TELEDYNE TEKMAR
Everywhereyoulook™

Lumin User Manual

Part Number: 15-2500-074

Rev: J, October - 2021

Copyright

Updated Information

The information contained in this document is subject to change without notice. This document may be translated into languages other than English. If the accuracy of any information is in doubt, always refer to the English version and/or contact Teledyne Tekmar for clarity.

Trademarks

The companies indicated own the following trademarks:

Tekmar: Teledyne Instruments, Inc.

All other brands or product names are trademarks or registered trademarks of their respective owners.

Contact Information

Teledyne Tekmar

4736 Socialville Foster Road

Mason, OH 45040 U.S.A.

www.teledynetekmar.com

Toll Free: 800-543-4461

Sales/Support: 800-874-2004

Main: 513-229-7000

Fax: 513-229-7050

TELEDYNE TEKMAR
Everywhereyoulook™

EAR99 Technology Subject to Restrictions Contained on the Cover Page

Lumin User Manual

Table of Contents

Chapter 3: Lumin TekLink Software Overview

Appendix A: Diagrams

List of Figures

List of Tables

Lumin User Manual

Preface

P.1 Warranty

Refer to www.teledynetekmar.com for the Terms and Conditions of Sale and the product warranty.

For questions regarding this policy and its application, contact the Teledyne Tekmar Customer Support Center.

P.2 Teledyne Tekmar Customer Support Center

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

U.S. Email: tekmarsupport@teledyne.com

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

International Email: Tekmar_Intltech@teledyne.com

NOTE

For technical troubleshooting, also review the procedures in Section 5.23 "Technical Assistance".

P.3 Essential Instructions

NOTE

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 Lumin 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 Lumin. 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 as well as guidance in the *Lumin User Manual* and software Help. 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 the *Lumin User Manual*, software Help and according to applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Install all instruments and accessories connected to the Lumin according to the procedures provided in their specific *User Manuals*. Guidance included herein on external connections, is for general reference only.
- 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.

WARNING

Do not operate in an explosive environment or wet environments. Never use hydrogen or other flammable gas. Venting of this gas creates an explosive hazard.

P.4 Notations and Hazard Severity Levels

Notations and **Hazard Severity Levels** emphasize information that is important for instrument functionality and user and instrument safety. The four levels consist of:

NOTE

Note is used for information and descriptions to ensure correct usage to prevent damage of the instrument.

Caution

Cautions identify a potential hazard, which if not avoided, may result in minor or moderate injury. This category can also warn you of unsafe practices or conditions that may cause property damage.

WARNING

Warnings identify a potentially hazardous condition, which if not avoided, could result in death or serious injury.

DANGER

DANGER is limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.

P.5 Lumin Safety Symbols Defined

The Lumin instrument is labeled in compliance with the marking and nomenclature specified in the UL61010-1Ed.3 (2012) safety standard. The following symbols and their associated signal words are used in the *User Manual*, software Help and instrument labels.

L'instrument Lumin est étiqueté en conformité avec le marquage et la nomenclature spécifiés dans le standard de sécurité UL61010-1Ed.3 (2012). Les étiquettes ci-dessous et leurs marquages associés sont utilisés dans le manuel et sur l'étiquetage de l'instrument.

	**Electrical Hazard!** **Risque électrique!**
	**Warning/Caution! A hazardous or potentially hazardous situation that, if not avoided, will result in product and/or property damage and possible injury and/or death.** **Danger/Attention! Un risque ou une situation potentielle à risque, qui n'est pas respectée, résultera dans le dommage du produit et/ou des biens et la possibilité de blessures et/ou de mort.**
	**Fire Hazard!** **Risque de feu!**
	**Burn hazard! Hot surface inside. Allow this area to cool before servicing.** **Risque de brulure. Surface chaude à l'intérieur. Attendre le refroidissement de cette zone avant entretien.**

	**Read the Appropriate Documentation!** **Lire la documentation appropriée!**
	**Skin Contact Hazard! Use protective gloves and other appropriate PPE.** **Risque au contact de la peau. Utiliser des gants de protection ou autres équipements de protection personnel appropries.**
	**High Pressure Hazard!** **Risque de haute pression!**
	**Risk of Eye Injury. Wear safety glasses and other appropriate PPE.** **Risque de blessures aux yeux. Porter des lunettes de sécurité et autres équipements de protection personnel appropriés.**

P.6 Lumin Safety Labels

	**Electrical Ground** **Prise de terre**
	**WARNING: Electrical shock hazard. Do not operate without cover.** **DANGER: Risque d'électrocution. Ne pas utiliser sans capot.**
	**WARNING: To avoid electrical shock, disconnect supply before changing fuses.** **DANGER: Pour éviter le risque d'électrocution, débrancher l'alimentation avant de remplacer les fusibles.**
	**WARNING: For continued fire protection, replace with same type and rating of fuses.** **DANGER: Pour prévenir le risque d'incendie, remplacer avec des fusibles de même type et de même caractéristique.**

	**WARNING: Remove the power cable before performing maintenance and/or servicing the instrument.** **DANGER: Débrancher le câble d'alimentation avant toutes interventions de maintenance et/ou d'entretien sur l'instrument.**
	**CAUTION: Maximum pressure for carrier gas is 200 PSI (13.8 bar)** **ATTENTION: La pression maximale pour le gaz porteur est de 200 PSI (13.8 bar).**
	**CAUTION: Inlet pressure recommended for sample gas is a minimum of 65 PSI to maximum of 100 PSI (4.5 to 6.9 bar).** **ATTENTION: La pression d'entrée recommandée pour le gaz échantillonné doit être comprise entre 65 PSI et 100 PSI (4.5 to 6.9 bar).**
	**Power entry module requires:** **La puissance de module d'entrée nécessite:** **2 IEC 5 x 20 mm fuses** **100V operation** **T 10.0A – 250v** **115V operation** **T 10.0A – 250v** **230V operation** **T 5.0A – 250v**

DANGER

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

The Lumin weighs 27 lbs (12.2 kg). If this weight exceeds your lifting ability, lift and position the Lumin with two people. Only lift and position the instrument by the base.

Route tubing drain lines to slope downward only. Do not extend tubing into the waste bottle more than 3 to 5" (7.6 to 12.7 cm). Failure to follow these directions may result in improper drainage of the Lumin.

Please be aware that if the Lumin, its components and/or accessories are used in a manner not specified by Teledyne Tekmar, protection by the equipment may be impaired.

Only use replacement parts supplied or approved by Teledyne Tekmar when performing maintenance on the Lumin. Use of unapproved parts could result in damage to the instrument, as well as personal injury.

Running an improper method may damage the Lumin. Setting up a new method should be performed by personnel who are properly trained, knowledgeable and well-acquainted with the Lumin.

Ensure that the installation location allows the concentrator to be easily turned off and the power cord disconnected, in the event of an emergency.

The circuit used to power the Lumin should be protected by a Certified/Listed 15/20 Circuit Breaker for short circuit protection.

Do not plug the Lumin into an extension cord. An extension cord may overheat and cause a fire.

Only replace the Lumin mains supply AC power cable with a UL listed cable of the same current and voltage rating.

Ensure the power cable is routed away from, and is not capable of contacting, any hot surface.

Only replace fuses with those of the same type and rating. Refer to Section 5.16 "Power Entry Module (PEM) Fuse Replacement".

To avoid the risk of fire and maintain optimum instrument performance, install the concentrator on a non-flammable surface and maintain a minimum 6" (15.24 cm) perimeter around the unit that is unobstructed by flammable material or other equipment.

NEVER use hydrogen or other flammable gas with the Lumin. Venting of this gas creates an explosion hazard. Follow the manufacturer's directions for safe handling of gas and chemicals. Also refer to the Safety Data Sheets (SDSs) for information on specific chemicals.

To avoid injury to yourself or damage to the Lumin, do not exceed the recommended pressure settings. Observe safety regulations when handling pressurized gas. For more information see Matheson™ Gases Data Book (available from the Matheson Company, East Rutherford, New Jersey).

Sample and associated waste may contain hazardous and toxic substances. Follow the proper safety and health practices, as well as anticipating all regulatory limitations before using or disposing of chemicals.

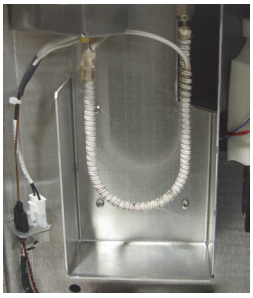
To avoid electrical shock:

- Do not operate without the panels, covers and guards installed.
- Plug the power cord into a properly grounded outlet.
- To avoid electrical shock, turn OFF and unplug before servicing.

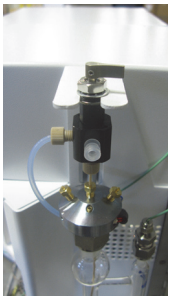
Risk of Eye Injury. Wear safety glasses and other appropriate PPE. It is recommended that safety glasses be worn at all times in the presence of pressurized gases.

This instrument contains heated components. Touching any heated zone during the operation of the instrument can cause a burn. To prevent injury, allow areas with this label to cool before servicing.

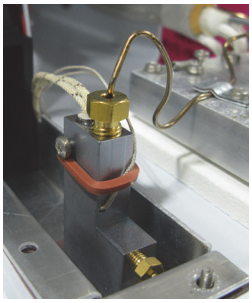
When accessing the sample mount, 4-way tee, Moisture Control System (MCS), analytical trap compartment or 6-port valve (in the valve oven area), allow the components to cool to room temperature.



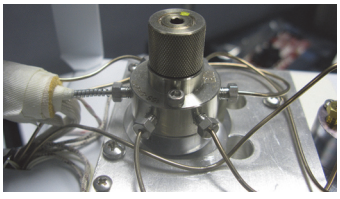
Analytical Trap



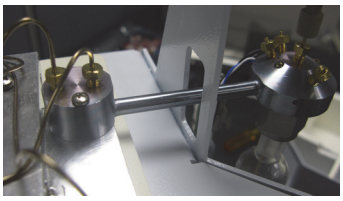
Sample Mount



MCS



6-Port Valve



4-Way Tee

P.8 Electromagnetic Compatibility (EMC)

P.8.1 South Korea EMC Declaration

Class A EMC Declaration

Warning: This equipment has been evaluated for its suitability for use in a commercial environment. When used in a domestic environment, there is a risk of radio interference.

사용자안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서
가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다 .
※ 사용자 안내문은 " 업무용 방송통신기자재 " 에만 적용한다 .

P.9 Explanation of Regulatory Marks

P.9.1 Unit Disposal

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

Please contact Teledyne Tekmar or your local distributor for instructions on returning the system for proper disassembly and disposal. Contact Teledyne Tekmar Customer Support. Refer to Section P.2 "Teledyne Tekmar Customer Support Center".

P.9.2 CE Mark

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

CE

Lumin User Manual

Chapter 1: Introduction

The Lumin is a modern laboratory instrument designed to concentrate Volatile Organic Compounds (VOCs) from samples using the Purge and Trap (P&T) technique. The Lumin uses advanced P&T technology that allows accelerated automatic processing of liquid samples for analysis by Gas Chromatograph (GC). The Lumin purges VOCs from liquids onto an analytical trap. The trap is then rapidly heated and the analytes are swept with carrier gas onto the column for separation and detection.

1.1 Purge and Trap Background

1.1.1 Purge and Trap Fundamentals

A good grasp of P&T fundamentals helps prevent problems and assists in tasks such as method development and troubleshooting.

This section is not intended to be a full theoretical evaluation of P&T gas chromatography, but rather to help 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, for a wide variety of sample types, have gradually been developed to overcome these limitations. P&T concentration in particular is designed to overcome:

1. Lack of sensitivity

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

   - Environmental Analysis - Many pollutants must be measured at low levels; sometimes, in the sub-part per billion (ppb) range.
   - 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 lifespan 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, which cannot be directly introduced into a GC.

   The ability to analyze VOCs is a vital part of environmental monitoring, outgassing studies and 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 and detection.

1.1.2 Brief History

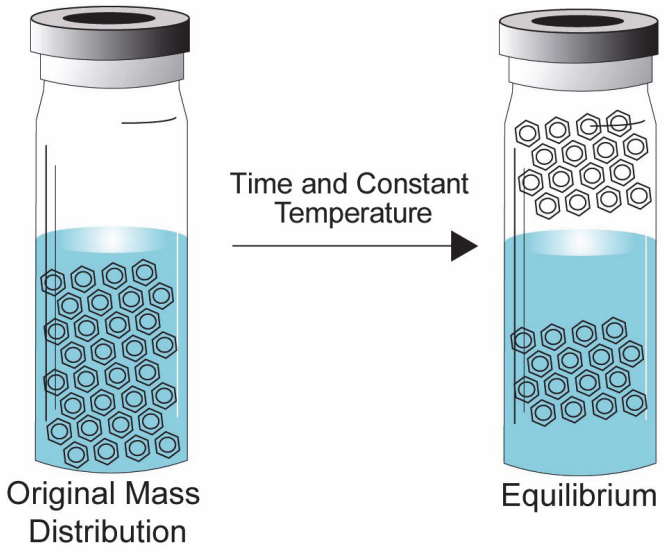
In the 1960s, P&T was used in the study of bodily fluids. In the mid-to-late 1970s, P&T became a technique that was well-known and widely applied due the need to monitor VOCs in drinking water. Using this technique, it was possible to detect sub-ppm level VOCs of a wide variety. Today, P&T is routinely 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.

1.2 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 back-flushing the trap with carrier gas and separated and detected by normal GC operation.

While purging and sweeping the sample with an inert gas sounds simple, it is in reality a very complex process. Purging a sample to extract analytes is a gas extraction. There are many factors that affect 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, affected 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 at a constant temperature, the concentration of the volatile compounds in each phase will be stabilized, the chemical system will have reached equilibrium (Figure 1-1).

Figure 1-1 Headspace Equilibrium Diagram



At this point a portion of the headspace can be removed and injected into the GC for analysis. This technique is known as Equilibrium Analysis or Static Headspace Analysis. The amount of material in the vapor phase will be proportional to the partial pressure of the component. The equation below describes the phase distribution of sample.

$PT = P1 + P2 + P3 + \ldots + Pn = X1P1^{\circ} + X2P2^{\circ} + X3P3^{\circ} + \ldots + XnPn^{\circ}$

where:

P_T = total vapor pressure of system

P_1, etc. = partial pressure of each compound

$P1^{\circ}$, etc. = vapor pressures of the pure compounds

X1, etc. = mole fractions of each compound

In purging 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, extracting the VOC from the sample more efficiently. Purging a sample for 10 minutes with helium (at a flow rate of 50 ml/min.) results in a more efficient extraction of volatiles than equilibrium, using 500 ml 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 limitations are determined by the compounds of interest in the sample and the sorbent material used in the trap.

1.2.1 Trapping, Adsorption and Desorption

An analytical trap is essentially a short gas chromatograph column. Compounds entering the trap will slowly elute with a measurable retention volume. Retention volume is the amount of purge gas that passes through the trap before the elution of the analytes from the sorbent materials.

The requirements of a trap are as follows:

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

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

When elution does occur, it is usually referred to as breakthrough. 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 the analytes of interest 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 sorbent materials 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 are retained by the weaker sorbent as they are not effectively desorbed if they are trapped on the stronger 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 back-flushing the trap, ensuring that the less volatile, or heavier, analytes never come in contact with the stronger sorbent.

1.3 Lumin Specifications

For additional information on installation requirements refer to Chapter 2: "Installation and Setup".

Table 1-1 General Specifications

Part Numbers	Lumin (100-120 VAC): 15-2500-100 Lumin (220-240 VAC): 15-2500-200 Lumin (100-120 VAC) w/Guardian Foam Sensor and Foam Eliminator: 15-2500-1E0 Lumin (220-240 VAC) w/Guardian Foam Sensor and Foam Eliminator: 15-2500-2E0
Dimensions	Height: 17.2 in (43.7 cm) Width: 8.9 in (22.6 cm) Depth: 18.7 in (47.5 cm)
Weight	27 lbs (12.2 kg)
Environmental Specifications	Operating Temperature: The system is capable of operating in lab temperatures between 10 ° and 30 °C (50 ° and 86 °F). Relative Humidity: 10% to 90%
Corrosion	The cover is corrosion resistant to waters within a pH range of 1-10
GC Interface	Designed to interface with virtually all commercially available GC instruments
Column Compatibility	Teledyne Tekmar recommends the use of 20 m x 0.18 mm ID Fast Volatiles columns

Table 1-2 Performance Specifications	
Cycle Time	The cycle time for the unit is less than or equal to 15 minutes when using an 11 minute purge time. This time includes purge, desorb, bake and cool down to "purge ready" for the Lumin only. Note: This specification assumes an ambient room temperature between 20-22 ° C (68 °-71.6 ° F).
Maximum Sample Concentration	1 ppm. High level samples should be pre-screened with the Teledyne Tekmar HT3 or Versa Headspace Sampler.

Table 1-3 Methods, Applications and Certifications	
Official Methods	US EPA 502.1, 502.2, 524.2, 524.3, 524.4, 503.1
	US EPA 601,602, 603, 624
	US EPA 8010, 8015, 8020, 8021, 8030, 8240, 8260
	ASTM and Standard Methods
	Massachusetts VPH and GRO Methods
Applications	Environmental
	Food and Beverage
	Petrochemical
	Plastics and Polymers
Certifications	Certifications are listed on the Declaration of Conformity (DoC). The DoC is included with the instrument, in the shipping box.

Table 1-4 Temperatures	
Trap Heater Cooling	Trap heater cools from 250 °C to 40 °C in 70 seconds
Maximum Temperature Ranges	
6-Port Valve Oven	Temperature controlled up to 250 °C
External Transfer Line	250 °C
Trap Heater	350 °C
Sample Mount	90 °C
MCS (Condenser)	200 °C
Sample Heater Assembly for Glassware (Optional)	90 °C
Temperature Zone Equilibrium	For all zones other than the sample heater, temperature changes equilibrate within 10 minutes or at 10 °C/min, whichever is longer
Uniformity	Temperatures will be within 10% of measured temperatures after 30 minutes of equilibration

Table 1-5 Liquid Handling	
Sparger	Standard 5 mL fritted sparger. Optional spargers include: 25 mL fritted sparger, 5 or 25 mL fritless sparger, 5 or 25 mL needle sparger and 25 mL disposable test tubes.
External Transfer Line	Inert coated tubing and SilcoTek® coated fittings
Sample Mount	SilcoTek coated
Moisture Control System (MCS)	SilcoTek coated

Table 1-6 Sample Gas Requirements	
Sample Gas Requirements	Nitrogen or helium of 99.999% purity and < 0.5 ppm hydrocarbon tested
Gas Pressure	65 - 100 psi (4.48 bar - 6.89 bar)
Electronic Mass Flow Controller	Patented (US 7,651,866) system is capable of controlling flow rates from 5 mL/min to 500 mL/min. Each mode is independently controlled
Electronic Pressure Monitor	Automatic leak check and over-pressure sensing capability

Table 1-7 Electrical Requirements	
Voltage Requirements	100-120 VAC +/- 10%, 50/60Hz, 10.0A, 1150W 220-240 VAC +/- 10%, 50/60Hz, 5.0A, 1150W
External Circuits	The circuit used to power the Lumin should be protected by a Certified/Listed 15/20 Circuit Breaker for short circuit protection The AC power cable supplied with the Lumin is compliant with applicable safety standards Supplied USB communication cables are of proper type jacketing

Table 1-8 Valving	
Valving	24VDC Motor-Actuated 6-Port Valve
System Solenoid Valves (4)	24VDC Rocker-style Valves
Optional Guardian Foam Sensor and Eliminator Solenoid Valves (2)	24VDC Rocker-style Valves

Table 1-9 PC Requirements	
Operating System	TekLink software in a Windows® 7 or greater environment via USB. Windows® 10 is recommended.
Instrument Control	Lumin TekLink software via USB cable to the concentrator.

Table 1-10 Other Features
Unit status light indicator. Rhombi color will change to indicate standby, schedule running and error states.
Optional Sample Heater Jacket Assembly for all glassware types.
Optional Guardian Foam Sensor and Foam Eliminator senses foam, stops purge and adds defoaming agent for samples prone to foaming.
Optional Teledyne Tekmar AQUATek LVA or AQUATek 100 autosampler.

1.4 Lumin Component Overview

Table 1-11 Lumin Components

Component	Function
Sample Mount/Sparger	Sample gas is passed through the sample in the sparger and then conveyed through the sample mount.
Sample Heater Jacket Assembly for all Glassware Types (Optional)	Heats the sparger between the range of 20-90 °C.
Guardian Foam Sensor and Foam Eliminator (Optional)	Recognizes foaming during sample purge, adds defoaming agent and rinses the sample lines prior to attempting to rerun the sample. Two additional solenoid valves and an additional pressure regulator add anti-foam to foaming samples and rinse the anti-foam lines between samples.
Unit Status Light	Indicates standby, schedule running and error states.
Sample/Purge Gas Inlet	The inlet introduces the sample gas (helium or nitrogen) from the blue, 1/8" sample gas tubing to the sparger. The sample gas then carries VOCs onto the analytical trap.
Mass Flow Controller (MFC)	Monitors and precisely controls the gas flow rates throughout the entire purge and trap process.
Sample Pathway	An inert sample pathway with treated fittings.
Analytical Trap	Captures VOCs by adsorption. The trap is then heated causing VOCs to desorb from the trap and be carried to the column of the GC.
Analytical Trap Heater Jacket and Resistance Temperature Detector (RTD)	The analytical trap heating jacket heats the analytical trap to a consistent temperature defined in the Lumin TekLink software. The Resistance Temperature Detector (RTD) in the heating jacket verifies this temperature to the software.
Moisture Control System (MCS)	Allows water in the sample gas to be condensed and then removed prior to introduction to the GC column.
Carrier Gas Inlet	The inert tubing that runs down the side of the heated transfer line from the GC. The carrier gas is used to desorb VOCs off the analytical trap.
Heated Sample Transfer Line to GC	The inert tubing that runs next to the carrier gas inlet line to the GC. Carrier gas in the sample transfer line carries desorbed VOCs back to the GC.
Solenoid Valves	Valves mounted to the valve manifold and actuated according to the mode of analysis (Purge, Bake, Drain and Vent). If the system is equipped with the Foam Eliminator option, the valve manifold will have two additional solenoid valves.
6-Port Valve	The 6-port valve is a two-position valve that routes the purge and trap concentrator flows according to each mode of operation. The 6-port valve is actuated by the two-position actuator control module.
4-Way Heated Tee	Directs flow of purge gas from the sample mount.
24VDC Power Supply	Supplies 24V Direct Current (DC) to the Lumin's valves and motors.
5VDC Power Supply	Supplies 5V Direct Current (DC) to the Lumin's Printed Circuit Boards (PCBs).
Multi-Channel Temperature Control Board	Responsible for all AC control and RTD feedback for the standard temperature zones.

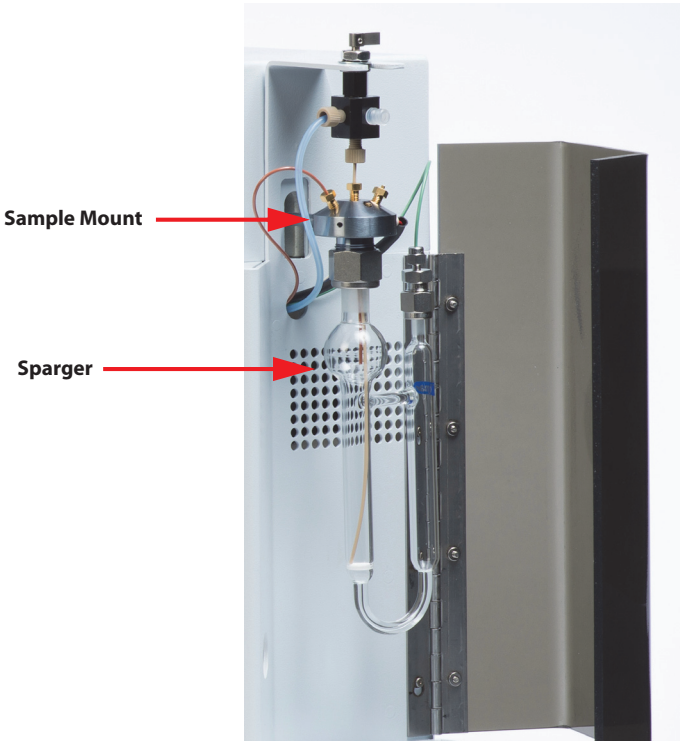
Table 1-11 Lumin Components (Continued)	
Component	**Function**
CPU Communication Board (Master Board)	Communications to the GC via GC I/O cable, controlling PC via the USB port and interfaces with the AQUATek 100 autosampler.
DC Valve Control Board	Actuates the Lumin's solenoid valves as well as the analytical trap and the Moisture Control System (MCS) cooling fans.
Optional Autosampler	The AQUATek LVA or AQUATek 100. A purge and trap autosampler that automates liquid sample preparation steps.
Communication Cable	Conveys data from the Lumin to Lumin TekLink software installed on the controlling PC.

1.4.1 Sample Mount and Sparger

The front panel contains a heated sample mount and glass sparger. The sample mount is heated via the 6-port valve oven plate on one end and a cartridge heater inside of the mount itself. A standard 5 mL frit sparger is included with the Lumin. The following options are also available:

- 25 mL frit sparger
- 5 or 25 mL fritless sparger
- 5 or 25 mL needle sparger
- 25 mL disposable test tubes

Figure 1-2 Sample Mount and Sparger



1.4.2 Status Light

The Teledyne Logo, the rhombi on the front of the Lumin, changes color to indicate the concentrator's state. Table 1-12 shows indications according to color. The rhombi is lit using an LED board behind the panel.

Table 1-12 Unit Status Light Indications

Color	Indication
Blue	Standby
Green	Schedule Running
Red	Error

Figure 1-3 Unit Status Light/Mode Indicator

1.4.3 Sample Purge Gas Inlet

Sample gas (ultra-high purity [99.999%] helium or nitrogen) flows through the sparger to carry VOCs onto the trap. Nitrogen can be used as sample gas, but it may contain more impurities. The helium or nitrogen enters the back panel through the blue, 1/8" tubing labeled "Sample Gas". The sample gas is also used for the Dry Purge and Bake Modes.

NOTE

Teledyne Tekmar recommends a sample gas flow of 40 mL/min ±5 mL for 11 minutes to achieve a 440 mL purge volume.

1.4.4 Mass Flow Controller (MFC)

The Lumin incorporates a patented Mass Flow Controller (MFC) to monitor and control the gas flow rates throughout the entire purge and trap process. Once set, the parameters remain precisely controlled throughout all modes of operation and achieve highly repeatable analyses. Flow rates are set via the Lumin TekLink software.

Figure 1-4 Mass Flow Controller

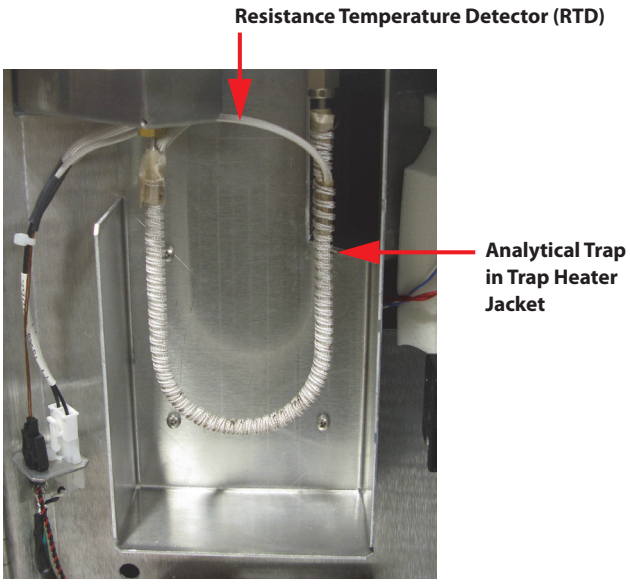
1.4.5 Sample Pathway

When dealing with active, polar and high-boiling compounds, it is imperative to keep the sample contained in an inert sample pathway. The Lumin utilizes inert tubing and treated fittings throughout the sample path. This ensures resistance to corrosion and prevents loss of compounds.

1.4.6 Analytical Trap

The analytical trap is used to capture and release VOCs swept out of the sample by the purge gas. Once VOCs are captured, the trap is heated, causing the VOCs to desorb. The trap is then back-flushed with carrier gas carrying the VOCs to the GC for analysis. The analytical trap is heated using a heating jacket which surrounds it and cooled by a fan at the top of the analytical trap compartment. The temperature of the trap is verified by a Resistance Temperature Detector (RTD) inside the trap heating jacket.

Figure 1-5 Lumin Analytical Trap Compartment



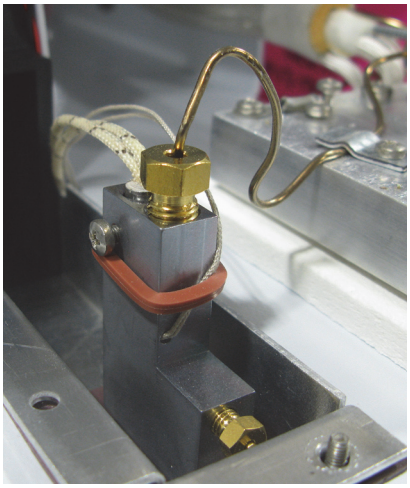
1.4.7 Moisture Control System (MCS)

The Moisture Control System (MCS) is located above the analytical trap and prior to the trap inlet. The MCS block contains a cartridge heater and a Resistance Temperature Detector (RTD) for heating to temperature setpoint. The MCS is typically cooled during the Purge Mode to ensure that the MCS is cool during the Desorb Mode. This allows water to be condensed, prior to introduction to the GC column. The MCS is then heated during the Bake Mode to remove any water condensed during the Desorb Mode.

NOTE

The user may elect to keep the MCS hot during all modes to effectively bypass any moisture removal.

Figure 1-6 Moisture Control System

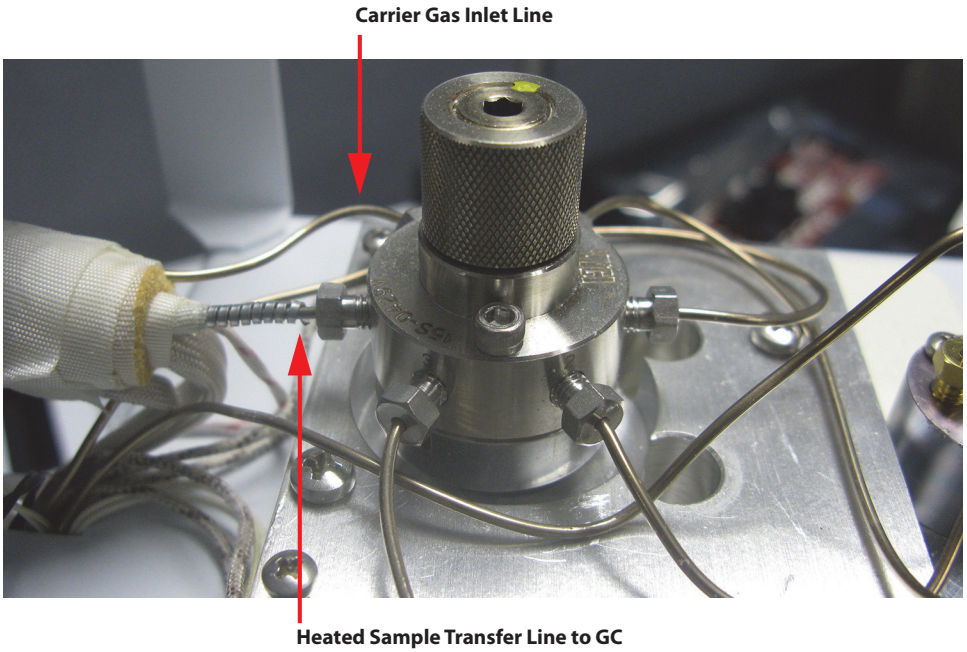


1.4.8 Carrier Gas Inlet Line/Heated Sample Transfer Line

The carrier gas inlet line is the inert tubing that runs down the side of the heated sample transfer line from the GC. Carrier gas is used to desorb VOCs off the analytical trap and carry them through the sample transfer line back to the GC.

The sample transfer line is the inert piece of tubing that runs down the center of the transfer line heater to ensure the VOCs being transferred to the GC column stay in their gaseous state. Carrier gas makes a passive loop through the Lumin and returns unchanged to the GC through the transfer line. GC carrier gas is independently controlled through the GC or an External Pressure Control (EPC).

Figure 1-7 Carrier Gas Inlet Line and Heated Sample Transfer Line



1.4.9 Valving

NOTE

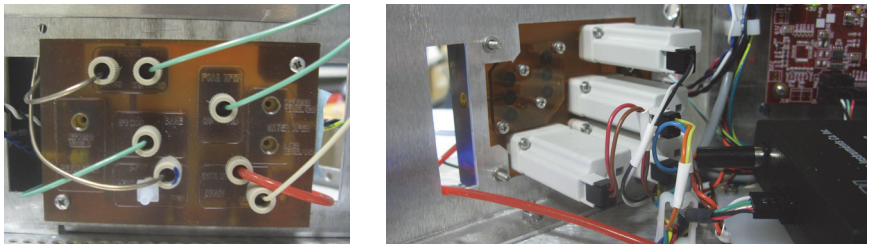
Each valve and its function is also detailed in Table 1-8 "Valving".

Solenoid Valves

The purge valve, bake valve, drain valve and vent valve are mounted on a valve manifold that supplies gas to various locations within the system.

If the system is equipped with the Foam Eliminator option, the valve manifold will have two additional solenoid valves used to add anti-foam to foaming samples and rinse the anti-foam lines between samples. The manifold will also be equipped with a pressure regulator to control pressure within the eliminator system vessels.

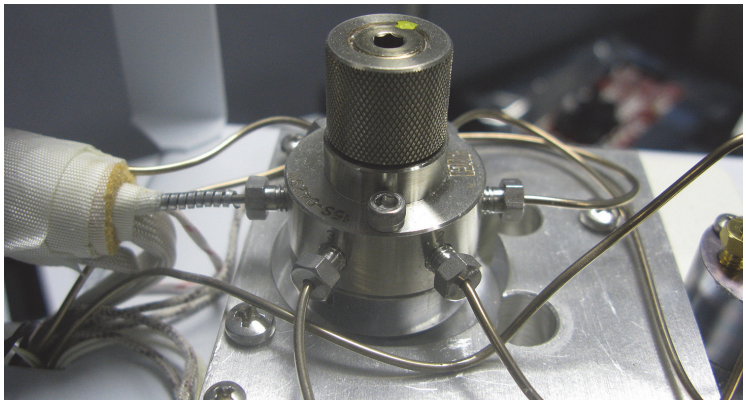
Figure 1-8 Lumin Valve Manifold and Solenoid Valves



Heated 6-Port Valve

The 6-port valve is a two-position valve that routes the purge and trap concentrator flows according to each mode of operation. The valve is located in the “valve oven” which heats the valve to a set temperature.

Figure 1-9 Heated 6-Port Valve



Three-Port Sample Valve

The three-port sample valve controls the flow between the sparger and the drain line and is used for operation of the Lumin without autosampler, as well as for troubleshooting. Refer to Table 1-13 "Valves and Functions" for information on each valve position.

Figure 1-10 3-Port Sample Valve

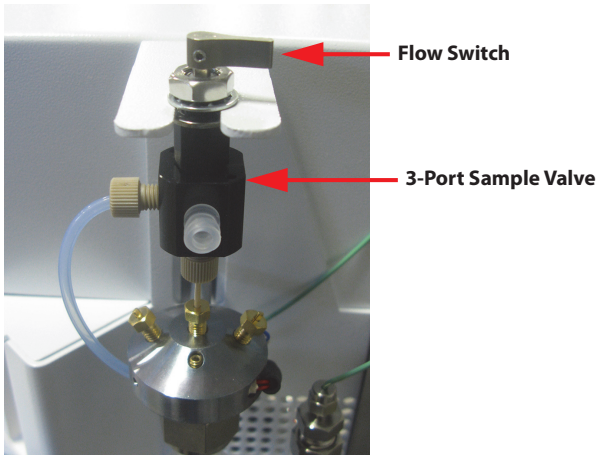


Table 1-13 Valves and Functions			
Valve	**Function**	**Actions**	
		Off	**On**
Bake Valve	The bake valve receives inlet flow from the MFC.	Flow moves to the purge valve.	Allows the trap to be back-flushed and baked.
Purge Valve	The purge valve receives sample gas flow from the Bake Valve.	Sample gas flow is routed around the sparger.	Routes the sample gas through the sparger.
Vent Valve	The vent valve receives vent flow from the 6-port valve.	Closes the system.	Allows flow out the vent.
Drain Valve	The drain valve receives waste flow from the Sample Valve.	Drain Line is closed.	Liquid or gas flows from the sparger, out the sparger drain line and to the red, 1/8" concentrator drain line.
Foam Transfer Valve (Optional)	Used on configurations with the Guardian Foam Sensor and Foam Eliminator.	N/A	Adds a defoaming agent to the sparger.
H_2O Transfer Valve (optional)	Used on configurations with the Guardian Foam Sensor and Foam Eliminator.	N/A	Rinses the sample path with water prior to re-running the sample.
6-Port Valve	The 6-port valve is a two position valve consisting of a stator, which is stationary, and a rotor that rotates to one of two positions. In one configuration the rotor allows ports 1&2, 3&4 and 5&6 to be connected, while in the other position the rotor allows ports 2&3, 4&5 and 6&1 to be connected. This valve allows for the trap to be loaded during the Purge Mode by connecting the trap to the sparger, and in the second position, to be in series with the GC to allow desorption onto the column.		
Mass Flow Controller (MFC)	The MFC controls the sample gas flow by regulating the exhaust port with a proportional valve to allow an exact mass of gas to pass through the unit.		
3-Port Sample Valve	The 3-port sample valve controls the flow between the sparger and the drain line. When the flow switch (valve handle) is turned to center or left positions, the opening to the drain line is closed. When the valve handle is turned to the right, the valve is open to the drain line.		

1.5 Optional Autosampler

For automated sample analysis, the Lumin was designed to be combined with the Teledyne Tekmar AQUATek LVA or its predecessor, the AQUATek 100 autosampler.

The AQUATek LVA is a microprocessor-controlled purge and trap autosampler that automates the sample preparation steps for Purge and Trap (P&T) analysis of liquid samples. The system is capable of preparing samples such as drinking water and wastewater and transfers liquid sample aliquots from the vial to the sparger of the Lumin or Stratum Purge and Trap (P&T) concentrator. The AQUATek LVA interfaces directly to the P&T concentrator and allows for complete automation of sample preparation for liquid samples including: vial handling, sample volume measurement, internal standard injections, sample transfer to the concentrator and rinse/clean up between samples.

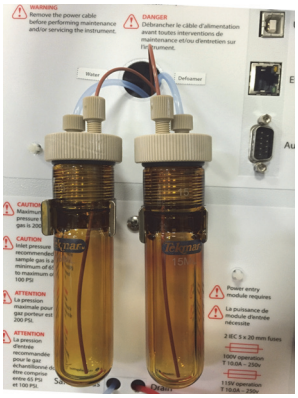
The AQUATek LVA offers all the capabilities required for compliance with US EPA methods for the analysis of volatile organic samples, including a true closed-system technique for sample handling and vial cooling. This ensures sample integrity during the sample preparation process and greatly minimizes the loss of volatile organic compounds (VOCs).

Figure 1-11 AQUATek LVA Autosampler

1.6 Optional Guardian Foam Sensor and Foam Eliminator

An optional foam sensing and eliminating system to safeguard the Lumin from the adverse effects of liquid entering the gas pathway. The Lumin can be equipped with only the foam sensor to trigger an alert; or a sensor and foam eliminator to trigger an alert, remove the foam from the sample and rerun. For more information on Guardian Foam Sensor and Foam Eliminator actions, refer to Section 2.14 "Guardian Foam Sensor and Foam Eliminator (Optional)".

Figure 1-12 Guardian Foam Sensor and Foam Eliminator/Rinse Vessels



Intentionally Left Blank

Lumin User Manual

Chapter 2: Installation and Setup

2.1 Pre-Installation

2.1.1 Overview

This chapter contains information on:

- Pre-installation requirements including electric, gas and software/PC.
- Unpacking the concentrator and checking for shipping damage and/or missing items.
- Concentrator component overview.
- Installation procedures including gas, electrical, data and GC connection.

NOTE

Use the images in Section 2.4 "Concentrator Overview" to identify and locate the components on the instrument, described in the installation procedures.

NOTE

For information on making liquid and gas connections with the variety of nuts and ferrules used on the Lumin and autosampler, refer to Section 5.2 "How to Make Gas and Liquid Connections".

2.1.2 Operating Environment

The Lumin 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.

NOTE

To avoid material and/or component damage, keep the concentrator away from corrosive substances.

2.1.3 Work Surface Requirements

The Lumin is 17.2” (43.7 cm) high, 8.9” (22.6 cm) wide, 18.7” (47.5 cm) deep and weighs 27 lbs (12.2 kg).

Make sure the surface where you place the Lumin 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.

The optional AQUATek LVA autosampler for the Lumin is designed to have the concentrator placed on top of the autosampler. If an AQUATek LVA is also being installed, consider the combined dimensions and weight of both units, when selecting a location. The Lumin and AQUATek LVA have a combined weight of 44.0 kg (97 lb) and a combined height of 81.3 cm (32”). The Lumin can be placed next to the AQUATek LVA, but care should be taken when routing cables and the aqueous transfer line to avoid interference with the autosampler arm.

WARNING

To avoid the risk of fire and maintain optimum instrument performance, install the concentrator on a non-flammable surface and maintain a minimum 6” (15.24 cm) perimeter around the unit that is unobstructed by flammable material or other equipment.

WARNING

Ensure that the installation location allows the concentrator to be easily turned off and the power cord disconnected, in the event of an emergency.

2.1.4 Electrical Requirements

After selecting and clearing a location for the concentrator, check the availability of the required grounded outlets. The Lumin requires:

- 100-120 VAC +/- 10%, 50/60Hz, 10.0A, 1150W **or** 220-240 VAC +/- 10%, 50/60Hz, 5.0A, 1150W.
- One grounded, three-pronged receptacle for the main power cord.

WARNING

The circuit used to power the Lumin should be protected by a Certified/Listed 15/20 Circuit Breaker for short circuit protection.

NOTE

Additional accessories may require one or more grounded outlets.

2.1.5 Gas Supply Requirements

The Lumin requires two independent gas flows:

1. Sample Purge Gas
2. Regulated Carrier Gas supplied from the GC or carrier gas source.

NOTE

If an AQUATek LVA or AQUATek 100 autosampler will be installed, refer to the Autosampler User Manual for information on connecting the gas supply to the autosampler.

Ultra high-purity nitrogen or helium should be used as the sample purge gas. Verify that the following requirements are met:

1. Nitrogen or helium purity must be 99.999% and < 0.5 ppm hydrocarbon tested.

NOTE

To use nitrogen as the sample purge gas, the Mass Flow Controller will need to be configured for nitrogen on the Configuration Screen in Lumin TekLink.

2. Gas pressure at the source must be high enough to:
   - Allow at least a 65 psi (4.48 bar) pressure drop at every flow or pressure regulator.
   - Travel the distance from the source to the concentrator.
   - Provide the required gas pressure at the concentrator. Operation of the Lumin requires helium or nitrogen at an incoming (supply) pressure of 65 - 100 psi (4.48 - 6.89 bar).
3. The diameter of the tubing that supplies the gas depends on the maximum pressure drop allowable for the configuration:
   - If the helium supply is close to the concentrator, use the pre-installed blue, 1/8” tubing on the concentrator.
   - If the gas supply is a significant distance from the concentrator, a single source supplies several instruments or a single source is subject to high demand for gas, you may want to reduce pressure by replacing the supply line from the gas source with 1/4” tubing.
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 Lumin allows you to move the instrument without disconnecting the plumbing. The system is supplied with 5’ (1.5 m) 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 and 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 a high source pressure to that required by the concentrator.

NOTE

Teledyne Tekmar recommends using a single, two-stage regulator rather than two single-stage pressure regulators to meet the concentrator'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 PTFE tape.

NOTE

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

2.1.6 Minimum PC Requirements

Connect the Lumin to a computer that meets or exceeds the specifications shown in Table 2-1 "Minimum Computer Requirements":

Table 2-1 Minimum Computer Requirements

Component	Specification
Processor	300 MHz Pentium II (Or Equivalent)
Memory	512 MB
Hard Drive Space	6.4 MB
Display	VGA
Drive	4x CD-ROM
Operating System	PC interface through Windows® 7 or higher. Windows® 10 is recommended.
Input	Mouse
Devices	Compatible speakers and sound system

2.1.7 Required Tools and Supplies for Installation

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

- Tubing cutters
- 5/16” Open-ended wrenches (2) (carrier gas and sample transfer line connection)
- 3/8” Open-ended wrench (if changing the standard Vocarb® 3000 trap)
- 7/16” Open-ended wrenches (2) (sample gas connection)
- 1/2” Open-ended wrench (sparger installation)
- 9/16” Open-ended wrench (sparger installation)
- 7/8” Open-ended wrench (sparger installation)
- Waste container (not supplied with the Lumin)
- Ultra-pure helium or nitrogen supply, regulated prior to the concentrator to 65 -100 psi (4.48 bar - 6.89 bar)
- Carrier gas regulator if not connecting to regulated GC carrier gas supply.
- Luer-Lok ™ gas tight syringes (5 or 25 mL)
- Gas tight syringes (10 µL)
- Volumetric flasks
- Purge and trap (P&T) grade methanol (if methanol extraction methods are to be used)
- VOC Standards
- GC I/O Cable (must be ordered separately). Refer to Section 5.5 "GC I/O Cable and GC Type Reference".

2.2 Unpacking the Lumin

Unpack the Lumin, Installation Kit Box, optional components and accessories and inspect the contents against the packing list.

If there are any damaged or missing items contact Teledyne Tekmar customer service, using the information in Section P.2 "Teledyne Tekmar Customer Support Center", immediately. Claims for loss of a package or shipping damage should be promptly filed with the carrier.

2.3 Installation Kit Box

The Lumin is provided with an Installation Kit Box that contains parts for completing the concentrator installation. Throughout the installation procedure obtain parts from the Installation Kit Box when necessary.

Figure 2-1 Installation Kit Box Contents

FLANGELESS NUT EXTENDER (14-7679-000) NUT EXTENDER INSTRUCTION SHEET (14-7679-074)		TELEDYNE TEKMAR Everywhereyoulook™ (800) 874-2004 (513) 229-7000 www.teledynetekmar.com		SEPTA, THERMLITE 7MM (14-8909-043)	P/N: 15-2500-333 Rev. C
Nut, 1/16", Short, Gold Plated (14-0243-116) Qty 2	Ferrule, 1/16", SS (14-0241-016) Qty 2	Nut, 1/16", Peek (14-7695-016)	Ferrule, 1/16", Peek (14-7671-016)	1/8", Brass Tee (12-0070-016)	1/8", Vespel Ferrule (15-0285-016)
	Washer, Teflon (14-7201-009)	Ferrule, 1/2" Set, Teflon (14-1301-016)	Union, 1/16 - 1/16 SS (14-0051-016)	Plug Nut,1/4 - 28, Tefzel, Flat Bottom (14-8470-016)	Nut, Male Plug, 1/16", Zero Dead Volume, Gold Plated (14-1590-116)
	Fuse, 10A, 250V, 5 x 20mm (14-5180-034) Qty 2 (Only included with 115V systems)	Fuse, 5A, 250V, 5 x 20mm (14-5665-034) Qty 2 (Only included with 230V systems)	Cap Fuse, 2A (14-9432-034)	Cap Fuse, 3.15A (14-9433-034)	Cap Fuse, 5A, (14-9434-034)

2.4 Concentrator Overview

Figure 2-2 Front of Lumin

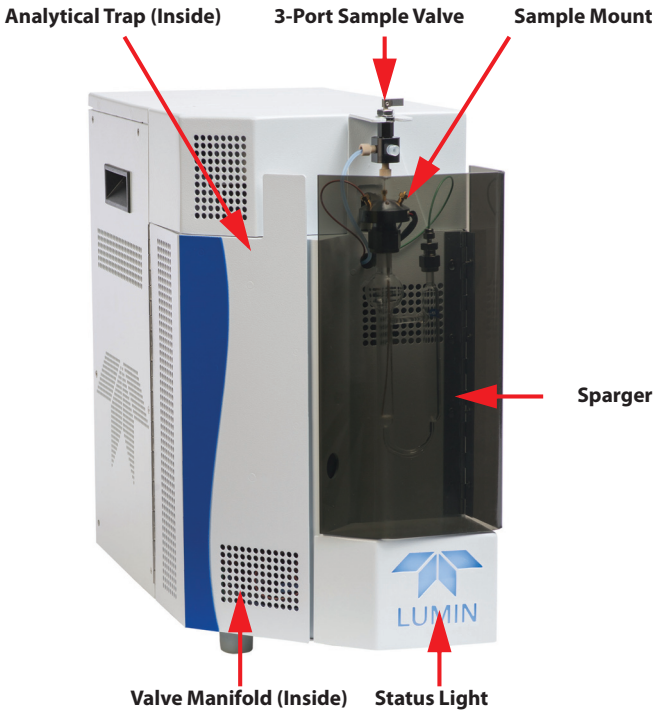
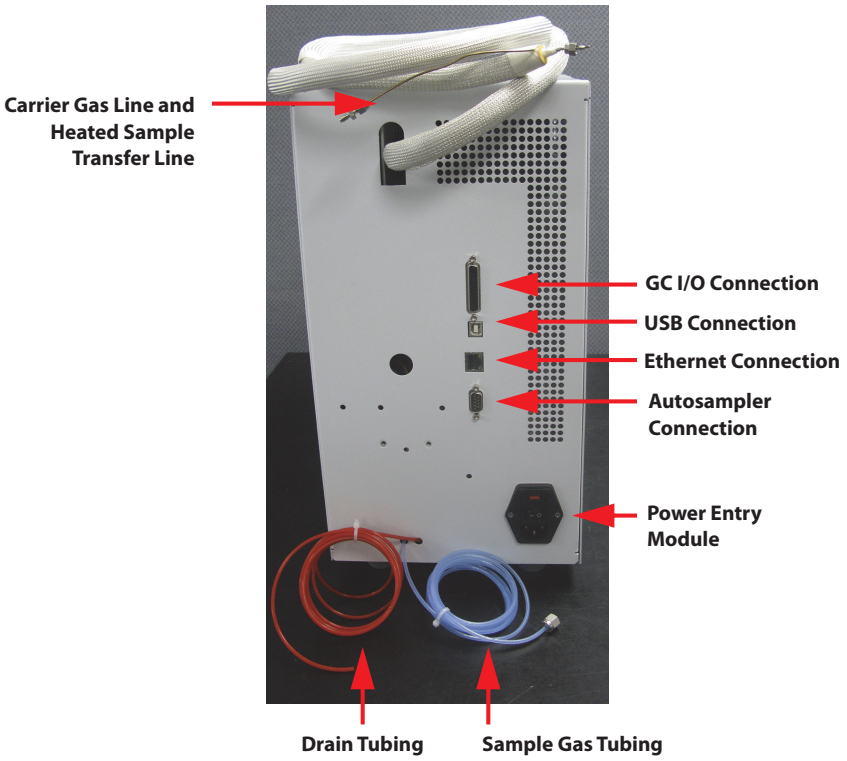


Figure 2-3 Back of Lumin



2.5 Electrical and Data Connections

2.5.1 AC Power Cable

NOTE

For electrical requirements refer to Section 2.1.4 "Electrical Requirements".

1. Ensure the switch on the Power Entry Module (PEM) is in the OFF (O) position.
2. Plug the AC power cable into the PEM and connect it to a properly rated and grounded AC receptacle.

WARNING

The circuit used to power the Lumin should be protected by a Certified/Listed 15/20 Circuit Breaker for short circuit protection.

WARNING

Ensure the power cable is routed away from, and is not capable of contacting, any hot surface.

Figure 2-4 Lumin Power Entry Module

2.5.2 GC I/O (Input/Output) Connection

NOTE

Refer to Section 5.5 "GC I/O Cable and GC Type Reference" to determine what cable should be used.

1. Connect the GC I/O cable to the GC I/O port on the back of the Lumin.
2. Connect the other end of the cable to an appropriate port on the GC.
3. Once connected, communication to the GC should be configured via the TOOLS>CONFIGURATION SCREEN in Lumin TekLink. For information on configuring Lumin TekLink according to GC type, refer to Section 2.11 "Create an Instrument Profile".

2.6 Connecting the Lumin Sample Purge Gas Supply

NOTE

For information on making liquid and gas connections with the variety of nuts and ferrules used on the Lumin and autosampler, refer to Section 5.2 "How to Make Gas and Liquid Connections".

NOTE

For sample gas requirements refer to Section 2.1.5 "Gas Supply Requirements".

Helium or nitrogen sample purge gas enters the back panel through the blue, 1/8" tubing labeled "Sample Gas". The sample purge gas connected to the Lumin is used during Purge Mode to strip VOCs from the sample and deposit them on the analytical trap. It is also used during Bake Mode to clean the analytical trap between samples. Figure 2-5 shows the rear panel of the Lumin with the sample purge gas tubing.

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

1. Connect the 1/8" Swagelok® brass tee (found in the Installation Kit Box) to the laboratory helium or nitrogen supply line. Insert the tubing into the tee and then tighten with a 7/16" wrench.
2. Route the blue, 1/8" (0.32 cm) sample purge gas tubing from the Lumin to the tee and connect. Insert the tubing into the tee and then tighten with a 7/16" wrench.

WARNING

Ensure the sample gas line is not within 10" of any heated components.

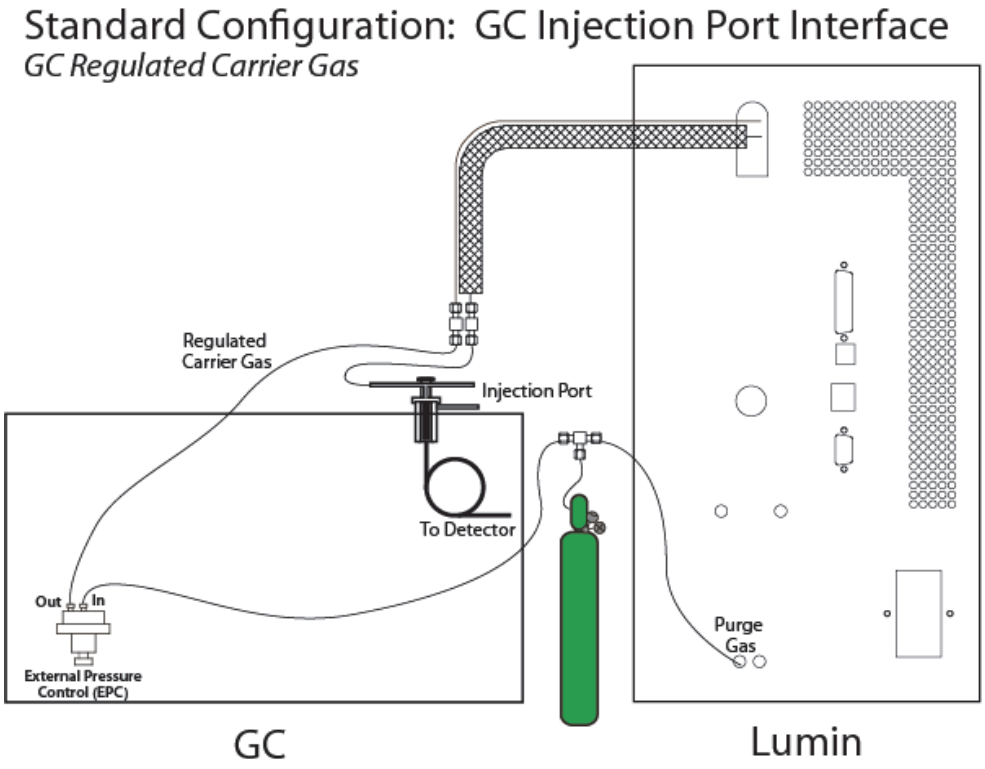
Figure 2-5 Rear of Lumin - Sample Purge Gas Connection

2.7 Lumin Carrier Gas Supply and Heated Sample Transfer Line Connection to the Gas Chromatograph (GC)

Figure 2-6 Carrier Gas Supply and Heated Sample Transfer Line

The Lumin connects to the regulated carrier gas of the GC at a location after the GC Electronic Pressure Control (EPC) and prior to the GC injection port. By connecting at this location, the GC regulated carrier gas is routed through the Lumin to carry desorbed VOCs from the analytical trap back to the GC sample inlet. This typically requires cutting the GC tubing and making two connections to the Lumin carrier gas line/heated sample transfer line. How the connections are made can vary according to gas supply and GC manufacturer. Follow the procedures below, as well as referencing the GC manufacturer's *User Manual*.

Figure 2-7 Lumin Carrier Gas Line, Heated Sample Transfer Line and Purge Gas Tubing Connections



Warning! - Hot surface! Allow the injection port to cool prior to beginning work on the transfer line installation.

1. Route the GC carrier gas line/heated sample transfer line from the Lumin to the GC.

WARNING

Ensure there is at least 10" of clearance between the heated jacket of the sample transfer line and any other object.

2. Power off the GC and allow the injection ports to cool. Select an injection port on the GC. Remove any covers around the GC injection port to expose the regulated carrier gas line that connects to the injection port.

NOTE

Some injection ports have multiple tubing connections. Do not cut any lines until you are certain which one is the regulated carrier gas line going to the injection port.

3. Prepare to connect the Lumin carrier gas line and heated sample transfer line using Swagelok® unions according to one of the following scenarios:
   - If a union connects the tubing from the GC EPC to the GC injection port, disconnect one side of the existing union and remove the tubing. Install an additional 1/16” Swagelok union (from the Installation Kit Box) on the removed tubing. Insert the tubing into the union and then tighten using one 5/16” wrench to hold the center of the union and another to tighten the nut.
   - If there is no union, cut the tubing from the GC EPC approximately one inch from the GC injection port and install two 1/16” Swagelok unions (from the Installation Kit Box) on each of the tubing lines. Insert the tubing into the union and then tighten using one 5/16” wrench to hold the center of the union and another to tighten the nut.
4. Connect the Lumin carrier gas line (outside tubing) to the union on the tubing from the GC Electronic Pressure Control (EPC). Connect the union to the tubing in the same manner as previous procedures.
5. Connect the Lumin heated sample transfer line (inside center tubing) to the tubing going to the GC injection port. Connect the union to the tubing in the same manner as previous procedures.

2.8 Routing the Drain Tubing

Route the red drain tubing to a waste bottle of suitable size and construction. Add an additional 7-13 cm (3-5”) to the tubing length so that it can extend into the container, then cut to length. Make sure the drain tubing is not crimped or blocked in any way. Because the drain is gravity fed, ensure that the drain line does not include any loops and is lower than the concentrator.

2.9 Install Sparger

1. Locate the standard 5 mL sparger located in the Installation Kit Box or the sparger of your choice.
2. If necessary, remove the shipping fixture from the sample mount by loosening the 1/2” nut on the sample mount.
3. Install the sparger according to the installation procedures in Section 5.10 "Sparger Replacement".

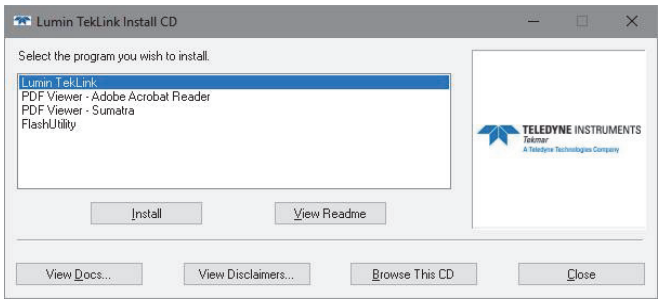
2.10 Install Lumin TekLink Software

NOTE

For PC requirements refer to Section 2.1.6 "Minimum PC Requirements".

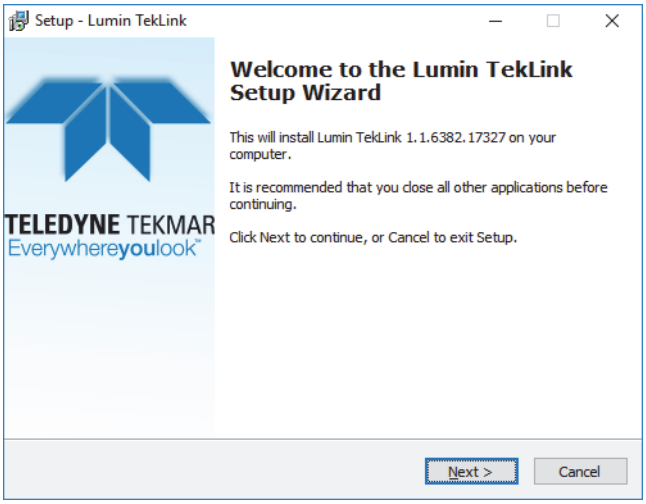
1. Ensure the controlling PC is **not** connected to the Lumin by USB cable.
2. Power on the controlling PC.
3. Insert the Lumin TekLink Software Installation CD into the PC's disc drive. The LUMIN TEKLINK INSTALLATION MENU will be displayed.
4. Highlight LUMIN TEKLINK from the installation menu and then select the INSTALL BUTTON.

Figure 2-8 Lumin Software Install Menu



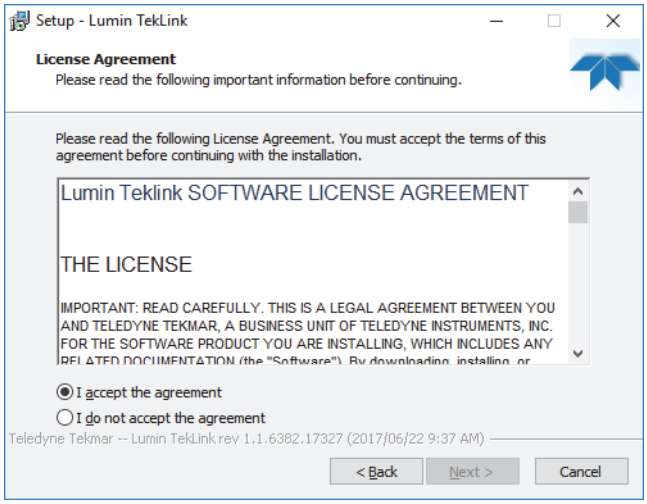
5. The LUMIN TEKLINK SETUP WIZARD will begin. It is recommended to close all other programs during the software installation. Select the NEXT BUTTON to continue.

Figure 2-9 Lumin TekLink Installation Wizard



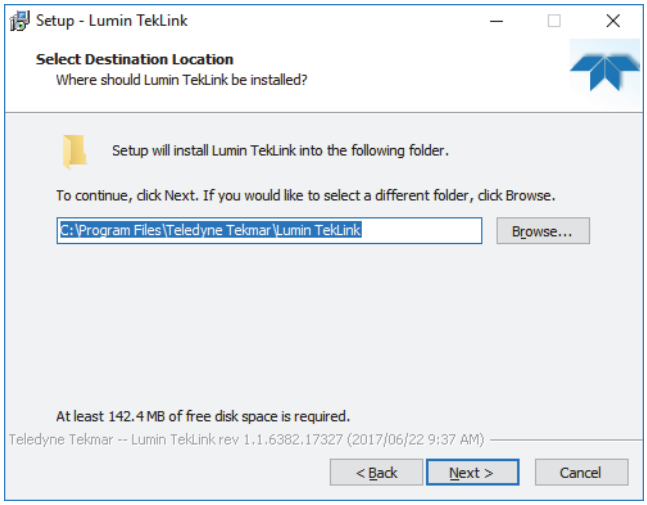
6. The LICENSE AGREEMENT will be shown. Review the agreement and then select the I ACCEPT THE AGREEMENT RADIO BUTTON. Once selected, click the NEXT BUTTON to continue.

Figure 2-10 License Agreement



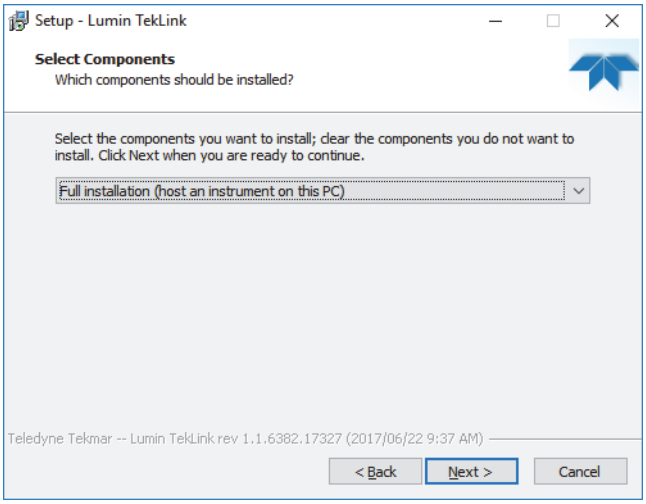
7. The wizard will request where to install the software. Use the default software installation location shown or browse to a custom location. Once chosen, select the NEXT BUTTON to continue.

Figure 2-11 Select Destination Location



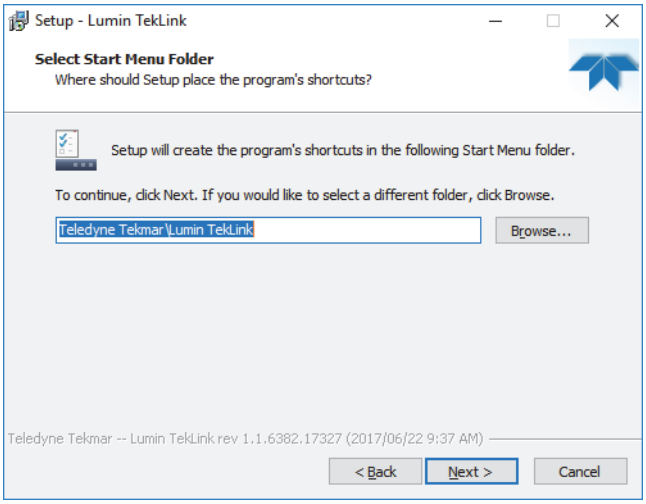
8. The wizard will request what additional components (configuration) to install. Select the components to install from the drop-down menu. Once chosen, select the NEXT BUTTON to continue.

Figure 2-12 Select Components



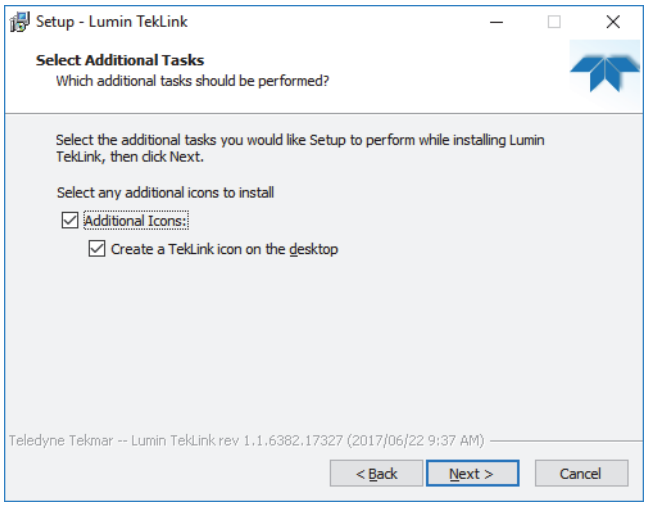
9. The wizard will request in which START MENU FOLDER to place the software shortcut. Use the default location or browse to a custom location for the software shortcut. Once chosen, select the NEXT BUTTON to continue.

Figure 2-13 Select the Start Menu Folder



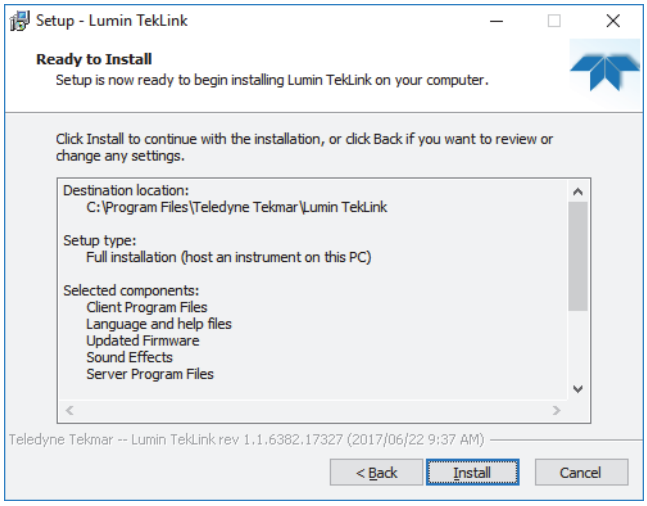
10. The wizard will request what additional tasks should be accomplished during installation. Select if you would like the software icon to be installed on the desktop by placing a check mark beside the selection. Once chosen, select the NEXT BUTTON to continue.

Figure 2-14 Select Additional Tasks



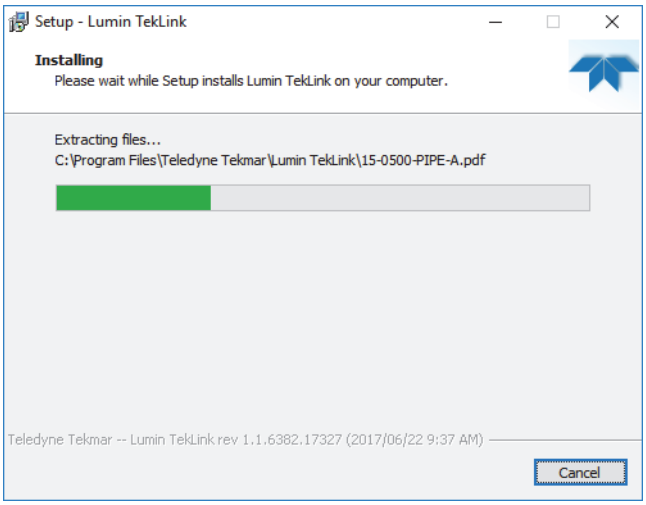
11. The software is now ready to install. Select the INSTALL BUTTON to install the software.

Figure 2-15 Ready to Install



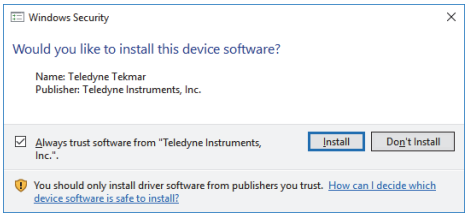
12. The software installation progress will be shown. Continue through the installation and respond to any prompts as necessary.

Figure 2-16 Installation in Progress



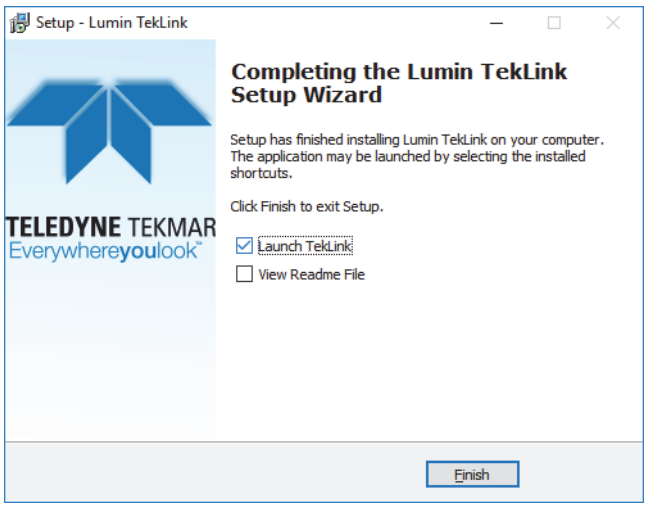
13. Next the TEKLINK INSTALLATION WIZARD will install USB drivers. If a Windows® Security Prompt is shown, select ALWAYS TRUST SOFTWARE FROM "TELEDYNE INSTRUMENTS, INC.", then select the INSTALL BUTTON to proceed.

Figure 2-17 USB Driver Install Windows Security Prompt



14. The COMPLETION SCREEN will be shown when the installation is done. To open the Lumin TekLink software and create an instrument profile, place a check in the LAUNCH TEKLINK CHECK BOX. Select the FINISH BUTTON to close the wizard.

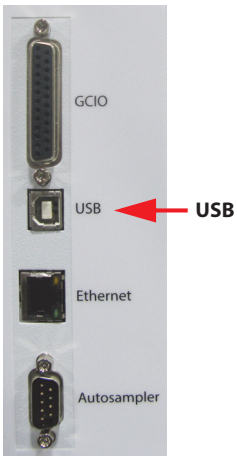
Figure 2-18 Software Completion



2.10.1 Connect the USB Interface Cable

The Lumin is connected to a controlling PC (with Lumin TekLink installed) using the supplied USB cable. Connect the cable to the USB port at the back of the Lumin labeled "USB" and then to a USB port on the PC.

Figure 2-19 Lumin USB Connection



2.11 Create an Instrument Profile

NOTE

All methods, schedules, TekLink software configurations and software settings are profile specific.

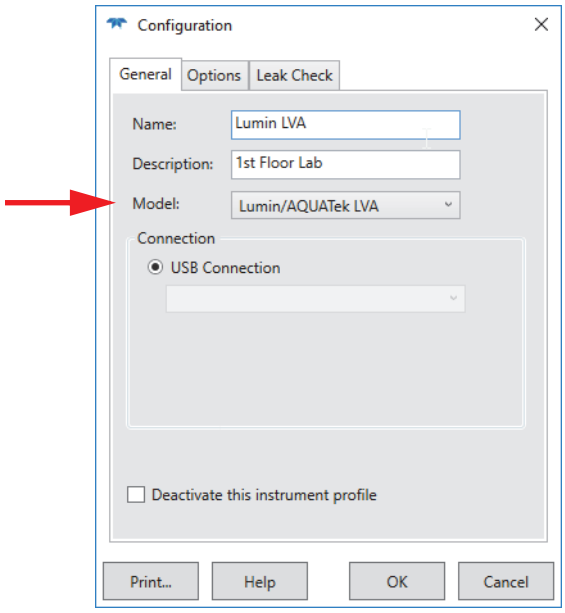
1. When Lumin TekLink is first opened, a NO DEFAULT INSTRUMENT CONFIGURED NOTIFICATION MESSAGE will be displayed. Clicking the OK BUTTON of the notification will display the CONFIGURATION DIALOG to create a new instrument profile. Once selections have been made on the GENERAL, OPTIONS and LEAK CHECK TABS of the CONFIGURATION DIALOG, select the OK BUTTON to create the instrument profile.
2. On the GENERAL TAB:
   - Enter a NAME for the concentrator.

NOTE

If the lab has multiple Lumin, use the name and description to differentiate one concentrator from another.

   - Enter a DESCRIPTION so the concentrator is easily identified.
   - Select the MODEL from the MODEL DROP-DOWN MENU (LUMIN, LUMIN/AQUATEK LVA or LUMIN/AQUATEK 100).

Figure 2-20 Creating an Instrument Profile



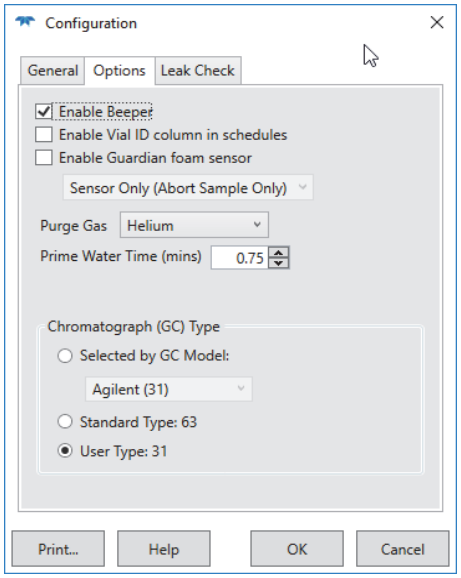
- Select the default USB CONNECTION CHECK BOX, then choose the available USB connection from the drop-down menu.

NOTE

If no USB connections are shown in the drop-down menu, ensure the controlling PC is connected to the Lumin and powered on.

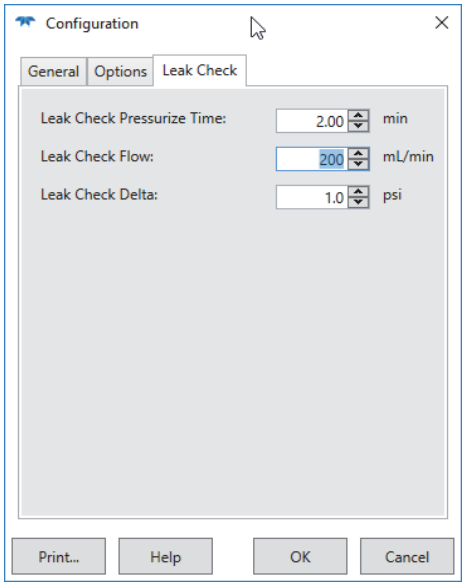
3. On the OPTIONS TAB:
   - Select ENABLE BEEPER if you would like the concentrator to make an audible noise when an error occurs.
   - Select ENABLE VIAL ID COLUMN IN SCHEDULES to add a VIAL ID COLUMN to the SAMPLE SCHEDULE TABLE.
   - If the configuration includes an AQUATek LVA or AQUATek 100 autosampler equipped with a pH probe, select the pH PROBE CHECK BOX.
   - If an optional Guardian Foam Sensor and/or Eliminator is installed, select ENABLE GUARDIAN FOAM SENSOR. Choose the configuration and action from the drop-down menu.
   - Select the appropriate sample PURGE GAS from the PURGE GAS DROP-DOWN MENU. This configures the MFC correctly for the type of gas selected.
   - Select the CHROMATOGRAPH (GC) TYPE from the GC MODEL DROP-DOWN MENU. If the specific model of the GC is not shown in the drop-down menu, use the STANDARD TYPE:63 or USER TYPE:31 CHECK BOX according to the GC manufacturer's instructions.

Figure 2-21 Options Tab



4. On the LEAK CHECK TAB:
   - Customize LEAK CHECK PRESSURIZE TIME, LEAK CHECK FLOW pressure settings and LEAK CHECK DELTA (amount of change in pressurization that indicates a leak).

Figure 2-22 Leak Check Tab



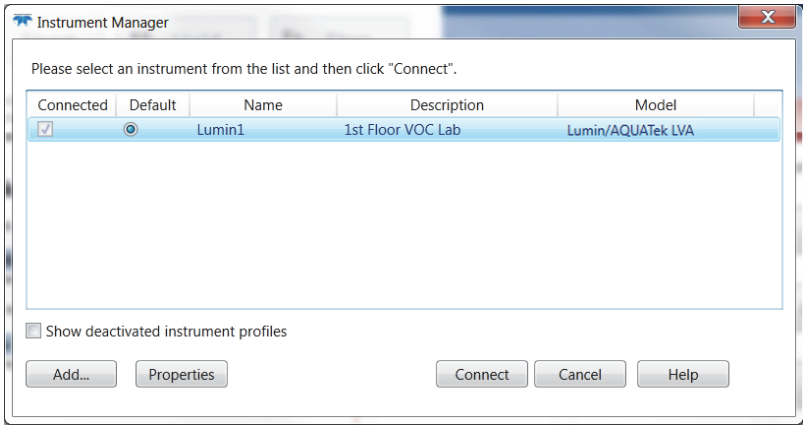
5. Select the OK BUTTON to create the instrument profile. Lumin TekLink will automatically connect to the new profile. The INSTRUMENT STATUS PANEL, METHODS SCREEN and SCHEDULES SCREEN will display the connected instrument profile name.

   Once a profile is created, methods, schedules, system properties and preferences can be saved to that profile when it is connected.

NOTE

Once an instrument profile has been created, it cannot be deleted. “Deactivating” an instrument profile removes the instrument profile from the list of active profiles in the Instrument Manager Dialog. For information on deactivating an instrument profile, refer to 3.9 "Deactivate an Instrument Profile".

Figure 2-23 Instrument Manager - Profile Set to Default



2.12 Autosampler Setup and Connection

NOTE

If the configuration includes an AQUATek LVA or AQUATek 100 autosampler, ensure that the "Model" is set correctly in the Instrument Configuration Dialog's General Tab.

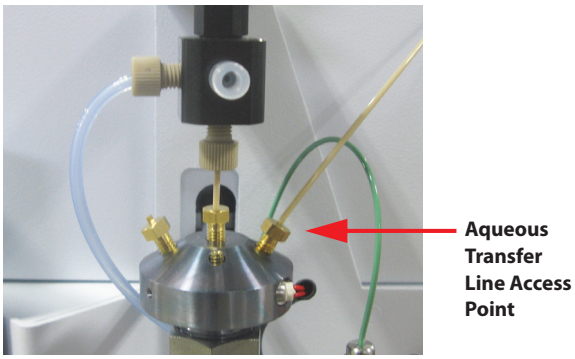
2.12.1 Communication Cable Connection

The Lumin will control the AQUATek LVA or AQUATek 100 autosampler via a 9-pin autosampler communication cable. Refer to the appropriate *Autosampler User Manual* for installation information.

2.12.2 Autosampler Aqueous Transfer Line Installation

The aqueous transfer line conveys the sample from an AQUATek LVA or AQUATek 100 autosampler to the Lumin purge and trap concentrator. Refer to the appropriate *Autosampler User Manual* for installation information.

Figure 2-24 Aqueous Transfer Line Installed



2.13 Materials and Reagents

2.13.1 Preparing DI Water

DI water is used for autosampler system rinsing, auto-blanks and high-temperature system rinse. 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" (3.66 m) 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 °C to 90 °C (176 °F to 194 °F) with helium or nitrogen for at least one hour.
- Pass water through a freshly charged water purifier (such as Millipore Super Q®).

2.13.2 Methanol Supply Grade

If methanol extraction methods are to be used, purge and trap grade methanol is recommended.

2.13.3 Preparing Working Standards

Commercial standards, in various mixtures and concentrations, are available for volatile analysis. These standards should be kept at 0 °C (32 °F) 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 AQUATek LVA or AQUATek 100 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.

2.14 Guardian Foam Sensor and Foam Eliminator (Optional)

The Guardian Foam Sensor and Foam Eliminator are designed to safeguard the Lumin from the adverse effects of liquid entering the gas pathway. The foam sensor uses a photo sensor mounted on the outside of the sparger to detect the presence of foam in the neck of the sparger. Upon detection, the foam sensor immediately stops the purge gas flow and contains the foaming sample in the sparger before it reaches the Lumin's gas pathway. When combined with the optional foam eliminator, a defoamer is added to the sample.

If ordered with the Lumin, the Guardian Foam Sensor and/or Foam Eliminator will be installed. To retrofit a Lumin with the Guardian Foam Sensor and/or Foam Eliminator refer to the installation instruction sheet included with the Guardian Foam Sensor and Foam Eliminator.

Guardian Foam Sensor and the Eliminator actions vary according to the concentrator configuration (with or without autosampler), installation of the foam sensor with or without foam eliminator and sensor/eliminator settings in TOOLS>CONFIGURATION>OPTIONS TAB.

2.14.1 Lumin with Guardian Foam Sensor

1. When foam is sensed, the Lumin shuts off the purge gas and drains the sample.
2. YES will be displayed in the FOAM COLUMN of the sample schedule and the event will be recorded in the SAMPLE HISTORY LOG (TOOLS>VIEW HISTORY LOG>SAMPLE HISTORY TAB).

2.14.2 Lumin With Guardian Foam Sensor and Foam Eliminator

1. When foam is sensed, the Lumin shuts off the purge gas. The purge clock is stopped and the foam transfer valve is activated to add a defoaming agent.
2. The purge gas and purge clock are reactivated. If the sensor does not trip again, the Lumin will proceed with the sequence.
3. If the sensor is tripped a second time, the defoaming procedure is repeated.
4. If the sensor is tripped a third time, YES will be displayed in the FOAM COLUMN of the sample schedule and the event recorded in the SAMPLE HISTORY LOG (TOOLS>VIEW HISTORY LOG>SAMPLE HISTORY TAB).

2.14.3 Lumin and AQUATek LVA/AQUATek 100 Autosampler with Guardian Foam Sensor

1. When foam is sensed, the Lumin shuts off the purge gas and aborts the sample.
2. If ABORT SAMPLE is selected in the TOOLS>CONFIGURATION>OPTIONS TAB:
   - The sample will be aborted. The Lumin will report that there was a foaming sample. ABORTED will be displayed in the STATUS COLUMN and YES will be displayed in the FOAM COLUMN beside the sample that foamed.
   - Once drained, the Lumin steps to the Desorb Preheat Mode to keep the GC sequence correct.
   - The next line of the sample schedule will be run.
3. If ABORT SCHEDULE is selected in TOOLS>CONFIGURATION>OPTIONS TAB:
   - The Lumin will go into Abort Mode and perform a system cleanup.
   - ABORTED will be displayed in the STATUS COLUMN of the foaming sample and all pending samples. YES will be displayed in the FOAM COLUMN beside the ONE sample that did foam.

2.14.4 Lumin and AQUATek LVA/AQUATek 100 Autosampler with Guardian Foam Sensor and Foam Eliminator

1. When foam is sensed, the Lumin shuts off the purge gas. The purge clock is stopped and the foam transfer valve is activated to add a defoaming agent.
2. The purge gas and purge clock are reactivated. If the sensor does not trip again, the Lumin will proceed with the sequence.
3. If the sensor is tripped a second time, the defoaming procedure is repeated.
4. If the sensor is tripped a third time, the system gives an error that is written to the SAMPLE HISTORY LOG (TOOLS>VIEW HISTORY LOG>SAMPLE HISTORY TAB).

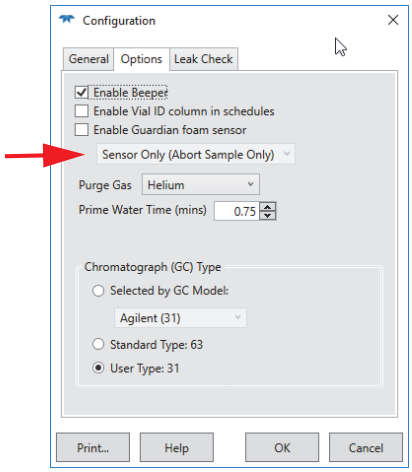
5. If ABORT SAMPLE is selected in the TOOLS>CONFIGURATION>OPTIONS TAB:
   - The sample will be aborted. The Lumin will go to Desorb Preheat Mode to keep the GC schedule correct. ABORTED will be displayed in the STATUS COLUMN and YES in the sample's FOAM COLUMN.
   - The schedule will continue with the next sample.
6. If ABORT SCHEDULE is selected in TOOLS>CONFIGURATION>OPTIONS TAB:
   - The current sample and all remaining samples in the schedule will be aborted. The Lumin will report that there was a foaming sample. ABORTED will be displayed in the STATUS COLUMN of the foaming sample and all pending samples. YES will be displayed in the FOAM COLUMN beside the ONE sample that did foam.

2.14.5 Configuring the Guardian Foam Sensor & Eliminator

To activate and configure the Guardian Foam Sensor and Foam Eliminator:

1. Navigate to TOOLS>CONFIGURATION>OPTIONS TAB.
2. Select the check box beside ENABLE GUARDIAN FOAM SENSOR.
3. Use the drop-down menu to configure the Guardian Foam Sensor and Eliminator actions.

Figure 2-25 Configuration Dialog - Guardian Foam Sensor



2.15 Preparation for Analysis

2.15.1 Regulator Pressure Confirmation

Confirm an incoming (supply) pressure of 65 - 100 psi (4.48 - 6.89 bar).

2.15.2 System Leak Check

Perform a leak check to ensure the system is air tight. Refer to Section 5.20.3 "Initial Leak Check".

2.15.3 Condition Analytical Trap

Ensure the analytical trap has been conditioned according to 5.12 "Analytical Trap Conditioning".

2.15.4 Optional Guardian Foam Sensor and Eliminator

If an optional Guardian Foam Sensor and Eliminator system is installed on the concentrator:

1. Fill the eliminator water and defoamer vessels.
2. Ensure that Guardian Foam Sensor and/or Eliminator system actions are configured under TOOLS>CONFIGURATION>OPTIONS TAB of the TekLink software.

2.15.5 Optional Autosampler

If an AQUATek LVA or AQUATek 100 is installed, ensure the following according to the *Autosampler User Manual*:

- DI water supply filled and primed
- Internal standard vessels filled and primed
- Optional pH Probe calibration performed

Lumin User Manual

Chapter 3: Lumin TekLink Software Overview

NOTE

For Lumin TekLink PC requirements refer to Section 2.1.6 "Minimum PC Requirements". For information on installing Lumin TekLink refer to Section 2.10 "Install Lumin TekLink Software".

3.1 About Lumin TekLink Software

Lumin TekLink is a software user interface designed for the following functions:

- Define custom methods or operating sequences that meet analytical requirements by defining Standby, Purge, Desorb and Bake parameters.
- Build multi-sample schedules when using an autosampler.
- Load (Start), Hold and Abort a sample schedule.

NOTE

When a schedule is "loaded" the concentrator will immediately begin heating temperature controlled zones to method parameters. Once setpoints are attained, it will automatically begin running the schedule.

- Troubleshoot and perform diagnostics on the concentrator using advanced diagnostics.

3.2 The Lumin TekLink Software Environment

Lumin TekLink software is designed for convenient monitoring of the concentrator while it is running. The sections below detail the primary user features of the software.

3.2.1 Touchscreen Capability

Lumin TekLink software is designed for use with touchscreen PCs. All screens have active hot-spots, check box selections or drop-down menus. An optional on-screen alpha-numeric keyboard can be enabled via TOOLS>SYSTEM PROPERTIES>MISC TAB.

Figure 3-1 On-Screen Keyboard

3.2.2 "Pinnable" Screens

All screens can be "pinned" so that they remain in view when the HOME SCREEN is reduced. Use the pin in the upper right-hand corner of the screen to "pin" and "unpin" each screen.

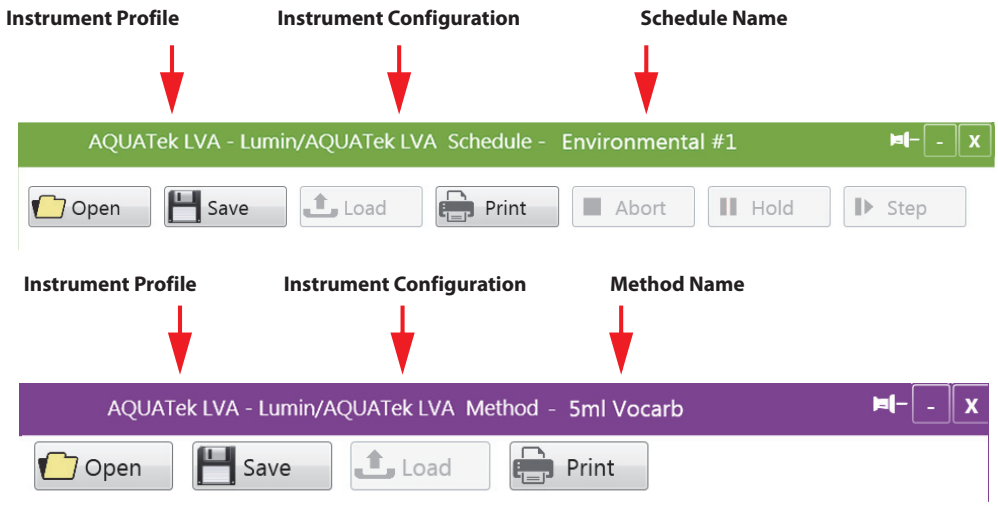
- When the pin is horizontal, the screen will be reduced from view when the HOME SCREEN is reduced.
- When the pin is vertical, the screen will remain visible when the HOME SCREEN is reduced. The screen can still be reduced using the REDUCE SCREEN BUTTON.

Figure 3-2 Pin Function

3.2.3 Title Bar

The title bar of the METHODS and SCHEDULES SCREEN displays information on the active INSTRUMENT PROFILE and the ACTIVE SCHEDULE or METHOD (according to screen).

Figure 3-3 Schedule and Method Screen Title Bar



3.2.4 Open, Save, Load and Print Buttons

Figure 3-4 Open, Save, Load and Print Buttons

- OPEN BUTTON - Opens a previously saved method or schedule. The OPEN METHOD/SCHEDULE DIALOG shows saved methods and schedules by name and last modified date. To open a method or schedule that has been archived, select the ARCHIVE from the SOURCE DROP-DOWN in the OPEN METHOD/SCHEDULE DIALOG. Multiple methods may be opened for comparison.

NOTE

Methods and schedules are saved according to instrument profile and will not be available under a different instrument profile from which they were created/saved.

- SAVE BUTTON - Save the currently open method or schedule.

NOTE

Lumin TekLink includes default methods that cannot be over-written.

- LOAD BUTTON - Load the currently open method or schedule to the concentrator.

  When a method is loaded, the concentrator will begin heating to temperature setpoints as defined in the method. Once temperature setpoints are achieved, the schedule will begin to run.

- PRINT BUTTON - Print the currently open method or schedule.

3.2.5 Instrument Control Buttons

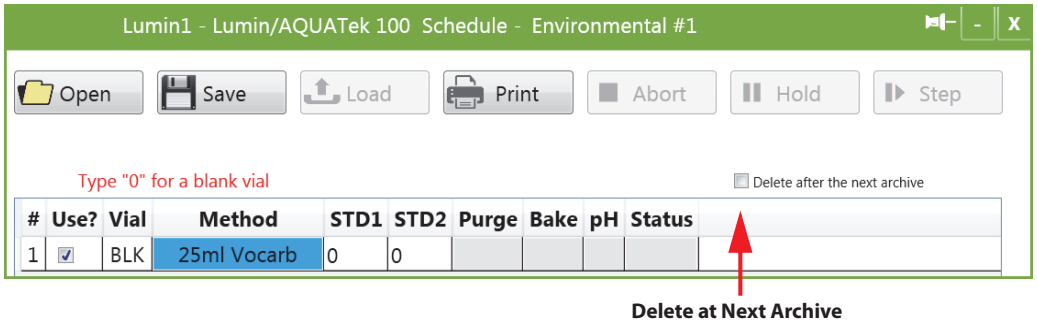
The INSTRUMENT STATUS PANEL and the SCHEDULES SCREEN have control buttons that are used to ABORT or HOLD a schedule or STEP through concentrator modes.

Figure 3-5 Control Buttons

3.2.6 Delete at Next Archive Check Box

The DELETE AT NEXT ARCHIVE CHECK BOX is available on both the METHODS and SCHEDULES SCREENS. When selected, the method or schedule will be deleted from the list of CURRENT methods or schedules in the OPEN METHOD/SCHEDULE DIALOGS and saved to the "archive" location.

Figure 3-6 Delete at Next Archive Check Box - Schedule Screen

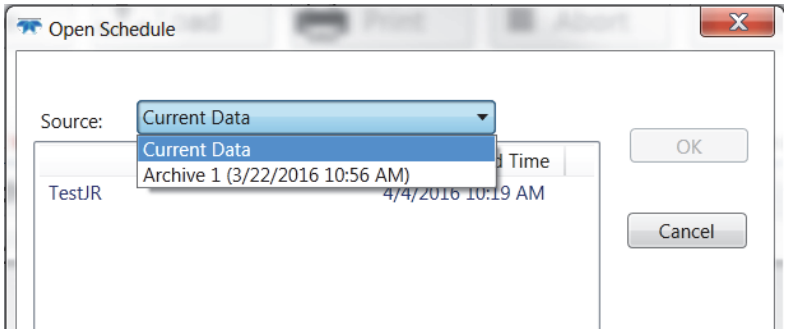


Once archived, the method or schedule can then only be viewed by selecting ARCHIVE in the OPEN SCHEDULE DIALOG'S SOURCE DROP-DOWN MENU (Figure 3-7).

NOTE

Archive settings and the Archive Now command are located under Tools>System Properties>Data Tab.

Figure 3-7 Open Dialog Source Drop-down Menu



3.3 Primary Screens

3.3.1 The Home Screen

The HOME SCREEN contains buttons to navigate to three primary screens and the Lumin TekLink Help:

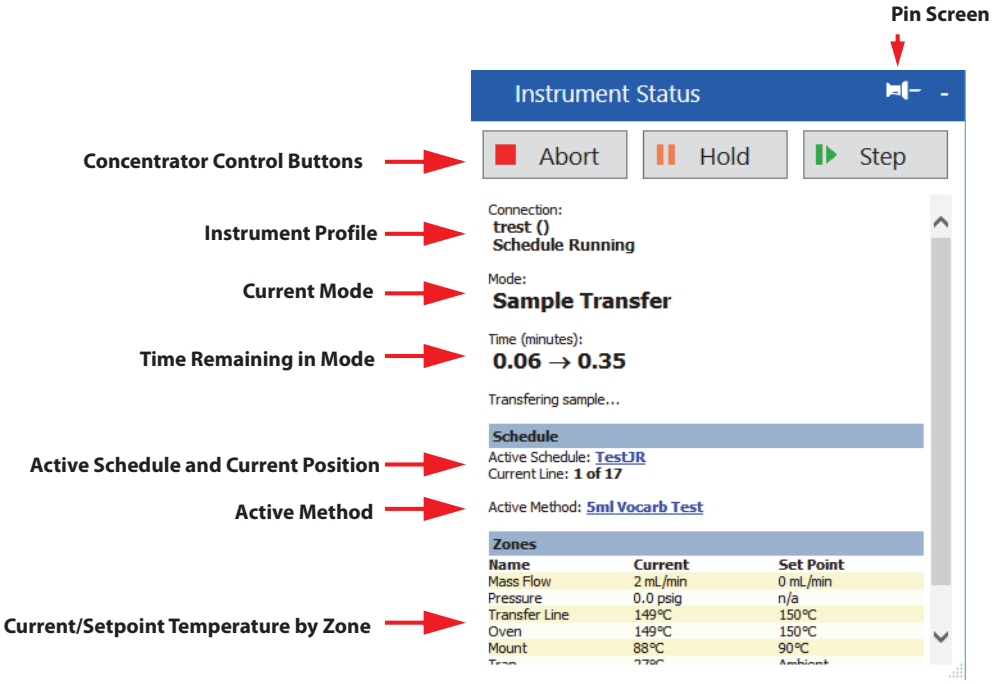
- METHODS SCREEN - Used for defining Standby, Purge, Desorb and Bake method parameters as well as opening, saving, loading and printing methods. If an AQUATek LVA or AQUATek 100 is installed, the METHOD SCREEN will also have an AQUATEK LVA or AQUATEK 100 TAB.
- SCHEDULES SCREEN- Used for creating and saving new sample schedules, opening previously created schedules and printing an open schedule. Schedules are then loaded from the SCHEDULES SCREEN to the concentrator and the sample run begun.
- TOOLS SCREEN - Used for direct control of the concentrator's functions for troubleshooting and diagnostics; software configuration options and settings; and sample, instrument and error logs.
- HELP - Lumin TekLink Help is context sensitive and provides relevant software/instrument information according to the screen on which the HELP BUTTON was selected.

Figure 3-8 Home Screen

3.3.2 Instrument Status Panel

The INSTRUMENT STATUS PANEL contains information related to the activities of the concentrator including the schedule that is running, the current method, the current position in the schedule being run, as well as the mode and time remaining. Similar to the SCHEDULES SCREEN, control buttons can be used to ABORT or HOLD a schedule or STEP through concentrator modes.

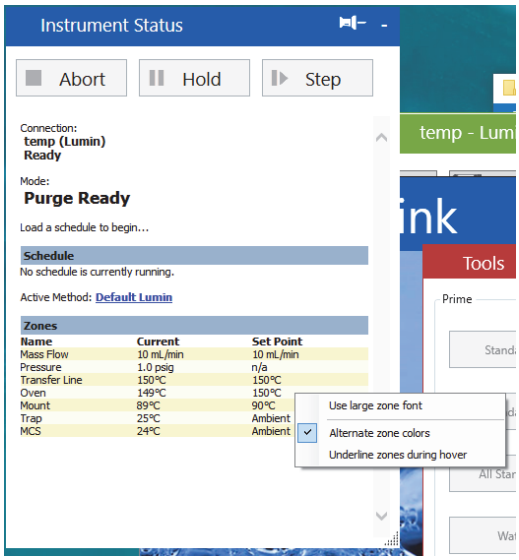
Figure 3-9 Instrument Status Panel



NOTE

Right-clicking on the Zones Panel of the Instrument Status Screen will show additional display options.

Figure 3-10 Instrument Status Zone Display Options



3.4 Methods Screen

NOTE

For recommended method parameters according to the type of trap installed, refer to 4.4.6 "Analytical Trap Recommended Operating Conditions".

The METHODS SCREEN contains STANDBY, PURGE, DESORB and BAKE TABS for defining method parameters. If an AQUATek LVA or AQUATek 100 is installed and configured, an AQUATEK LVA or AQUATEK 100 TAB will also be shown.

NOTE

Multiple Methods Screens can be opened for comparison of one method to another.

3.4.1 Standby Tab

The STANDBY TAB is used to set the concentrator's standby temperatures and flows:

- VALVE OVEN TEMP

  The temperature setpoint for the 6-port valve. The temperature should be high enough to prevent cross-contamination, but not so high as to decompose analytes.

- TRANSFER LINE TEMP

  The temperature setpoint for the sample transfer line. The temperature should be high enough to prevent cross-contamination or carry-over, but not so high as to decompose analytes.

- SAMPLE MOUNT TEMP

  The temperature setpoint for the sample mount heater. The sample mount heater eliminates cold spots in the sample path that could lead to analyte adsorption, carryover and reduced sensitivity.

- STANDBY FLOW

  The amount of carrier gas flow sweeping the sample pathway while the concentrator is idle.

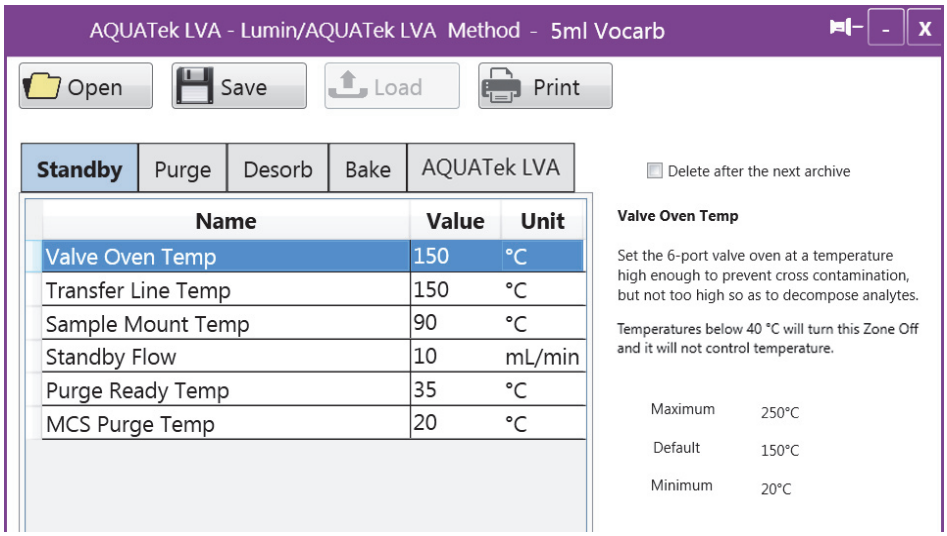
- PURGE READY TEMP

  The temperature setpoint for the analytical trap that must be reached before stepping to Purge Mode. Set approximately 10-20 degrees higher than ambient air temperature to decrease cycle time.

- MOISTURE CONTROL SYSTEM (MCS) PURGE TEMP

  The standby and purge temperature setpoint for the MCS. 20 °C is the recommended setpoint temperature ensuring that the heater remains off during Purge Mode to reduce the moisture transfer to the analytical trap.

Figure 3-11 Methods Screen - Standby Tab



3.4.2 Purge Tab

The PURGE TAB is used to define the time, flow and temperature of the Purge Mode. Click in the VALUE COLUMN to revise the method's purge parameters.

NOTE

The MCS purge temperature is also the temperature the MCS remains at during Standby Mode. The MCS Purge Temp is set on the Methods Screen's Standby Tab.

The following settings can be made on the PURGE TAB:

- PURGE TIME

  The amount of time gas is passed through the sample to concentrate the analytes on the trap.

- PURGE FLOW

  The flow rate at which the sample is purged with gas and analytes are collected on the trap.

- DRY PURGE TEMP

  The analytical trap temperature during the Dry Purge Mode. 20 °C is the recommended setpoint. This ensures the heater is off and that the trap remains cool. Heating the trap can lead to loss of analytes before the Desorb Mode.

- DRY PURGE TIME

  The time that dry gas is passed through the analytical trap during Dry Purge Mode. Allowing dry gas to pass through the analytical trap prior to desorb reduces the amount of water transfered during Desorb Mode.

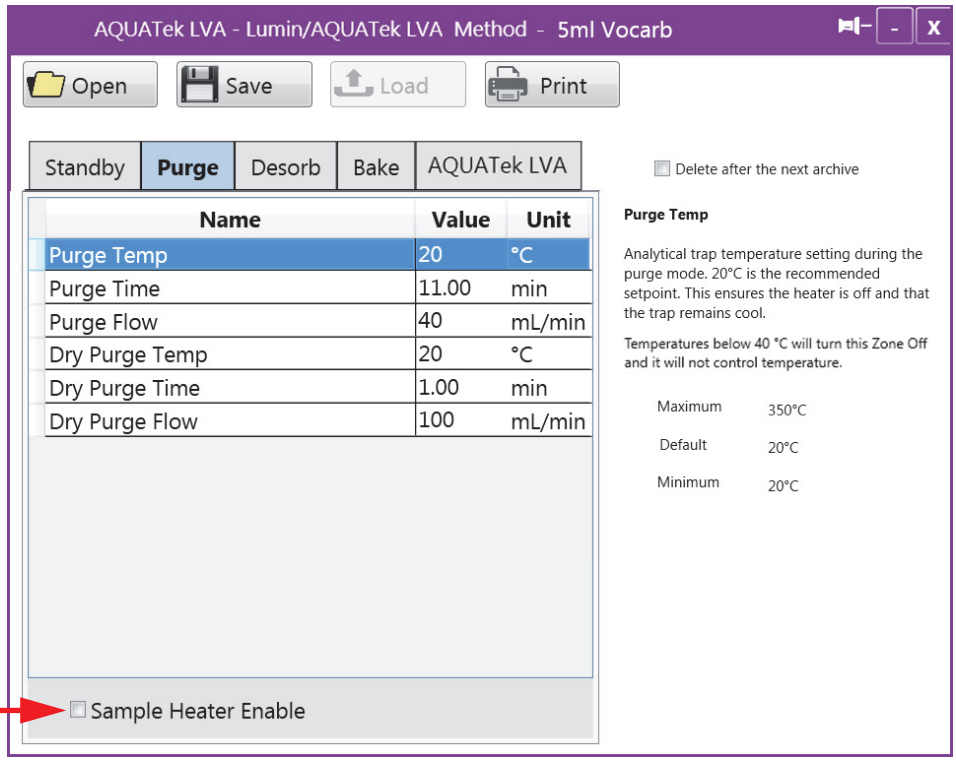
- DRY PURGE FLOW

  Flow rate at which dry gas is passed through the analytical trap during Dry Purge Mode.

- SAMPLE HEATER ENABLE

  Select the SAMPLE HEATER ENABLE Check Box to add additional parameters to the PURGE TAB when a sample heater is installed on the sparger.

Figure 3-12 Methods Screen - Purge Tab



NOTE

The following parameters are only shown on the Purge Tab when the Sample Heater Enable Check Box is selected.

- SAMPLE TEMP (Sample Heater Enabled)

  The sample temperature range is 20-90 °C. For environmental samples, the typical range is 40-60 °C. Flavor and fragrance analysis may have much higher temperatures.

- PRE-PURGE TIME (Sample Heater Enabled)

  The amount of time the sparger is swept with purge gas to remove oxygen in the headspace, prior to heating the sample. Usually pre-purge time combined with pre-purge flow allows the volume of the glassware to be swept three times.

- PRE-PURGE FLOW (Sample Heater Enabled)

  The amount of purge gas flow sweeping the sparger to remove oxygen in the headspace, prior to heating the sample. Usually pre-purge flow combined with pre-purge time allows the volume of the glassware to be swept three times.

- PREHEAT TIME (Sample Heater Enabled)

  Preheat time is used to allow the heaters to reach their temperature setpoints before Purge to ensure that all samples are purged under the desired conditions.

3.4.3 Desorb Tab

The DESORB TAB is used to define the time, flow and temperature of the Desorb Mode. Click in the VALUE COLUMN to revise the method's desorb parameters. The following settings can be made on the DESORB TAB:

- DESORB PREHEAT TEMP

  The temperature of the analytical trap in desorb preheat. This setting is dependent on the type of trap used. Use a temperature that is slightly below (5-10 degrees) the recommend desorb temperature for the sorbent trap. This allows the analytes to release from the sorbent trap prior to moving to the GC during desorb.

- DESORB TEMP

  Temperature setpoint of the analytical trap during Desorb Mode. This setting is dependent on the type of trap used. Use the recommended temperature for the trap installed. Refer to Section 4.4.6 "Analytical Trap Recommended Operating Conditions".

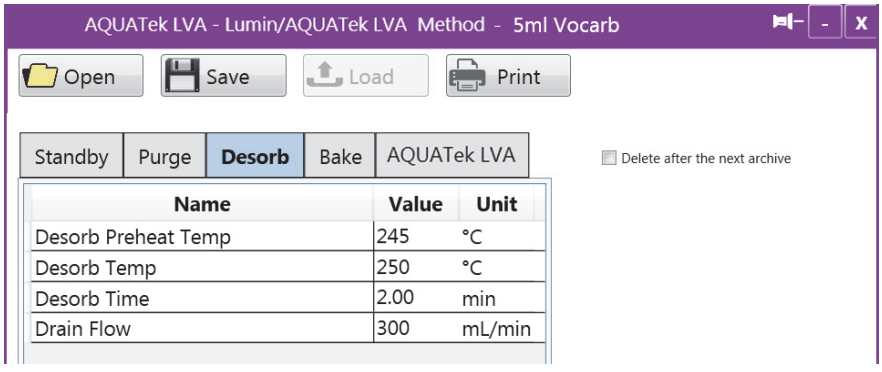
- DESORB TIME

  The amount of time over-which the analytical trap is desorbed. Set the time as low as possible to minimize water transfer, but long enough to completely transfer analytes to the GC. Desorb time is dependent on the GC carrier gas flow rate and split ratio.

- DRAIN FLOW

  The amount of flow used to drain the sparger during Desorb Mode.

Figure 3-13 Methods Screen - Desorb Tab



3.4.4 Bake Tab

The BAKE TAB is used to define the time, flow and temperature during Bake Mode. Click in the VALUE COLUMN to revise the method's bake parameters. The following settings can be made on the BAKE TAB:

- BAKE TIME

  The time the analytical trap and the Moisture Control System (MCS) remain at bake temperature setting. Allow enough time to reduce the carryover between runs and remove residual moisture from the MCS.

- BAKE TEMP

  Temperature of the analytical trap during the Bake Mode. This setting is dependent on the type of trap used. Set the temperature according to the trap manufacturer's recommendation.

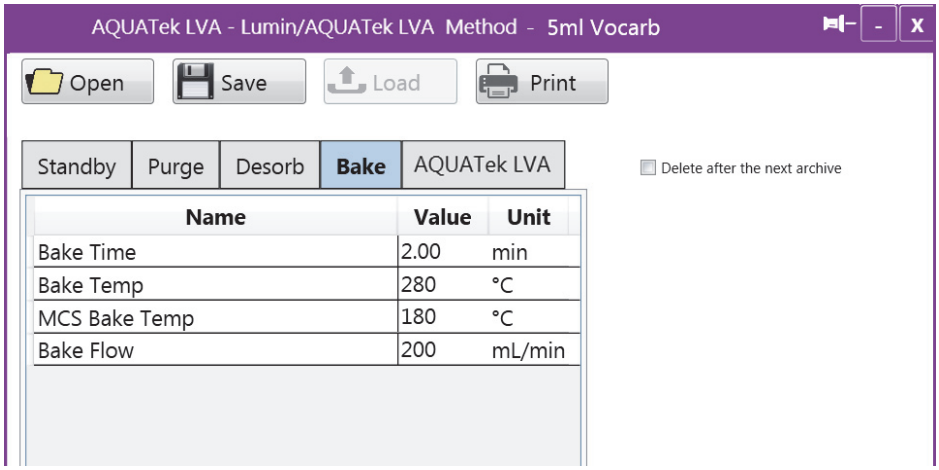
- MCS BAKE TEMP

  Temperature of the MCS during Bake Mode. Use the recommended setpoint to effectively remove residual moisture from MCS.

- BAKE FLOW

  Amount of gas flow through the analytical trap and MCS during Bake Mode.

Figure 3-14 Methods Screen - Bake Tab



3.4.5 AQUATek LVA/AQUATek 100 Tab

Method parameters for the AQUATek LVA or AQUATek 100 autosampler are configured on the AQUATEK LVA or AQUATEK 100 TAB of the TekLink METHODS SCREEN. Parameters include:

- SAMPLE LOOP TIME (PRESSURIZE TIME)

  The amount of time the vial is pressurized to allow for sample to be displaced to fill the sample loop (Minimum: 0.00 min, Maximum: 299.99 min, Recommended 0.35 min).

NOTE

The amount of Sample Loop Time (Pressurization Time) is dependent on the sample loop volume. Ensure the Sample Loop Time (Pressurization Time) is long enough to fully fill the sample loop. If the time is too short, the volume will be inaccurate.

- Sample Transfer Time

  The amount of time the sample and standards are swept to the sparge vessel of the concentrator (Minimum: 0.00 min, Maximum: 299.99 min, Recommended 0.35 min).

- Rinse Loop Time

  The amount of time the sample loop and stage one of the sample needle is rinsed with hot water (Minimum: 0.00 min, Maximum: 299.99 min, Recommended 0.30 min).

- Sweep Needle Time

  The amount of time stage two of the sample needle is flushed with inert gas (Minimum: 0.00 min, Maximum: 299.99 min, Recommended 0.30 min).

- Presweep Time

  The amount of time the sample lines and needle are swept with inert gas prior to filling the sample loop (Minimum: 0.00 min, Maximum: 299.99 min, Recommended 0.25 min).

- Water Temp

  Water temperature for rinsing the sample pathway, sample needle and glassware (Minimum: 20 °C [68 °F], Maximum: 100 °C [212 °F], Recommended: 90 °C [194 °F]).

NOTE

The system does not actively attempt to control temperatures below 40 °C (104 °F) (ambient) unless the laboratory temperature requires it.

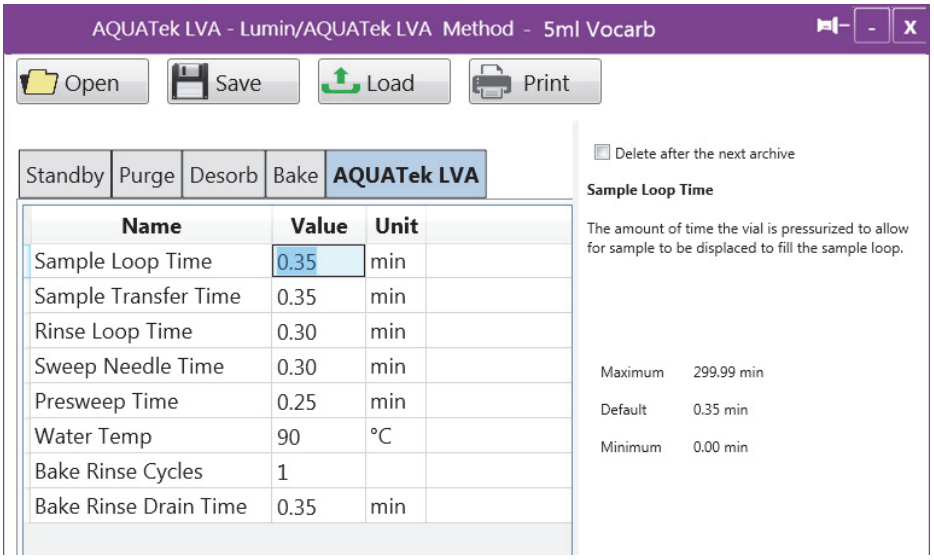
- Bake Rinse Cycles

  The total number of Bake Rinses between samples (Minimum: 1, Maximum: 3, Recommended: 1).

- Bake Rinse Drain Time

  The amount of time allowed to drain the Bake Rinse water from the sparge vessel (Minimum: 0.00 min, Maximum: 299.99 min, Recommended 0.30 min).

Figure 3-15 AQUATek LVA Tab

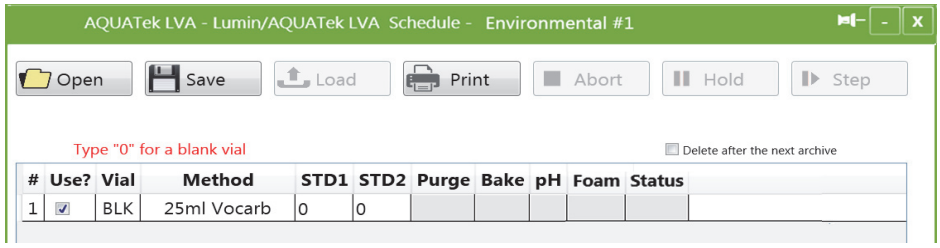


3.5 Schedules Screen

The SCHEDULES SCREEN is used to create and save new sample schedules, open previously created schedules and print an open schedule. Schedules are "loaded" using the LOAD BUTTON on the SCHEDULES SCREEN. Once a schedule is loaded, the concentrator will begin heating to temperature setpoints as defined in the method. Once setpoints are achieved, the sample schedule will begin to run.

Control buttons on the right are used to ABORT or HOLD a schedule once it has been loaded or to STEP through concentrator modes as the concentrator runs each line of the schedule.

Figure 3-16 Schedules Screen



The columns of the SCHEDULE TABLE are used for the following:

- # - The line number of the sample/blank.
- USE - Selecting/deselecting the USE CHECK BOX includes/excludes that item from the schedule. The USE CHECK BOX allows the convenient revision of a previously saved schedule.
- VIAL - The autosampler vial position that corresponds to that line of the schedule. Blanks can be added to the schedule by entering "0" in the vial position and hitting <Enter>.

- METHOD - A drop-down menu that allows the selection of any method saved in the CURRENT DATA folder.

NOTE

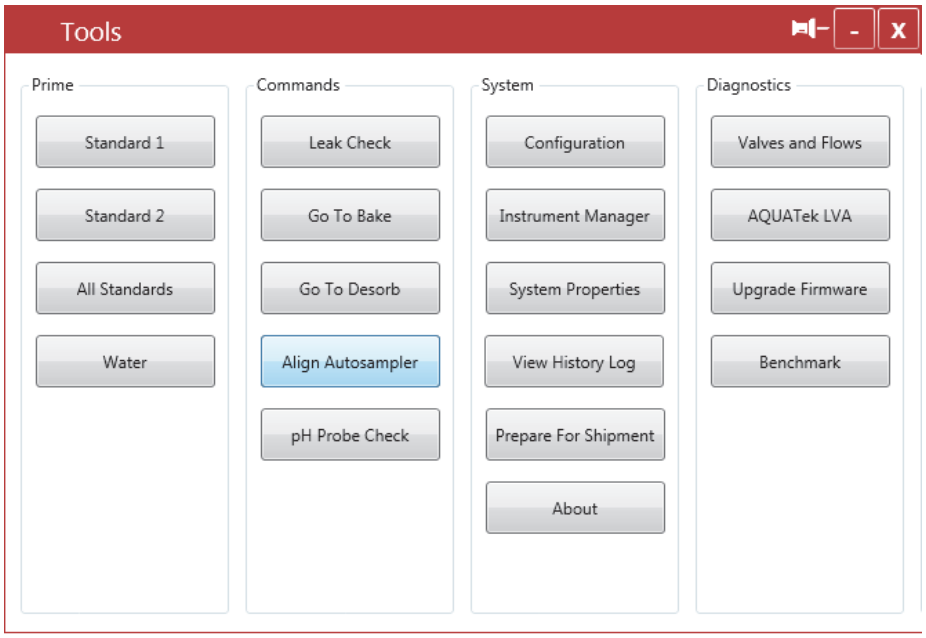
Archived Methods will not be shown. To use an archived method, open it from the Method Screen and save it as a current method. Refer to Section 3.10.1 "Open a Method".

- VIAL ID (Optional) - A VIAL ID COLUMN can be added to the SCHEDULE TABLE via TOOLS>SYSTEM>CONFIGURATION>OPTIONS TAB.
- STD1 and STD2 - These columns permit the addition of two check and/or internal standards to the schedule, when the Lumin is connected to the AQUATek LVA or AQUATek 100 autosampler.
- PURGE - Records the amount of back-flow pressure through the analytical trap, during Purge Mode. This value can be used as a diagnostic and troubleshooting tool.
- BAKE - Records the amount of back-flow pressure through the analytical trap during Bake Mode. This value can be used as a diagnostic and troubleshooting tool.
- PH - If a pH sensor is installed on the AQUATek LVA or AQUATek 100 autosampler, and enabled in TOOLS>CONFIGURATION>OPTIONS, the sample schedule will have a PH COLUMN.
- FOAM - If the Guardian Foam Sensor has been enabled in TOOLS>CONFIGURATION>OPTIONS, the sample schedule will have a FOAM COLUMN. For information on what is displayed according to configuration, refer to Section 2.14 "Guardian Foam Sensor and Foam Eliminator (Optional)".
- STATUS - The status of the sample being run. Status will indicate PENDING, COMPLETED, ABORTED and HOLD.

3.6 Tools Screen

The TOOLS SCREEN is used for direct control of the concentrator's functions for troubleshooting, diagnostics, instrument configuration creation/management and filling/priming liquid systems. It also contains software configuration options and settings as well as sample, instrument and error logs.

Figure 3-17 Tools Screen



3.6.1 Prime Menu

The PRIME MENU contains functions related to filling/priming the AQUATek LVA or AQUATek 100 internal standards and priming the DI water supply tubing.

NOTE

Priming removes air from the tubing lines and should be performed whenever the standard addition vials or DI water supply has been disconnected.

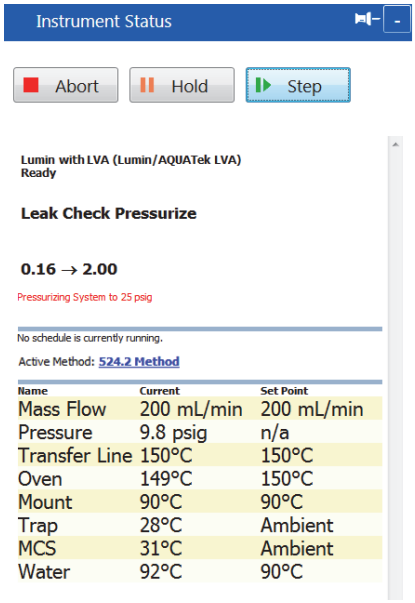
- STANDARD 1 BUTTON- Change the standard, and/or prime Standard 1 vial tubing, on the AQUATek LVA or AQUATek 100 autosampler.
- STANDARD 2 BUTTON - Change the standard, and/or prime Standard 2 vial tubing, on the AQUATek LVA or AQUATek 100 autosampler.
- ALL STANDARDS BUTTON - Change the standards, and/or prime Standards 1 and 2 vial tubing, on the AQUATek LVA or AQUATek 100 autosampler.
- WATER BUTTON - Prime the DI Water Supply tubing on the AQUATek LVA or AQUATek 100 autosampler.

Caution

Exercise caution when manually overriding concentrator functions. Damage to the concentrator can result.

Leak Check

Figure 3-18 Leak Check Started



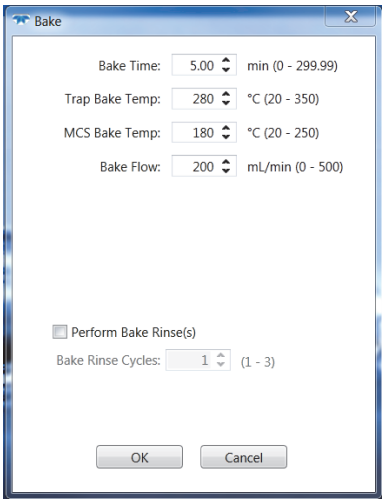
- Activates the Lumin leak check function. The concentrator performs a leak check by closing certain valves and shutting down the Mass Flow Controller (MFC) to isolate the pressurized system. Once isolated, the Lumin will take pressure readings to identify any pressure loss that would indicate a leak.

NOTE

Leak Check settings are configured on the Leak Check Tab of the Configuration Dialog (Tools Screen>Configuration>Leak Check Tab).

Bake

Figure 3-19 Bake Dialog



The GO TO BAKE BUTTON will display the BAKE DIALOG. The BAKE DIALOG permits the manual configuration of Bake Mode settings and automatically steps the concentrator to BAKE MODE.

NOTE

Manually activated bake settings are typically used to condition a new analytical trap. Refer to Section 5.12 "Analytical Trap Conditioning" and the recommended trap conditioning settings from the trap manufacturer.

Permits the manual override of the following:

- Bake Time
- Trap Bake Temperature
- Mass Flow Controller Bake Temperature
- Bake Flow
- Perform Bake Rinse(s) - Set the number of bake rinse cycles (up to 3) and bake rinse volume.

Go to Desorb

The DESORB BUTTON manually steps the concentrator to Desorb Mode. The concentrator will use the desorb settings as configured in the currently active method.

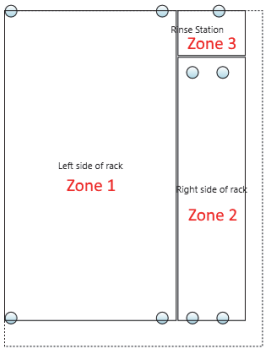
NOTE

The Desorb Button is typically used for diagnostic and troubleshooting functions.

Align Autosampler (AQUATek LVA Only)

The ALIGN AUTOSAMPLER BUTTON opens the AQUATEK LVA ALIGNMENT WIZARD. The AUTOSAMPLER ALIGNMENT WIZARD is used to align and test the X and Y axes of the robotic arm using the Alignment Target included in the AQUATek LVA Installation Kit Box. When the alignment procedure is begun, the current alignment is disabled. The wizard then sequentially performs the X and Y-axis alignment of the autosampler vial rack's three zones (Figure 3-20).

Figure 3-20 Autosampler Zones



For zones 1 and 2, three landmarks per zone are manually aligned using a target placed in the vial rack landmark position. The fourth landmark (the last corner of the zone) is then calculated and tested. The X and Y-axis of the single alignment landmark of Zone 3, the rinse station, is then aligned using the sample needle and target and tested. Once the alignment has been completed, the coordinates are then programmed into the autosampler and enabled.

NOTE

Once an alignment is initiated, all zones must be completed. It is possible to exit and re-enter the wizard and use the Align Zone Buttons to advance to the necessary alignments requiring completion.

pH Probe Check

The pH PROBE CHECK BUTTON opens the pH PROBE WIZARD. The wizard can be used to verify the AQUATek LVA and AQUATek 100 pH probe calibration and recalibrate when necessary. For calibration verification, one pH check standard is required. For calibration, two known pH reference standards are required. Refer to the *Autosampler User Manual* for more information.

NOTE

When recalibrating, Teledyne Tekmar recommends using two standards that bracket the expected pH measurements. If 2 is the expected pH of the samples, reference standards of 1.68 and 4 would allow for the greatest accuracy.

3.6.3 System Menu

Configuration - General Tab

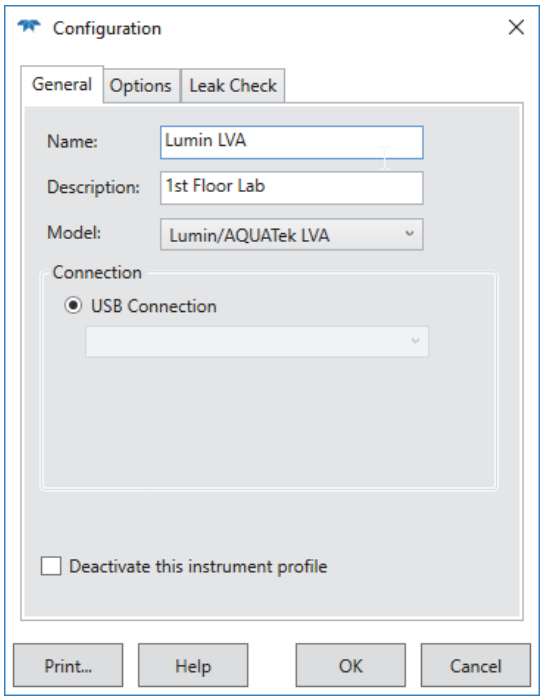
The GENERAL TAB displays information related to the current instrument profile and connection, as well as controls to create new instrument profiles.

- NAME - Name of the active or selected instrument.
- DESCRIPTION - A user-defined, brief set of text identifying the instrument.
- MODEL - The instrument/configuration. Choose between a stand-alone Lumin concentrator or a Lumin concentrator with an AQUATek LVA or AQUATek 100 autosampler.
- CONNECTION - Defaults to USB
- DEACTIVATE THIS INSTRUMENT PROFILE CHECK BOX - disables the instrument profile.

NOTE

When an instrument profile has been "deactivated" it will not show in the selection of instrument profiles available via Tools>Instrument Manager unless the "Show deactivated instrument profiles" Check Box is selected in that dialog.

Figure 3-21 Tools - Configuration - General Tab



Configuration - Options Tab

- ENABLE BEEPER - Enables/disables the concentrator beeper for instrument errors.
- ENABLE VIAL ID COLUMN IN SCHEDULES - Adds/removes a VIAL ID COLUMN to/from the SCHEDULE TABLE on the SCHEDULES SCREEN.
- ENABLE PH SENSOR - Only shown for Lumin with AQUATek LVA/AQUATek 100 configurations with a pH sensor installed. Enables/disables the optional pH sensor on the autosampler.

  When selected, a pH COLUMN will be added to the SCHEDULE SCREEN.
- ENABLE GUARDIAN FOAM SENSOR - Enables/disables Guardian Foam Sensor functionality as well as defining the sensor and eliminator actions. Use the drop-down menu to choose from the following actions:
  - Sensor Only (Abort Sample Only)
  - Sensor Only (Abort Schedule)
  - Eliminator (Abort Sample Only)
  - Eliminator (Abort Schedule)

  When selected, an additional FOAM COLUMN will be added to the SAMPLE SCHEDULE SCREEN.

NOTE

For more information on Guardian Foam Sensor and Eliminator actions according to instrument configuration, refer to 2.14 "Guardian Foam Sensor and Foam Eliminator (Optional)".

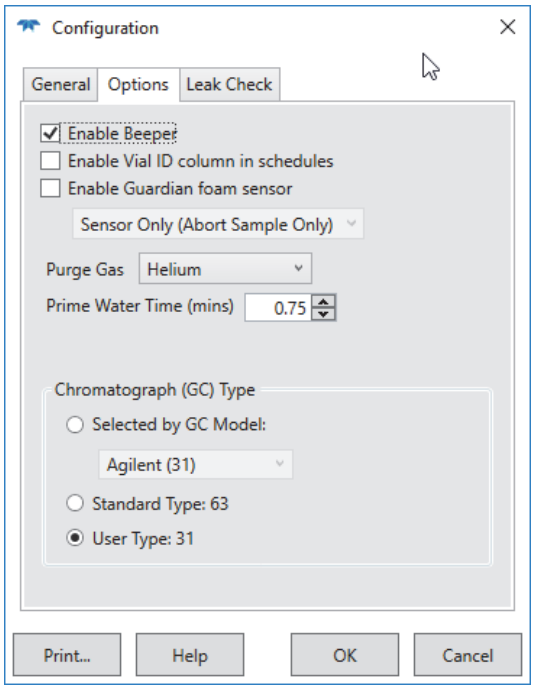
- Sample PURGE GAS - Specifies the type of purge gas. Choose between Ultra-high purity helium or nitrogen. The default gas is helium.

NOTE

If this configuration is made incorrectly, the gas flow from the Mass Flow Controller (MFC) will not be accurate.

- PRIME WATER TIME (MINS) - Only shown for Lumin with AQUATek LVA/AQUATek 100 configurations. This time allows for priming of the rinse water heater and associated lines. The amount should be sufficient to remove any air trapped in the system.
- GAS CHROMATOGRAPH TYPE - Use the SELECT BY GC MODEL DROP-DOWN MENU to select the GC. If the model is not found from the drop-down list, refer to the GC manufacturer's instructions and use the STANDARD TYPE:63 or USER TYPE:31 RADIO BUTTONS.

Figure 3-22 Tools - Configuration - Options Tab



Configuration - Leak Check Tab

LEAK CHECK TAB options Include:

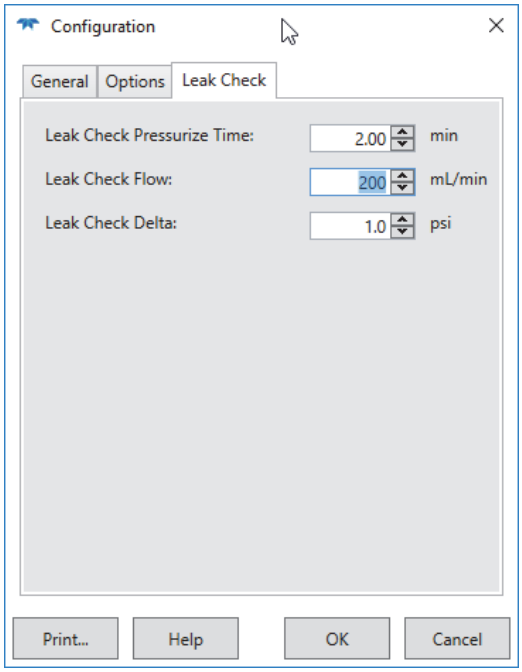
- LEAK CHECK PRESSURIZE TIME - The amount of time allowed for the system to become fully pressured.

NOTE

If using a 25 mL sparger, 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 pressure readings that indicates a leak.

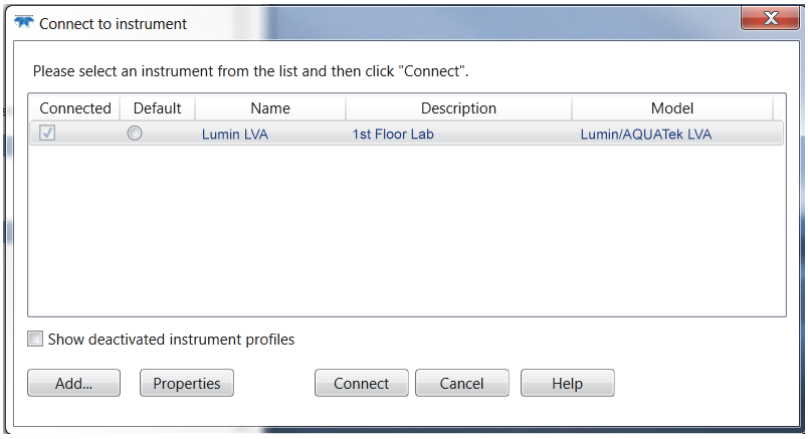
Figure 3-23 Tools - Configuration - Leak Check Tab



Instrument Manager

The INSTRUMENT MANAGER DIALOG is used to create, connect and view/change the properties of an instrument profile.

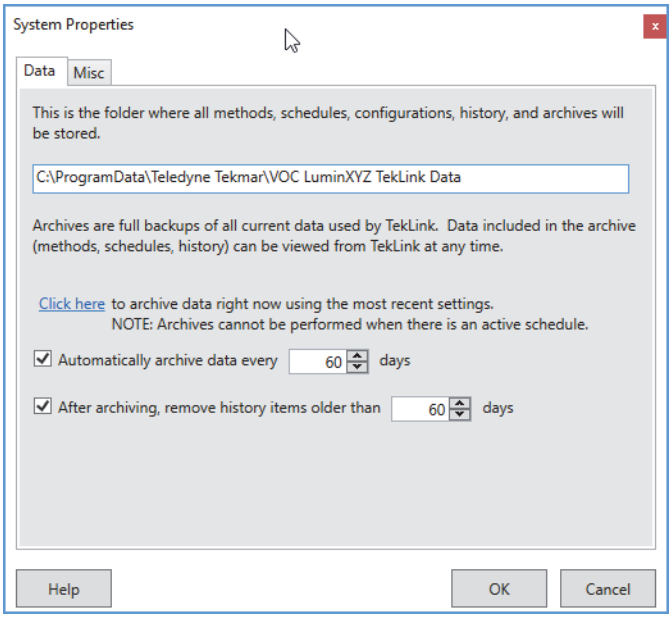
Figure 3-24 Tools - Instrument Manager



System Properties

The SYSTEM PROPERTIES DIALOG contains settings for data storage location, data archive interval and the ability to enable/disable the on-screen keyboard.

Figure 3-25 System Properties Dialog



- DATA TAB

  The DATA TAB displays the default location where Lumin TekLink stores methods, schedules, configurations, instrument history and archived data.

  NOTE

  The data storage location is not editable.

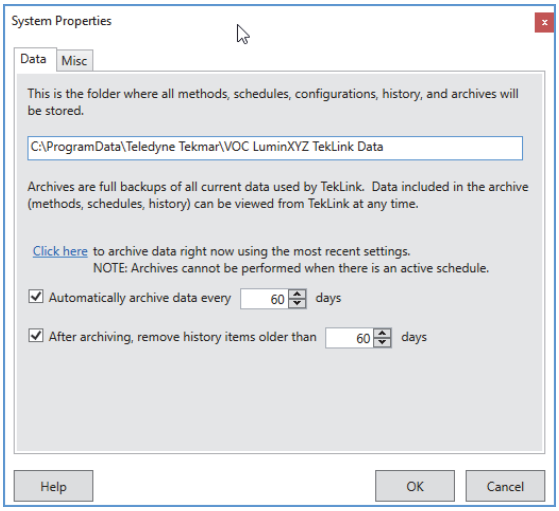
  Archive data immediately by selecting the "CLICK HERE TO ARCHIVE DATA RIGHT NOW USING THE MOST RECENT SETTINGS" command or schedule regular intervals for archiving information.

  NOTE

  Data cannot be archived when a schedule is running.

Archives are full backups of all current data used by Lumin TekLink. Any methods or schedules with DELETE AT NEXT ARCHIVE selected, will be archived. Data included in the archive (methods, schedules and history) can be viewed from Lumin TekLink at any time by using the OPEN BUTTON on the SCHEDULE or METHODS SCREENS and selecting the SOURCE to ARCHIVE.

Figure 3-26 System Properties - Data Tab



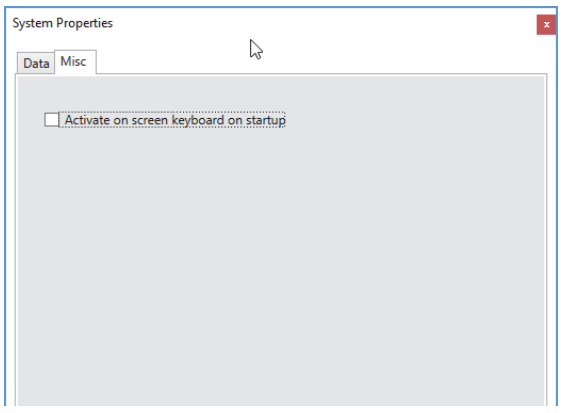
- MISCELLANEOUS TAB

  The MISCELLANEOUS TAB contains a setting to enable/disable the on-screen alpha-numeric keyboard for use with a touchscreen PC.

NOTE

The keyboard can be reduced and closed. If closed, it will be available again when the software is re-opened.

Figure 3-27 System Properties - Misc Tab



View History Log

The VIEW HISTORY LOG displays the HISTORY LOG SCREEN. The SAMPLE HISTORY TAB, INSTRUMENT HISTORY TAB and ERROR HISTORY TAB display their respective events. Use the EVENT FILTER to refine results. When troubleshooting, information from the VIEW HISTORY LOG may be requested by a Teledyne Tekmar Customer Support Representative. Use the PRINT or EXPORT BUTTONS.

Figure 3-28 History Log - Sample History

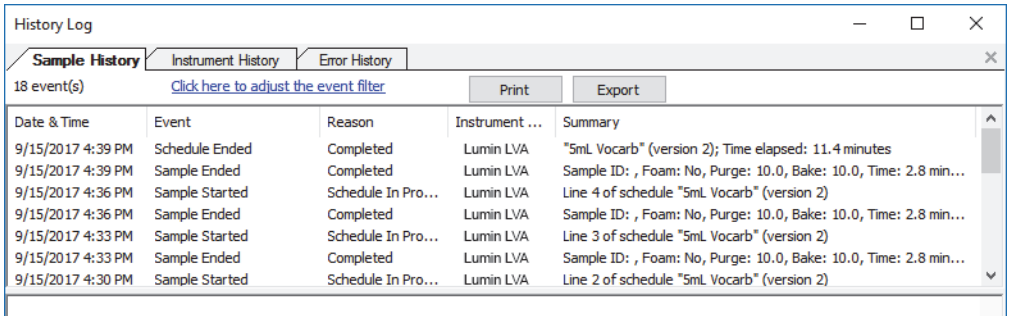
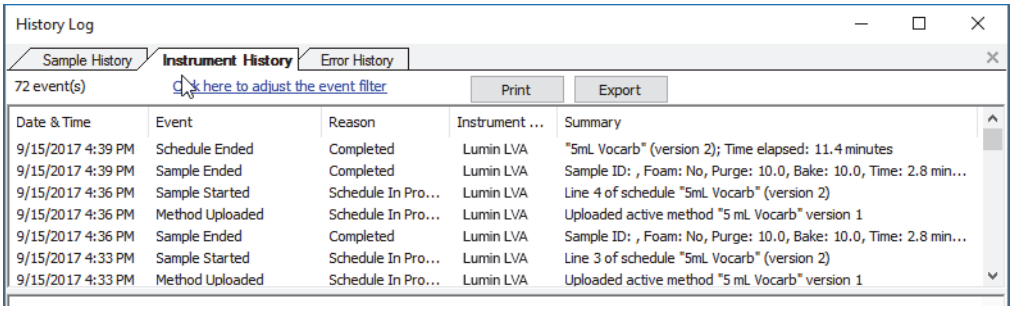


Figure 3-29 History Log - Instrument History



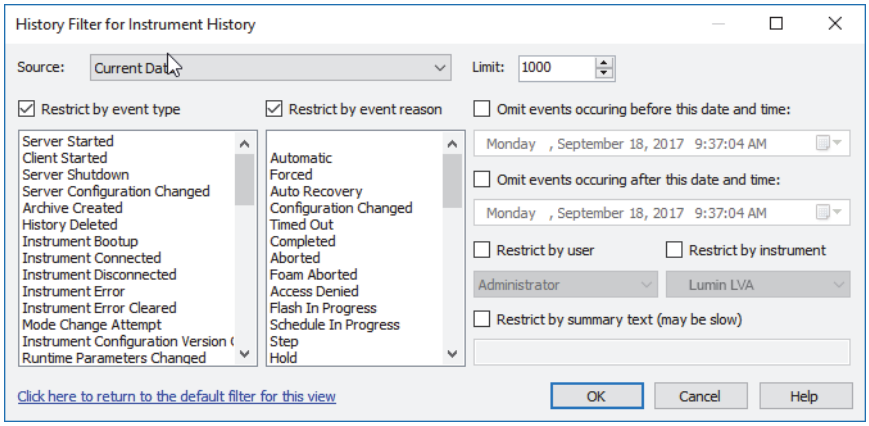
To refine results, select CLICK HERE TO ADJUST THE EVENT FILTER on each tab. Events can be filtered according to:

- SOURCE - Select the event source (current data or archive).
- LIMIT - The amount of events displayed.
- EVENT TYPE - Restrict the events displayed by the selections.
- EVENT REASON - Restrict the events displayed by the selected event reasons.
- DATE RANGE - Omit events occurring before or after a certain date. Selecting the down arrow will display a calendar.
- USER - Restrict events according to the privilege levels of users.
- INSTRUMENT PROFILE - Restrict events according to each instrument profile.
- SUMMARY TEXT - Restrict events displayed according to the text entered.

NOTE

Event filters can be returned to their default settings by selecting "Click here to return to the default filter for this view".

Figure 3-30 History Log Event Filter



Prepare for Shipment/Long-Term Shutdown

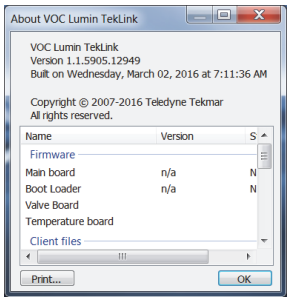
Use the PREPARE FOR SHIPMENT BUTTON to prepare the system for long-term shutdown or for packaging and safe shipment. Functions include draining all liquids from the system, sending the autosampler arms to their home positions and providing information on properly disconnecting the instrument.

3.6.4 About

The ABOUT DIALOG shows details about the Lumin TekLink software and firmware installed on the Lumin concentrator and AQUATek LVA/AQUATek 100. When troubleshooting, information from the ABOUT DIALOG may be requested by a Teledyne Tekmar Customer Service representative.

Information in the ABOUT DIALOG can be printed by using the PRINT BUTTON at the bottom left of the dialog box.

Figure 3-31 About Dialog



3.6.5 Diagnostics

Valves and Flows

NOTE

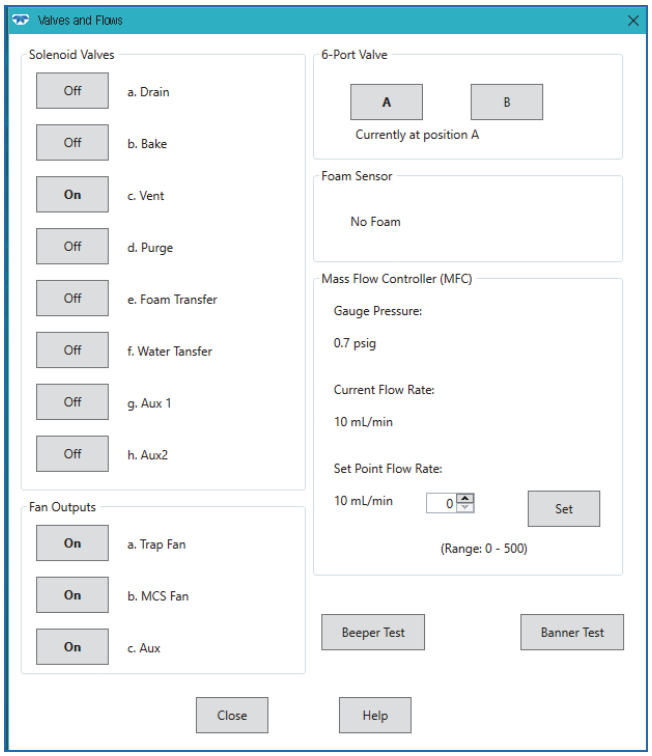
Valves and flow controls for the autosampler are located on the AQUATek LVA or AQUATek 100 Diagnostics Screen. Refer to "AQUATek 100 Diagnostics Screen (If Installed)" or "AQUATek LVA Diagnostics Screen (If Installed)".

The VALVES AND FLOWS DIALOG provides discrete control of the concentrator's valves for diagnostics and troubleshooting. The 6-port valve can be toggled to its two positions or initialized. The Mass Flow Controller (MFC) can also be tested by setting the flow rate manually and observing the actual flow and pressure.

Caution

The Valves and Flows controls are for diagnostic and troubleshooting purposes and should only be used by someone who understands their functions. Exercise caution when manually turning on the concentrator's valves. Damage to the concentrator can result.

Figure 3-32 Diagnostics - Valves and Flows



AQUATek 100 Diagnostics Screen (If Installed)

The AQUATEK 100 DIAGNOSTICS SCREEN provides manual control of the AQUATek 100 autosampler and should only be used for diagnostics and troubleshooting. To display the AQUATEK 100 DIAGNOSTICS SCREEN select the TOOLS BUTTON, then select the AQUATEK 100 BUTTON under the DIAGNOSTICS MENU.

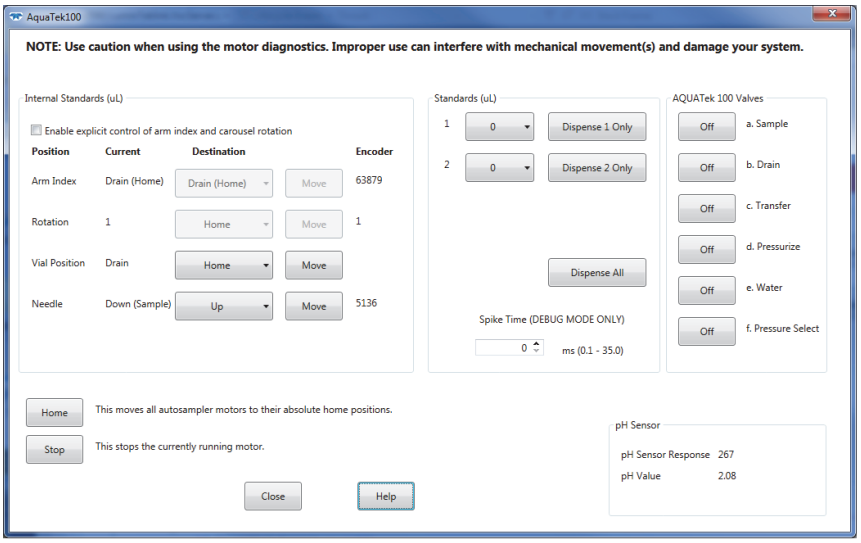
Diagnostic functions include:

- Direct control of the autosampler arm, carousel rotation, vial position and needle elevator.
- Dispense Internal Standards 1, 2 or both standards at the same time.
- Individual control of each AQUATek 100 valve including:
  - Sample Valve
  - Drain Valve
  - Transfer Valve
  - Pressurize Valve
  - Water Valve
  - Pressure Select Valve
- pH Sensor feedback:
  - pH Probe Response
  - pH Value

Caution

Exercise caution when using the Diagnostics Screen. Damage to the AQUATek 100 autosampler can result.

Figure 3-33 AQUATek 100 Diagnostics Screen



AQUATek LVA Diagnostics Screen (If Installed)

The AQUATEK LVA DIAGNOSTICS SCREEN provides manual control of the AQUATek LVA autosampler and should only be used for diagnostics and troubleshooting. To display the AQUATEK LVA DIAGNOSTICS SCREEN select the TOOLS BUTTON, then select the AQUATEK LVA BUTTON under the DIAGNOSTICS MENU.

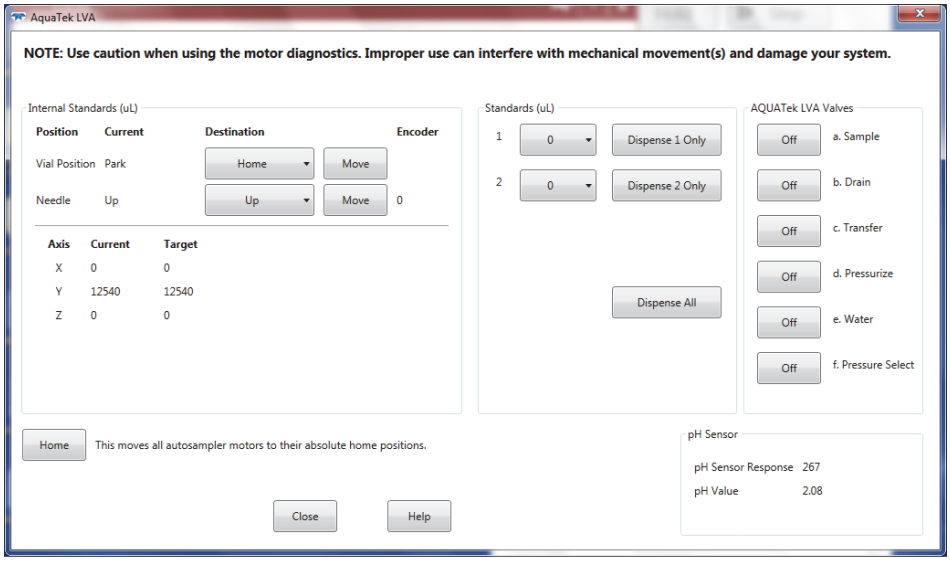
Diagnostic functions include:

- Direct control of the XYZ robotic arm, vial position and needle elevator.
- Dispense Internal Standards 1, 2 or both standards at the same time.
- Individual control of each AQUATek LVA valve including:
  - Sample Valve
  - Drain Valve
  - Transfer Valve
  - Pressurize Valve
  - Water Valve
  - Pressure Select Valve
- pH Sensor feedback:
  - pH Probe Response
  - pH Value

Caution

Exercise caution when using the Diagnostics Screen. Damage to the AQUATek LVA autosampler can result.

Figure 3-34 AQUATek LVA Dialog



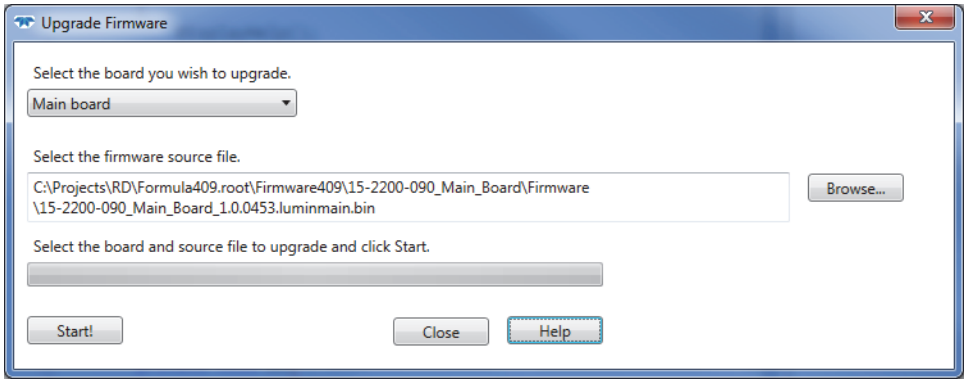
Upgrade Firmware

The UPGRADE FIRMWARE BUTTON is used to upgrade the firmware for the concentrator's Printed Circuit Boards (PCB). For information on upgrading firmware, refer to Section 5.18 "Upgrade Concentrator Firmware". For information on upgrading the AQUATek LVA or AQUATek 100 firmware, refer to the *Autosampler User Manual*.

NOTE

The current concentrator and autosampler PCB firmware version can be viewed via Tools>About Button.

Figure 3-35 Upgrade Firmware Dialog



Benchmark

The BENCHMARK BUTTON starts the Benchmark function. The benchmark test is an interactive program that tests heaters, LEDs and the continuity of inputs and outputs on the CPU board. During the benchmark test, the system will present a series of questions to the user.

The results of the benchmark test are saved in the INSTRUMENT HISTORY LOG using the name entered before starting the benchmark test. To access a saved benchmark test select TOOLS>VIEW HISTORY LOG>INSTRUMENT HISTORY.

NOTE

For information on using the benchmark test function refer to Section 5.20.2 "Benchmark Test".

3.7 Create an Instrument Profile

NOTE

All methods, schedules, TekLink software configurations and software settings are profile specific.

1. If the instrument profile will use the same connection as the currently connected profile, first deactivate that profile. Refer to Section 3.9 "Deactivate an Instrument Profile". If it will use a different connection, ensure the instrument is connected to the controlling PC.
2. From the HOME SCREEN select the TOOLS BUTTON to display the TOOLS SCREEN. On the TOOLS SCREEN select the CONFIGURATION BUTTON to display the CONFIGURATION DIALOG.
3. Complete the following in the CONFIGURATION DIALOG:

   On the GENERAL TAB:

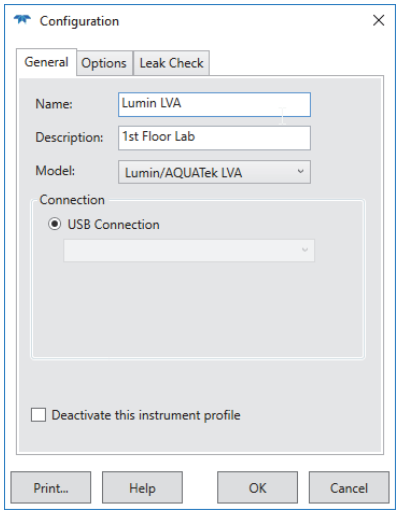
   - Enter a name for the instrument.

NOTE

If the lab has multiple Lumin concentrators, use the name and description to differentiate one concentrator from another.

   - Enter a description so the instrument is easily identified.
   - Select the MODEL from the MODEL DROP-DOWN MENU (LUMIN, LUMIN WITH AQUATEK LVA or LUMIN WITH AQUATEK 100).

Figure 3-36 Creating an Instrument Profile

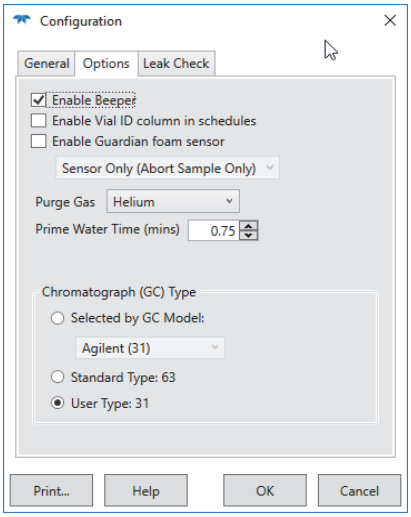


   - Select the default USB CONNECTION CHECK BOX.

On the OPTIONS TAB:

- If you would like the concentrator to notify you of errors, enable the beeper option.
- If you would like a VIAL ID COLUMN available on the SAMPLE SCHEDULE TABLE enable this option.
- If an AQUATek LVA or AQUATek 100 autosampler with pH sensor is installed, select ENABLE PH SENSOR. This will add a PH COLUMN to the sample schedule and pH sensor feedback information to the autosampler DIAGNOSTICS SCREEN.
- If an optional Guardian Foam and/or Eliminator is installed, place a check mark in the selection box. Choose the configuration and action from the drop-down menu.
- Select the appropriate purge gas from the PURGE GAS DROP-DOWN MENU. This configures the MFC correctly for the type of gas selected.
- If an AQUATek LVA or AQUATek 100 autosampler is installed, input the PRIME WATER TIME. The amount should be sufficient to remove any air trapped in the water system (water heater and rinse tubing lines).
- Select the CHROMATOGRAPH (GC TYPE) from the GC MODEL DROP-DOWN MENU. If the specific model of the GC is not shown in the drop-down menu, use the STANDARD TYPE:63 or USER TYPE:31 CHECK BOX according to the GC manufacturer's *User Manual*.

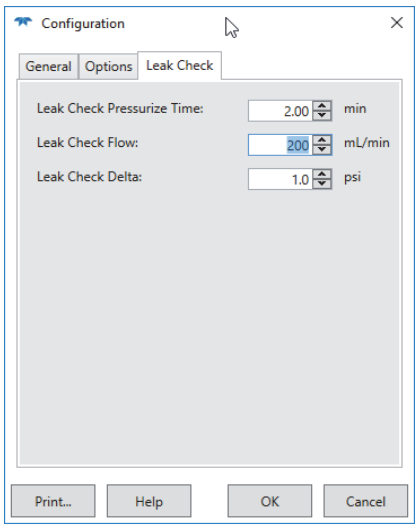
Figure 3-37 Options Tab



On the LEAK CHECK TAB:

- Customize LEAK CHECK PRESSURIZE TIME, LEAK CHECK FLOW and LEAK CHECK DELTA or use the default settings.

Figure 3-38 Leak Check Tab



4. Select the OK BUTTON to create the Instrument Profile.

   Lumin TekLink will automatically connect to the new profile and the INSTRUMENT STATUS PANEL, METHODS SCREEN and SCHEDULES SCREEN will display the connected instrument profile name. Once a profile is created, methods, schedules, system properties and preferences can be saved to that profile when it is connected.

NOTE

Once an instrument profile has been created it cannot be deleted. "Deactivating" an instrument profile removes the instrument profile from the list of active profiles in the Instrument Manager Dialog. For information on deactivating an instrument profile, refer to 3.9 "Deactivate an Instrument Profile".

3.8 Connect to an Instrument Profile

NOTE

If only one instrument is connected to the controlling PC, first deactivate the instrument profile that is currently connected. Refer to Section 3.9 "Deactivate an Instrument Profile".

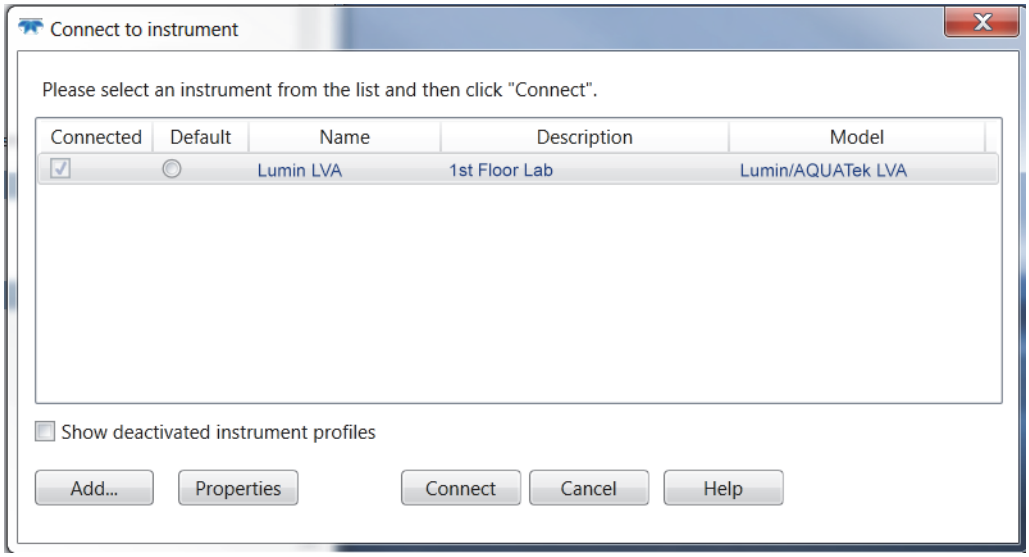
1. An instrument profile must be previously created in order to make a connection. Refer to Section 3.7 "Create an Instrument Profile".
2. From the HOME SCREEN select the TOOLS BUTTON to display the TOOLS SCREEN.
3. Select the INSTRUMENT MANAGER BUTTON to display the INSTRUMENT MANAGER DIALOG.

4. Highlight the instrument profile desired.

> **NOTE**
>
> If the profile is not shown, it may be deactivated. Select the "Show deactivated instrument profiles" Check Box to display deactivated instrument profiles. Highlight the deactivated profile and then select the Properties Button. In the Configuration dialog for the deactivated profile, deselect the "Deactivate the instrument profile" Check Box. Return to the Instrument Manager and continue the procedure.

5. If the instrument profile will be used as a "default profile" select the DEFAULT RADIO BUTTON.

Figure 3-39 Instrument Manager



6. Select the CONNECT BUTTON to connect to the profile.
7. Once connected, a check mark will appear in the box beside the profile.

> **NOTE**
>
> The Instrument Status Panel and the title bar on the Method and Schedules Screens will display the instrument profile name.

3.9 Deactivate an Instrument Profile

NOTE

Instrument Profiles cannot be deleted. When an instrument profile is deactivated it will be removed from the list of available instruments on the "Connect to Instrument Dialog" unless the "Show deactivated instrument profiles" Check Box is selected.

1. From the HOME SCREEN select the TOOLS BUTTON to display the TOOLS SCREEN.
2. Select the CONFIGURATION BUTTON to display the CONFIGURATION DIALOG.
3. Place a check mark in the DEACTIVATE THIS INSTRUMENT PROFILE CHECK BOX.
4. Select the OK BUTTON to save the change.

3.10 Using the Methods Screen

3.10.1 Open a Method

Use the OPEN BUTTON on the METHODS SCREEN to open a default, existing or archived method. Use the SOURCE DROP-DOWN MENU to select the CURRENT or ARCHIVED location.

NOTE

Methods are specific (saved) to each Instrument Profile and cannot be opened from other instrument profiles.

NOTE

The Lumin TekLink default 5 mL Vocarb and 25 mL Vocarb methods cannot be overwritten. If they are opened and revised, they must be saved under a different name.

Figure 3-40 Methods Screen

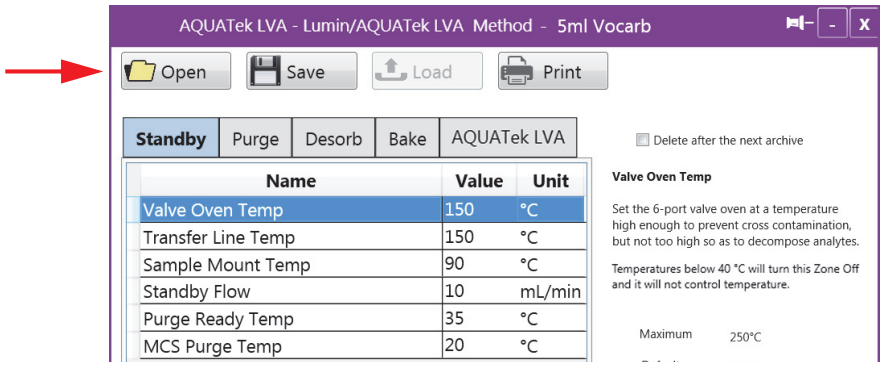
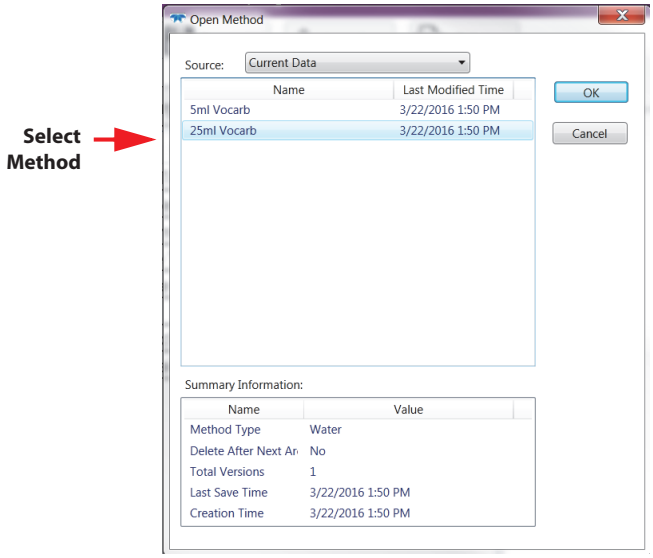


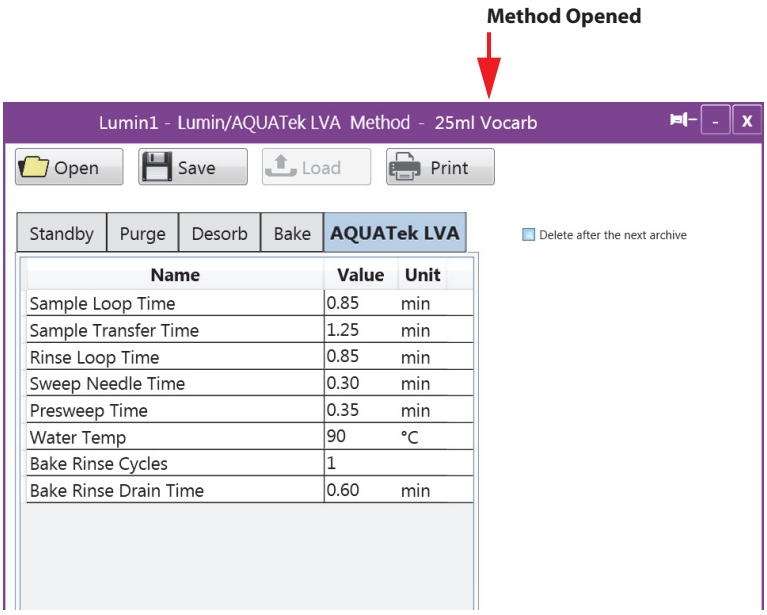
Figure 3-41 Open Method Dialog Showing Default Methods



NOTE

The Instrument Status Panel and the title bar on the Methods and Schedules Screens will display the opened method.

Figure 3-42 25 mL Method Open



3.10.2 Creating a Custom Method

If necessary, connect to the appropriate instrument profile. The current instrument profile is shown on the INSTRUMENT STATUS PANEL and the title bar of the METHODS and SCHEDULES SCREENS. Refer to Section 3.8 "Connect to an Instrument Profile".

NOTE

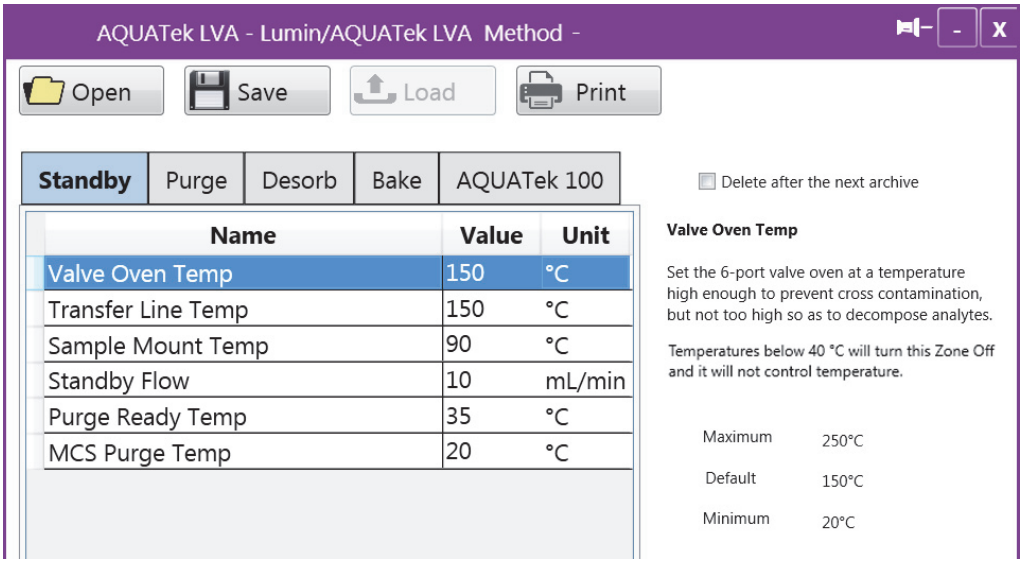
Custom methods can easily be created from the default 5 mL Vocarb or 25 mL Vocarb methods. Refer to Section 3.10.1 "Open a Method".

NOTE

Methods are specific (saved) to each Instrument Profile and cannot be opened from other instrument profiles.

1. From the HOME SCREEN select the METHODS BUTTON to display the METHODS SCREEN.

Figure 3-43 Methods Screen



2. The METHOD SCREEN TABS will be populated with default values. The default values shown for each parameter are good starting points for successful analysis and can be used as the foundation of a user-defined custom method. Revise parameters on the STANDBY, PURGE, DESORB and BAKE TABS by double-clicking in the VALUE COLUMN and inputting the parameter values.
3. Save the new method by selecting the SAVE BUTTON. Name the method, then select the OK BUTTON.

NOTE

Note that the title bar on the Methods Screen updates with the method name.

Figure 3-44 Save Method As Dialog

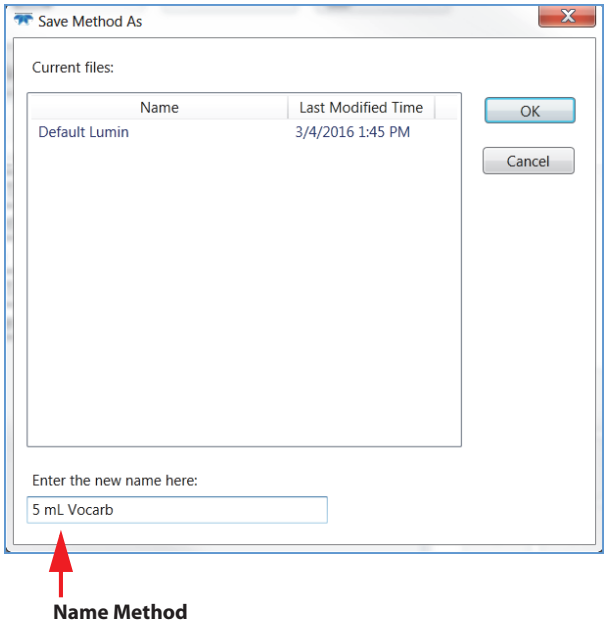
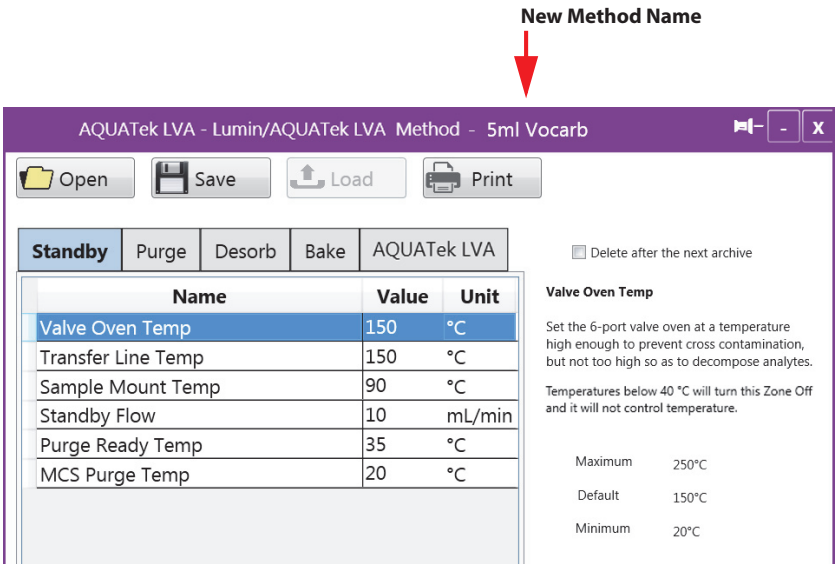


Figure 3-45 New Method Saved - Name in Title Bar



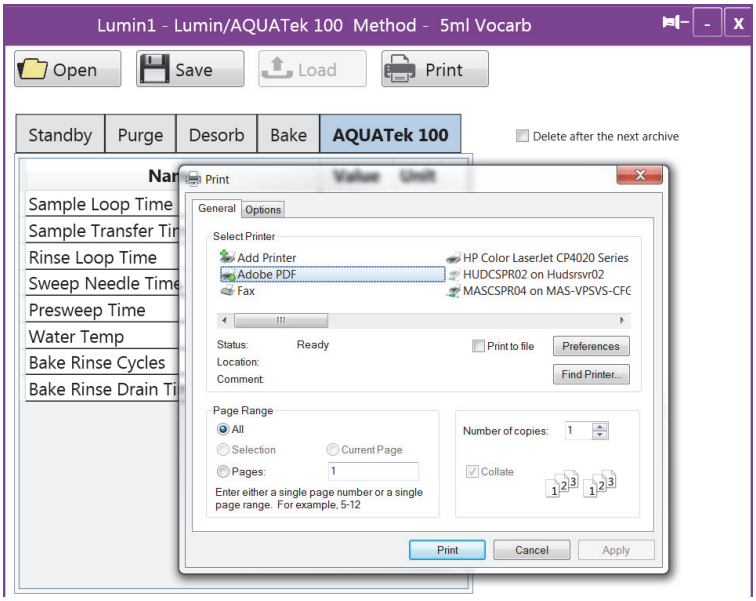
3.10.3 Load the Method

Select the LOAD METHOD BUTTON to prompt the Lumin to begin using method parameters immediately. After temperature setpoints are reached, the system will go into Standby/Purge Ready Mode. If the method is not loaded from the METHODS SCREEN, it will be loaded (if selected in the METHOD COLUMN) when the schedule is loaded from the SCHEDULES SCREEN.

3.10.4 Print a Method

Use the PRINT BUTTON on the METHODS SCREEN to print the current or completed method. A PRINT DIALOG will be displayed.

Figure 3-46 Method Print Dialog



3.11 Using the Schedules Screen

3.11.1 Open Schedule

Use the OPEN BUTTON on the SCHEDULES SCREEN to open an existing or archived schedule. Use the SOURCE DROP-DOWN MENU to select the CURRENT or ARCHIVE location.

3.11.2 Create a Schedule

NOTE

Multi-line schedules can only be created when the Lumin is combined with the AQUATek LVA or AQUATek 100 autosampler. If no autosampler is installed, schedules are limited to one line.

The schedule is created using a combination of manual entries, drop-down menus and right-click options on each line. Right-click options are a particularly simple way to create and revise schedule lines.

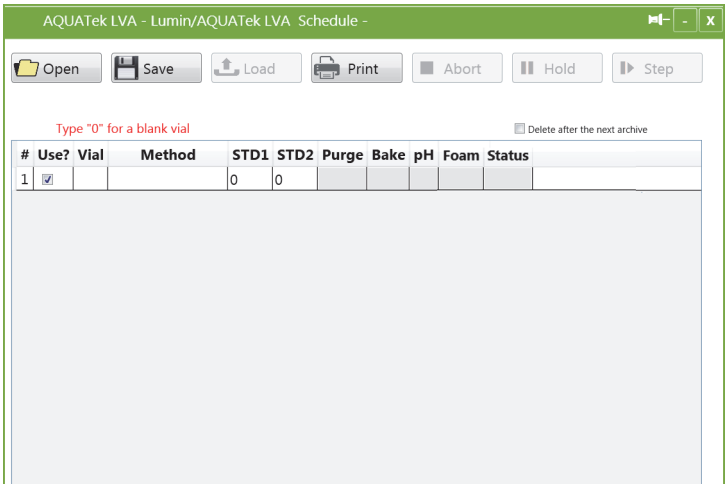
1. If necessary, connect to the appropriate instrument profile. The current instrument profile is shown on the INSTRUMENT STATUS PANEL and the title bar of the METHODS and SCHEDULES SCREENS. Refer to Section 3.8 "Connect to an Instrument Profile".

NOTE

Schedules are specific (saved) to each Instrument Profile and cannot be opened from other instrument profiles.

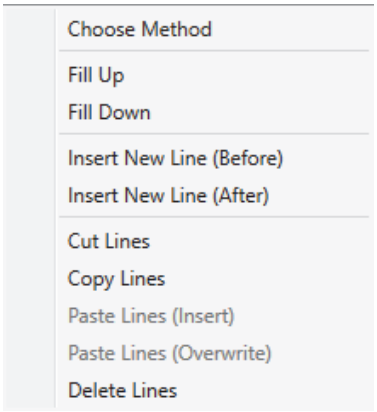
2. From the HOME SCREEN select the SCHEDULES BUTTON to display the SCHEDULES SCREEN.

Figure 3-47 Blank Schedule



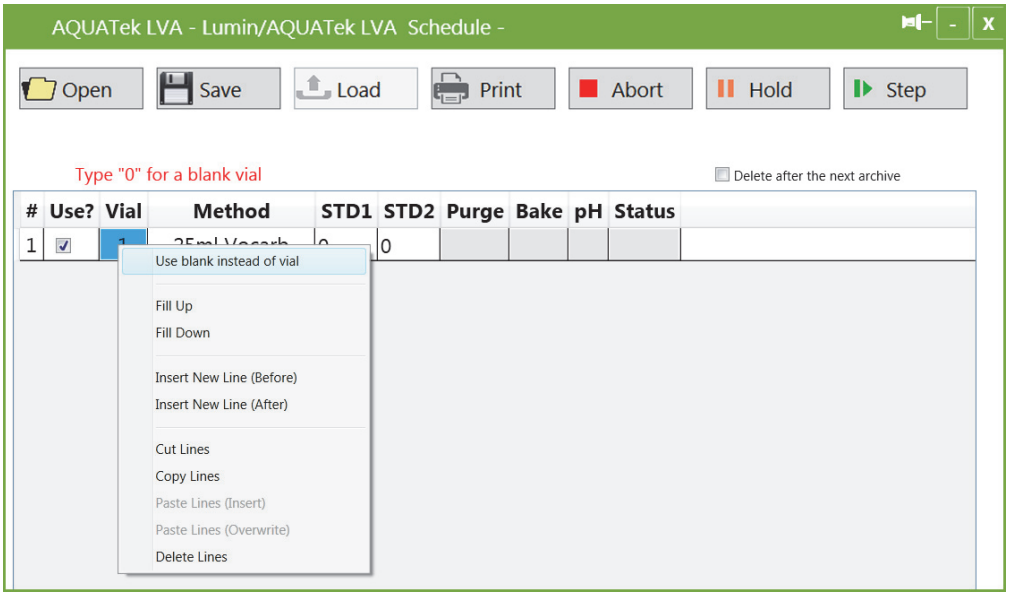
3. To add additional lines to the schedule:
   - Click in the current schedule line and then use the down arrow key.
   - Right -click on the current schedule line and select INSERT NEW LINE (ABOVE or BELOW) (Figure 3-48).
4. Easily fill in incrementing vials using the FILL UP/DOWN command.
   - Highlight a schedule line and then drag down or up to highlight other lines. Right-click and choose FILL DOWN or FILL UP to autofill the other lines (Figure 3-48). Vial Positions will increment while blanks, method and standard choices will autofill.

Figure 3-48 Schedules Screen Right-Click Options



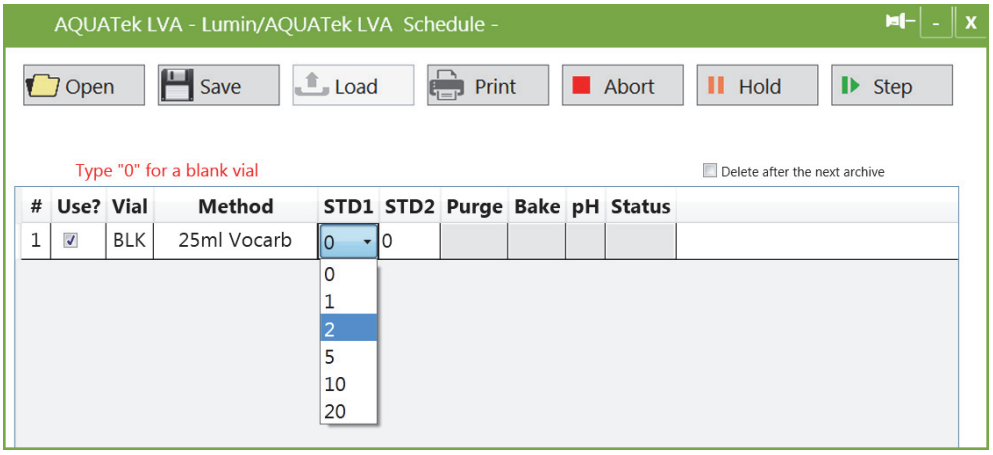
5. Fill in the criteria for each cell of the schedule line:
   - USE COLUMN - Select or deselect the USE CHECK BOX to include/exclude the schedule line from the current schedule. The USE CHECK BOX is an easy way to modify a previously created schedule.
   - VIAL COLUMN- The vial number will automatically fill and increment. When blanks are added, the vial numbers will increment "around" them. To add a Blank to the schedule, enter zero in the VIAL COLUMN and press <Enter>. The zero will turn to "BLK" indicating a blank in the schedule line. Alternatively, right-click in the VIAL COLUMN and select USE BLANK INSTEAD OF VIAL (Figure 3-49).

Figure 3-49 Right-click to Add Blank



- METHOD COLUMN- Double-click in the METHOD COLUMN to display the OPEN METHOD DIALOG. Alternatively, right-click in the METHOD COLUMN and select CHOOSE METHOD to display the OPEN METHOD DIALOG. Choose the appropriate method from a CURRENT or ARCHIVE source and then select the OK BUTTON.
- SAMPLE ID (Optional) - The SAMPLE ID COLUMN is optional and is configured via TOOLS>CONFIGURATION>OPTIONS TAB. Select the ENABLE VIAL ID COLUMN IN SCHEDULES CHECK BOX. Enter a sample ID in the field.
- STD 1 and 2 COLUMNS - The STD1 and STD2 COLUMNS are only available if an AQUATek LVA or AQUATek 100 autosampler is installed. Add a standard by double-clicking in the STD1 and/or STD2 cells. Select the standard volume (in µL) from the drop-down menu.

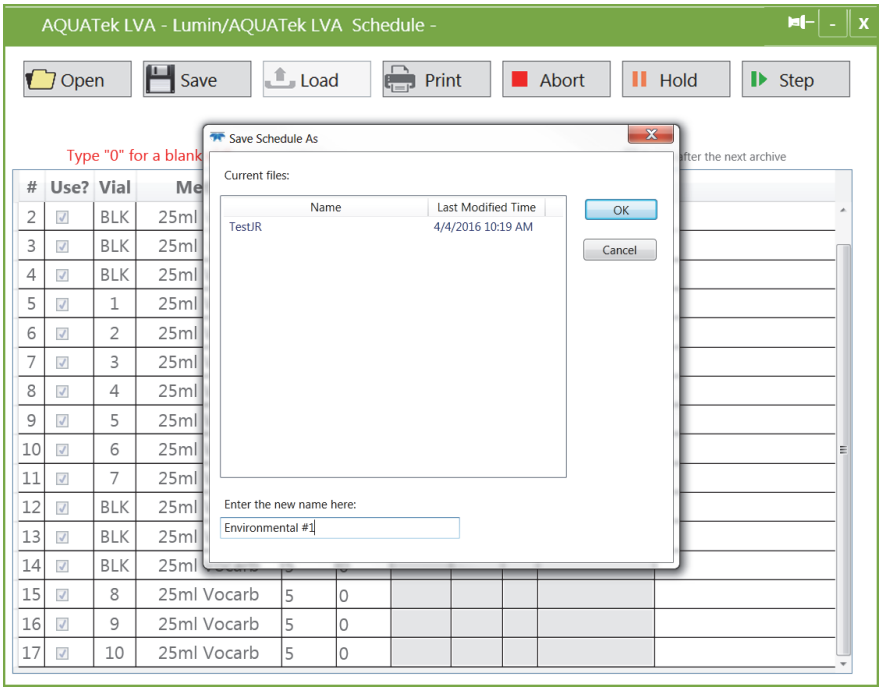
Figure 3-50 Standards Drop-Down



3.11.3 Save Schedule

Use the SAVE BUTTON to save the active schedule. The SAVE BUTTON will display the SAVE SCHEDULE AS DIALOG where a name for the schedule can be entered. Select the OK BUTTON to save the schedule. Schedules must be saved, prior to loading to the instrument.

Figure 3-51 Save Schedule



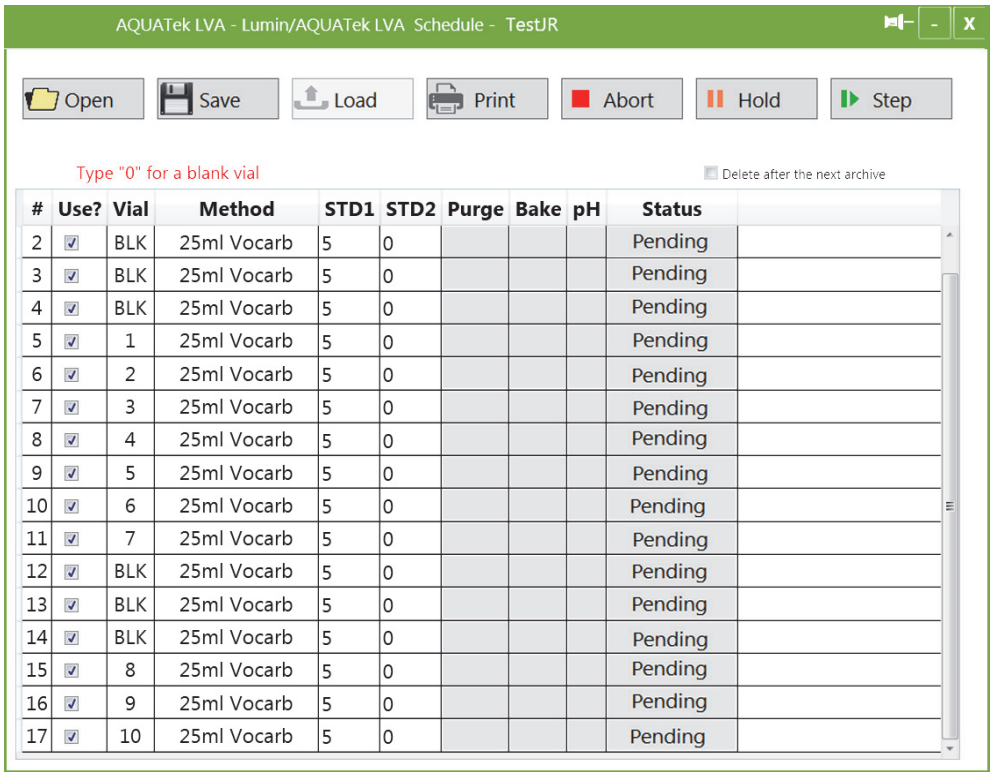
3.11.4 Print Schedule

Use the PRINT BUTTON on the SCHEDULES SCREEN to print the current or completed schedule. A PRINT DIALOG will be displayed.

3.11.5 Load (Run) the Schedule

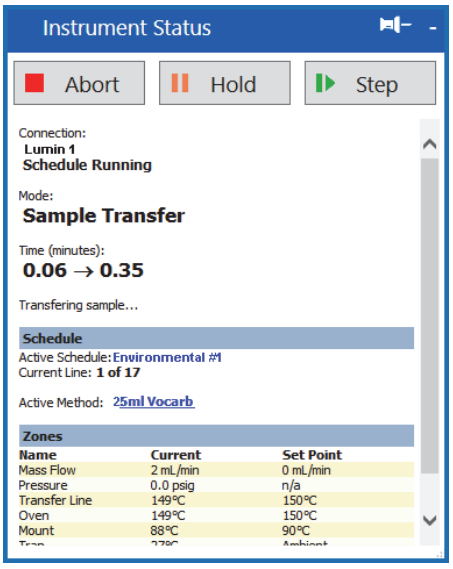
To run the schedule, select the LOAD BUTTON on the SCHEDULES SCREEN. The STATUS COLUMN will update to PENDING, indicating that the concentrator is heating to temperature setpoints. The INSTRUMENT STATUS PANEL will update with the current mode, time and action.

Figure 3-52 Schedule Loaded



#	Use?	Vial	Method	STD1	STD2	Purge	Bake	pH	Status
2	☑	BLK	25ml Vocarb	5	0				Pending
3	☑	BLK	25ml Vocarb	5	0				Pending
4	☑	BLK	25ml Vocarb	5	0				Pending
5	☑	1	25ml Vocarb	5	0				Pending
6	☑	2	25ml Vocarb	5	0				Pending
7	☑	3	25ml Vocarb	5	0				Pending
8	☑	4	25ml Vocarb	5	0				Pending
9	☑	5	25ml Vocarb	5	0				Pending
10	☑	6	25ml Vocarb	5	0				Pending
11	☑	7	25ml Vocarb	5	0				Pending
12	☑	BLK	25ml Vocarb	5	0				Pending
13	☑	BLK	25ml Vocarb	5	0				Pending
14	☑	BLK	25ml Vocarb	5	0				Pending
15	☑	8	25ml Vocarb	5	0				Pending
16	☑	9	25ml Vocarb	5	0				Pending
17	☑	10	25ml Vocarb	5	0				Pending

Figure 3-53 Instrument Status Panel Updated



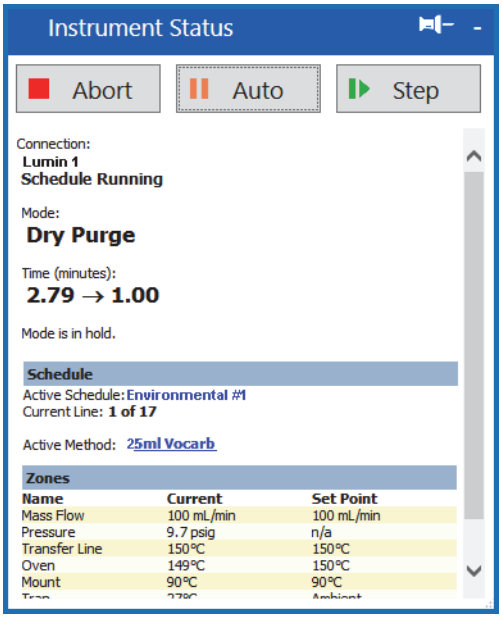
3.11.6 Step Schedule

Use the STEP BUTTON to sequentially move through each of the concentrator's modes. When using the STEP BUTTON, use the INSTRUMENT STATUS PANEL to view the current mode of the concentrator.

3.11.7 Hold Schedule

Once the schedule has been loaded to the concentrator, the HOLD BUTTON can be used to hold the schedule at its current position. The HOLD BUTTON on the INSTRUMENT STATUS PANEL will change to an AUTO BUTTON, that when selected, begins the schedule again.

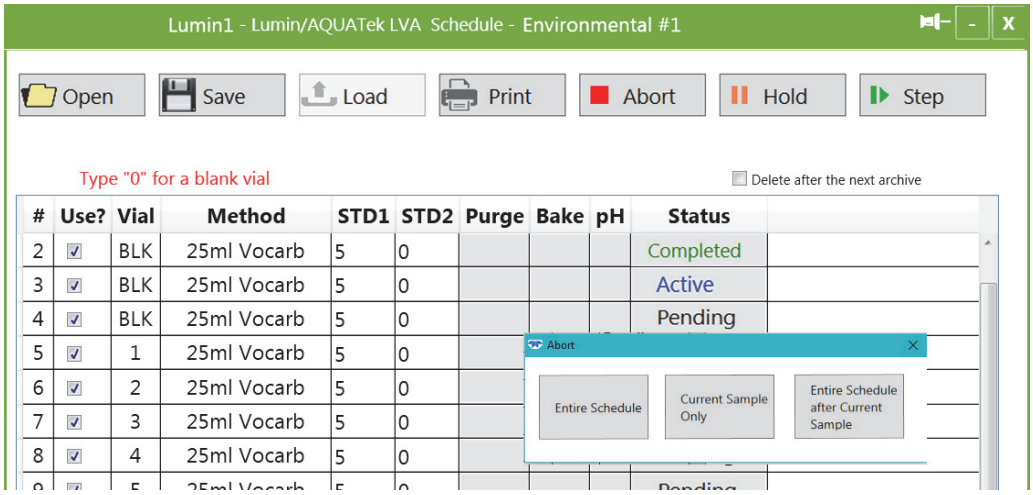
Figure 3-54 Schedule Hold - Instrument Status Panel



3.11.8 Abort a Sample or Schedule

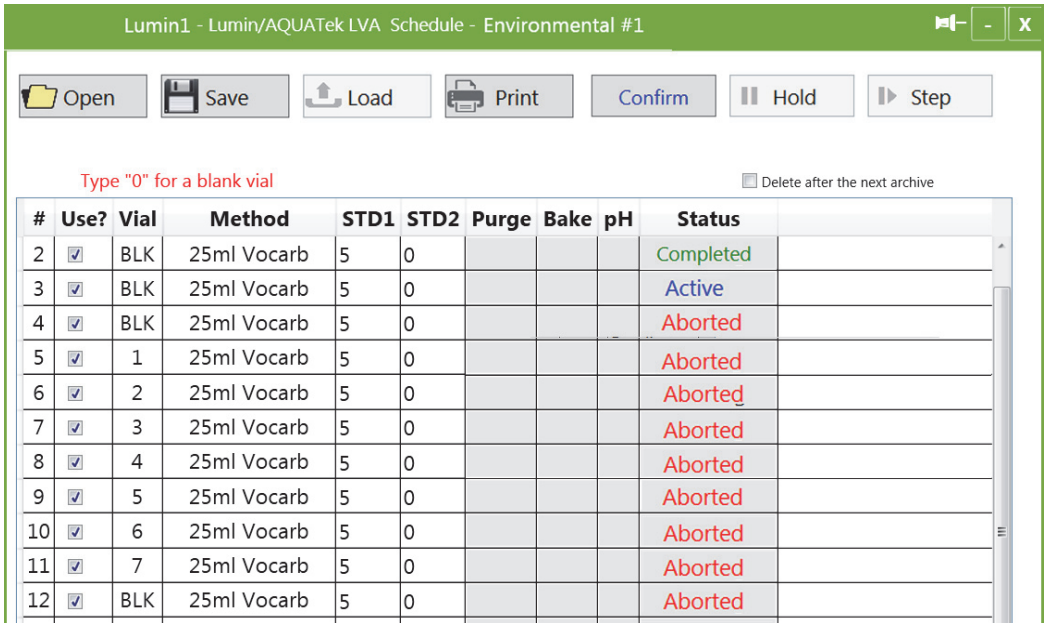
1. To abort a sample or schedule that has been loaded to the concentrator, use the ABORT BUTTON on the SCHEDULES SCREEN or the INSTRUMENT STATUS PANEL.
2. Once aborted, Lumin TekLink will ask if the abort command is for:
   - The ENTIRE SCHEDULE
   - The CURRENT SAMPLE ONLY
   - The ENTIRE SCHEDULE AFTER CURRENT SAMPLE

Figure 3-55 Aborted Schedule



3. Once the type of abort has been selected, Lumin TekLink will prompt to confirm the abort command using the CONFIRM BUTTON on the SCHEDULES SCREEN or the INSTRUMENT STATUS PANEL.

Figure 3-56 Confirm Selected, Schedule Aborted



Lumin User Manual

Chapter 4: Instrument Operations

4.1 Concentrator Mode Descriptions

The concentrator system performs a programmed series of operating steps. These steps are referred to as modes and vary depending on installed equipment and system configuration. Mode descriptions for the Lumin and Lumin with AQUATek LVA or AQUATek 100 are provided in Table 4-1 "Lumin Mode Descriptions". In depth system functions by mode are shown in Table 4-2 "Lumin (Default Method) - Valve Output Chart" and Table 4-3 "Lumin with AQUATek LVA/AQUATek 100 (5 mL Vocarb Method) - Valve Output Chart". For Flow Diagrams for each mode, refer to Appendix A: "Diagrams".

Table 4-1 Lumin Mode Descriptions

Mode	Description
Standby	This mode indicates that the system is waiting for all temperature zones and flow rates to reach their setpoints.
Purge Ready	This mode indicates all method setpoints are at equilibrium and the concentrator is ready to analyze samples.
Pressurize	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode allows an aliquot to be removed from the sample vial and directed to a sample loop.
Fill Internal Standard	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode allows the internal standard to be directed to a standard addition manifold.
Sample Transfer	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode indicates that a liquid sample is being introduced into the sparging vessel. The time required for this step is autosampler dependent. Please refer to the *Autosampler User Manual* for additional information.
Pre-Purge	When the Lumin is configured with an optional Sample Heater Assembly for Glassware, this mode directs purge gas to the vessel to remove excess oxygen prior to heating and subsequent purging.
Preheat	When the Lumin is configured with an optional Sample Heater Assembly for Glassware, this mode allows the sample to reach a uniform programmed temperature prior to sample purging.
Purge	This mode is the VOC extraction step in which the inert gas (such as helium) is dispersed through the sample matrix in the sparger 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.
Rinse Loop	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode allows time for the sample loop to be rinsed with hot water.
Purge Loop	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode allows time for the sample loop to be purged with dry gas.

Table 4-1 Lumin Mode Descriptions (Continued)	
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 sparger. 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 back-flushed through the trap and over to the GC for separation and subsequent detection. This mode will also start the GC column program.
Bake Fill	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode introduces hot water into the sample loop for subsequent delivery to the concentrator's sparger.
Bake Transfer	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode introduces water into the sparger for sparger and line rinsing.
Bake Drain	When the Lumin is connected to an AQUATek LVA or AQUATek 100, this mode drains the water, introduced during the Bake Rinse mode, from the system.

4.2 Lumin Valve Output Chart

Table 4-2 Lumin (Default Method) - Valve Output Chart

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Aux	6-Port	Fan
Standby With Flow	This mode indicates that the system is waiting for all temperature zones to meet their setpoints prior to starting a sample run. While the system is waiting, there is a low flow forced through the unit to allow the system to maintain positive pressure.	MFC	10	0	500	mL/min	ON	OFF	ON	OFF	OFF	Purge (A)	ON
		Trap Temp	20	20	350	°C							
		Transfer Line	150	20	250	°C							
		Valve Oven	150	20	250	°C							
		MCS	20	20	200	°C							
		Mount	90	20	90	°C							

Table 4-2 Lumin (Default Method) - Valve Output Chart (Continued)

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Aux	6-Port	Fan
Purge Ready	This mode indicates to the user that all setpoints have been reached and the system is ready to begin running samples.	-	-	-	-	-	ON/ OFF[a]	OFF	ON	OFF	OFF	Purge (A)	ON
Pre-Purge	When the Lumin is configured with an optional Sample Heater Assembly for Glassware, this mode sweeps the headspace of the sample to remove any oxygen prior to heating the sample. This mode is typically only used when running soil samples.	Pre-Purge Time	0.5	0	299	min	ON	ON	ON	OFF	OFF	Purge (A)	ON
		Pre-Purge Flow	40	0	500	mL/min							
Preheat	When the Lumin is configured with an optional Sample Heater Assembly for Glassware, this mode allows for the sample to be heated prior to purging the sample.	Preheat Time	1	0	299	min	OFF	ON	ON	OFF	OFF	Purge (A)	ON
		Preheat Temp	40	20	90	°C							
Purge	This mode is used to extract the volatiles from the sample and deposit them on the analytical trap.	Purge Time	11	0	299	min	ON	ON	ON	OFF	OFF	Purge (A)	ON
		Purge Flow	40	0	500	mL/min							
		Purge Temp (Trap)[b]	0	0	350	°C							
		Purge Temp (MCS)[c]	20	20	250	°C							

Table 4-2 Lumin (Default Method) - Valve Output Chart (Continued)

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Aux	6-Port	Fan
Dry Purge	This mode is used to remove any excess water deposited in the analytical trap.	Dry Purge Time	0	0	299	min	ON	OFF	ON	OFF	OFF	Purge (A)	ON
		Dry Purge Flow	0	0	500	mL/min							
		Dry Purge Temp	20	0	350	°C							
Desorb Ready	This mode indicates to the user that the analytical trap is loaded and ready to transfer the sample to the GC.	-	-	-	-	-	OFF	OFF	OFF	OFF	OFF	Purge (A)	ON
Desorb Preheat	This mode indicates that the analytical trap is heated to a preset temperature in a static state. This allows the analytes to release from the sorbent and move forward.	Desorb Preheat Temp (Trap)	245	20	350	°C	OFF	OFF	OFF	OFF	OFF	Purge (A)	OFF
Desorb	This mode heats the analytical trap to its final temperature and rotates the 6-port valve so that the carrier gas is back-flushed through the trap in order to carry VOCs to the GC for separation and detection. This mode will also start the GC column program.	Desorb Time	2	0	299	min	ON	ON	OFF	ON	OFF	Desorb (B)	OFF
		Desorb Temp	250	20	350	°C							

Table 4-2 Lumin (Default Method) - Valve Output Chart (Continued)

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Aux	6-Port	Fan
Drain	This mode is used to drain the sample from the sparger and send it to a waste container. This mode occurs during Desorb and is only used with water samples.	Drain Flow	300	0	500	mL/min	ON	OFF	OFF	ON	ON	Desorb (B)	OFF
Bake	This mode is used to heat and back-flush the analytical trap and MCS with gas to prevent cross contamination of samples.	Bake Time	2	0	299	min	ON	OFF	OFF	ON	ON	Purge (A)	OFF
		Bake Flow	200	0	500	mL/min							
		Trap Temp	280	20	350	°C							
		MCS	180	20	200	°C							

a. The MFC would be set to OFF for zero flow.

b. Temperatures below 40 °C are not controlled and the heater remains off.

c. Temperatures below 40 °C are not controlled and the heater remains off.

4.3 Lumin with AQUATek LVA/AQUATek 100 Valve Output Chart

Table 4-3 Lumin with AQUATek LVA/AQUATek 100 (5 mL Vocarb Method) - Valve Output Chart

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Bake	6-Port	Fan
Standby With Flow	This modes indicates that the system is waiting for all temperature zones to meet their setpoints prior to starting a sample run. While the system is waiting, there is a low flow forced through the unit to allow the system to maintain positive pressure.	MFC	10	0	500	mL/min	ON	OFF	OFF	OFF	OFF	Purge (A)	ON
		Trap Temp	25	20	350	°C							
		Transfer Line	150	20	250	°C							
		Valve Oven	150	20	250	°C							
		MCS	20	20	200	°C							
		Mount	90	20	90	°C							
Purge Ready	This mode indicates to the user that all setpoints have been reached and the system is ready to begin running samples.	-	-	-	-	-	ON/ OFF [a]	OFF	ON	OFF	OFF	Purge (A)	ON
Pressurize	This mode allows sample to be removed from the sample vial and directed to a sample loop.	Pressurize Time	0.35	0	299	min	ON	OFF	ON	OFF	OFF	Purge (A)	ON
STD Dispense[b]	This mode allows standards to be added to the sample.	N/A	N/A	N/A	N/A	min	ON	OFF	ON	OFF	OFF	Purge (A)	ON

Table 4-3 Lumin with AQUATek LVA/AQUATek 100 (5 mL Vocarb Method) - Valve Output Chart (Continued)

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Bake	6-Port	Fan
Sample Transfer	This mode indicates that a liquid sample is being introduced into the sparging vessel. The time required for this step is volume dependent. Please refer to your autosampler's operating manual for further assistance.	Sample Transfer Time	0.35	0	299	min	OFF	OFF	ON	OFF	OFF	Purge (A)	ON
Preheat	When the Lumin is configured with an optional Sample Heater Assembly for Glassware, this mode allows for the sample to be heated prior to purging the sample.	Preheat Time	1	0	299	min	OFF	OFF	ON	OFF	OFF	Purge (A)	ON
		Preheat Temp	40	20	90	°C							
Purge	This mode is used to extract the volatiles from the sample and deposit them on the analytical trap.	Purge Time	11	0	299	min	ON	ON	ON	OFF	OFF	Purge (A)	ON
		Purge Flow	40	0	500	mL/min							
		Purge Temp (Trap)[c]	0	0	350	°C							
		Purge Temp (MCS)[d]	20	20	250	°C							
Rinse Loop (During Purge)	This mode allows time for the sample loop to be rinsed with hot water.	Loop Rinse Time	0.70	0	299	min	ON	ON	ON	OFF	OFF	Purge (A)	ON

Table 4-3 Lumin with AQUATek LVA/AQUATek 100 (5 mL Vocarb Method) - Valve Output Chart (Continued)

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Bake	6-Port	Fan
Purge Loop (During Purge)	This mode allows time for the sample loop to be purged with dry gas.	Loop Purge Time	0.30	0	299	min	ON	ON	ON	OFF	OFF	Purge (A)	ON
Dry Purge	This mode is used to remove any excess water deposited in the analytical trap.	Dry Purge Time	1	0	299	min	ON	OFF	ON	OFF	OFF	Purge (A)	ON
		Dry Purge Flow	100	0	500	mL/min							
		Dry Purge Temp (Trap)	20	20	350	°C							
Desorb Ready	This mode indicates to the user that the analytical trap is loaded and ready to transfer the sample to the GC.	-	-	-	-	-	OFF	OFF	OFF	OFF	OFF	Purge (A)	ON
Desorb Preheat	This mode is used to flush the sample from the analytical trap onto the GC column.	Desorb Preheat Temp	245	20	350	°C	OFF	OFF	OFF	OFF	OFF	Purge (A)	OFF
Desorb	This mode is used to flush the sample from the analytical trap onto the GC column.	Desorb Time	2	0	299	min	ON	ON	OFF	ON	OFF	Desorb (B)	OFF
		Desorb Temp	250	20	350	°C							
Drain	This mode, occurs during Desorb and is used only with water samples. This mode drains the sample from the sparger to a waste container.	Drain Flow	300	0	500	mL/min	ON	OFF	OFF	ON	ON	Desorb (B)	OFF

Table 4-3 Lumin with AQUATek LVA/AQUATek 100 (5 mL Vocarb Method) - Valve Output Chart (Continued)

Mode	Description	Variables	Default	Min	Max	Unit	MFC	Purge	Vent	Drain	Bake	6-Port	Fan
Bake Rinse Fill	This mode allows hot water to be introduced to the sample loop for subsequent delivery to the concentrator's sparger.	Bake Fill Time	0.35	0	299	min	ON	OFF	OFF	ON	OFF	Purge (A)	OFF
Bake Rinse Transfer	This mode allows the autosampler to introduce water into the sparger for sparger and line rinsing.	Bake Transfer Time	0.35	0	299	min	ON	OFF	ON	OFF	OFF	Purge (A)	OFF
Bake Rinse Drain	This mode drains the water that was introduced to the sparger from the system.	Bake Drain Time	0.35	0	299	min	ON	ON	OFF	ON	ON	Purge (A)	OFF
		Bake Drain Flow	200	0	500	mL/min							
Bake	This mode is used to heat and back-flush the analytical trap and MCS with gas to prevent cross contamination of samples.	Bake Time	2	0	299	min	ON	OFF	OFF	ON	ON	Purge (A)	OFF
		Bake Flow	200	0	500	mL/min							
		Trap Temp	280	20	350	°C							

a. The MFC would be set to OFF for zero flow.

b. This parameter is fixed and cannot be changed; it is set by the firmware.

c. Temperatures below 40 °C are not controlled and the heater remains off.

d. Temperatures below 40 °C are not controlled and the heater remains off.

4.4 Optimization

NOTE

Also refer to 4.4.6 "Analytical Trap Recommended Operating Conditions".

4.4.1 Standby Optimization

Sample Transfer Line, 6-port Valve Oven and Sample Mount

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

NOTE

The system does not actively attempt to control temperatures below 40 °C (104 °F) (ambient) unless the laboratory temperature requires it.

The temperature range for the Lumin sample transfer line and 6-port valve oven is 20-250 °C. For environmental samples, the most common temperature for the sample transfer line and 6-port valve oven is 150 °C. Flavor and fragrance samples are usually run at higher line and valve temperatures.

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

Analytical Trap and Moisture Control System (MCS)

NOTE

The Lumin will not automatically advance from standby to purge ready if the trap and MCS temperatures are above the set standby temperatures.

The standby temperature range for the trap is 20-350 °C and 20-200 °C for the MCS. However, the typical trap standby temperature setting is between 30-45 °C to prevent a sample from purging on to a hot trap, resulting in incomplete trapping.

The typical temperature setting for the MCS is 20 °C when using the MCS for water removal. If the MCS is not being used for water removal, the temperature is typically the same as the sample transfer line and 6-port valve oven temperature. The MCS works most efficiently with lower temperatures; however higher temperatures can be used to reduce the possibility of removing highly polar compounds such as ethanol.

NOTE

If an autosampler is used in conjunction with the Lumin, a higher standby temperature is recommended for the trap and MCS due to cooling of these zones after the Lumin has advanced to purge ready and the autosampler prepares the next sample. The user should ensure that there is enough time for the Lumin to reach the desired purge temperature, prior to the sample being purged.

Standby Flow

The standby flow can be set to provide the system with continual gas flow while sitting idle providing positive pressure and preventing contamination from lab air. The positive pressure also prevents oxygen from being introduced to the trap and tubing, which can result in deterioration. Typical standby flows are set between 0-10 mL/min.

4.4.2 Purge Optimization

Purge Temperature

The purge temperature setpoint determines when the instrument steps to Purge Ready Mode and indicates that the trap and MCS have cooled below their respective set standby temperatures and all other temperature setpoints have been reached.

The recommended setting for the trap purge temperature is 20 °C. A higher temperature decreases water adsorption, but can also significantly decrease trapping efficiency for the target compounds.

When the MCS is used for water removal as a condensate trap, the typical purge temperature setting is 20 °C.

If the MCS is not being used as a condensate trap, make the MCS temperature, sample transfer line and 6-port valve oven temperature the same.

NOTE

When the MCS is not being used as a condensate trap, dry purge should be used.

Purge Flow

During Purge Mode, gas is passed through the sample in the sparger, causing volatiles to be removed for analysis. Purge has two controlling factors that determine purge volume: the duration of purge (time) and the rate of the gas (flow). For most applications, the purge volume should not exceed 600 mL.

The recommended flow rate is 40 mL/min for 11 minutes or 440 mL purge volume. In some applications a slower flow rate is advisable (when looking for very light compounds) to allow improved trapping efficiency.

NOTE

The purge volume for most applications should be between 400-500 mL. To deliver the correct purge volume, you must determine the correct purge time.

Dry Purge Temperature, Time and Flow Rate

Dry Purge Mode is used to remove water from the trap and can be used when a hydrophobic trap is installed (#1, #7, #8, #9, Vocarb® 3000 or Vocarb 4000) or any time the MCS is not being used as a condensate trap.

Dry purge causes "dry" purge gas to pass through the trap, pushing water off the trap and out to vent. During Dry Purge Mode the trap is already loaded with the compounds of interest. Consequently, dry purging for too long, too fast or at too high of a temperature, may result in a lower response due to breakthrough.

Typically, 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 5-500 mL/min; however, it is not recommended to exceed 300 mL/min.

The recommended trap temperature is 20 °C. A higher temperature will improve water removal, but will reduce the volume of purge gas that can be passed through the trap before significant loss of target compounds occurs.

Sample Temperature

Sample temperature is only used when the optional sample heater assembly for glassware is installed and enabled on the PURGE SETTINGS TAB. The sample temperature range is 20-90 °C. For environmental samples, the typical range is 40-60 °C. Flavor and fragrance analysis may have much higher temperatures.

Pre-Purge Time and Flow Rate (Sample Heater Enabled)

Pre-Purge Time and Flow are only used when the optional sample heater assembly for glassware is installed and enabled on the PURGE SETTINGS TAB. Pre-purge time and flow settings sweep the sparger with purge gas to remove oxygen in the headspace prior to heating the sample. Typically the amount of pre-purge time should allow the volume of the sparger to be swept three times.

NOTE

Pre-purge flow should not exceed purge flow.

The volumes of a 5 mL and 25 mL sparger are 11 mL and 34 mL, respectively. Use the calculation below to find the pre-purge time:

$$\frac{\textbf{3 x Actual Volume of Sparger (mL)}}{\textbf{Pre-purge Flow (mL/min)}} = \textbf{Pre-Purge Time}$$

Sample Temperature/Preheat Mode (Sample Heater Enabled)

Preheat time is only used when the optional sample heater assembly for glassware is installed and enabled on the PURGE SETTINGS TAB. Preheat time is used to allow the heaters to reach their temperature setpoints before purge. This ensures that all samples are purged under the desired conditions.

4.4.3 Desorb Optimization

Desorb Ready Mode is initiated when the trap has been loaded with VOCs and the temperature setpoint has been achieved. If the GC is not ready, the Lumin will wait for the GC during this mode. During this mode the Lumin is in a static state with no flow through the trap.

Desorb Preheat Mode

Desorb Preheat Mode is used to heat 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 introduce the “slug”, in as little time as possible, similar to a direct injection. A typical desorb preheat temperature is 5 °C below the desorb temperature. The Lumin will hold in this mode for 0.33 min to ensure full heat transfer to the center of the trap.

Desorb Temperature

In Desorb Mode, the 6-port valve rotates to back-flush analytes from the analytical trap to the GC. The desorb temperature range is 20-350 °C and typical values range between 180-260 °C. The temperature should vary according to the type of analytical trap installed (refer to Section 4.4.6 "Analytical Trap Recommended Operating Conditions").

Desorb Time and Drain Flow Rate

Desorb time, in combination with drain flow rate, determines the volume of purge gas used to drain the sample. Enough time should be allowed for the GC carrier gas to fully desorb the compound with the highest boiling point, while simultaneously allowing enough time and flow to drain the sample from the sparger vessel. Time values range from 0.5-8 minutes, depending on flow rates.

Typically, drain flow rate should be set to 200-300 mL/min. This flow rate is regulated by the Mass Flow Controller (MFC) to pressurize the sparger and drain the sample, prior to stepping to Bake Mode. The drain flow rate should be set high enough to ensure that the sample is completely drained during desorb mode.

If the sample is not fully removed, it will continue to drain during Bake Mode.

4.4.4 Bake Optimization

Bake Mode is used to regenerate the trap and MCS for the next analysis. 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 MCS elevated to help clean the system.

Bake Temperatures

Trap bake temperatures should be selected based upon the type of trap installed. Typical trap bake temperatures can range from 270-300 °C.

If the MCS has been used as a condensate trap for water removal, the temperature will typically be set to between 150-200 °C for bake.

If the MCS is not being used as a condensate trap, the bake temperature should match the sample transfer line and 6-port valve oven temperatures.

Bake Flow

Flow rates for bake can range between 5-500 mL/min. If cycle time is being minimized, a flow rate of 300-400 mL/min is recommended for 2-4 minutes.

NOTE

A bake time that is too short can result in carryover.

4.4.5 AQUATek LVA/AQUATek 100 Autosampler Optimization

Concentrator Standby Temperature

A higher standby temperature (METHOD STANDBY TAB) is recommended for the trap and MCS due to cooling of these zones after the Lumin has advanced to purge ready and the autosampler prepares the next sample. The user should ensure that there is enough time for the Lumin to reach the desired purge temperature, prior to the sample being purged.

4.4.6 Analytical Trap Recommended Operating Conditions

Table 4-4 Analytical Trap Recommended Operating Conditions

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	2	20	220	225	230
(#1A) Tenax[a]	12-0083-503	35	100	2	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	2	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	2	20	220	225	230
(#8) Carbopack™ B/Carbosieve® S-III	14-3928-403	35	100	2	20	245	250	260
(#9) Trap (Proprietary)	14-9908-403	35	100	2	20	245	250	260
(#10) Tenax/Silica Gel/Carbosieve S-III	14-9909-403	35	0	0	N/A	220	225	230
(#11) VPH Trap (Proprietary)	15-0884-403	35	100	2	20	245	250	260
(K) Vocarb® 3000	14-5864-403	35	100	2	20	245	250	260
Vocarb 4000	14-5865-403	35	100	2	20	245	250	260
BTEX™	14-5866-403	35	100	2	20	245	250	260
BTEX + MTBE	14-9333-403	35	100	2	20	245	250	260

a. Uses a different mesh size.

Intentionally Left Blank

Lumin User Manual

Chapter 5: Maintenance and Troubleshooting

NOTE

Caution and Warning Symbols are defined in Section P.5 "Lumin Safety Symbols Defined" and Section P.6 "Lumin Safety Labels".

Les symboles d'Alerte et de Danger sont définis dans la section P.5 "Symboles Sécurité Lumin" la section P.6 "Label Sécurité Lumin" (Section P.5 "Lumin Safety Symbols Defined" and Section P.6 "Lumin Safety Labels").

DANGER

Remove the power cable before performing maintenance and/or servicing the instrument.

DANGER - Débrancher le câble d'alimentation avant toutes interventions de maintenance et/ou d'entretien sur l'instrument.

5.1 Replacing Parts

NOTE

For replacement part numbers contact Teledyne Tekmar Customer Support using the information in Section 5.23 "Technical Assistance" or use the Teledyne Advanced Chemistry Systems Online Store (https://store.teledyneacs.com/account/login).

Appendix A: "Diagrams"and the Printed Circuit Board (PCB) connection schematic affixed to the interior of the instrument can be valuable resources when any doubt exists about making the correct connections.

WARNING

Only use replacement parts supplied or approved by Teledyne Tekmar when performing maintenance on the Lumin. Use of unapproved parts could result in damage to the instrument, as well as personal injury.

DANGER

Do not replace the Lumin mains supply AC power cable with a cable of any other type or rating. Only replace fuses with those of the same type and rating. Refer to Section 5.16 "Power Entry Module (PEM) Fuse Replacement".

5.2 How to Make Gas and Liquid Connections

To make gas and liquid tubing connections, compression nuts and ferrules, as well as quick-connect fittings, are used. This section explains how to make these connections properly to prevent leaks.

NOTE

If the nuts and ferrules are the wrong sizes or are not properly swaged, leaks can occur.

Tubing connections must be made with:

- Swagelok® nut and two-piece metal ferrule (typically brass or stainless steel) (Figure 5-1)
- PEEK nut and one-piece plastic ferrule (Figure 5-2)
- PEEK nut and two-piece PEEK/metal ferrule (Figure 5-3)
- Valco nut and metal ferrule (Figure 5-4)

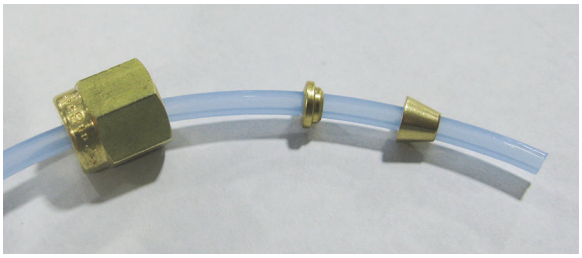
All procedures will designate what type of fitting to be used for a given connection.

NOTE

To check if a nut and ferrule have been properly swaged, loosen the nut and pull on the ferrule. The ferrule should not slide.

5.2.1 Swagelok Nut and Two-Piece Metal Ferrule

Figure 5-1 Swagelok Nut and Two-Piece Metal Ferrule



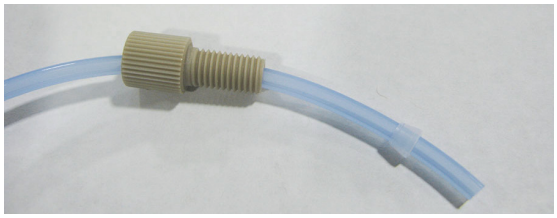
1. Slide the nut onto the tubing with the threads toward the end of the tubing.
2. Slide the small rear ferrule onto the tubing with the wide face toward the nut.
3. Slide the front cone-shaped ferrule onto the tubing with the wide end toward the nut.
4. Thread onto the fitting and tighten with an appropriately sized open-ended wrench.

NOTE

For metal ferrules (such as to the gas supply), use a wrench to tighten the nut further. Turning the nut 1/4 turn (90°) to 1/2 turn (180°) is usually adequate. However, the amount of force required can vary, depending on the friction between the nut and threads, as well as the composition and thickness of the tubing or line.

5.2.2 PEEK Nut and One-Piece Plastic Ferrule

Figure 5-2 PEEK Nut and One-Piece Plastic Ferrule



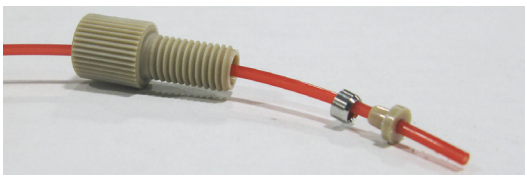
1. Slide the nut onto the tubing with the threaded end toward the end of the tubing.
2. Slide the plastic ferrule onto the tubing with the narrow end oriented toward the nut.
3. Insert the tubing into the designated connector on the instrument.
4. Finger-tighten the nut, but do not over-tighten.

NOTE

For most connections, the end of the tubing should be flush with the end of the ferrule.

5.2.3 PEEK Nut and Two-Piece PEEK/Metal Ferrule

Figure 5-3 PEEK Nut and Two-Piece PEEK/Metal Ferrule



1. Slide the PEEK nut onto the tubing with the threaded end toward the end of the tubing.
2. Slide the rear metal ferrule onto the tubing with the flat towards the nut and the rounded end towards the end of the tubing.
3. Slide the front t-shaped plastic ferrule onto the tubing with the narrow end toward the metal ferrule.
4. Insert the tubing into the designated connector on the instrument.
5. Finger-tighten the nut, but do not over-tighten.

5.2.4 Valco Nut and Metal Ferrule

Figure 5-4 Valco Nut and Ferrule Orientation

1. Slide the Valco nut onto the tubing with the threaded end toward the end of the tubing.
2. Slide the metal ferrule with the wide, flat end toward the nut.
3. Insert the tubing and ferrule into the designated connector on the instrument.
4. Tighten the nut using an open-ended wrench, but do not over-tighten.

Caution

To prevent damage to metal nuts and ferrules, do not tighten them over 3/4 turn (270 °). Once swaged onto tubing, it is only necessary to tighten a nut slightly to eliminate a leak. If leaking persists, look for other causes.

5.3 Preventative Maintenance Checks

The following checklists outline the preventative maintenance required for continued successful operation of the Lumin.

NOTE

In addition to Lumin preventative maintenance checks, also perform all autosampler preventative maintenance checks as specified in the Autosampler User Manual, to ensure the system maintains optimal performance.

5.3.1 Daily Preventative Maintenance Checks

Table 5-1 Daily Preventative Maintenance Checklist	
Sample Purge Gas Supply	Verify the gas source is supplying an input pressure of 65 -100 psi (4.48 bar - 6.89 bar) to the Lumin. If you are using a gas cylinder, verify the cylinder is at, or greater than, 500 psi (34.5 bar). 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 (If using an AQUATek LVA/AQUATek 100 Autosampler)	Replace the DI water supply with fresh DI water. Make sure the DI water supply is sufficient for sample analysis (1 L minimum).
Leak Check	Run a leak check to ensure that the unit is leak tight. Refer to Section 5.20.3 "Initial Leak Check".

5.3.2 Weekly Preventative Maintenance Checks

Table 5-2 Weekly Preventative Maintenance Checklist	
Perform Daily Checks	
Purge Pressure Stability	Scan through the Sample History Log to verify that the purge pressures are staying consistent throughout the daily runs.

5.3.3 Monthly Preventative Maintenance Checks

Table 5-3 Monthly Preventative Maintenance Checklist	
Perform Daily and Weekly Checks	
Inspect Sparger	Inspect sparger glassware for damage and the frit for discoloration that could restrict flow or cause contamination. Clean and replace as necessary. Refer to Section 5.9.1 "Sparger Cleaning" and Section 5.10 "Sparger Replacement".

NOTE

The Installation Kit Box includes most of the items needed for routine maintenance of the Lumin.

5.4 Preventative Maintenance Chart

Table 5-4 Preventative Maintenance Chart									
Rate	**Action**	**Check When Completed**							
Daily	Verify Stage 2 Pressure: 65 - 100 psi (4.48 bar - 6.89 bar)								
	Sample Purge Gas: 500+ psi (34.5+ bar) from Tank								
	Waste Container has Sufficient Volume								
	Autosampler DI Water: Fresh and Ample Supply								
	Leak Check								
	Initials and Date								
Weekly	Daily Maintenance Items								
	Verify Purge Pressure Stability								
	Initials & Date								
Monthly	Daily and Weekly Maintenance Items								
	Inspect Sparger								
	Initials and Date								

5.5 GC I/O Cable and GC Type Reference

NOTE

If Table 5-5 "GC I/O Cable and GC System Reference" does not contain your GC System, contact Teledyne Tekmar Customer Support using the contact information in Section 5.23 "Technical Assistance".

Table 5-5 GC I/O Cable and GC System Reference		
Part Number	**GC System**	**GC Type**
14-2371-000	Varian Vista Series with 401 or 402 Data System	Standard
14-2372-000	Shimadzu 9A	User
14-2377-100	Hewlett-Packard (HP) 5700 Series (excluding 5710/30/90)	Standard
14-3054-000	HP 5983/93/95 with SIDS Data System	Standard
14-3168-000	HP 5710/30/90 or 5790 with MSD and Chemstation/ Quicksilver software	Standard
14-3170-000	HP 5840A/80A	User
14-3171-000	HP 5890	User
14-3172-000	Perkin-Elmer Sigma Series	User
14-3176-000	Tracor 540/800 Series MS	Standard
14-3312-000	HP5890 with RTE and HP-1000 GC/MS software with 5970MSD or 5988 MS	Standard
14-3315-000	General; Any GC/MS that has electronic READY and REMOTE START signals	See Instructions
14-3316-100	Varian 3700	Standard
14-3319-000	HP 5995 GC/MS with Chemstation/Quicksilver software	Standard
14-3320-000	General HP GC/MS with RTE Software	User
14-3335-000	Perkin-Elmer 8000 Series or 9000 Autosystem	Standard
14-3569-000	Varian 3300, 3400 and 3600 Series without Serial I/O	Standard
14-4009-100	Finnagin 5100	Standard
14-4188-074	HP 5890 with 5970 MSD or 5988 MS with Unix or Pascal based Chemstation	Standard
14-4610-074	Shimadzu 14A, 15A and 17A	Standard
14-4652-074	HP 5890 with 5971 MSD (MS/DOS) or HP Engine GC	User
14-4655-074	Two Units to a Tracor 540/800 Series MS	Standard
14-4830-074	Two Units to a HP 5890	Standard
14-4938-074	Carlo Erba Vega/Mega or 8000	Standard
14-5044-074	One or Two Units to a Varian 3400/3600/Data System/Integrator (with Serial I/O)	Standard
14-5397-074	Two Units to a Perkin-Elmer 8000 Series or 9000 Autosystem	Standard
14-6689-074	HP 6890	User

5.6 Instrument Access Panels

The Lumin has the following access panels:

- Sparger Panel Door
- Analytical Trap Door
- Left-Side Access Panel
- Right-Side Access Panel
- Top Access Panel

Access panels are secured to the instrument chassis with phillips-head screws and locater pins. Remove the screws that secure the panel and pull away from the chassis to remove.

WARNING

The Lumin is designed to keep liquid spills from coming in contact with electronics inside the unit. The Lumin access panels must be installed prior to turning the instrument ON.

Figure 5-5 Front of the Lumin

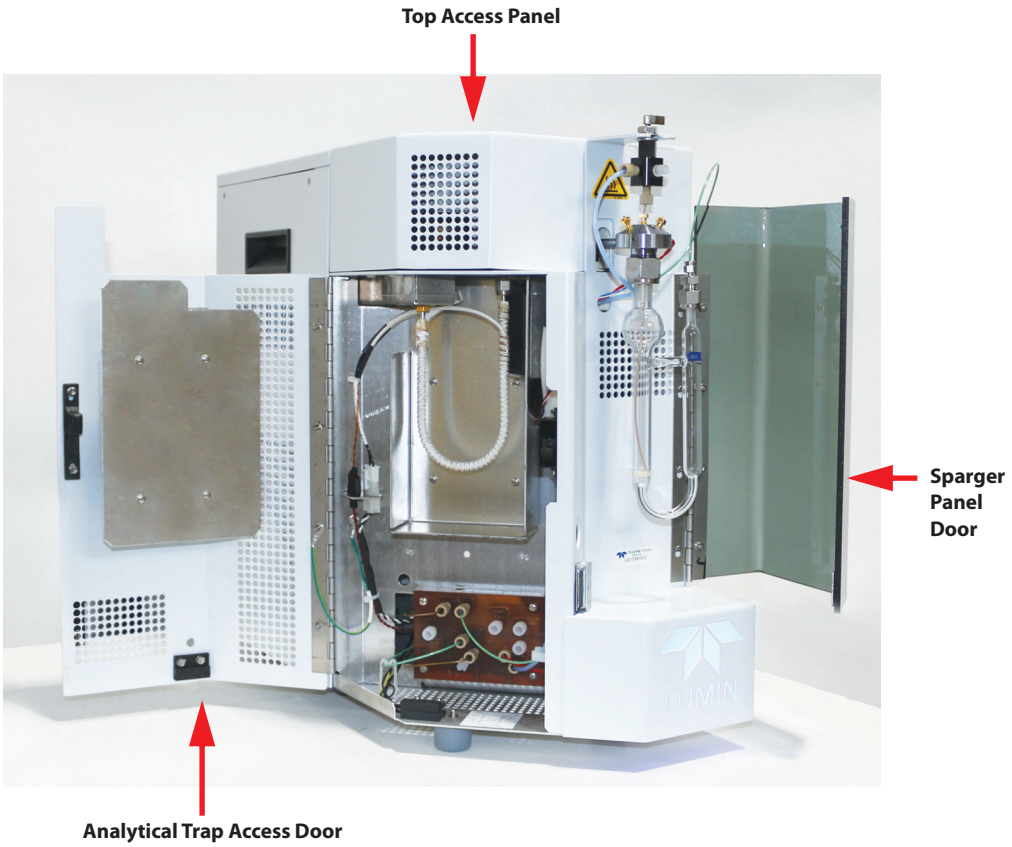


Figure 5-6 Right Side of Lumin

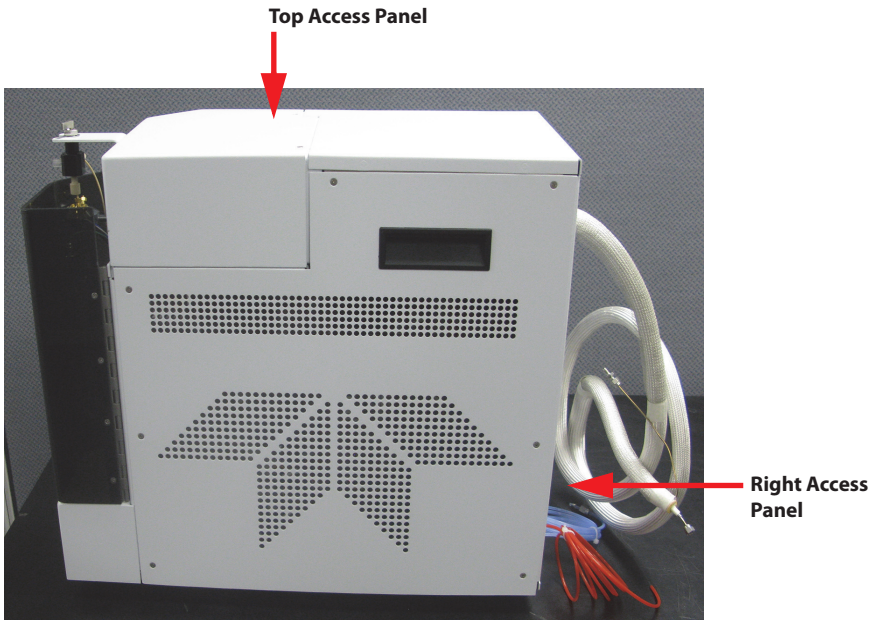
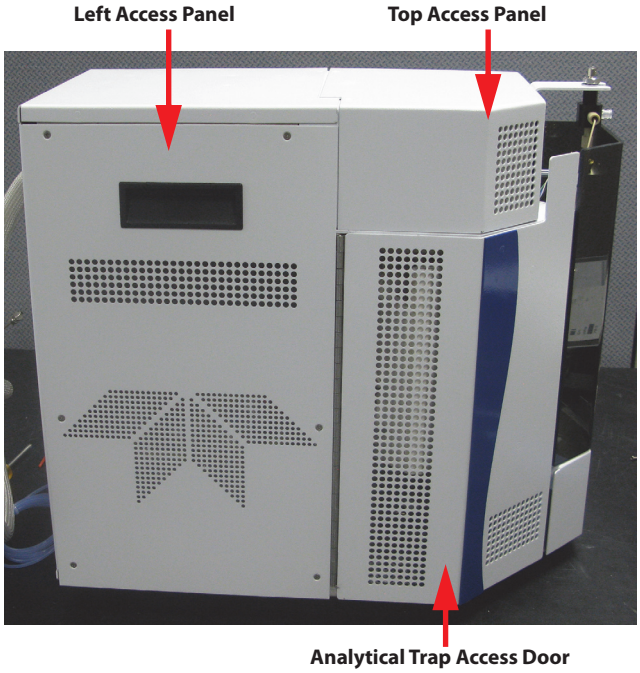


Figure 5-7 Left Side of the Lumin



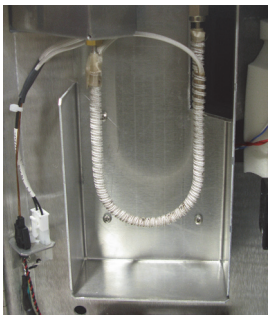
5.7 Plumbing Overview

NOTE

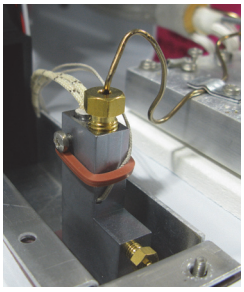
For information on the function of each plumbing component, refer to Section 1.4 "Lumin Component Overview". Also refer to Section A.2 "Lumin Plumbing Diagram".

Figure 5-8 Plumbing Components

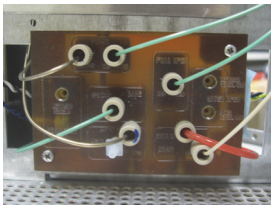
Sample Mount and Sparger



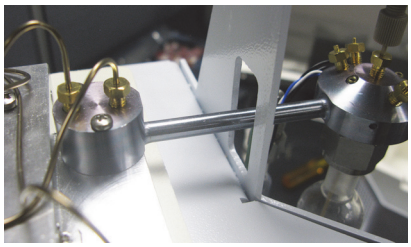
Analytical Trap



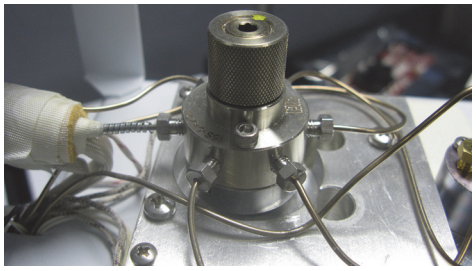
Moisture Control System



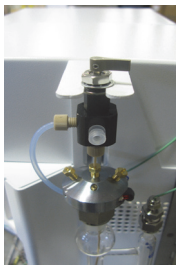
Valve Manifold



4-Way Tee

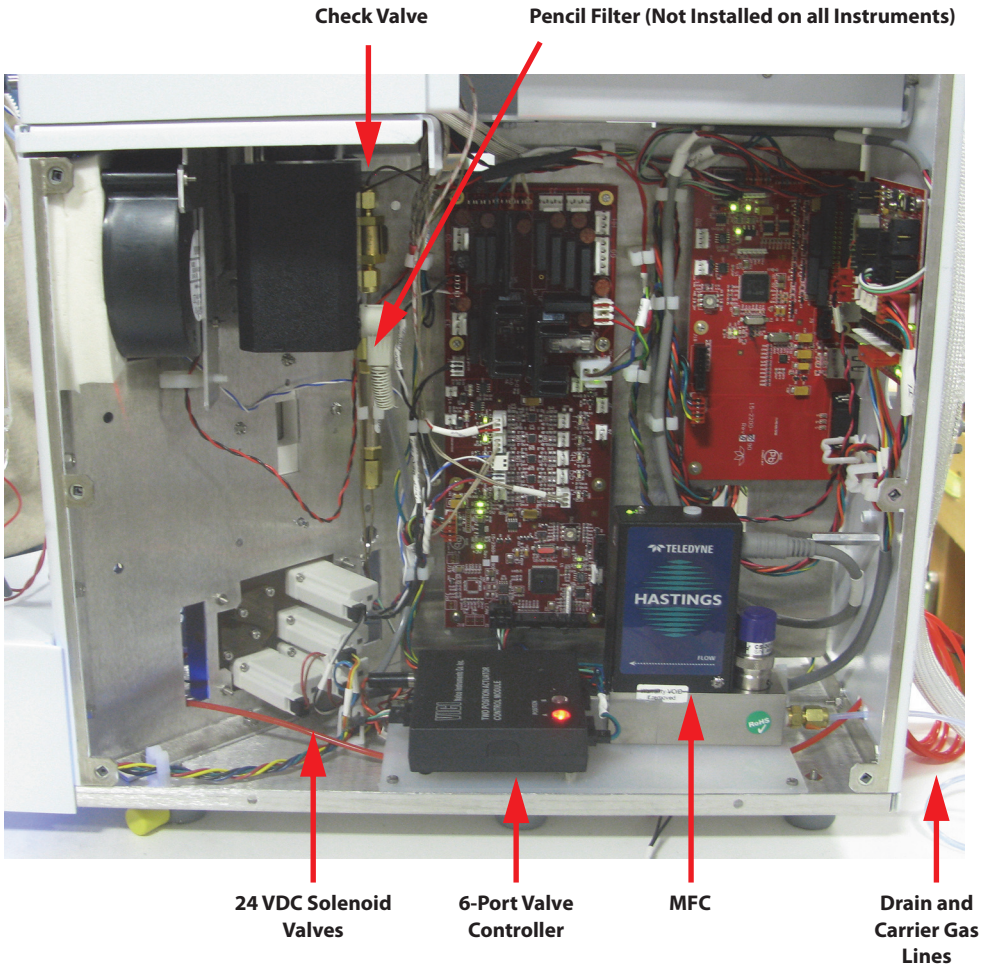


6-Port Valve



3-Port Sample Valve

Figure 5-9 Plumbing Components



5.8 Electrical Overview

NOTE

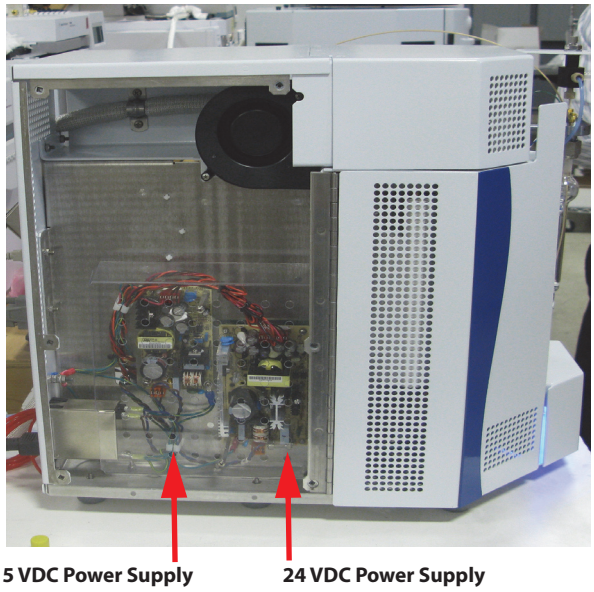
Also refer to Section A.1 "Lumin Electrical Schematic".

5.8.1 Power Supplies

The 24 VDC power supply is located on the left side of the Lumin and is identified by its brown/orange wiring. This power supply powers motors and valves within the Lumin, including the 6-port valve and solenoid valves.

The 5 VDC power supply is also located on the left side of the Lumin and is identified by its black/red wiring. This power supply powers the status light and other boards within the Lumin (multi-channel temperature board, CPU communication master board and DC valve control board).

Figure 5-10 Power Supplies



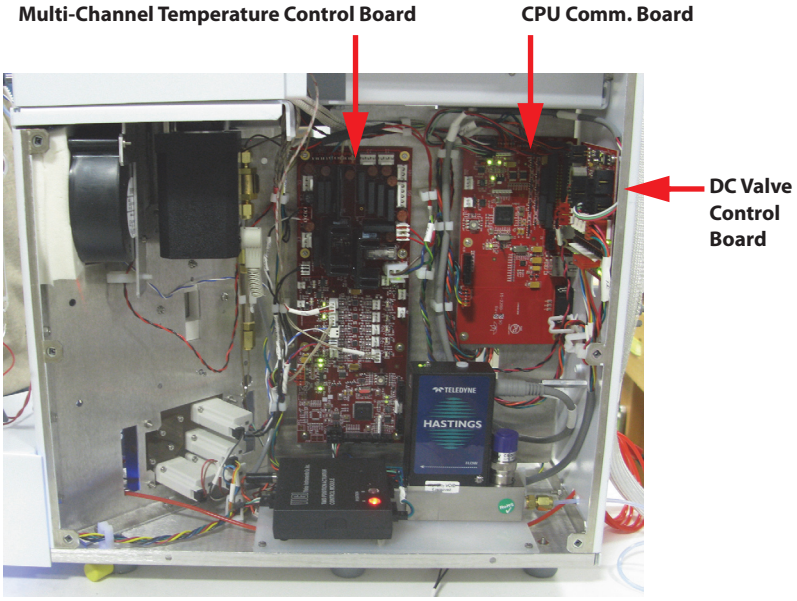
5.8.2 Printed Circuit Boards

The Lumin has three primary Printed Circuit Boards (PCB):

- Multi-Channel Temperature Control Board
- DC Valve Control Board
- CPU Communication Board

Locations of the boards are shown in Figure 5-11. Diagrams of the boards are affixed to the interior of the concentrator, as well as shown in relevant maintenance procedures.

Figure 5-11 Printed Circuit Board Locations



Each board in the Lumin has a selector switch setting that uniquely identifies it for communications with Lumin TekLink and should not be changed. The selector switch settings are shown in Table 5-6 "Lumin PCB Selector Switch Settings".

Table 5-6 Lumin PCB Selector Switch Settings

Printed Circuit Board	Selector Switch Setting
CPU Communication (Master) PCB	0
DC Valve Control PCB	1
Multi-Channel Temperature Control PCB	2

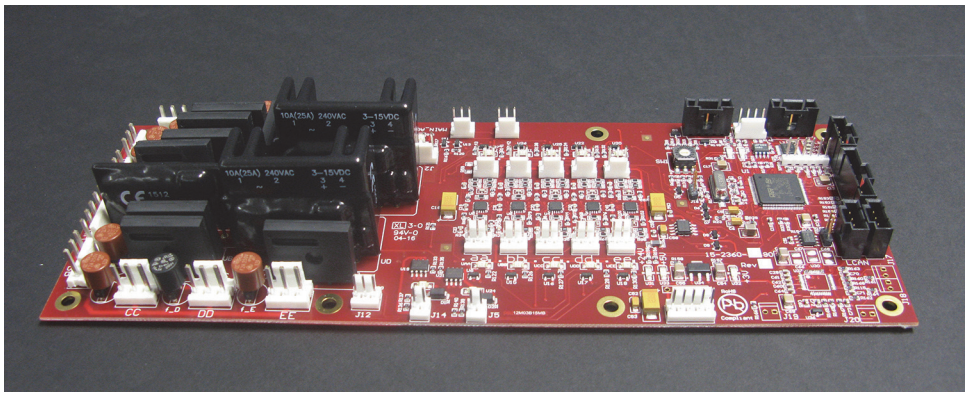
Caution

Do not change the factory set selector switch positions on any PCB board.

5.8.3 Multi-Channel Temperature Control Board

The multi-channel temperature control board is located in the right side of the concentrator. It is responsible for all AC control and RTD feedback for the standard temperature zones (6-port valve oven, heated sample mount, heated analytical trap, sample transfer line heater and optional sample heater assembly for sparger glassware).

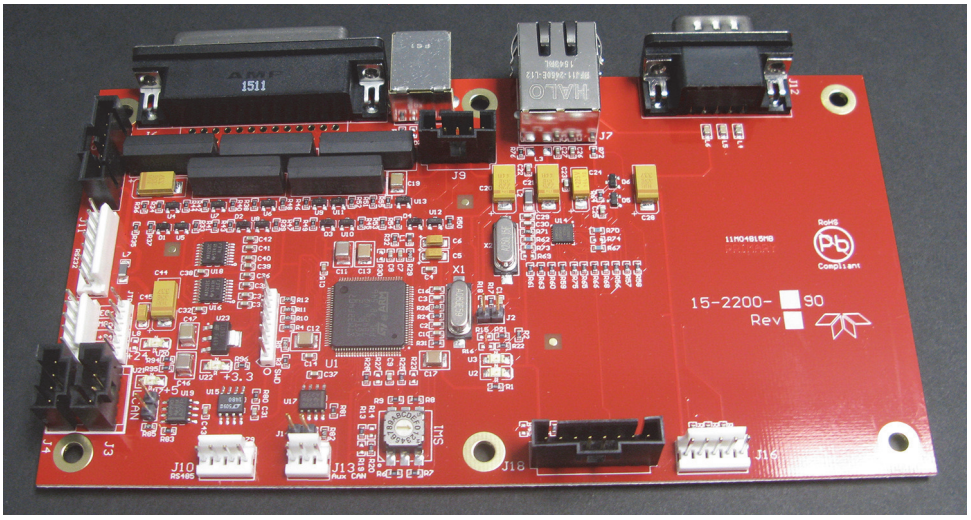
Figure 5-12 Multi-Channel Temperature Control Board



5.8.4 CPU Communication Board (Master Board)

The CPU communication board (master board) is located on the concentrator's right side. This board has a 25-pin, Sub-D connector for communications to the GC via the GC I/O cable, USB Port for external communication to the controlling PC and interface for the AQUATek LVA/AQUATek 100 autosampler.

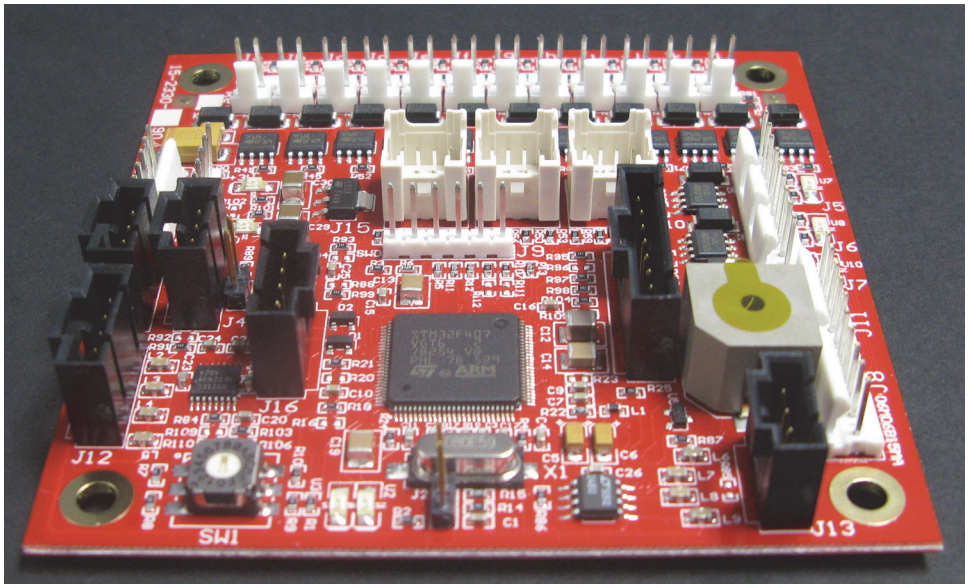
Figure 5-13 CPU Communication Board (Master Board)



5.8.5 DC Valve Control Board

The DC valve control board is located in the right side of the concentrator. This board controls all DC valve outputs.

Figure 5-14 DC Valve Control Board



5.9 Glassware Good Practices Cleaning Procedures

Clean glassware is essential for trouble-free analyses. This glassware includes spargers, samplers, flasks, cylinders - anything used in handling samples, standards or blank water.

NOTE

Glassware used for other procedures, such as extractions, is usually not clean enough to use for trace applications.

Consult your laboratory's Standard Operating Procedures (SOPs) for keeping glassware clean. In addition to your standard glassware protocol, Teledyne Tekmar recommends the following:

- Only clean glassware with DI water and do not use soaps or cleaning products which could introduce contamination.
- Use dedicated glassware. Dedicated glassware is glassware that is used for the Lumin only.

5.9.1 Sparger Cleaning

Always wear safety glasses and appropriate Personal Protective Equipment (PPE) when working with Methanol. Consult the Methanol SDS and/or manufacturer's information for containment and cleanup methods and materials and disposal procedures.

Use a methanol rinse followed by DI water to clean contamination from the sparger.

NOTE

If sparger contamination cannot be removed, the sparger should be replaced. Refer to Section 5.10 "Sparger Replacement".

Caution

When using Methanol, ensure it does not come into contact with any plastic or rubber instrument components.

5.10 Sparger Replacement

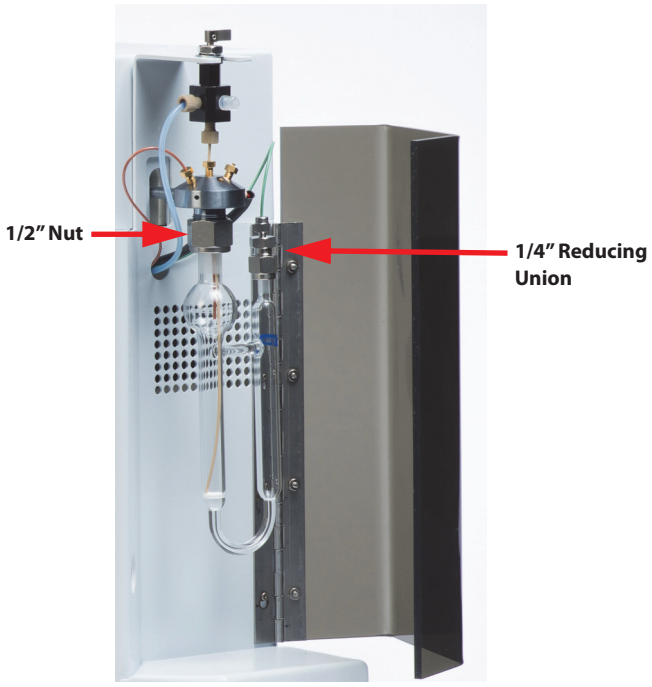
Tools Required

- 1/2" Open-ended Wrench
- 9/16" Open-ended Wrench
- 7/8" Open-ended Wrench

Procedure

Warning! - Hot surface! Turn OFF power to the Lumin and remove the AC power line from the back of the instrument. Allow the Sample Mount and surrounding area to cool to room temperature.

Figure 5-15 Sparger Connections



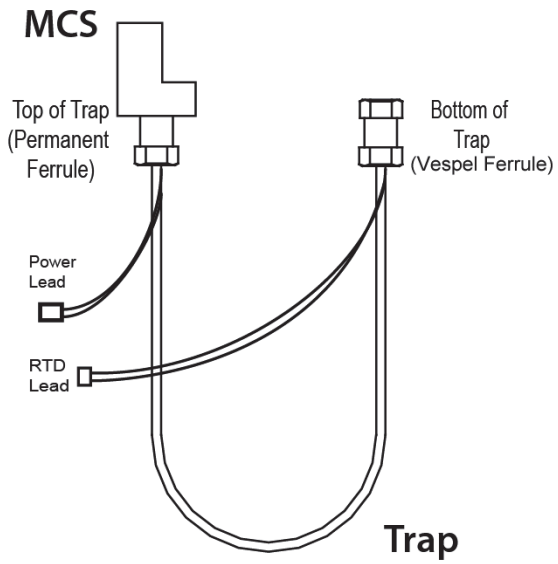
1. Power off the Lumin and remove the AC power cable from the back of the unit. Allow the sample mount and surrounding areas to cool.
2. Open the sparger panel door on the front of the Lumin. The guard has a keyhole slotted hinge that can be removed by lifting the guard up and out, if necessary.
3. Begin with the small diameter side of the U-shaped sparger glassware. Place a 1/2" wrench on the 1/4" reducing union and then loosen the nut above the sparger with a 9/16" wrench. Slide the union off of the glassware neck (Figure 5-15).
4. Support the glassware in one hand and loosen the 1/2" nut below the sample mount using a 7/8" wrench (Figure 5-15). Once the nut is loose, slide the glassware out of the sample mount.
5. Install the new sparger by sliding it into the 1/2" 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 the glassware is backed off the mount 1 mm-2 mm. First finger-tighten the nut, then use a 7/8" wrench to tighten further, no more than a 1/2 turn.
6. Reconnect the union on the small diameter side of the U-shaped glassware and finger-tighten the nut. Hold the 1/4" reducing union with a 1/2" wrench, then tighten the nut above the sparger with a 9/16" wrench turning it no more than a 1/2 turn.
7. Connect the AC power cable and turn the unit ON.
8. Start the Lumin TekLink software, if necessary.
9. Perform a leak check according to Section 5.20.3 "Initial Leak Check".

5.11 Analytical Trap Replacement

Tools Required

- Phillips-head Screwdriver
- 3/8” Open-ended Wrench
- 7/16” Open-ended Wrench

Figure 5-16 Analytical Trap Diagram



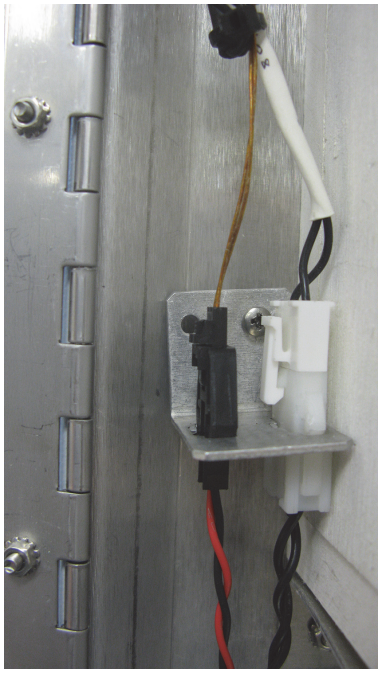
Procedure

Warning! - Hot surface! The trap and surrounding areas can be extremely hot. Allow adequate time to cool.

Warning! - Electrical Hazard! To avoid electrical shock turn OFF and unplug the Lumin before servicing.

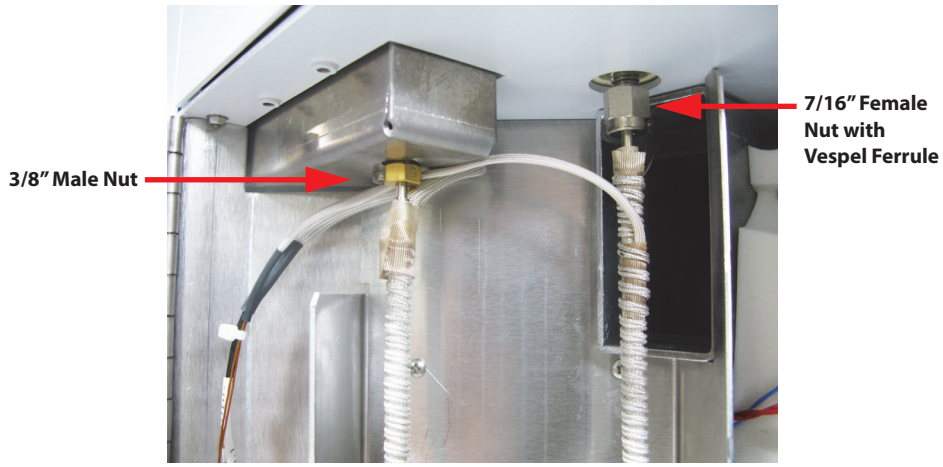
1. Power off the Lumin and remove the AC power cable from the back of the unit. Allow the analytical trap and surrounding areas to cool.
2. Open the analytical trap compartment door.
3. Disconnect the trap heater and RTD plugs at the left side of the trap compartment.

Figure 5-17 Trap Heater and RTD Plugs



4. The analytical trap is connected at the top of the compartment using a 3/8" male nut on one side and a 7/16" female nut on the other. Using an open-ended wrench, loosen both nuts and remove the analytical trap.

Figure 5-18 Analytical Trap Connections



5. Remove the 7/16" nut and Vespel® ferrule from the right side of the analytical trap.
6. Retain the vespel ferrule and trap nut.
7. Carefully slide the trap out of the heater jacket.
8. Remove the protective end covers on the new trap.

9. Slide the trap heater jacket and RTD onto the new trap with the RTD oriented **toward the side with the 7/16" female nut**. After installation, the RTD should be orientated to the right side of the compartment, when facing the unit.
10. Place the 7/16" nut, then the Vespel ferrule, cone oriented upward, over the end of the trap.
11. Reattach the new trap at the top of the compartment. The 7/16" nut and vespel ferule should be oriented to the right side. Tighten, but do not over-tighten.
12. With the permanent nut and ferrule oriented toward the left side, install the trap nuts and tighten. Ensure the trap is installed in the correct direction. Refer to Figure 5-18.
13. Reconnect the trap heater and RTD plugs at the left side of the trap compartment.
14. Close the analytical trap compartment door.
15. Connect the AC power cable and turn the unit ON.
16. Start the Lumin TekLink software, if necessary.
17. Perform a leak check according to Section 5.20.3 "Initial Leak Check".
18. Condition the Analytical Trap according to Section 5.12 "Analytical Trap Conditioning".

5.12 Analytical Trap Conditioning

1. From the HOME SCREEN, select the TOOLS BUTTON to display the TOOLS SCREEN. Select the BAKE BUTTON to display the BAKE DIALOG.
2. In the BAKE DIALOG, enter the recommended trap conditioning settings shown in Table 5-7 "Analytical Trap Recommended Conditioning Temperatures and Times" or the trap manufacturer's instructions for conditioning.
3. Select the OK BUTTON to begin conditioning the trap.

Figure 5-19 Bake Dialog

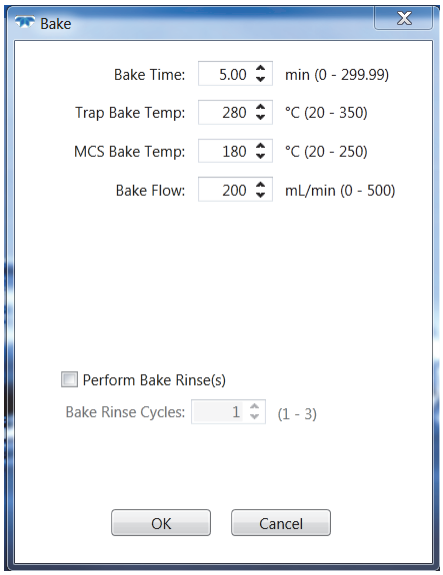


Table 5-7 Analytical Trap Recommended Conditioning Temperatures and Times			
Description	**Part #**	**Conditioning Temperature (°C)**	**Conditioning Time (Min)**
(#1) Tenax®	12-0083-403	225	180
(#1A) Tenax®[a]	12-0083-503	225	180
(#2) Tenax®/Silica Gel	12-0084-403	225	180
(#3) Tenax®/Silica Gel/Charcoal	14-0124-403	225	180
(#4) Tenax®/Charcoal	14-1457-403	225	180
(#5) OV®-1/Tenax®/Silica Gel/Charcoal	14-2366-403	225	180
(#6) OV®-1/Tenax®/Silica Gel	14-1755-403	225	180
(#7) OV®-1/Tenax®	14-3347-403	225	180
(#8) Carbopack™ B/Carbosieve® S-III	14-3928-403	260	90
(#9) Trap (Proprietary)	14-9908-403	270	120
(#10) Tenax®/Silica Gel/Carbosieve® S-III	14-9909-403	225	180
(#11) VPH Trap (Proprietary)	15-0884-403	270	120
(K) Vocarb® 3000	14-5864-403	270	120
Vocarb® 4000	14-5865-403	270	120
BTEX™	14-5866-403	270	120
BTEX™ + MTBE	14-9333-403	270	120

a. Uses a different mesh size.

5.13 Analytical Trap Heater Jacket

Follow the procedures in Section 5.11 "Analytical Trap Replacement" to remove the trap and heater jacket, then reinstall.

5.14 Pencil Filter Replacement (If Applicable)

Some Lumin instruments may have pencil filters installed to remove impurities from the carrier gas. When ghost peaks start appearing in the chromatograms, often the pencil filter needs to be replaced.

Tools Required

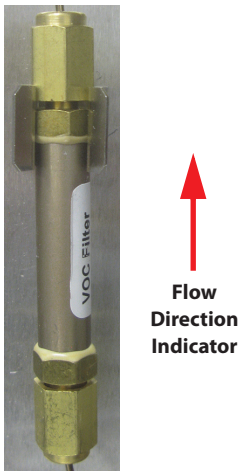
- Phillips-head Screwdriver
- Two 7/16” Open-ended Wrenches

Procedure

Warning! - Electrical Hazard! To avoid electrical shock turn OFF and unplug the Lumin before servicing.

1. Turn the unit off and remove the AC power cable.
2. Remove the right access panel and locate the pencil filter (Figure 5-20).

Figure 5-20 Pencil Filter



3. Using two 7/16” open-ended wrenches, unscrew the connections at 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 on the filter points towards the check valve.
5. Tighten the nuts, but do not over-tighten.
6. Connect the AC power cable and turn the unit ON.
7. Start the Lumin TekLink software, if necessary.
8. Perform a leak check according to Section 5.20.3 "Initial Leak Check".

5.15 Check Valve Replacement

The check valve prevents back flow. When a high level of carryover is observed, often the symptom indicates that the valve requires replacement.

Tools Required

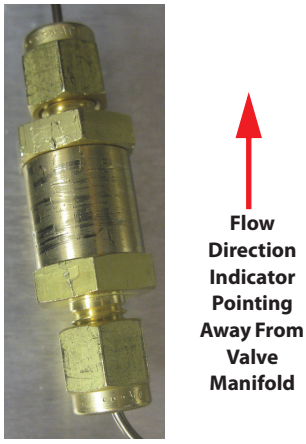
- Phillips-head Screwdriver
- 7/16” Open-ended Wrench
- 5/8” Open-ended Wrench

Procedure

Warning! - Electrical Hazard! To avoid electrical shock turn OFF and unplug the Lumin before servicing.

1. Turn the unit off and remove AC power cable.
2. Remove the right access panel of the unit and locate the check valve.

Figure 5-21 Check Valve



3. Using a 7/16” and a 5/8” open-ended wrench, unscrew both sides of the check valve.
4. Remove the old check valve and replace with a new check valve, making sure that the flow direction indicator points away from the valve manifold assembly.
5. Tighten the nuts, but do not over-tighten.
6. Reinstall the right access panel.
7. Connect the AC power cable and turn the unit ON.
8. Start the Lumin TekLink software, if necessary.
9. Perform a leak check according to Section 5.20.3 "Initial Leak Check".

5.16 Power Entry Module (PEM) Fuse Replacement

NOTE

This section explains the procedure for replacing blown fuses. If a fuse has blown, the root cause of the blown fuse should be determined before re-powering the instrument. If you require assistance, contact Teledyne Tekmar Customer Service using information in Section 5.23 "Technical Assistance".

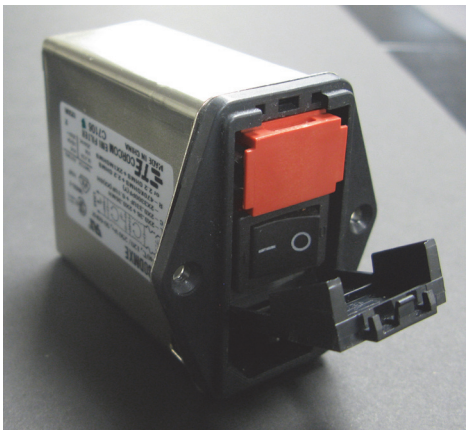
The PEM requires two IEC 5 x 20 mm fuses. To replace the fuses, follow the steps below. Fuses according to electrical standard are shown Table 5-8 "Lumin PEM Fuse Ratings (2 IEC 5 x 20 mm Fuses)".

Figure 5-22 Lumin Power Entry Module (PEM)

To avoid electrical shock turn OFF and unplug the Lumin before servicing.

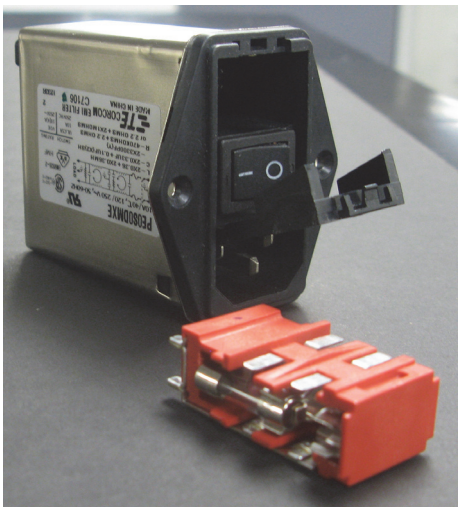
1. Ensure the Lumin is OFF and the AC power cable removed from the back of the unit.
2. Open the hinged fuse module cover by inserting a small flat-head screwdriver at the top and then pulling the cover down.

Figure 5-23 PEM Fuse Module Cover Open (PEM Removed for Clarity)



3. Remove the fuse module from the PEM.

Figure 5-24 Fuse Module Removed



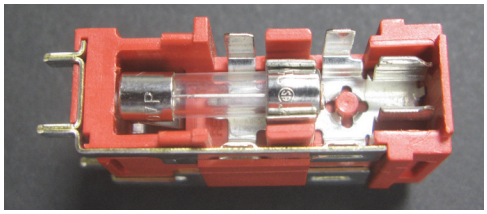
4. Remove the blown fuse(s).
5. Install fuses by pressing them into the fuse module. The correct fuse ratings and specifications are listed on the back of the instrument below the PEM as well as in Table 5-8 "Lumin PEM Fuse Ratings (2 IEC 5 x 20 mm Fuses)". Fuses should be installed toward the rear of the module (toward the electrical contacts).

DANGER

The fuses are rated 5A for 230V and 10A for 115V. Only replace fuses with those of the same type and rating.

Table 5-8 Lumin PEM Fuse Ratings (2 IEC 5 x 20 mm Fuses)		
Electrical Configuration	**Rating**	**Description**
100VAC Operation	T 10.0A – 250V	Time Delay Fuse
115VAC Operation	T 10.0A – 250V	Time Delay Fuse
230VAC Operation	T 5.0A – 250V	Time Delay Fuse

Figure 5-25 Fuse Orientation in Fuse Module



6. Push the fuse module back into the PEM until fully seated. Close the cover over the fuse module.
7. Connect the AC power cable and turn the unit ON.
8. Start the Lumin TekLink software, if necessary.

5.17 Multi-Channel Temperature Control Board Fuse Replacement

Tools Required

- Phillips-head Screwdriver
- Insulated Flat-head Screwdriver
- Needle-nose Pliers (**only** for heater output fuse removal)

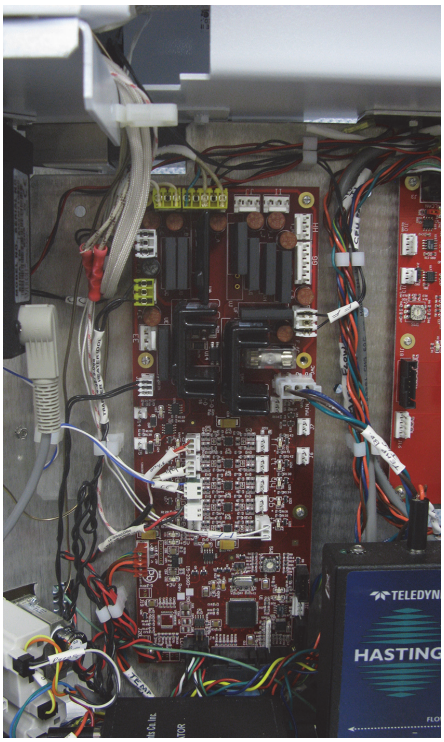
Procedure

Warning! - Electrical Hazard! To avoid electrical shock turn OFF and unplug the Lumin before servicing.

5.17.1 Main Fuse

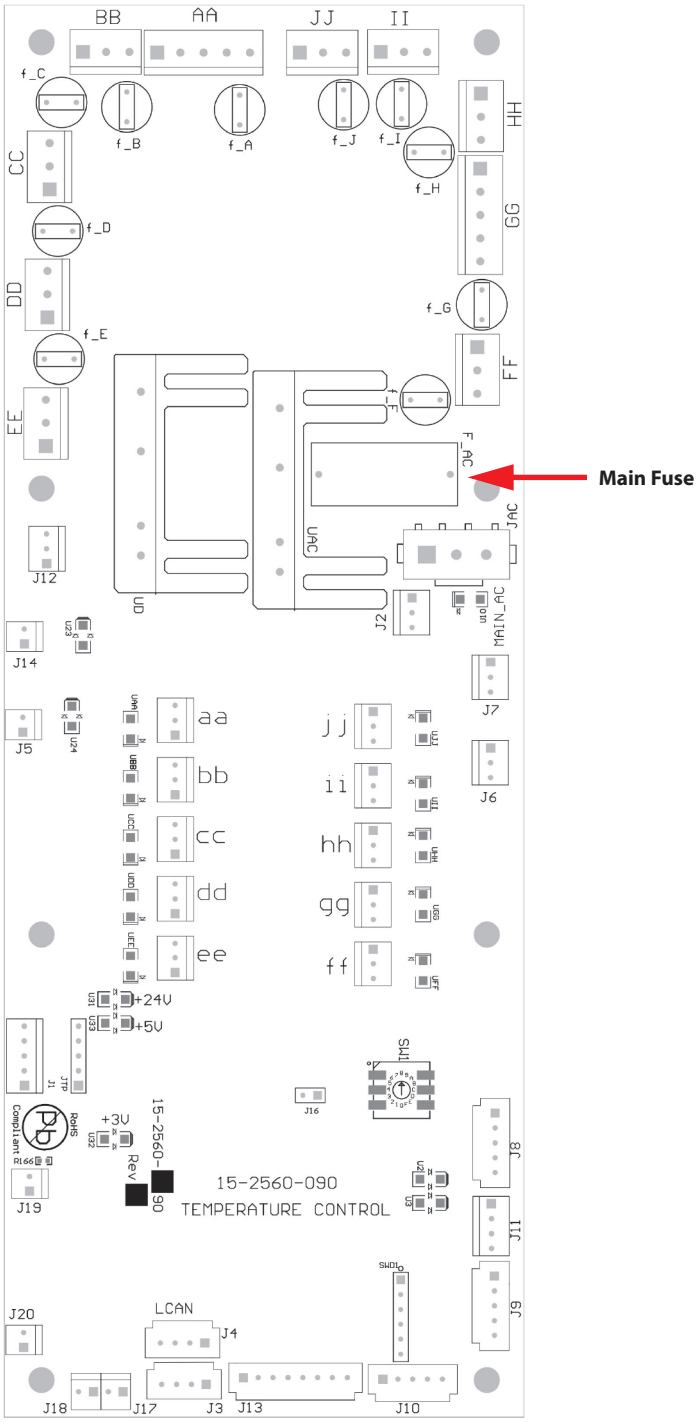
1. Turn the unit off, remove the AC power cable, remove the right access panel and locate the temperature control board.

Figure 5-26 Multi-Channel Temperature Control Board



2. Using a properly insulated flat-head screwdriver, pry the plastic cover off of the main fuse compartment.

Figure 5-27 Multi-Channel Temperature Control Board Diagram - Main Fuse



3. Carefully pry the fuse at location “F_AC” from the fuse compartment.

4. Locate the appropriate amperage replacement fuse (according to Table 5-9 "Temperature PCB Main Fuse") in the Installation Kit Box.

Table 5-9 Temperature PCB Main Fuse

Main AC Inlet	Fuse Location	Fuse Rating
J_AC	F_AC	10 Amps

DANGER

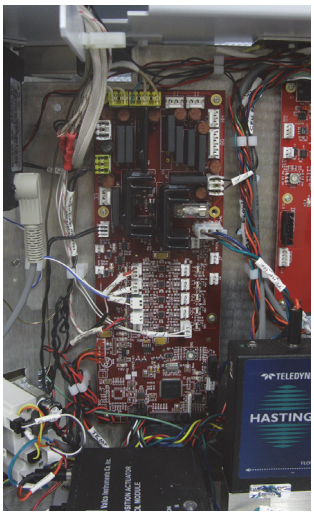
Do not use a fuse of any other rating.

5. Carefully insert the new fuse, then replace the plastic cover.
6. Reinstall the right access panel.
7. Connect the AC power cable and turn the unit ON.
8. Start the Lumin TekLink software, if necessary.

5.17.2 Heater Output Fuses

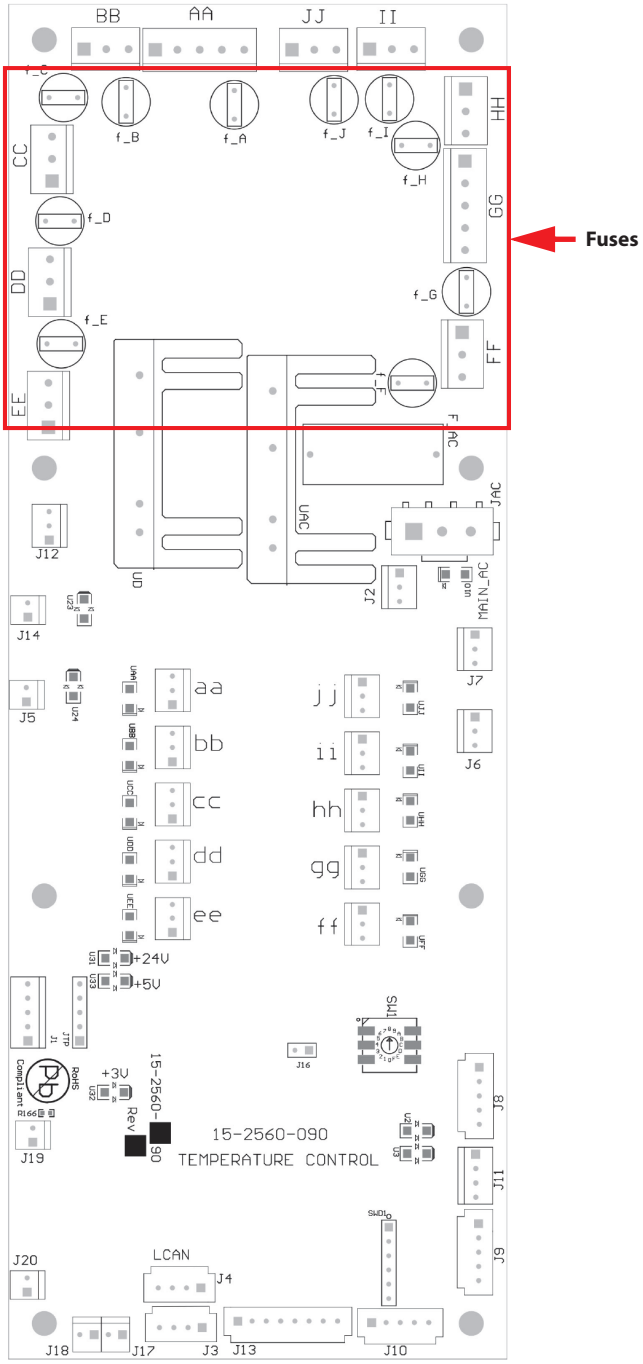
1. Turn the unit off, remove the AC power cable, remove the right access panel and locate the temperature control board.

Figure 5-28 Multi-Channel Temperature Control Board



2. Refer to Figure 5-29 to locate the appropriate heater output fuse(s). Heater output fuses are cylinder shaped fuses located adjacent to each heated zone at the top of the board. Heated zones are identified on the board (AA, JJ, etc.) The fuse that corresponds to each zone will have the same letter identifier prefixed by the letter “F”.

Figure 5-29 Multi-Channel Temperature Control Board Diagram - Heater Output Fuses



3. Remove the appropriate fuse by grasping it with needle-nose pliers and pulling it straight out.

4. Locate the appropriate amperage replacement fuse (according to Table 5-10 "Temperature PCB Heater Output Fuses") in the Installation Kit Box. Carefully insert a new fuse into the board ensuring both pins of the fuse are aligned with the receiving holes.

Table 5-10 Temperature PCB Heater Output Fuses

Heated Zone	Fuse Location	Fuse Rating
AA	F_A	3.1 Amps
BB	F_B	2 Amps
CC	F_C	2 Amps
DD	F_D	5 Amps
EE	F_E	2 Amps
FF	F_F	2 Amps
GG	F_G	2 Amps
HH	F_H	2 Amps
II	F_I	2 Amps
JJ	F_J	2 Amps

DANGER

Do not use a fuse of any other rating.

5. Reinstall the right access panel.
6. Connect the AC power cable and turn the unit ON.
7. Start the Lumin TekLink software, if necessary.

5.18 Upgrade Concentrator Firmware

NOTE

The AQUATek LVA autosampler XYZ robotic arm PCB firmware must be upgraded using a procedure that differs from concentrator firmware upgrade procedure. Refer to the AQUATek LVA User Manual.

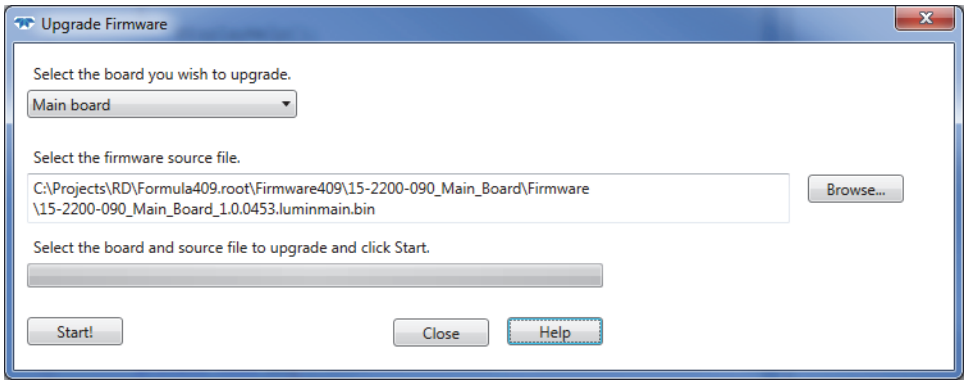
5.18.1 Download Firmware

1. Click this hyperlink for Software/Firmware downloads: (http://www.teledynetekmar.com/Resource-Center/software-firmware-updates), or go to the software downloads page at www.teledynetekmar.com.
2. Under VOC Firmware and Software, find the appropriate firmware update.
3. Follow all prompts to download the new firmware.

5.18.2 Upgrade Concentrator Board Firmware

1. Navigate to TOOLS>UPGRADE FIRMWARE.

Figure 5-30 Upgrade Firmware Dialog



2. In the UPGRADE FIRMWARE DIALOG, select the board to upgrade from the BOARD DROP-DOWN MENU.
3. SELECT THE FIRMWARE SOURCE FILE that was downloaded.
4. Select the START BUTTON and follow all installation prompts.

5.19 Upgrade Software

5.19.1 Download Software

1. Click this hyperlink for Software/Firmware downloads: (http://www.teledynetekmar.com/Resource-Center/software-firmware-updates), or go to the software downloads page at www.teledynetekmar.com
2. Under VOC Firmware and Software, find the appropriate software update.
3. Follow all prompts to download the new firmware.

5.19.2 Install Software Upgrade

1. Select the downloaded software executable file (.exe file type) to start the software upgrade.
2. Follow all installation prompts.

5.20 Troubleshooting

NOTE

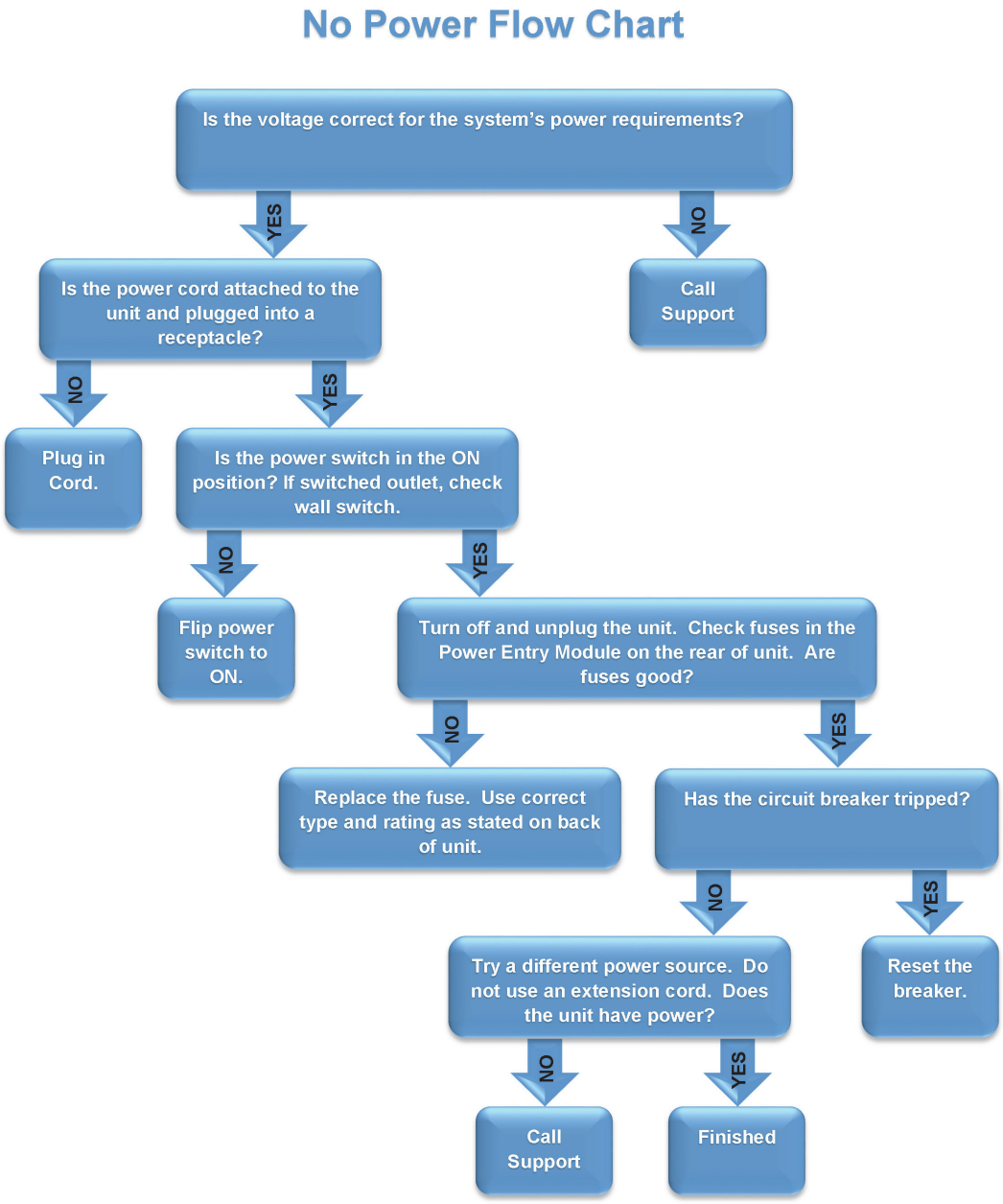
Concentrator diagnostic controls are accessed via Tools>Valves and Flows. AQUATek LVA and AQUATek 100 diagnostic controls are accessed via Tools>AQUATek LVA or AQUATek 100 Buttons. Refer to 3.6.5 "Diagnostics"

5.20.1 No Power Flow Chart

NOTE

Refer to Section 5.16 "Power Entry Module (PEM) Fuse Replacement" for information on accessing the PEM fuses.

Figure 5-31 No Power Flow Chart



5.20.2 Benchmark Test

The BENCHMARK SELF TEST is a troubleshooting tool that tests the components and software routines (heaters, LEDs, continuity of inputs and outputs on the CPU board, etc.) to ensure that the concentrator is in working order. If any sequence of the benchmark test fails, the failure should be addressed before analysis is attempted.

Some tests will be completed automatically, while others will require user response. The benchmark test may be stopped at any time by clicking the STOP BENCHMARK BUTTON in the BENCHMARK DIALOG. Advance to a specific section of the test by selecting the item in the TEST SEQUENCE WINDOW.

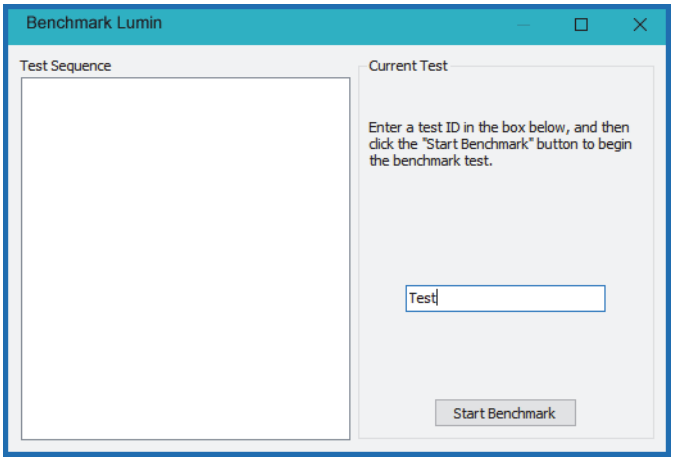
NOTE

Make sure to give the concentrator the necessary time to complete the task.

The results of the benchmark test can be printed at the completion of the test and are automatically saved in the INSTRUMENT HISTORY LOG using the name entered at the beginning of the test.

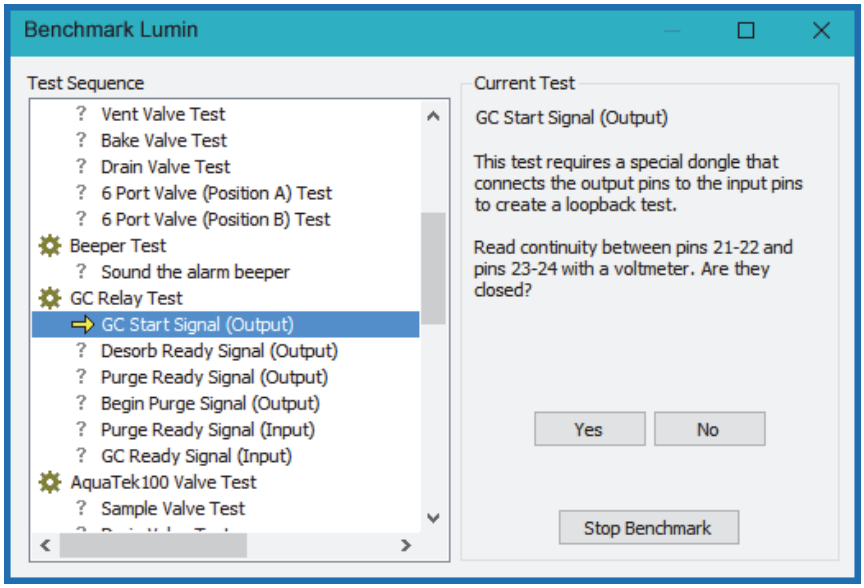
1. From the HOME SCREEN, select the TOOLS BUTTON. On the TOOLS SCREEN, select the BENCHMARK TEST BUTTON to start the benchmark function.
2. Name the benchmark test, then select the START BENCHMARK BUTTON.

Figure 5-32 Benchmark Test



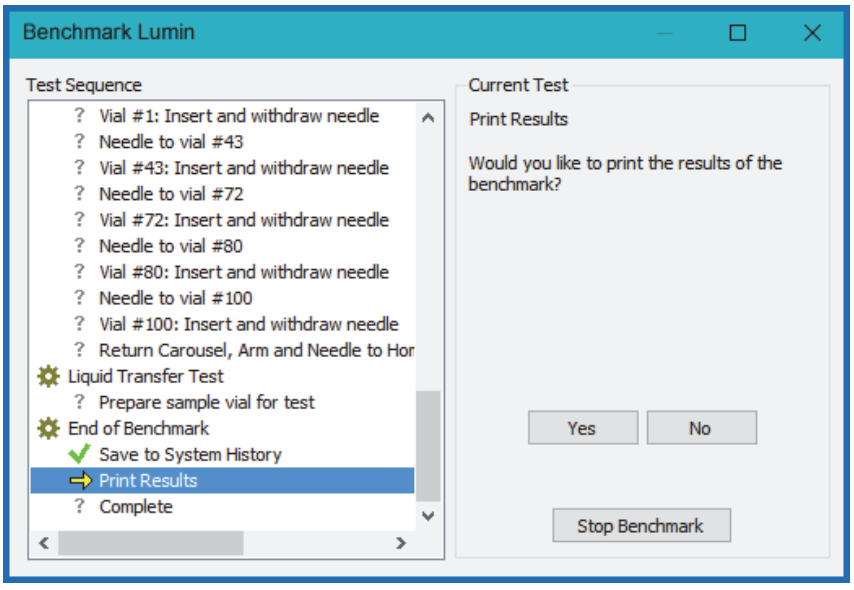
3. Once started, the TEST SEQUENCE WINDOW will display the actions of the benchmark test. The CURRENT TEST PANEL of the dialog will explain the item being tested and prompt the user to respond. The INSTRUMENT STATUS PANEL will also indicate that a benchmark test is being conducted.

Figure 5-33 Benchmark Test Prompt



4. As the benchmark test progresses, Lumin TekLink will prompt the user for responses. Read the prompt and respond accordingly using the buttons in the CURRENT TEST PANEL.
5. Prior to completion of the test, Lumin TekLink will prompt if the benchmark test results should be printed. Once completed, results of the test are saved in the INSTRUMENT HISTORY LOG. To access a saved benchmark test, go to TOOLS>VIEW HISTORY LOG>INSTRUMENT HISTORY TAB.

Figure 5-34 Print Benchmark Results



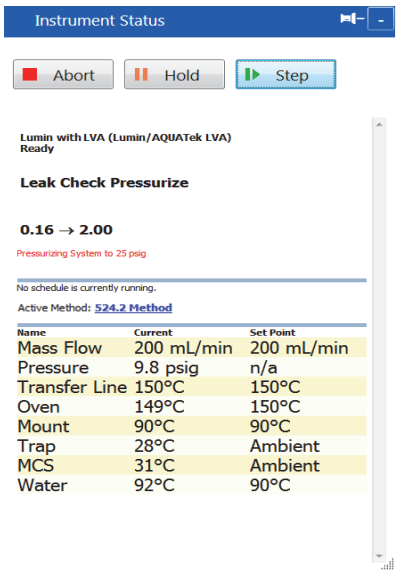
5.20.3 Initial Leak Check

NOTE

Leak Check settings are configured on the Leak Check Tab of the Configuration Dialog (Tools Screen>Configuration>Leak Check Tab).

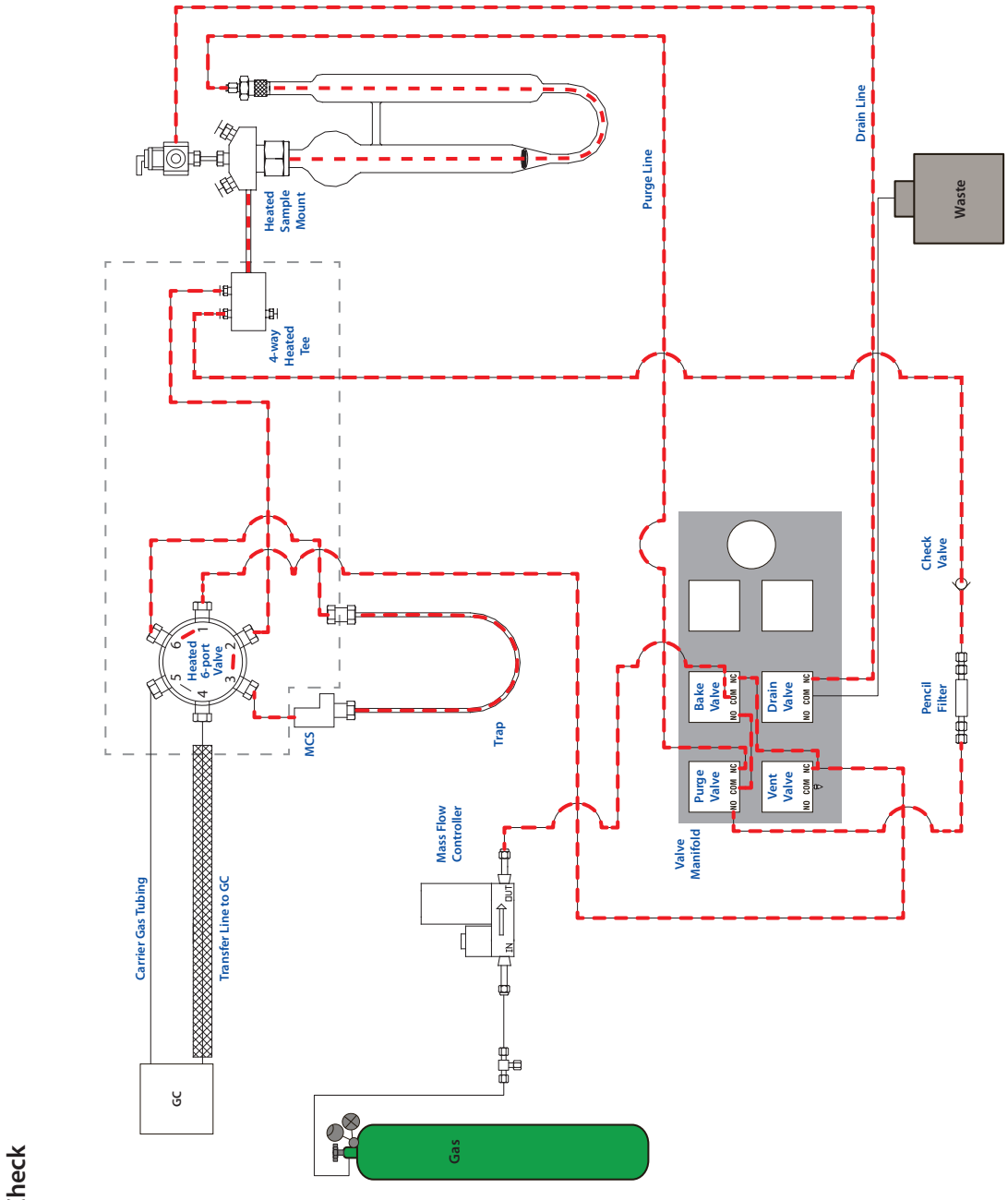
1. To begin the Initial Leak Check, navigate to TOOLS>LEAK CHECK BUTTON. Once begun, the INSTRUMENT STATUS SCREEN will indicate that the Leak Check is in progress (Figure 5-35). Refer to Section 5.20.4 "Leak Check Flow Diagram" and Section 5.20.5 "Initial Leak Check Flow Chart" for more information on the leak check process.

Figure 5-35 Instrument Status During Leak Check



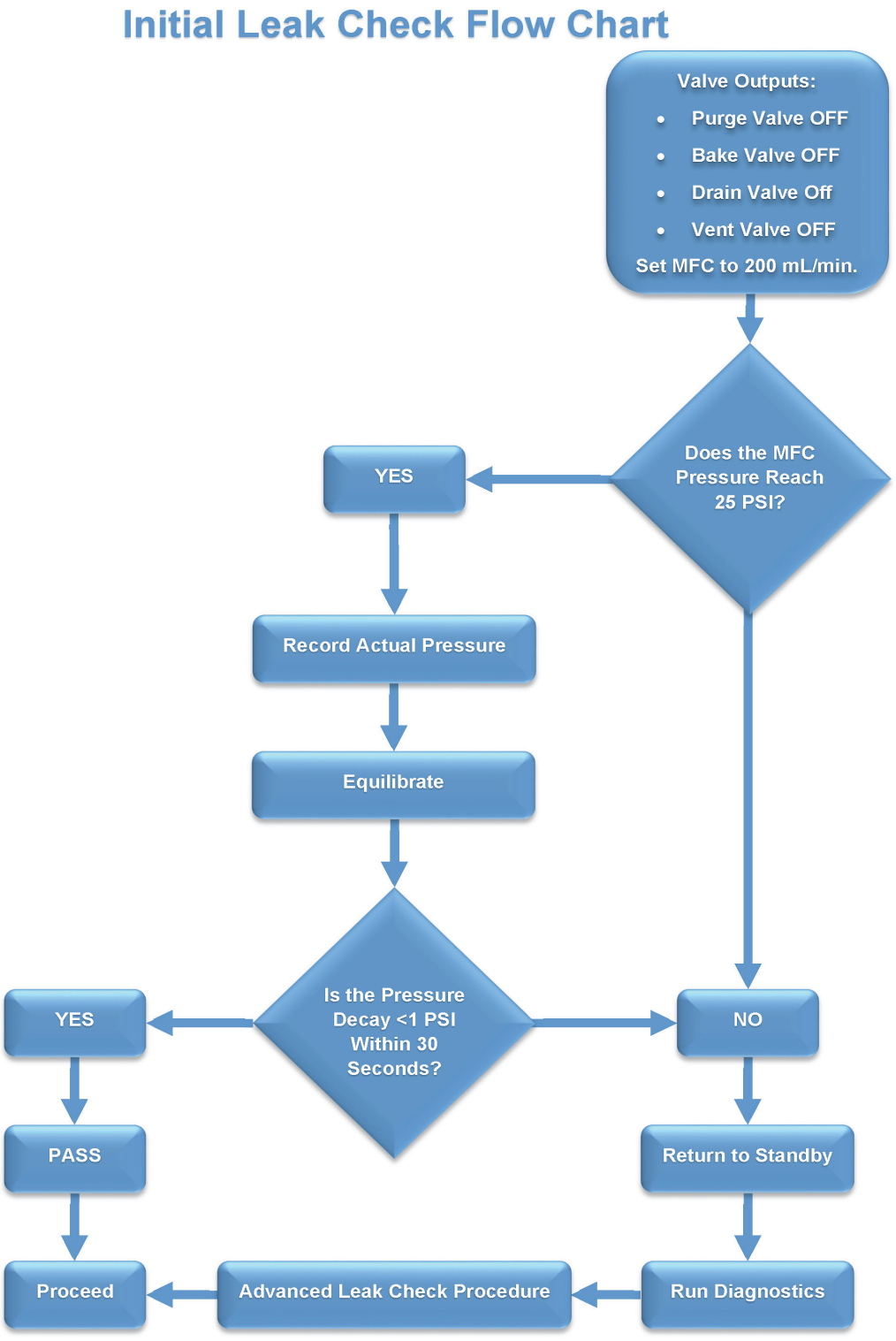
2. If the instrument fails the Initial Leak Check, proceed to Section 5.20.6 "Advanced Leak Check".

5.20.4 Leak Check Flow Diagram



Leak Check

5.20.5 Initial Leak Check Flow Chart



5.20.6 Advanced Leak Check

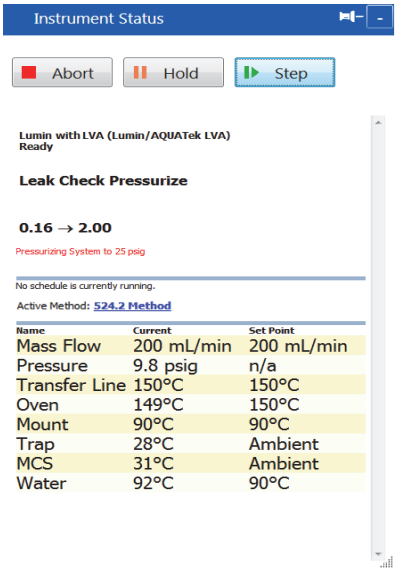
If the instrument fails the Initial Leak Check, an Advanced Leak Check should be performed to isolate the problem area. The Advanced Leak Check manually isolates sections of the pressurized system and then checks the integrity of each component connection.

NOTE

Leak Check settings are configured on the Leak Check Tab of the Configuration Dialog (Tools Screen>Configuration>Leak Check Tab).

1. To begin the Advanced Leak Check, navigate to TOOLS>LEAK CHECK BUTTON. Once begun, the INSTRUMENT STATUS SCREEN will indicate that the leak check sequence is in progress (Figure 5-36).

Figure 5-36 Instrument Status During Leak Check



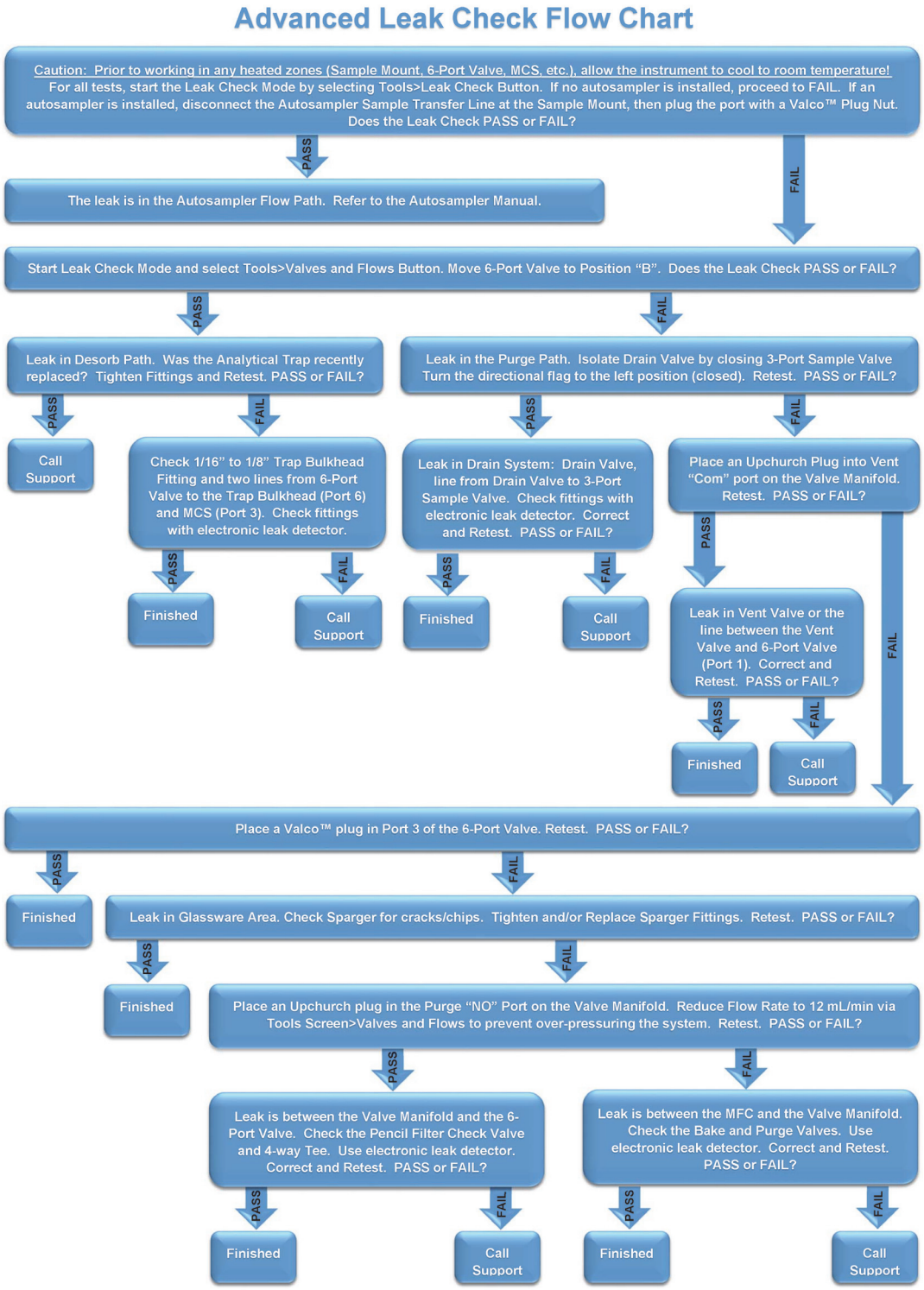
2. Once the Leak Check is initiated, follow the procedures in the Section 5.20.7 "Advanced Leak Check Flow Chart".

Caution

The Advanced Leak Check Procedure may require working in and around heated zones inside the instrument. Allow the sample mount, analytical trap, 4-way tee, Moisture Control System (MCS) and 6-port valve, to cool before performing any procedure.

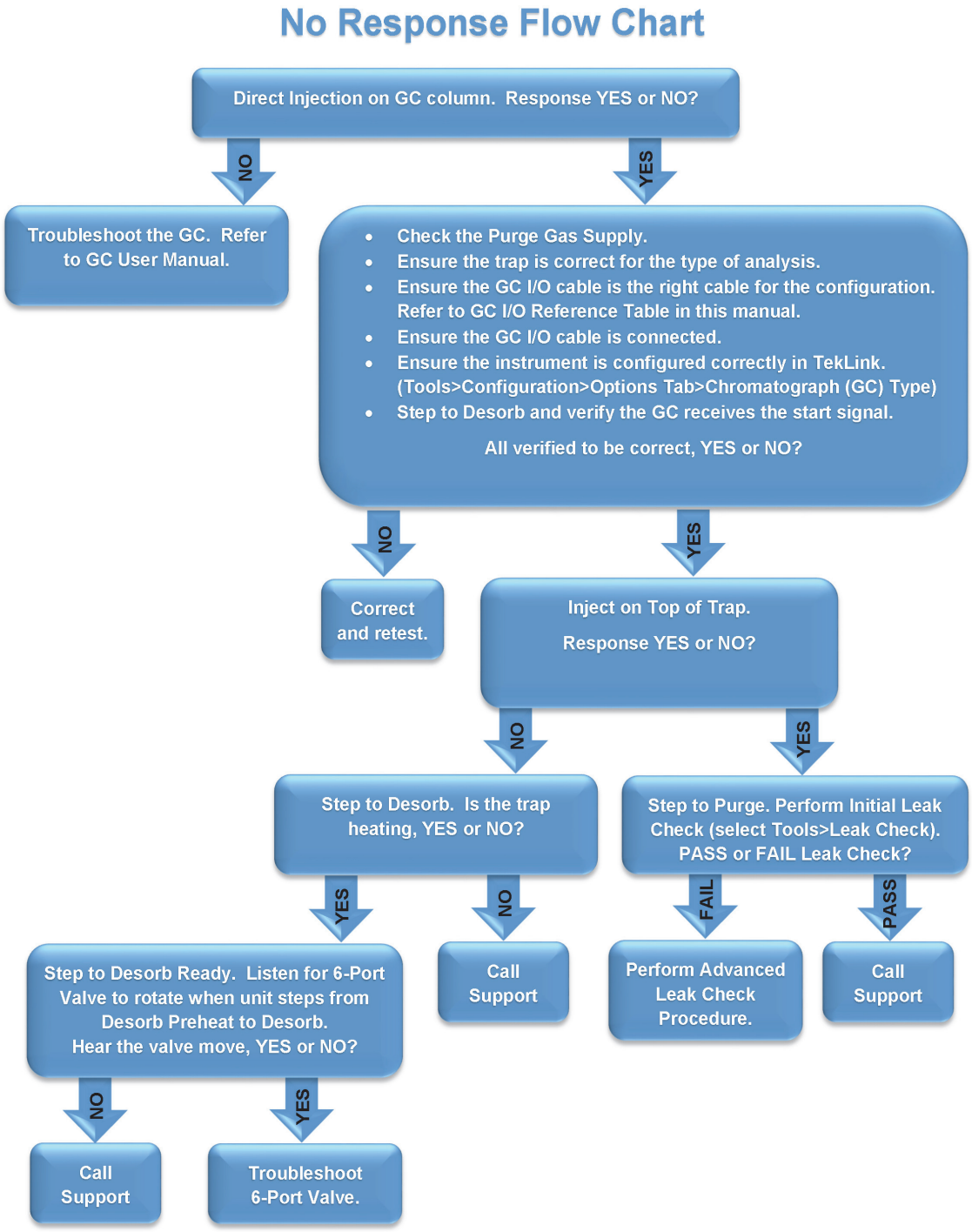
3. If the system continues to fail the Advanced Leak Check, contact customer support using the information in 5.23.1 "Teledyne Tekmar Customer Support".

5.20.7 Advanced Leak Check Flow Chart



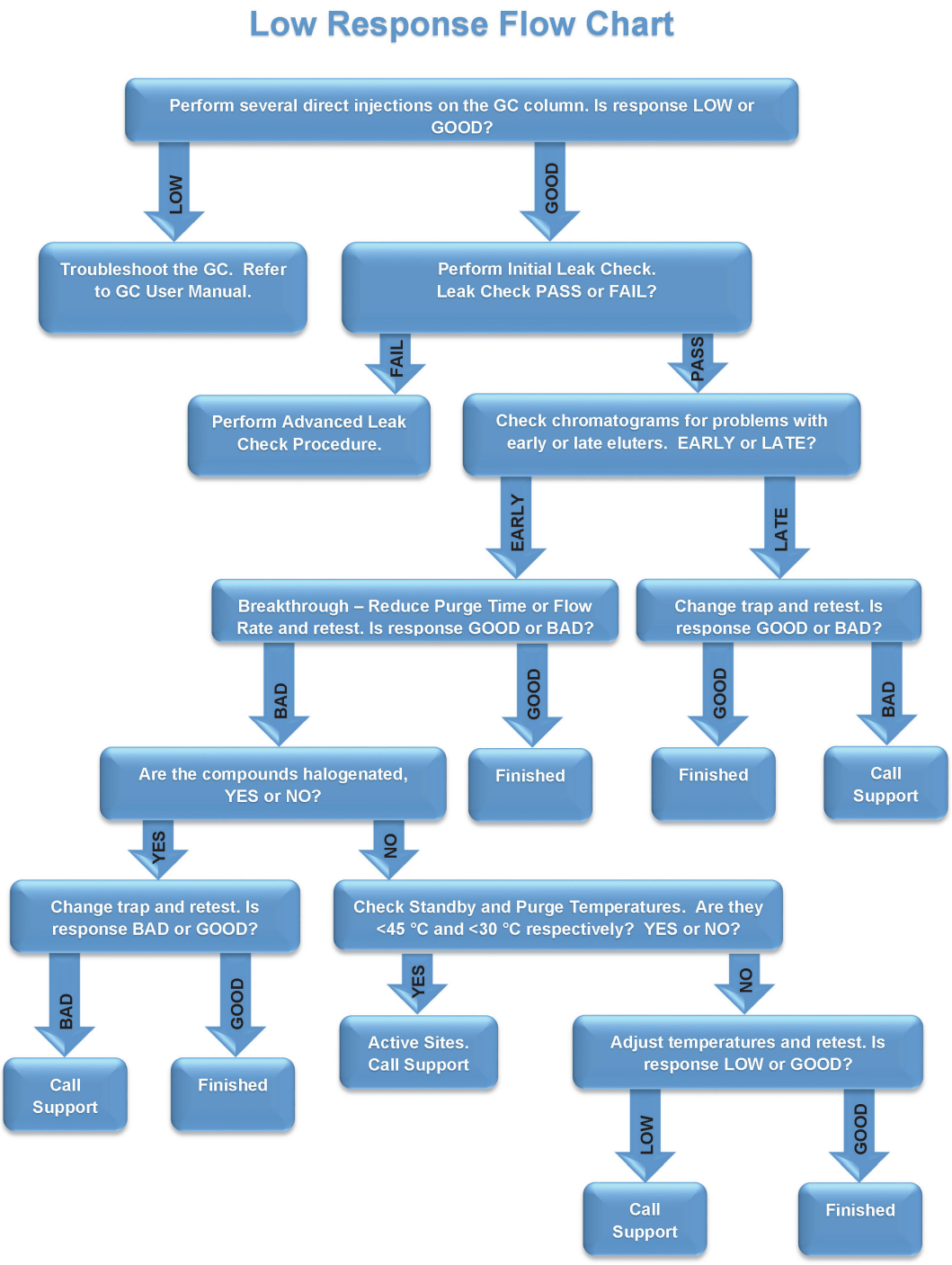
5.20.8 No Response Flow Chart

Figure 5-37 No Response Flow Chart



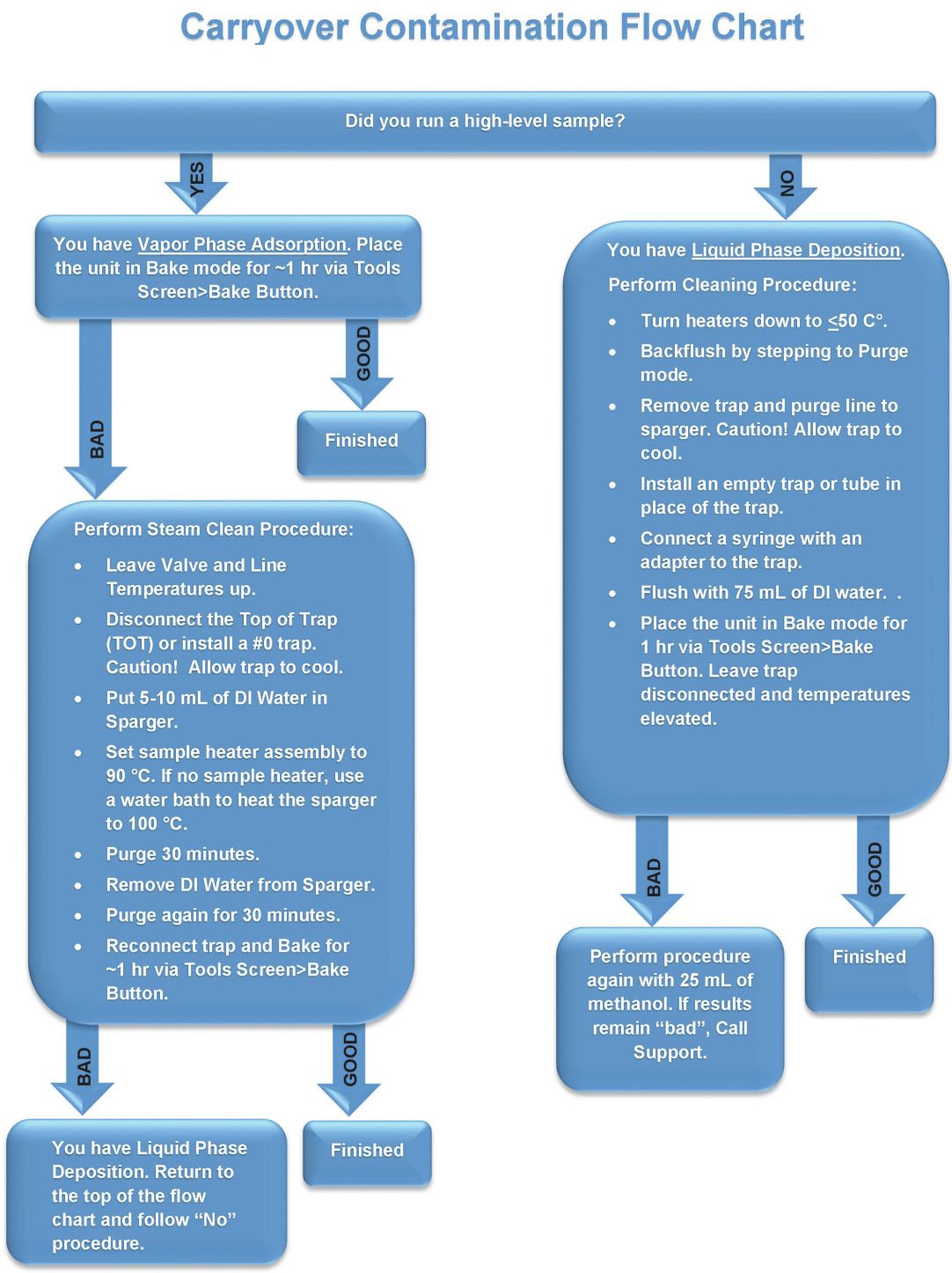
5.20.9 Low Response Flow Chart

Figure 5-38 Low Response Flow Chart



5.20.10 Carryover Contamination Flow Chart

Figure 5-39 Carryover Contamination Flow Chart



5.21 Returning the Lumin

Do not return the Lumin unless a Teledyne Tekmar representative authorizes you to do so. A service representative may be able to help you solve the problem over the telephone. If the instrument must be returned, the representative can tell you how to prevent damage during shipment. The representative must give you a return authorization number and instructions on how to return the instrument properly. Also refer to "Prepare for Shipment/Long-Term Shutdown".

5.22 Unit and Parts Disposal

Refer to Section P.9 "Explanation of Regulatory Marks".

5.23 Technical Assistance

If you need assistance solving a problem, follow the steps below:

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, mode of operation, activity or result that indicated the presence of a problem.
3. Have an electronic or paper copy of the *Lumin User Manual* and any other pertinent information accessible from the telephone. Your service representative may refer to diagrams or other information in the manual.
4. Call Teledyne Tekmar using Section 5.23.1 "Teledyne Tekmar Customer Support".

5.23.1 Teledyne Tekmar Customer Support

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

U.S. Email: tekmarsupport@teledyne.com

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

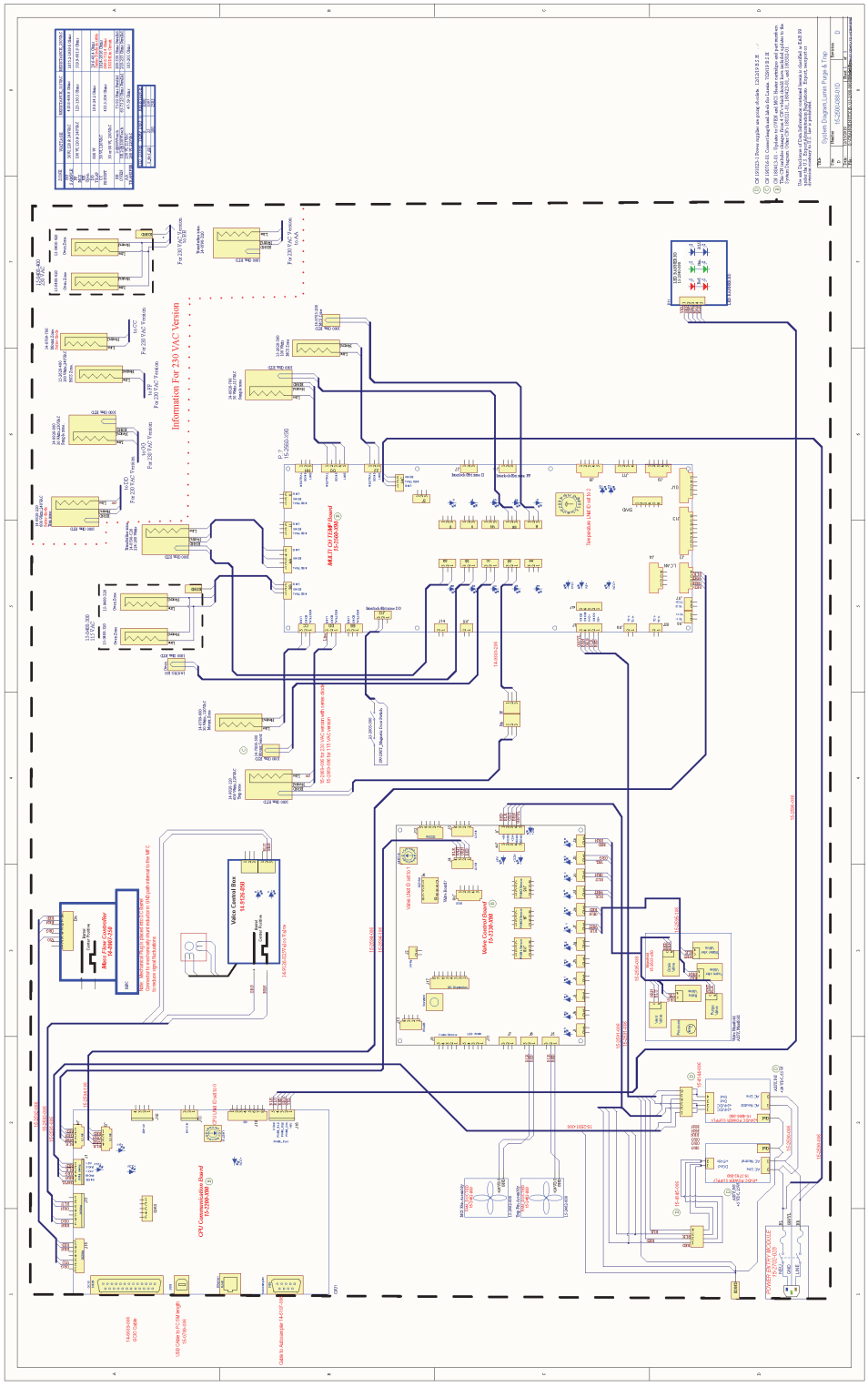
International Email: Tekmar_Intltech@teledyne.com

Lumin User Manual

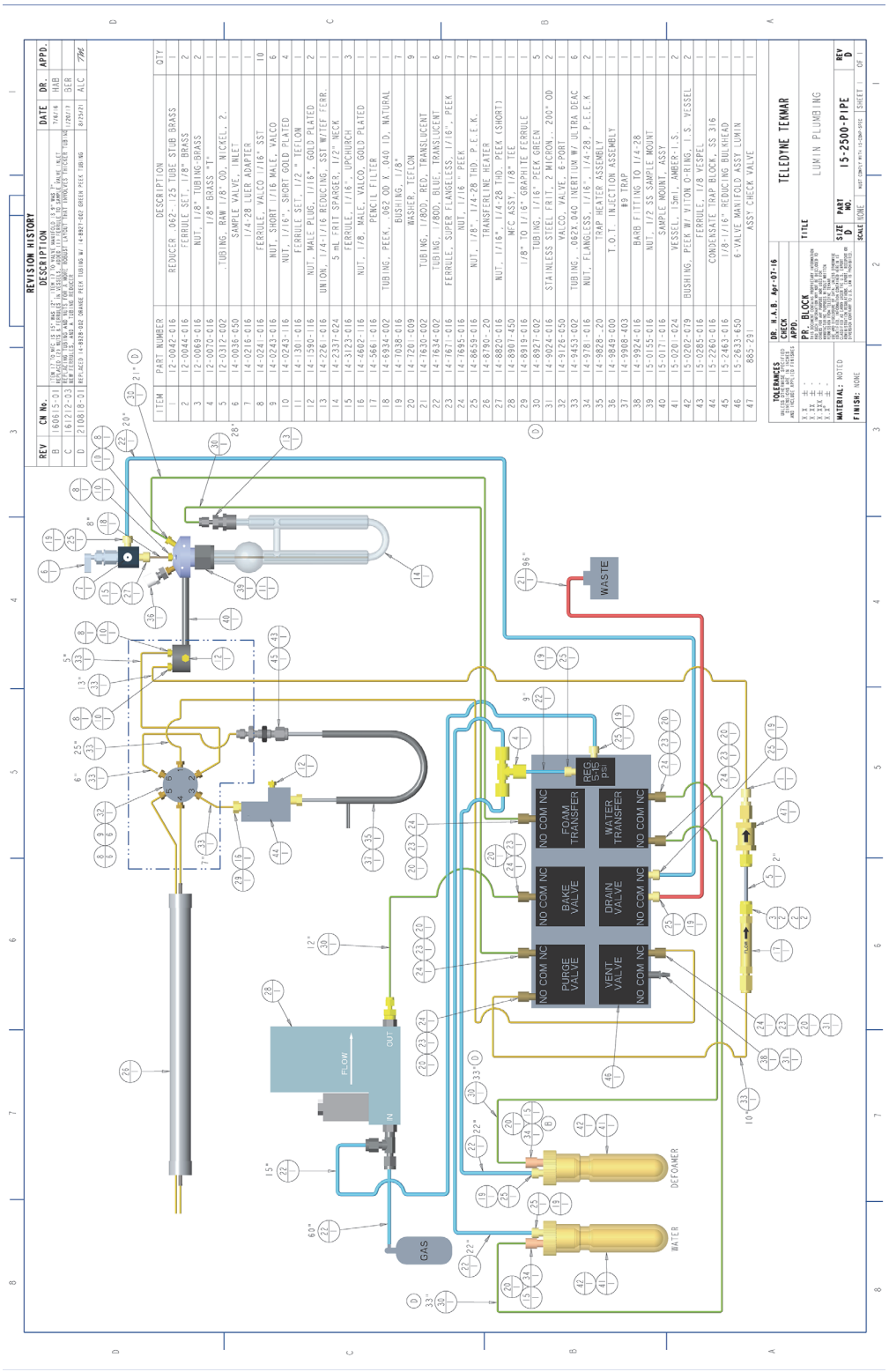
Appendix A: Diagrams

Intentionally Left Blank

A.1 Lumin Electrical Schematic



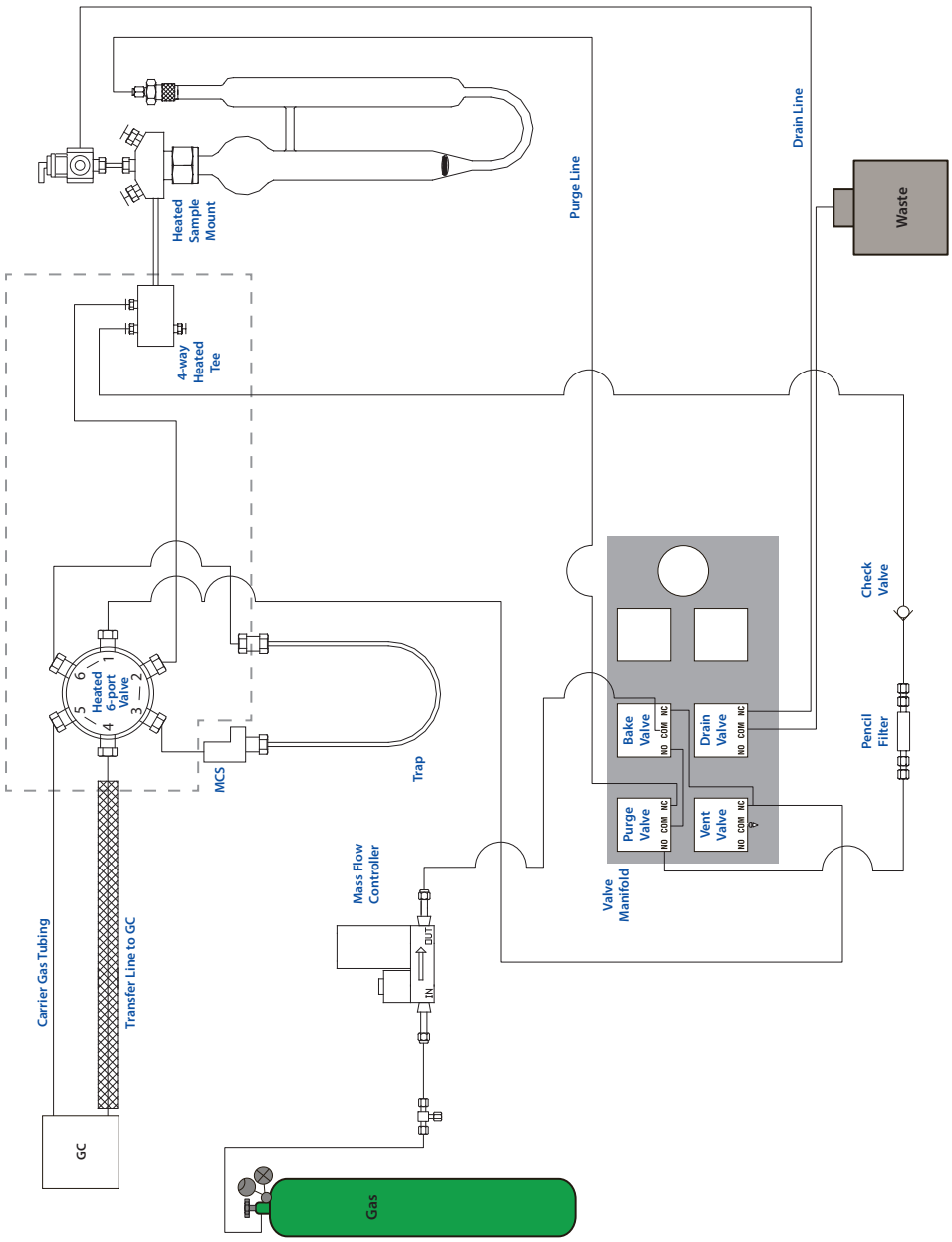
A.2 Lumin Plumbing Diagram



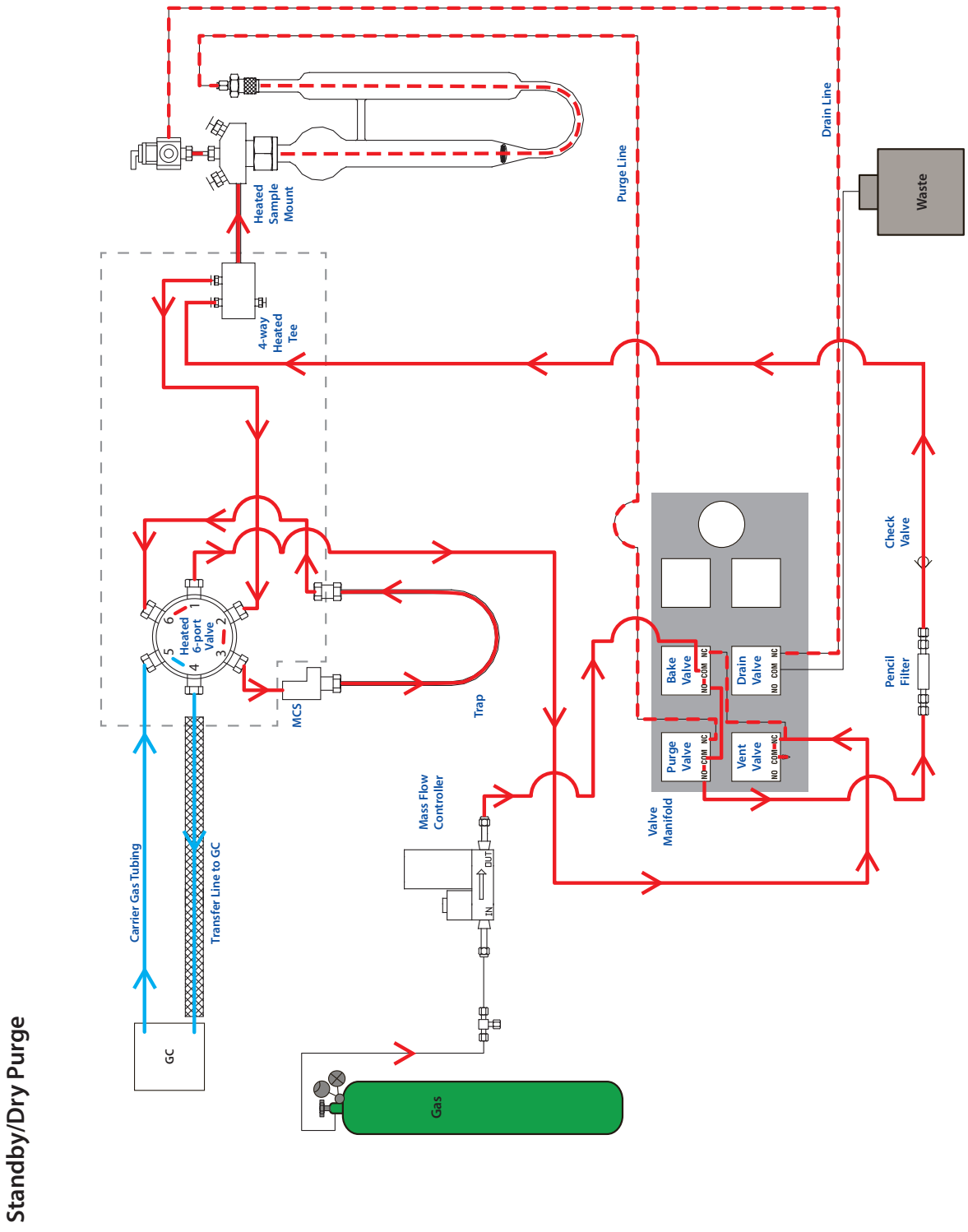
A.3 Lumin Flow Diagrams

For Lumin with Guardian Foam Sensor and Eliminator Flow Diagrams, refer to Section A.4 "Lumin With Guardian Foam Sensor (GFS) & Eliminator Flow Diagrams". For a leak check flow diagram, refer to Section 5.20.4 "Leak Check Flow Diagram". For Flow Diagrams of the Lumin and AQUATek LVA or AQUATek 100 autosampler, refer to the *Autosampler User Manual*

A.3.1 Lumin - Basic Flow Diagram

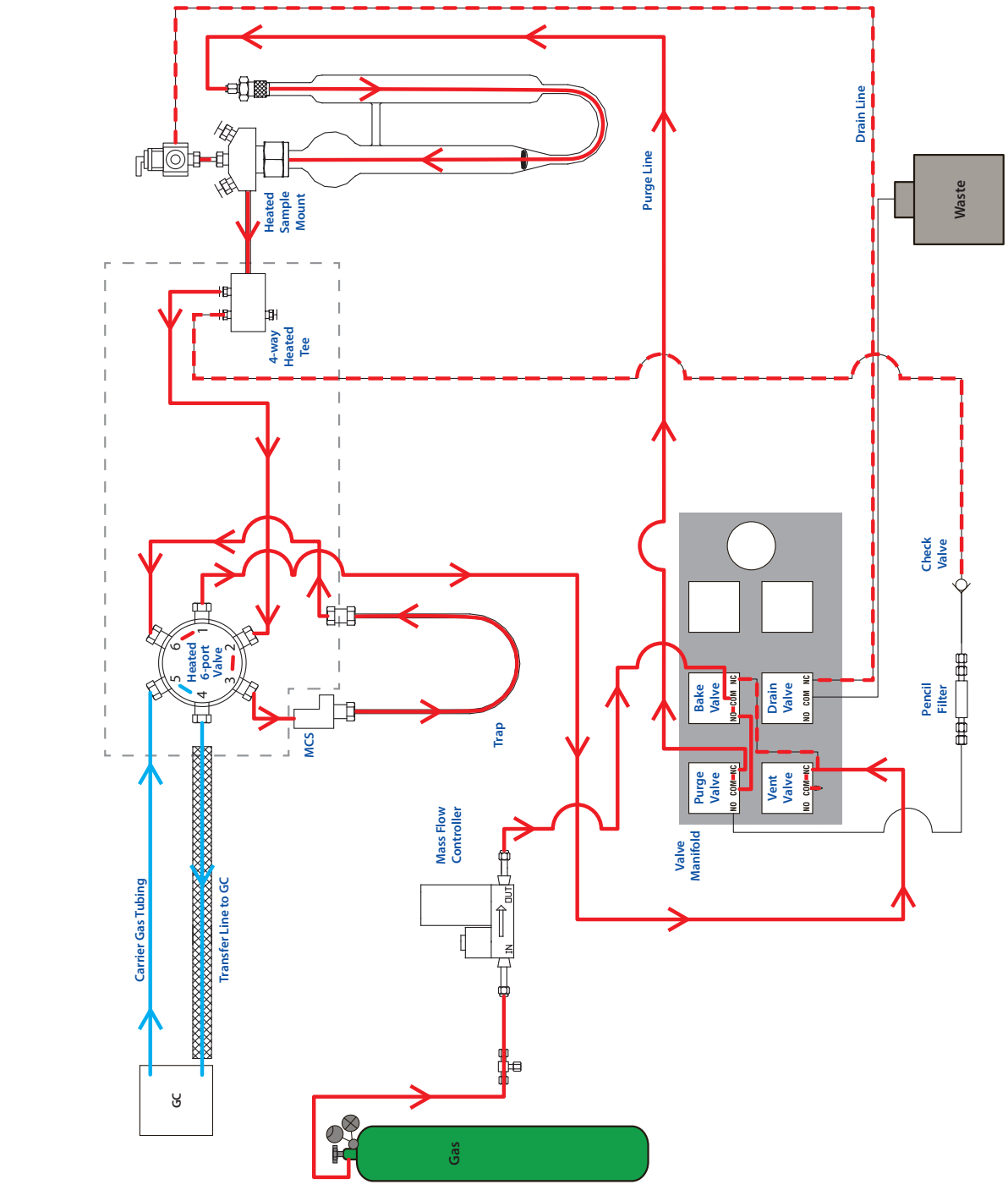


A.3.2 Lumin - Standby Dry Purge Flow Diagram



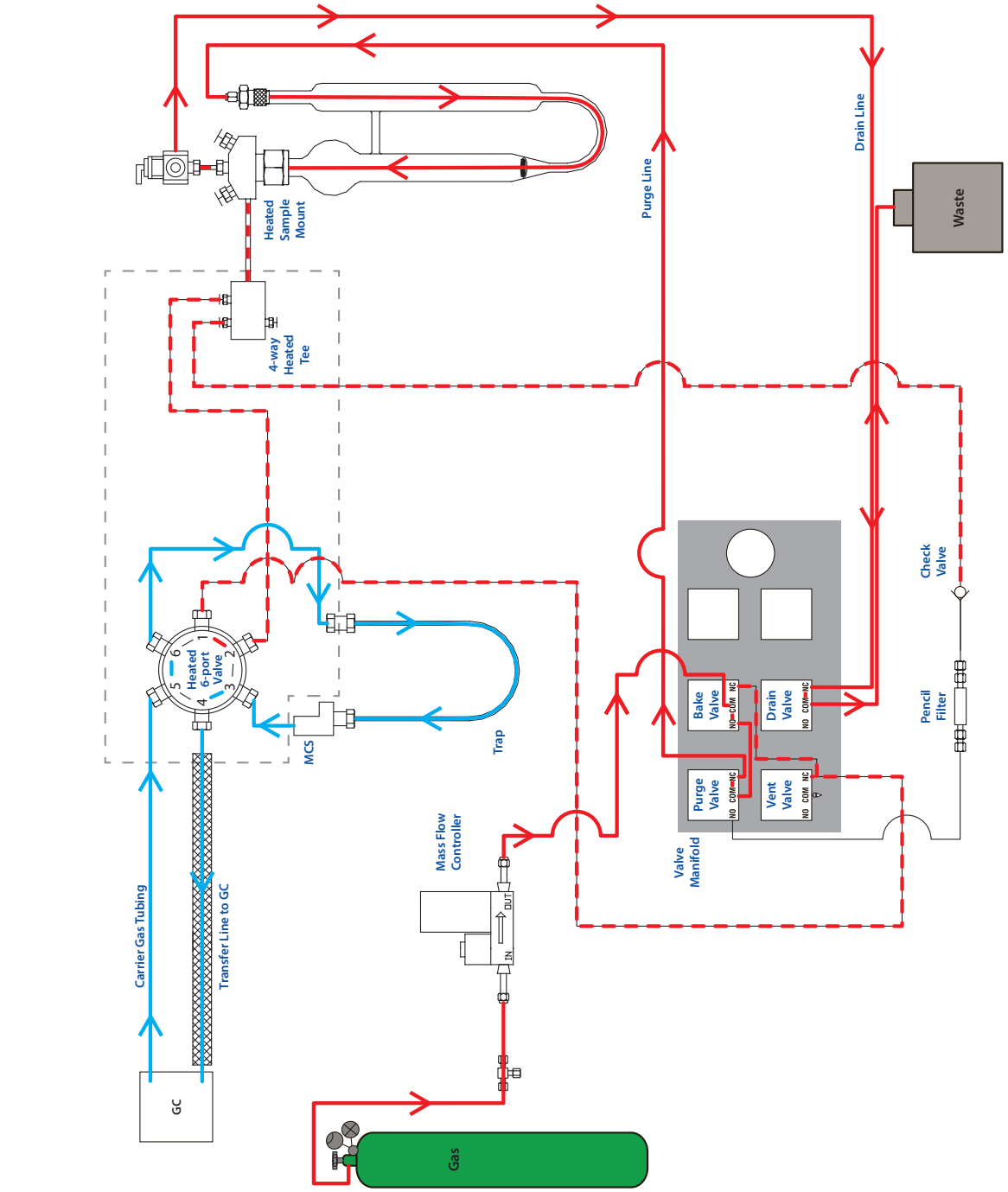
Standby/Dry Purge

A.3.3 Lumin Purge Flow Diagram



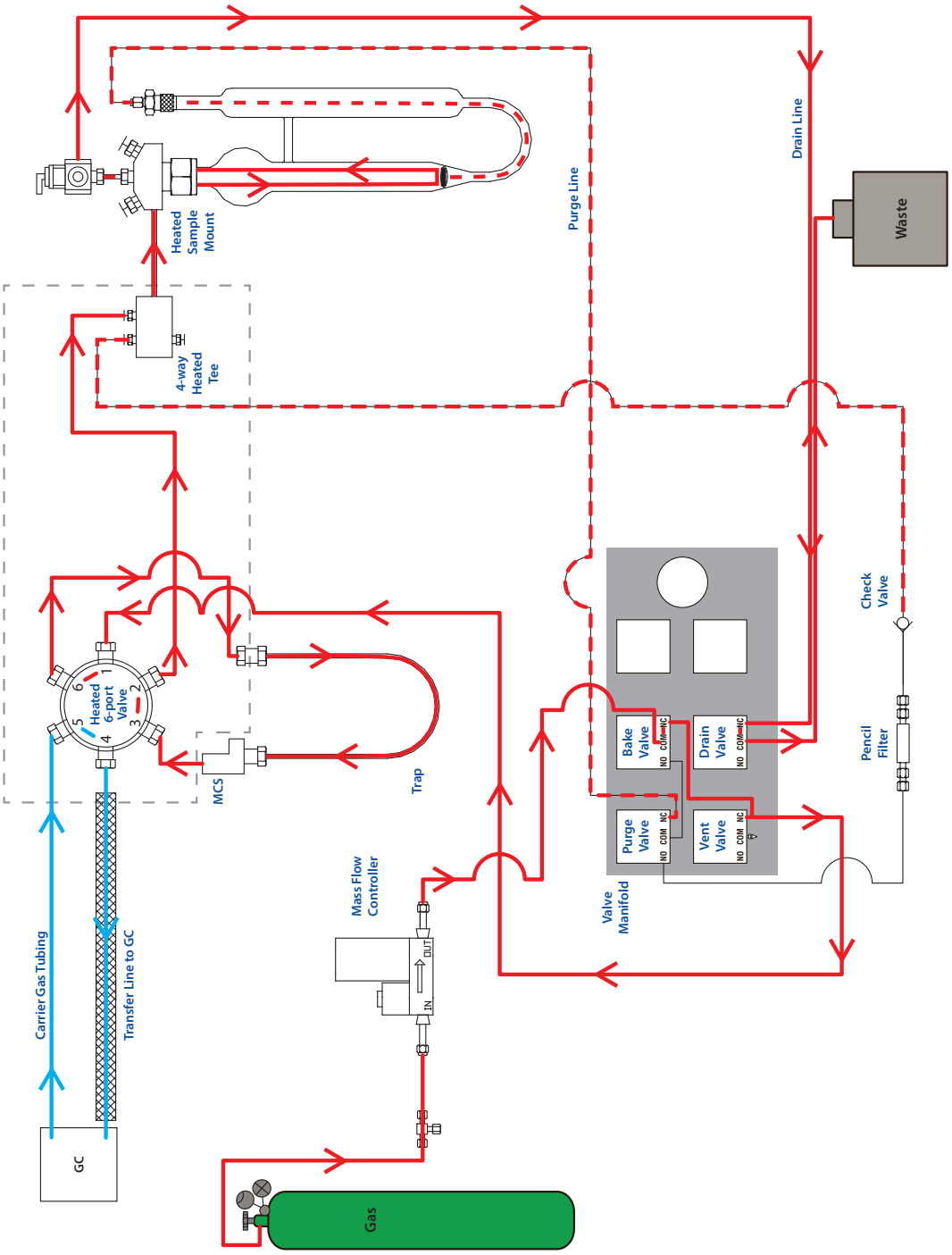
Purge

A.3.4 Lumin Desorb Flow Diagram



Desorb

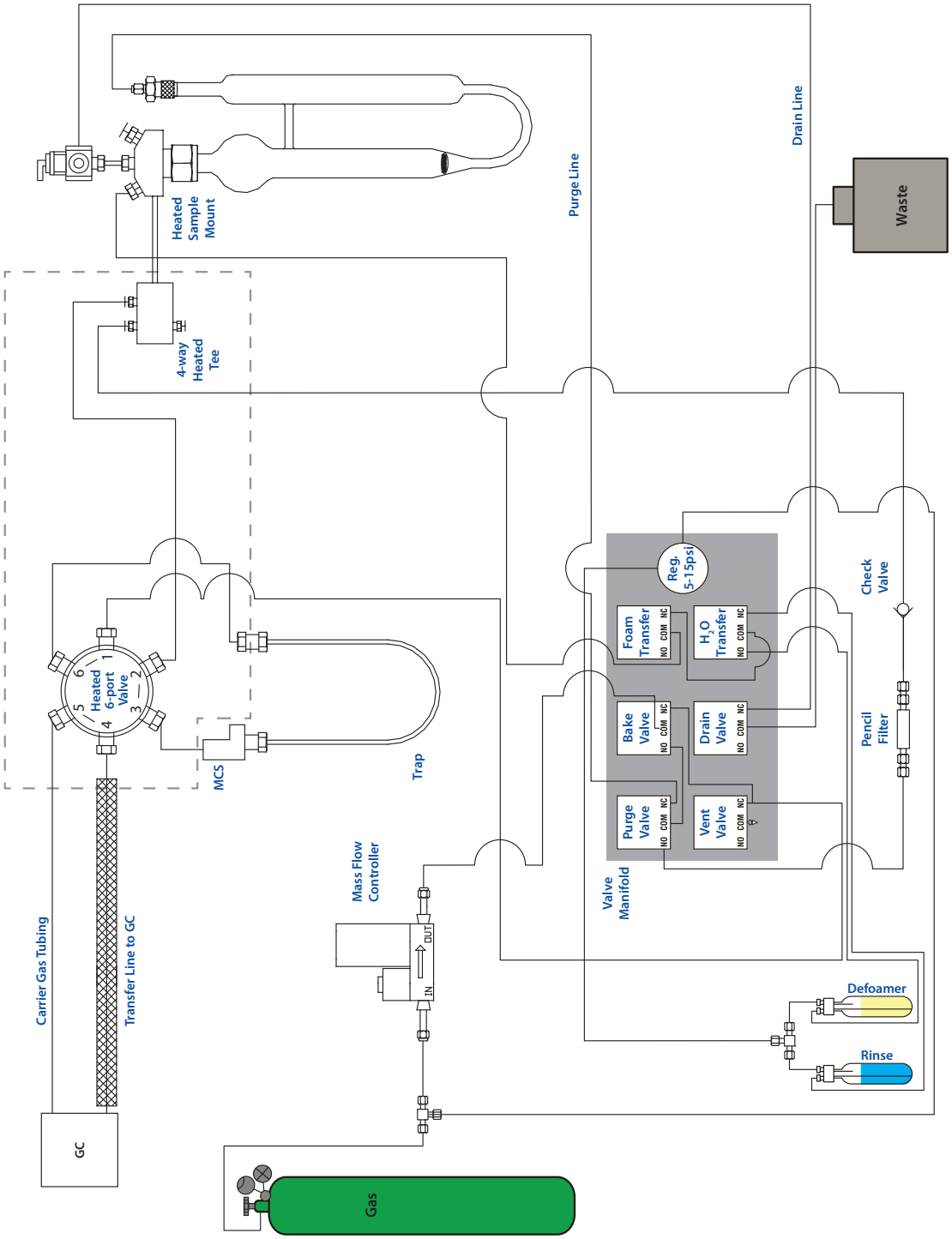
A.3.5 Lumin Bake Flow Diagram



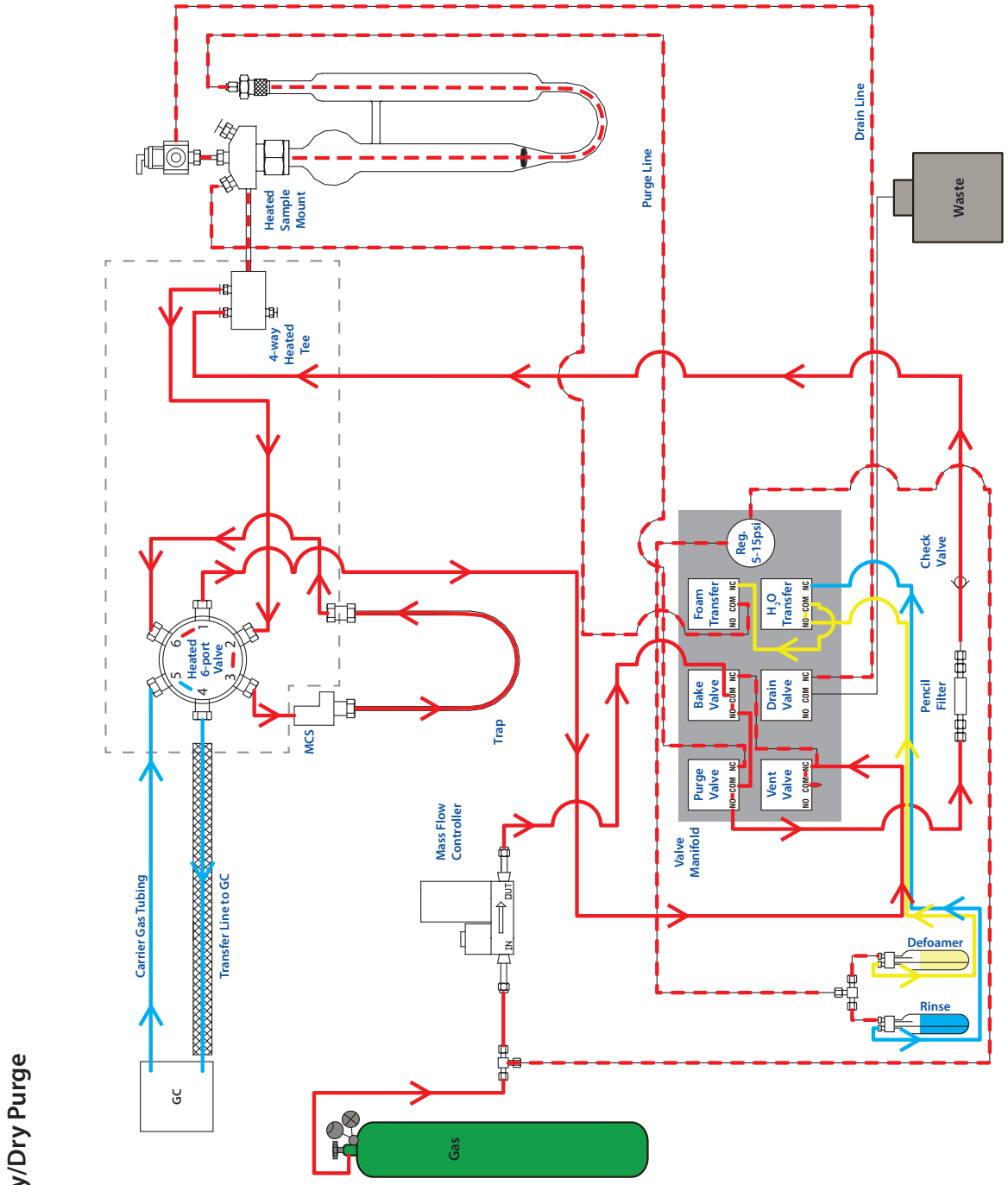
Bake

A.4 Lumin With Guardian Foam Sensor (GFS) & Eliminator Flow Diagrams

A.4.1 Lumin With GFS & Eliminator - Basic Flow Diagram

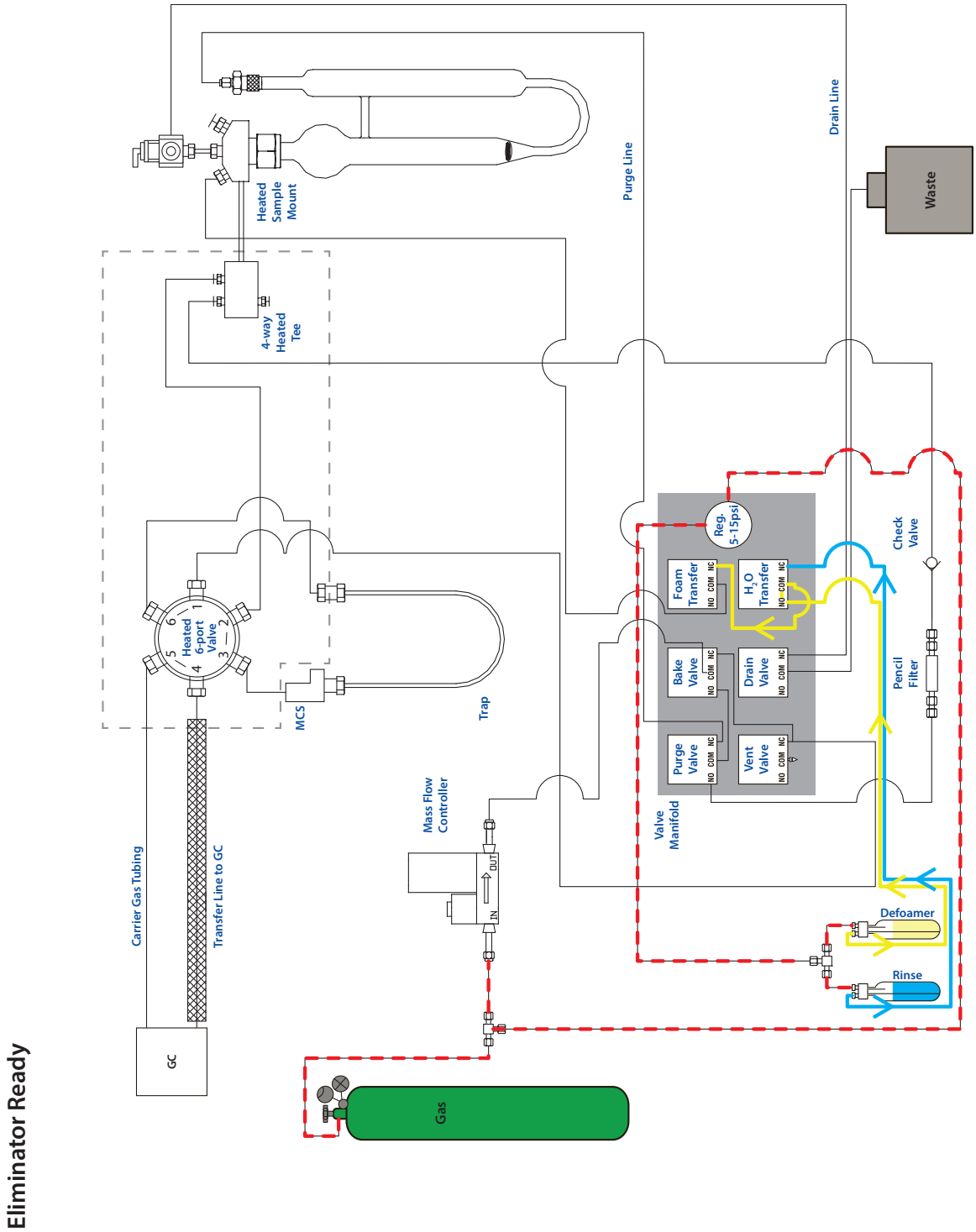


A.4.2 Lumin With GFS & Eliminator - Standby/Dry Purge Flow Diagram

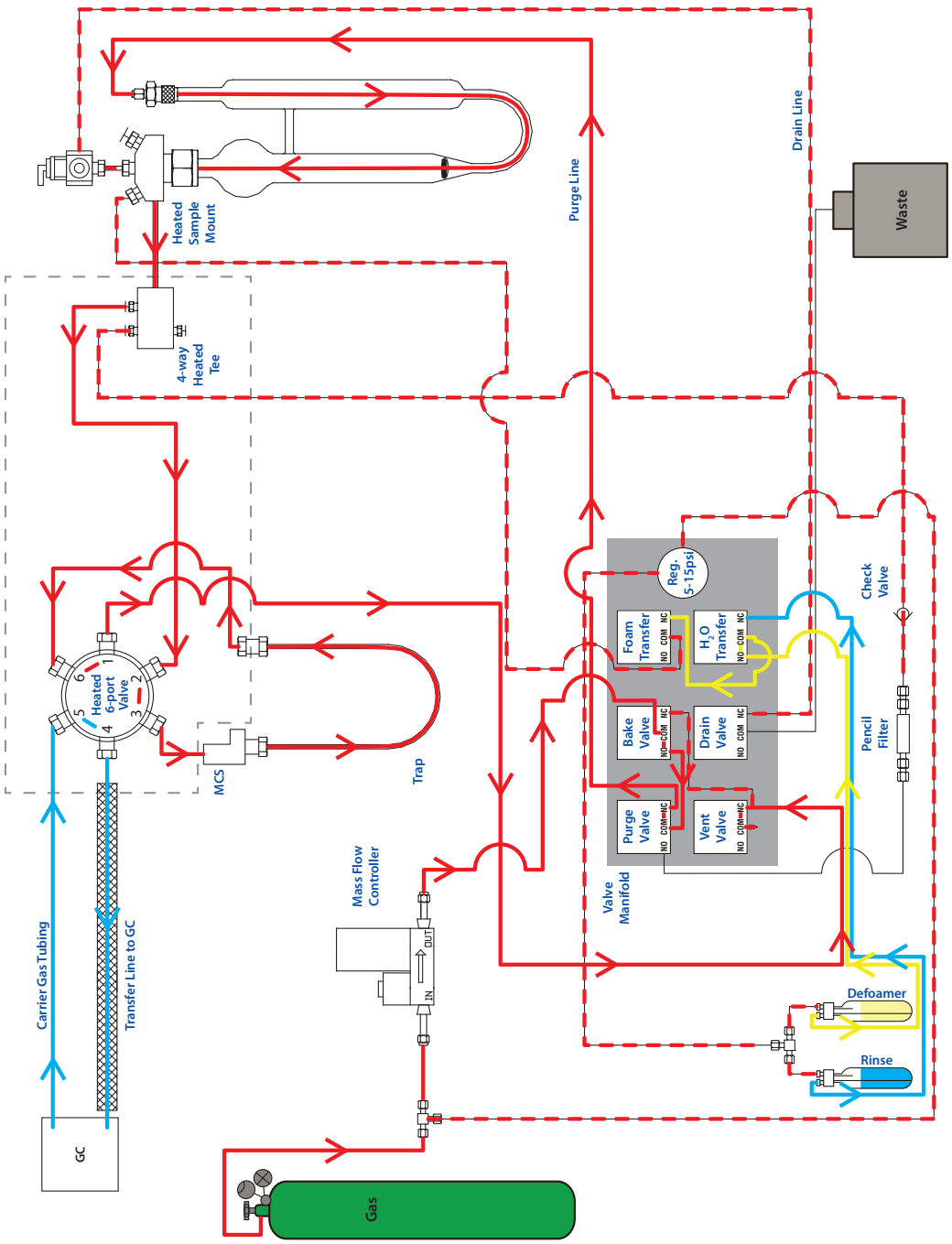


Standby/Dry Purge

A.4.3 Lumin With GFS & Eliminator - Eliminator Ready Flow Diagram

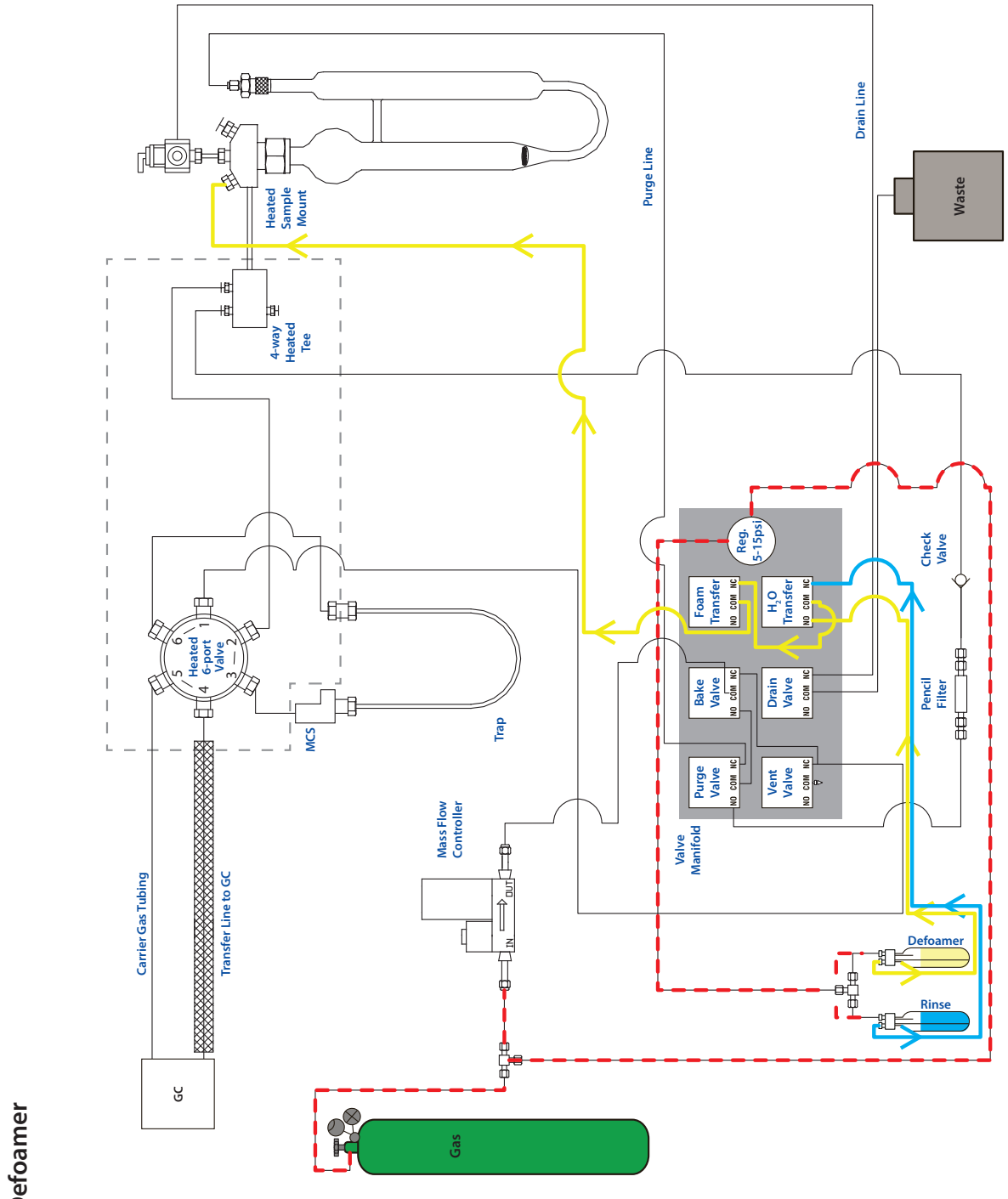


A.4.4 Lumin With GFS & Eliminator - Purge Flow Diagram

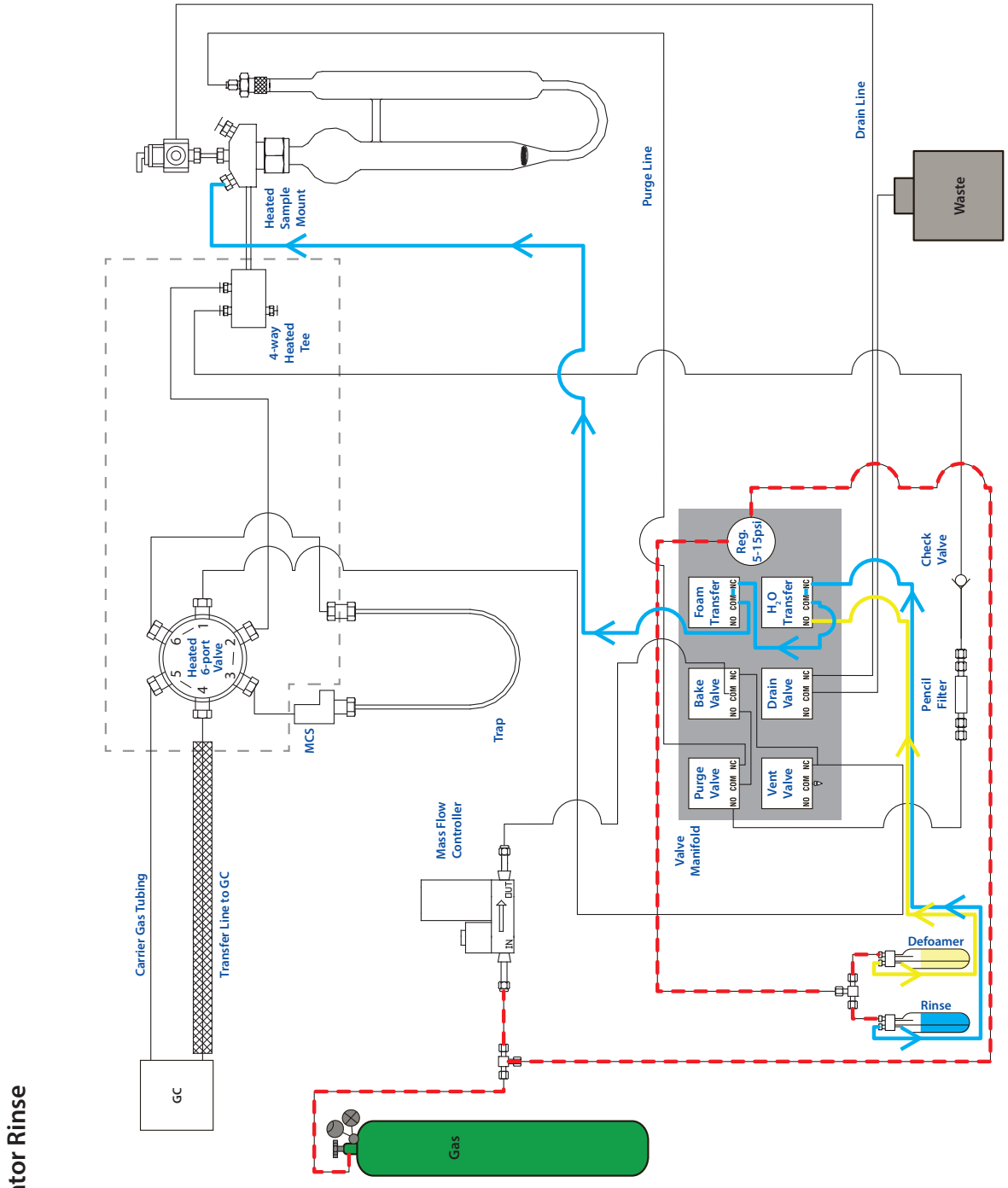


Purge

A.4.5 Lumin With GFS & Eliminator - Add Defoamer Flow Diagram

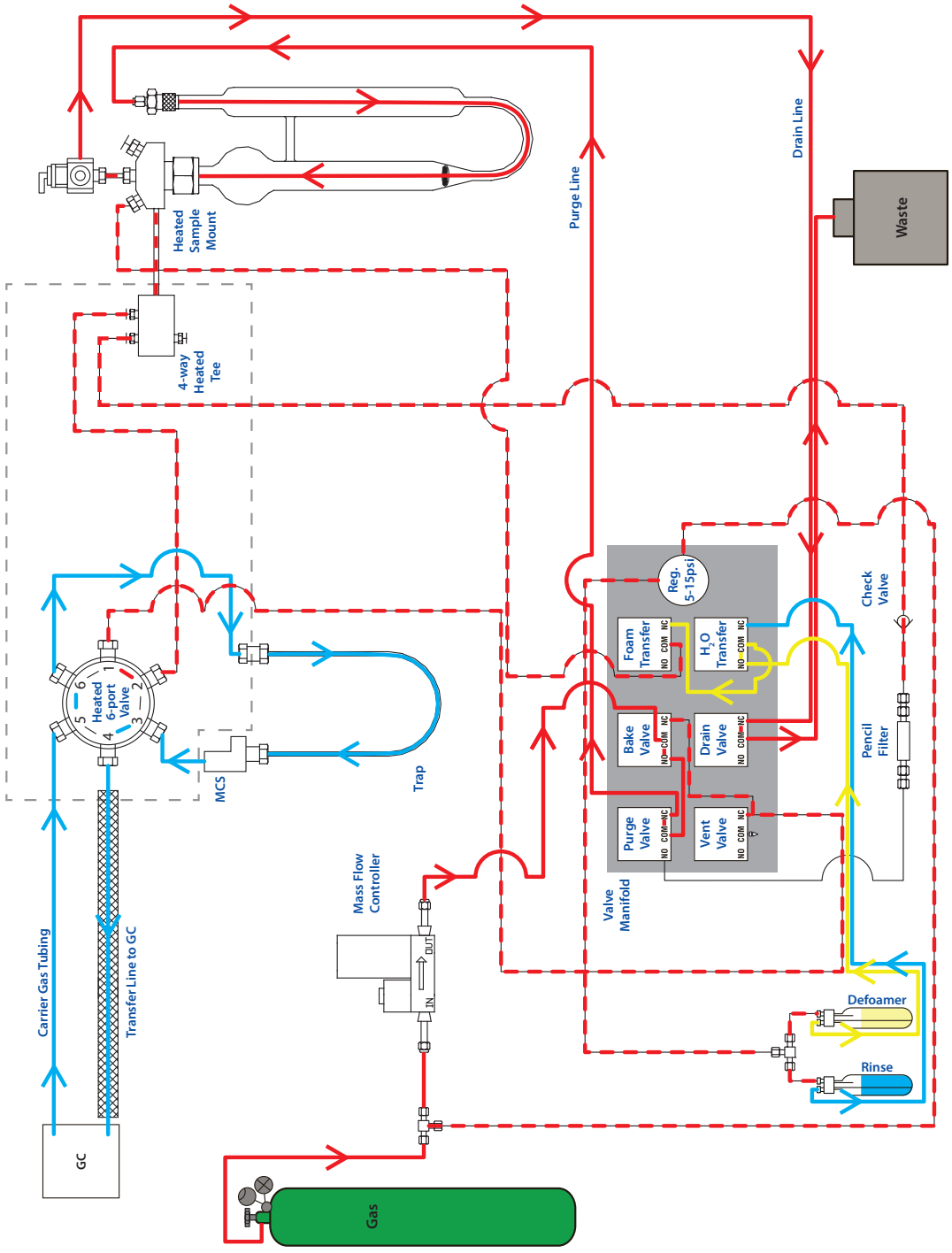


A.4.6 Lumin With GFS & Eliminator - Eliminator Rinse Flow Diagram



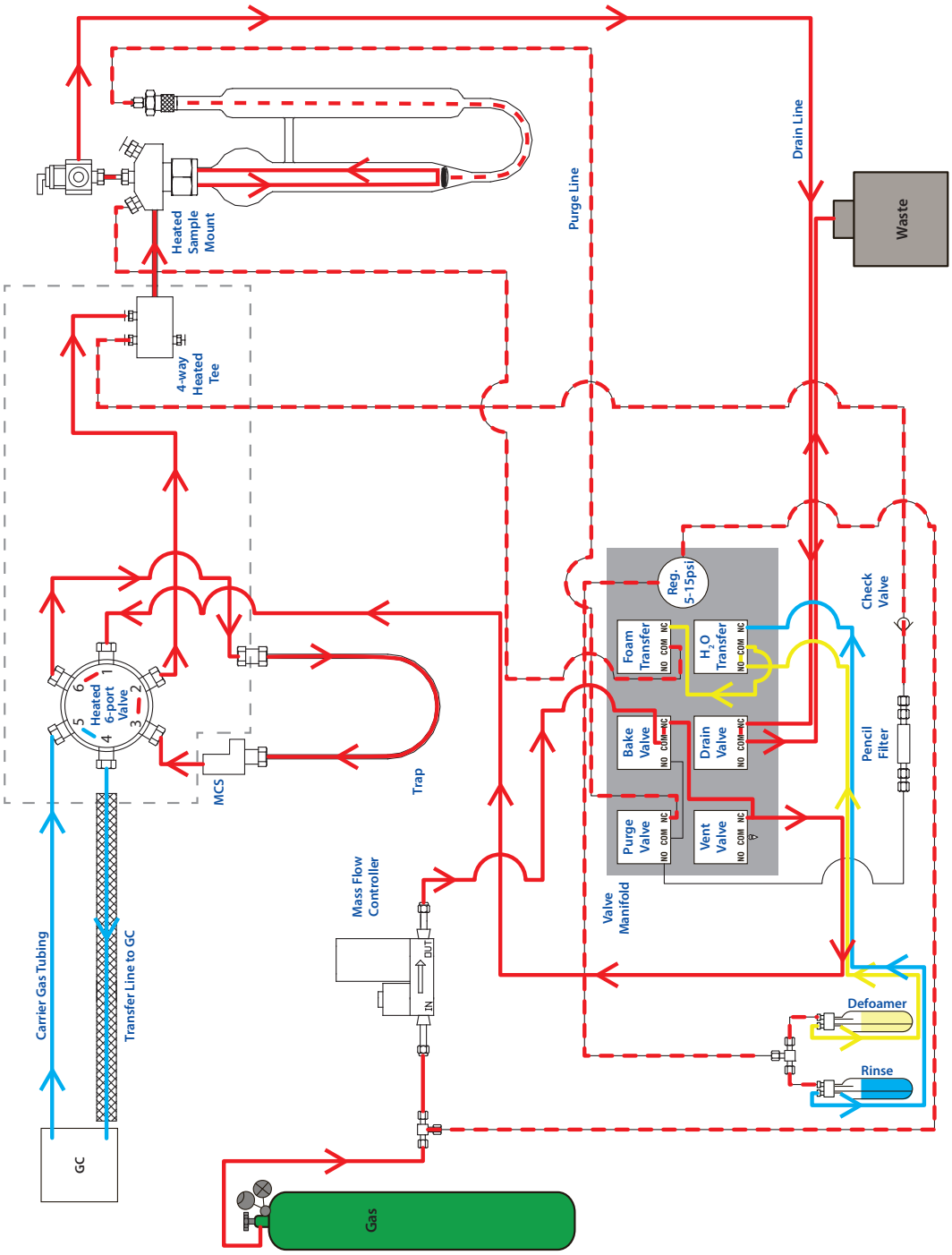
Eliminator Rinse

A.4.7 Lumin With GFS & Eliminator - Desorb Flow Diagram



Desorb

A.4.8 Lumin With GFS & Eliminator - Bake Flow Diagram



Bake

Lumin User Manual

Index

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

V

W

Intentionally Left Blank