SOLATek 72™

Multi-Matrix Vial Autosampler

User Manual

SOLATek 72

User Manual

TELEDYNE INSTRUMENTS
Tekmar
A Teledyne Technologies Company

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Preface

SOLATek 72 Multi-Matrix Vial Autosampler Description

SOLATek 72 is a microprocessor-controlled vial autosampler for purge and trap analysis of solid and liquid samples. The system prepares purge and trap samples, including drinking water, waste water, soils, and sludges. SOLATek 72 completely automates sample preparation steps for purge and trap analysis including vial handling, sample volume measurement, standard injections, dilutions, and rinsing.

The SOLATek 72 single needle design transfers liquid sample aliquots from the vial to the sparger on the purge and trap concentrator. Solid samples are purged directly in the vial, transferring purge gas to the trap of the concentrator.

SOLATek 72 offers all the capabilities you need for compliance with EPA Method 5035 for the analysis of volatile organics in soil samples, including a true closed-system technique for sample handling. The closed-system sampling technique ensures the integrity of the sample during the sample preparation process, greatly minimizing volatile organics loss.

#1

INTRODUCTION

1 Introduction

1.1 Technical Specifications

Sample Specifications	
Vials	Nominal 40 mL capacity, single hole cap with Teflon®-faced silicone septum, per EPA specifications. • 3 3/4“ (9.5 cm) high; 1 1/16” OD; 24 mm ID cap for liquid sampling
Trays	Dual removable trays for easy refrigerator storage of 40 mL vials with 36-vial capacity (72 vials with both trays). • Height: 2 1/2” (6.35 cm); Width: 5 3/4” (14.6 cm); Length: 18 7/16” (45.7 cm)
Vial Cooling (optional)	Cools samples to 4° C prior to analysis (requires an external recirculating cooling bath)
Bath Connection	Inlet and outlet hose connections require 1/4” ID rubber tubing. (Bath must have a minimum cooling capacity of 300 W)
Syringes	• Sample Syringe dispenses variable volumes of liquid from 1 mL to 25 mL (in increments of 1 mL) • Dilution Syringe dispenses volumes of sample up to 250 µL
Sample Precision	< 1% RSD (n=7) at 5 mL delivery volume measured by weight.
Sample Types	• Aqueous liquid samples, including drinking water and wastewater (water samples containing sediment levels up to 15 mm when measured from the bottom of an upright 40 mL vial) • Solid samples, including all types of natural soils and sediments
Sample Dilutions	Programmable automatic aqueous sample dilutions: 1:250, 1:100, 1:50, 1:20, 1:10, 1:5, 1:2, 1:1
Sample Gas Pathway:	• 1/16” OD Silcosteel® tubing. • Silcosteel treated fittings including the sample needle and the sample block. • Transfer line temperature variable from 35° to 300°C • Needle transfer line temperature variable from 35° to 100°C
Sample Liquid Path	1/8” OD Teflon tubing and Peek™ tubing
Standard Injection Specifications	
Systems	Option for up to three standard injection systems utilizing a 4-port, 2-position valve capable of delivering up to 5 aliquots in 5 µL increments
Precision	< 3% RSD measured by GC/FID for Fluorobenzene and Bromofluorobenzene, (n=7)
Accuracy	5 µL ± 0.25 µL
Consumption	24 µL per injection @ 15 psi system pressure
Standard Vessels	• Up to three 20 mL standard vessels, UV-coated to block ultra-violet rays for added standard stability • Standard vessels sealed to reduce standard degradation.

Table 1-1: SOLATek 72 Specifications

Technical Specifications (continued)

Other Specifications	
Vial Heater	Variable Heat Control from 35°C to 100°C.
Instrument Control	SOLATek 72 is controllable by a handheld controller, or by TekLink software in a Windows 95 or greater environment. TekLink integrates control of the 3000-Series Purge and Trap Concentrator with SOLATek 72.
Method Storage	Up to 16 methods including pre programmed USEPA methods.
Method Scheduling	Up to 32 method changes in any sample order. Solid or liquid samples can be run from any position in the sample sequence. Up to three standards can be added to any user-specified position. Multiple runs can be made from the same vial, but this practice is not recommended.
Vial Transport Device	Three-axis linear motion robotic arm utilizing linear slides, stepper motors, and optical encoders for positioning.
Sample Stirring	Stirring and agitation modes with 10 user-selectable speed settings
Cleaning	SOLATek 72 uses the High Temperature OptiRinse. This system uses dual internal reservoirs to heat blank water up to 90°C and rinses clean the entire liquid pathway including the syringe, liquid transfer line, and concentrator glassware. The system provides user control over liquid path rinse volume, and the number and volume of glassware rinses.
Purge and Trap Concentrator Communication (Input Signals)	• Handshake through relay contact closures • TTL Logic • RS-232 for advanced communications
Purge and Trap Concentrator Communication (Electronic Control)	Modular four microprocessor system linked via RS-485 communications: • Two Motorola 68332 microprocessor embedded controllers, 16 MHz CPU, 4 MB flash, 4 MB RAM; Two Motorola HC 711 microprocessor embedded controllers, 16 MHz CPE, 4 MB flash, 1 MB RAM
Certifications	CE, CETL, CSA, ETL

1.2 Site Requirements

Site Requirements	
Dimensions	Height: 21 5/8” (55.3 cm) Width: 25 3/4” (65.4 cm) Depth: 25” (63.5 cm)
Weight	115 lb (unit); 172 lb (shipping)
Power Requirements	• 100/120/240 VAC (±10%) factory configured) • 50/60 Hz, 8.0/4.0 AMPS, 960VA
Environmental Specifications	Operating Temperature: 10° to 32°C Storage Temperature: -20° to 60°C Relative Humidity: 10% to 90%
Gas Supply Requirements	Ultra high Purity (99.999%) pure helium or nitrogen Incoming Pressure: 20-60 psi (100 psi max.)
Water Supply	Requires use of GAC filter with either a tap rinse kit or a reservoir kit (10-15 psi recommended, 28 psi max)

Table 1-2: SOLATek 72 Site Requirements

1.3 SOLATek 72 Components

This Chapter describes and illustrates the internal and external parts of the SOLATek 72.

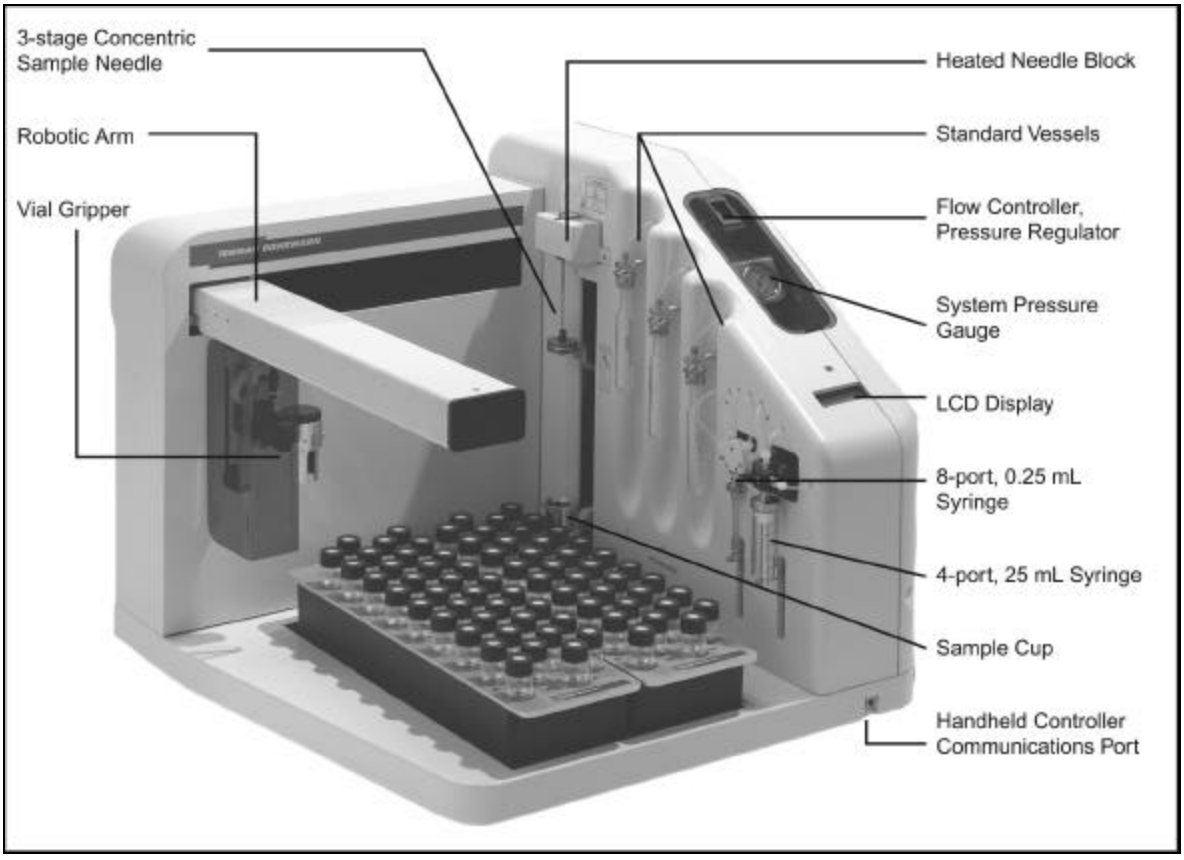


Figure 1-1: SOLATek 72 (Front)

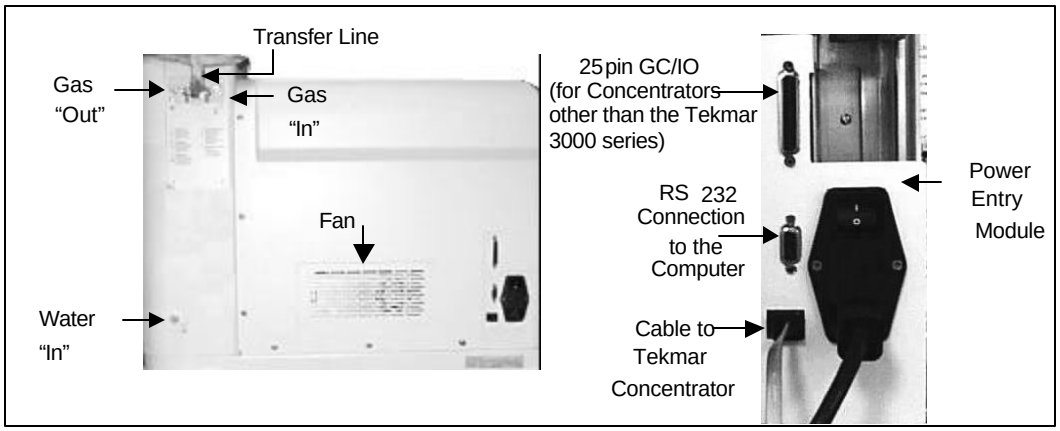


Figure 1-2: SOLATek 72 - Rear View

1.4 Vials

The standard USEPA-approved 40mL glass vial is commonly used for environmental samples. Tekmar recommends Teledyne Tekmar VOA vials.

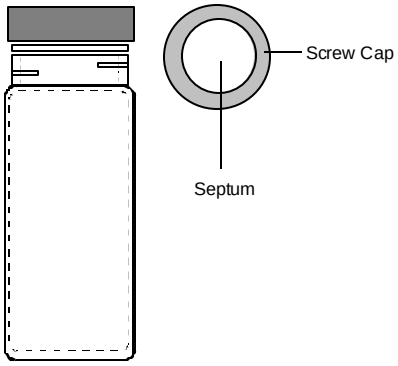


Figure 1-3: Vial

1.5 Status Indicators

The screen below the System Pressure Gauge on your SOLATek 72 displays information concerning the status of your instrument (Figure 1.4). This screen indicates:

- The SOLATek 72 current mode of operation
- When the SOLATek 72 is operating automatically
- When the SOLATek 72 in “hold” mode
- An error
- The mode in which the error occurred

1.6 Pressure Gauge, Pressure Control, and Flow Control Knobs

Above the screen display the SOLATek 72 has a System Pressure Gauge, a Flow Control knob, and a Pressure Regulator knob.

- The Flow Control Adjustment maintains the flow rate of gas traveling through the system flow paths.
- The System Pressure Regulator regulates pressure throughout the system.

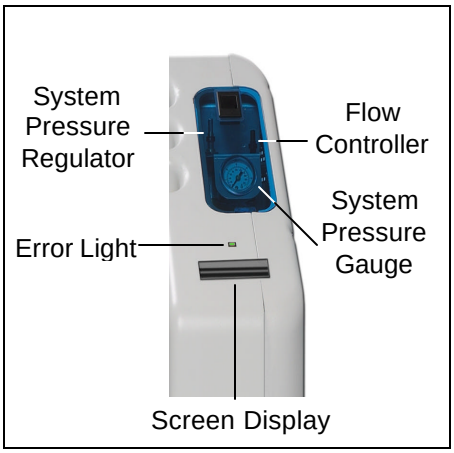


Figure 1-4: System Regulator and Pressure Flow Control Adjustment

1.7 Standard Vessels

Standards are stored in glass 20mL vessels with UV-coating. The coating prevents transmission of UV radiation, preserving standard integrity.

SOLATek 72 is equipped with up to three standard vessels. Each vessel holds a maximum standard volume of 20 mL. From left to right the standard vessels are referred to as ST3, ST2, and ST1.

Each standard vessel is pressurized to 15 psi and can deliver one to five aliquots, in 5µL increments to each sample. Each standard has a maximum volume of 25µL. 75µL can be added to each sample if all three standards are used. You can use any combination of the three standards, in units of 5µL to ≤ 75µL.

Standard Volume (µL) Addition per Sample	
# Aliquots	**ST1, ST2, ST3**
0	0
1	5
2	10
3	15
4	20
5	25

Table 1-3: Standard Additions

Figure 1-5: Standard Vessels

1.8 Syringes

The SOLATek 72 has a Sample Syringe and a Dilution Syringe:

- The 25 mL Sample Syringe the system accurately dispenses 1 to 25 mL of liquid at 1 mL increments (±1%))
- The 250 µL Dilution Syringe dispenses volumes of sample up to 250 µL

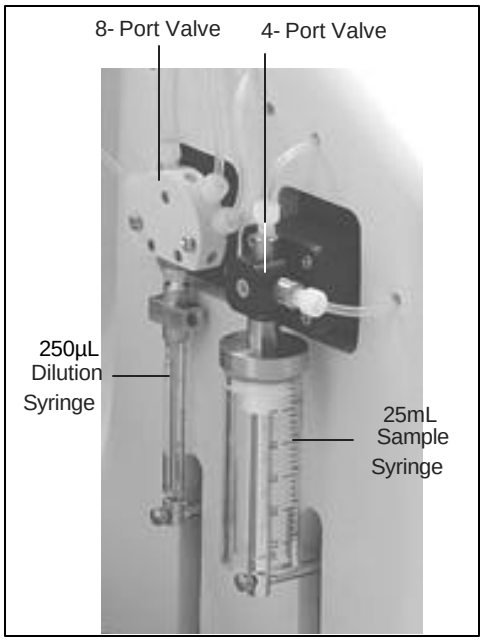


Figure 1-6: Sample Syringes

1.9 Robotic Arm

The robotic arm is an electronically controlled mechanism that transports vials between the vial tray and the sample cup. The arm moves in three directions:

Arm Direction	Movement	Range
Side to Side	X	Maximum of 15” (38.1 cm)
Front to Back	Y	Maximum of 11” (27.9 cm)
Up and Down	Z	Maximum of 4” (10.2 cm)

Table 1-4: Robotic Arm Parameters

Figure 1-7: Robotic Arm Movement (X, Y, and Z)

1.10 Sample Module

The SOLATek 72 processes samples at the Sample Station. The Robotic Arm places the sample vial in the Sample Cup and the Elevator Assembly lifts the vial, piercing the septum with the concentric needle. A sample, or sample gases, is removed from the vial, and the robotic arm returns the vial to the tray.

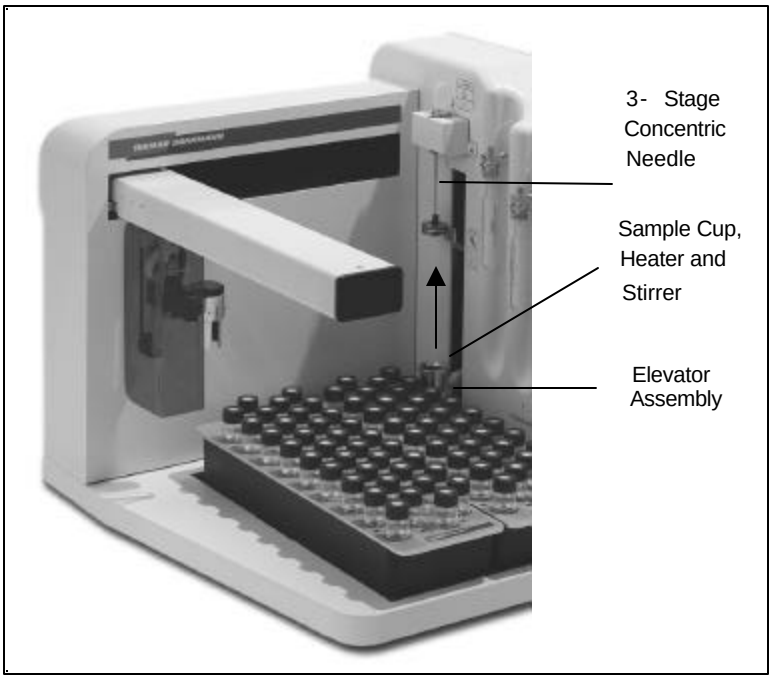


Figure 1-8: Sample Module

1.11 Sample Needles

The module that processes the samples uses a dual function concentric sample needle. The same needle is used for soil and aqueous samples. Concentric needles have the same center (one needle is inside the other). SOLATek 72 positions the inlet of the inner needle 3/4” above the bottom of the vial. Samples leave the vial through this inlet. The outlet of the outer needle is positioned 1/8” below the septum. At this outlet the headspace in the vial is pressurized with gas.

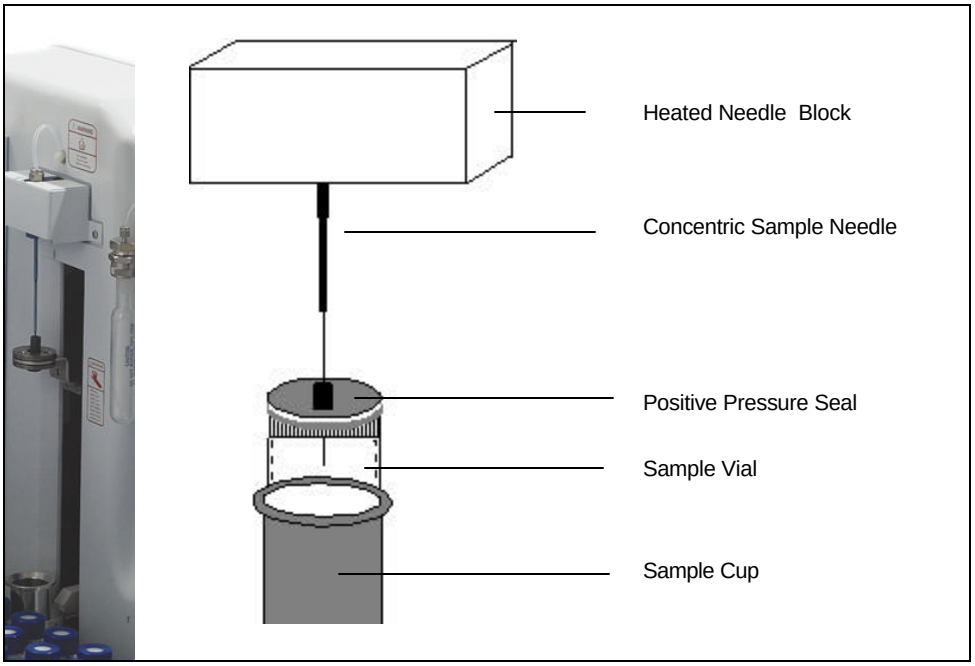


Figure 1-9: Concentric Sample Needle

1.12 Sample Cup

The Sample Cup holds the vial while the SOLATek 72 moves it onto and off the sample needle. The sample cup also serves as a drain. The cup catches liquid that that been flushed through the sample needle. The liquid exits through a drain, into the bottom of the cup, and out the drain line.

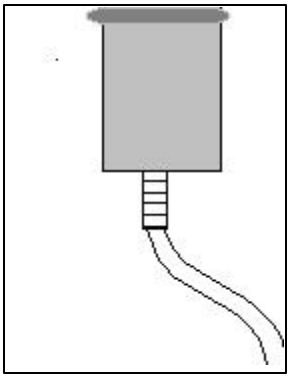


Figure 1-10: Sample Cup and Drain

1.13 Vial Trays

Two removable vial trays hold 72 vials (36 vials per tray). This allows the user to process one load of 36 samples while the other tray is being prepared or refrigerated. The vial chiller (optional) can also be used to cool the vials.

The base plate in front of the SOLATek 72 holds the vial trays. The robotic arm removes the vial from a tray and places it into the sample cup.

Vials must be inserted in an upright position with caps on top.

Figure 1-11: Vial Trays

1.14 Handheld Controller

The handheld controller is the interface allowing you to configure and operate the SOLATek 72 and Tekmar 3000 series concentrators.

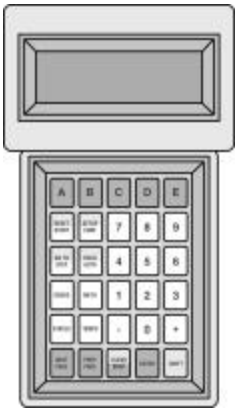


Figure 1-12: Handheld Controller

1.15 Vial Chiller (optional)

The Vial Chiller Assembly is inside the SOLATek 72, underneath the vial trays. Recirculating coolant maintains a sample temperature, preventing loss of sample integrity and reducing the possibility of microbial activity in aqueous samples.

The vial chiller must be connected to an external recirculating cooling bath.

1.16 Electronic Connections

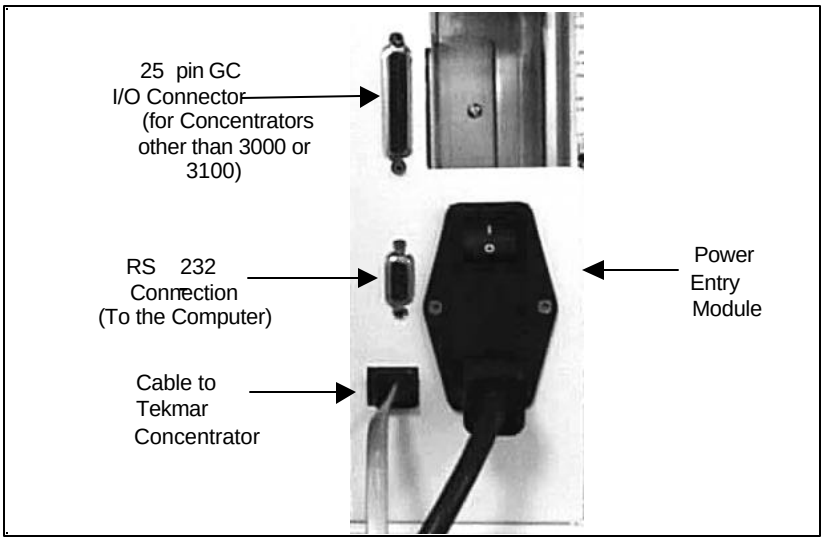


Figure 1-13: Connectors (Back Panel of SOLATek 72)

1.17 Heaters

When processing solid samples the SOLATek 72 heats the sample pathway to aid in sample transfer and prevent carryover.

Heated Rate Zone	Temperature Range (Celsius)	Rise Rate (°C/minute)	Cool down (°C/minute)
Vial Sample Cup	Ambient +5 to 100	>50	>10
Needle Block	Ambient +5 to 100	>50	>10
Soil Valve	Ambient +5 to 300	>50	>10
Transfer Line (Switching Valve to Concentrator)	Ambient +5 to 300	>50	>10
Rinse Water	Ambient +5 to 90	-	-

Table 1-5: Heated Zones (Aqueous & Solid Systems)

1.18 Valves

Valves regulate gas and liquid flow throughout the SOLATek 72. SOLATek 72 uses a variety of valves depending on the type of sample you are running.

For more detailed valve configurations, refer to the flow diagrams in Chapter 5 of this manual.

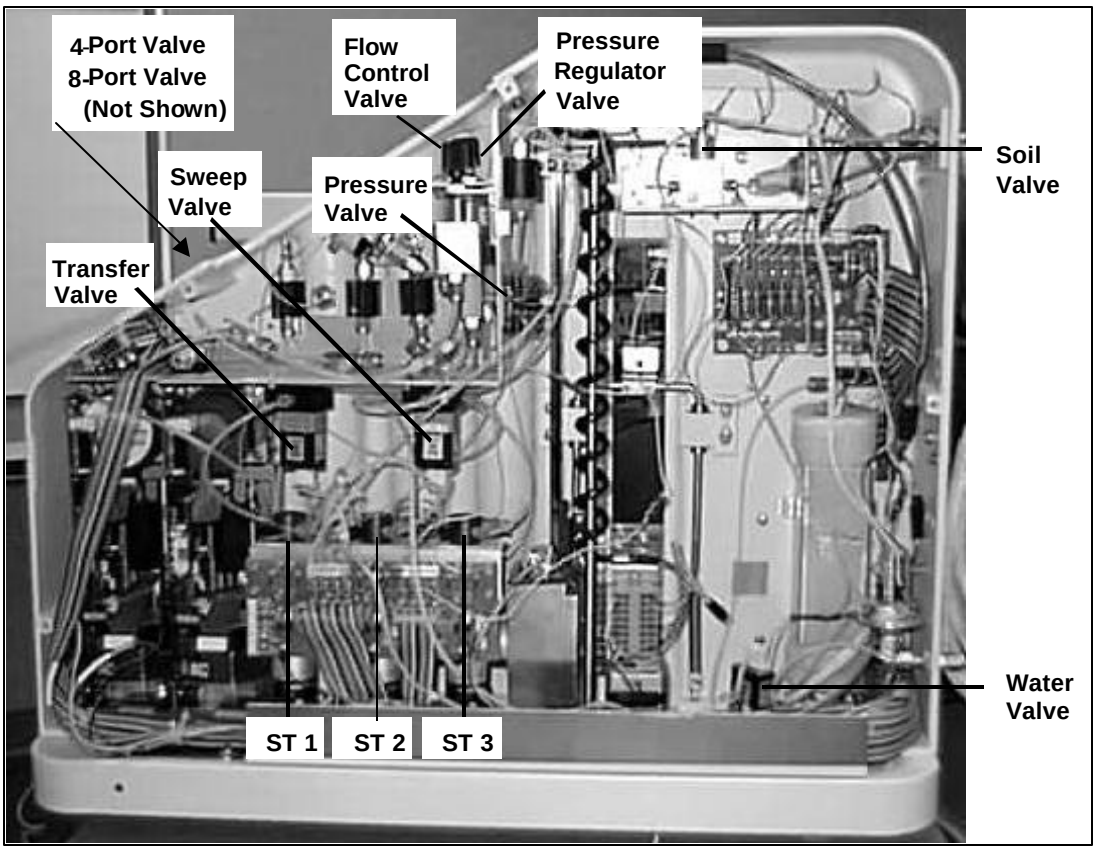


Figure 1-14: SOLATek 72 Valve Locations

1.19 PCB Boards

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

Refer to board pictures and diagrams in Chapter 4 (Preventive Maintenance & Troubleshooting) should you need to replace a board or cable.

- CPU Board
- Motor Board
- Temperature Control Board
- Relay Control Board
- Valve Interface Board
- Valve Control Board

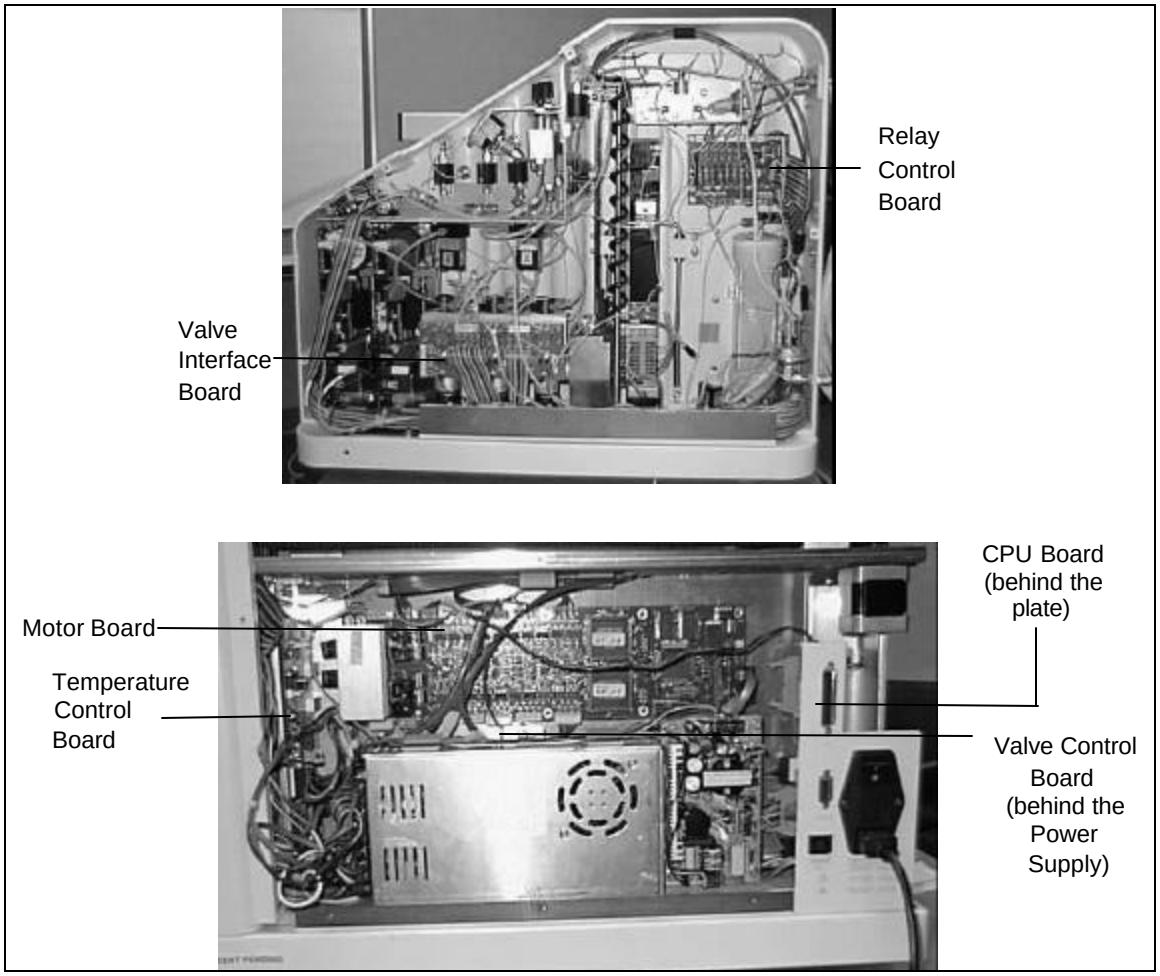


Figure 1-15: SOLATek 72 Board Locations

1.20 Motors

SOLATek 72 motors control the arm and elevator motion, gripper retrieval and disposal, internal standard activation, and 4 and 8-port valve actuation. All motors operate on 24 VDC. The fans on the side and rear of the SOLATek 72 pull their 24 VDC power from the Valve Control Board.

- Elevator Motor
- Gripper Motor
- X, Y, and Z Drive Motors
- Mixer Motor
- Standard Injection Motors (3)
- Plunger Motors (2)
- Syringe Valve Control Motors (2)

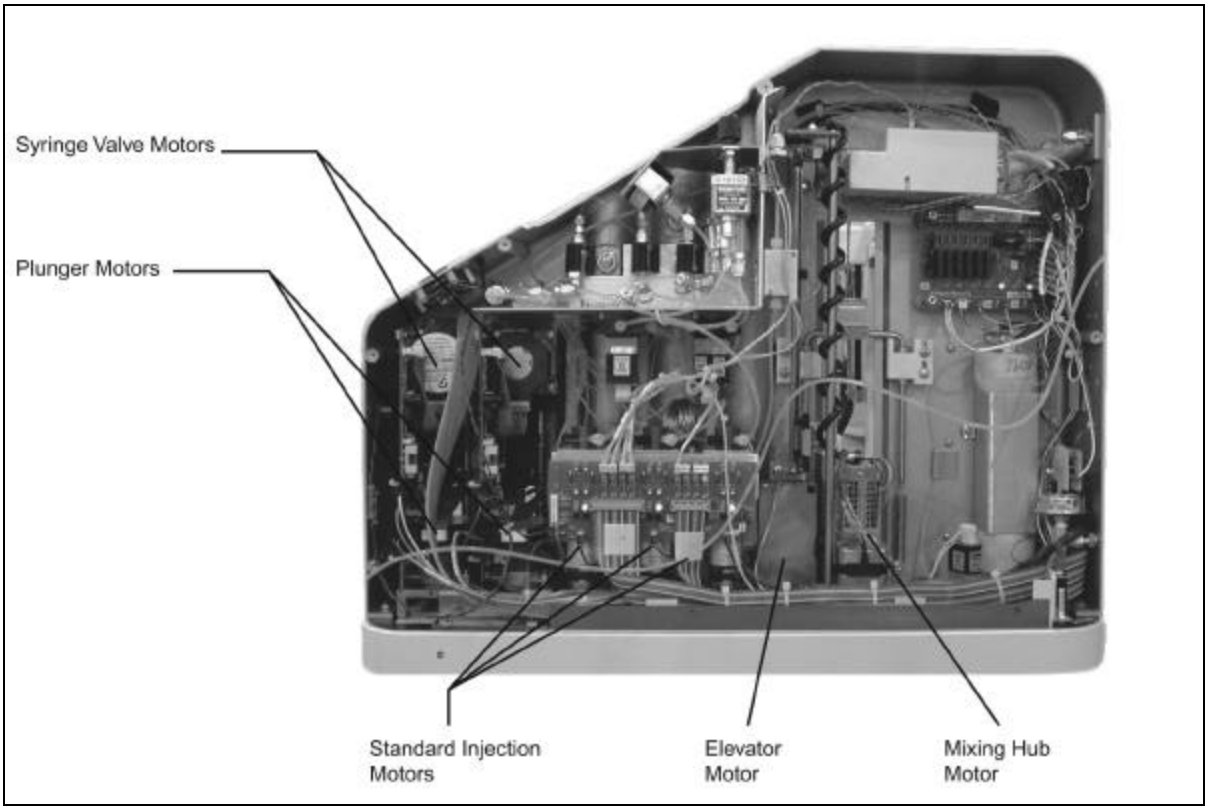


Figure 1-16: SOLATek 72 Motor Locations (1)

Motors (continued)

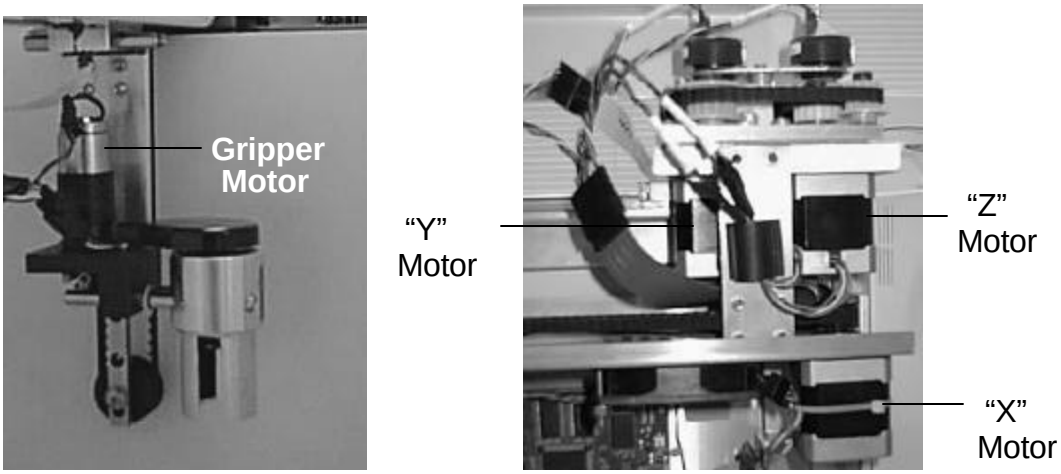


Figure 1-17: SOLATek 72: Motor Locations (2)

1.21 Power Supply

The Power Supply is located in the back of the unit, in front of the Valve Control Board. The Power Supply accepts 100 to 240 VAC. 240 VAC units have different fuses in the power entry module and heaters.

- 24VDC is used for the motors, solenoid valves, and the pumpers
- +/- 15 VDC is used on the Temperature Control Board for temperature conditioning
- 5VDC is used for Logic Signals

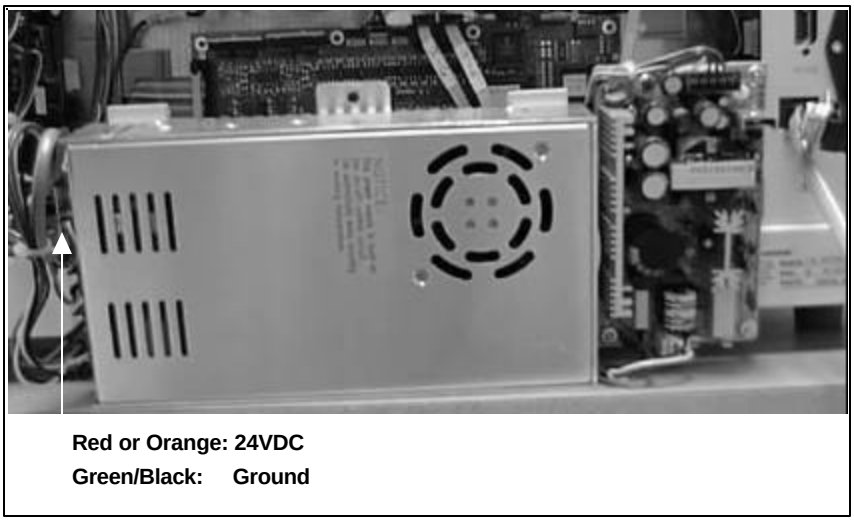


Figure 1-18: Power Supply

#2

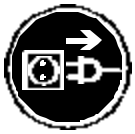
INSTALLATION

2. Installation

2.1. Safety

The following Safety symbols may be used throughout the manual.

The following Safety Precautions must be strictly observed:

	Never use hydrogen or other flammable gases with the SOLATek 72. Use only 99.999% ultra high pure helium or nitrogen. The wrong gas can explode or catch on fire.
	When using gas and chemicals follow the manufacturers' directions for safe handling. Gas and chemicals can explode or catch on fire if you use them improperly. Refer to Material Safety Data Sheets for information on safe handling.
	Voltages inside the SOLATek 72 can cause electrical shock and other injuries. Use the following precautions when working with the SOLATek 72: • Do not process samples without the panels in place. • Do not remove panels unless necessary. • Plug SOLATek 72 into outlets that provide the proper voltage.
	To avoid electrical shock, turn off and unplug the SOLATek 72 and the concentrator before removing panels.
	• Do not use an extension cord with the SOLATek 72 or the concentrator; it can overheat and cause a fire. • The three-wire power cord is a safety feature. Plug the power cord into a properly grounded outlet.
	Some Tekmar components heat to high temperatures. To avoid being burned allow the instruments to thoroughly cool before you remove the panels.
	Always keep hands, hair, jewelry, and clothing away from moving parts. Since you may not be able to predict when a part will move, turn off and unplug the SOLATek 72 before you place your hands near parts that can move. Whenever possible, stop a moving part by using a software command. If this is not possible, stop movement by turning off SOLATek 72.

	Do not place your hands near the sample needle. The cup or module that raises and lowers the vial can push your hand into the needle.
	**CAUTION** Hazardous situation, which, if not avoided, will result in product or property damage and possible injury. **WARNING** Potentially hazardous situation, which, if not avoided, can result in death or serious personal injury. **DANGER** Imminently hazardous situation, which, if not avoided, will result in death or serious injury.

Figure 2-1: Safety Symbols

2.2. Installation Requirements

Refer to Table 1.2 for the Site Requirements for the SOLATek 72.

2.2.1. Setup and Installation Tools

The following tools are needed for installation:

- Set of open-end Wrenches
- Needle Nose Pliers
- Set of Allen Wrenches
- Set of Flat head screwdrivers
- Set of Philips head screwdrivers
- Utility knife or scissors
- Flow Meter (recommended)
- Leak Detector (recommended)

2.2.2. Workspace Placement

SOLATek 72 weighs 115 lbs. Make sure the surface that supports the SOLATek 72 is level, stable, and capable of supporting the weight of the unit.

SOLATek 72 has several drainage tubes that exit at the rear of the unit. These tubes must have adequate space to extend without being crimped, bent, or impeded in any way. Failure to allow for unimpeded drainage may damage your system.

2.3. Making Connections

For a more detailed setup diagram, refer to the “Recommended SOLATek 72 Bench Setup” diagram in Chapter 5.

The SOLATek 72 must be connected to:

- Purge and Trap Concentrator
- Gas and water supplies
- Drain lines leading to a repository
- After connecting SOLATek 72 to the gas and water supplies, concentrator, and accessories, you must set pressure, adjust flow rates, and leak check all connections. Refer to Chapter 3 (Operation) for the correct procedures for these operations.

2.4. Installing a Purge and Trap Concentrator

Refer to the Service Manual for your model concentrator for detailed installation instructions.

2.5. Connecting SOLATek 72 to a Gas Supply

Connect the carrier gas (Helium or Nitrogen regulated to < 100 psi) to the port labeled “GAS IN” on the rear panel of the SOLATek 72.

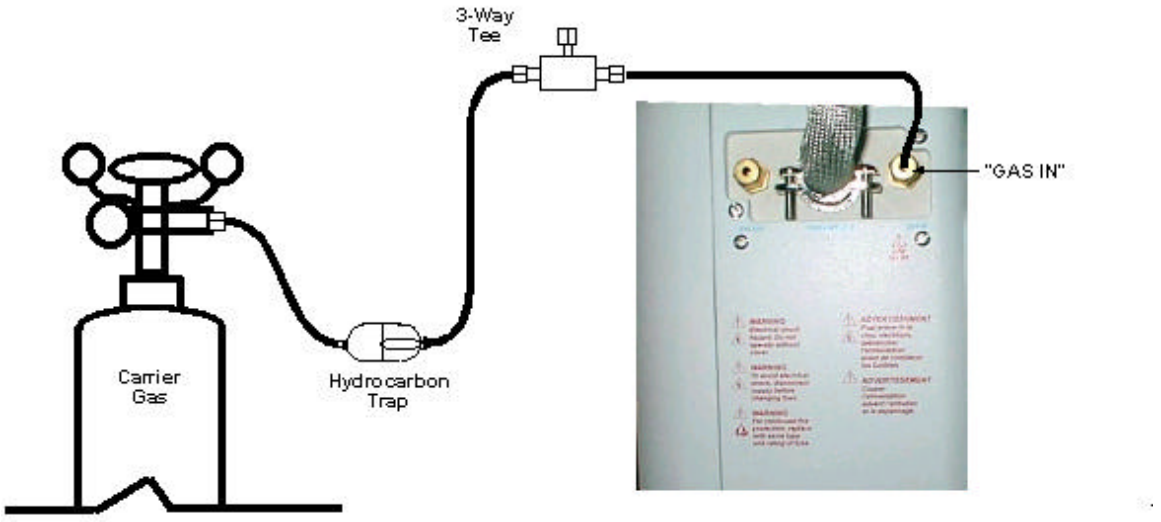


Figure 2-2: Connecting SOLATek 72 to a Gas Supply

2.5.1. Connecting the Gas Supply to a Hydrocarbon Trap and Tee Union

SOLATek 72 requires a high purity (99.999%) helium or nitrogen gas supply. The gas enters SOLATek 72 through the copper tubing and a hydrocarbon trap. The trap and copper tubing are located in the SOLATek 72 kit box.

Note: If you need to attach other instruments to the line, you may connect a tee union (usually 1/8") to the tubing between the hydrocarbon trap and the unit (on the same tubing).

To make the connections:

1. Refer to the Appendix: *Swaging a Nut and Ferrule onto Tubing.*

2. Turn off the gas supply to the concentrator.

3. Disconnect the tubing from the outlet of the hydrocarbon trap between the supply tank and the rear of the concentrator. Remove any existing union.

4. Use tubing and a 1/8" brass ferrule and nut assembly to connect the tee union on the outlet side of the hydrocarbon trap. Make sure that the small part of the ferrule faces the outlet of the trap.

5. Tighten the nut ¾ turn (270°) past finger tight.

6. Reconnect the tubing (that you disconnected in Step 3) to the tee union. Use the 1/8" brass nut and ferrule

2.5.2. Connecting Tubing from the Hydrocarbon Trap to SOLATek 72

To connect tubing to SOLATek 72:

1. Check the direction arrow on the hydrocarbon trap and verify that the direction of the gas flow is correct.

2. Route tubing from the hydrocarbon trap to the rear of SOLATek 72. Teledyne Tekmar recommends leaving a few extra feet of tubing so that SOLATek 72 may be easily moved.

3. Using the 1/8" brass nut and ferrule assembly, attach the tubing to the connection labeled: "Gas In" on the rear of SOLATek 72 (Figure 2.2).

.

2.6. Connecting SOLATek 72 to a Water Supply

CAUTION!

Failure to connect SOLATek 72 to a water supply can clog the sample pathways and void your warranty.

You can connect SOLATek 72 to a water supply using an external tap rinse kit, or a Teledyne Tekmar rinse reservoir kit.

- If you choose an external tap rinse kit, connect SOLATek 72 to a water pipe. Refer to the installation directions that come with your rinse kit
- If you use the Teledyne Tekmar rinse reservoir kit, water is provided via a reservoir or container. Refer to the installation directions that come with your external reservoir kit

2.6.1. Installing the Water Filter

Note: It may be necessary to cut tubing to install the water filter. If this is the case, make sure your cuts are clean and free of burrs and your openings round, and free of distortion.

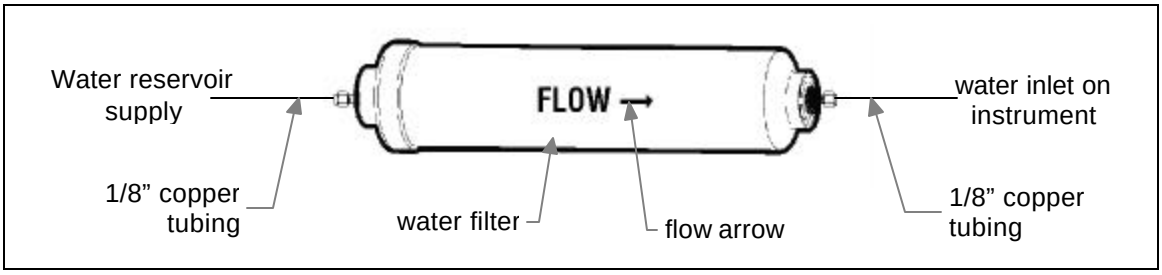


Figure 2-3: Connecting the Rinse Water Filter

1. Turn off the water supply.
2. Remove the old filter (if installed). As you loosen the nuts or fittings, some “leftover” water may leak from the filter and lines.
3. If you remove an old filter, you should not have to cut lines. Install the new filter using the existing lines. Examine the existing lines for damage and fix imperfections.
4. Loosen the nuts on the ends of the water filter. Be careful not to lose the ferrules, which are inside the nuts.

Note: Locate the flow arrow (Figure 2-3) on the water filter. This arrow must point away from the water supply line.

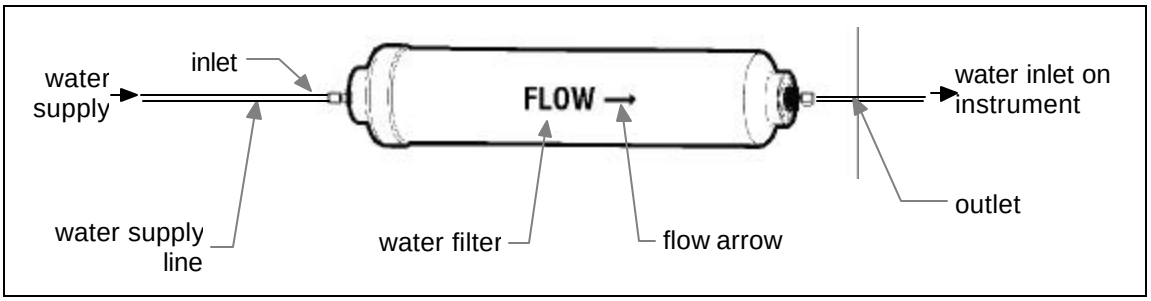


Figure 2-4: Direction of Water Flow

5. Slide one of the nuts, then one of the ferrules, on to the end of the water supply line.

6. Connect the water supply line to the INLET on the water filter. **Do not over tighten the nut**.

7. Connect another line to the other end of the water filter.

8. If you have not already done so, connect the opposite end of this line to the water inlet on the back of SOLATek 72.

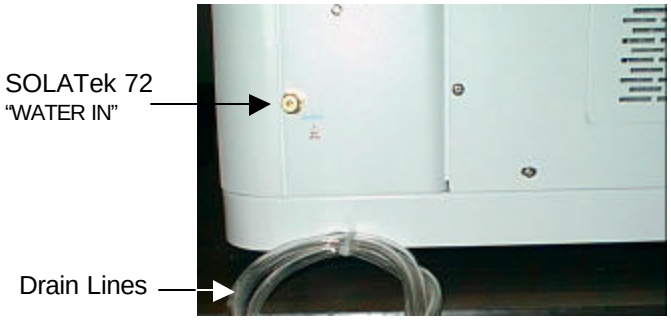


Figure 2-5: SOLATek 72 "WATER IN"

9. Turn on the water supply. Check for leaks.

Note: To prevent contamination, replace the water filter every six months. Turn off the water supply before replacing the filter.

2.7. Fill Rinse Water Reservoir

The rinse water reservoir holds the water for system flushing, blanks, and dilutions. Tekmar recommends using deionized (DI) water. An inline filter prevents SOLATek 72 contamination from the reservoir.

Gas from SOLATek 72 ("GAS OUT") to the reservoir (at the quick release connection) pressurizes the water, forcing it out of the reservoir through the filter and then to SOLATek 72 (Water In).

- Disengage the quick release fitting on the reservoir to release pressure.
- Remove the screw and clamp on top of the reservoir to disconnect from SOLATek 72.
- Fill the reservoir with DI water (recommended) leaving at least 3" of headspace.
- Replace the reservoir clamp and secure with a screw.
- Reconnect the quick release fitting to pressurize the reservoir.
- **If a Tap Kit is used rather than a Reservoir, a 1/8" cap must be placed on the "Gas Out" connector**.

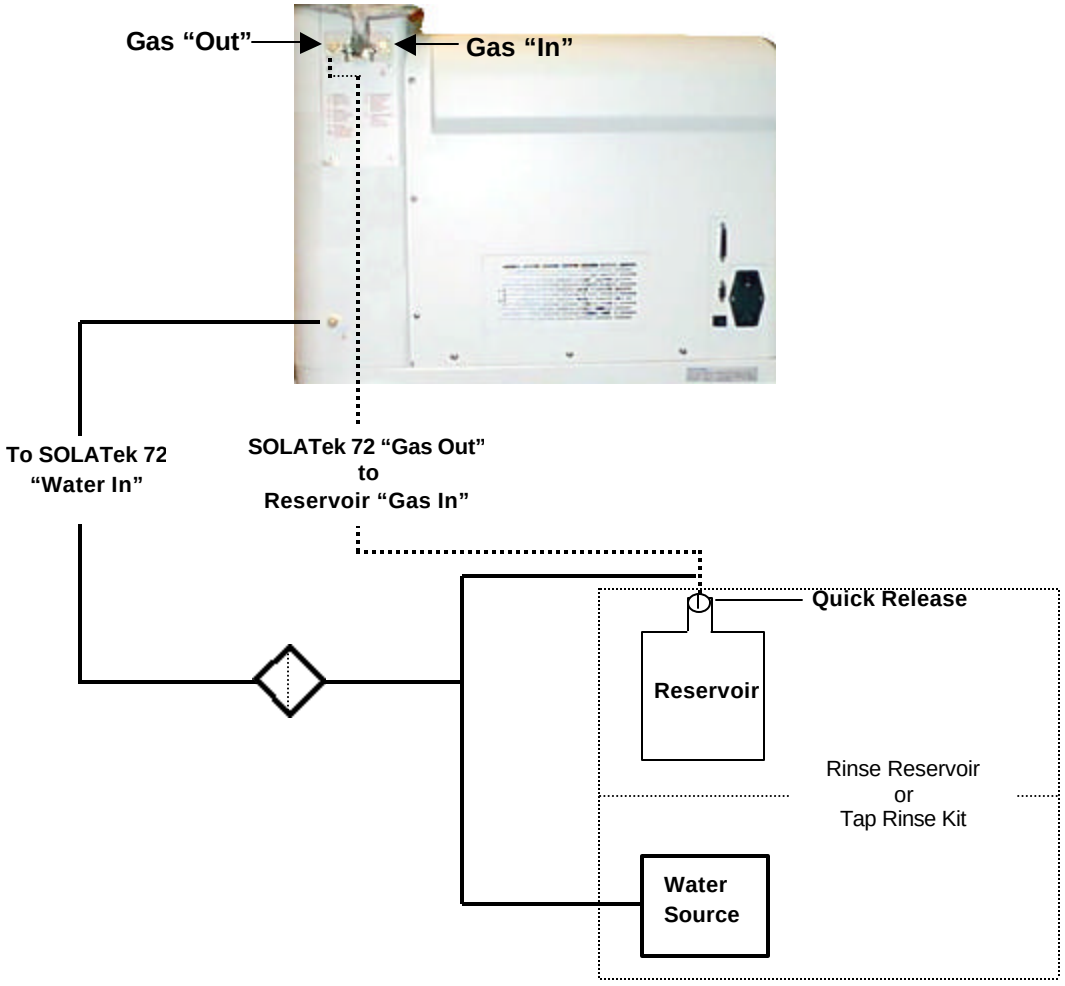


Figure 2-6: Rinse Water Reservoir Connection to SOLATek 72

2.7.1. Drain Lines

Tygon tubing drain lines are connected to drain fittings on the following items:

- Sample Cup
- Tray Drain (connected to the Sample Cup drain line)
- 4-port valve connecting the three Standard Vessels
- 25mL and 250µL Syringes

These drain lines are coiled together at the base at the rear of SOLATek 72 (Figure 2.5). Route each piece of tubing to a collection container.

If you have the optional chiller unit, the condensation produced from this unit may increase the amount of water exiting through the drain. Make sure your collection container is large enough to accommodate a large amount of drainage.

- The sampling cup relies on gravity to drain. The tubing must run down from the instrument.
- Tubing must have adequate space to extend without being crimped, bent, or impeded in any way. Failure to allow for unimpeded drainage may damage your system.

⚠ WARNING!

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

⚠ CAUTION!

Do not tee the Sampling Cup drain and the Standards Vessels and Sampling Syringes together. If the drains are teed together and the line is plugged downstream of the tee, the sample drain will back up, and liquid will spill from the system.

2.7.2. Blank Water Preparation

To avoid contamination problems use blank (organic-free) water to clean the sample pathways and to dilute samples. Several methods for preparing blank water are listed below

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

2.8. Prime Water and Internal Standards

Note: The process of priming water requires that you be connected to a source of organic-free water.

Press [Shift] + [Setup] to take you to the “Purge Ready” Screen.

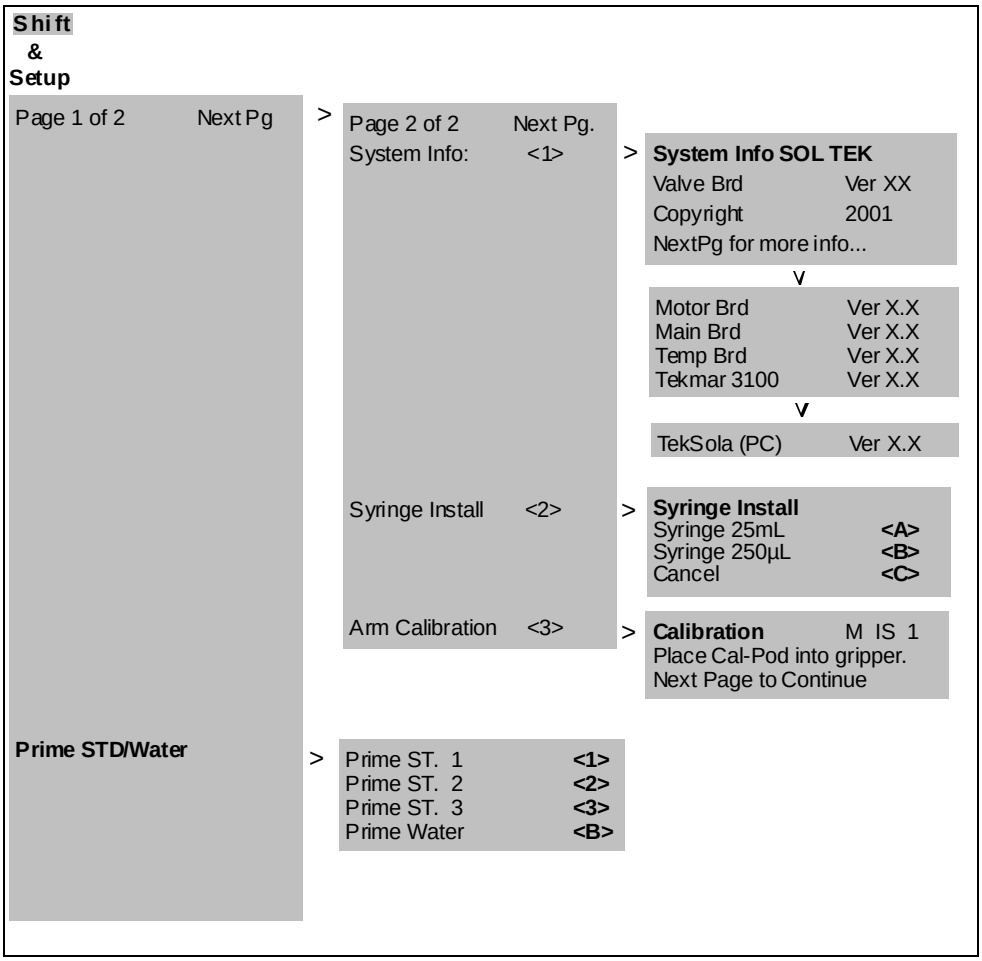


Figure 2-7: Setup Screen

10. Press <1>, <2>, or <3> to prime internal standard(s). Each standard used must be primed separately.

11. Press <B> to prime water.

2.9. Preparing Standards

Commercially available standards, in various mixtures and concentrations, are available for volatile analysis. These standards should be kept at 0° C with a minimum of headspace. The longevity of the standard is generally defined by the manufacturer, or the specific analytical method. In general, purgeable gases have a life of six weeks after the vial is opened.

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

2.9.1. Sample Calculation

1. A final concentration of 50ppb is desired in 5mL of water:

   [ppb = ng/mL, ug/L and ug/kg]

2. Using NG/ML to determine the starting concentration, the conversion is set up as follows:

   50ng/1mL = X ng/5mL solving for X yields: X = 50 x 5 / 1 = 250 ng/mL

Stock Solution: **2000 ug/ml (ppm)**

Final Concentration desired: **50ppb in 5ml of Sample**

50ppb = 50 ug/L or 50 ng/mL

Multiplying by 5 yields 250 ng/5mL.

Therefore, you would add 250ng for every 5mL of Sample.

The SOLATek 72 has the capability to inject 5µL up to five times for a total of 25µL per vessel. It is important to use the proper starting concentration, especially when varying the volume of the standard. Use a concentration and volume that best fits your method.

Concentration in the vessel: 200ug/mL (ppm) = 200ng/µL.

5µL contains: 5 (200), or 1000ng to be delivered in 5mL of Sample, expressed as 1000ng/5mL.

Dividing by 5 yields 200ng/mL or 200ppb final concentration.

Therefore,	10µL =	400ppb
	15µL =	600ppb
	20µL =	800ppb
	25µL =	1,000ppb

Note: For information on preparing other standards, refer to Appendix C.

2.10. Connecting SOLATek 72 to a Tekmar 3000 Series Concentrator

2.10.1. Checking the ROM Version of your 3000 Series Concentrator

Your concentrator needs the latest ROM version to operate with SOLATek 72. To check the ROM version:

- Press and hold the SHIFT key on the handheld controller
- Choose SETUP
- Choose **A**. Your ROM version appears on the display

ROM Version	Capability	Requirements
Prior to 3.00	No Backflush capability ROM is not Flashable 3-way tee must be replaced with 4-way tee before you can plumb the heated transfer line.	A Back Flush valve is required. Installation Kit Part No. 14-7080-000 3000 Memory Board Required. Installation Kit Part No. 14-5393-090 Contact Closure Cable Kit required to replace the 3-way tee. Installation Kit Part No. 14-8418-000
3.00	Has Backflush capability, but the ROM is not Flashable	3000 Memory Board Required. Installation Kit Part No. 14-5393-090
Between 3.00 and 3.11 for a 3000 Between 3.00 and 5.17 for a 3100	Has Backflush Capability and the ROM is Flashable. Has Backflush Capability and the ROM is Flashable	Install the software from the floppy disk included in your kit box. Refer to Appendix D (Performing a Flash Upgrade) for instructions on how to upgrade your concentrator firmware. Call Tekmar if you require assistance.
5.18	Latest ROM version	If your ROM version is 5.18, you have the latest ROM version and there is no need to install the upgrade.

Table 2-1: Concentrator ROM Versions

2.10.2. Disconnecting a Tekmar Autosampler

WARNING!

To avoid electrical shock, turn off and unplug your autosampler and concentrator before proceeding.

To disconnect your autosampler from your concentrator, refer to the installation procedure in your autosampler documentation and reverse the process.

If you experience problems disconnecting your autosampler, contact the Teledyne Tekmar Customer Support Center

To contact the Teledyne Tekmar Customer Support Center call:

- **(800) 874-2004 in the US and Canada**
- **(513) 229-7000 outside the U.S. and Canada**

2.11. Plumbing Connections: SOLATek 72 to the 3000 Series Concentrator

WARNING!

To avoid electrical shock, turn off and unplug SOLATek 72 and the concentrator before removing panels.

WARNING!

Parts inside the concentrator are heated to high temperatures. To prevent burn injury, allow the concentrator to thoroughly cool before removing panels.

Note: If you have not already done so, leak check the concentrator. (Reference your Concentrator manual)

1. Refer to the Appendix, (Swaging a Nut and Ferrule onto Tubing) as needed.
2. If you have not already done so, remove the concentrator's panels.
3. Viewing the concentrator from the front, loosen the two fasteners on the right corner (trap) panel. Pull the panel forward, then to the right (Figure 2.8).

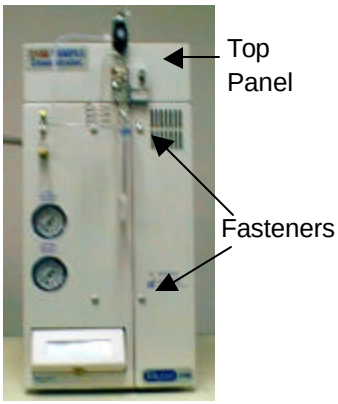
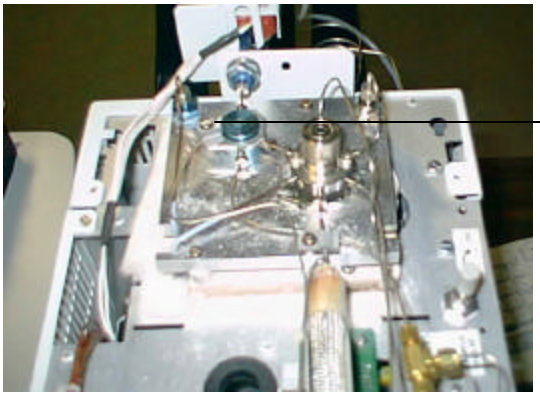


Figure 2-8: Accessing the 3000 Series Concentrator

4. Pull the top panel forward until it stops, then lift.
5. Locate the square-shaped valve oven cover on the top of the concentrator.
6. Remove the thumbscrew on the front of the valve oven cover.
7. Tilt the valve oven cover toward the back of the unit about 45°. Pull up the cover carefully.
8. If your concentrator has a 3-way tee (Figure 2.10). You must replace it with a 4-way tee (Figure 2.11) before you can plumb the heated transfer line.



Top View of Concentrator: Transfer Line Connects to 4-Way Tee.

Figure 2-9: Transfer Line to the Concentrator

CAUTION!

The screw that holds the 3-way tee to the 3000 may be difficult to remove. Do not force the screw or you can strip the oven block. If this happens, the entire block must be replaced. If you have difficulty removing the 3-way tee please call the Teledyne Tekmar Customer Support Center toll-free in the US and Canada (800) 874-2004. Outside the US and Canada call (513) 229-7000.

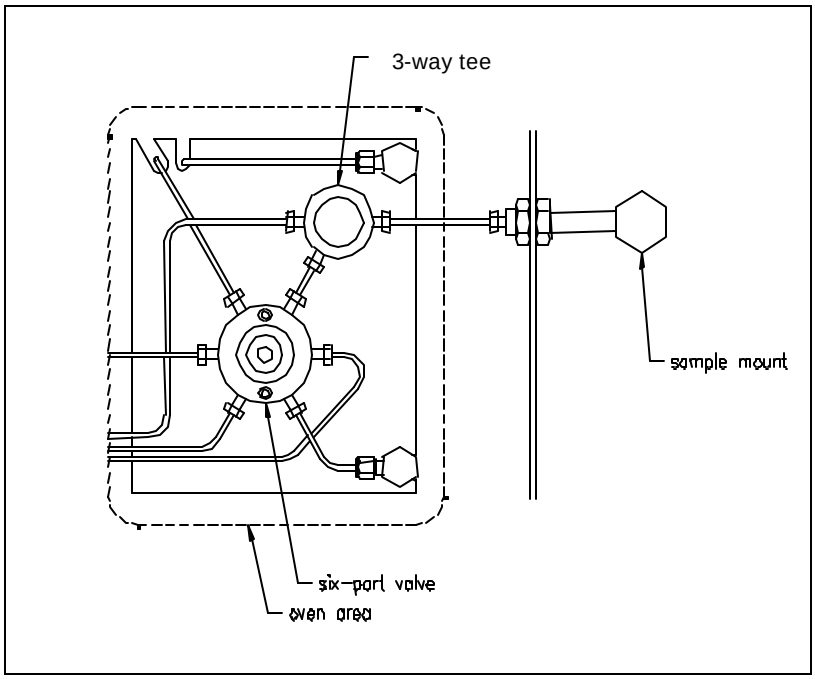


Figure 2-10: 3-Port Sample Tee

9. Slide SOLATek 72's heated transfer line (Figure 2.9) through the hole in the top part of the 3000's rear panel. Allow SOLATek 72's heated transfer line to rest on top of the 3000-to-GC transfer line.

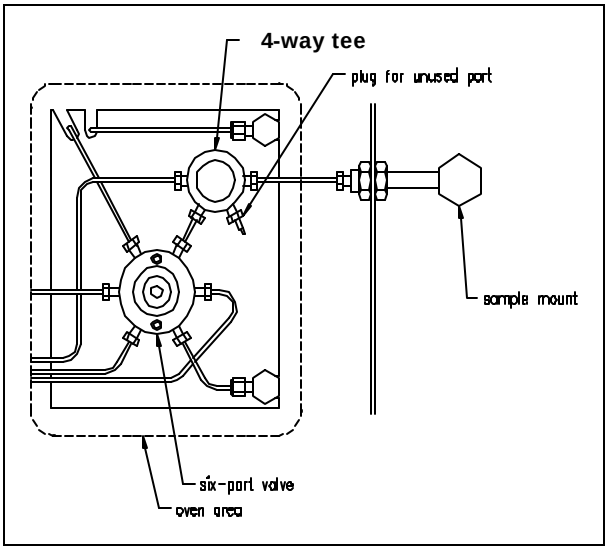


Figure 2-11: 4-Port Sampling Tee

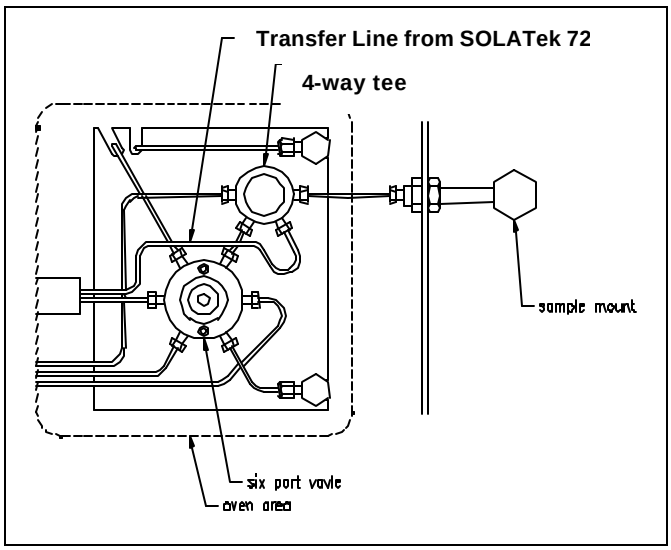


Figure 2-12: Transfer Line from SOLATek 72

10. Referring to Figures 2-11 and 2-12 locate the 4-way tee.
11. Locate the fitting attached to the cross union that has no line or tubing connected. This fitting is a plug. Remove the plug (Figure 2.10).
12. Attach SOLATek 72's transfer line to the cross union fitting where you removed the plug. **Do not over tighten**.
13. If you still need to set flow rates and pressure and check for leaks, do not install the valve oven cover or panels. Finish making all connections before you proceed. It is easier to leak check all connections at the same time.

2.11.1. Connecting the SOLATek 72 to a Concentrator other than the Tekmar 3000 Series

If you are connecting to a concentrator other than the Tekmar 3000 series you will need some additional components.

- Purge Bypass Valve. This valve adds soil purging capabilities by shutting down the purge flow of the concentrator. This is a 24 VDC 2-way valve located between the concentrator purge bulkhead and the glassware.
- Drain Valve. This is a 2-way 24 VDC valve located between SOLATek 72 and the drain bulkhead.
- Contact Closure Cable kit (Part Number 14-8418-000) as described in Table 2.1.

2.12. Connecting a Line From SOLATek 72 to the Glassware on the 3000 Series Concentrator

14. Attach the reducing fitting (1/4” to 1/8”) from the kit box (Part No. 080-863) on to the end of the tubing coming from the SOLATek 72. There are three possible outlets for this tubing, allowing greater flexibility in locating the SOLATek 72 and the concentrator.

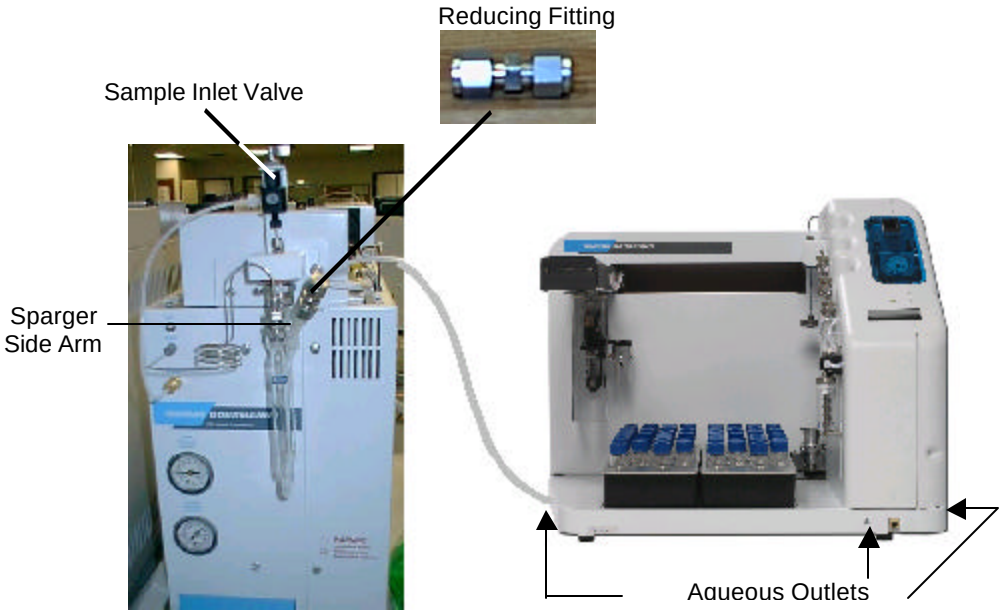


Figure 2-13: Aqueous Transfer: SOLATek 72 to Concentrator

15. Place the fitting over the Sparger side arm.

16. Feed the tubing through the fitting and into the arm until the tubing just enters the foam trap beneath the knurled nut (approximately ½ “ into the bulge).

17. Finger tighten the reducing fitting. Do not use a wrench to tighten the fitting further. Over tightening may damage the sparge arm and cause injury.

18. Make sure the sample inlet valve on the concentrator is set open to drain.

2.13. Electrical Connections: SOLATek 72 to the 3000 Series Concentrator

DANGER
Power down the concentrator and any other connected devices before making electrical connections. Failure to follow this procedure can result in serious injury or death.

1. Locate the Communication cable in the kit box (Part No. 14-8390-086) The modular end plugs into the rear of SOLATek 72 and the 9-Pin connector goes to the concentrator (Figure 2-13)

2. Locate the Power Cord in the kit box (Part No. 14-0298-039) and plug it into the unit and into a wall outlet.

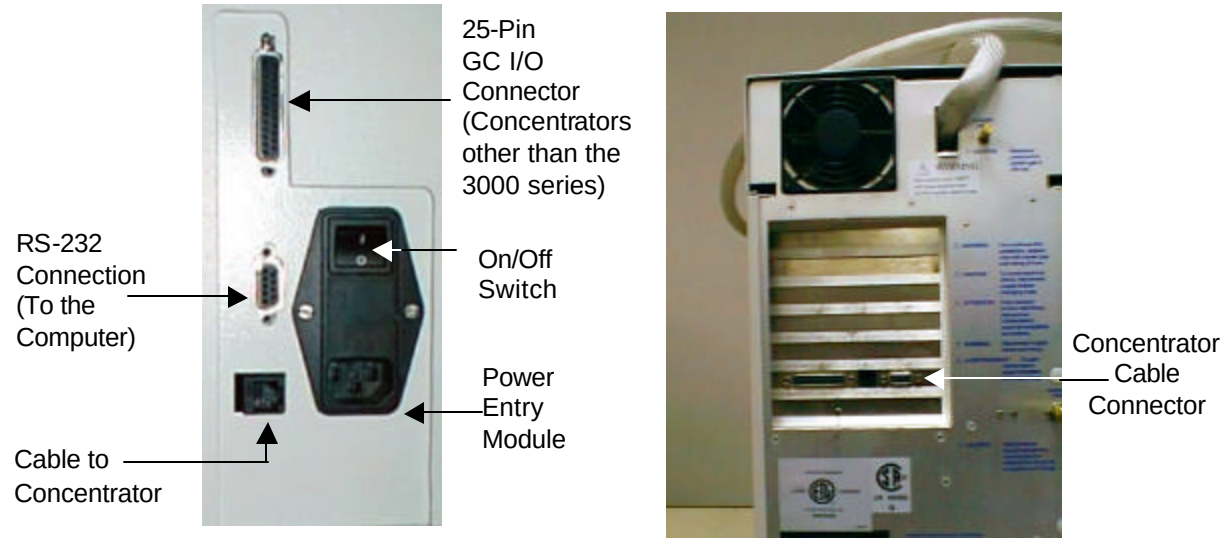


Figure 2-14: SOLATek 72 Electrical Connections

3. Locate the handheld assembly cable (Part No. 14-7998-086) in the kit box and connect one end to the bottom of the hand held controller, and the other end to the cable jack at the bottom right of the SOLATek 72 panel.

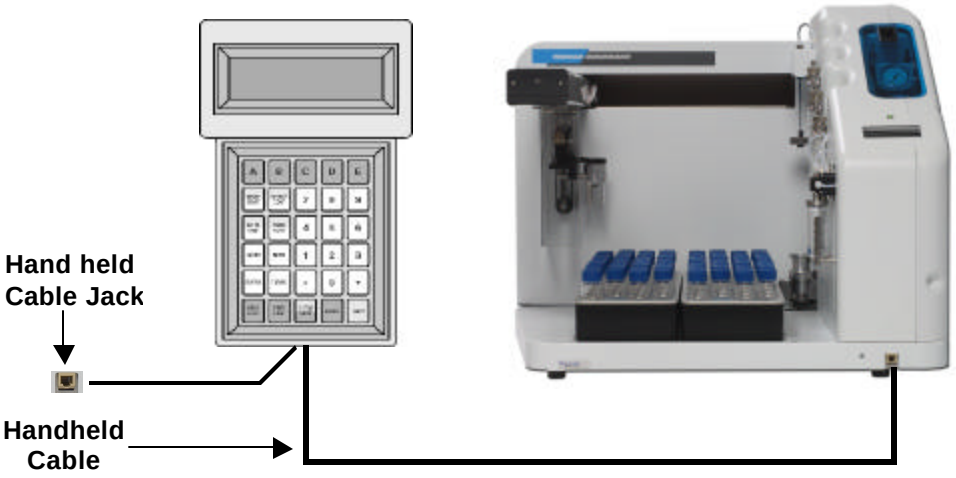


Figure 2-15: Handheld Controller Connection

2.14. SOLATek 72 Configuration

SOLATek 72 and the Concentrator must be configured to communicate with the GC and any optional accessories you may have.

1. Press [Conf] on the handheld controller to open the configuration screen.

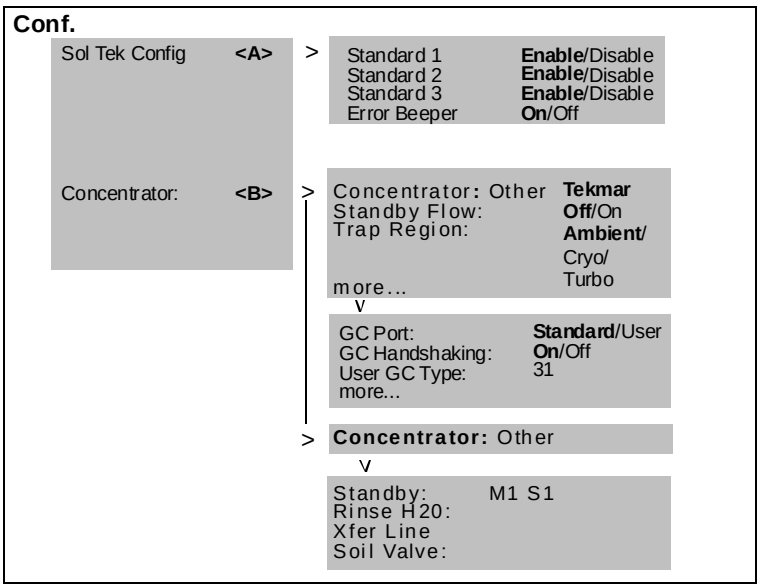


Figure 2-16: Configuration Screens

2. Press any numeric key [#] to toggle between settings.

3. Press [Enter] to confirm a change or to move to the next line.

Note: If you are not connected to the concentrator, the handheld controller might display an error during the configuration process and display the option to Abort or Execute. If this occurs, press [Enter] to clear the error and return to the configuration screen.

4. Press [Next Page] to go to the next configuration screen.

2.14.1. Concentrator Configuration

If you are using a Tekmar 3000 series concentrator with SOLATek 72, additional GC parameters must be set. Please reference your concentrator and GC user manuals for these settings.

Notes

#3

OPERATION

3 Operation

3.1 Handheld Controller

The handheld controller uses a four-line, 20-character wide display screen, and a 30-button keypad (Figure 3.1)

Figure 3-1: Handheld Controller

- The handheld controller connects to the SOLATek 72 with an interface cable.
- The four-line *display screen* displays data entry fields for programming, menus for selecting commands, and status information.
- The *keypad* has five variable function keys, thirteen control keys, and twelve numeric keys. These keys are used to monitor the operational status of the SOLATek 72 and program it to run operating sequences.

3.1.1 Key Functions

Keys	Variable Function Keys
A through E	Use to select options from a screen menu. The function varies according to the display.
Keys	**Action Keys**
RESET (SHIFT)	RESET lets you abort a scheduled run, abort the processing of a single sample, rerun a sample, or reset the microprocessor to start-up status.
START	START moves SOLATek 72 to the first step in an operating run.
GO TO (SHIFT)	GO TO allows you to stop an operating run and immediately go to Standby, Bake, or Bake Rinse
STEP	Moves SOLATek 72 to the next operating step.
HOLD (SHIFT)	Keeps SOLATek 72 in its current mode.
AUTO	Resumes normal operation after SOLATek 72 has been in HOLD.
SETUP (SHIFT)	SETUP allows you to access the basic system information.
CONF	CONF displays the configuration screens that allow you to configure the SOLATek 72 to communicate with other GCs, concentrators, and optional accessories.
SCHED	SCHED displays the scheduling screen that allows you to edit and enable *Method Schedules* and review the current status of scheduled runs.
METH	METH displays the *Select Method* screen that allows you to select a method and change its parameters.
STATUS	Displays the current status of the SOLATek 72.
TEMPS	TEMPS displays the Temperatures screen, which shows temperature set points and actual readings for all actively controlled temperature zones.

(Table Continued Next Page)

Keys	Special Keys
NEXT PAGE	When a screen contains more than one screen of data, NEXT PAGE moves to the next screen of data.
PREV PAGE	When a screen contains more than one screen of data, PREV PAGE moves to the previous screen of data.
CLEAR	CLEAR erases an entry completely
BKSP	BKSP deletes the character beneath the cursor
ENTER	ENTER saves your entry and moves the cursor to the next data entry field.
SHIFT	SHIFT activates the light gray labeled functions on two-part control keys. Press SHIFT, hold it down, and press the selected key to execute the *shifted* function.
Keys	**Numeric Keys**
0 through 9	Use the numeric keys 0 through 9, the decimal point (.), and the plus (+) and minus (-) signs to enter numeric data such as time or temperature parameters.
To enter numeric data press the desired number keys, including decimal places and the plus or minus sign, then press **ENTER.** To clear the last character press **BKSP** To clear an entry completely press **SHIFT + CLEAR**	

Table 3-1: Keypad Functions

3.2 SOLATek 72 Operation Checklist

1. Check the System Pressure
2. Set and Check the Concentrator Pressure and Flow Rate
3. Check the SOLATek 72 and the Concentrator for leaks and Set the Transfer Flow Rate
4. Set the Solid Flow Purge Rate
5. Fill the Standard Vessels
6. Load the Vial Tray
7. Create or Edit a Method
8. Build a Schedule
9. Run

3.3 Check the System Pressure

The system pressure is preset at 15 psi. Read the Pressure Gauge on the front of the SOLATek 72. If the pressure needs adjusting, turn the knob on the System Pressure Regulator until 15 psi is reached (Figure 1-4).

3.4 Set and Check the Concentrator Pressure and Flow Rate

Refer to your concentrator documentation for the procedures for setting and checking the concentrator pressure and flow rate.

3.5 Check the SOLATek 72 and the Concentrator for Leaks and Set the Transfer Flow Rate

3.5.1 Checking the Gas Flow & Leak Checking the Water Pathway

1. Using the handheld controller, place the concentrator in “Set Transfer Flow” mode. (Press [Shift] + [Setup], <B> (Set Xfer Flow). Press [Next Page]
2. The TPC gauge should read 15-20 psi. Press [Next Page]
3. Attach a flow meter to the vent fitting to measure the flow rate of the sample gas (Figure 3.2).

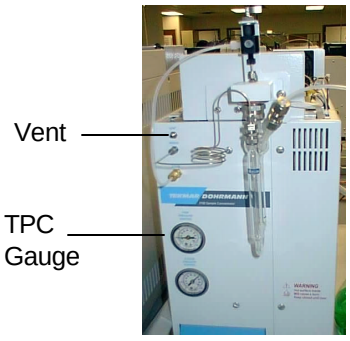


Figure 3-2: Concentrator Vent

4. Set the concentrator flow rate to 40mL/min. by adjusting the concentrator flow controller. Press [Next Page].

5. The flow out of the vent of the concentrator should be 70-80mL/min.

6. Adjust the flow by using the SOLATek 72 flow controller. Press [Next Page]

3.6 Set the Solid Flow Purge Rate

1. Use the handheld to place the concentrator in “Set Soil Purge Flow” mode.
(Press [Shift] + [Setup]. <C> (Set Soil Purge Flow).

2. Place an empty vial (with a new septum) in the SOLATek 72 sample cup. Press [Next Page].

3. Raise the Vial. Press [Next Page]

Figure 3-3: Sample Cup

4. Wait 1 to 2 minutes, then press [Next Page].

5. The Trap Pressure Control (TPC) gauge should read between 10 and 15 psi. Pres [Next Page].

6. Measure the vent flow on the concentrator. Press [Next page]

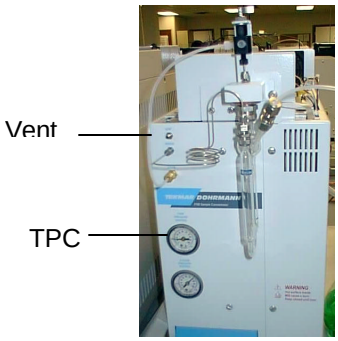


Figure 3-4: Concentrator Vent

7. Wait two minutes and check the flow from the concentrator vent (Figure 3-4). The flow should be between 35 and 40mL/min. Adjust the flow controller on the SOLATek 72, if necessary. Press [Next Page]

8. Lower the elevator. Press [Next Page]

9. Remove the vial from the Sample Cup. Press [Next Page].

10. If the Vial is out of the cup press [Next Page].

11. Press [Next Page] to exit.

3.7 Fill Standard Vessel(s)

SOLATek 72 is equipped with up to three standard vessels. These vessels are mounted on the inside wall of the SOLATek 72 (Figure 1-.5). Each standard vessel is pressurized to 15 psi and can deliver one to five aliquots, in 5µL increments, to each sample. Each standard has a maximum volume of 25µL. 75µL can be added to each sample if all three standards are used. You can use any combination of the three standards, in units of 5µL to ≤ 75µL.

Standard Volume (µL) Addition per Sample	
# Aliquots	**ST1, ST2, ST3**
0	0
1	5
2	10
3	15
4	20
5	25

Table 3-2: Standard Volume Addition per Sample

3.7.1 To Fill a Standard Vessel:

WARNING:
Use care opening Standard Vessels. Vessel is under 15 psi of pressure.

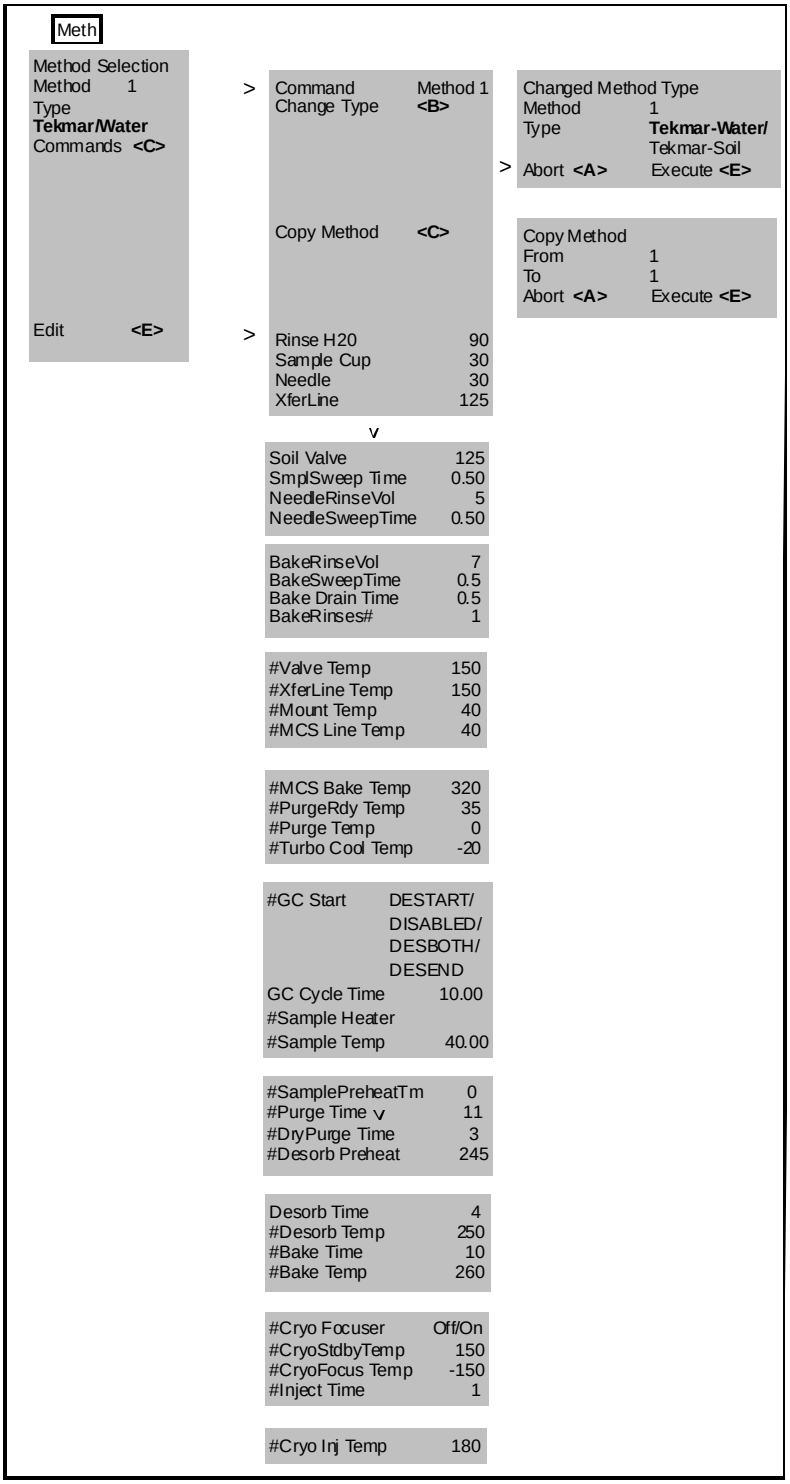
1. Firmly grasp the standard vessel with one hand.
2. With your free hand gently loosen the fitting that holds the vessel by turning the fitting counterclockwise.
3. Slide the vessel out from under the fitting.
4. Add your standard solution to the vessel leaving at least 2 mL of headspace.
5. Reattach the standard vessel.
6. Repeat steps 1 through 5 to add additional standards.

3.8 Load the Vial Tray

Place your samples in the vial tray, in an upright position, with the caps on top. The vial trays hold 72 vials (36 vials per tray). Two trays allow the user to process one tray of samples while the other is refrigerated.

3.9 Creating and Editing Methods

The Method Editor creates and stores parameters for SOLATek 72 and the Concentrator. Up to sixteen Methods can be stored, designated by the number 1-16.



1. Press [Methods] on the handheld controller to open the Methods Selection display.
2. Type the number of the Method you want and press [Enter].
3. To edit methods, press [Methods], then [E].
4. SOLATek 72 and Concentrator parameters are selected by entering a numeric value or by pressing the [0] key to toggle between options.

Note: **Remember that you must press [Enter] after each method entry to save the parameter.**

5. Changes to a Method are automatic. After changing a parameter in the Method Editor and accepting the change by pressing [Enter], the new parameters are saved.
6. By default:
   - Methods 1 through 8 are Tekmar Water Methods
   - Methods 9 through 16 are Tekmar Soil Methods.

Note: Refer to Tables 3.4 and 3.5 Tekmar Liquid Method Parameters) and Tables 3.6 and 3.7 (Tekmar Solid Parameters) for default method values.

Figure 3-5: Method Editor Display

3.10 Editing and Building Schedules

Press [Sched] to open the Schedule menu display

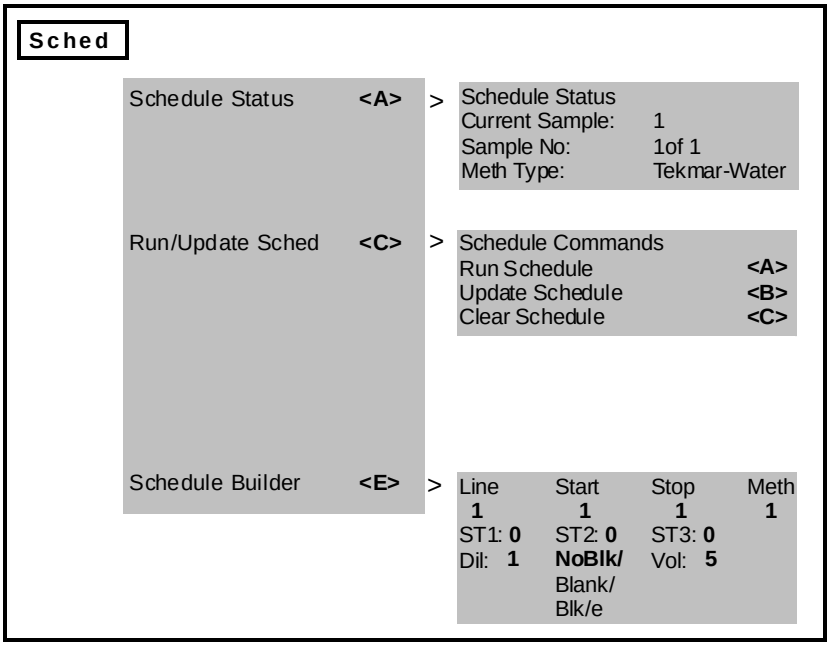


Figure 3-6: Schedule Menu Displays

3.10.1 Schedule Status:

Press <A> to view the current schedule status.

3.10.2 Run/Update Schedule:

Press <C> to open the Schedule Commands display

- Select Run Schedule <A> to confirm method and schedule changes
- Select Update Schedule <B> to add to or update an existing schedule.

Note: You can make Schedule changes while the SOLATek 72 is running, but you cannot change a line of the Schedule that is currently executing or has executed. Changes can only be made to the lines of the Schedule that have not yet executed.

- Select Clear Schedule <C> to clear the current schedule

3.10.3 Running Instrument Blanks from an External Water Source

The SOLATek 72 can run system Blanks from the water reservoir in single quantities or consecutive runs. You can vary Blank Sample volume by editing the schedule to reflect the amount of Blank (1 to 25mL) you want to deliver to the concentrator. Multiple blanks can be run sequentially through the scheduler. The number of Blanks run is determined by calculating the difference between the Start and Stop fields.

Line	Start	Stop	Method
1	1	5	1
ST1: 0	ST2: 0	ST3: 0	
Dil: 1	No BLk	Vol: 5	

The sequence pictured to the left will run Method #1:

- The method will analyze vial positions 1 through 5.
- No Standards are added.
- Sample volume is 5 mL.
- Runs vials from the Vial Tray only

Line	Start	Stop	Method
1	1	5	1
ST1: 0	ST2: 0	ST3: 5	
Dil: 1	Blank	Vol: 5	

The sequence pictured on the left will run Method #1:

- SOLATek 72 adds 5 µL of Standard #3.
- SOLATek 72 uses a 5 mL final sample volume.
- SOLATek 72 will pull 5 consecutive runs from the water reservoir, and no vials from the tray.

Line	Start	Stop	Method
1	1	5	1
ST1: 0	ST2: 0	ST3: 5	
Dil: 1	Blk/e	Vol: 25	

The sequence pictured to the left:

- SOLATek 72 analyzes vial positions 1 through 5.
- SOLATek 72 runs an instrument blank after each Sample 1 through 5.
- SOLATek 72 final sample volume = 25mL.
- SOLATek 72 Instrument Blanks = 25mL
- A Blank is inserted after each Sample in the schedule (all lines).

Figure 3-7: Running Instrument Blanks

3.10.4 Schedule Builder

Schedule Builder is the framework of your autosampler sequences. This is the screen you access to edit your schedule.

Select Schedule Builder <E> to open the Schedule Builder.

Parameter		Definition	Notes
Line		• The handheld controller has 32 schedule lines • A line is a group of samples that have the same Method • Press [Next Page] and [Prev Page] to scroll through the schedule lines	Min: 1 Max: 32
Start		Autosampler tray position where the sample group begins	Min: 1 Max: 72
Stop		Autosampler tray position where the sample group ends.	Min: 1 Max:72
Type		Method Type. Methods are stored in the memory of the instrument. A method is associated with a number and can be either a water or soil method.	Min: 1 Max: 11
ST1, ST2, ST3		Internal Standards 1-3. These are volumes of each ST vessel added. Standard is injected in 5µL aliquots, with the limit being 5-25µL	Min:0 Max:25
Dil:		Dilutions. SOLATek 72 performs dilutions in the ranges of 1:2, 1:5, 1:10, 1:20, 1:50, 1:100, and 1:250.	Min: 1 Max: 250
Blanks			
	No Blk	The instrument will run Sample Vials from the Autosampler Sample Trays	Default
	Blank	The instrument will deliver Blank water from an external water source. The quantity is determined by the number of Samples scheduled in the START and STOP fields	
	Blank/e	The instrument will deliver a Blank after every tray position scheduled on the schedule line.	
Vol:		Sample Volume. This is the aliquot of sample transferred during a water method, and the volume of water added to the vial during a soil method.	Min: 0 Max: 25

Table 3-3: Schedule Builder Parameters

3.10.5 To Build a Schedule

1. Press [Sched], <C>, <C> to clear the schedule.
2. Press [Sched], <E> to open the Schedule Builder.
3. Press [Enter] to move the cursor between parameters.
4. Enter the vial position where the Sample group begins under **Start** Position. Press [Enter] to save your selection.
5. Enter the position where the Sample group ends under **Stop** Position, Press [Enter] to save your selection.
6. Enter the Method Number, press [Enter] to save your selection.
7. Use the [0] key to toggle between the different Standard values. If no standard is added, set the ST values to zero. Press [Enter] to save your selection.
8. Use the [0] key to toggle between the different dilution values. Press [Enter] to save your selection (Dil: 1 = no dilution).
9. Enter the sample volume in the last field. Press [Enter] to save your selection.
10. Press [Next Page] to add a new line to the schedule.
11. Repeat steps 2-10 to add additional schedule lines.
12. Press [Sched] <C>, <A> to download and run a new schedule
13. Press [Sched] <C>, <B> to update the current schedule.

Note: You can make Schedule changes while the SOLATek 72 is running, but you cannot change a line of the Schedule that is currently executing, or has executed. Changes can only be made to the lines of the Schedule that have not yet executed.

3.11 Operation Commands

Use the navigational keys on the handheld controller to control SOLATek 72 during a sample run.

Step moves the SOLATek 72 to the next step in a run.

- Pressing [Step] during an operating sequence ends the current operating step and moves SOLATek 72 to the next specified step in the active method.

- Go To [Standby] moves SOLATek 72 to a Standby condition. In [Standby] mode SOLATek 72 is waiting on conditions to be met (heaters to reach their set point etc.) for SOLATek 72 to move to the next step in the method
- Go To [Bake] places SOLATek 72 in the mode to start the Bake procedure.
- Go To [Bake Rinse] places SOLATek 72 in the mode to start a Bake Rinse procedure

Shift + Hold prevents SOLATek 72 from moving to the next step.

Auto resumes normal operations after SOLATek 72 has been in HOLD

Shift + Reset allows you to choose from the following:

- Abort a scheduled run
- Abort the processing of a single sample
- Rerun a sample
- Finish a current sample and abort the rest of the scheduled run

3.12 Method Parameters

3.12.1 SOLATek 72 Liquid Method Parameters

Method parameter outlines for the SOLATek 72 during liquid and solid analysis.

SOLATek 72 Liquid Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
Hot Water Temperature	Setpoint for water used during cleanup rinses.	Hot Water	90	20	90	-	°C
Sample Cup Temperature	Setpoint for sample cup heater.	SampleCup	30	20	100	-	°C
Sample Needle Temperature	Setpoint for third stage (top most) of sample needle.	Needle	30	20	100	-	°C
Transfer Line Temperature	Temperature of SOLATek 72 > concentrator transfer line. 125-150°C recommended, to prevent cross-contamination, carryover, and analyte decomposition.	XferLine	125	20	300	-	°C
Soil Valve Temperature	Setpoint of soil valve. 125 maximum, to prevent cross-contamination, carryover, and analyte decomposition.	SoilValve	125	0	125	-	°C
Sample Sweep Time	Length either of time to sweep syringe fill volume to sample vial or directly to concentrator.	SmplSweep Time	0.5	0.2	299.99	-	min
Needle Rinse Volume	Volume of hot water to rinse sample needle and lines.	NeedleRinseVol	5	1	25	-	ml
Needle Sweep Time	Length of time to sweep hot water from sample needle and lines.	NeedlSweepTime	0.5	0.5	299.99	-	min
Bake Time	Length of time to bake concentrator trap. Note: If you are using a non-Tekmar concentrator, make sure that this setting is long enough to accomplish the number of Bake Rinses.	Bake Time	10	0	299.99	-	min
Bake Rinse Volume	Volume of hot water to rinse concentrator glassware during Bake mode. 7–25 mLl recommended, depending on Sample Volume.	BakeRinse Vol	7	1.0	25	-	ml
Bake Sweep Time	Length of time to sweep Bake Rinse through SOLATek 72 sample lines and to concentrator glassware.	BakeSweep Time	0.5	0.1	299.99	-	min
Bake Drain Time	Length of time to drain Bake Rinse from concentrator sparger.	BakeDrain Time	0.5	0.1	299.99	-	min
Bake Rinse Number	Number of times (1, 2 or 3) you want to rinse the concentrator glassware during Bake.	BakeRinses#	1	1	3	-	cycles

Table 3-4: SOLATek 72 Liquid Method Parameters

3.12.2 3000 Series Concentrator Liquid Method Parameters (# = Concentrator Value)

Concentrator Water Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
GC Start	Determines when GC receives its Start signal. DESEND: Signal sent at end of Desorb step DESTART: Signal sent at beginning of Desorb step. DISABLED: No signal sent. DESBOTH: Signal sent at both beginning and end of Desorb step. .	#GC Start	DESTART			DESEND	option
Valve Temperature	Setpoint for BOT and valve oven.	#Valve Temp	150	20	300	-	°C
Transfer Line Temperature	Setpoint for concentrator > GC transfer line.	#XferLine Temp	150	20	300	-	°C
Sample Mount Temperature	Setpoint for sample mount heater.	#Mount Temp	40	20	100	-	°C
Moisture Control System (MCS) Temperature	Setpoint for MCS line.	#MCS Line Temp	40	20	310	-	°C
MCS Bake Temperature	MCS Temperature during Bake step.	#MCS Bake Temp	320	20	320	-	°C
Purge Ready Temperature	Setpoint for trap that signals system to step from Purge Ready to Purge.	#PurgeRdy Temp	35	20	320	-	°C
TURBOCool Temperature	Temperature of trap during Purge, if TURBOCool option is installed and configured.	#TurboCoolTemp	-20	-20	400	-	°C
Sample Preheat Time	Length of time given for sample to reach equilibrium, at its setpoint, before beginning Purge. Note: Add one minute of Sample Preheat Time for every 25°C above ambient.	#SmplPreHeatTm	0	0	299.99	-	min
Sample Temperature	Setpoint for the Sample Heater.	#Sample Temp	40	20	100	-	°C
Purge Time	Length of time to purge Sample.	#Purge Time	11	0	299.99	-	min
Dry Purge Time	Length of time to sweep concentrator trap.	#DryPurge Time	2	0	299.99	-	min
Sample Drain	Whether automatic drain function is On or Off.	#Sample Drain	On	On	Off	-	option
Desorb Preheat	Concentrator trap setpoint, prepares trap > GC analyte transfer.	#Desorb Preheat	175	20	420	-	°C
Desorb Temperature	Temperature of trap during Desorb.	#Desorb Temp	180	20	420	-	°C
Bake Time	Length of time to Bake trap.	#Bake Time	10	0	299.99	-	min
Bake Temperature	Temperature of trap during Bake.	#Bake Temp	225	20	420	-	°C

Table 3-5: Concentrator Liquid Method Parameters

3.12.3 SOLATek 72 Solid Method Parameters

SOLATek 72 Soil Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
Hot Water Temperature	Setpoint for water used during cleanup rinses.	Rinse Water	90	20	90	-	°C
Sample Cup Temperature	Setpoint for sample cup heater.	SampleCup	40	20	100	-	°C
Sample Needle Temperature	Setpoint for third stage (top most) of sample needle.	Needle	60	20	100	-	°C
Transfer Line Temperature	Temperature of SOLATek 72 > concentrator transfer line. 125 recommended, to prevent cross-contamination, carryover, and analyte decomposition.	XferLine	125	20	300	-	°C
Soil Valve Temperature	Setpoint of soil valve. 125 recommended, to prevent cross-contamination, carryover, and analyte decomposition.	SoilValve	125	20	125	-	°C
Bake Time	Length of time to bake concentrator trap: **Note:** If you are using a non-Tekmar concentrator, make sure that this setting is long enough for the number of Bake Rinses.	Bake Time	225	0	299.99	-	min
Sample Sweep Time	Length either of time to sweep syringe fill volume to sample vial or directly to concentrator.	SmplSweep Time	0.5	0	299.99	-	min
Sample Preheat Time	Length of time given for sample to reach equilibrium, at its setpoint. **Note:** Add one minute of Sample Preheat Time for every 25°C above ambient.	PreHeat Time	0	0	299.99	-	min
Preheat Stir	Whether the sample stirring/agitation function is On or Off.	PreHeat Stir				-	option
Preheat Stir Speed	Variable mixing hub speed setting, between 1 and 10; sample matrix dependent.	PreHtStirSpeed	5	1	10	-	variable
Purge Time	Length of time to purge sample.	Purge Time	11	0	299.99	-	min
Purge Stir	Whether the sample stirring/agitation function, during Purge, is On or Off.	Purge Stir				-	option
Purge Stir Speed	Variable mixing hub speed setting, between 1 and 10, during Purge; sample matrix dependent.	Prge StirSpeed	5	1	10	-	variable
Needle Rinse Volume	Volume of hot water to rinse sample needle and lines.	NeedleRinseVol	5	0	25	-	ml
Needle Sweep Time	Length of time to sweep hot water from sample needle and lines.	NeedlSweepTime	0.5	0	299.99	-	min
Purge Stir Mode	The mixing hub stirs soil samples during Purge in one of three ways: by revolving around (norm), by agitating (agit), or by revolving with variable speed (var) around the sample vial.	PurgeMixMode	norm	var	agit	-	option
Preheat Stir Mode	The mixing hub stirs soil samples during Purge in one of three ways: by revolving around (norm), by agitating (agit), or by revolving with variable speed (var) around the sample vial.	PreHTMixMode	norm	var	agit	-	option

Table 3-6: SOLATek 72 Solid Method Parameters

3.12.4 Concentrator Solid Method Parameters

Concentrator Soil Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
GC Start	Determines when GC receives its Start signal. DESTART: Signal sent at beginning of Desorb step. DISABLED: No signal sent. DESBOTH: Signal sent at both beginning and end of Desorb step. DESEND: Signal sent at end of Desorb step.	#GC Start	DESTART			DESEND	option
Valve Temperature	Setpoint for BOT and valve oven.	#Valve Temp	150	20	300	-	°C
Transfer Line Temperature	Setpoint for concentrator > GC transfer line.	#XferLine Temp	150	20	300	-	°C
Sample Mount Temperature	Setpoint for sample mount heater.	#Mount Temp	40	20	100	-	°C
Moisture Control System (MCS) Line Temperature	Setpoint for MCS line.	#MCS Line Temp	40	20	320	-	°C
MCS Bake Temperature	MCS Temperature during Bake step.	#MCS Bake Temp	320	20	320	-	°C
Purge Ready Temperature	Setpoint for trap that signals system to step from Purge Ready to Purge.	#PurgeRdy Temp	35	20	420	-	°C
Purge Temperature	Temperature of trap during Purge.	#Purge Temp	0	0	420	-	°C
TURBOCool Temperature	Temperature of trap during Purge, if TURBOCool option is installed and configured.	#TurboCoolTemp	-20	-20	400	-	°C
Sample Fill Time	Length of time to transfer sample.	#SampleFill Tm	0	0	299.99	-	min
Sample Temperature	Setpoint for the Sample Heater.	#Sample Temp	40	20	100	-	°C
Dry Purge Time	Length of time to sweep concentrator trap.	#DryPurge Time	2	0	299.99	-	min
Desorb Preheat	Concentrator trap setpoint, prepares trap > GC analyte transfer.	#DesorbPreheat	175	20	420	-	°C
Desorb Temperature	Temperature of trap during Desorb.	#Desorb Temp	180	20	420	-	°C
Bake Time	Length of time to Bake trap.	#Bake Time	10	0	299.99	-	min
Bake Temperature	Temperature of trap during Bake.	#Bake Temp	225	20	420	-	°C
Cryofocusing Module	Whether or not Cryofocusing module option is installed and configured.	#CryoFocuser				-	option
Cryo Standby Temperature	Temperature of idle Cryo.	#CryoStdbyTemp	150	-190	300	-	°C
Cryo Temperature	Low-temperature setpoint for trapping analytes.	#CryoFocusTemp	-150	-190	300	-	°C
Injection Time	Length of time Cryo heater remains at Inject temperature.	#Inject Time	100	0	299.99	-	min
Cryo Injection Temperature	Cryo heater temperature when analytes are released.	#Cryo Inj Temp	180	-190	300	-	°C

Table 3-7: Concentrator Solid Method Parameters

#4

PREVENTIVE MAINTENANCE &

TROUBLESHOOTING

4 Preventive Maintenance and Troubleshooting

4.1 Preventive Maintenance

A carefully designed and faithfully executed Preventive Maintenance program is the best method for maintaining your SOLATek 72. Adherence to scheduled maintenance in the areas of cleaning, checking of parts, and lubrication will help maintain the performance standards of your unit and decrease the chances of down time.

The Preventive maintenance schedule (Table 4.1) lists Preventive Maintenance that can be performed without the assistance of a Tekmar service representative. The more familiar you become with these procedures, the less time it will take to accomplish them. If you have questions, please call the Teledyne–Tekmar Customer Support Center.

Teledyne Tekmar Customer Support Center:

- **(800) 874-2004 in the US and Canada**
- **(513) 229-7000 outside the U.S. and Canada**

4.2 Preventive Maintenance Schedule

Component	Fig #	Frequency	Tools Needed	Maintenance Performed
Tray Vial Holes	4-1	Daily	• Soapy water • Small bristle brush of medium hardness	Check the tray vial holes for foreign particles. Clean if necessary.
Placement Surface And Locating Pins For Vial Trays	4-2	Weekly	• Warm soapy water (deionized) or denatured alcohol • Bristle brush of medium hardness	Check the placement surfaces and the locating pins for the vial trays. Clean, if necessary.
3-Stage Concentric Needle	4-3	Bi-weekly	• Warm water (deionized) • Bristle brush of medium hardness	Inspect the needle for particles or calcification build up. Clean, if necessary.
Vial Mixing Cup and Drain Tubing	4-4	Monthly	• Warm water (deionized) • Bristle brush of medium hardness	Inspect the mixing cup and tubing for clogging. Replace drain line, if necessary

Table 4-1: Preventive Maintenance Schedule

4.2.1 Checking the Tray Vial Holes

Perform a visual inspection of the tray vial holes. Check for any foreign matter that may cause the vials to seat unevenly.

Figure 4-1: Tray Vial Holes

4.2.2 Placement Surface and Locating Pins for Vial Trays

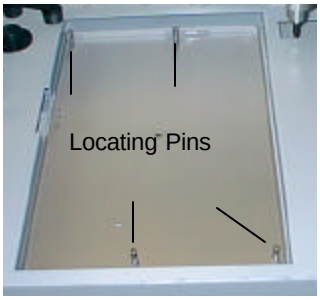


Figure 4-2: Locating Pins for Vial Trays

4.2.3 Three–Stage Concentric Needle

Figure 4-3: Three-Stage Concentric Needle

4.2.4 Vial Mixing Cup and Drain Tubing

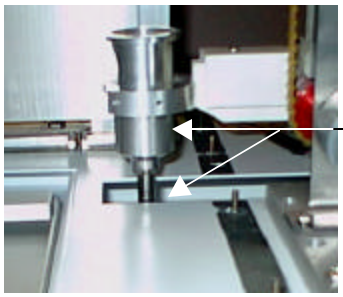


Figure 4-4; Mixing Cup and Drain

4.3 Troubleshooting

Basic troubleshooting information includes troubleshooting safety, finding leaks, and solving basic electronic, mechanical, and analytical problems.

4.4 Error Messages

SOLATek 72 may display error messages when the system detects a problem within itself. If you encounter an error message, and the solution is not obvious, contact the Teledyne Tekmar Customer Support Center.

4.5 Analytical Troubleshooting

If your system develops a problem, and the cause is not obvious, a check of certain conditions and equipment may help to isolate the problem area.

4.5.1 *Problem:* Reduced Sensitivity in Soil Samples
(for Valve locations reference Figure 1-14)

Check for leaks in the following areas:

1. Leak in Soil Pathway

1. Run a leak-check soil pathway program. (Instructions for this procedure are in section 3.5 of this manual)
2. Most leaks in the autosampler occur at the fittings around the soil valve (Figure 1-14) and needle block (Figure 1-1). Check these fittings and tighten, if necessary.

2. Leak in the Standard Vessel

1. Check all the fittings on standard mounts and tighten, if necessary.
2. Make sure all standard positions have glassware in position and secured.

3. Leak in Water Reservoir

Check the following areas for leaks (Figure 2-6)

1. “GAS OUT” bulkhead on the back of the unit.
2. “GAS IN’ fitting on the water reservoir
3. Cap of the water reservoir

4. Failed Soil Valve

1. Place the SOLATek 72 in Purge Mode
2. Run the soil method with a clean, empty vial. Check the flow out of NO port of the soil valve. If there is flow, the soil valve is leaking across ports and must be replaced.
3. Disconnect the 1/8” Teflon line entering the twelve o’clock position of the 4-port, 25mL syringe valve. Check and record the flow.
4. Reconnect the line to the valve.
5. While in the Purge mode, place the SOLATek 72 in Hold and disconnect the heated transfer line from the NC position of the soil valve. The flow coming out of the NC port of the soil valve should be within 10% of the flow measured going in to the top of the 4-port valve.

5. Failed Transfer Valve

Run soil method with a clean empty vial. While unit is in Purge mode, disconnect the 1/8" Teflon line entering the COM port of the transfer valve. Check for flow exiting the COM port. If there is flow, the transfer valve is leaking across ports and must be replaced.

6. Concentrator Leak

Reference the procedure outlined in your concentrator manual for checking the unit for leaks.

4.5.2 *Problem*: Reduced Sensitivity Liquids
(for Valve locations reference Figure 1-14)

1. Failed Transfer Valve

Run a water method on a clean, full vial of DI water. During purge, after the SOLATek has finished its line rinse and sweep, check for flow out of the NO and COM ports of the transfer valve. If there is flow, then the transfer valve is not sealing, or is leaking across ports and must be replaced.

2. Failed Soil Valve

Step the concentrator to the Purge mode. Cap the concentrator vent. Check for flow out the NO port of the soil valve and out of the top stage of the needle. If flow is present at either location, then the soil valve is leaking across ports and must be replaced.

3. Leak in Standard Vessels

1. Check all the fittings on standard mounts and tighten, if necessary.
2. Make sure all standard positions have glassware in position and secured.

4. **Leak in Water Reservoir**

Check the following areas for leaks (Figure 2-6).

1. Check "GAS OUT" bulkhead on back of unit
2. Check “GAS IN” fitting on the water reservoir
3. Check the cap of the water reservoir for leaks

5. **Leak in the SOLATek 72 Aqueous Pathway**

Use a clean, full vial of DI water and run the water method on the SOLATek 72. During Purge, with the SOLATek in Line Rinse and Sweep Mode, cap the concentrator vent and place the concentrator in hold. The purge vessel should stop bubbling within 7 minutes. If bubbling continues, leak check all fittings around:

- Sweep valve
- Transfer valve
- Standard valves
- Pumper valves
- NO position of pressure valve
- Flow controller
- Pressure regulator

The TPC gauge on the front of the concentrator should read within 10% of the system pressure.

4.5.3 *Problem*: Non reproducible or Low Standard Response
(for Valve locations reference Figure 1-14)

1. Failed Standard Check Valve

While the system is pressurized, disconnect the 1/8" Teflon line entering the check valve of the problem standard vessel. If a flow is detected from the check valve, the valve has failed and must be replaced.

2. Failed Standard Restrictor Coil

Place a clean, empty standard vessel on the problem fitting. Step SOLATek 72 to Prime Standard Mode. Flow out of the exit of the restrictive tubing should be approximately 5.1/2mL per minute.

3. Leak in Standards Vessels

Tighten all fittings on standard mounts, make sure all standard positions have glassware attached and tightened.

4.5.4 *Problem*: Incomplete Transfer of Liquid Sample to Concentrator
(for Valve locations reference Figure 1-14)

1. Failed Transfer Valve

One indicator of a failed Transfer Valve is when a sample leaks from the SOLATek 72 needle during Sample Sweep Two Mode, rather than being transferred to the concentrator. If this occurs:

1. Run a water method on a clean, full vial of DI water. During purge, after the SOLATek 72 has finished its Line Rinse And Sweep, check for flow out of the NO and COM ports of the transfer valve.
2. If there is flow, then the Transfer Valve is not sealing, or is leaking across ports and must be replaced.
3. If no flow is present, wait for the SOLATek to finish it's Line Rinse and Sweep.
4. While the concentrator is still in Purge mode check the NO and COM ports of the Transfer Valve for flow. If flow is present, the valve is not sealing, or is leaking across ports and must be replaced.

2. Clogged Needle

Schedule and run a water method on the SOLATek 72.

1. During Presweep A Mode check for flow out of the bottom portion of the needle. The flow out of the needle during this mode is 15 psi, and should be audible.
2. During Presweep B mode check for a slightly slower flow out of the middle stage of the needle.
3. Place the unit in hold; if there is still no flow disconnect the 1/8" Teflon line at the top of the needle. If there is flow out of the line, the needle could be clogged. Remove and replace, or clean, if necessary.

4.5.5 *Problem*: Syringe is not Filling Correctly
(for Valve locations reference Figure 1-14)

1. Leak in Syringe

1. The syringe could be dirty, or leaking at the plunger.
2. Remove the syringe and clean and rinse it with methanol and DI water.
3. Replace the syringe if noticeable damage is present.

2. 4-Port Valve Problem or 8-Port Valve Problem (Reference Figure 1-6)

Schedule and run a water or soil method on the SOLATek 72.

1. Remove the 1/8" Teflon line from port 2 of the 8-port valve. During Presweep A check for flow. The flow should be 15 psi and audible.
2. Step the unit to Presweep B and place the unit in hold. Check for flow out of port 4 of the 8-port. The flow should be similar to that of port 2.
3. If no flow is present at these ports, with the unit still in hold, remove the 1/8" Teflon line entering the twelve o'clock position of the 4-port valve.
4. If flow is present, there is a problem in the 4-port or 8-port valve.
5. Reconnect the line into the twelve o'clock position of the 4-port valve.
6. Disconnect the line entering the nine o'clock position of the 4-port.
7. If no flow is present, the 4-port is malfunctioning.
8. If flow is present, then the 8-port is probably malfunctioning.

3. Failed Pressure Valve

1. While the syringe is pulling a sample from a vial, check for flow out of the NO port of the pressure valve.
2. If flow is present, the valve is leaking and must be replaced.
3. If no flow is present, place the unit in hold. While still in the Fill Syringe Mode disconnect the line entering the COM port of the pressure valve. If no flow is present, the valve might not be actuating and may need to be replaced.

4.5.6 *Problem*: No Water is Transferring to the Vial during a Soil Method
(for Valve locations reference Figure 1-14)

1. Failed Transfer Valve

Schedule and run a soil method.

1. While the SOLATek is in Presweep A or B Mode, place the unit in HOLD and confirm there is flow out of the line entering the top of the needle.
2. Reconnect the line and check for flow out of the NC port of the transfer valve.
3. If flow is present at the NC port, then the valve is leaking across ports and must be replaced.

2. Failed Standard Valve

1. During Sample Sweep 2, place the SOLATek 72 in hold and disconnect the 1/8" Teflon line entering the first Standard Valve. Confirm that there is flow exiting the line.
2. Replace the line and disconnect the line exiting the last Standard Valve. Check for the same flow.
3. If the flow is not present, one of the Standard Valves is clogged or is stuck in the ON position. Call the Teledyne Tekmar Customer Support Center.

3. 4-Port Valve Problem or 8-Port Valve Problem

Schedule and run a Water or Soil method on the SOLATek 72.

1. Remove the 1/8" Teflon line from port 2 of the 8-port valve. During Presweep A check for flow. The flow should be 15 psi and audible.
2. Step the unit to Presweep B and place the unit in hold. Check for flow out of port 4 of the 8-port. The flow should be similar to that of port 2.
3. If no flow is present at these ports, with the unit still in hold, remove the 1/8" Teflon line entering the twelve o'clock position of the 4-port valve.
4. If flow is present, there is a problem in the 4-port or 8-port valve.
5. Reconnect the line into the twelve o'clock position of the 4-port valve.
6. Disconnect the line entering the nine o'clock position of the 4-port valve.
7. If no flow is present, the 4-port is malfunctioning.
8. If flow is present, then the 8-port is probably malfunctioning.

4. Clogged Needle

Schedule and run a water method on the SOLATek 72.

1. During Presweep A Mode check for flow out of the bottom portion of the needle. The flow out of the needle during this mode is 15 psi, and should be audible.
2. During Presweep B Mode check for a slightly slower flow out of the middle stage of the needle.
3. Place the unit in hold; if there is still no flow disconnect the 1/8" Teflon line at the top of the needle. If there is flow out of the line, the needle could be clogged. Remove and replace, or clean, if necessary.

4.6 Valve Truth Tables

4.6.1 Tekmar 3000 Series Liquid Method Modes

Tekmar 3000 Series Liquid Method Modes	aa Pressure	bb Transfer	cc Water	dd Sweep	ee Soil	4-port	8-port	ST1	ST2	ST3
Standby						Input	1	A	A	A
Purge Ready						Input	1	A	A	A
Elevator Up						Input	1	A	A	A
PreSweep A	x			x*		Bypass	4	A	A	A
PreSweep B	x			x*		Bypass	2	A	A	A
PreSweep C	x	x		x*		Bypass	2	A	A	A
Lower Elevator						Input	1	A	A	A
Move Sample to Elevator						Input	1	A	A	A
Elevator Up	x	x		x		Input	4	A	A	A
Sample Prime-- Fill Syringe	x	x		x		Input	4	A	A	A
Sample Prime-- Dispense Syringe	x	x		x		Input	6	A	A	A
Sample Fill-- Fill Syringe	x	x		x		Input	4	A	A	A
Sample Fill-- Dispense Waste	x	x		x		Output	4	A	A	A
Sweep Waste		x		x		Extra	4	A	A	A
Sample Fill-- Fill STD		x		x		Input	2	B	B	B
Sample Xfer		x				Input	2	A	A	A
Sample Transfer-- Dispensing Waste		x				Output	2	A	A	A
Sample Sweep 1		x		x*		Bypass	6	A	A	A
Sample Sweep 2		x				Bypass	2	A	A	A
Elevator Down						Input	2	A	A	A
Move Vial Sample Tray						Input	2	A	A	A
Elevator Up			X			Input	2	A	A	A
Line Rinse 1-- Fill Syringe Water	x		x			Input	7	A	A	A
Line Rinse 1-- Dispense Water						Input	4	A	A	A
Line Sweep 1	X			x*		Bypass	4	A	A	A
Line Rinse 2-- Fill Syringe	x		x			Input	7	A	A	A
Line Rinse 2-- Dispense Water	x					Input	2	A	A	A
Line Sweep 2	X			x*		Bypass	2	A	A	A
Needle Sweep	x			x*		Input	2	A	A	A
Elevator Down						Input	2	A	A	A
Waiting for End of Desorb						Bypass	4	A	A	A
* Bake Rinse-- Fill Syringe			x			Input	7	A	A	A
* Bake Rinse-- Dispense Syringe Water		x	x			Input	2	A	A	A
* Bake Sweep	x	x		x		Bypass	2	A	A	A
* Bake Drain	X	X		X		Bypass	2	A	A	A
Bake						Bypass	2	A	A	A

* Valve is actuated for first 0.15 minutes of the mode

Table 4-2: Tekmar 3000 Series Liquid Method Modes

4.6.2 Other Concentrator Liquid Method Modes

Other Concentrator Liquid Method Modes	aa Pressure	bb Transfer	cc Water	dd Sweep	ee Soil	ff Drain³	gg Purge*	4-port	8-port	ST1	ST2	ST3
Standby								Input	1	A	A	A
Purge Ready								Input	1	A	A	A
Elevator Up								Input	1	A	A	A
PreSweep A	x			x*				Bypass	4	A	A	A
PreSweep B	x			x*				Bypass	2	A	A	A
PreSweep C	x	x		x*		x		Bypass	2	A	A	A
Lower Elevator								Input	1	A	A	A
Move Sample to Elevator								Input	1	A	A	A
Elevator Up	x	x		x				Input	4	A	A	A
Sample Prime-- Fill Syringe	x	x		x				Input	4	A	A	A
Sample Prime-- Dispense Syringe	x	x		x				Input	6	A	A	A
Sample Fill-- Fill Syringe	x	x		x				Input	4	A	A	A
Sample Fill-- Dispense Waste	x	x		x				Output	4	A	A	A
Sweep Waste		x		x				Extra	4	A	A	A
Sample Fill-- Fill STD		x		x				Input	2	B	B	B
Sample Xfer		x						Input	2	A	A	A
Sample Transfer-- Dispensing Waste		x						Output	2	A	A	A
Sample Sweep 1		x		x*				Bypass	6	A	A	A
Sample Sweep 2		x					x	Bypass	2	A	A	A
Elevator Down							x	Input	2	A	A	A
Move Vial Sample Tray							x	Input	2	A	A	A
Elevator Up			x					Input	2	A	A	A
Line Rinse 1-- Fill Syringe Water	x		x					Input	7	A	A	A
Line Rinse 1-- Dispense Water								Input	4	A	A	A
Line Sweep 1	x			x*				Bypass	4	A	A	A
Line Rinse 2-- Fill Syringe	x		x					Input	7	A	A	A
Line Rinse 2-- Dispense Water	x							Input	2	A	A	A
Line Sweep 2	x			x*				Bypass	2	A	A	A
Needle Sweep	x			x*				Input	2	A	A	A
Elevator Down			x					Input	2	A	A	A
Waiting for End of Desorb								Bypass	4	A	A	A
* Bake Rinse-- Fill Syringe			x					Input	7	A	A	A
* Bake Rinse-- Dispense Syringe Water		x	x					Input	2	A	A	A
* Bake Sweep	x	x		x				Bypass	2	A	A	A
* Bake Drain	x	x		x				Bypass	2	A	A	A

* Valve is actuated for first 0.15 minutes of the mode

Table 4-3: Other Concentrator Liquid Method Modes

4.6.3 Tekmar Solid Method Modes

Tekmar-Solid Method Modes	aa Pressurize	bb Transfer	cc Water	dd Sweep	ee Soil	4-port	8-port	ST1	ST2	ST3
Standby						Input	1	A	A	A
Purge Ready						Input	1	A	A	A
Elevator Up						Input	1	A	A	A
PreSweep A	x			x*		Bypass	4	A	A	A
PreSweep B	x			x*		Bypass	2	A	A	A
PreSweep C	x	x		x*		Bypass	2	A	A	A
Lower Elevator						Input	1	A	A	A
Move Sample to Elevator						Input	1	A	A	A
Water Prime-- Fill Syringe						Input	7	A	A	A
Water Prime-- Dispense Syringe						Output	7	A	A	A
Fill Syringe – Dispense to Vial						Input	7	A	A	A
Sample Fill-- Fill Std					x	Input	2	B	B	B
Elevator Up					x	Input	2	A	A	A
Fill Vial --Dispense To Vial					x	Input	2	A	A	A
Sample Sweep 1				x*	x	Bypass	6	A	A	A
Sample Sweep 2				x	x	Bypass	2	A	A	A
Sample Preheat		x			x	Bypass	3	A	A	A
Purge Sample		x			x	Bypass	4	A	A	A
Elevator Down						Input	4	A	A	A
Move Vial Sample Tray						Input	4	A	A	A
Elevator Up						Input	4	A	A	A
Line Rinse 1-- Fill Syringe	x		x			Input	7	A	A	A
Line Rinse 1-- Dispense Water	x					Input	4	A	A	A
Line Sweep 1	x			x*		Bypass	4	A	A	A
Line Rinse 2-- Fill Syringe	x		x			Input	7	A	A	A
Line Rinse 2-- Dispense Water	x			x		Input	2	A	A	A
Line Sweep 2	x			x*		Bypass	2	A	A	A
Needle Sweep	x			x		Bypass	2	A	A	A
Elevator Down						Output	1	A	A	A
Desorb-- Waiting for end of desorb						Output	1	A	A	A
Bake-- Waiting for end of bake						Output	1	A	A	A

* Valve is actuated for first 0.15 minutes of the mode

Table 4-4: Tekmar Solid Method Modes

4.6.4 Non-Tekmar Solid Method Modes

Soil-other Method Modes	aa Pressurize	bb Transfer	cc Water	dd Sweep	ee Soil	ff Drain*	gg Purge*	4-port	8-port	ST1	ST2	ST3
Standby								Input	1	A	A	A
Purge Ready								Input	1	A	A	A
Elevator Up								Input	1	A	A	A
PreSweep A	x			x*				Bypass	4	A	A	A
PreSweep B	x			x*				Bypass	2	A	A	A
PreSweep C	x	x		x*		x		Bypass	2	A	A	A
Lower Elevator								Input	1	A	A	A
Move Sample to Elevator								Input	1	A	A	A
Water Prime-- Fill Syringe								Input	7	A	A	A
Water Prime-- Dispense Syringe								Output	7	A	A	A
Water Fill-- Fill Syringe								Input	7	A	A	A
Sample Fill-- Fill Std					x			Input	2	B	B	B
Elevator Up					x			Input	2	A	A	A
Fill Vial --Dispense To Vial					x			Input	2	A	A	A
Sample Sweep 1				x*	x			Bypass	6	A	A	A
Sample Sweep 2				x	x		x	Bypass	2	A	A	A
Sample Preheat		x			x		x	Bypass	3	A	A	A
Purge Sample		x			x		x	Bypass	4	A	A	A
Elevator Down								Input	4	A	A	A
Move Vial Sample Tray								Input	4	A	A	A
Elevator Up								Input	4	A	A	A
Line Rinse 1-- Fill Syringe	x		x					Input	7	A	A	A
Line Rinse 1-- Dispense Water	x							Input	4	A	A	A
Line Sweep 1	x			x*				Bypass	4	A	A	A
Line Rinse 2-- Fill Syringe	x		x					Input	7	A	A	A
Line Rinse 2-- Dispense Water	x			x				Input	2	A	A	A
Line Sweep 2	x			x*				Bypass	2	A	A	A
Needle Sweep	x			x				Bypass	2	A	A	A
Elevator Down								Bypass	1	A	A	A

* Valve is actuated for first 0.15 minutes of the mode

Table 4-5: Non-Tekmar Solid Method Modes

4.7 Robotic Arm Calibration

The SOLATek 72 mechanical XYZ arm has a homing setup that keeps the arm position in check. XYZ Arm Calibration requires four components:

- (2) tray calibration bars (cal-bar)
- calibration disk (cal disk)
- gripper calibration pin (cal-pin)

To calibrate the XYZ arm:

1. Press [Shift] + [Setup], [3]. (Arm Calibration).

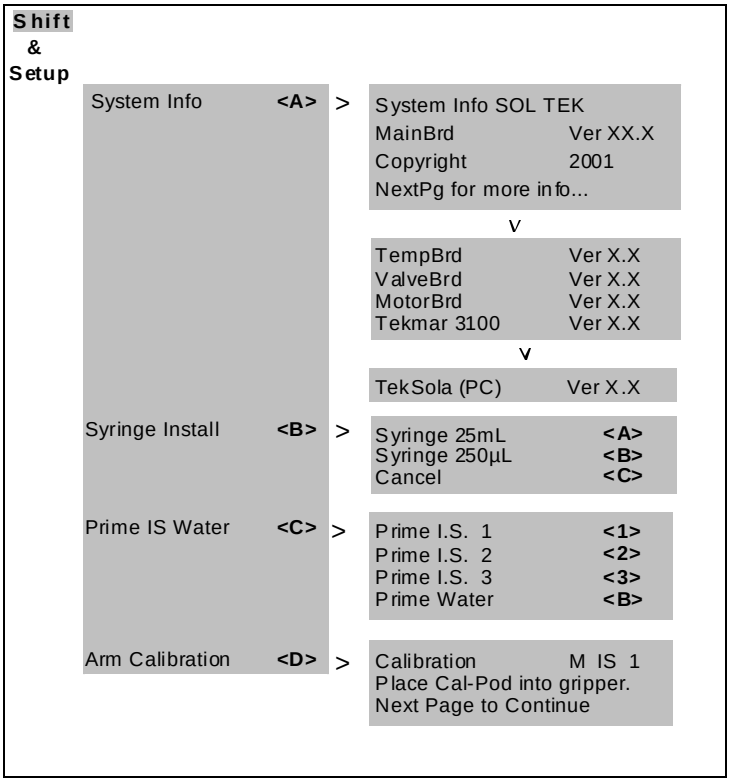


Figure 4-5: System Setup Screen

2. Press [Step] to begin arm calibration.

3. Press [Next Page] to open the gripper

4. Place the Cal-pod up into the gripper with the pin facing down.

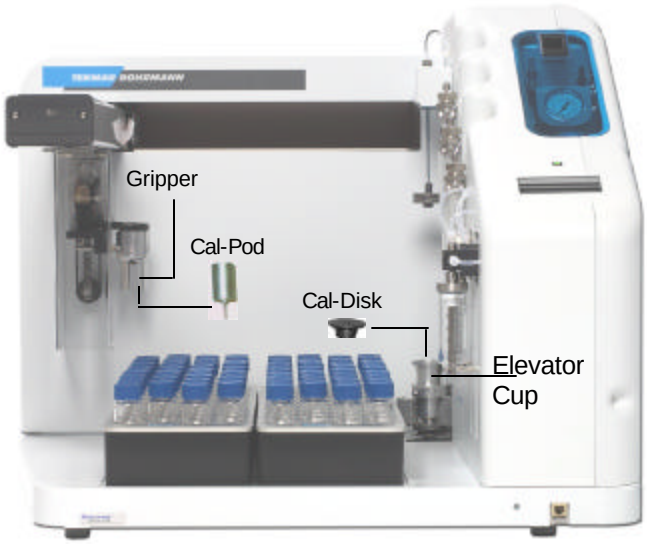


Figure 4-6**:** Cal-Pod, Cal-Disk, and Gripper

5. Press [Next Page] to close the gripper around the cal-pin.

6. In Tray 1, place one calibration bar in positions 9 and 27 and the other in positions 10 and 28. Make sure that both bars are firmly situated and correctly oriented (Figure 4-7). **Failure to correctly orient the calibration bars will cause the arm movement to be misaligned with the vials.**

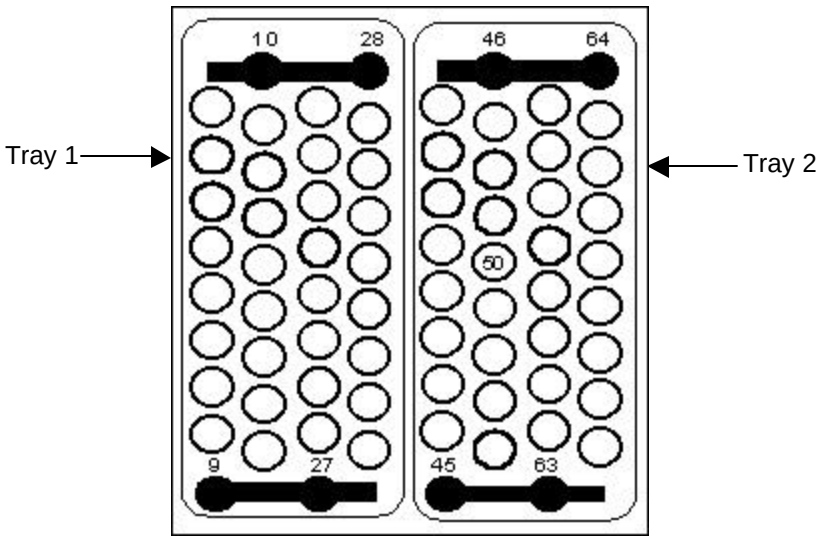


Figure 4-7 Calibration Bar Placements

7. Press [Step] to start Tray 1 calibration.

8. When the arm finishes Tray 1 calibration, press [Next Page].

9. Remove the cal-bars from Tray 1.

10. In Tray 2, place one calibration bar in positions 45 and 63 and the other in positions 46 and 64. Make sure that both bars are oriented correctly (see Figure 4-7).

11. Press [Step] to start Tray 2 calibration.

12. When the arm finishes Tray 2 calibration, press [Next Page].

13. Place the Cal-disk into the elevator cup and press [Step] (Figure 4-6).

14. When the arm finishes, press [Step].

15. Press [Next Page] to release the cal-pin from the gripper.

16. SOLATek 72 acknowledges the calibration and stores it in memory.

4.8 Troubleshooting Boards

Errors that do not produce error codes can often be diagnosed to the board component causing the problem. The tables in this section provide information on voltages, connections, resistance, fuse ratings, and LED designations.

Use the information in these tables in conjunction with the Troubleshooting information in section 4.9.

4.8.1 Relay Control Board

The Relay Control Board is located on the back right side of the unit (Figure 1-15) and is controlled by the Temperature Control Board. It is supplied with 115VAC from the power supply. See Table 4-6 for detailed component information

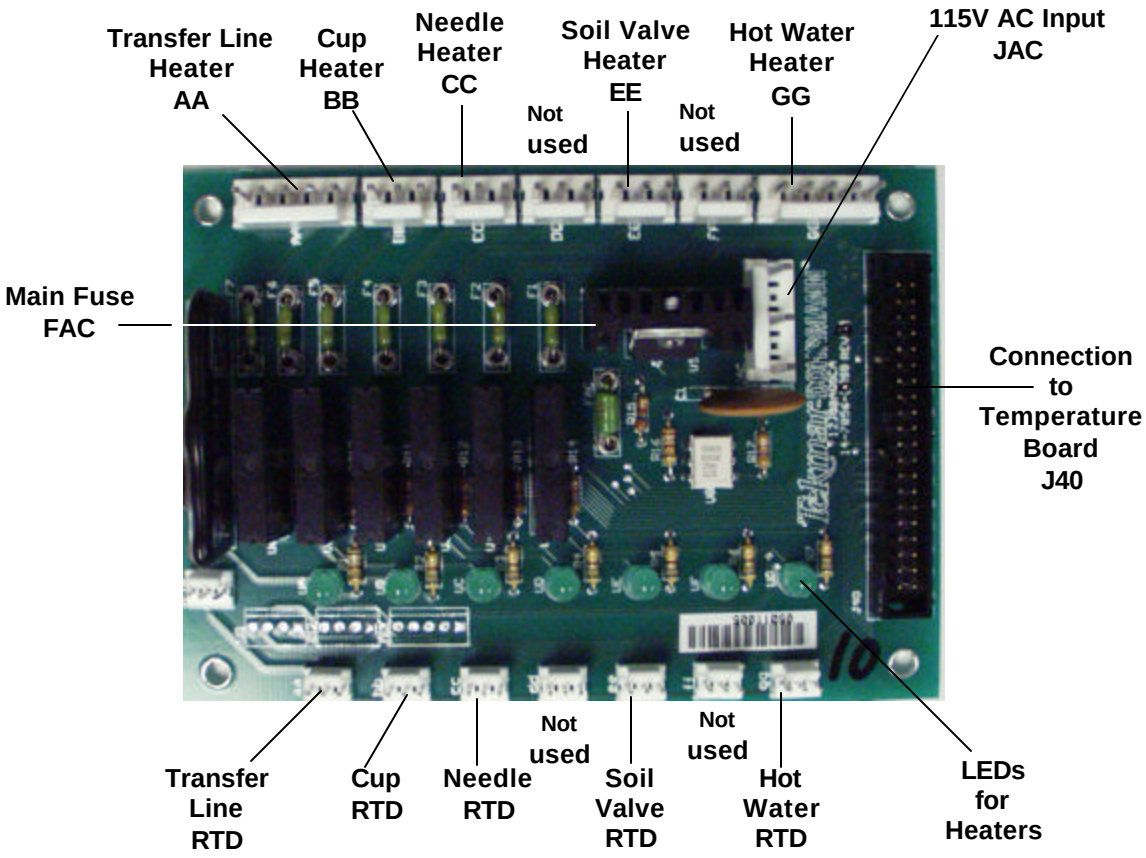


Figure 4-8: Relay Control Board

Relay Control Board Resistance Table

Relay Control Board Resistance Table					
PCB Connection	**Part**	**Voltage**	**Resistance**	**Voltage**	**Resistance**
AA	Transfer Line Heater	120 VAC	47-59 Ω	240 VAC	140-170 Ω
BB	Vial Cup Heater	120 VAC	518-604Ω	240 VAC	1728-2880Ω
CC	Needle Block Heater	120 VAC	518-604Ω	240 VAC	1728-2880Ω
DD	Not Used				
EE	Valve Oven Heater	120 VAC	518-604Ω	240 VAC	1728-2880Ω
FF	Not Used				
GG	Water Heater	120 VAC	129-151Ω	240 VAC	518-604Ω
PCB Connection	**Part**	**Temp**	**Resistance**	**Temp**	**Resistance**
aa	Transfer Line RTD	0°C	1000Ω	100°C	1385Ω
bb	Vial Cup RTD	0°C	1000Ω	100°C	1385Ω
cc	Needle Block RTD	0°C	1000Ω	100°C	1385Ω
dd	Not Used				
ee	Valve Oven RTD	0°C	1000Ω	100°C	1385Ω
ff	Not Used				
gg	Water heater RTD	0°C	1000Ω	100°C	1385Ω

Table 4-6: Relay Control Board Resistance Table

Relay Control Board Fuse Table

Relay Control Board Fuse Table		
Fuse Designator	**Connection Designator Associated with Fuse**	**Value**
FAC	No Connection	5 AMP
F1	GG	2 AMP
F2	FF	2 AMP
F3	EE	2 AMP
F4	DD	2 AMP
F5	CC	2 AMP
F6	BB	2 AMP
F7	AA	3 AMP
Note: Fuses listed are for 100-240 VAC units		

Table 4-7: Relay Control Board Fuse Table

Relay Control Board LED Designations

Relay Control Board LED Designations	
Note: When the LED is illuminated, it means that power is applied to its associated connector.	
LED Designation	**Associated Connector**
UA	AA
UB	BB
UC	CC
UD	DD
UE	EE
UF	FF
UG	GG

Table 4-8: Relay Control Board LED Designations

4.8.2 Valve Interface Board

The Valve Interface Board is located on the right side of the unit (Figure 1-15). All valves connect to this board.

The Solenoid Valves are located across the top with the LEDs right below them

Designator	Function
JM1, JM2, and JM3	Voltage for standards valves
L1A through L3B	LEDs for status the of the standard addition valves. A (Position with flow path), B (Loading Standard)
J3	Connects to the Valve Control Board (motor control)
J4	Connects to the Valve Control Board (DC valves)
J6	Error light
J7	The 24 VDC from pumpers for output on J8
J8	24VC output to the fan on the left panel

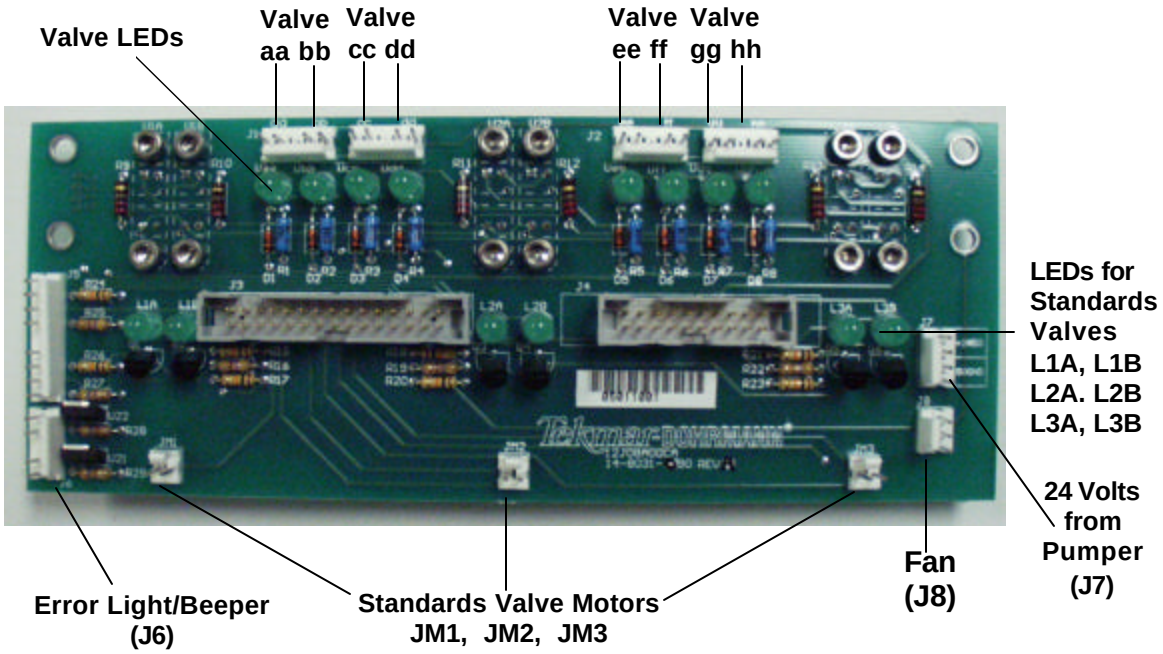


Figure 4-9: I.S. Valve Interface Board

Valve Interface Board Voltage Table

I.S. Valve Board Voltage Table		
PCB Connection	**Voltage**	**Part**
aa	24 VDC to actuate, 12 VDC to hold the actuation	Pressure Valve
bb	24 VDC to actuate, 12 VDC to hold the actuation	Transfer Valve
cc	24 VDC to actuate, 12 VDC to hold the actuation	Water Valve
dd	24 VDC to actuate, 12 VDC to hold the actuation	Sweep Purge Valve
ee	24 VDC to actuate, 12 VDC to hold the actuation	Soil Valve
ff	24 VDC to actuate, 12 VDC to hold the actuation	Optional Drain Valve
gg	24 VDC to actuate, 12 VDC to hold the actuation	Optional Purge Valve
hh	24 VDC to actuate, 12 VDC to hold the actuation	Spare Valve Connection
JM1	12 VDC during rotation	ST1 Valve
JM2	12 VDC during rotation	ST2 Valve
JM3	12 VDC during rotation	ST3 Valve
J7	24 VDC Continuous	Power Input
J8	24 VDC Continuous	Fan Output

Table 4-9: I.S. Valve Board Voltage Table

I.S. Valve Board LED Designators

I.S. Valve Board LED Designations	
Note: When the LED is illuminated, it means that power is applied to its associated connector.	
LED Designation	**Associated Connector**
Uaa	J1-aa
Ubb	J1-bb
Ucc	J1-cc
Udd	J1-dd
Uee	J2-ee
Uff	J2-ff
Ugg	J2-gg
Uhh	J2-hh

I.S. Valve Board LED Designations				
Valve	**LED Designators**	**LED Status**	**Valve Position**	**Valve Status**
Standard Valve #1	L1A	ON	ST1 at CCW Position	Idle
	L1B	ON	ST1 at CW Position	Filling
	L1A	OFF	ST1 at the Intermediate Position	Motor Turning
	L1B	OFF	ST1 at the Intermediate Position	Motor Turning
Standard Valve #2	L2A	ON	ST2 at CCW Position	Idle
	L2B	ON	ST2 at CW Position	Filling
	L2A	OFF	ST2 at the Intermediate Position	Motor Turning
	L2B	OFF	ST2 at the Intermediate Position	Motor Turning
Standard Valve #3	L3A	ON	ST3 at CCW Position	Idle
	L3B	ON	ST3 at CW Position	Filling
	L3A	OFF	ST3 at the Intermediate Position	Motor Turning
	L3B	OFF	ST3 at the Intermediate Position	Motor Turning

Figure 4-10: Internal Standard Valve board LED Designations

4.8.3 CPU Board

The CPU Board is located on the right wall in the rear of the unit (Figure 1-15). A 3-volt battery on the back of the CPU board holds operating parameters.

Designator	Function
J3	Network connection
J8	Connects to the handheld controller

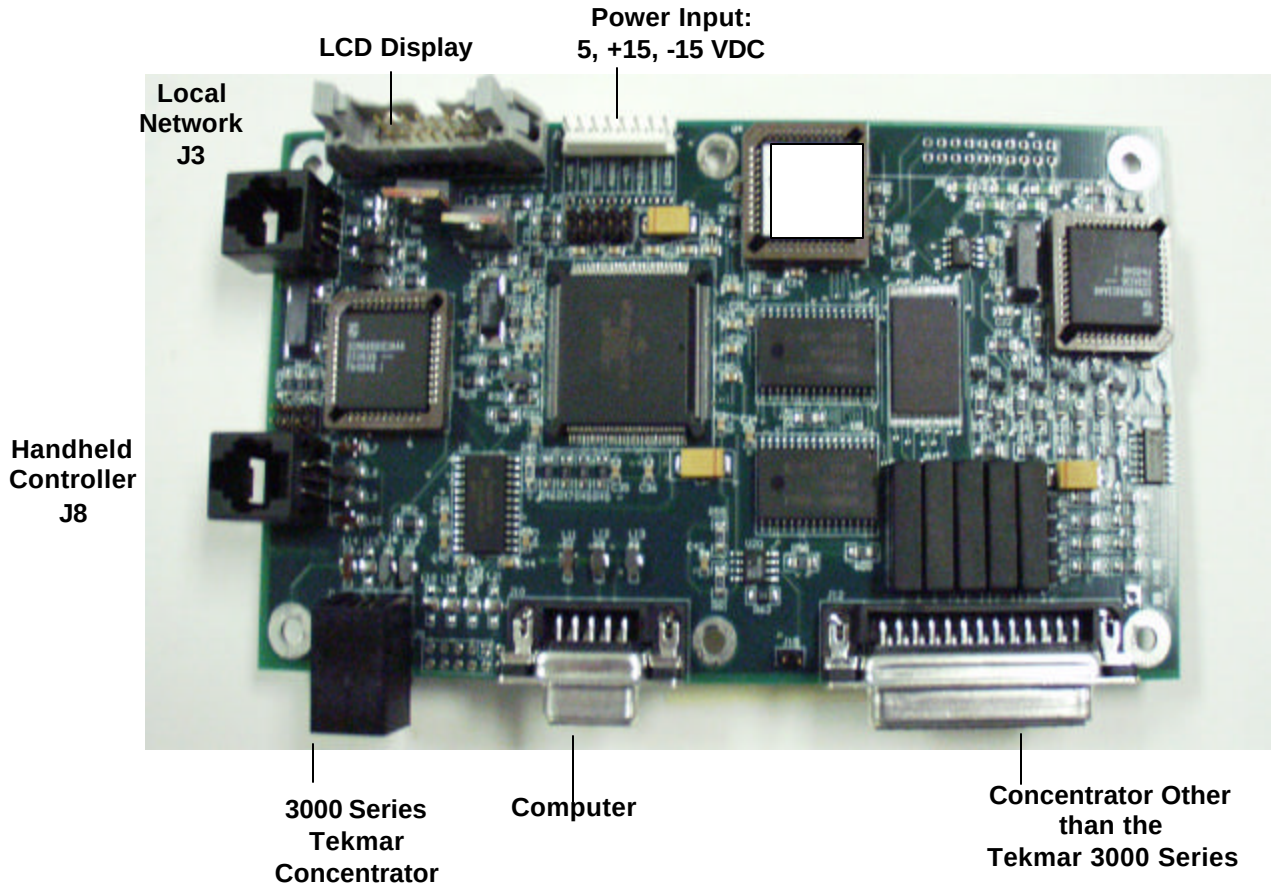


Figure 4-11: CPU Board

4.8.4 Valve Control Board

The Valve Control Board is located on the on the back wall behind the Power Supply (Figure 1-15).

Designator	Function
J3 and J4	Local Network connections (interchangeable)
J5	Connect to the 8-port valve
J6	Connects to the 4-port valve
J14	Power Input
J1	Test Point
LEDs (aa through hh)	Redundant LEDs for the valves
Dip Switches	All down

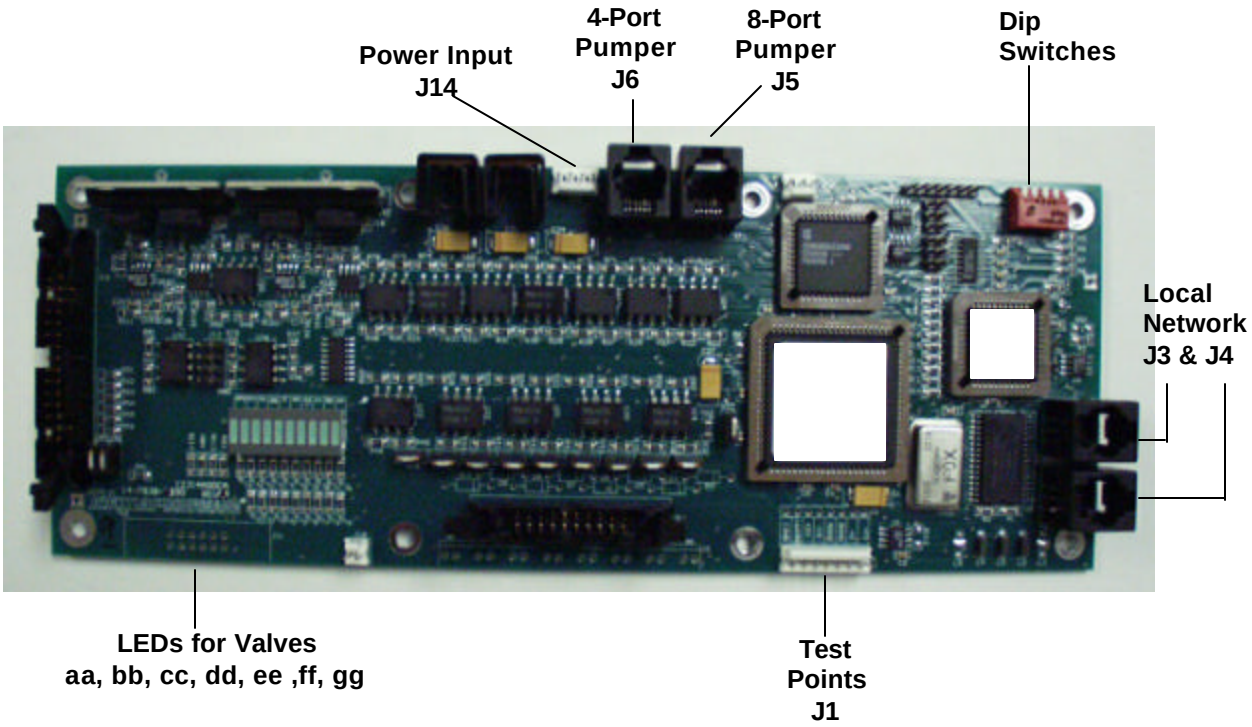


Figure 4-12: Valve Control Board

4.8.5 Temperature Control Board

The Temperature Control Board is located on the left side on the back panel (Figure 1-15).

Designator	Function
J1	Power input and test point
J3 and J4	Local Network connections (interchangeable)
Dip Switches	All the pins are down
LED Bank 1 – (1-4)	Power supplies
LED Bank 2 – (3-9)	Heater elements. Main, at the top of the bank, must be on for the heaters to operate

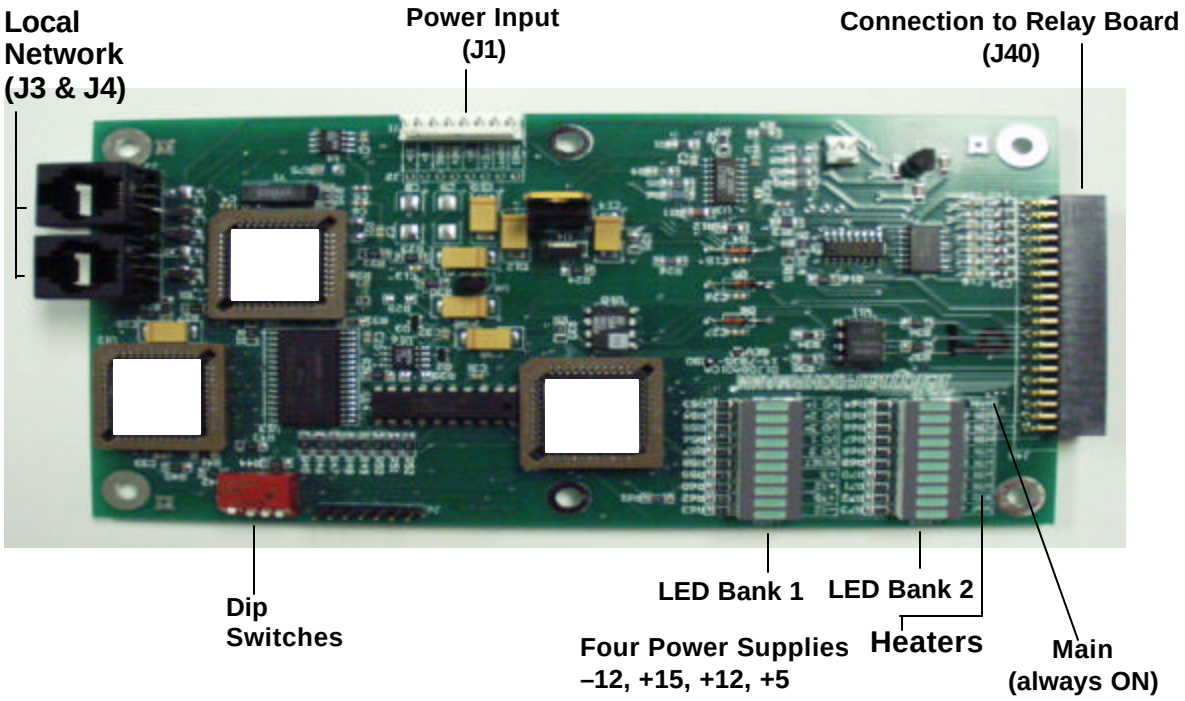


Figure 4-13: Temperature Control Board

4.8.6 Motor Control Board

The Motor Control board is on the back wall right above the Power Supply (Figure 1-15). The Motor Board holds the coordinates for Arm Calibration.

Designator	Function
J23	Located on the left side of the board. Supplies the Motor Connector with 24 VDC.
J3 and J4	Local Network connections (interchangeable)
Dummy test points	Located on the bottom of the board

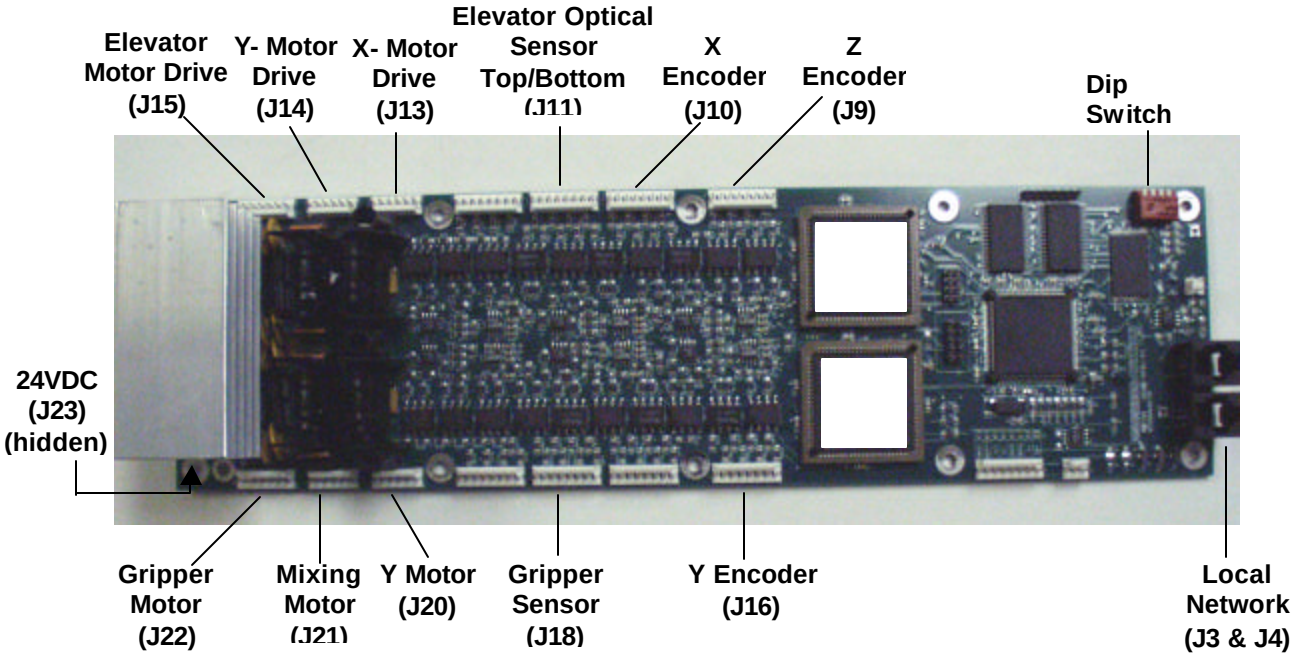


Figure 4-14: Motor Control Board

4.9 Electrical Troubleshooting

WARNING
Before servicing your SOLATek 72, turn the unit OFF and unplug the power cord.

If your system develops an electrical problem, an analytical check of certain conditions may help to isolate the problem area. The problems and possible solutions presented here are by no means inclusive, but represent some basic electrical problems and their possible solutions.

As always, please contact the Teledyne Tekmar Customer Support Center if you need assistance.

Heated Zone Troubleshooting

Symptom	Conditions	Where to Check
A Heated Zone is not Heating	The LED indicator for the zone in question is illuminated, but the heated zone remains at room temperature.	Measure the resistance of the heater, and compare it to the resistance value in Table 4-6. If the value does not agree, it may indicate a failed heater.
		Refer to Table 4-6 and locate the zone in question. Check the appropriate fuse for continuity (Table 4-7). If the fuse indicates open, replace it with a fuse of the same rating.
	The LED indicator for the zone in question is not illuminated, the heated zone remains at room temperature, but the set point is set higher than room temperature.	Check the status LED on the Relay Control Board (Figure 4-8). If the LED is illuminated, make sure the J40 cable is secure and properly seated. If the LED is not illuminated, download the program again by turning the unit on and off.
More than one Heated Zone is not Heating	The LED indicators for the zones in question are illuminated, but the heated zones remain at room temperature.	The main AC power for all of the heated zones is applied at connector JAC on the Relay Control Board (Figure 4.8). Check the connector to make sure it is properly seated and firmly in place.
		Check the main fuse (FAC) on the Relay Control board for continuity (Figure 4-8). If the fuse indicates open, replace it with a fuse of the same rating (Table 4-7).
Heated Zone indicates an open Resistance Thermal Detector (RTD)	A Resistance Thermal Detector (RTD) is open	Refer to Table 4-6 to identify where the zone in question attaches to the Relay Control Board. Remove the RTD in question and measure its resistance. The resistance should be in the range of 1,000 – 2,000Ω. If the resistance is outside this range, replace the RTD in question.
More than one Heated Zone indicates an open RTD	It is highly unlikely that multiple Heated Zones would indicate open simultaneously	Reseat the 40-Pin ribbon cable between the Relay Control Board and the Temperature Control Board

Table 4-10: Heater Zone Problem Analysis

Solenoid Valve Troubleshooting

Symptom	Conditions	Where to Check
Solenoid valves do not actuate, but the pumpers, motors, IS valves, and fans operate	The 24-volt supply to the Valve Board is missing. The 24 volts supplied to the IS Board is a pass-through connection for the fan only.	Reseat the 24-volt connector on the Valve Control Board (Figure 4-12)
	The 20-pin ribbon cable from the Valve Board to the IS Board is loose or not connected	Reseat the 24-volt connector on the Valve Control Board (Figure 4-12).
Solenoid valve does not actuate, but the LED indicator on the IS Board can be controlled ON and OFF	The Solenoid Valve is bad.	Replace the Solenoid Valve.
Solenoid valve does not actuate and the LED indicator on the ID board can not be controlled ON and OFF	The Valve Control Board in the rear of the cabinet or the cable is defective	Inspect the corresponding valve control indicator for the valve zone on the Valve Control Board. • If this indicator can be controlled ON and OFF replace the 20-pin ribbon cable. • If this indicator cannot be controlled ON and OFF replace the Valve Control Board.

Table 4-11: Solenoid Valve Problem Analysis

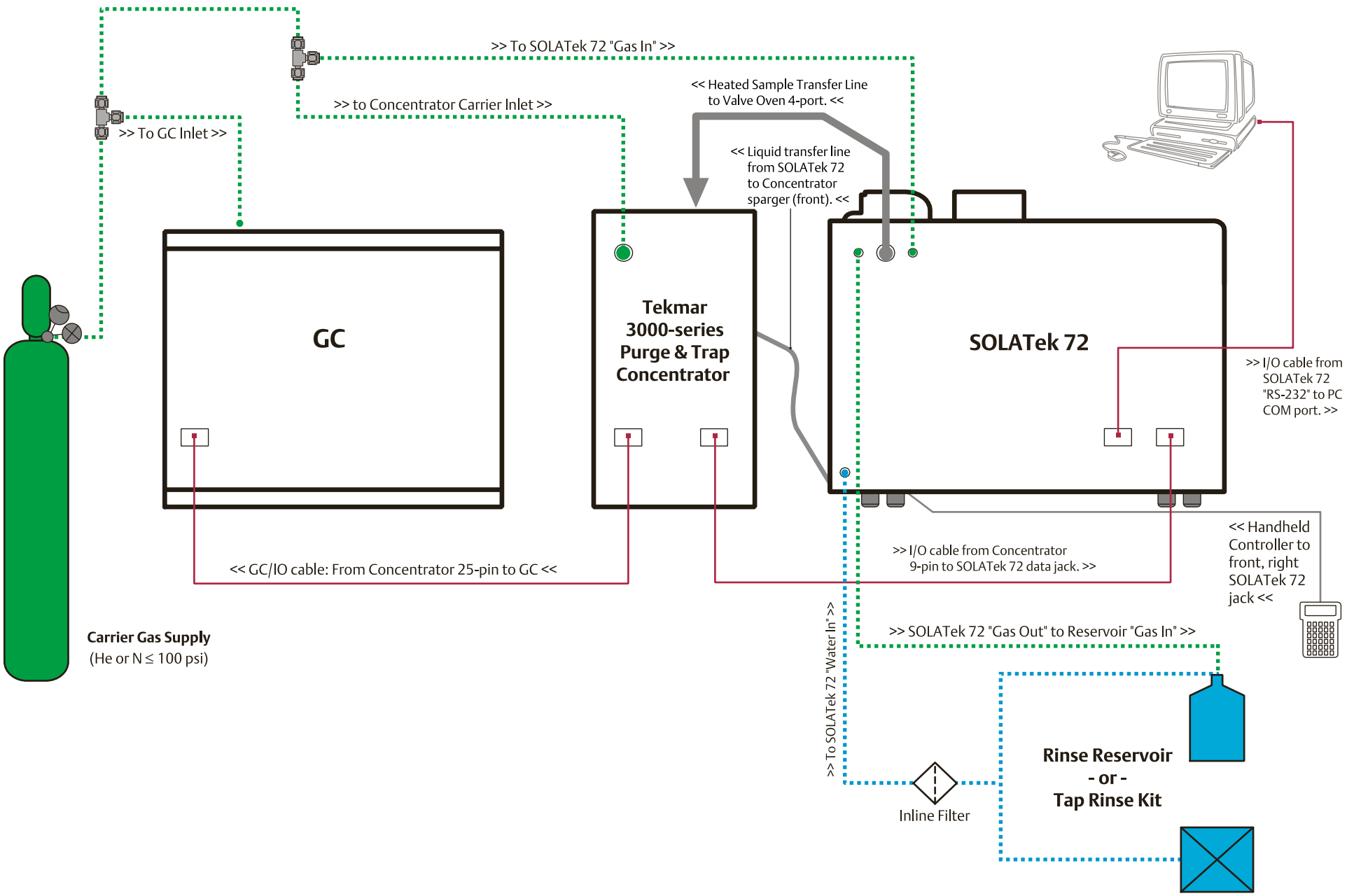
IS Board Troubleshooting

Symptom	Conditions	Where to Check
Internal Standards valves cannot be controlled, but some Internal Standards indicators on the internal valve are illuminated	Internal standards valve is not responding from the Valve Board Assembly	Turn the power OFF and ON to reestablish communication on the Valve board. If the Internal Standard Valves do not function properly after power is reapplied, replace the Valve Control Board.
Internal Standards valves cannot be controlled, and none of the Internal Standards indicators on the internal valve are illuminated	Check the 30-pin ribbon cable connecting the IS Board to the Valve Board. It has probably come unseated.	Reseat the cable at both assemblies

Table 4-12: IS Board Problem Analysis

#5

DIAGRAMS



Recommended SOLATek 72 Bench Setup

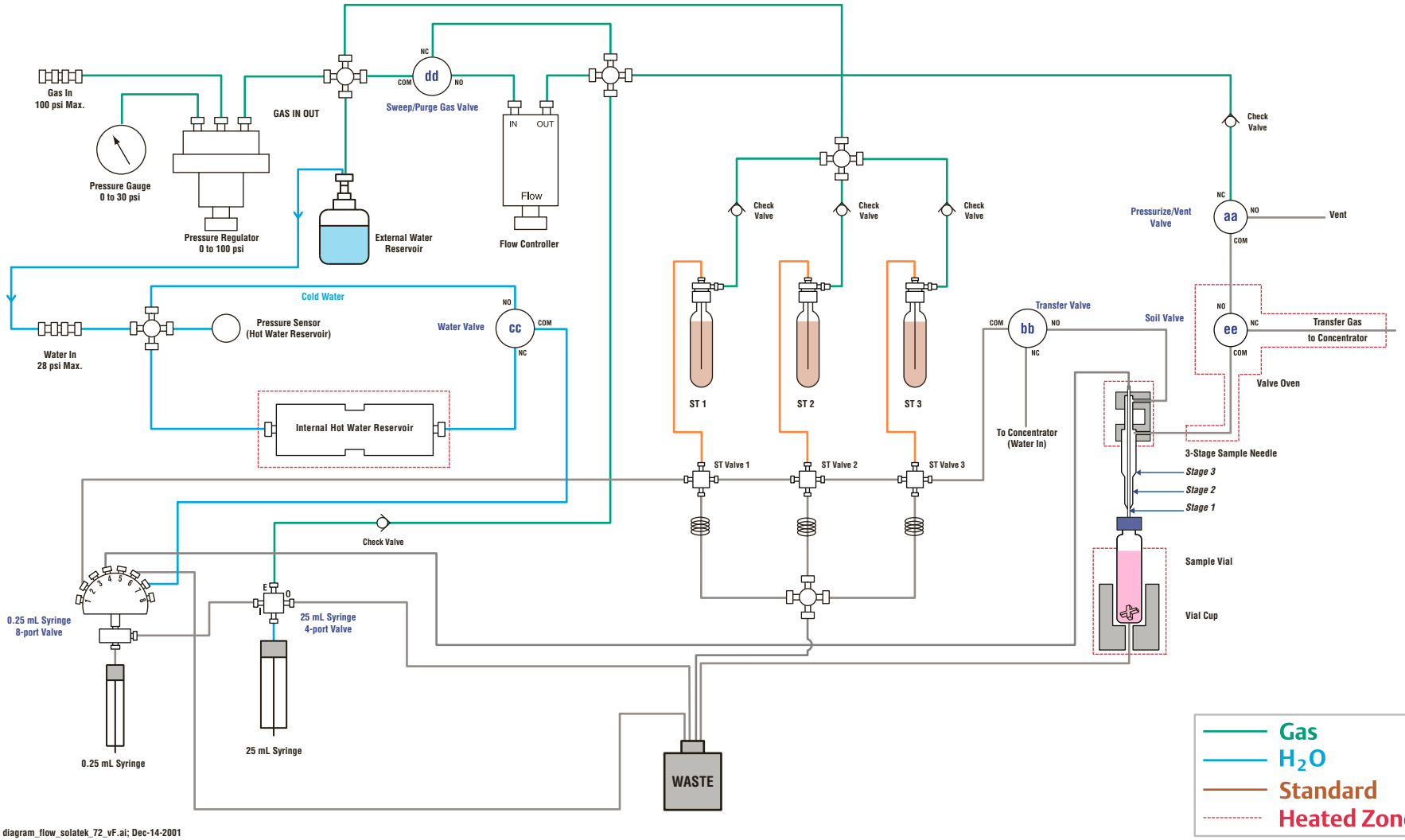
Mode	Tekmar 3000-series Liquid Method Modes	aa Pressure	bb Transfer	cc Water	dd Sweep	ee Soil	25 mL 4-port	0.25 mL 8-port	ST1	ST2	ST3	
1	Standby						Input	1	A	A	A	
2	Purge Ready						Input	1	A	A	A	
3	Elevator Up						Input	1	A	A	A	
4	PreSweep A	X			X*		Bypass	4	A	A	A	
5	PreSweep B	X			X*		Bypass	2	A	A	A	
6	PreSweep C	X	X		X*		Bypass	2	A	A	A	
7	Lower Elevator						Input	1	A	A	A	
8	Move Sample to Elevator						Input	1	A	A	A	
9	Elevator Up	X	X		X		Input	4	A	A	A	
10	Sample Prime—Fill Syringe	X	X		X		Input	4	A	A	A	
11	Sample Prime—Dispense Syringe	X	X		X		Input	6	A	A	A	
12	Sample Fill—Fill Syringe	X	X		X		Input	4	A	A	A	
13	Sample Fill—Dispense Waste	X	X		X		Output	4	A	A	A	
14	Sweep Waste		X		X		Extra	4	A	A	A	
15	Sample Fill—Fill Standard		X		X		Input	2	B	B	B	
16	Sample Transfer		X				Input	2	A	A	A	
17	Sample Transfer—Dispensing Waste		X				Ouput	2	A	A	A	
18	Sample Sweep 1		X		X*		Bypass	6	A	A	A	
19	Sample Sweep 2		X				Bypass	2	A	A	A	
20	Elevator Down						Input	2	A	A	A	
21	Move Vial Sample Tray						Input	2	A	A	A	
22	Elevator Up			X			Input	2	A	A	A	
23	Line Rinse 1—Fill Syringe Water	X		X			Input	7	A	A	A	
24	Line Rinse 1—Dispense Water						Input	4	A	A	A	
25	Line Sweep 1	X			X*		Bypass	4	A	A	A	
26	Line Rinse 2—Fill Syringe	X		X			Input	7	A	A	A	
27	Line Rinse 2—Dispense Water	X					Input	2	A	A	A	
28	Line Sweep 2	X			X*		Bypass	2	A	A	A	
29	Needle Sweep	X			X*		Input	2	A	A	A	
30	Elevator Down						Input	2	A	A	A	
31	Waiting for End of Desorb						Bypass	4	A	A	A	
32	Bake Rinse—Fill Syringe			X			Input	7	A	A	A	
33	Bake Rinse—Dispense Syringe Water		X	X			Input	2	A	A	A	
34	Bake Sweep	X	X		X		Bypass	2	A	A	A	
35	Bake Drain	X	X		X		Bypass	2	A	A	A	
36	Bake						Bypass	2	A	A	A	

*Valve is actuated for first 0.15 min of mode.

Mode	Tekmar 3000-series Solid Method Modes	aa Pressurize	bb Transfer	cc Water	dd Sweep	ee Soil	25 mL 4-port	0.25 mL 8-port	ST1	ST2	ST3	
1	Standby						Input	1	A	A	A	
2	Purge Ready						Input	1	A	A	A	
3	Elevator Up						Input	1	A	A	A	
4	PreSweep A	X			X*		Bypass	4	A	A	A	
5	PreSweep B	X			X*		Bypass	2	A	A	A	
6	PreSweep C	X	X		X*		Bypass	2	A	A	A	
7	Lower Elevator						Input	1	A	A	A	
8	Move Sample to Elevator						Input	1	A	A	A	
9	Water Prime—Fill Syringe						Input	7	A	A	A	
10	Water Prime—Dispense Syringe						Output	7	A	A	A	
11	Water Fill—Fill Syringe						Input	7	A	A	A	
12	Sample Fill—Fill Standard					X	Input	2	B	B	B	
13	Elevator Up					X	Input	2	A	A	A	
14	Fill Syringe—Dispense to Vial					X	Input	2	A	A	A	
15	Sample Sweep 1				X*	X	Bypass	6	A	A	A	
16	Sample Sweep 2				X	X	Bypass	2	A	A	A	
17	Sample Preheat		X			X	Bypass	3	A	A	A	
18	Purge Sample		X			X	Bypass	4	A	A	A	
19	Elevator Down						Input	4	A	A	A	
20	Move Vial Sample Tray						Input	4	A	A	A	
21	Elevator Up						Input	4	A	A	A	
22	Line Rinse 1—Fill Syringe	X		X			Input	7	A	A	A	
23	Line Rinse 1—Dispense Water	X					Input	4	A	A	A	
24	Line Sweep 1	X			X*		Bypass	4	A	A	A	
25	Line Rinse 2—Fill Syringe	X		X			Input	7	A	A	A	
26	Line Rinse 2—Dispense Water	X			X		Input	2	A	A	A	
27	Line Sweep 2	X			X*		Bypass	2	A	A	A	
28	Needle Sweep	X			X		Bypass	2	A	A	A	
29	Elevator Down						Output	1	A	A	A	
30	Desorb—Waiting for End of Desorb						Output	1	A	A	A	
31	Bake—Waiting for End of Bake						Output	1	A	A	A	

*Valve is actuated for first 0.15 min of mode.

SOLATek 72 Flow Diagram



diagram_flow_solatek_72_vF.ai; Dec-14-2001

A. Appendix

A.1 Swaging a Nut and Ferrule onto Tubing

Connect SOLATek 72 to a water or gas supply by swaging a nut and ferrule onto the end of tubing, then attaching the tubing to the SOLATek 72. If the nut and ferrule are the wrong size or improperly installed, leaks may result. Different types of nuts and ferrules are show below.

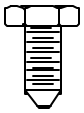
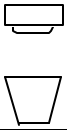
One-piece ferrule and nut set		Two-piece ferrule and nut set	
			
Male nut	One-piece ferrule “Upchurch”	Female nut	Two-piece ferrule “Swagelok”

Figure A-1: Different Types of Nuts and Ferrules

To swage a nut and ferrule onto tubing, refer to the illustration below and follow these steps:

1. Slide the nut onto the tubing.

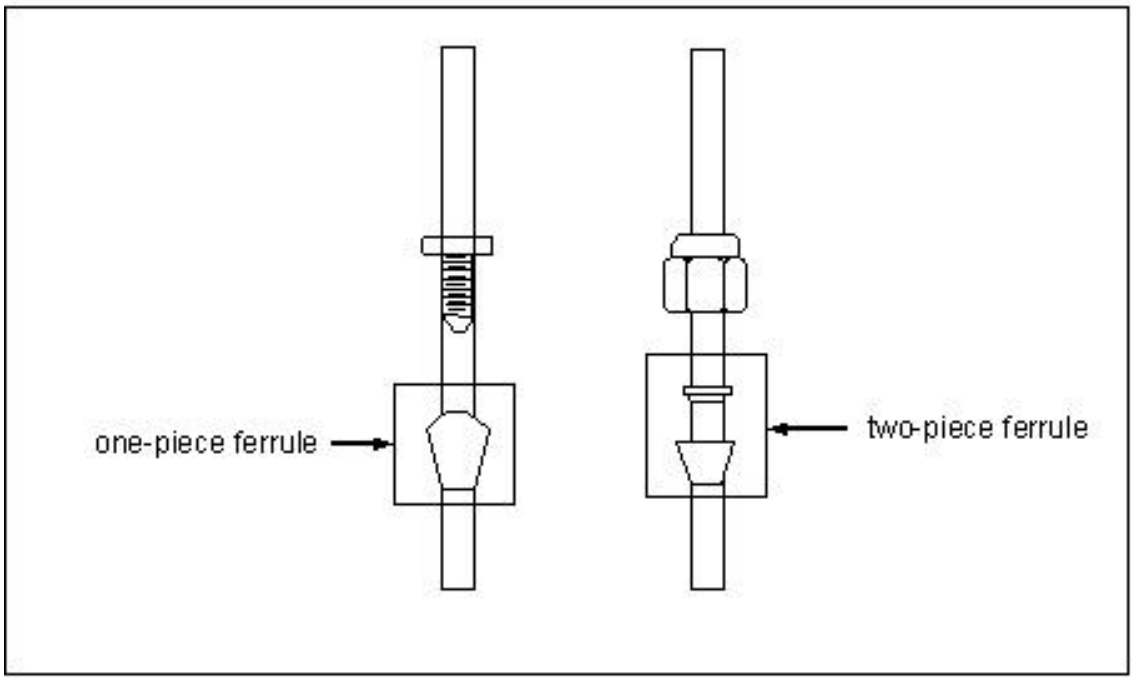


Figure A-2: Placing Nuts and Ferrules onto Tubing

2. Slide the ferrule onto the tubing, with the smallest end of the ferrule toward the tip of the tubing. Allow about 1/8” of tubing to extend past the ferrule’s smallest end.

CAUTION

To avoid damaging the nuts and ferrules, do not over tighten them. Once swaged onto tubing, you may slightly tighten the nuts and ferrules to eliminate a leak. If a leak persists, use a leak detector to find another source of the leak, or call Teledyne Tekmar Service toll free in the US and Canada (800) 874-2004; or outside the US or Canada (513) 229-7000.

3. Tighten the nut in ¼ turn increments (¼ turn (90°) to a maximum ¾ turn (270°) past finger tight) onto a designated bulkhead or connection

Note: Finger-tighten the nut first, then secure the fitting with a wrench. Turning the nut in ¼" (90°) increments is adequate for most fittings. The amount of force you need to apply can vary however, depending on the friction between the nut and the threads, as well as the composition and thickness of the tubing or line.

To assure that the nut and the ferrule have been properly swaged, loosen the nut and pull on the ferrule. The ferrule should remain firm and not slide.

B. Appendix

B.1 Repackaging SOLATek 72

If you ship your SOLATek 72, you must use the original packing material and box that the unit arrived in. Do not return the unit to Teledyne Tekmar unless authorized to do so by a Teledyne Tekmar representative.

Prior to shipping the unit make sure all liquid is removed.

1. Make sure you are wearing safety glasses.

2. SOLATek 72 weighs 115 lbs. **Do not attempt to lift the unit by yourself! A minimum of two people is required to lift and carry SOLATek 72.**

Important!
Never lift or move the autosampler by its horizontal arm.

3. Before lifting the unit make sure the elevator is parked at the bottom and the arm is positioned as far in the X travel position as it can go.

4. Using proper lifting procedures grasp the unit underneath and lift together. Place the unit on the skid.

5. Place the rectangular foam piece against the arm and position the two additional boxes against the Styrofoam.

6. Place the additional foam pieces around the unit as they fit.

7. Place the box over the top of the unit.

Fasten two (2) straps around the unit and the skid from both directions for a total of four (4) straps.

Notes

C. Appendix

C.1 Preparing a Methanol Standard

To prepare a methanol standard according to procedures approved by the USEPA, follow these steps:

1. Fill a clean 10 mL volumetric flask with approximately 9.8 mL of methanol. Allow the open flask to stand until all alcohol-wetted surfaces have dried.
2. Weigh the flask and its contents to the nearest 100µg. Assign the alphanumeric combination "W_1" to the microgram value.
3. Using a 100 mL syringe, immediately add two drops of neat standard (minimum 75% purity) to the flask. Make sure the drops fall directly into the methanol without touching the neck of the flask.
4. Weigh the flask with its contents. Assign the alphanumeric combination "W_2" to the microgram value.
5. Dilute the solution to volume with methanol. Assign a "V_C" to this milliliter value. Stopper the flask and turn it upside down several times to mix the liquids.
6. Use the formula, $(W_2-W_1)/V_c$ to calculate the concentration in micrograms per milliliters.
7. Transfer the solution to a 10mL screw cap bottle with a Teflon cap liner and store it at 6°C.

C.2 Water Standard Preparation

Concentration and volume are the two prime considerations when creating Water Standards.

Calculate the final standard concentration needed.

1. Standards should be prepared in volumetric glassware, 50mL or greater, in DI water. After adding the standard to the DI water, cap the volumetric flask and invert the standard three times to insure proper mixing.
2. When transferring standard volume from volumetric glassware to a 40 mL vial, slightly overfill the vial, then cap immediately.
3. To ensure accurate and consistent results, water samples and standards must be in sealed vials with no headspace. Invert sample vials after sealing. If you see air bubbles, then headspace is present.
4. Never resample samples or standards.
5. Refrigerate standards until needed.

C.3 Soil Standard Preparation

During a soil method samples are purged in a sample vial. SOLATek 72 adds rinse water and standards into the sample vial before purging.
Concentration and volume are the two prime considerations when creating Soil Standards.

1. Prepare standards in volumetric glassware or in a calibrated syringe using DI water.
2. Calculate the concentration needed. Soil Standards made in volumetric glassware provide multiple standards. After spiking the DI water with standard, cap the volumetric glassware and invert the standard three times to ensure proper mixing. The final volume after the additions from SOLATek 72 should be a minimum of 15mL during soil purging (for example: 5g soil + 10mL of water). Samples, blanks, and Standards should all have the same volume during soil purging.
3. When transferring standard volume from volumetric glassware to a 40mL vial, use a calibrated syringe to measure aliquot.
4. Firmly tighten the cap to form a good seal.

C.4 Preparing Soil Standards by Spiking Standards Directly into a Calibrated Syringe.

1. Transfer aliquot from the syringe to a 40mL sample vial.
2. The volume in the vial is important for reproducible volatile recovery. The final volume after the additions from SOLATek 72 should be a minimum of 15mL during soil purging (for example: 5g soil + 10mL of water). Samples, blanks, and Standards should all have the same volume during soil purging.

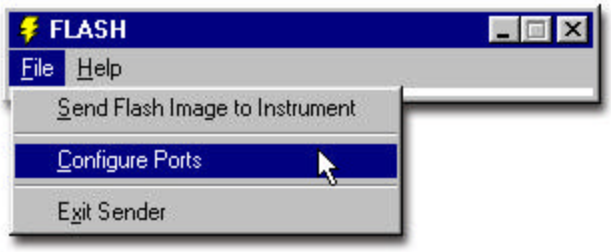
When using stir bars for samples, the stir bars should be included in blanks and standard runs.

D. Appendix

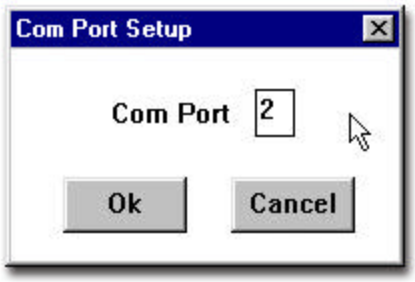
D.1 Performing a Flash Upgrade

1. Insert the CD that came in your kit box into the CD Drive of your computer
2. Open the Flash program by double-clicking on the TekLink program folder, and then double-click the Flash program icon

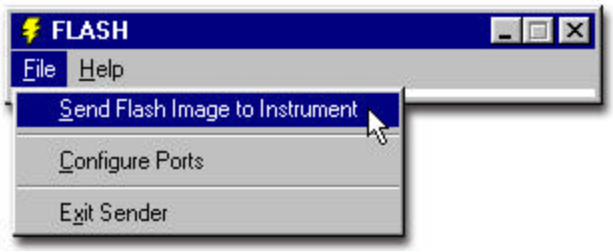
3. Select: Start > Programs > TekLink > Flash.
4. Select File > Configure Ports:



5. Enter the COM Port number the 3000 series unit is connected to. Click OK.

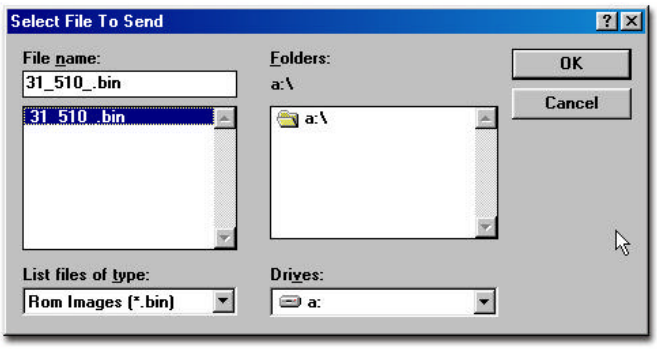


6. Select File> Send Flash Image to Instrument:



7. Select the ROM Image File furnished to you by Teledyne Tekmar This file is called 30_518.bin for the 3000, and 31_518bin for the 3100. The file is located on the Flash upgrade diskette

   Click OK



8. The Flash burning process appears in this window and supplies the following information:

   a) Stage gives the current state for each sector

   b) Current Sector is a progress indicator

   c) Error Count gives the number of errors encountered while trying to communicate with the concentrator. After three errors the Flash program will abort.

   d) Verify Errors gives the number of errors encountered while trying to verify a sector on the concentrator. After three errors the Flash program will abort.

9. If the Flash program aborts one of three messages will appear:

   a) Connect Error

   b) Lost communication with instrument

   c) Can't program current sector

Check the TekLink port configuration to verify the correct COM port setup. If you continue to encounter errors, contact the Teledyne Tekmar Customer Support Center:

- **(800) 874-2004 in the US and Canada**
- **(513) 229-7000 outside the U.S. and Canada**

10. When Flash programming is successful, a status window will appear.
11. If Flash programming is complete, with no errors, exit out of the Flash program, power down the concentrator, then restart the concentrator. Your 3000 series concentrator should now be updated with the new ROM version.
12. To verify the programming of your ROM upgrade, launch TekLink, and select Help > About TekLink . The new ROM version, listed after the 3000 series Firmware Version, should correspond with the new ROM version you installed.

Glossary

Term	Definition
Adsorb	To take in by adsorption, or to be drawn in
Aliquot	A small sample representative of a larger quantity
Ambient Temperature	The surrounding temperature, or that temperature present in the location indicated.
Aqueous	Pertaining to liquid
Blank Water	Water that is organic-free. Typically used to clean sample pathways and to dilute samples.
Build	Compile and synchronize a sample schedule
Carrier Gas	The gas (usually helium or nitrogen) used to transport the sample through the system
Concentration	The amount of a substance in a mixture or solution expressed as weight or mass per unit volume.
Dilution	The process of reducing the concentration of a solute in solution, usually by mixing with more solvent
Distilled Water (DI)	Water that has been purified by distillation
Flame Ionization Detection	a process used in gas chromatography that decomposes the neutral solute molecules in a flame into charged species and electrically measures the changes in conductivity.
Gas Chromatography	a technique for separating gas mixtures, in which the gas is passed through a long column containing a fixed absorbent phase that separates the gas mixture into its component parts.
Gauge pressure	A measure of the force per area exerted by a fluid, using atmospheric pressure as a zero reference.
headspace	The area between the septum and substance in the vial where the vial is pressurized with gas
Method	The procedure, or sequence of steps and parameters, used in an analytical sampling run
microprocessor	A silicon chip that contains a CPU (central processing unit). The terms microprocessor and CPU are used interchangeably.
Normally Closed	A switch in which the contacts are closed (contacting) without any external force acting upon it.
Normally Open	A switch in which the contacts are open (separated) when no external forces act upon the switch.
Parameter	The value given to a variable until an operation is completed.
Pneumatic	Concerning gas or air
Solid State	Any element that controls current without moving parts, heated filaments, or vacuum gaps.

Term	Definition
Solute	The dispersed (dissolved) phase of a solution.
Standard Solution	A solution containing a defined amount of a substance as a normal solution. Used for comparison or analysis.
Volume	The space occupied by a substance, usually a gas or liquid, Liquid volume is expressed in liters or milliliters, gas volume in cubic centimeters
Volumetric Analysis	Quantitative Analysis performed by the measurement of the volume of solutions or liquids
Volumetric Solution	A standard solution containing a definite amount of a substance in a 1L (1000 mL) of solution

List of Acronyms, Abbreviations, and Symbols

Acronym	Meaning
µl	Micro liter.
C	Celsius
COM port	Communications port.
DI	Distilled (as in water).
FID	Flame Ionization Detection
g	Gram
GC	Gas chromatograph.
GC/MS	Gas Chromatograph/Mass Spectrometer
HPLC	High performance liquid chromatography.
HRP	High rate purge.
Hz	Hertz
I/O	Input/output.
I.D.	Inside diameter.
IS	Internal Standard .See STD.
LED	Light-emitting diode.
MCS	Moisture Control system
MDL	Minimum Detection Limit
mg	Milligram
min	Minute.
mL	Milliliter.
mm	Millimeter
NC	Normally closed. See Valve Output Table
NO	Normally open. See Valve Output Table
O.D.	Outside diameter.
PC	Personal computer
PC card	System interface devices for PC, SOLATek 72, and the concentrator.
PROM	Programmable read-only memory.
psi	Pounds per square inch.
psig	Gauge pressure.
ROM	Read-only memory.
RSD	Relative Standard Deviation
RTD	Resistance Thermal Detector

sec	Second
SS	Solid-state. See SS Relay Board.
ST	See STD.
STD	Standard (or Internal Standard). See STD
USEPA	United States Environmental Protection Agency
XYZ	Describes the movement of the robotic arm: the “X” movement is side to side, the “y” movement is front to back. The “Z” movement is up and down.
W/V	Weight/Volume
TPC	Trap Pressure Control

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W

TekLink

USER GUIDE

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Chapter 2 – SOLATek 72 Operation Checklist

Chapter 3 - Troubleshooting SOLATek Errors

1. TekLink Overview

1.1. Installation

1.1.1. System Requirements

To install and use Teklink you need a Pentium, AMD K6, or higher computer with one of the following Windows Operating Systems installed:

- Windows 95
- Windows 98
- Windows ME
- Windows NT 4.0 (requires Administrator Privileges to install)
- Windows 2000 (requires Administrator Privileges to install)
- Windows XP (requires Administrator Privileges to install)

Your hard drive must have at least 4 megabytes of free space and a CD Rom drive.

1.1.2. Install TekLink

Insert the TekLink CD Rom into your drive. When the window appears locate the icon with the description SETUP .exe. Double click the icon, and follow the installation instructions on the screen.

1.1.3. Start TekLink

TekLink may be started from the desktop, or from the [Start] menu.

- Locate and double-click the SOLATek 72 TekLink shortcut on the desktop:

Figure 1-1: TekLink Start up Icon

- If you installed TekLink in the default directory, you can follow the path from the Start menu:

[Start]>Programs>Teledyne Tekmar>SOLATek 72 TekLink 1.0>SOLATek 72 TekLink

Note: If you use TekLink to operate the SOLATek72 with a 3000 series concentrator, your concentrator must have a compatible ROM version.

- If you purchased a 3100 concentrator with your SOLATek 72, your ROM version is current.
- If the ROM version of your 3000 is less than 3.11, refer to page 13 of Chapter 2 (Installation) of the SOLATek 72 User Manual.

1.2. TekLink Control Screen

When you start TekLink, the TekLink control screen appears (Figure 1.2). The control screen is the primary interface between the computer, SOLATek 72, concentrator, and any peripheral equipment. It governs the configuration, Method Development, and Schedule Building.

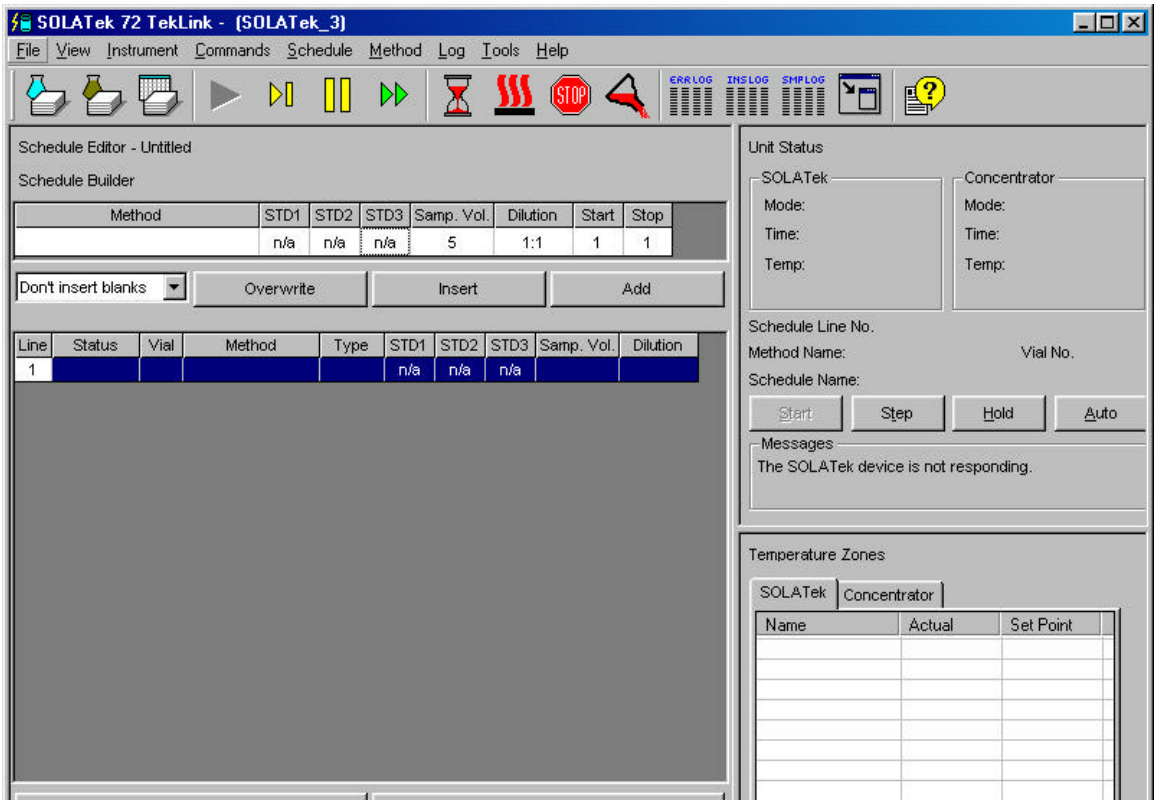


Figure 1-2: TekLink Control Screen

When using the Method Editor or Schedule Editor you can stop the mouse over a button or icon on the control screen, and a balloon appears with a brief description of that particular feature. Figure 1.3 describes the function of the current selection in the menu that governs how blanks are inserted into a schedule.

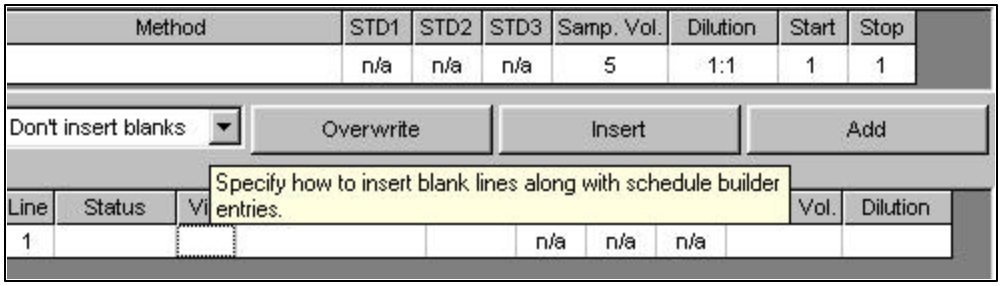


Figure 1-3: Balloon Help

1.3. Toolbar Menus

The toolbar menus on the control screen provide access to the same functions as the handheld controller. The listing below provides an overview of the menu commands and their associated options.

1.4. File

From the File menu you can:

- Create a new Schedule or Method (Reference 2.12 for Schedule Building)
- Open and close a Soil Method, Water Method, or Schedule
- Access Recent Methods and Schedules
- Print copies of Schedules and Methods
- Save or [Save As] an open Method, Schedule, or Log
- Exit TekLink

1.5. View

From the View menu you can access:

- The Compact status. This window is a floating adjustable palette that gives you a smaller window with limited options. You can resize the palette (using the up and down arrow keys at the bottom of the palette) to display more or less information. The palette remains on the screen allowing the user to access the functions of the TekLink without having to have the full TekLink window active. Clicking on the down arrow key when the floating palette is full size returns you to the main screen.

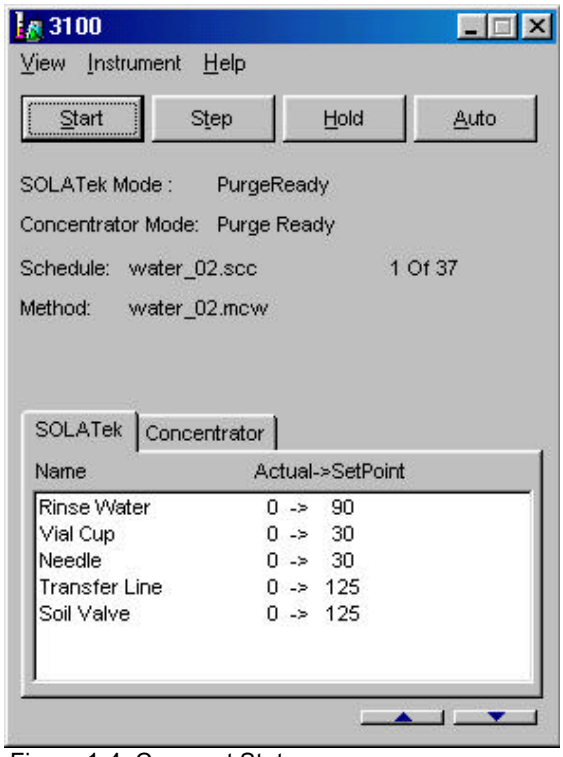


Figure 1-4: Compact Status

The floating, adjustable palette of the Compact Status controller is a reproduction of the right side of the control screen. From the View menu you can elect to return to the main screen, keep the palette version of the handheld on the screen, select a different unit, and access the Help menu.

The screen also gives you access to the following functions and information:

- Start
- Step
- Hold
- Auto
- The current mode for the SOLATek 72
- The current mode for the selected concentrator.
- The current Schedule
- The current Method
- The active line of the current schedule
- Temperature Zone Information

From the **View** menu you can also view:

- The Active Schedule (also accessible by pressing F9)
- Active Methods (with a submenu listing of the currently stored SOLATek 72 Methods)
- The Instrument Log
- The Error Log
- The Sample Log

The Instrument Log, Error Log, and Sample Log are discussed in more detail in section 1.10.

1.6. Instrument

From the Instrument menu you can access the Configuration menu for your SOLATek 72.

From the Configuration menu you can:

(The operations listed under the Configuration menu are explained in section 2)

- Designate a Communication Port (COM Port) for the connected concentrator.
- Name the SOLATek 72 unit.
- Specify if the concentrator you are using is a Tekmar 3000 series or later.
- Specify the type of Gas Chromatograph you are using.
- Enable or disable GC handshaking.
- Enable or disable the Standby Flow.
- Specify the type of Trap Region.
- View which Standard(s) are present and which ones you wish to use (ST1, ST2, or ST3).
- Enable or disable the beeper.
- Retrieve the configuration settings for the current specified device.
- Detect the concentrator.

1.7. Commands

The following commands can be accessed from the Commands Menu:

Step (F2)	Moves SOLATek 72 to the next operating step
Start (F3)	Moves SOLATek 72 to the first step in an operating run
Hold (F4)	Keeps SOLATek 72 in its current mode
Auto (F5)	Resumes normal operation after SOLATek 72 has been in a hold state
Go To Standby then…	The unit jumps to Standby and then performs one of the following specified procedures: • Abort the Schedule • Abort the Sample • Rerun the Sample
Go To Bake	Aborts the current Schedule and places the SOLATek 72 in the mode to start the Bake procedure.
Go To Bake Rinse	Aborts the current Schedule and places the SOLATek 72 in the mode to start the Bake Rinse procedure
Abort	Abort allows you to choose from the following: • Abort the entire Schedule • Abort the processing of the current sample • Rerun a sample • Finish running the current sample then abort the remainder of the scheduled run

1.8. Schedule

From the Schedule menu you can:

- Upload a new schedule (if you are in Standby. Purge, or End of Schedule Mode).
- Upload changes you have made to the Active schedule. Note that in an Active Schedule only a line of Schedule that has not yet executed can be changed.
- Cut, Copy, Paste, Delete, and Insert lines of the Schedule. To cut, copy, or delete a line(s) of the Schedule, highlight the lines and then click on the action you wish to perform. These commands are also available by clicking the opposite button of your mouse in the Schedule area.

Note: If you are going to Paste your selection back into the Schedule, and do not want to overwrite an existing line of Schedule, you must first use the Insert Empty Line command. The [Paste] command inserts over the selected line of Schedule. It does not create a new line.

Fill Up and Fill Down

Fill Up and Fill Down copy the contents of the starting row of a highlight to the ending row. You can select and copy an entire row or select the data from a single column

- The Fill Up and Fill Down commands are only active when more than one line of the Schedule is selected.
- If you select lines of the Schedule from bottom to top, then the Fill Up command is active. If you select lines from top to bottom, then Fill Down is active.
- When you select from the Vial column and choose File Up or File Down it arranges the Vial numbers sequentially in increments of one. If you select Blank it copies Blanks to all of the selected lines.

1.9. Method

From the Method menu you can:

- Upload changes you have made to a Method to the SOLATek 72. The changes must be to an active or unexecuted Method in an active Schedule.

1.10. Log

From the Log menu you can:

- View the Error Log, the Sample Log, and the Instrument Log.
- Clear the messages in a log (the system gives you the option of saving the entries before clearing)
- Refresh a log so that it shows the latest entries
- Make a New entry, Edit an entry, View an Entry, or Delete an entry in the Instrument Log. The Error Log and the Sample Log are generated automatically and cannot be edited, but the user maintains the Instrument Log. When you open the Instrument Log the screen displays the [New], [View], [Edit], and [Delete] buttons (Figure 1-5).

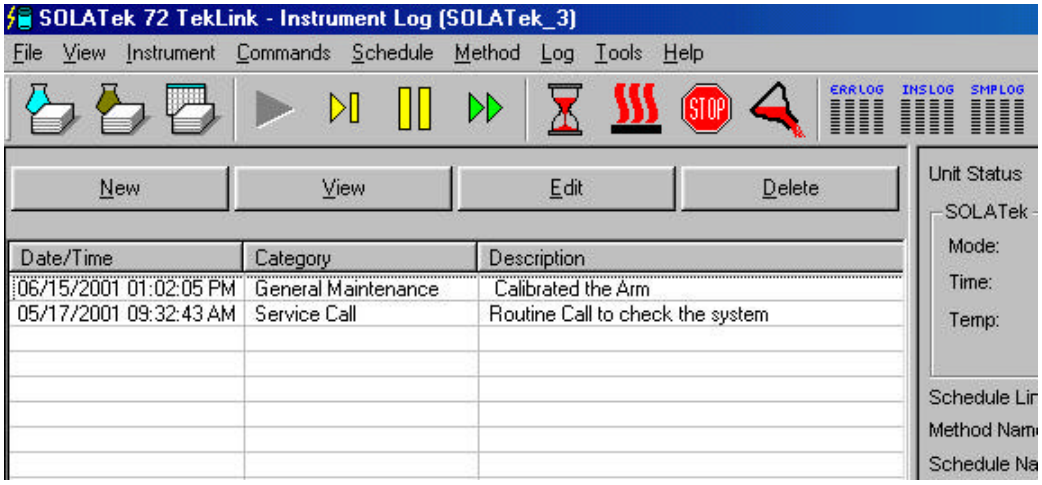


Figure 1-5: Instrument Log

1.11. Tools

1.11.1. Diagnostics

From the Tools menu you can run individual diagnostics for specific SOLATek 72 components:

Motor Board

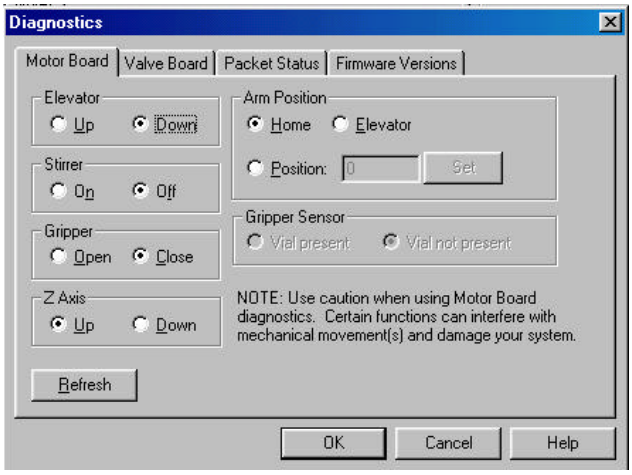


Figure 1-6: Motor Board Diagnostics

Figure 1-6 shows the Diagnostic screen for the Motor Board. The functions governed by the Motor Board can be manipulated and tested from this screen. Motor Board diagnostics is only available during Standby and Purge Ready Modes.

Use caution when using Motor Board diagnostics. Certain functions can interfere with mechanical movement(s) and damage your system.

Valve Board

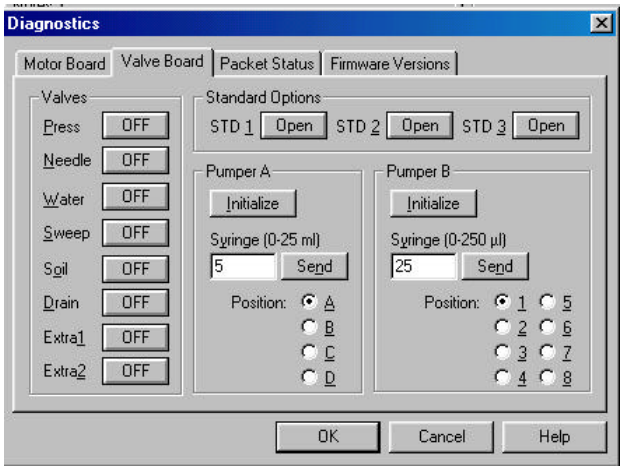


Figure 1-7: Valve Board Diagnostics

Figure 1-7 shows the Valve Board diagnostic screen. Valves, the Internal Standards, Pumper A and Pumper B, and both syringes can be manipulated and tested from this screen. Valve Board diagnostics is only available during Standby and Purge Ready Modes.

Packet Status

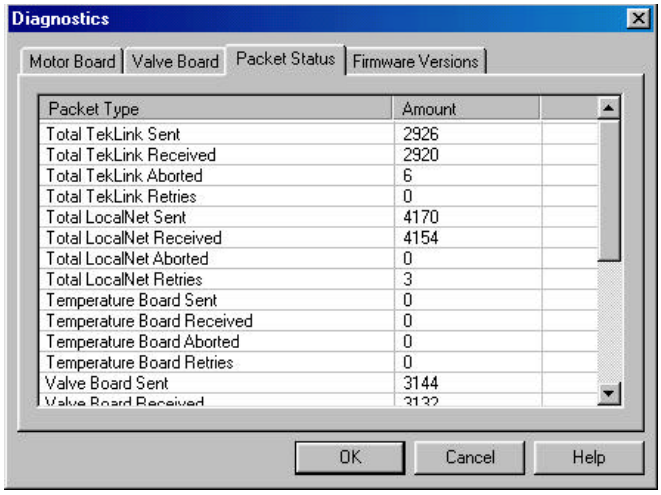
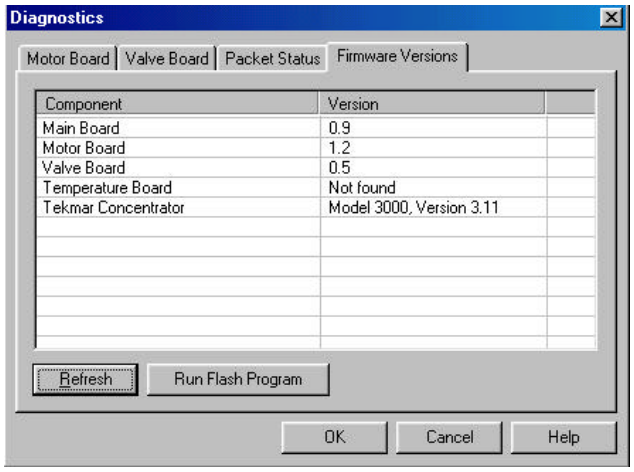


Figure 1-8: Packet Status Screen

The Packet Status screen provides data on system communication between the boards in the SOLATek 72, and also shows how TekLink is communicating with the SOLATek 72 itself. It records signals sent, received, aborted, and retried.

Firmware Versions



The [Run Flash Program] can be accessed from this window. Select this button and the SOLATek 72 Flash Memory Programmer appears. This program also comes up when you select **Tools>Upgrade Firmware**.

Note: Only the Motor Board and the Main Board can be flashed with this release of TekLink.

Figure 1-9: Firmware Versions Screen

The Firmware Versions screen lists the current version of the:

- Main Board (CPU Board)
- Motor Board
- Valve Board
- Temperature Board
- Tekmar Concentrator Board (if connected to the SOLATek)

1.11.2. Calibrate the Robotic Arm:

The SOLATek 72 mechanical XYZ arm has a homing setup that keeps the arm position in check. XYZ Arm Calibration requires four components:

- (2) Tray calibration bars (cal-bar)
- Calibration disk (cal disk)
- Gripper calibration pin (cal-pin)

To calibrate the XYZ arm select **Tools>Arm Calibration:**

1. While the arm is moving into position get the Calibration Pod. When you are ready to insert the Calibration Pod press [Next] to open the Gripper.

2. Quickly place the Cal Pod into the Gripper and hold. The Gripper will close automatically in 5 to 10 seconds.

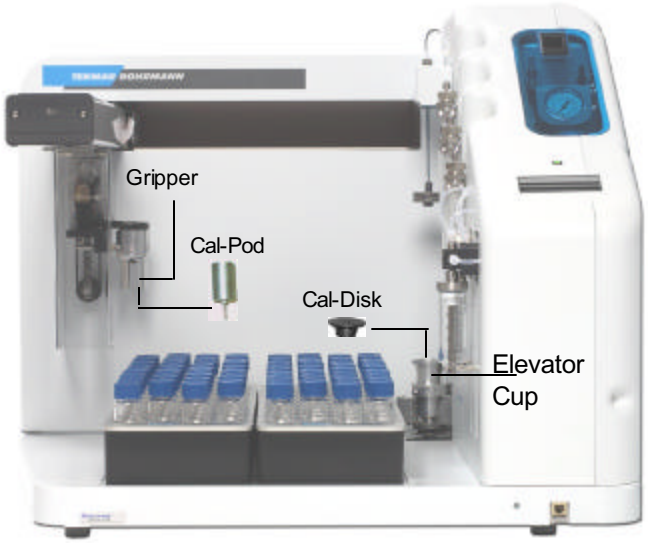
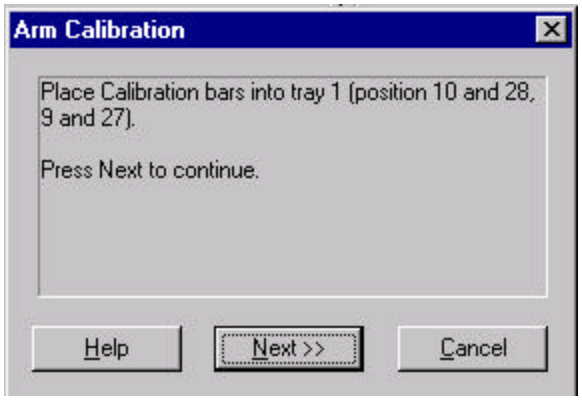


Figure 1-10: Cal-Pod, Cal-Disk, and Gripper

3. Position the Calibration Bars.



Note: Failure to correctly orient the calibration bars will cause the arm movement to be misaligned with the vials. (See Figure 1.11)

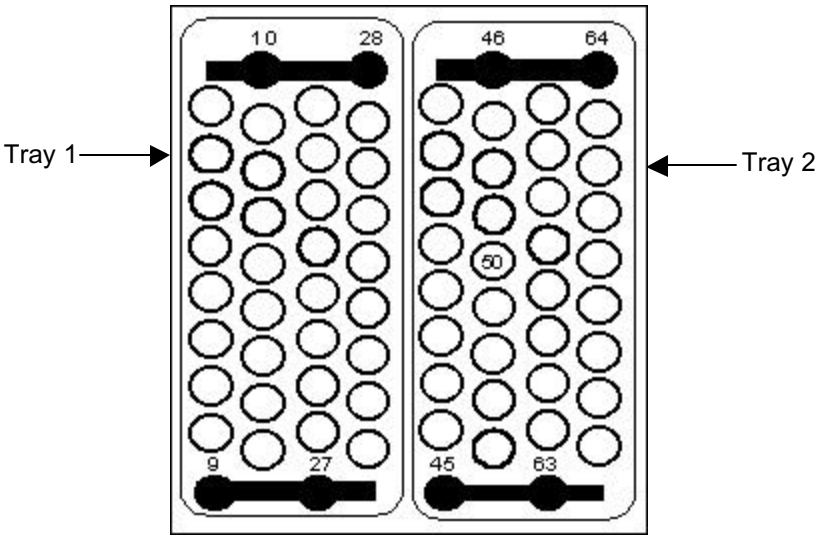
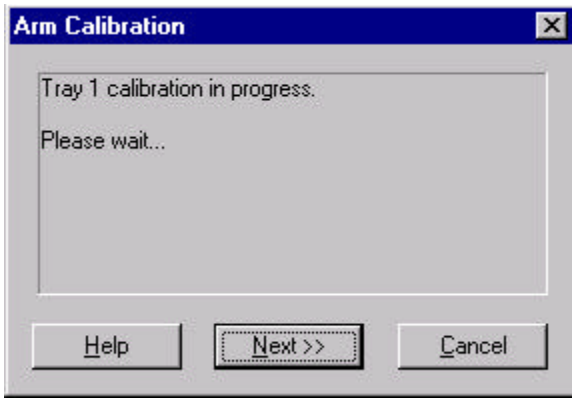


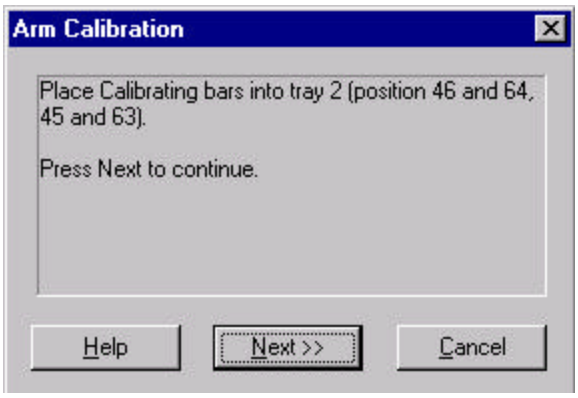
Figure 1-11 Calibration Bar Configuration

4. Press [Next] to start the Calibration process.



5. Remove the cal-bars from Tray 1.

6. Place the Calibration Bars into position in Tray 2.



7. Press [Next] to start Tray 2 calibration.
8. Place the Cal-disk into the elevator cup and press [Next] (Figure 1-10).
9. Press [Next] to release the cal-pin from the gripper.
10. SOLATek 72 acknowledges the calibration and stores it in memory.

1.11.3. Reset (reboot) SOLATek 72

Reset SOLATek 72 to return the Schedule to the parameters that were in place at the last Save or Upload.

1.11.4. Set the Transfer Flow

Refer to section 2.5 for this information.

1.11.5. Set the Soil Purge Flow

Refer to section 2.6 for this information.

1.11.6. Prime the Internal Standards & Prime Water

The process of priming water requires that you be connected to a source of organic-free water. The SOLATek 72 must be in Purge-Ready Mode, Standby Mode, or End of Schedule Mode before priming water or Internal Standards.

Select **Tools>Prime** and then choose >Water or >Standard 1, >Standard 2, or >Standard 3.

If you choose to prime one of the Internal Standards a screen appears informing you that the process has started:

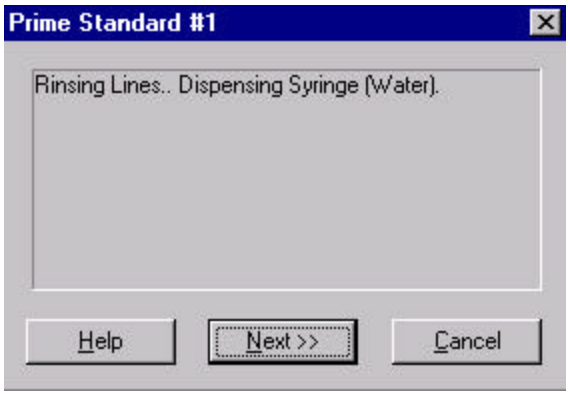


Figure 1-12: Prime Standard Screen

TekLink will display screens during the priming process. Press [Next>>] when the Prime Standard # screen appears. The following screens appear when priming Internal Standards:

Rinsing Lines. Dispensing Syringe [Water] [Next>>]

Sweeping Lines. [Next>>]

Prime Standard #1 complete! [Finish]

When Priming Water the Priming Standard screen appears, followed by these screens:

Rinsing Lines. Fill Syringe [Water] [Next]

Prime Water complete! [Finish]

1.11.7. Change the 250µL Dilution Syringe or the 25mL Sample Syringe

To change a syringe, disable it, replace the syringe while it is disabled, and enable it again using TekLink.

Select **Tools> Change Syringe** > and choose the >25mL Syringe or the >250µL Syringe. Follow the instructions on the screens:

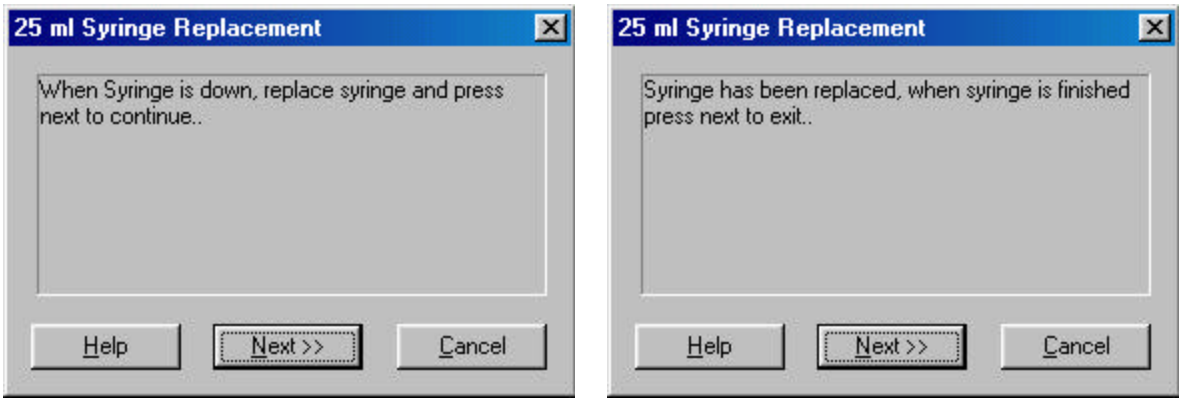


Figure 1-13: Syringe Replacement Screens

When the syringe has been replaced press [Next] and a screen appears telling you: **Syringe Replacement complete!** Select [Finish].

1.11.8. Toggle the Concentrator Drain Valve on and off.

Tools>Toggle Drain toggles the concentrator drain on and off. You can also turn the drain on and off using the Drain Icon below the menu bar.

1.11.9. Upgrade The Firmware in your System

Tools>Upgrade Firmware allows you to Flash upgrade the firmware in the following boards, if necessary:

- Main Board (CPU Board)
- Temperature Board (not available in this release)
- Valve Board (not available in this release)
- Motor Board
- 3000 Concentrator Main Board (not available in this release)

Select the board you wish to Flash upgrade from the Destination pop up menu and select [Flash…]. TekLink automatically detects the correct COM Port.

Note: At the time of this software release only the Main Board (CPU Board) and the Motor Board can be flashed.

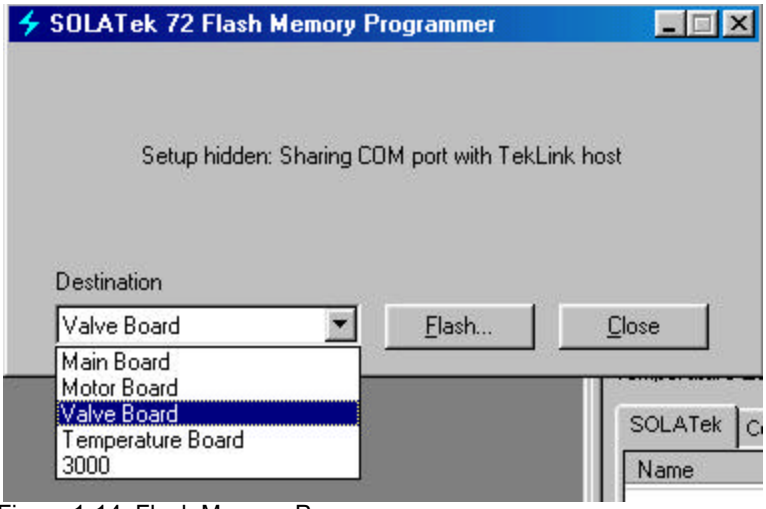


Figure 1-14: Flash Memory Program

1.11.10. Options

From the Options menu you can select Saving, Printing, and Storing options for your Schedules.

Select **Tools>Options>Schedules** to access the menu that allows you to define options for your Schedules:

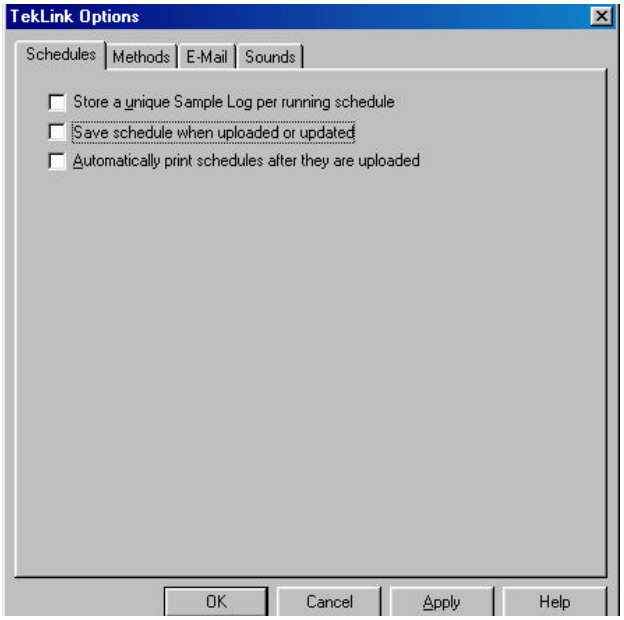


Figure 1-15: Options: Schedules Screen

The options for saving, storing, and printing Schedules are tools that allow you to automatically record and store the data used to build and run your Schedules.

Maintaining a file with Schedule information builds a library of information that can be helpful in diagnosing system problems.

Create default directories for saving and storing your Methods.

Select **Tools>Options>Methods>** to access the screen that allows you to create default directories for your Methods.

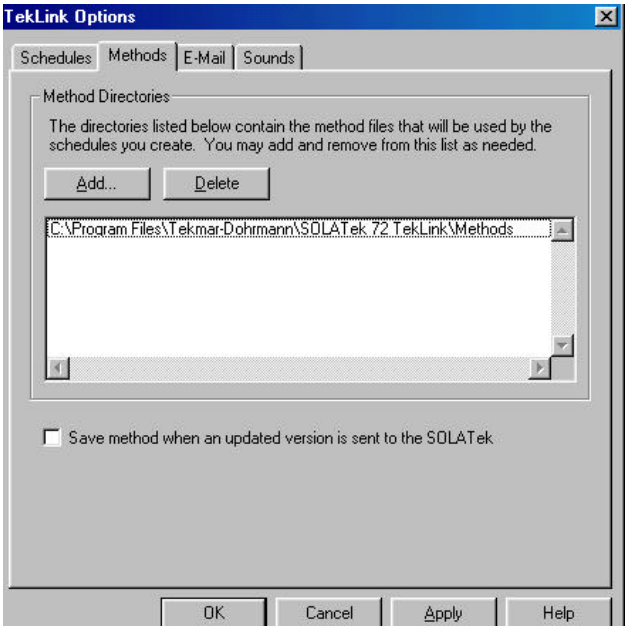


Figure 1-16: Options: Methods Screen

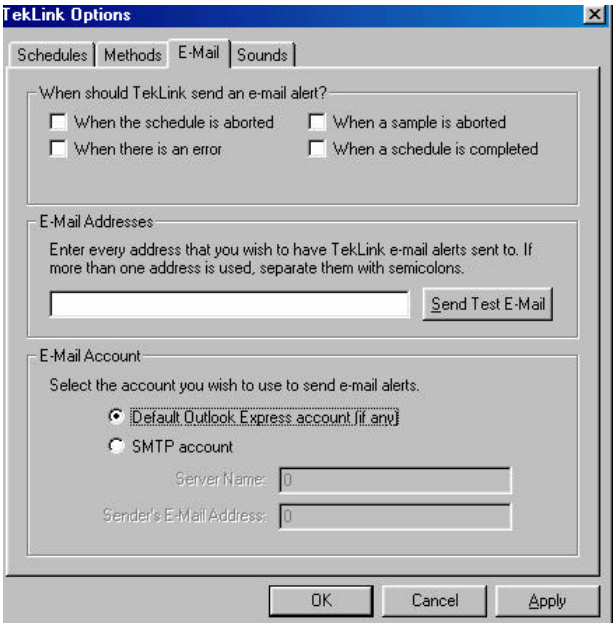
Use this screen to add or delete directories for your Methods files.

When you designate a default directory the Method Display field automatically accesses that directory when you click in the field to select a Method.

You can store Methods in more than one directory.

Select E-Mail notification options for your system.

TekLink allows you to designate certain conditions that will automatically alert you with E-mail when they occur. Select **Tools>Options>E-Mail**:



Use the checkboxes to designate when TekLink should notify you with E-Mail.

You must designate one or more E-mail addresses for TekLink to send to.

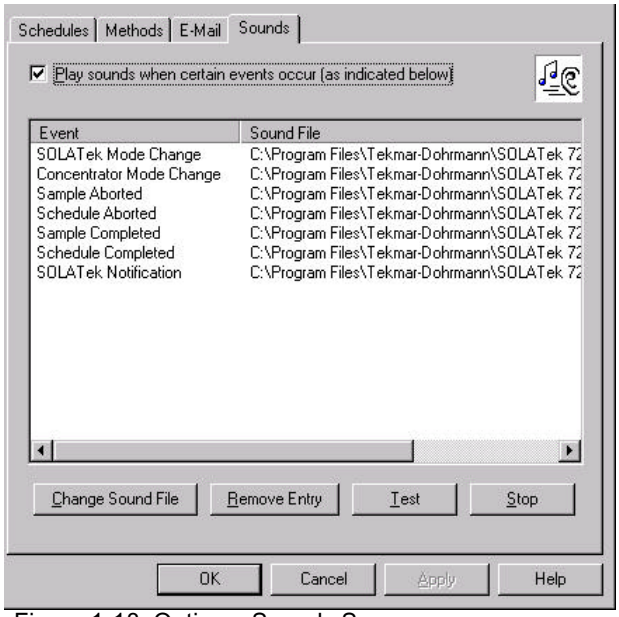
TekLink allows you to send a test E-mail to verify that the E-mail addresses and accounts are set up correctly.

If you need help with your E-Mail account notify your System Administrator.

Figure 1-17: Options: E-Mail Notification Screen

Assign or remove the sounds that are played when your system performs certain functions

TekLink allows you to assign sounds to certain events as a way of letting you know when a specific event has occurred. To assign or remove a sound select Tools>Options>Sounds.



You can change the sound that plays by selecting [Change Sound File] and browsing through the available options.

[Test] allows you to hear the sound and decide if you want to keep it.

[Stop] stops a test sound that is playing.

[Remove Entry] disables the sound file for the selected event.

[Help] takes you to the online Help menu.

[Cancel] removes changes made since the last time [OK] was pressed and closes the window.

[OK] accepts the changes made to the Sounds selection.

Figure 1-18: Options: Sounds Screen

1.12. Help

From the Help Menu you can access:

1.12.1. Online Help Table of Contents

The Contents tab displays general headings that are divided into more detailed subjects. Click on the Book or Question Mark icon to display the next level of information.

1.12.2. An Index of Help Topics

Scroll through a list of topics, or type in a keyword for the topic you need more information help with and press [Enter].

1.12.3. A Search Tool For Individual Topics:

You can search for help by entering a descriptive word or phrase and specifying whether you want to search [Titles], [Match Similar Words], or [Search previous Results].

1.12.4. An Online Registration Form For Your Copy of TekLink:

It is necessary to register your copy of TekLink in order to receive technical support and updates to your software. To access your registration form select **Help>Register TekLink** from the menu bar.

- Your CD Serial Number is on your TekLink CD and begins with the letters STTL.
- Enter your CD Serial Number and click [Register]. TekLink will take you to a screen with a Registration Form. Fill out the form and submit it to Tekmar using one of the methods offered on the Form. Tekmar will send you your TekLink registration number.

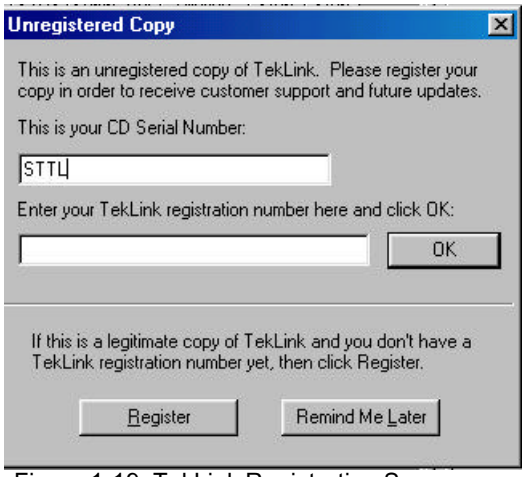


Figure 1-19: TekLink Registration Screen

1.12.5. TeledyneTekmar Web Site

The Teledyne Tekmar Web site (www.tekmar.com) provides Teledyne Tekmar product, service and company related information. If your computer has Internet access, select **Help>Teledyne Tekmar Web Site** to connect to the Tekmar Web site.

1.12.6. An E-Mail link to Tekmar Technical Support

If you wish to E-Mail the Teledyne Tekmar Customer Support Center, select **Help>E-Mail Technical Support** from the menu bar. TekLink automatically brings up the screen shown in Figure 1-20, with the E-Mail address posted in the address line.

If you need to contact Technical Support by phone call (800) 874-2004 in the United States and Canada, or (513) 229-7000 outside the U.S. and Canada.

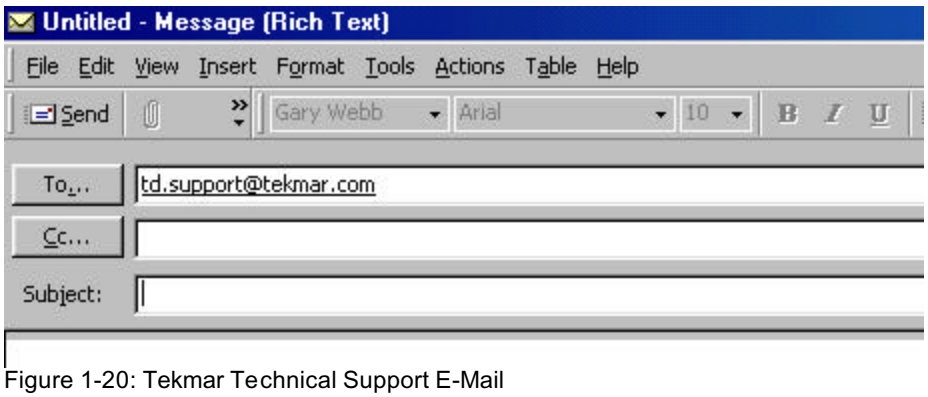


Figure 1-20: Tekmar Technical Support E-Mail

1.12.7. Version of SOLATek 72 TekLink

Figure 1-21: About TekLink Information

1.13. Icons

Situated below the SOLATek 72 Menu is a bar containing icons. These icons allow you easier access to some of the more commonly used menu items and commands.

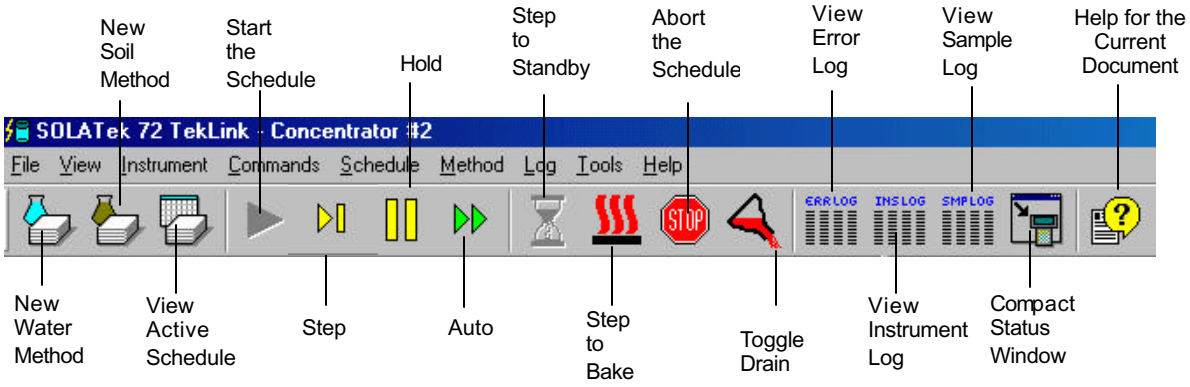


Figure 1-22: TekLink Icons

1.14. Unit Status

The right side of the control screen provides information about the current status of SOLATek 72 and the Concentrator status, if connected. The screen displays:

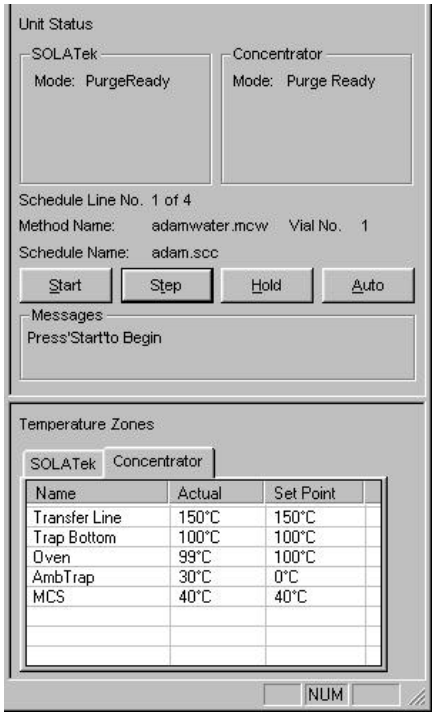


Figure 1-23: TekLink Unit Status Screen

- Current Mode for the SOLATek 72 and the Concentrator
- Active Line Number of the Current Schedule
- Method Name
- Schedule Name
- Vial No. being run
- Buttons to place the SOLATek 72 in Start, Step, Hold, or Auto Mode
- A message screen for Error and Mode messages
- Relevant information about the Temperature Zones

2. SOLATek 72 Operation Checklist

Before operating your SOLATek 72 complete the operations listed below.

1. Specify a COM Port (communication port) for SOLATek 72 and the concentrator.
2. Configure SOLATek.
3. Check the System Pressure.
4. Set and Check the Concentrator Pressure and Flow Rate.
5. Check the SOLATek 72 and the Concentrator for leaks, and Set the Transfer Flow Rate.
6. Set the Solid Flow Purge Rate.
7. Fill the Standard Vessels.
8. Load the Vial Tray.
9. Create or Edit a Method.
10. Build a Schedule.
11. Run.

2.1. Configuring the COM Ports

TekLink must be configured to identify the connected concentrator with its associated COM (communication) Port. From the control screen select **Instruments > Configure**, and select a unit to configure.

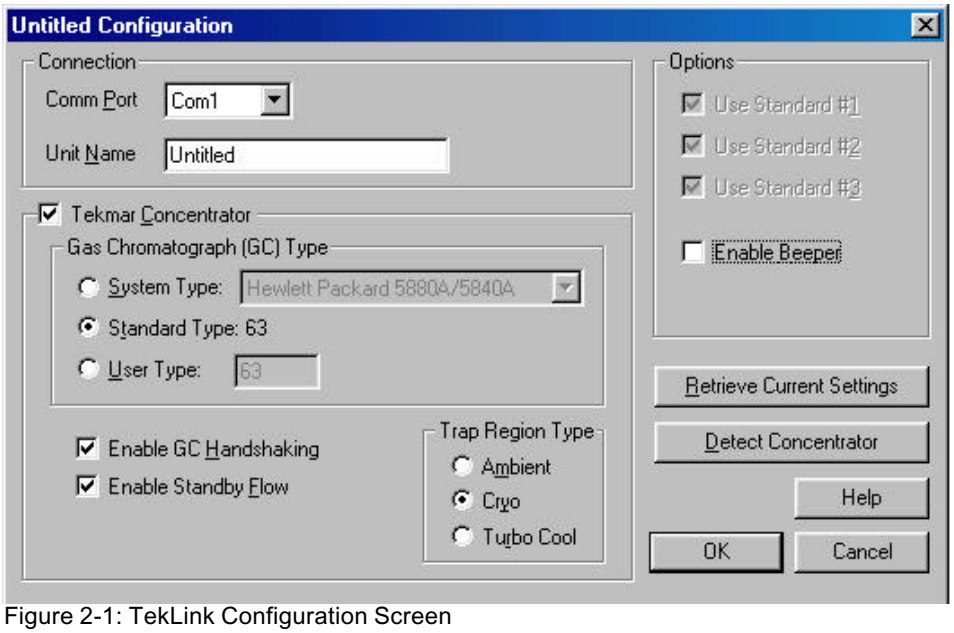


Figure 2-1: TekLink Configuration Screen

Specify the COM Port you are configuring.

Type a name for the SOLATek 72 in the Unit Name field (this can be any name you wish). The name will appear in the Title Bar of the Configuration window when it is active and in the TekLink Window Title Bar after the words SOLATek 72 TekLink

If you receive an error message:

- Check the connection between SOLATek 72 and the PC to make sure everything is secure.
- Verify that the COM Port on the PC matches the configuration.
- Check with the MIS administrator
- If you require further assistance please call the Teledyne Tekmar Customer Support Center:
    - (800) 874-2004 in the US and Canada
    - (513) 229-7000 outside the US and Canada

2.2. Specifying Configuration

TekLink lets you specify the configuration of any active unit:

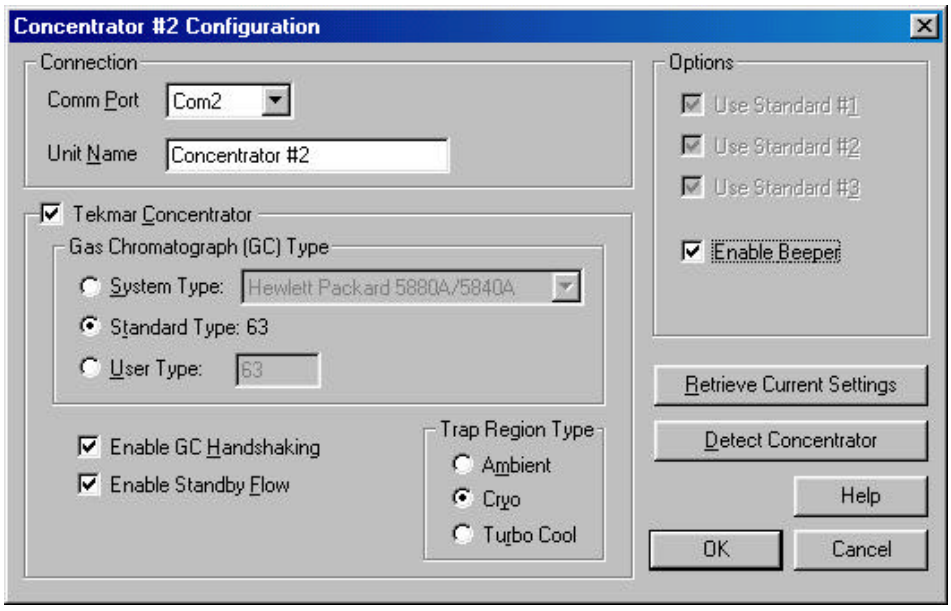


Figure 2-2: SOLATek 72 Configuration Specifications

Tekmar Concentrator (if selected)

If you are using a 3000 series Tekmar Concentrator, check the box to the left of “Tekmar” on the configuration screen. Checking this box activates the options below it.

Gas Chromatograph (GC) Type

You can specify the type of Gas Chromatograph system you have:

- Select from the pop up list.
- Configure the system for a Standard GC Port.
- Configure the system for a User GC Port.

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

Enable GC Handshaking

- Select GC Handshaking to configure the GC Port to run normally.
- Deselect GC Handshaking to operate the GC with no input or output signals between the concentrator and the GC.

Trap Region Type

- Select Ambient, and the concentrator uses the standard internal trap at ambient temperature.
- Select Turbo Cool, and the concentrator operates at cryogenic temperatures when the Turbo Cool unit (optional) is installed.
- Select Cryo, and the concentrator operates at cryogenic temperatures when the Cryofocusing trap (optional) is installed.

Specifying Standards

- The Options checkboxes allow you to specify which Standard(s) to use (#1, #2, or #3).
- The Enable Beeper checkbox allows you toggle the beeper on and off.

2.3. Check the System Pressure

The system pressure is preset at 15 psi. Read the pressure gauge on the front of the SOLATek 72. If the pressure needs adjusting, turn the knob on the System Pressure Regulator until 15 psi is reached.

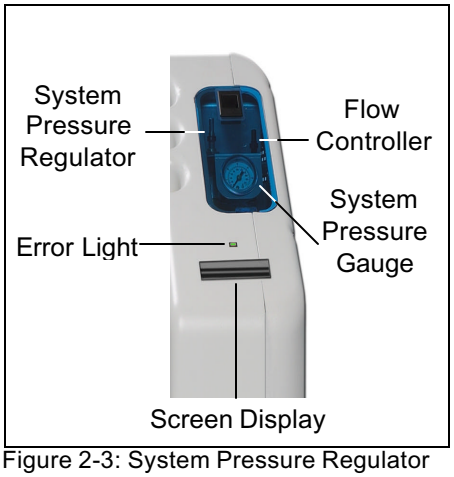


Figure 2-3: System Pressure Regulator

2.4. Set and check the Concentrator Pressure and Flow Rate

Refer to your Concentrator documentation for the procedures for setting and checking the concentrator pressure and flow rate.

2.5. Check the SOLATek 72 and the Concentrator for Leaks, and Set the Transfer Flow Rate.

1. From the menu bar select **Tools >Set Transfer Flow**.
2. Follow the instructions for setting the Concentrator Flow

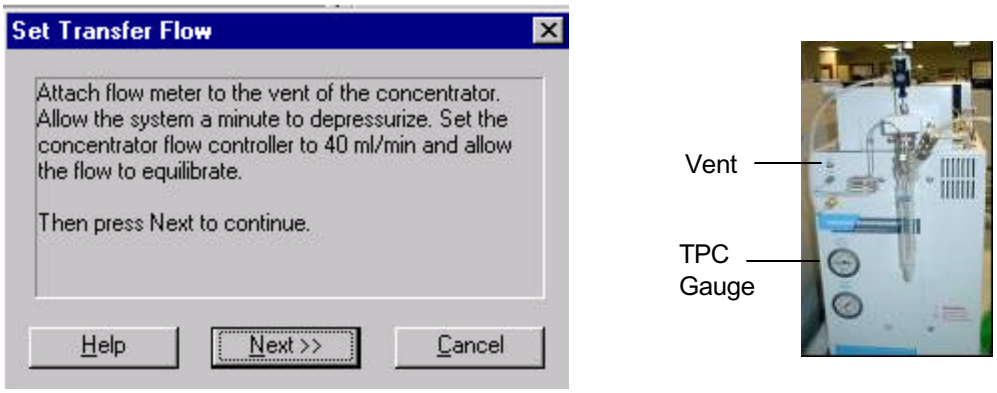


Figure 2-4: Concentrator Vent and TCP Gauge

3. Follow the instructions for setting the SOLATek 72 system pressure:

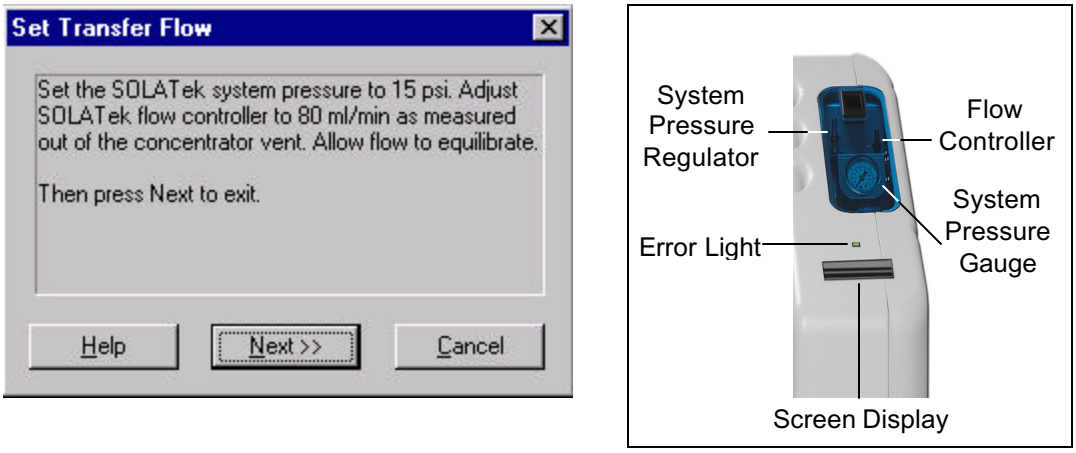
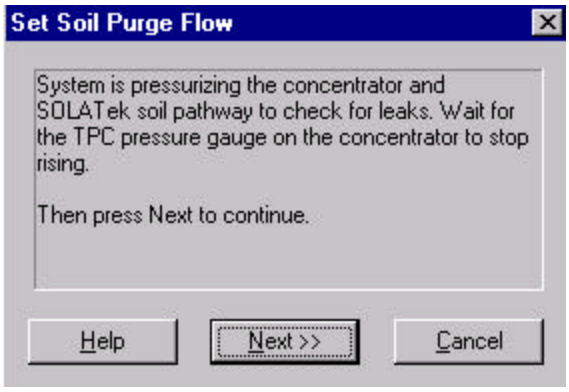


Figure 2-5: Setting the System Pressure on SOLATek 72

2.6. Set the Solid Flow Purge Rate

1. From the menu bar select **Tools >Set Soil Purge Flow**.



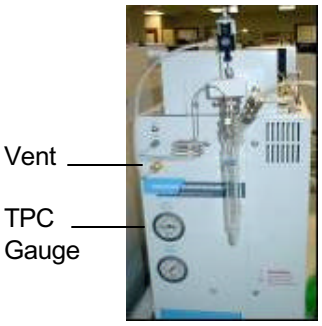
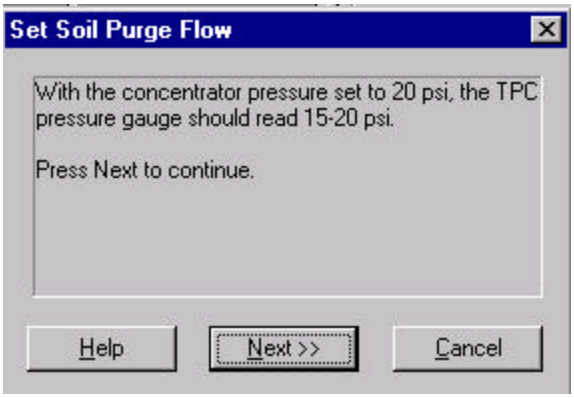
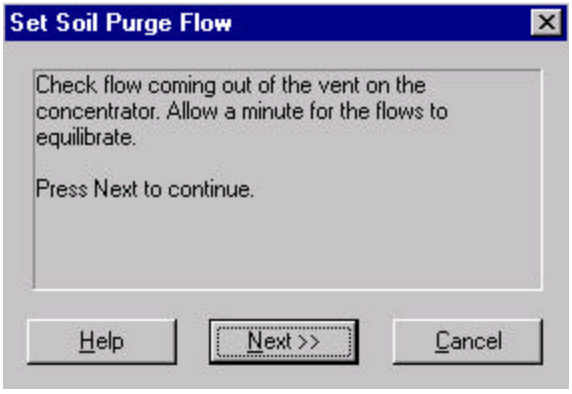


Figure 2-6: Concentrator Vent and TPC Gauge

2. Check the flow coming out of the vent on the concentrator.





3. Place a clean empty vial (with a clean septum) into the SOLATek 72 Sample Cup (Figure 2-7). Press [Next] to continue.

The SOLATek 72 raises the vial onto the needle. Please Wait…

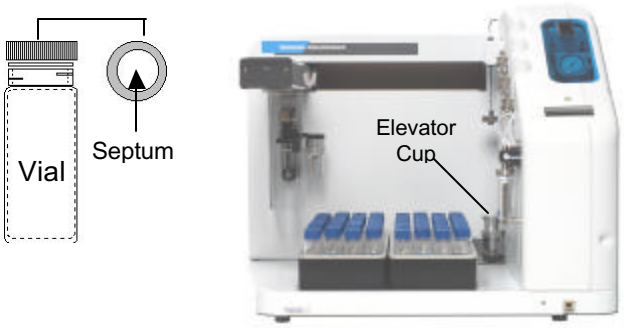


Figure 2-7: Sample Cup

4. Adjust the SOLATek 72 Flow Controller

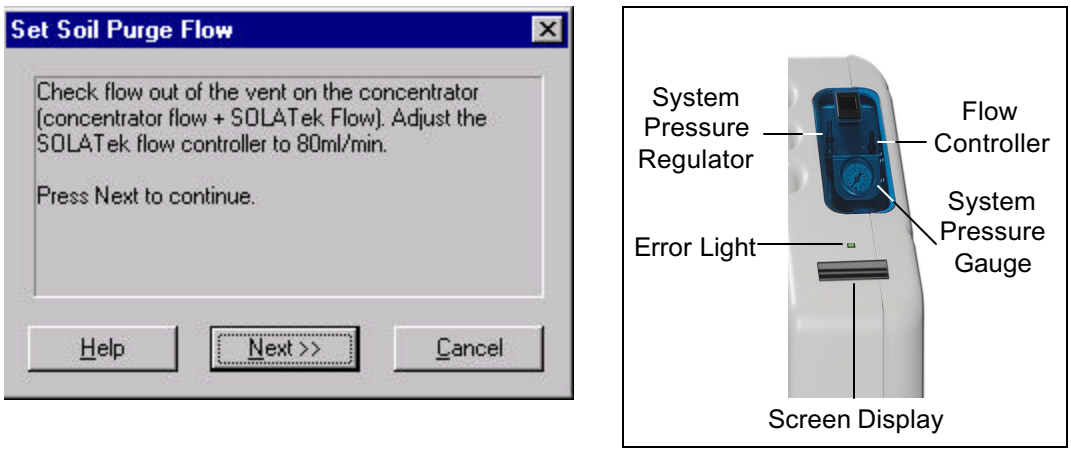
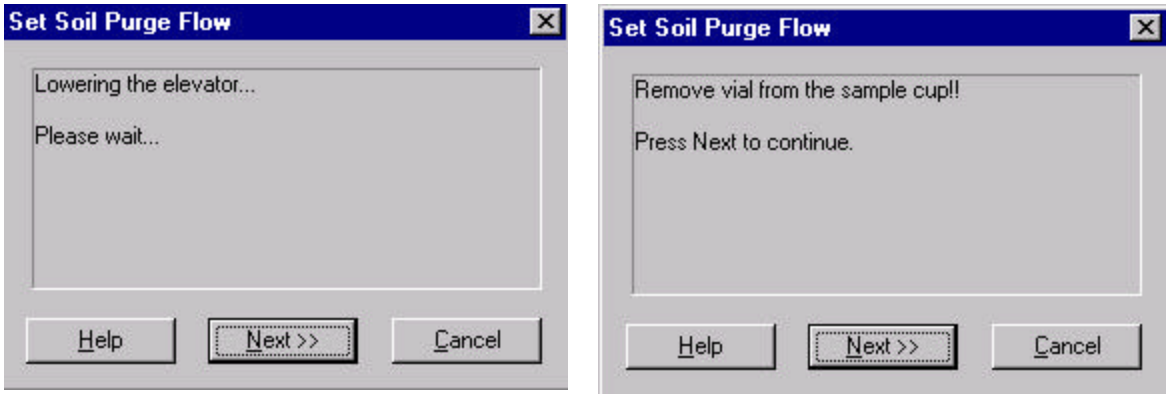
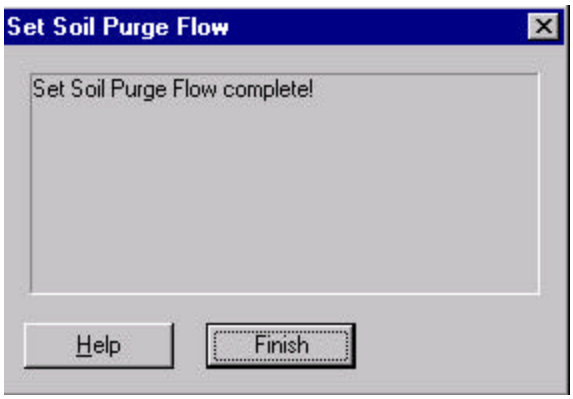


Figure 2-8: SOLATek Flow Controller

5. After the elevator is lowered remove the Vial Sample Cup.



Soil Purge Flow is now complete.



2.7. Fill Standard Vessel(s)

SOLATek 72 is equipped with up to three standard vessels. These vessels are mounted on the inside wall of the SOLATek 72 (Figure 1-.5, Chapter 1, Introduction). Each standard vessel is pressurized to 15 psi and can deliver one to five aliquots, in 5µL increments, to each sample. Each standard has a maximum volume of 25µL. 75µL can be added to each sample if all three standards are used. You can use any combination of the three standards, in units of 5µL to ≤ 75µL.

Standard Volume (µL) Addition per Sample	
# Aliquots	**ST1, ST2, ST3**
0	0
1	5
2	10
3	15
4	20
5	25

Table 2-1: Standard Volume Addition per Sample

2.7.1. To Fill a Standard Vessel:

WARNING:
Use care opening Standard Vessels. Vessel is under 15 psi of pressure.

1. Firmly grasp the standard vessel with one hand.
2. With your free hand gently loosen the fitting that holds the vessel by turning the fitting counterclockwise.
3. Slide the vessel out from under the fitting.
4. Add your standard solution to the vessel leaving at least 2 mL of headspace.
5. Reattach the standard vessel.
6. Repeat steps 1 through 5 to add additional standards.

2.8. Load the Vial Tray

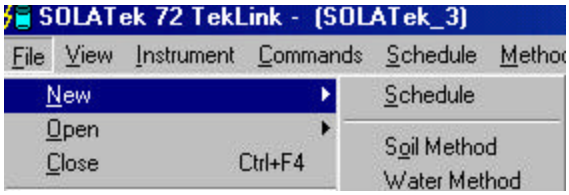
Place your samples in the vial tray, in an upright position, with the caps on top. The vial trays hold 72 vials (36 vials per tray). Two trays allow the user to process one tray of samples while the other is refrigerated.

2.9. Creating and Editing Methods

The Methods Editor creates and stores parameters for the SOLATek 72, the Concentrator (if configured), and a Cryo Focuser (if installed).

2.9.1. Creating a New Method

To create a new Water or Soil Method select **File>New>**, then select **Water Method** or **Soil Method.**



You can also click on the Water Method or Soil Method icons on the toolbar below the menu.

Figure 2-9: Create a New Method

TekLink allows you to create custom methods for sample processing that meet your analytical requirements. Figure 2-10 shows the screen that appears when you select a new Water Method.

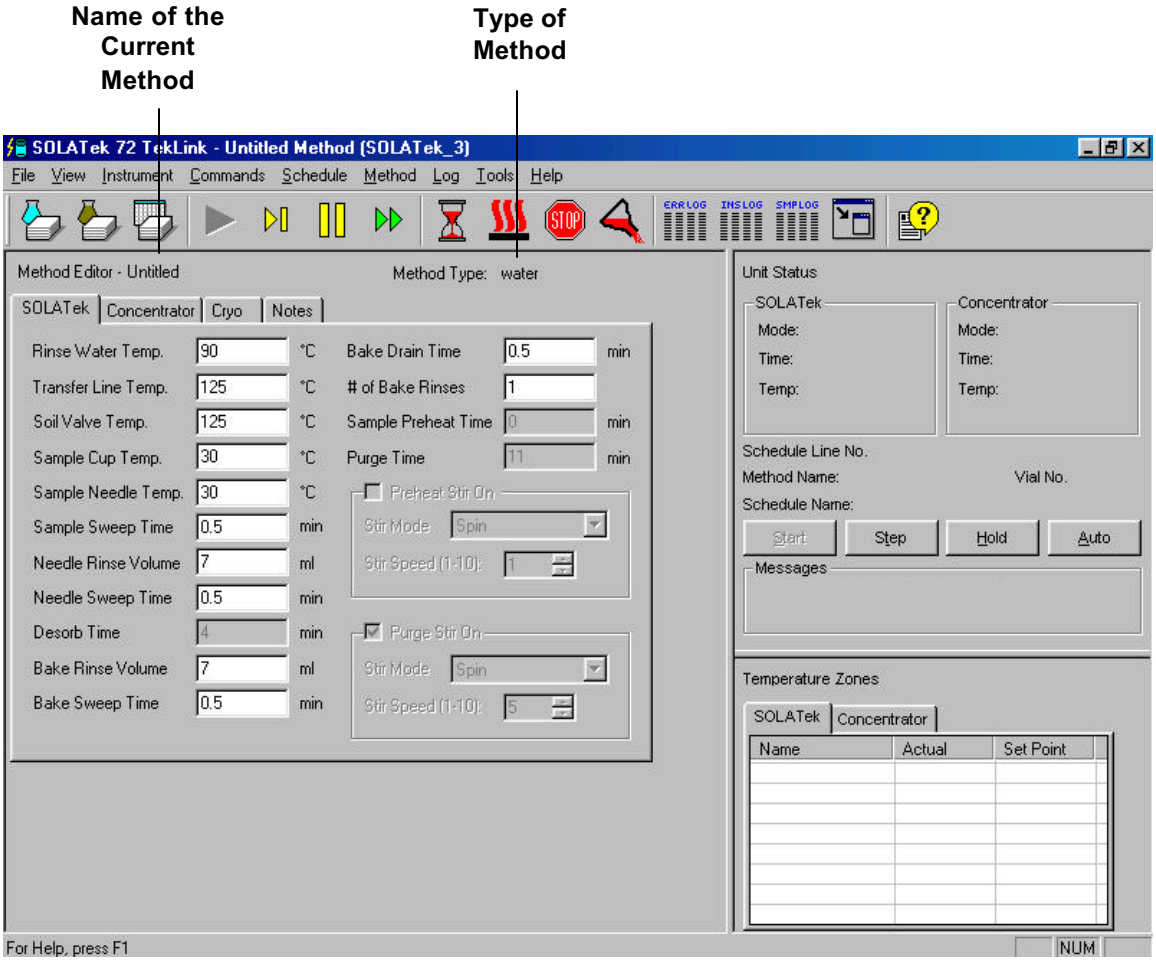


Figure 2-10: New Water Method

Method Parameter Values

The Method Editor screen displays values that define a Method's operational parameters. The Method Editor gives you access to the values for:

- SOLATek 72
- Concentrator (if configured)
- Cryo Focuser (if installed)

Notes

The Notes tab allows you to add additional information that you wish to attach to a particular Method**.** TekLink stores the notes with the Method File when it is saved.

Operational Parameters

When you pause the mouse cursor over a field in the operational parameters, a box appears displaying a brief explanation of the function and the minimum and maximum values for that parameter.

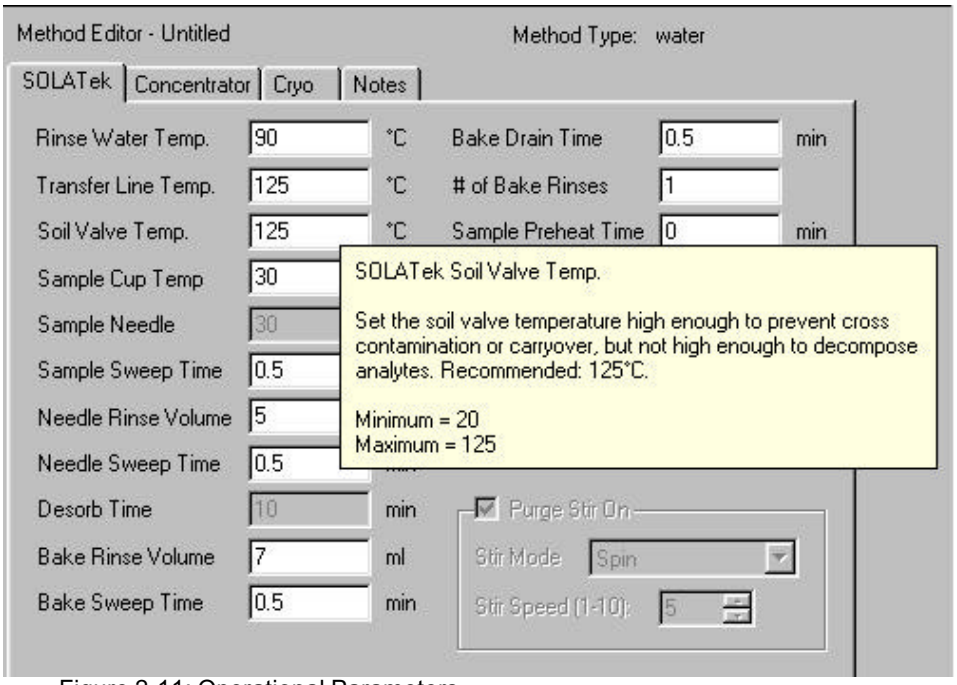


Figure 2-11: Operational Parameters

Note: If the value you enter is incompatible with this range an error message will display. Click OK to clear the error message and enter a value that is within the range.

Saving, Storing, and Printing Methods

When you have finished editing a Method go to **File>Save** or **File>Save As** to save the Method to the default directory

Use "Save As" to save the current Method Configuration under a new filename (**File>Save As**).

To print a copy of the Method select Print (**File>Print**).

2.9.2. Editing an Existing Method

To edit an existing Water or Soil Method select **File>Open>Method.** If the Method you wish to open has been used recently you may open it from the list of Recent Methods under the File menu (**File>Recent Methods**).

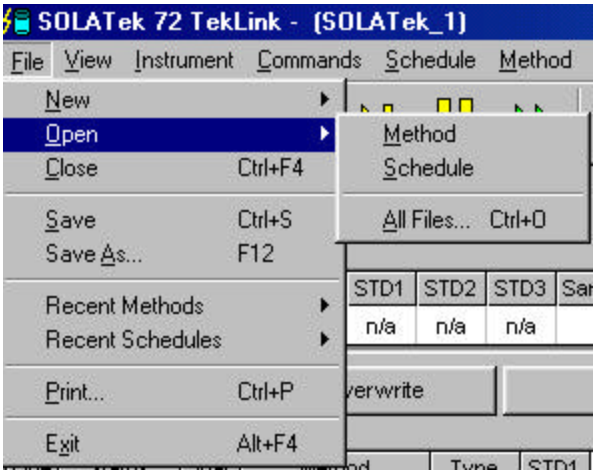


Figure 2-12: Open an Existing Method or a Recent Method

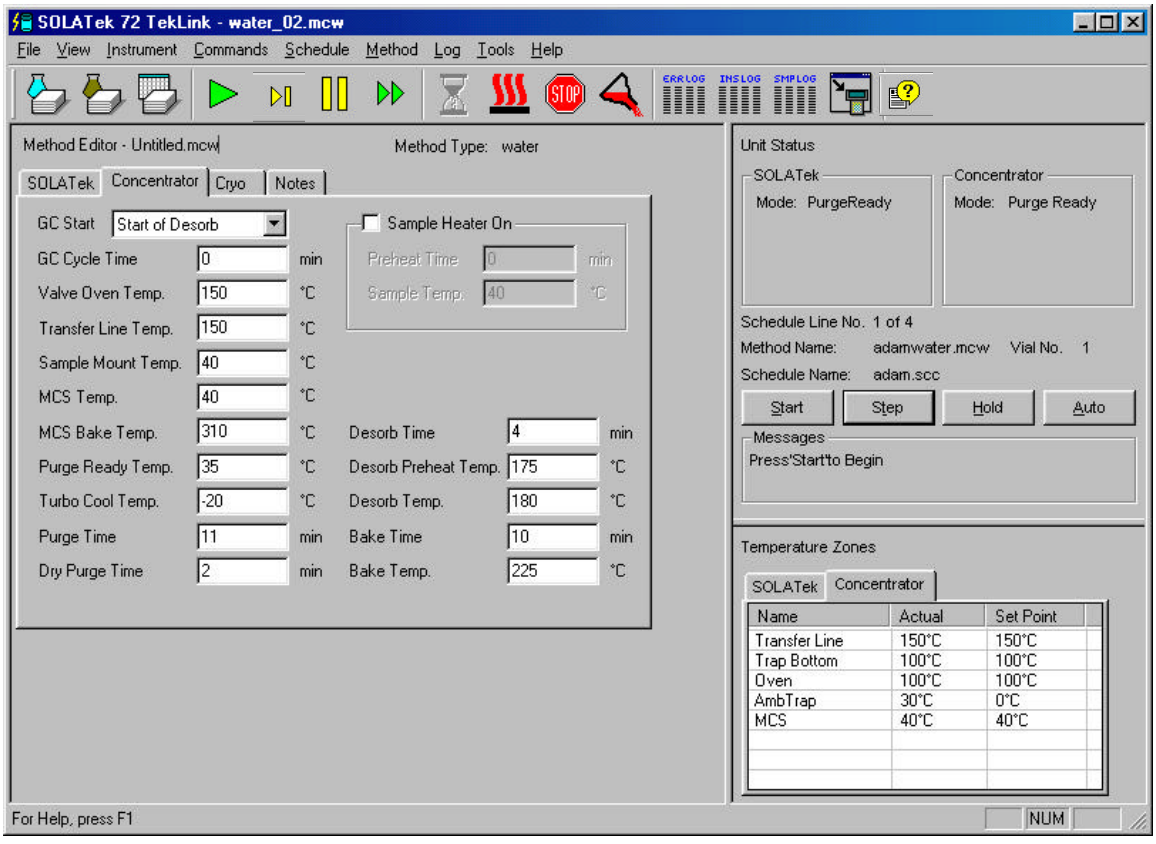


Figure 2-13: Editing an Existing Method

Changes you make to an existing Method are not automatically saved. You must save the Method before closing or exiting the Method Editor. If you do not, the system will alert you that you have unsaved changes and ask whether to keep or cancel them.

Refer to the Method Parameters Tables beginning on the page 2-14 for SOLATek 72 and Concentrator Liquid and Solid default Method values.

2.10. Method Parameters

2.10.1. SOLATek 72 Liquid Method Parameters

SOLATek 72 Liquid Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
Rinse Water Temperature	Setpoint for water used during cleanup rinses.	Hot Water	90	20	90	-	°C
Sample Cup Temperature	Setpoint for sample cup heater.	SampleCup	30	20	100	-	°C
Sample Needle Temperature	Setpoint for third stage (top most) of sample needle.	Needle	30	20	100	-	°C
Transfer Line Temperature	Temperature of SOLATek 72 > concentrator transfer line. 125-150°C recommended, to prevent cross-contamination, carryover, and analyte decomposition.	XferLine	125	20	300	-	°C
Soil Valve Temperature	Setpoint of soil valve. 125 maximum, to prevent cross-contamination, carryover, and analyte decomposition.	SoilValve	125	0	150	-	°C
Sample Sweep Time	Length either of time to sweep syringe fill volume to sample vial or directly to concentrator.	SmplSweep Time	0.5	0	299.99	-	min
Needle Rinse Volume	Volume of hot w ater to rinse sample needle and lines.	NeedleRinseVol	5	0	25	-	ml
Needle Sweep Time	Length of time to sweep hot water from sample needle and lines.	NeedlSweepTi me	0.5	0	299.99	-	min
Bake Rinse Volume	Volume of hot water to rinse concentrator glassware during Bake mode. 7–27 ml recommended, depending on Sample Volume.	BakeRinse Vol	7	0	25	-	ml
Bake Sweep Time	Length of time to sweep Bake Rinse through SOLATek 72 sample lines and to concentrator glassware.	BakeSweep Time	0.5	0	299.99	-	min
Bake Drain Time	Length of time to drain Bake Rinse from concentrator sparger.	BakeDrain Time	0.5	0	299.99	-	min
# of Bake Rinses	Number of times (1, 2 or 3) you want to rinse the concentrator glassware during Bake.	BakeRinses#	1	0	3	-	cycles

Table 2-2: SOLATek 72 Liquid Method Parameters

2.10.2. 3000 Series Concentrator Liquid Method Parameters (#=Concentrator Value)

Concentrator Water Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
GC Start	Determines when GC receives its Start signal. DESEND: Signal sent at end of Desorb step DESTART: Signal sent at beginning of Desorb step. DISABLED: No signal sent. DESBOTH: Signal sent at both beginning and end of Desorb step. .	#GC Start	DESTART			DESEND	option
Valve Temperature	Setpoint for BOT and valve oven.	#Valve Temp	150	20	300	-	°C
Transfer Line Temperature	Setpoint for concentrator > GC transfer line.	#XferLine Temp	150	20	300	-	°C
Sample Mount Temperature	Setpoint for sample mount heater.	#Mount Temp	40	20	100	-	°C
Moisture Control System (MCS) Temperature	Setpoint for MCS line.	#MCS Line Temp	40	20	320	-	°C
MCS Bake Temperature	MCS Temperature during Bake step.	#MCS Bake Temp	320	20	320	-	°C
Purge Ready Temperature	Setpoint for trap that signals system to step from Purge Ready to Purge.	#PurgeRdy Temp	35	20	320	-	°C
TURBOCool Temperature	Temperature of trap during Purge, if TURBOCool option is installed and configured.	#TurboCoolTemp	-20	-20	400	-	°C
Sample Preheat Time	Length of time given for sample to reach equilibrium, at its setpoint, before beginning Purge. Note: Add one minute of Sample Preheat Time for every 25°C above ambient.	#SmplPreHeatTm	0	0	299.99	-	min
Sample Temperature	Setpoint for the Sample Heater.	#Sample Temp	40	20	100	-	°C
Purge Time	Length of time to purge Sample.	#Purge Time	11	0	299.99	-	min
Dry Purge Time	Length of time to sweep concentrator trap.	#DryPurge Time	2	0	299.99	-	min
Sample Drain	Whether automatic drain function is On or Off.	#Sample Drain	On	On	Off	-	option
Desorb Preheat	Concentrator trap setpoint, prepares trap > GC analyte transfer.	#Desorb Preheat	245	20	420	-	°C
Desorb Temperature	Temperature of trap during Desorb.	#Desorb Temp	250	20	420	-	°C
Bake Time	Length of time to Bake trap.	#Bake Time	10	0	299.99	-	min
Bake Temperature	Temperature of trap during Bake.	#Bake Temp	260	20	420	-	°C

Table 2-3: Concentrator Liquid Method Parameters

2.10.3. SOLATek 72 Solid Method Parameters

SOLATek 72 Soil Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
Rinse Water Temperature	Setpoint for water used during cleanup rinses.	Rinse Water	90	20	90	-	°C
Sample Cup Temperature	Setpoint for sample cup heater.	SampleCup	40	20	100	-	°C
Sample Needle Temperature	Setpoint for third stage (top most) of sample needle.	Needle	60	20	100	-	°C
Transfer Line Temperature	Temperature of SOLATek 72 > concentrator transfer line. 125 recommended, to prevent cross-contamination, carryover, and analyte decomposition.	XferLine	125	20	300	-	°C
Soil Valve Temperature	Setpoint of soil valve. 125 recommended, to prevent cross-contamination, carryover, and analyte decomposition.	SoilValve	10	20	150	-	°C
Bake Time	Length of time to bake concentrator trap: **Note:** If you are using a non-Tekmar concentrator, make sure that this setting is long enough for the number of Bake Rinses.	Bake Time	260	0	299.99	-	min
Sample Sweep Time	Length either of time to sweep syringe fill volume to sample vial or directly to concentrator.	SmplSweep Time	0.5	0	299.99	-	min
Sample Preheat Time	Length of time given for sample to reach equilibrium, at its setpoint. **Note:** Add one minute of Sample Preheat Time for every 25°C above ambient.	PreHeat Time	0	0	299.99	-	min
Preheat Stir	Whether the sample stirring/agitation function is On or Off.	PreHeat Stir				-	option
Preheat Stir Speed	Variable mixing hub speed setting, between 1 and 10; sample matrix dependent.	PreHtStirSpeed	5	1	10	-	variable
Purge Time	Length of time to purge sample.	Purge Time	11	0	299.99	-	min
Purge Stir	Whether the sample stirring/agitation function, during Purge, is On or Off.	Purge Stir				-	option
Purge Stir Speed	Variable mixing hub speed setting, between 1 and 10, during Purge; sample matrix dependent.	Prge StirSpeed	5	1	10	-	variable
Needle Rinse Volume	Volume of hot water to rinse sample needle and lines.	NeedleRinseVol	5	0	25	-	ml
Needle Sweep Time	Length of time to sweep hot water from sample needle and lines.	NeedlSweepTime	0.5	0	299.99	-	min
Purge Stir Mode	The mixing hub stirs soil samples during Purge in one of three ways: by revolving around (norm), by agitating (agit), or by revolving with variable speed (var) around the sample vial.	PurgeMixMode	norm	var	agit	-	option
Preheat Stir Mode	The mixing hub stirs soil samples during Purge in one of three ways: by revolving around (norm), by agitating (agit), or by revolving with variable speed (var) around the sample vial.	PreHTMixMode	norm	var	agit	-	option

Table 2-4: SOLATek 72 Solid Method Parameters

2.10.4. Concentrator Solid Method Parameters

Concentrator Soil Method Parameter	Definition	Handheld Abbreviation	Default	Min	Max	Other	Unit of Measure
GC Start	Determines when GC receives its Start signal. DESTART: Signal sent at beginning of Desorb step. DISABLED: No signal sent. DESBOTH: Signal sent at both beginning and end of Desorb step. DESEND: Signal sent at end of Desorb step.	#GC Start	DESTART			DESEND	option
Valve Temperature	Setpoint for BOT and valve oven.	#Valve Temp	150	20	300	-	°C
Transfer Line Temperature	Setpoint for concentrator > GC transfer line.	#XferLine Temp	150	20	300	-	°C
Sample Mount Temperature	Setpoint for sample mount heater.	#Mount Temp	40	20	100	-	°C
Moisture Control System (MCS) Line Temperature	Setpoint for MCS line.	#MCS Line Temp	40	20	320	-	°C
MCS Bake Temperature	MCS Temperature during Bake step.	#MCS Bake Temp	320	20	320	-	°C
Purge Ready Temperature	Setpoint for trap that signals system to step from Purge Ready to Purge.	#PurgeRdy Temp	35	20	420	-	°C
Purge Temperature	Temperature of trap during Purge.	#Purge Temp	0	0	420	-	°C
TURBOCool Temperature	Temperature of trap during Purge, if TURBOCool option is installed and configured.	#TurboCoolTemp	-20	-20	400	-	°C
Sample Fill Time	Length of time to transfer sample.	#SampleFill Tm	0	0	299.99	-	min
Sample Temperature	Setpoint for the Sample Heater.	#Sample Temp	40	20	100	-	°C
Dry Purge Time	Length of time to sweep concentrator trap.	#DryPurge Time	2	0	299.99	-	min
Desorb Preheat	Concentrator trap setpoint, prepares trap > GC analyte transfer.	#DesorbPreheat	245	20	420	-	°C
Desorb Temperature	Temperature of trap during Desorb.	#Desorb Temp	250	20	420	-	°C
Bake Time	Length of time to Bake trap.	#Bake Time	10	0	299.99	-	min
Bake Temperature	Temperature of trap during Bake.	#Bake Temp	260	20	420	-	°C
Cryofocusing Module	Whether or not Cryofocusing module option is installed and configured.	#CryoFocuser				-	option
Cryo Standby Temperature	Temperature of idle Cryo.	#CryoStdbyTemp	150	-190	300	-	°C
Cryo Temperature	Low -temperature setpoint for trapping analytes.	#CryoFocusTemp	-150	-190	300	-	°C
Injection Time	Length of time Cryo heater remains at Inject temperature.	#Inject Time	100	0	299.99	-	min
Cryo Injection Temperature	Cryo heater temperature when analytes are released.	#Cryo Inj Temp	180	-190	300	-	°C

Table 2-5: Concentrator Solid Method parameters

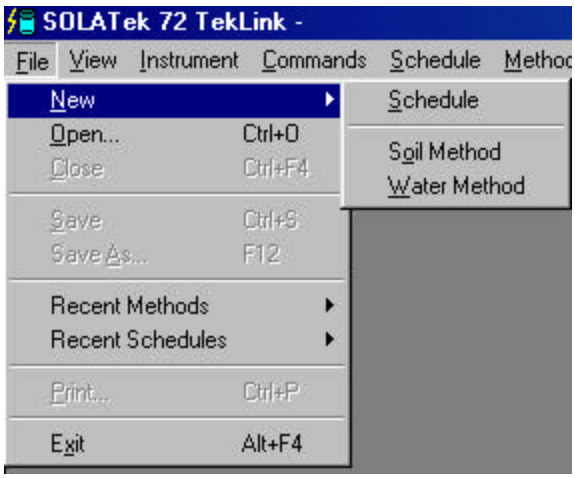
2.11. Building and Editing Schedules

After creating customized Methods, you can define a Method Schedule that specifies samples, operating sequences, and the order in which they run.

2.11.1. Schedule Builder

Note: The Schedule Builder is not functional for an “Active” schedule.

To Build a new Schedule select **File>New >Schedule,** or select the Schedule icon from the toolbar



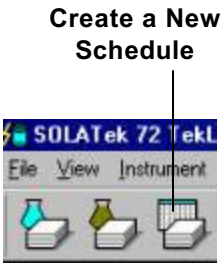


Figure 2-14: Creating a New Schedule

A screen similar to the one pictured in Figure 2-15 appears.

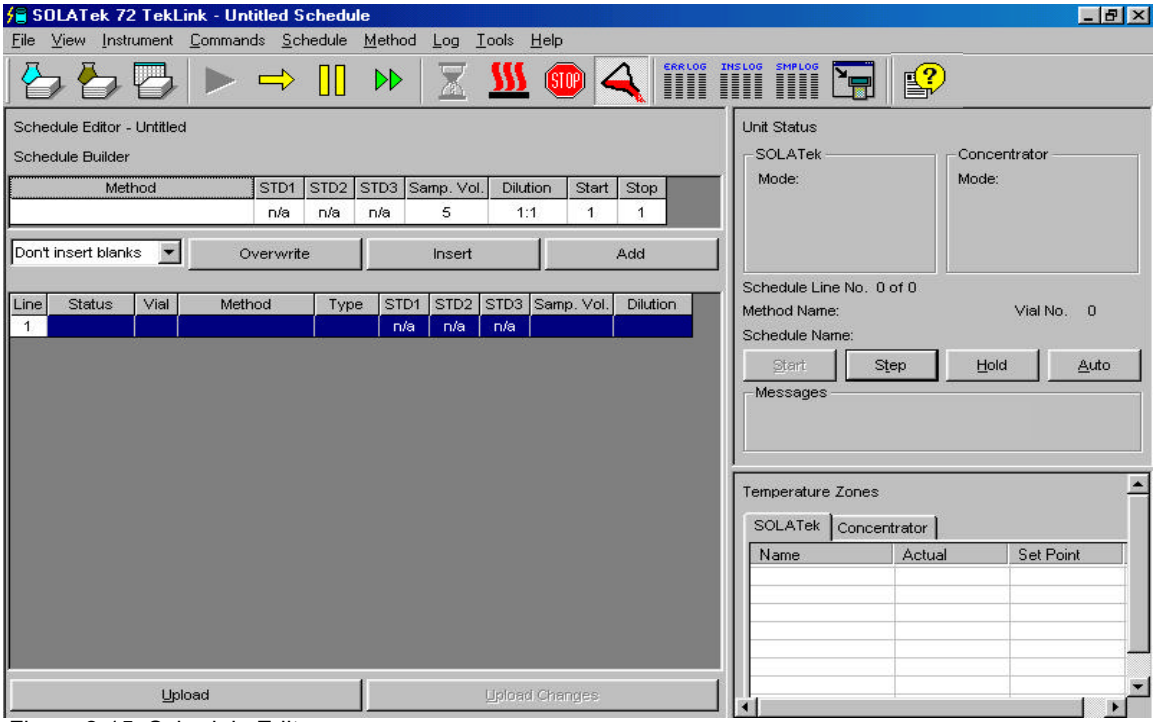


Figure 2-15: Schedule Editor

Method Display and Selection

Click in the Method Display field to select the file name of the method you want to schedule. The file name of the Method you select will appear in that field.

STD1, STD2, STD3

These are the volumes of each internal standard being added. Standard is injected in 5µL increments, with a limit of 25µL.

Sample Volume

- The aliquot of sample transferred during a Water Method.
- The volume of a Soil sample after water has been added to the vial during a Soil Method.

Dilution

SOLATek 72 performs dilutions in the range of 1:1,1:2, 1:5, 1:10, 1:20, 1:50, 1:100, and 1:250. To place a range in the dilution field double click in the field, click the down arrow, and make a selection.

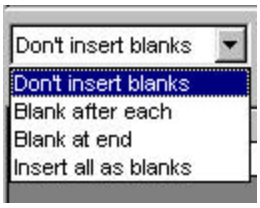
Start and Stop

Enter the Vial Position # of the first sample in the Start Field and the Vial Position # of the last sample in the Stop Field. All of the samples in the range are run according to the Method specified for that line of the schedule.

Figure 2-16: Vial Tray Positions

Blanks

The SOLATek 72 can run system Blanks from the water reservoir in single quantities or consecutive runs. You can vary Blank Sample volume by editing the schedule to reflect the amount of Blank (1 to 25mL) you want to deliver to the concentrator. Multiple Blanks can be run sequentially through the scheduler. The number of Blanks run is determined by calculating the difference between the Start and Stop fields.

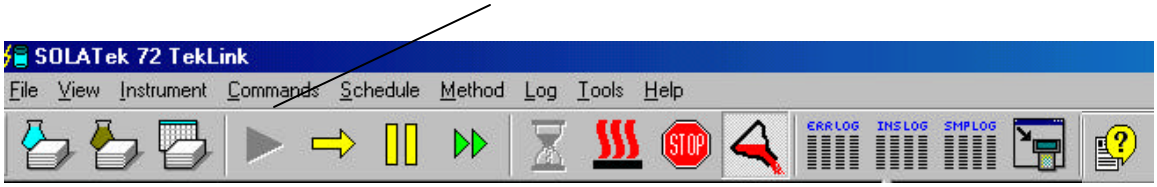


- "Don't Insert Blanks" runs samples from the Vial Tray only.
- "Blank After Each", delivers a Blank after every tray position scheduled on the schedule line.
- "Blank at End" runs a Blank at the end of the run.
- "Insert All as Blanks" pulls consecutive runs from the water reservoir.

2.11.2. To Build A Schedule

Note: You can only send a Schedule to the SOLATek 72 when the system is in Standby, Purge Ready, or End of Schedule mode

1. Open a new Schedule (**File>New Schedule**), or select the New Schedule icon (toolbar).
2. Enter the vial position where the Sample group begins under **Start** position.
3. Enter the vial position where the Sample group ends under **Stop** position.
4. Double click in the **Method** Display field to select the Method you want to schedule.
5. Enter the volume of each Internal Standard you wish to add. If no Standard is being added set the **STD** values to zero (n/a means that the Standard has not been configured or is unavailable).
6. Enter a quantity for the amount of **Sample Volume** you are adding.
7. Double click in the **Dilution** field and select a dilution range from the pop-up window.
8. If you are going to schedule system **Blanks** to run, make your selection from the pop up window under the Method Selection field.
9. To add (delete, cut, copy, paste, insert) a new line to the Schedule, right click anywhere in the Schedule line. Select the line where you want the action to occur.
10. To save the schedule select File>Save or File>Save As. The program takes you to the file where your Schedules are stored and prompts you to name the Schedule.
11. To upload the Schedule (to send it to the SOLATek 72 and make it active), select the **Upload** button at the bottom of the screen.
12. To Start the Schedule, select the **Start** Icon under the menu bar.



13. To print a copy of a Schedule, select File>Print.

2.11.3. Schedule Editor

To edit an existing Schedule select **File>Open**, browse to the folder where you store your Schedules, and open the desired Schedule. If the Schedule you want to open has been used recently you may open it from the list of Recent Schedules under the File menu (**File>Recent Schedules**).

Note: You can make Schedule changes while the SOLATek 72 is running, but you cannot change a line of the Schedule that is currently executing, or has executed. Changes can only be made to the lines of the Schedule that have not yet executed.

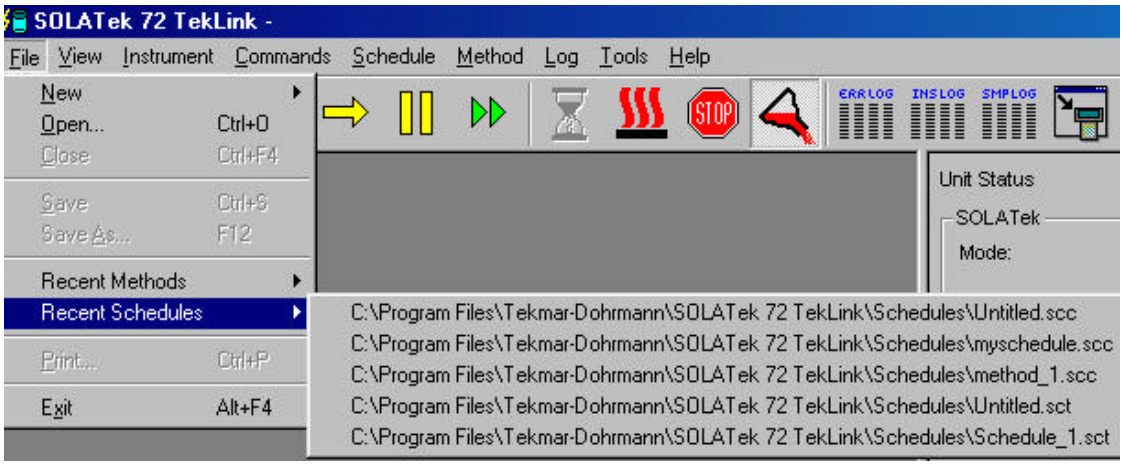


Figure 2-17: Opening an Existing Schedule

Editing a Schedule

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

Schedule Lines

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

Overwrite

Select a line of Schedule and edit it using the Schedule Builder. When you select Overwrite the system overwrites the Schedule with the entries from the Schedule Builder starting with the currently selected schedule line.

Insert

Select the line of Schedule where you want to start inserting entries. When you select the Insert button entries from the Schedule Builder are inserted into the Schedule at the location of the currently selected schedule line.

Add

Select a function you want to add to the Schedule. When you click Add your selection is added to the end of the Schedule.

Uploading Changes to a Schedule

To upload the changes you made to a Schedule, select the Upload Changes button at the bottom of the control screen or select **Schedule>Upload Changes** from the menu bar.

Saving and Storing Schedules

To save the schedule, select **File>Save** or **File>Save As**. The program takes you to the file where your Schedules are stored and prompts you to name the Schedule.

3. Troubleshooting SOLATek Errors

If a SOLATek electronic board detects a problem with system functionality, an error message is sent to, and appears in, TekLink.

Troubleshooting tables for the following boards provide error descriptions and recommended actions to correct potential SOLATek errors:

- CPU Board
- Motor Board
- Temperature Board
- Valve Board

Note: All SOLATek Errors are entered into the TekLink Error Log for troubleshooting reference. If particular errors persist, please contact Customer Support.

3.1. CPU Board (Main)

SOLATek Error	Meaning	Recommended Action
Error Uploading Schedule to Concentrator.	Concentrator could not receive uploaded Schedule.	Press 'OK' to clear error and continue. Check I/O cables and COM port Configuration.
Invalid Method Parameter.	An invalid or unrecognized Method Parameter was sent to SOLATek.	Press 'OK' to clear error and continue. Verify firmware compatibility, instrument configuration, and method setup.
Method Parameter Value above Maximum.	A Method Parameter value sent is above maximum allowed.	Press 'OK' to clear error and continue. Verify firmware compatibility, instrument configuration, and method setup.
Method Parameter Value below Maximum.	A Method Parameter value sent is below minimum allowed.	Press 'OK' to clear error and continue. Verify firmware compatibility, instrument configuration, and method setup.
Invalid Method.	An invalid or unrecognized Method type was uploaded.	Press 'OK' to clear error and continue. Verify firmware compatibility, instrument configuration, and method setup.
Communication Lost with Tekmar Unit.	Concentrator lost communication with SOLATek.	Press 'OK' to clear error and continue. Check I/O cables and COM port Configuration.
Configuration Error.	Corrupted or invalid data was found in configuration packet.	Press 'OK' to clear error and continue. Verify instrument GC Type configuration.
Temperature Board reset and attempts to download program failed.	Temperature Board lost program or communication with SOLATek CPU Board.	Press 'OK' to clear error. SOLATek will attempt to re-establish communication with Temperature Board. Check I/O cables and wiring.
Valve Board reset and attempts to download program failed.	Valve Board lost program or communication with SOLATek CPU Board.	Press 'OK' to clear error. SOLATek will attempt to re-establish communication with Valve Board. Check I/O cables and wiring.

Motor Board reset and attempts to download program failed.	Motor Board lost program or communication with SOLATek CPU Board.	Press ‘OK’ to clear error. SOLATek will attempt to re-establish communication with Motor Board.
Communication Lost with Temperature Board.	Temperature Board lost program or communication. Maximum consecutive abort packets reached.	Press ‘Retry’ or ‘Reboot’. Retry will attempt to re-establish communication and download program. Reboot will reset the system.
Communication Lost with Valve Board.	Valve Board lost program or communication. Maximum consecutive abort packets reached.	Press ‘Retry’ or ‘Reboot’. Retry will attempt to re-establish communication and download program. Reboot will reset the system.
Communication Lost with Motor Board.	Motor Board lost program or communication. Maximum consecutive abort packets reached.	Press ‘Retry’ or ‘Reboot’. Retry will attempt to re-establish communication and download program. Reboot will reset the system.
Maximum number of Schedule lines reached (Max. 144).	Too many Schedule lines uploaded to SOLATek. 144 Schedule lines is the maximum allowed.	Press ‘OK’ to clear error. Reduce number of Schedule lines $\geq$144.
No Temperature Board Found.	CPU Board cannot detect Temperature Board. Temperature Board is disconnected, dip switch settings are incorrect, or the Board is bad.	Press ‘Ignore’ or ‘Reboot’. Check I/O cables and make sure that dip switch settings are correct. Contact Customer Support if you think the Board must be replaced.
No Valve Board Found.	CPU Board cannot detect Valve Board. Valve Board is disconnected, dip switch settings are incorrect, or the Board is bad.	Press ‘Ignore’ or ‘Reboot’. Check I/O cables and make sure that dip switch settings are correct. Contact Customer Support if you think the Board must be replaced.
No Motor Board Found.	CPU Board cannot detect Motor Board. Motor Board is disconnected, dip switch settings are incorrect, or the Board is bad.	Press ‘Ignore’ or ‘Reboot’. Check I/O cables and make sure that dip switch settings are correct. Contact Customer Support if you think the Board must be replaced.

Error occurred during Flash Upgrade of Motor Board.	Motor Board firmware was not updated.	Press ‘OK’ to clear error. Check I/O cables and make sure that dip switch settings are correct.
System Powered Up or Rebooted.	Power lost, system anomaly, possible hardware reset.	Press ‘OK’ to restart system initialization.

3.2. Motor Board

SOLATek Error	Meaning	Recommended Action
Gripper or Arm timed out and all Motors have been Disabled.	The gripper motor and/or arm motor ran too long. This can damage the motor and/or motor board.	Press 'OK' to clear the error and continue. Watch for errant arm movement and any mechanical interference. If errors persist, call Customer Support.
Arm Move Request Denied.	Arm was busy or already moving. The Arm received a second command to move a vial before the previous vial move finished. If you Abort or Step out of mode sequence, this error can occur.	Press 'OK' to clear the error and continue. If errors persist, call Customer Support.
Move Z-axis (Up/Down) Error.	Vial Move was not able to complete its task. The gripper could not move the correct distance to either retrieve or deliver a vial to position or elevator cup.	Press 'Ignore' or 'Reboot'. Ignore will return arm to home position and drop vial from gripper. You must manually place the vial in correct position. Reboot will reset the system.
Z-axis Moving when it should Not be.	An external force caused the Z-axis to move.	Press 'OK' to clear the error and continue.
Y-axis is Moving when it should Not be.	An external force caused the Y-axis to move.	Press 'OK' to clear the error and continue.
X-axis is Moving when it should Not be.	An external force caused the X-axis to move.	Press 'OK' to clear the error and continue.
Last Vial Move Command Failed.	Vial Move request did not complete.	Press 'OK' to clear the error and continue.
Last Move Position Command Failed.	Move Position request did not complete.	Press 'OK' to clear the error and continue.
Arm Calibration Procedure Failed.	During Arm Calibration, many checks are performed to insure the arm calibrates correctly. If a single condition does not meet (or exceeds) a range, a calibration error will occur.	Press 'OK' to clear the error, cancel calibration procedure, and return to Standby mode. Retry Calibration (refer to User Manual for instructions). If Calibration fails again, call Customer Support.
Illegal Vial Position Requested.	A Vial Position request sent was out of range.	Press 'OK' to clear the error and continue. If this error persists, clear CPU Board memory (see *User Manual*) or contact Customer Support.

Attempt Made to Move Vial to Elevator Cup while another Vial was already in it.	A mode sequence skipped or aborted and the Vial was left in elevator.	Remove vial from elevator, press ‘OK’ to clear the error, and continue. The arm will check to make sure there is no vial in the elevator cup before proceeding.
Vial Not Found or Detected at Requested Position by Gripper During Last Vial Move Request.	Vial did not trigger optical sensor, no vial was at requested position, or the gripper sensor (or its mechanism) is bad.	Press ‘Ignore’ or ‘Reboot’. Ignore will return arm to home position and drop vial from gripper. You must manually place the vial in correct position. Reboot will reset the system.
Close Gripper Request Failed.	All motors are disabled. A firmware timeout or lockup caused the Gripper to malfunction.	Press ‘OK’ to clear the error and continue. The arm will reset and move to Home position.
Vial Dropped.	Vial dropped or slipped from Gripper during last Move Vial sequence.	Press ‘Ignore’ or ‘Reboot’. Ignore will return arm to home position and drop vial from gripper. You must manually place the vial in correct position. Reboot will reset the system.
Elevator Did Not Reach Destination in Allotted Time.	The SOLATek right panel safety switch may not be depressed. The right panel of SOLATek must be properly attached for Elevator motor to work.	Press ‘Retry’ or ‘Reboot’. Retry will attempt to raise/lower the Elevator again. Reboot will reset the system.
Gripper Detected Vial During Start-up or Move Vial.	Gripper sensor detected an illegal Vial in the Gripper.	Press 'OK' to drop Vial from Gripper and continue.
Motor Board Reset Occurred.	Possible power interruption, firmware lockup, or motor jam.	Press ‘OK’ to clear the error and continue.
Elevator current overload occurred.	The Elevator motor encountered mechanical interference or drag.	Press ‘Retry’ or ‘Reboot’. Retry will attempt to raise/lower the Elevator again. Reboot will reset the system. Check for obstructions in Elevator mechanism, bad sensors, bent flag, or bad Elevator motor.
X-axis motor moved in the wrong direction.	Improper wiring.	Press ‘OK’ to clear the error and continue. Check wiring, motor, or plug orientation.

Y-axis motor moved in the wrong direction.	Improper wiring.	Press ‘OK’ to clear the error and continue. Check wiring, motor, or plug orientation.
Z-axis Motor Moved in Wrong Direction.	Improper wiring.	Press ‘OK’ to clear the error and continue. Check wiring, motor, or plug orientation.
X-encoder Not Present.	The robotic arm X-encoder did not pass start-up testing.	Press ‘OK’ to clear the error and re-test all the arm encoders. If error persists, turn SOLATek power off, check encoder cable connections, and back up. Call Customer Support if problem is not solved.
Y-encoder Not Present.	The robotic arm Y-encoder did not pass start-up testing.	Press ‘OK’ to clear the error and re-test all the arm encoders. If error persists, turn SOLATek power off, check encoder cable connections, and back up. Call Customer Support if problem is not solved.
Z-encoder Not Present.	The robotic arm Z-encoder did not pass start-up testing.	Press ‘OK’ to clear the error and re-test all the arm encoders. If error persists, turn SOLATek power off, check encoder cable connections, and back up. Call Customer Support if problem is not solved.
X-axis Move Error.	X-axis (Side-to-Side) Motor encountered obstruction and could not complete its move.	Press ‘Ignore’ or ‘Reboot’. Ignore will return arm to home position and drop vial from gripper. You must manually place the vial in correct position. Reboot will reset the system.
Y-axis Move Error.	Y-axis (Back/Forward) Motor encountered obstruction and could not complete its move.	Press ‘Ignore’ or ‘Reboot’. Ignore will return arm to home position and drop vial from gripper. You must manually place the vial in correct position. Reboot will reset the system.

Z-axis Move Error.	Z-axis (Up/Down) Motor encountered obstruction and could not complete its move.	Press ‘Ignore’ or ‘Reboot’. Ignore will return arm to home position and drop vial from gripper. You must manually place the vial in correct position. Reboot will reset the system.

3.3. Temperature Board

SOLATek Error	Meaning	Recommended Action
Open RTD.	Zone [*.*] Resistance Thermal Detector (RTD) Open.	Press ‘OK’ to clear the error and continue. Check cable connections and broken wires.
Zone Runaway 1.	Zone [*.*] Runaway; Temperature above maximum setpoint.	Press ‘OK’ to clear the error and continue. Check cable connections and broken wires.
Zone Runaway 2.	Zone [*.*] Runaway; Temperature exceeded maximum setpoint twice.	Press ‘OK’ to clear the error and continue. Check cable connections and broken wires.
Above Max Operating Point.	Zone [*.*] Temperature above maximum setpoint.	Press ‘OK’ to clear the error and continue. Check cable connections and broken wires.
Heater Not Working.	Zone [*.*] Heater Circuit not heating.	Press ‘OK’ to clear the error and continue. Check cable connections, fuses, and for broken wires.
Low Calibration Reference.	Low Calibration Reference; Out of Range.	Press ‘OK’ to clear the error and continue. Turn SOLATek off and then back on. Call Customer Support if error persists.
High Calibration Reference.	High Calibration Reference; Out of Range.	Press ‘OK’ to clear the error and continue. Turn SOLATek off and then back on. Call Customer Support if error persists.
VREF 2.5 Voltage Error.	Voltage Out of Range.	Press ‘OK’ to clear the error and continue. Turn SOLATek off and then back on. Call Customer Support if error persists.

[*.*] = Internal Hot Water Reservoir, Vial Cup Heater, Transfer Line Heater, Sample Needle Heater, or Soil Valve Heater

3.4. Valve Board

SOLATek Error	Meaning	Recommended Action
Initialization Error.	[*.*] Syringe Valve received an initialization error.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Invalid Command.	[*.*] Syringe Valve received an invalid command.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Invalid Operand.	[*.*] Syringe Valve received an invalid operand.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Invalid Command Sequence.	[*.*] Syringe Valve received a command that was invalid and out of sequence.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Device Did Not Initialize.	[*.*] Syringe Valve could not initialize.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Plunger Overload.	The [*.*] Syringe Valve Plunger overloaded.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Valve Overload.	The [*.*] Syringe Valve overloaded.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Plunger Move Not Allowed.	The [*.*] Syringe Valve Plunger moved illegally.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.
Command Overflow.	[*.*] Syringe Valve received a command overflow.	Press ‘A’ to Abort Entire Schedule, ‘B’ to Abort Sample, or ‘C’ to Rerun Sample. First, valve will reinitialize and then complete selected action.

[*.*] = 8-port or 4-port Syringe Valve.