ended, mark the center of the encoder bracket (that can be viewed) with a fine tip black indelible marker.
3. Mark the center of the encoder shaft with respect to the center mark that you made on the bracket. See Figure 6-18.

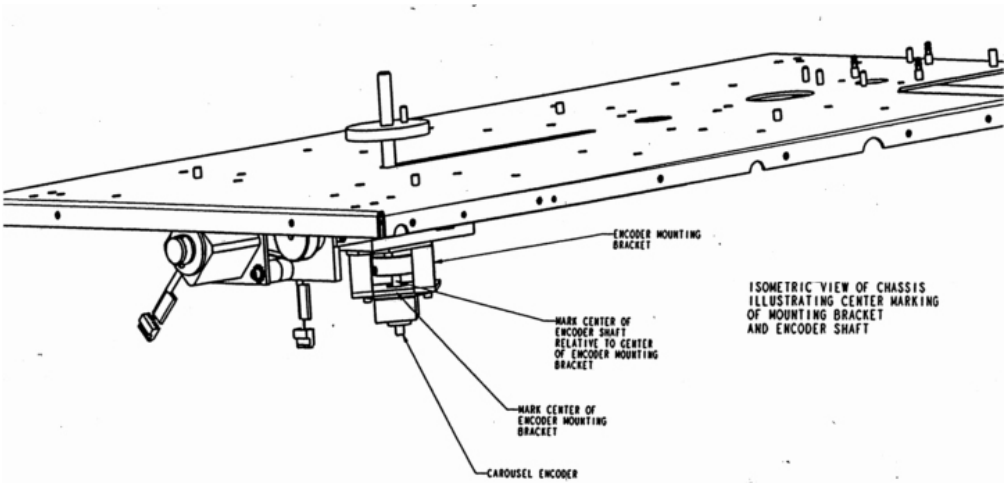


Figure 6-18: Encoder Bracket and Shaft

4. Turn the power OFF to the Atomx.
5. Using a short or stubby flat blade screwdriver inserted into the machined slot of the worm gear within the carousel drive, manually adjust the carousel radially until position 1 is centered with the center of the indexing slot for the carousel drive on the top of the chassis (+/- 0.062") (0.16cm). See Figure 6-19.

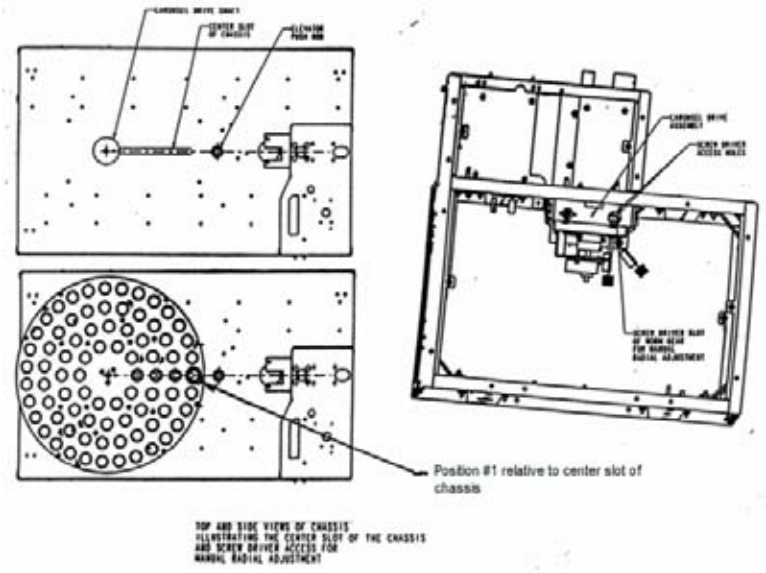


Figure 6-19: Centering with Indexing Slot

6. Loosen the 4-40 socket head cap screws that secure the encoder shaft to the carousel drive shaft. See Figure 6-20.
7. Using long needle nose pliers, carefully rotate the shaft of the encoder until the black marks that were created earlier are aligned.
8. Retighten the 4-40 screws to secure the encoder shaft to the drive shaft.
9. Reconnect the Atomx to the computer via RS232 and turn the power ON to the Atomx. The carousel tray should rotate to the #1 position. If not, proceed to the fine adjustment.

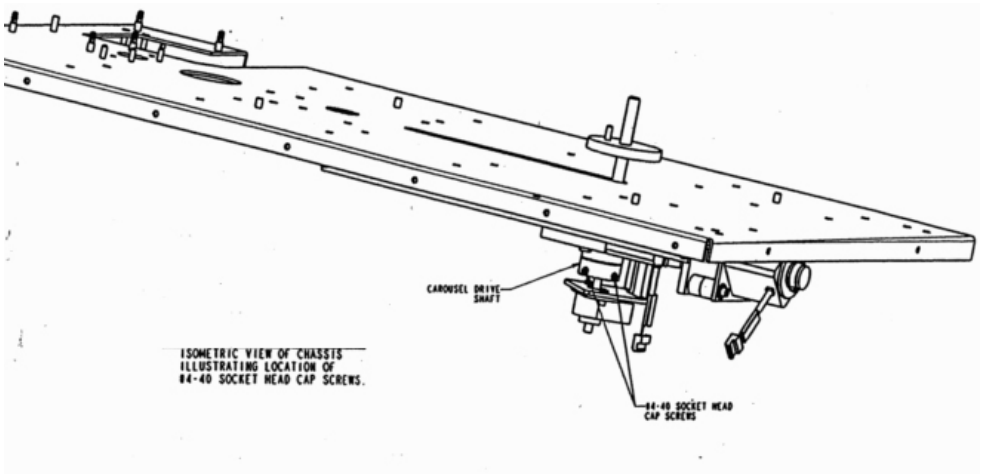


Figure 6-20: Securing the Encoder Shaft

Fine Adjustment

1. Disconnect the Atomx from the computer and turn the power ON to the Atomx.
2. The carousel encoder will seek the electrical home position. Vial position 1 and 30 should be between the center indexing slot. See Figure 6-21. Reconnect the Atomx to the computer via RS232.
3. Open the Atomx TekLink™ software and log in.
4. Click **Tools | Calibrate Carousel.**
5. Follow the on-screen instructions, then click **Step**. This will move the carousel tray and encoder to its electronic home position.
6. Using a stubby or short wide flat blade screwdriver inserted into the machined slot of the worm gear within the carousel drive as illustrated in Figure 6-21, rotate the carousel drive manually either clockwise or counterclockwise until vial position 1 is within the center carousel drive slot on top of the chassis, +/-0.062" (0.16cm).

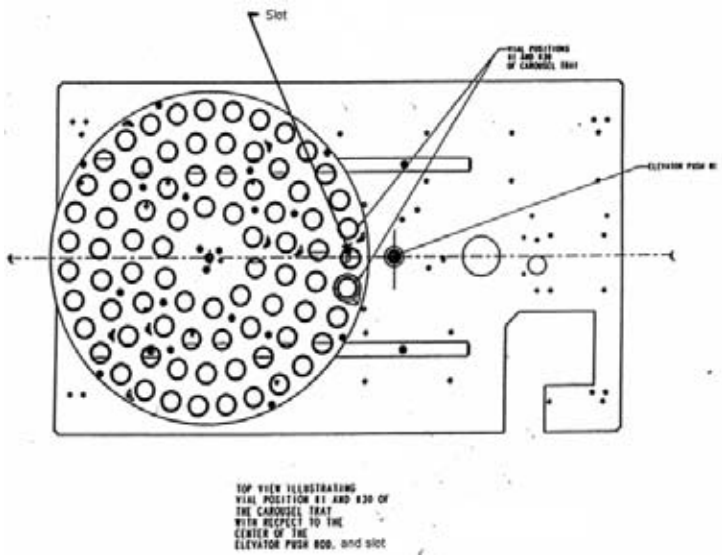


Figure 6-21: Centering Between Position 1 and 30

7. Click **Step** again when complete. The software will re-home the carousel drive mechanism to optically verify center.
8. Click **Step** once more to complete the procedure.

Note: *You may have to perform this procedure several times.*

Carousel Drive Indexing (Home) Adjustment

The indexing function is the linear travel of the carousel tray and drive mechanism. The Atomx carousel drive mechanism has an optical sensor and interrupting flag. The interrupting flag may have to be adjusted if the carousel drive is replaced or position 1 is not linearly centered over the elevator push rod +/-0.062" (0.16cm) prior to delivering a sample vial onto the 3-stage needle. See Figures 6-22, 6-23 and 6-24.

1. Connect the Atomx to the computer via RS232 and turn power ON to the Atomx.
2. Open the Atomx TekLink™ software.
3. Click **Tools | Diagnostics | Autosampler tab.**
4. Change the **Vial Position** to **1** and click the **Move** button.
5. After movement has ended check if the vial hole is not linearly centered with respect to the elevator push rod within +/-0.062" (0.16cm).
6. If it is not aligned properly, loosen the 4-40 x 3/16" (0.48cm) long slotted pan head screw and carefully move the optical sensor interrupter flag either towards or away from the optical sensor a small amount.
7. After adjustment, re-tighten the 4-40 x 3/16" (0.48cm) long pan head screw.
8. Repeat Steps 4 and 5.

Note: *You may have to perform this adjustment several times.*

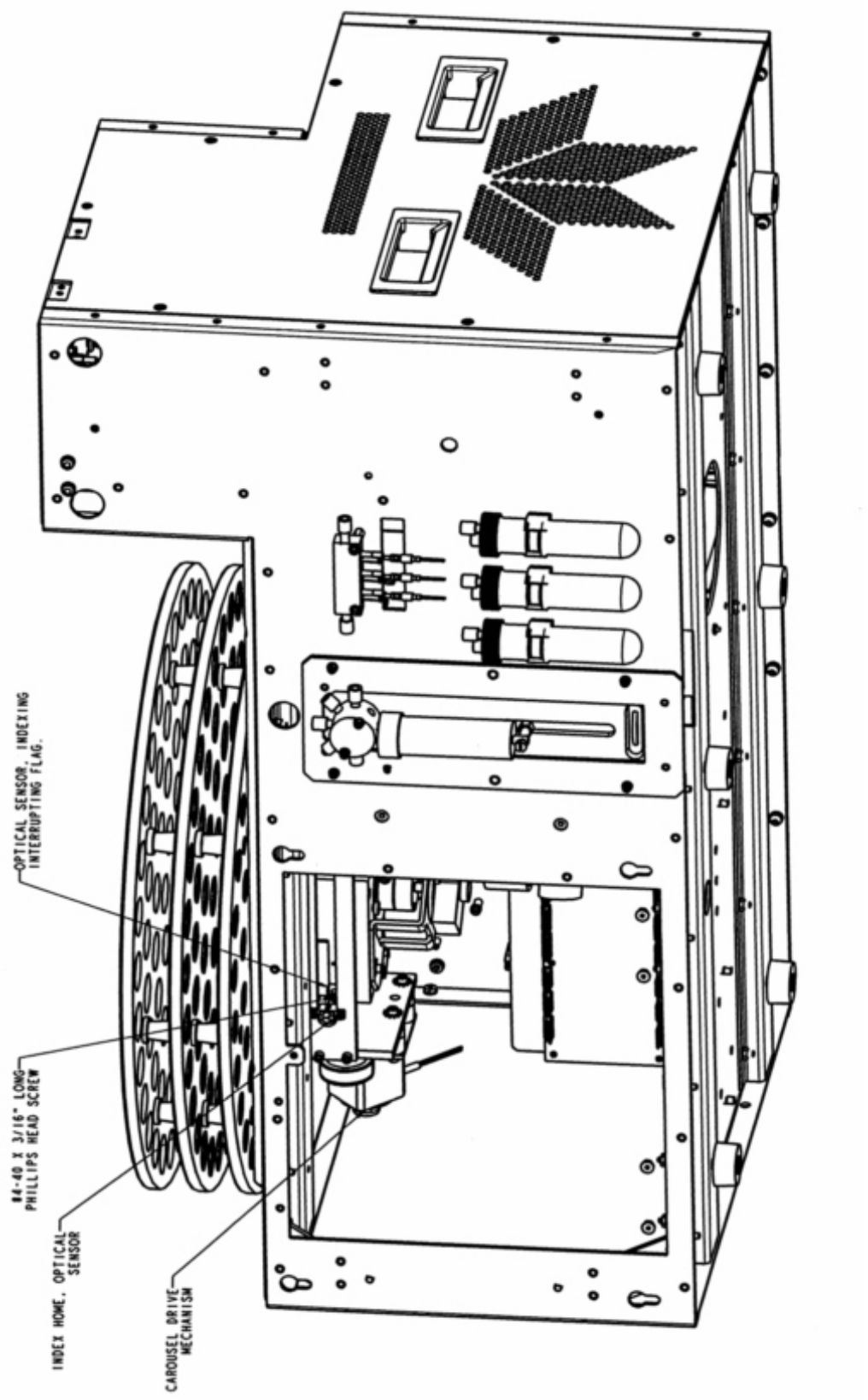


Figure 6-22: Optical Sensor

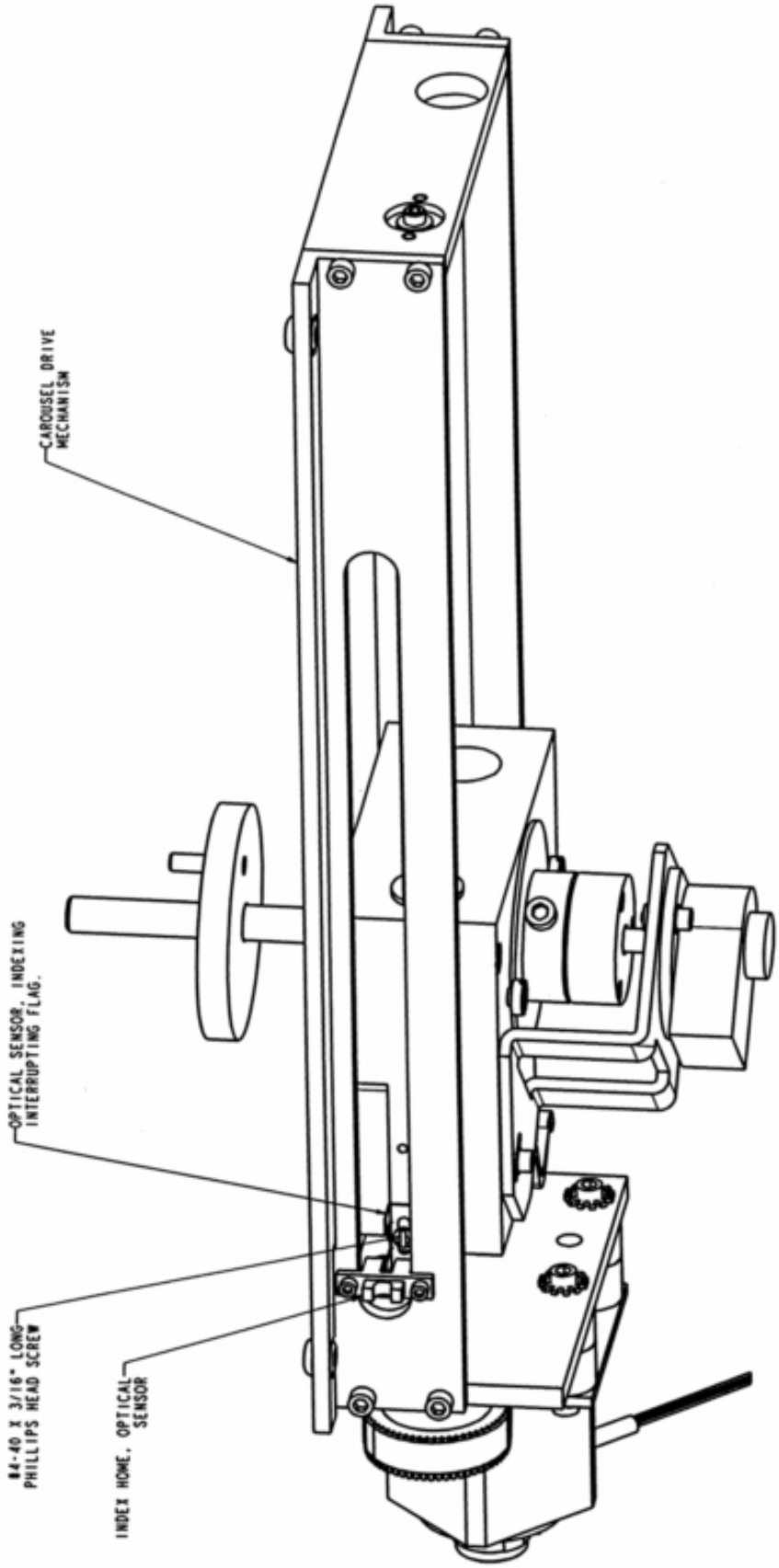


Figure 6-23: Interrupting Flag

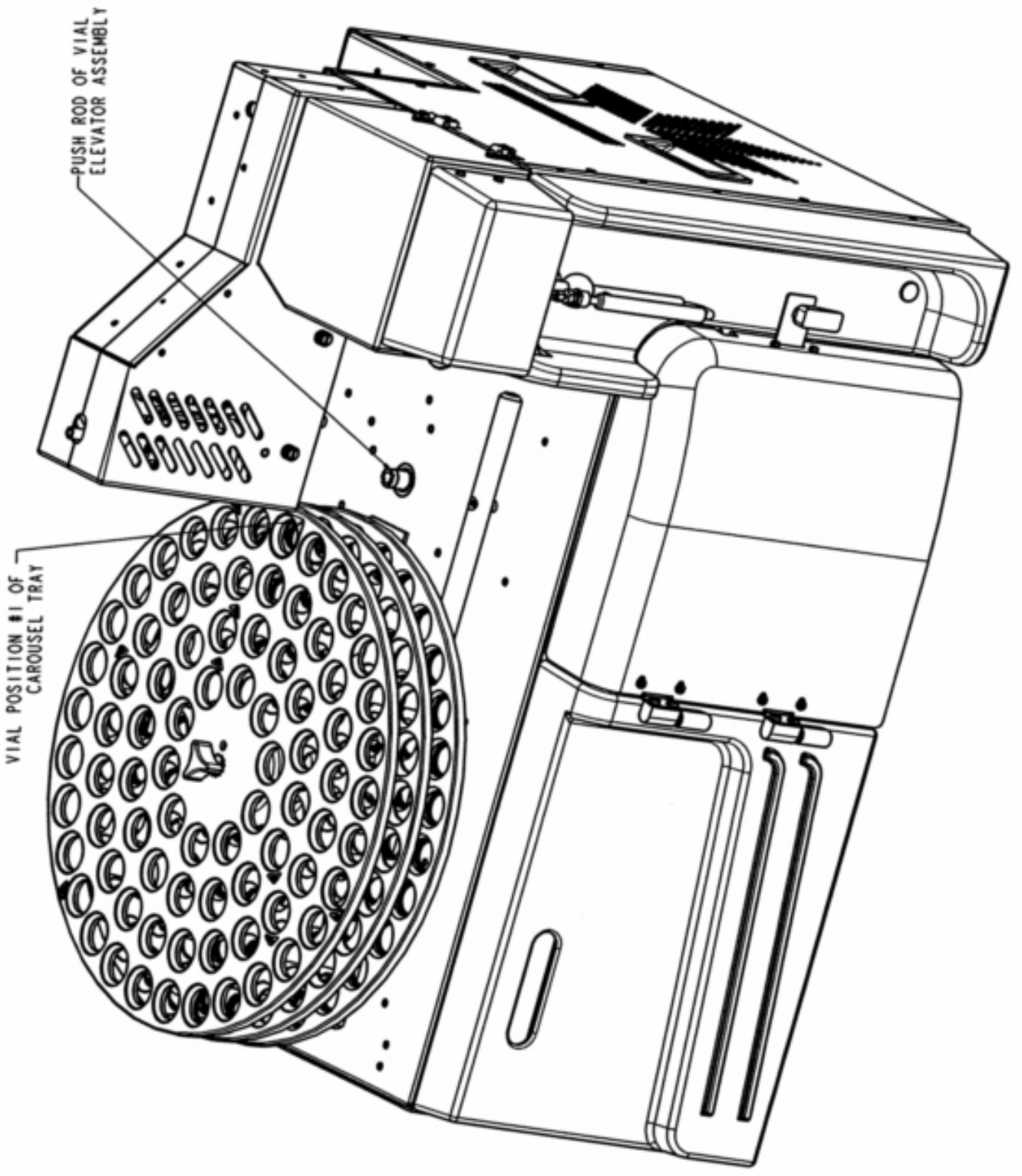


Figure 6-24: Elevator Rod and Positioning

CAROUSEL DRIVE LUBRICATION POINTS

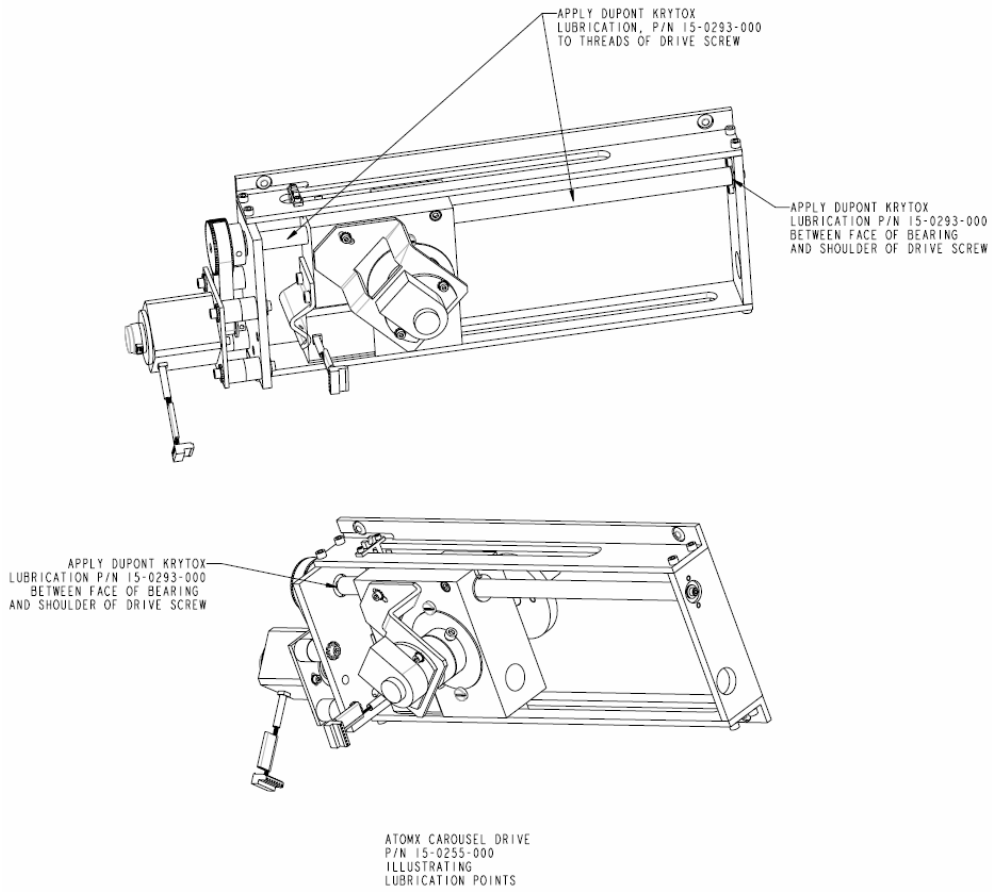


Figure 6-25: Carousel Drive Lubrication Points

UNIT AND PARTS DISPOSAL

DO NOT DISCARD!

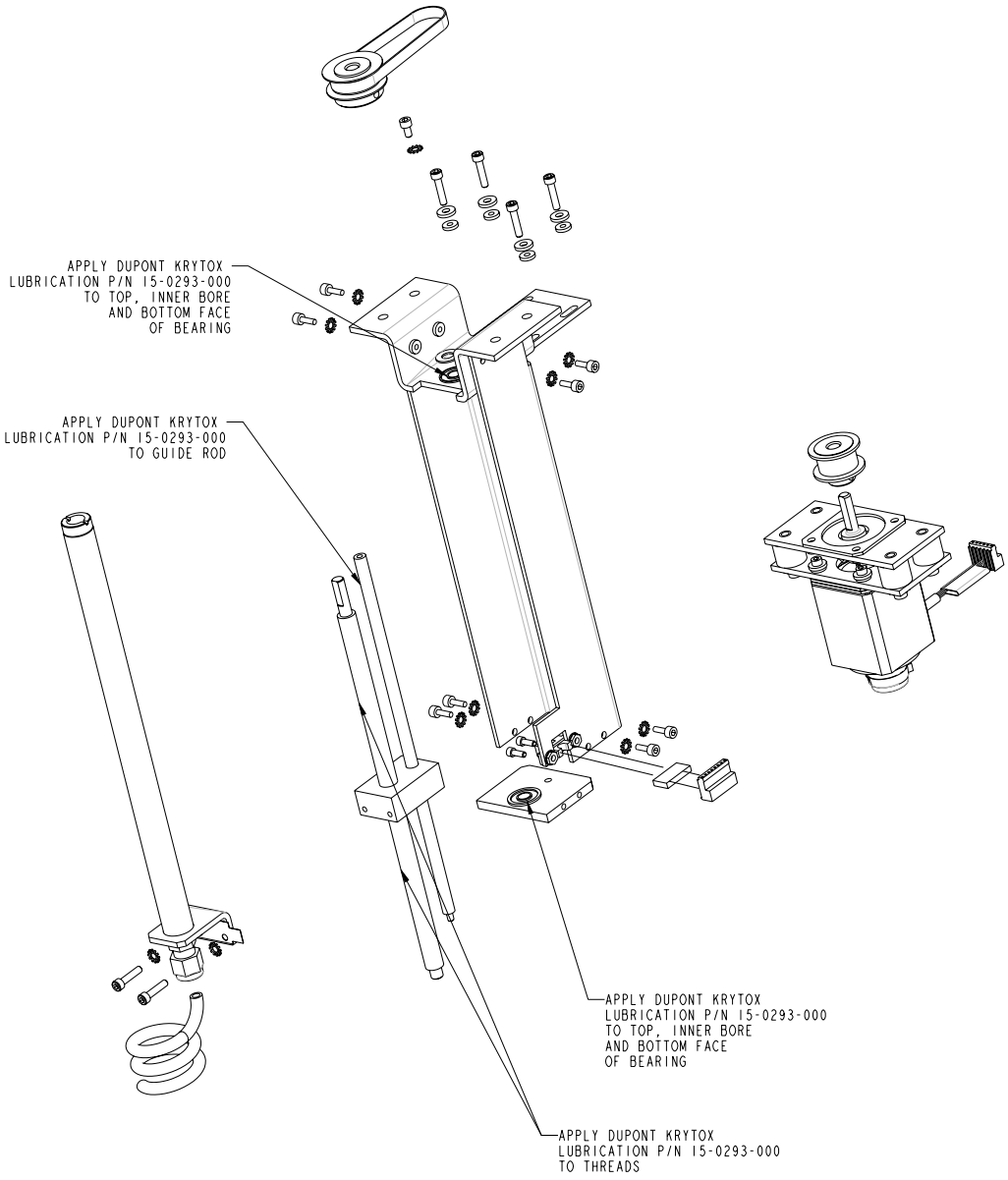
Please contact Teledyne Tekmar or your local distributor for instructions on returning the system for proper disassembly and disposal.

Teledyne Tekmar Customer Support:

U.S.A. (800) 874-2004

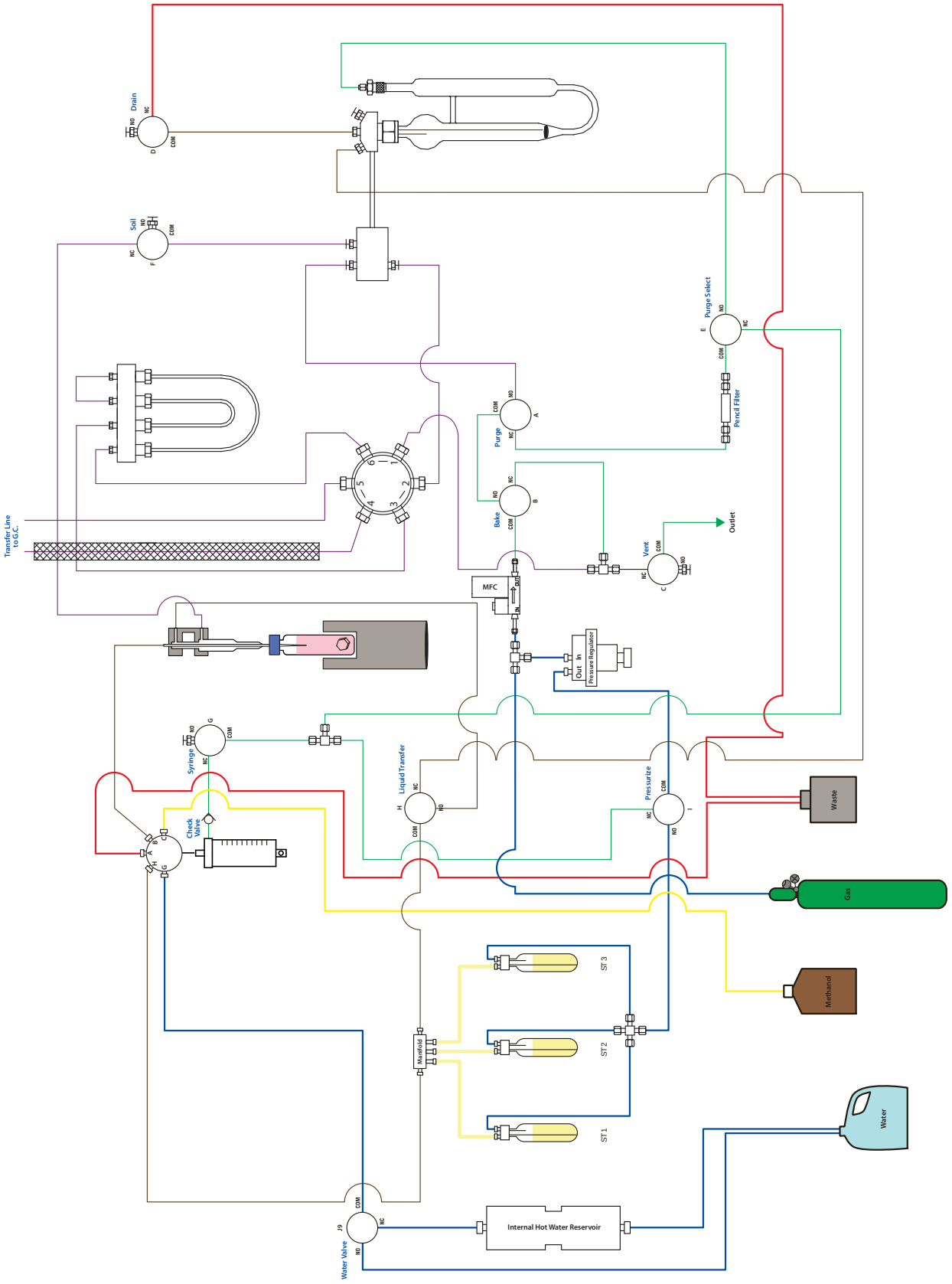
Outside the U.S.A. (Country Code) + 1 (513) 229-7000

ELEVATOR LUBRICATION POINTS



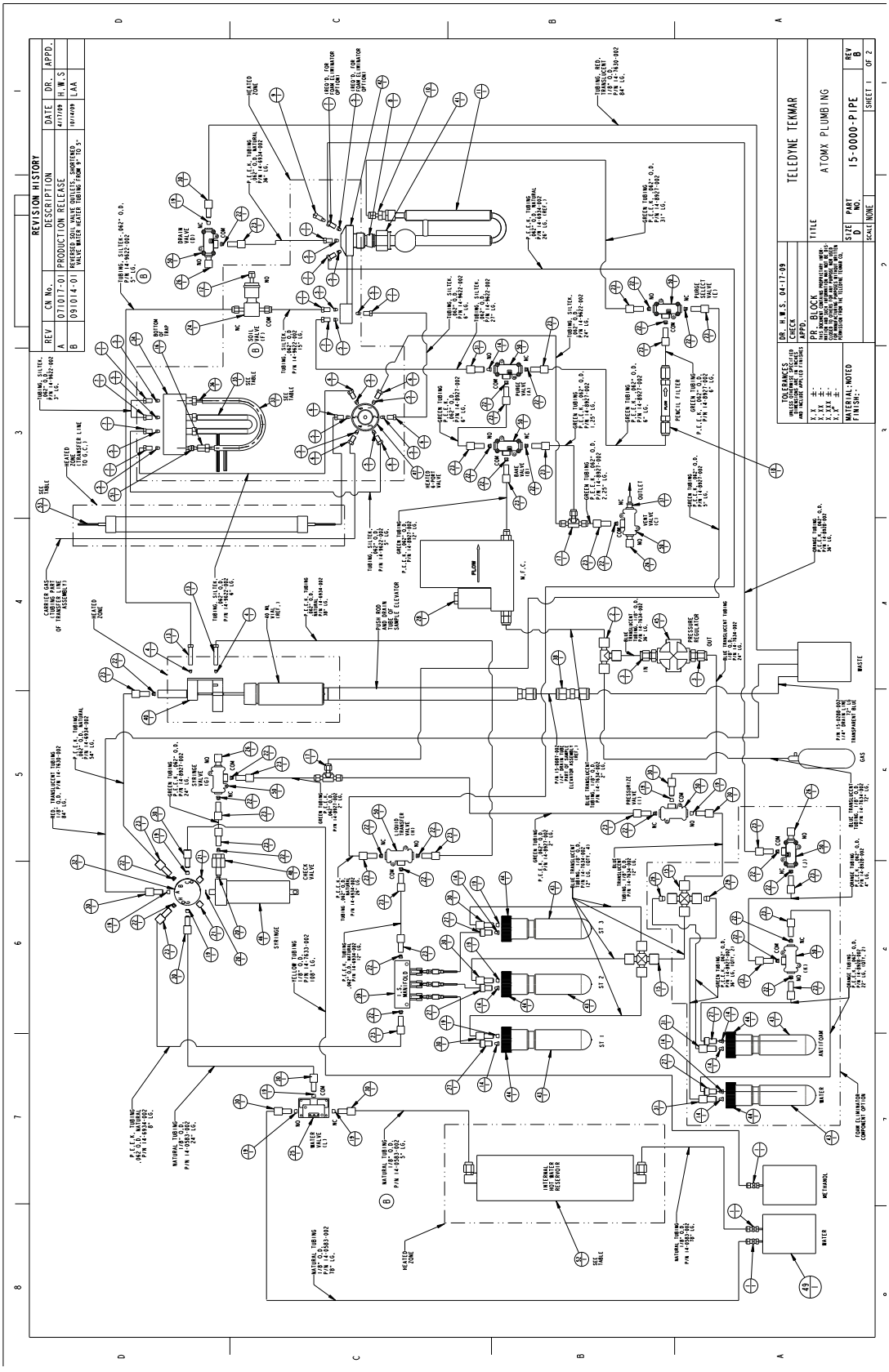
Chapter 7:
Diagrams

Plumbing



TELEDYNE TEKMAR
A Teledyne Technologies Company

Detailed Plumbing Part 1



Detailed Plumbing Part 2

REVISION HISTORY					
REV	CN No.	DESCRIPTION	DATE	DR.	APPD.
A	071017-01	PRODUCTION RELEASE	4/17/09	H.W.S	

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	12-0064-016	BULKHEAD,1/8"-1/8" TUBE STUB, BRASS	3
2	12-0070-016	1/8" BRASS "T"	1
3	12-0075-016	CONN., MALE 1/8"TUBE TO 1/8" NPT	2
4	14-0158-016	FERRULE SET, 1/16 SS, 2 PIECE	2
5	14-0241-016	FERRULE, VALCO 1/16" SST	16
6	14-0243-016	NUT, SHORT 1/16 MALE, VALCO	6
7	14-0243-116	NUT, 1/16", SHORT GOLD PLATED	10
8	14-1301-016	FERRULE SET, 1/2 " TEFLON	1
9	14-1590-116	NUT, MALE PLUG, 1/16", GOLD PLATED	1
10	14-2261-016	UNION, 1/4-1/16 REDUCING, SST W/TEF FERR.	1
11	14-2337-024	5 mL FRIT SPARGER, 1/2" NECK	1
12	14-2792-016	NUT,PLUG, 1/16" BRASS	1
13	14-2950-116	NUT, 1.00-LONG 1/16 MALE, VALCO(GOLD PLATED)	2
14	14-3123-016	FERRULE, 1/16, UPCHURCH	8
15	14-4261-016	CROSS, .1/8" UNION BRASS	2
16	14-4602-116	NUT, 1/8, MALE, VALCO, GOLD PLATED	1
17	14-4695-016	TEE, 1/16" BRASS	2
18	14-5661-016	PENCIL FILTER	1
19	14-7038-016	BUSING, 1/8	12
20	14-7201-009	WASHER, TEFLON	2
21	14-7514-001	PLUG, FLAT POINT NYLON	2
22	14-7671-016	FERRULE SET, 1/16" TUBING	27
23	14-7695-016	NUT, 1/16 " P.E.E.K.	27
24	14-8317-100	SOIL VALVE ASSEMBLY	1
25	14-8318-150	VALVE , 3-WAY LQX16	1
26	14-8470-016	PLUG NUT, 1/4-28, TEFZEL, FLAT BOTTOM	4
27	14-8820-016	NUT, 1/16", 1/4-28 THD. P.E.E.K. (SHORT)	5
28	14-8907-250	MASS FLOW CONTROLLER	1
29	14-8919-016	1/8" TO 1/16" GRAPHITE	2
30	14-9778-016	NUT, FLANGLESS, 1/8", 1/4-28, P.E.E.K	12
31	14-9781-016	NUT, FLANGLESS, 1/16", 1/4-28, P.E.E.K	3
32	14-9784-050	VALVE, 7-PORT (KLOHEN)	1
33	14-9828-_20	TRAP/HEATER ASSEMBLY	1
34	14-9845-216	OVEN TRAP MANIFOLD,	1
35	14-9895-_20	CONDENSATE TRAP HEATER	1
36	14-9908-403	#9 TRAP	1
37	14-9924-016	BARB FITTING TO 1/4-28	1
38	15-0088-016	UNION, 1/4" TUBE TO TUBE BRASS	1
39	15-0112-000	I.S. VALVE ASSEMBLY	1
40	15-0129-053	NEEDLE, 3 STAGE	1
41	15-0155-016	NUT, 1/2 SS SAMPLE MOUNT	1
42	15-0171-016	SAMPLE MOUNT, ASSY	1
43	15-0201-024	15 ml GLASS VESSEL	5
44	15-0202-079	BUSHING, P.E.E.K. WITH VITON O-RING	5
45	15-0244-050	PRESSURE REGULATOR, SELF RELIEVING, 0-15 PSI	1
46	15-0270-052	SYRINGE, 27ml W/SIDE PORT	1
47	15-0275-050	VALCO VALVE, 6-PORT	1
48	15-0278-050	VALVE, CHECK, IN LINE 1/4-28	1
49	15-0279-000	WATER RESERVOIR, 10 L	1
50	15-0280-050	VALVE, 24 VDC, LQX12	10
51	15-0285-016	FERRULE, 1/8 VESPEL	1
52	SEE TABLE	HEATER, HOT WATER	1
53	SEE TABLE	TRANSFERLINE HEATER	1

HEATER REFERENCE TABLE	15-0000-100 (115 VAC)	15-0000-200 (220 VAC)
TRANSFERLINE HEATER	14-8790-E20	14-8790-F20
CONDENSATE TRAP HEATER	14-9895-120	14-9895-220
TRAP HEATER	14-9828-120	14-9828-220
ASSY., WATER RESERVOIR/HEATER	14-8105-320	14-8105-420

TOLERANCES
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISHES
X.X ±-
X.XX ±-
X.XXX ±-
X.X° ±-
MATERIAL:NOTED
FINISH:-

DR. H.W.S. 04-17-09
CHECK
APPD.

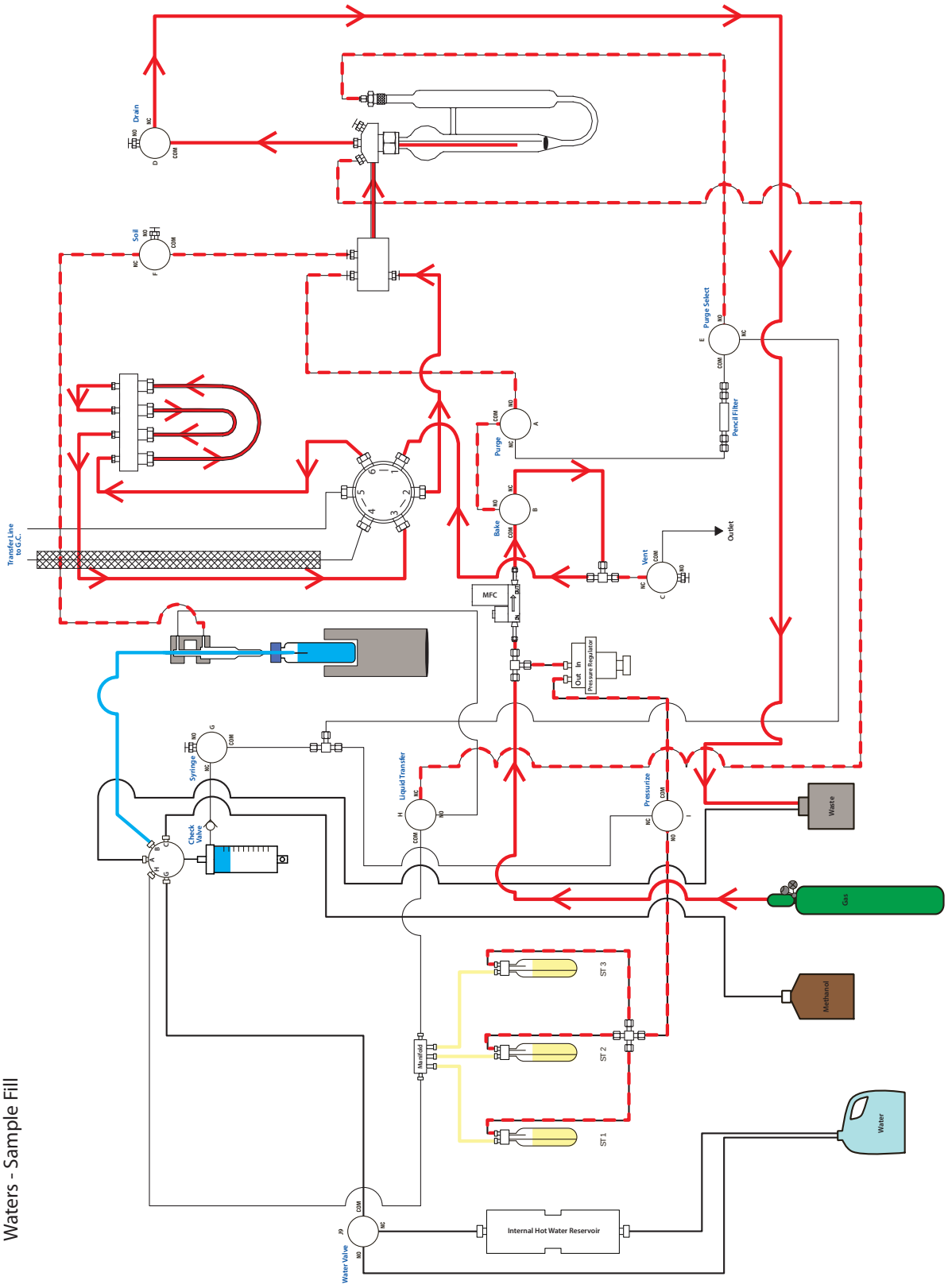
PR. BLOCK
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM THE TELEDYNE TEKMAR CO.

TELEDYNE TEKMAR
TITLE ATOMX PLUMBING
SIZE D PART NO. 15-0000-PIPE REV A
SCALE NONE SHEET 2 OF 2

Note: *Be aware that part numbers may have changed since the publication of this manual. Please contact technical support for current part number listing and pricing.*

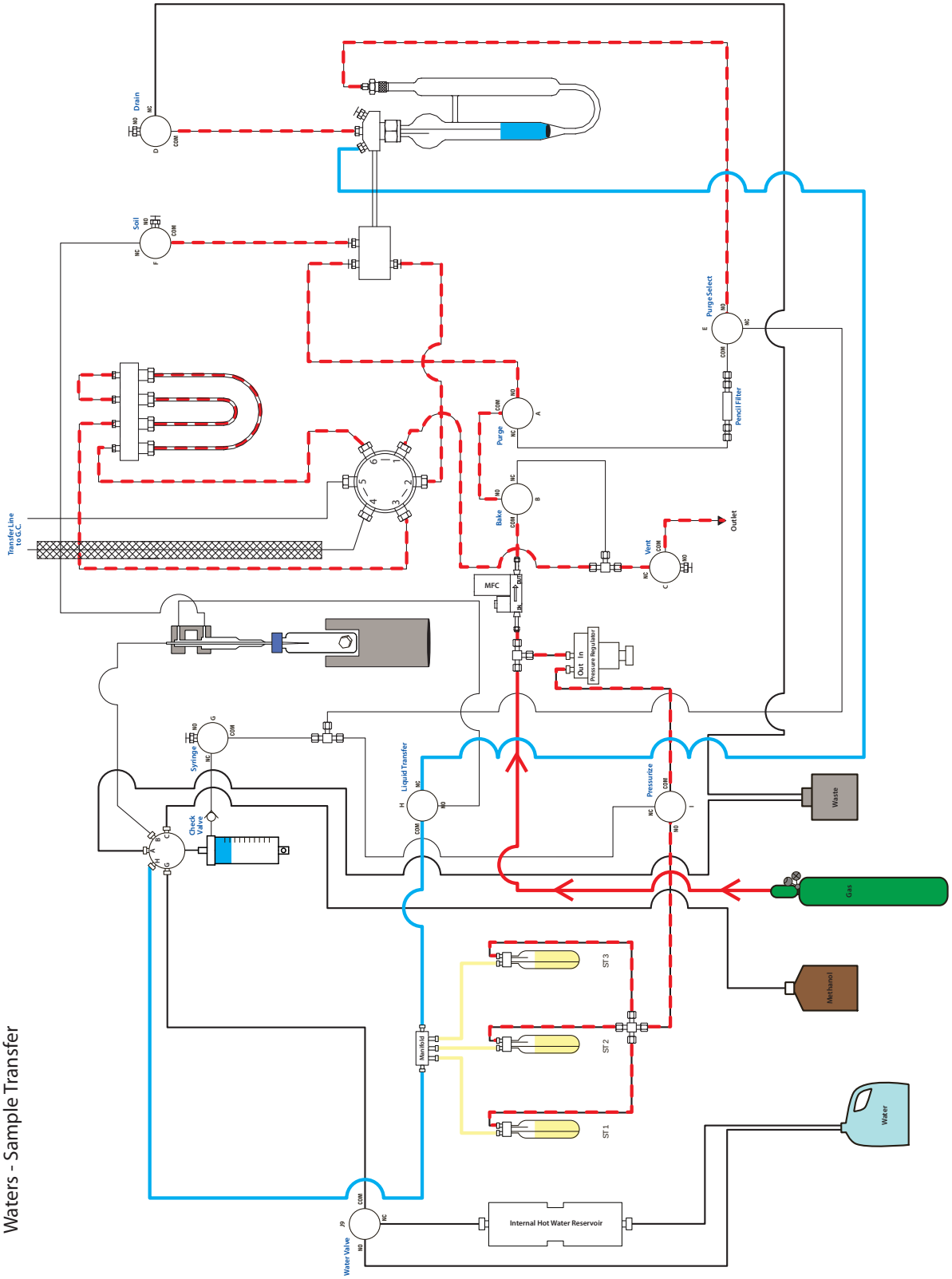
TELEDYNE TEKMAR
A Teledyne Technologies Company

Water Flow Diagrams - Sample Fill



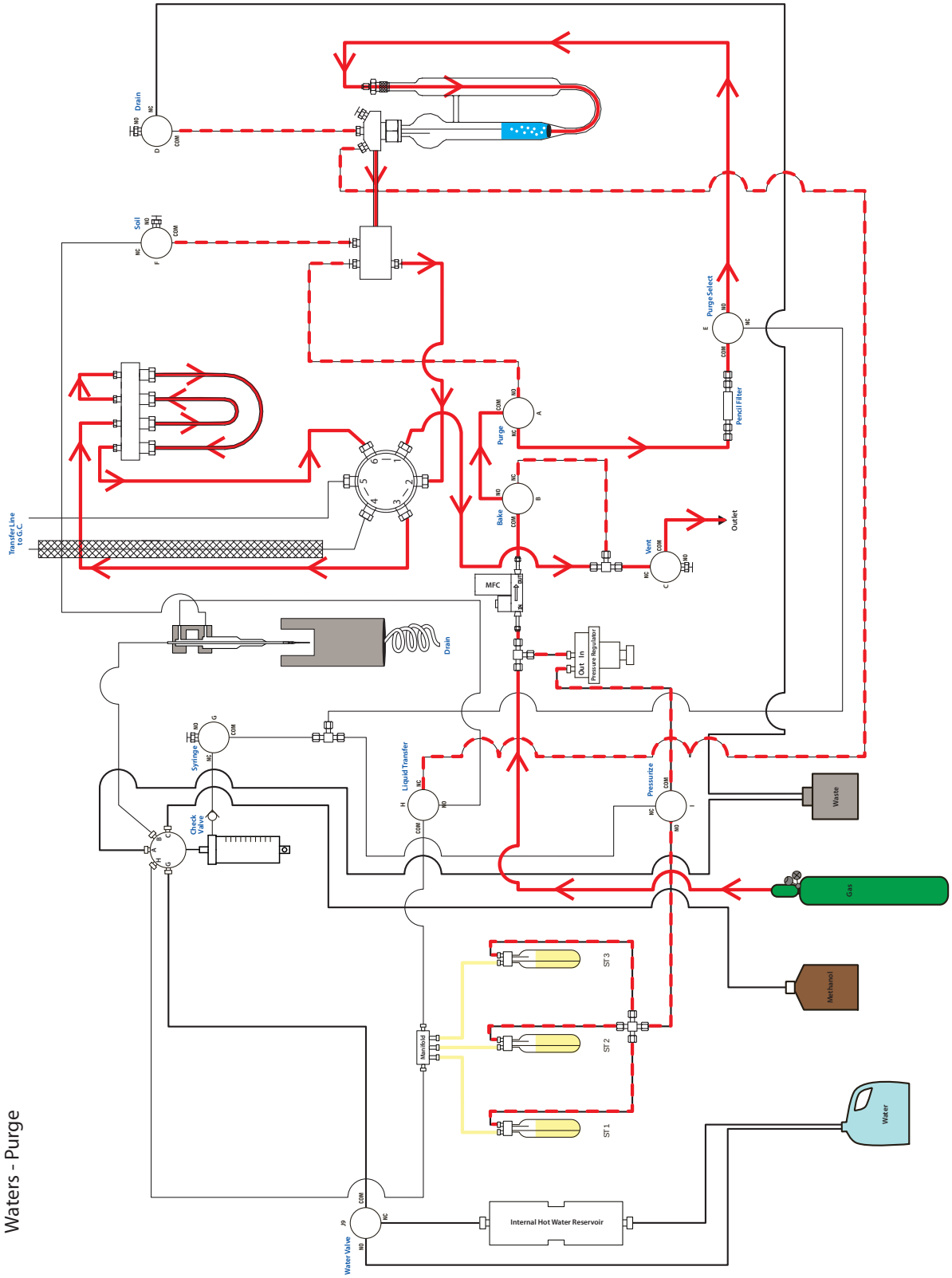
Waters - Sample Fill

Sample Transfer



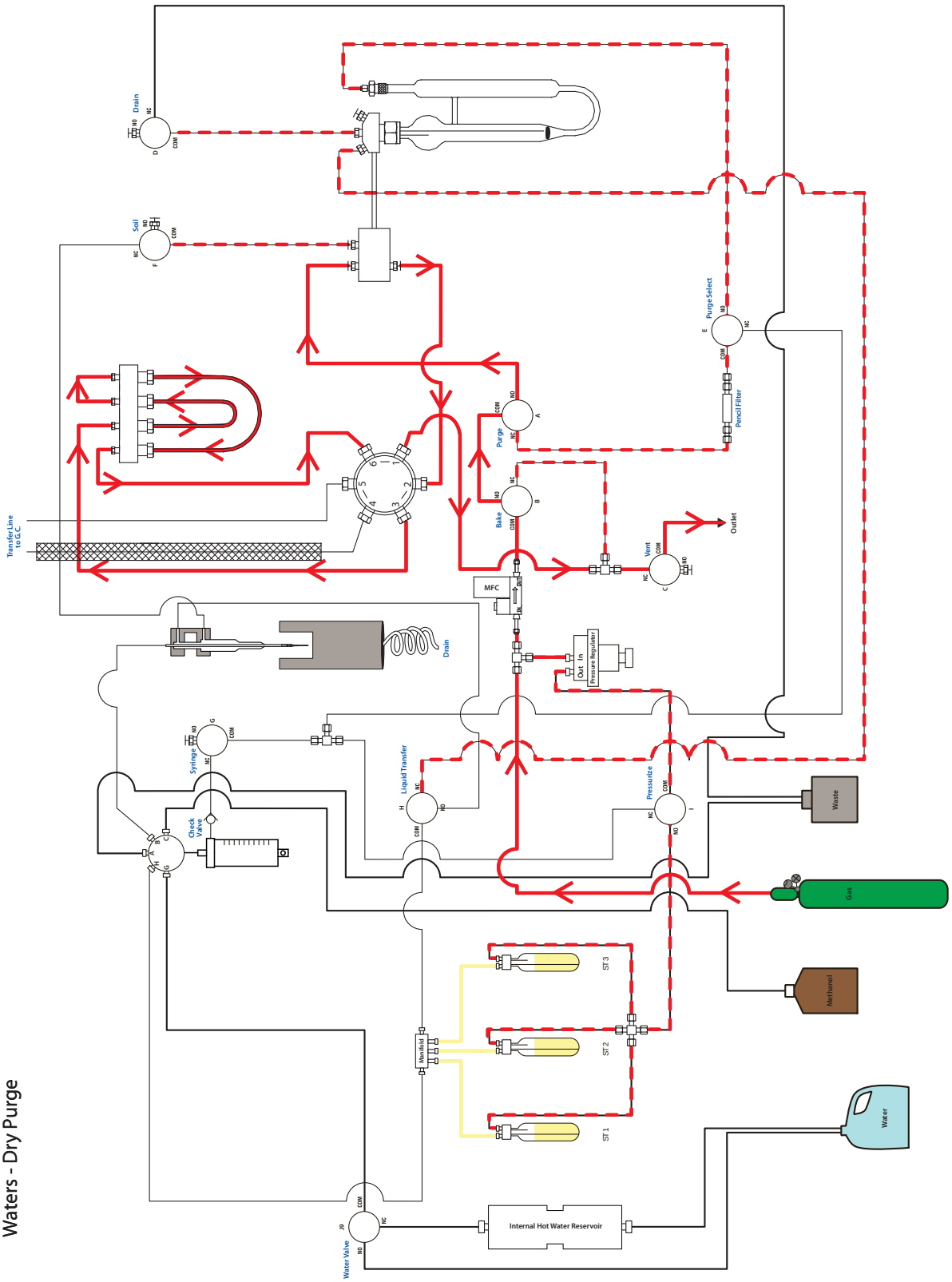
Waters - Sample Transfer

Purge



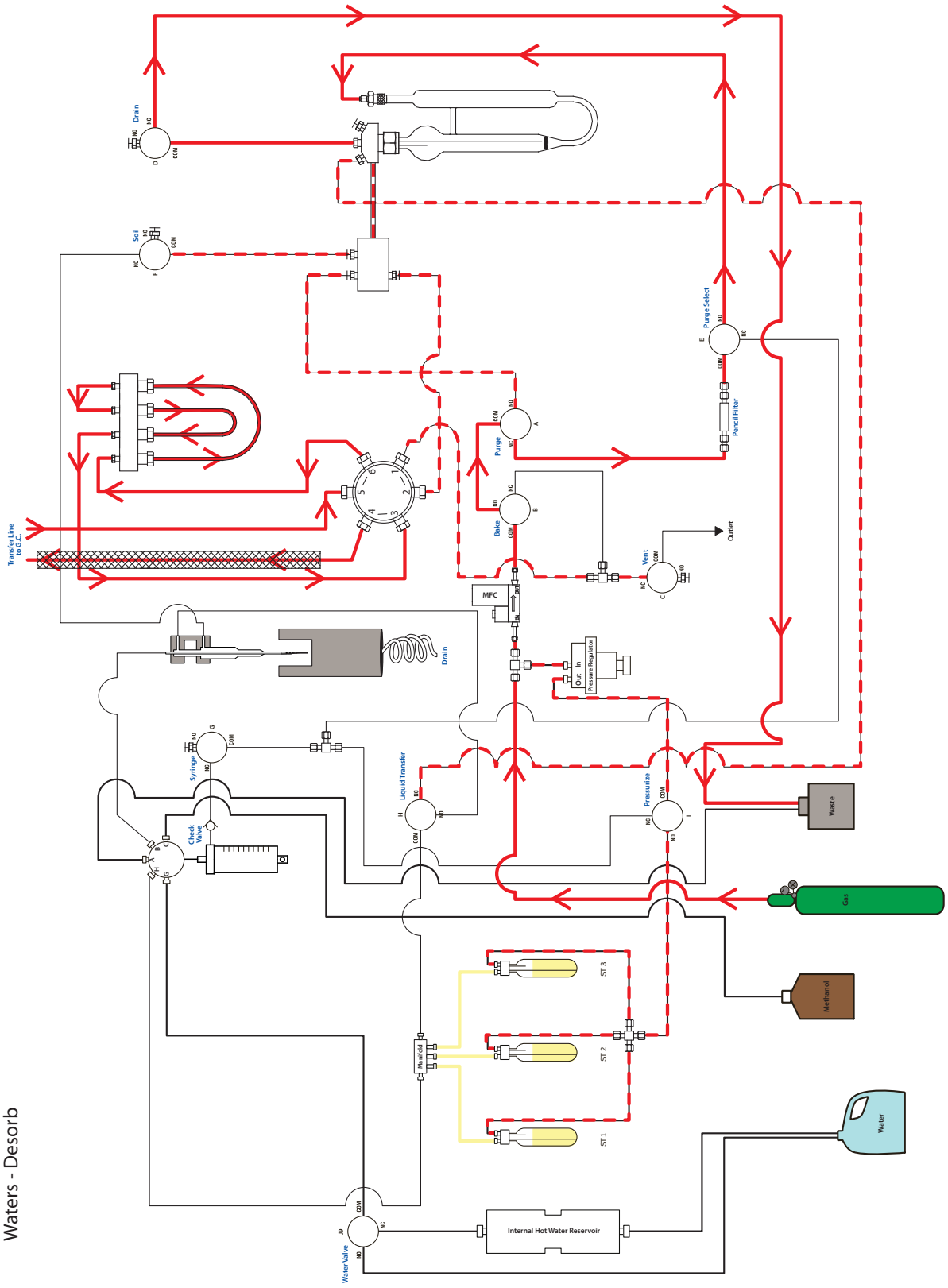
Waters - Purge

Dry Purge



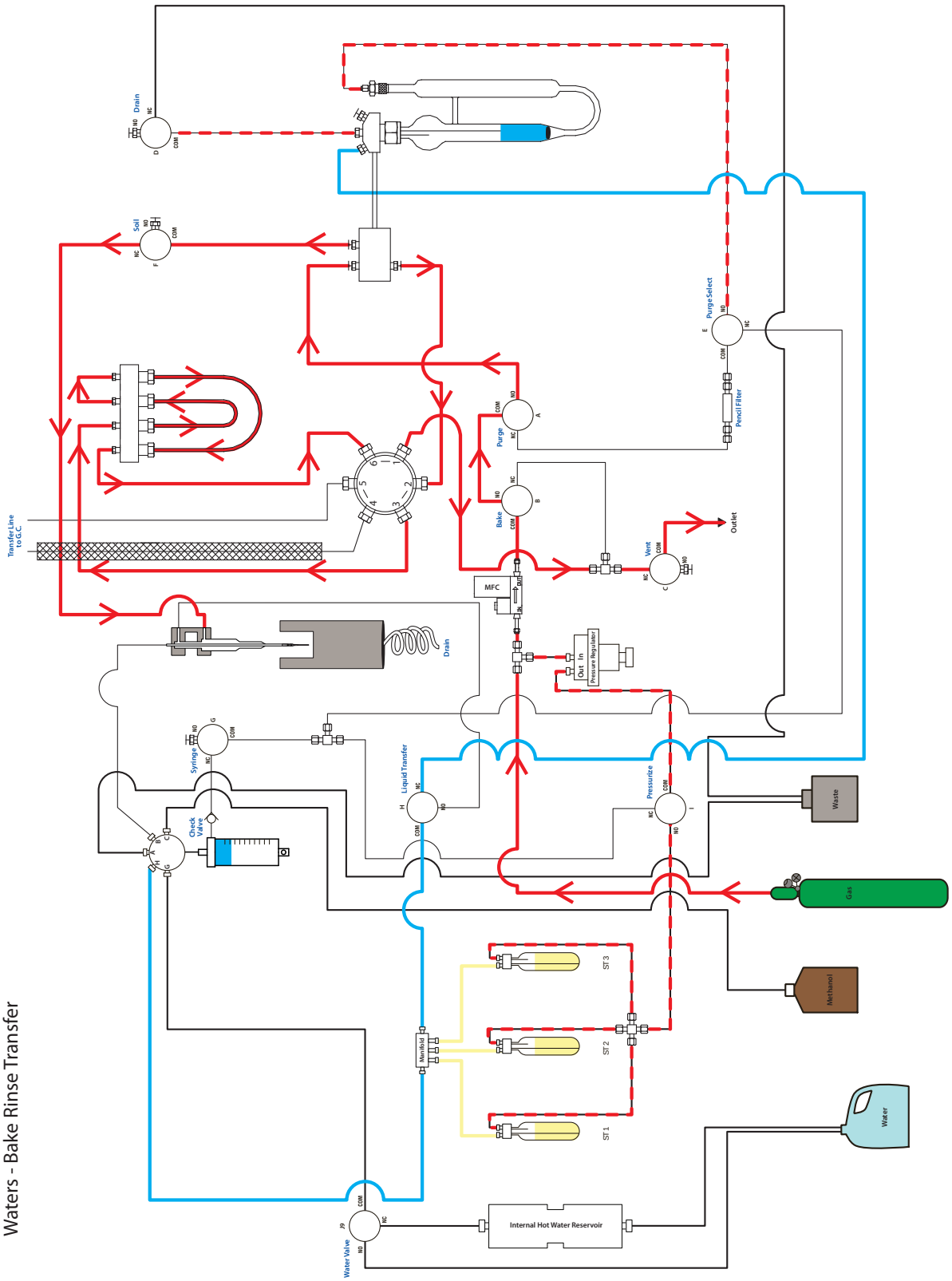
Waters - Dry Purge

Desorb



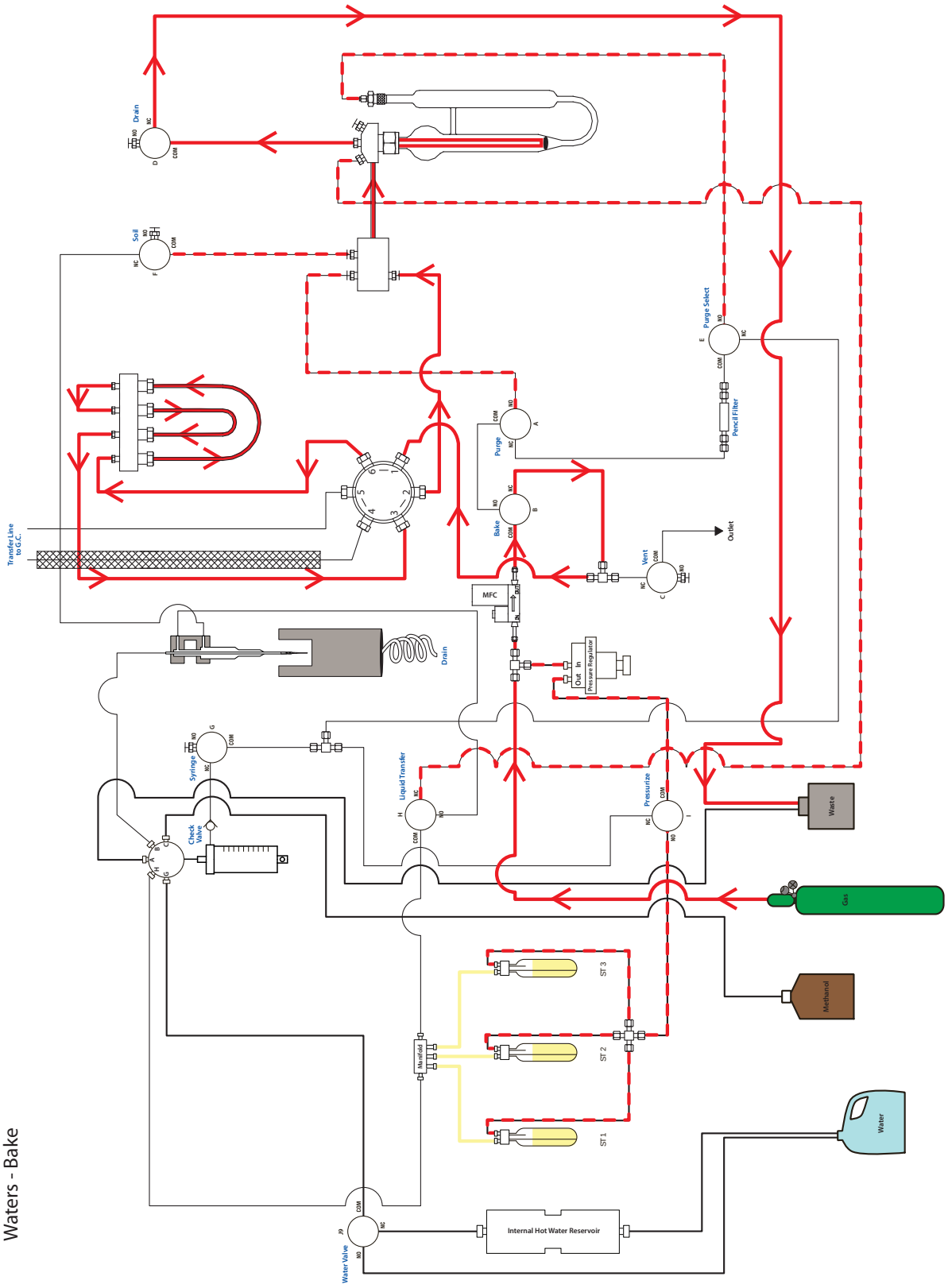
Waters - Desorb

Bake Rinse Transfer



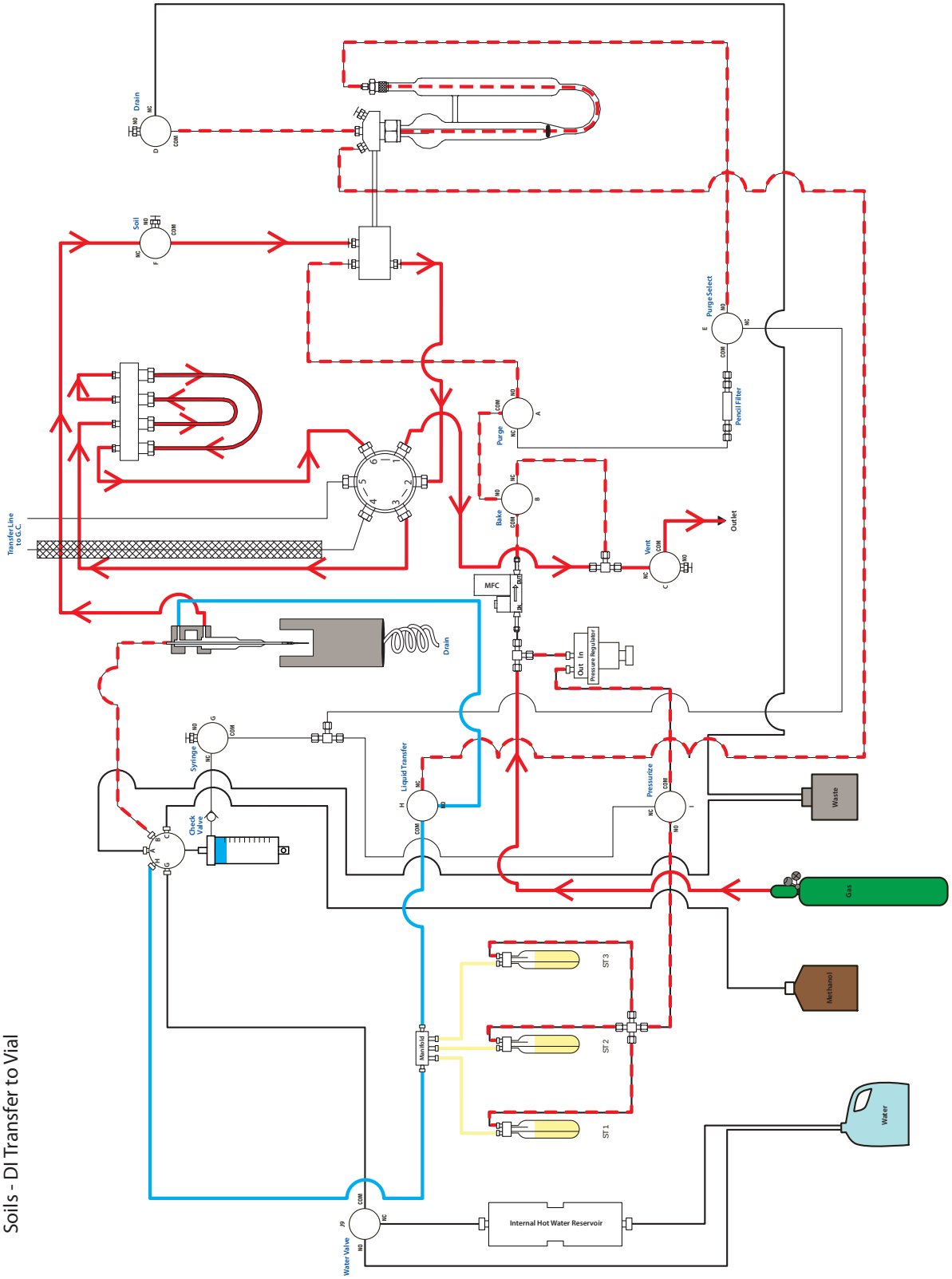
Waters - Bake Rinse Transfer

Bake



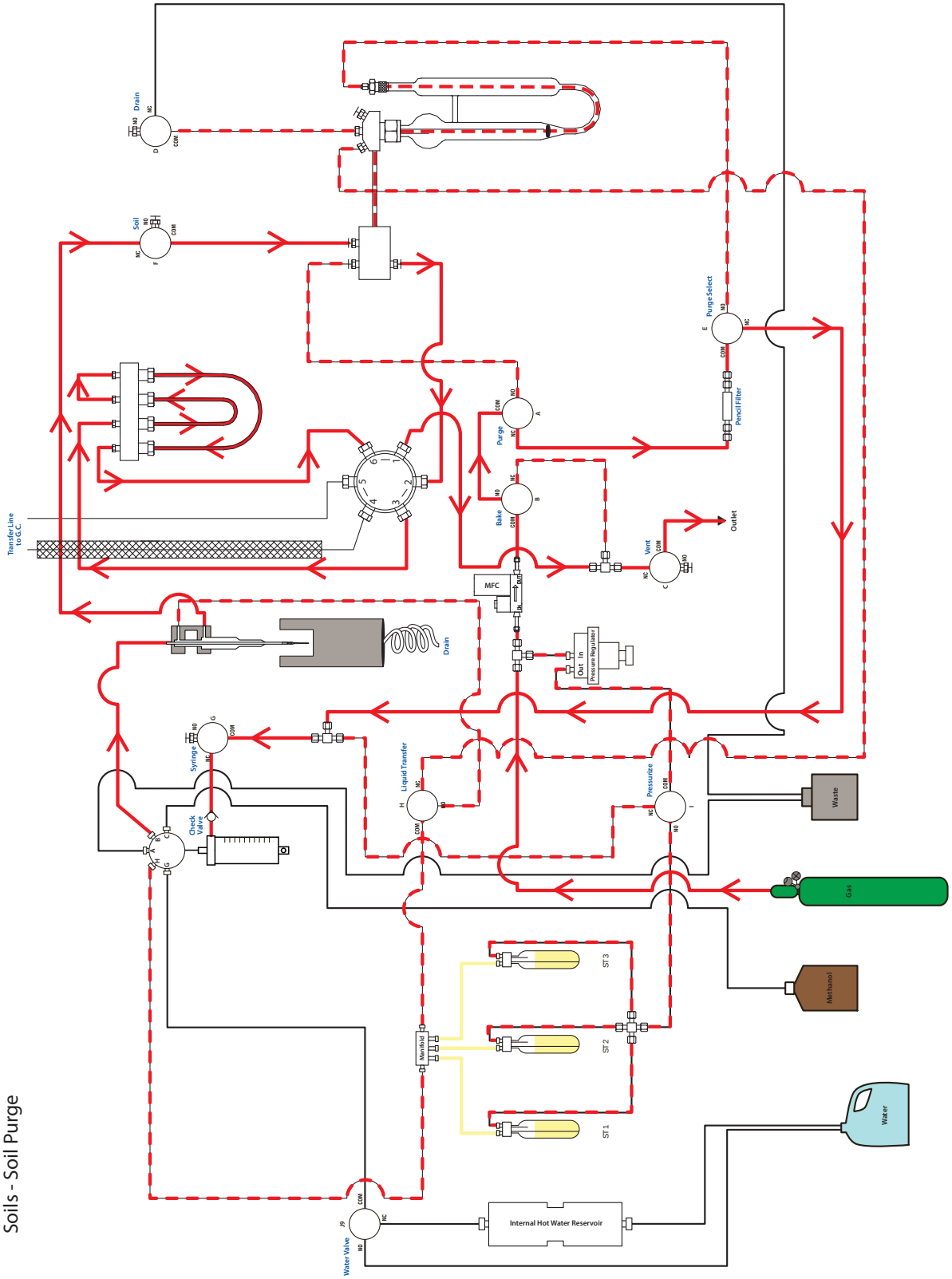
Waters - Bake

Soil Flow Diagrams - DI Transfer to Vial



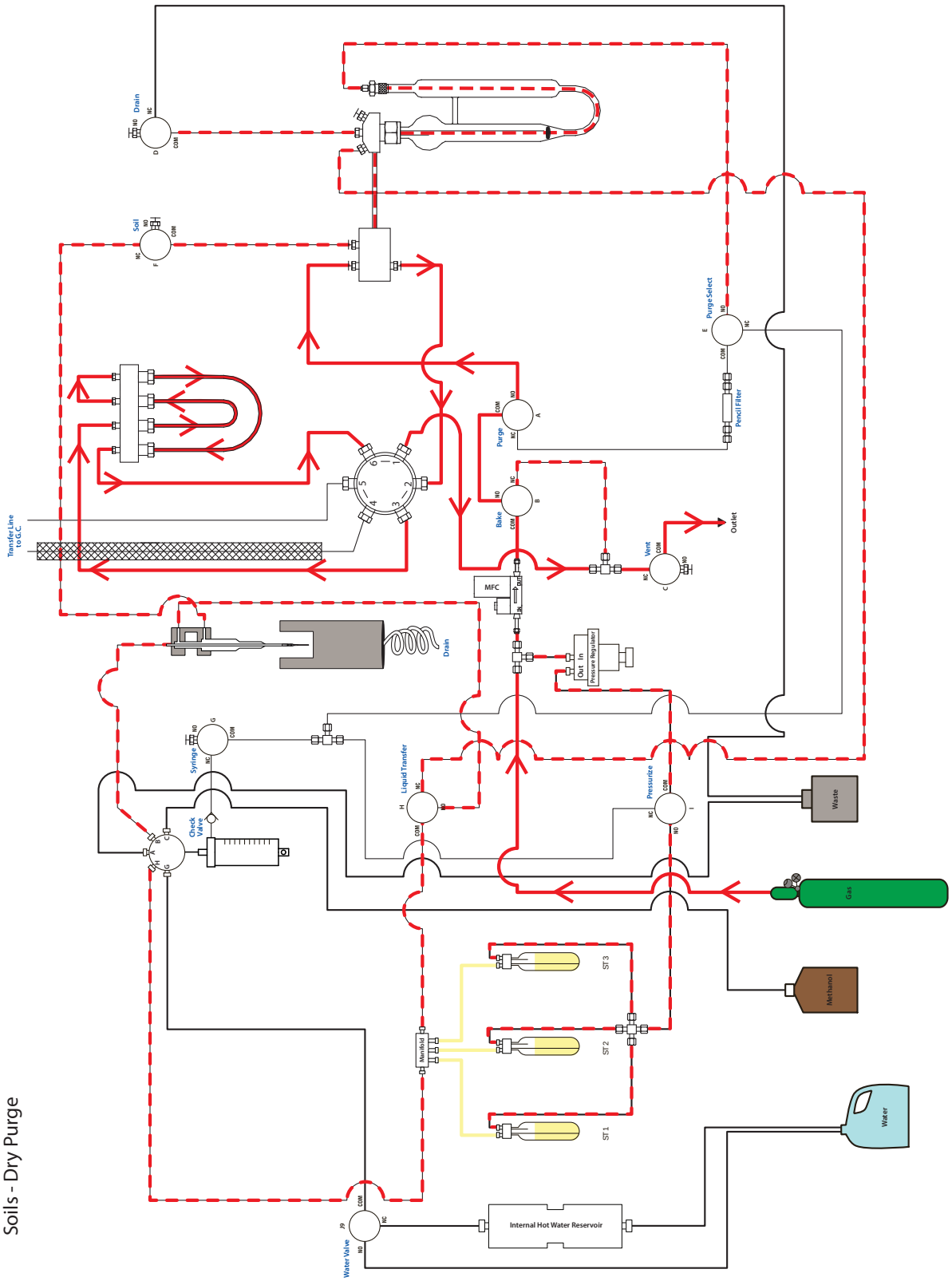
Soils - DI Transfer to Vial

Soil Purge



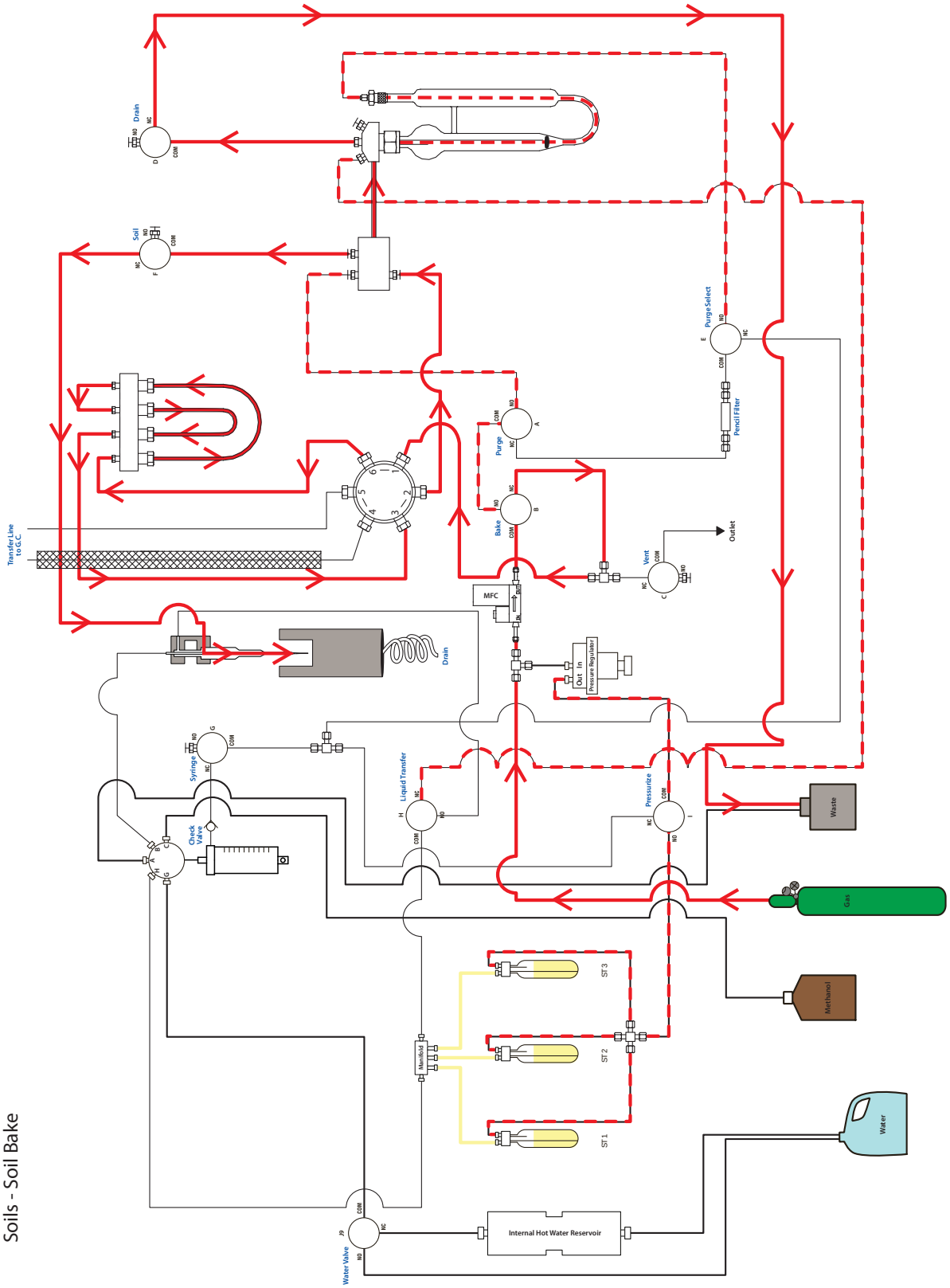
Soils - Soil Purge

Soil Dry Purge



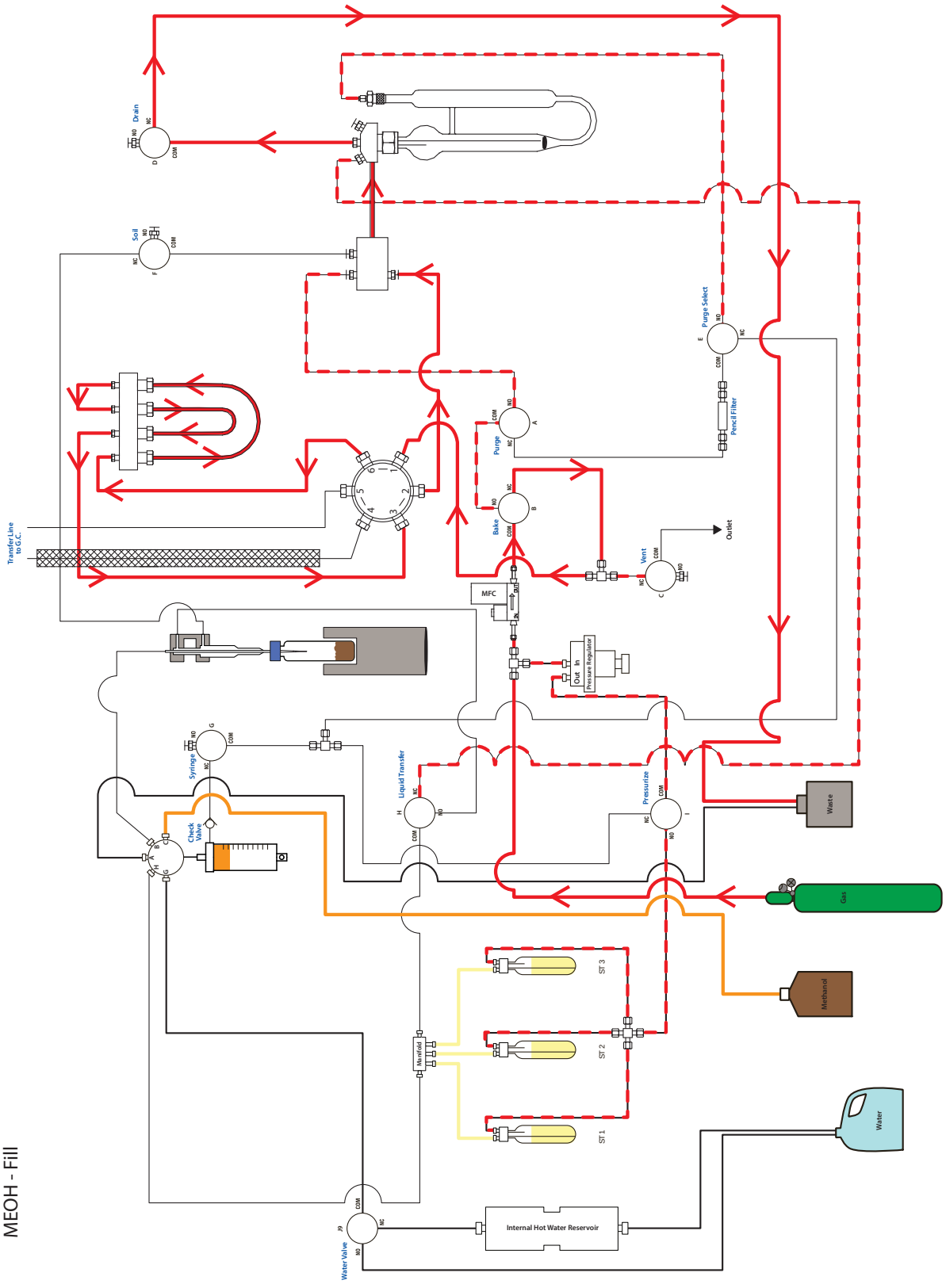
Soils - Dry Purge

Soil Bake

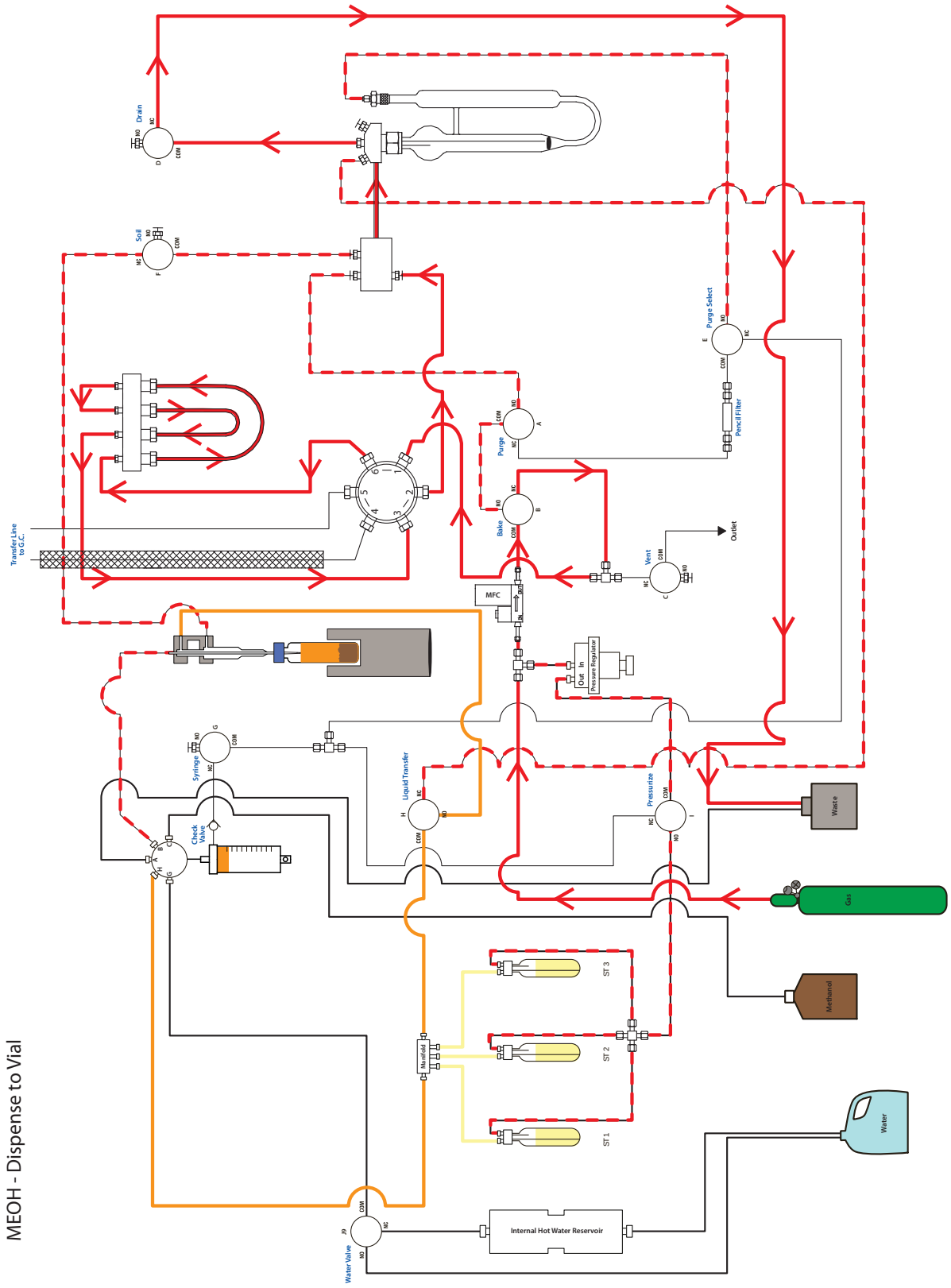


Soils - Soil Bake

Methanol Flow Diagrams - Methanol Fill

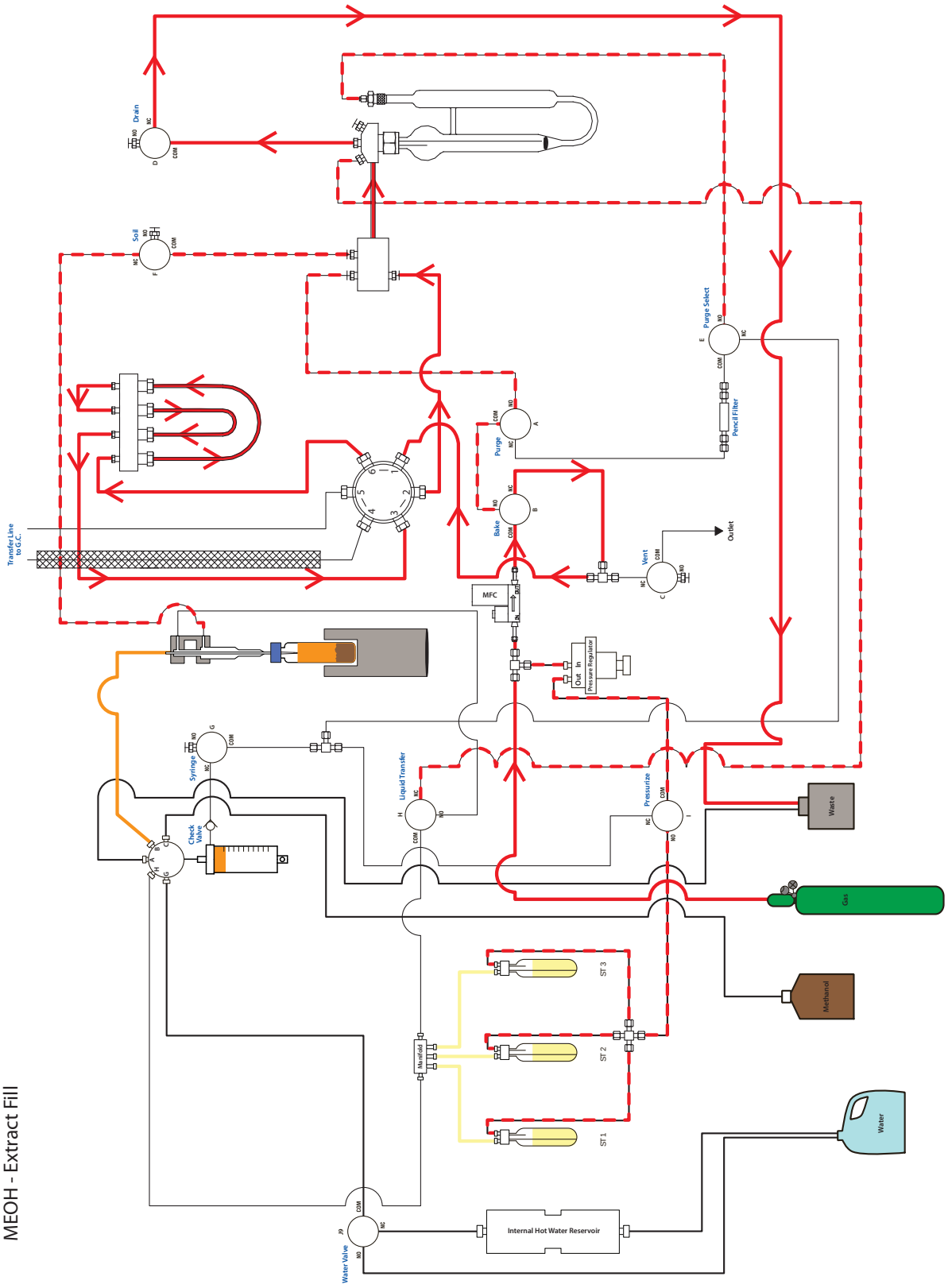


Methanol Dispense to Vial



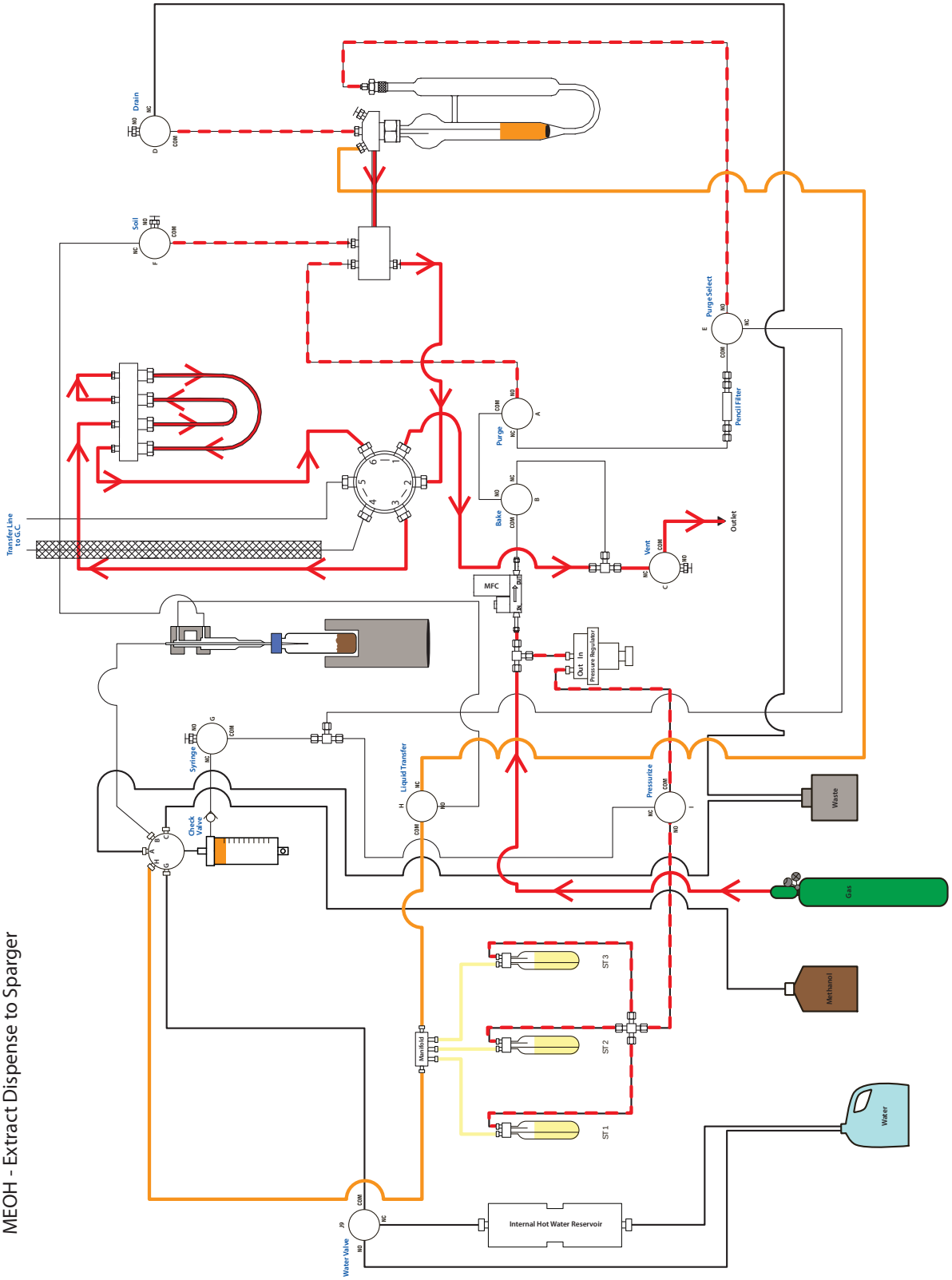
MEOH - Dispense to Vial

Methanol Extract Fill



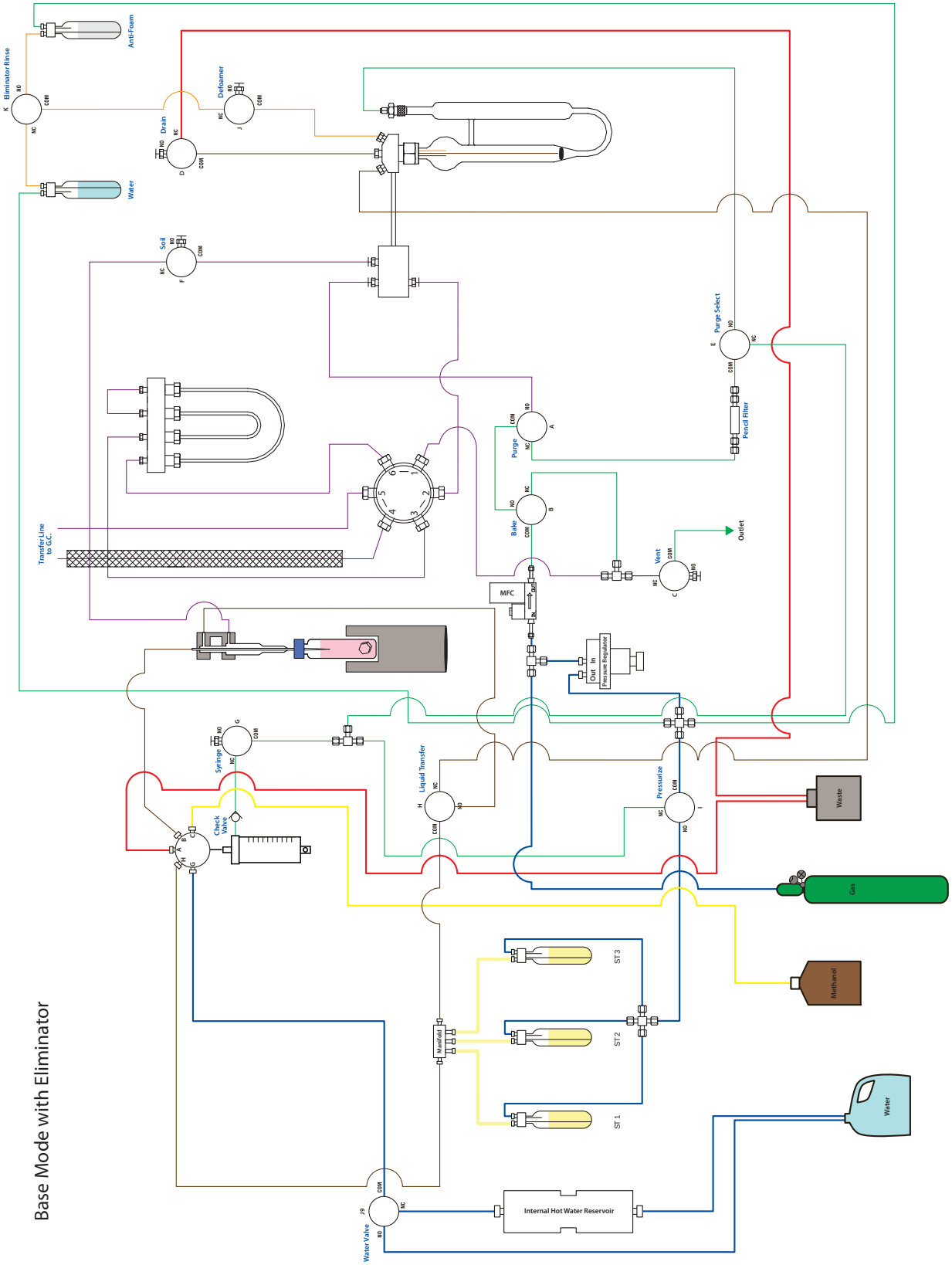
MEOH - Extract Fill

Methanol Extract Dispense to Sparger



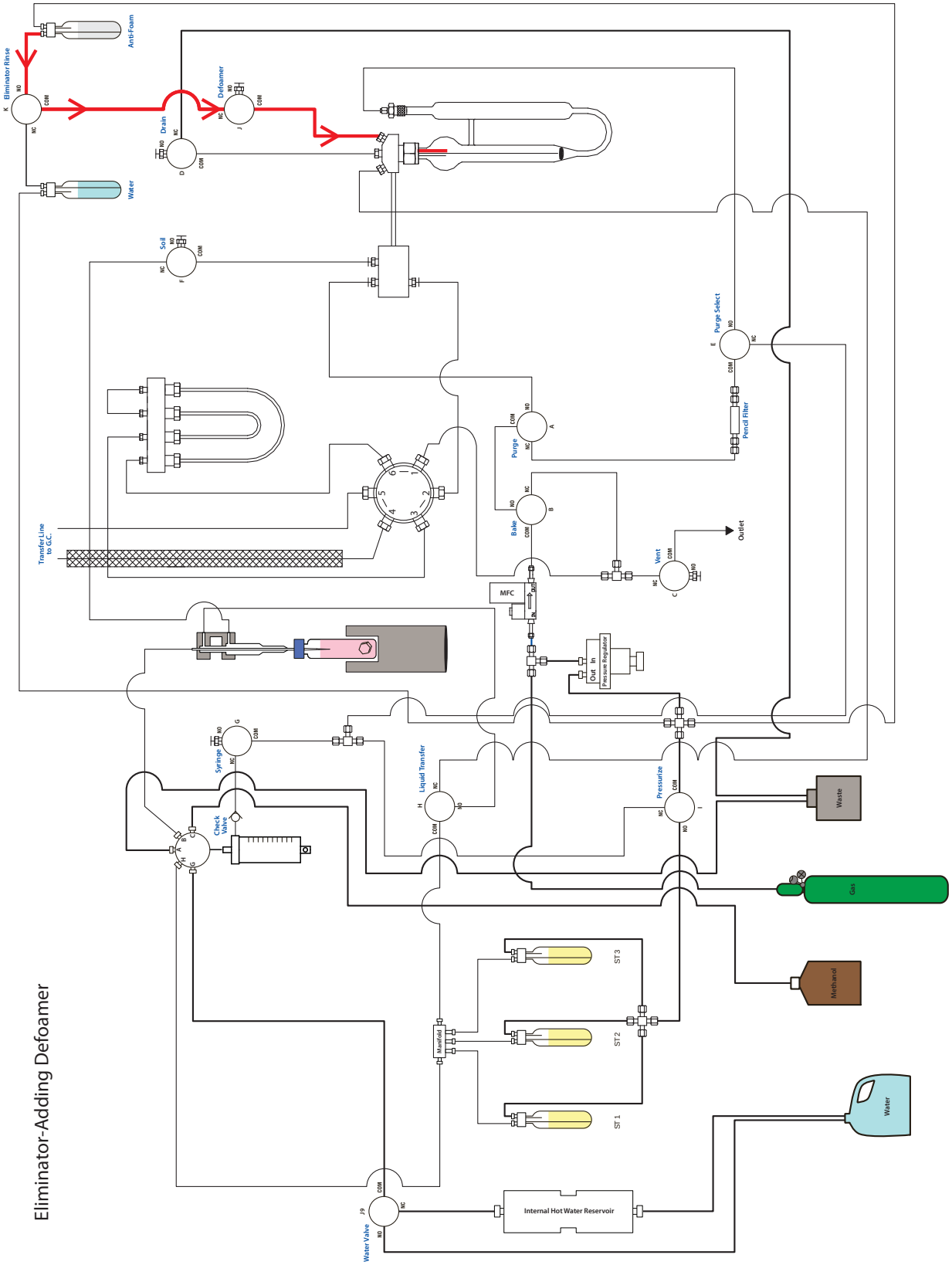
MEOH - Extract Dispense to Sparger

Eliminator Flow Diagrams - General

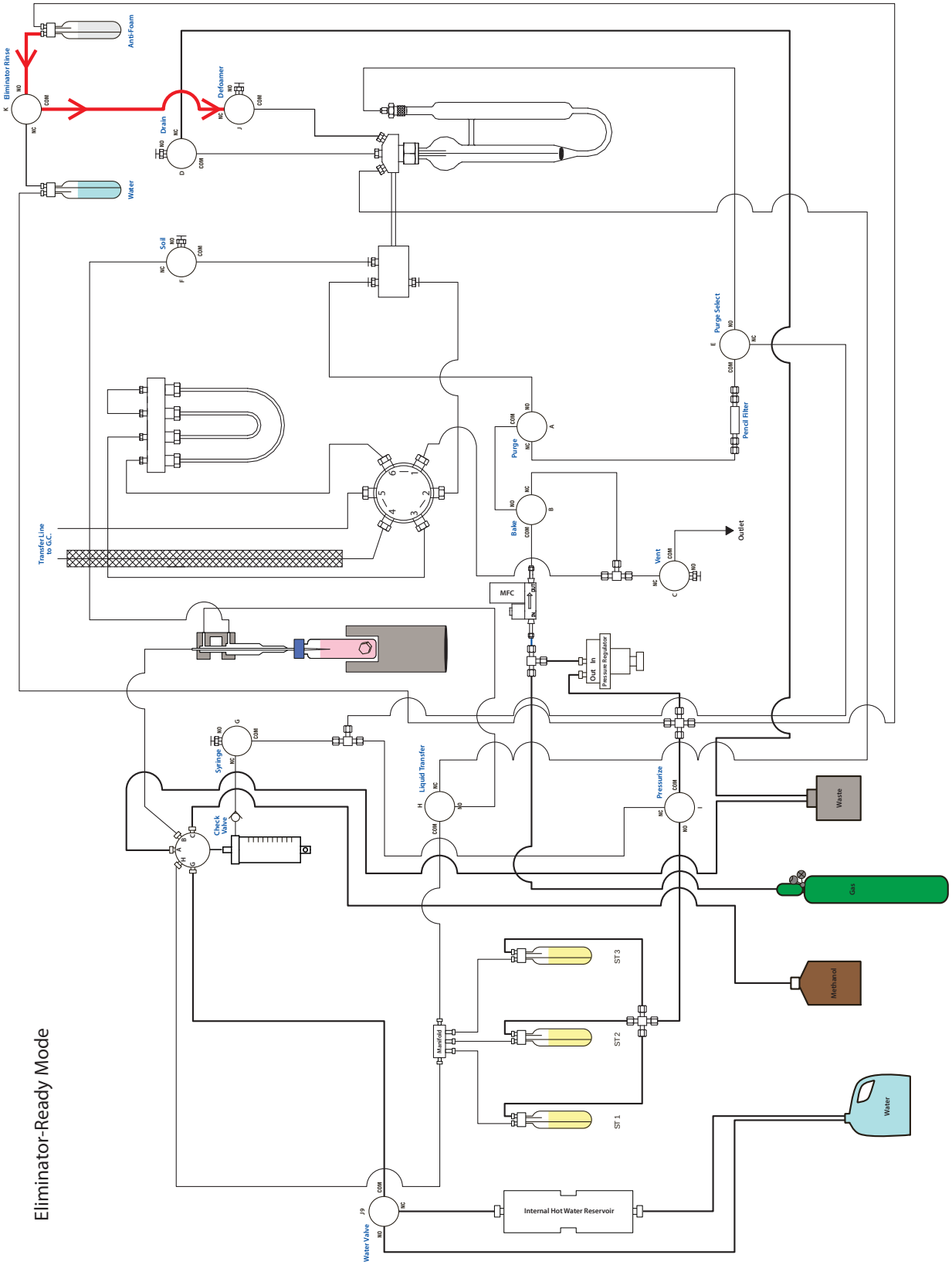


Base Mode with Eliminator

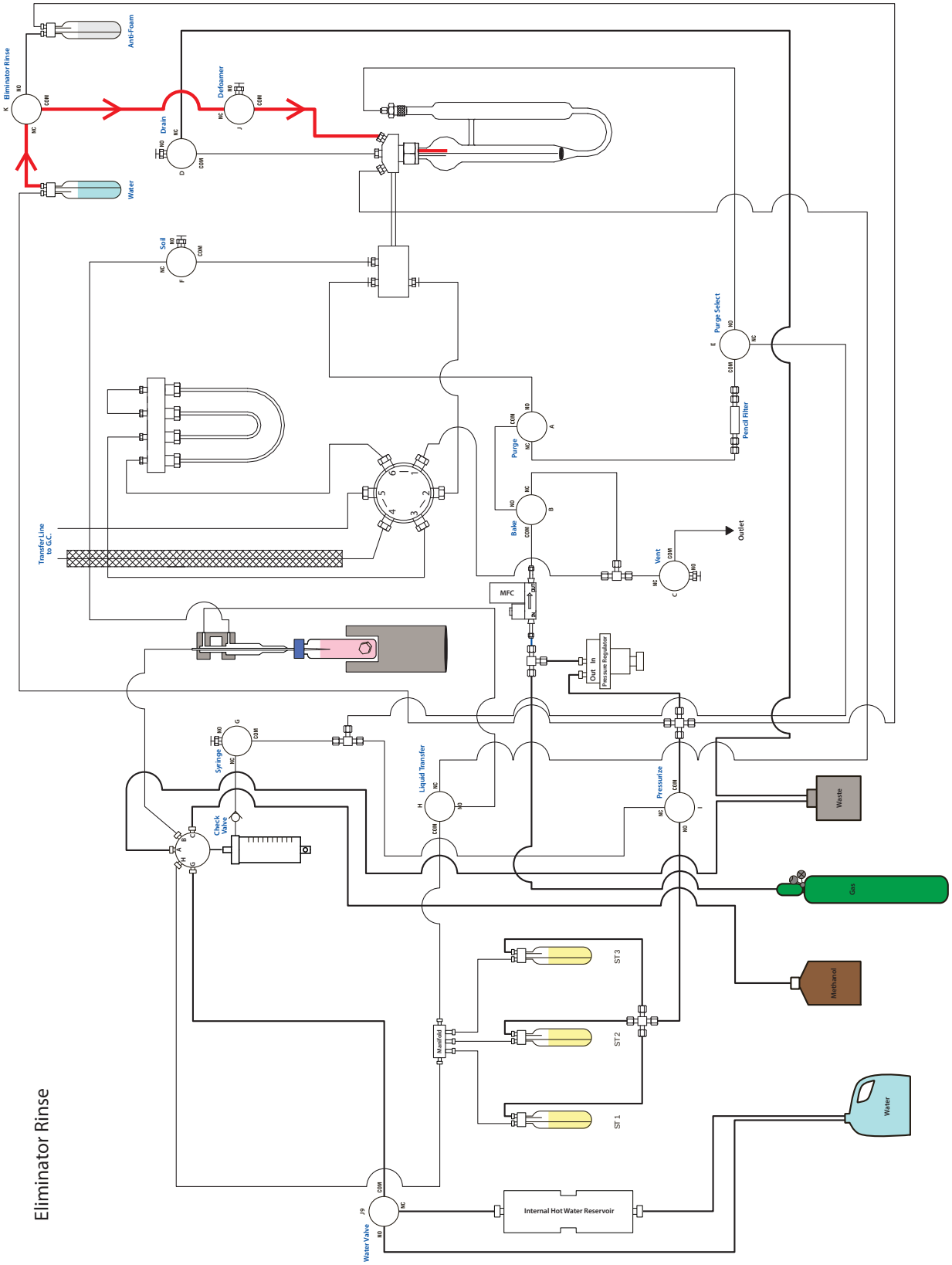
Adding Defoamer



Ready Mode

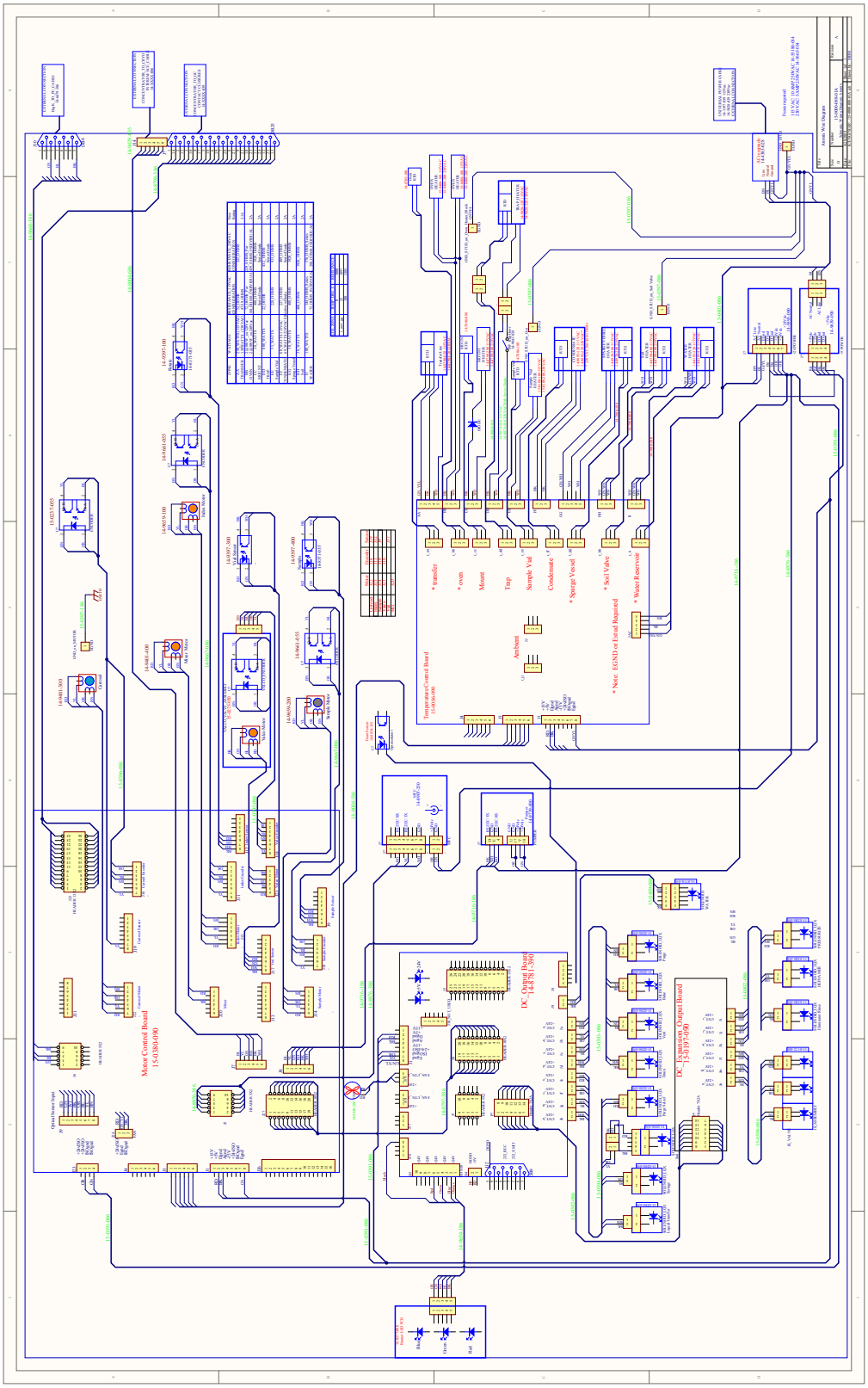

Eliminator-Ready Mode
Anti-Foam
Eliminator Rinse
Defoamer
Drain
Water
Soil
Purge Select
Pencil Filter
Purge
Bake
Vent
Outlet
Transfer Line to G.C.
MFC
Out In
Pressure Regulator
Syringe
Liquid Transfer
Pressurize
Waste
Check Valve
Gas
Methanol
ST 3
ST 2
ST 1
Manifold
Water
Internal Hot Water Reservoir
Water Valve

Rinse



Eliminator Rinse

Electrical Schematic



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Index

NUMERICS

A-B

C

D

E

F

G

H-L