AQUATek 50

User Manual

AQUATek 50

User Manual

7143 East Kemper Road, Cincinnati, Ohio 45242-9576
(800) 543-4461 • Outside the U.S. and Canada (513) 247-7000 • Service (800) 874-2004
Telefax (513) 247-7050

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Essential Instructions

Please read this page before proceeding!

Tekmar designs, manufactures, and tests its products to meet many national and international standards. Because the AQUATek 50 is a sophisticated technical product, you must properly install, use, and maintain the instrument to ensure that it continues to operate within its normal specifications. Also, you must adhere to and integrate the following instructions into your safety program when installing, using, and maintaining this Tekmar product. Failure to follow the proper instructions may invalidate the warranty.

- Read all instructions prior to installing, operating, and servicing the product. Follow all warnings, cautions, and instructions marked on and supplied with the product and in this manual. If you do not understand any of the instructions, contact your Tekmar representative for clarification.

- Educate your personnel in the proper installation, operation, and maintenance of the product.

- To ensure proper performance, only qualified personnel should install, operate, update, program, and maintain the product.

- Install your equipment as specified in the installation section of this manual and according to applicable local and national codes. Connect all products to the proper electrical and pressure sources.

- When replacement parts are required, ensure that qualified people use replacement parts specified by Tekmar. Unauthorized parts and procedures can affect the product's performance and jeopardize safety. Using look-alike substitutions may result in fire, electrical hazards, or improper operation.

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

1.1 Scope of the Manual

This manual describes the AQUATek 50 autosampler and tells you how to:

- Install the instrument
- Load vials
- Operate the instrument
- Perform routine maintenance and troubleshooting procedures
- Order replacement parts and service support

1.2 How the Manual Is Organized

The manual is organized into nine main sections.

Section 1 - Introduction is an overview of the manual organization. It also gives a brief description of the instrument and how it operates.

Section 2 - Safety and Specifications warns of possible safety hazards and lists product specifications.

Section 3 - Installing the AQUATek 50 includes set up, pneumatic, hydraulic, electronic connections as well as a description of major components of the AQUATek 50.

Section 4 - Overview of the Microprocessor explains the program panel, keypad, and the program steps.

Section 5 - Operating the AQUATek 50 has step-by-step instructions for running the instrument.

Section 6 - Routine Procedures and Maintenance covers changing sample loops and filter, cleaning, and leak checking.

Section 7 - Troubleshooting discusses potential electronic problems and recommended solutions.

Section 8 - Service and Parts tells you how to contact the Service Department for service support and replacement parts.

Section 9 - Diagrams includes wiring and flow diagrams.

1.3 Assumptions

The manual assumes the following:

- That you have access to a Tekmar™ Purge and Trap Concentrator and are familiar with Purge and Trap Gas Chromatography technology.

1.4 Conventions Used In the Manual

To help you locate and interpret information more easily, the manual uses certain typefaces and symbols with specific meanings, including:

⚠ DANGER

This symbol alerts you to a situation where incorrect operation of the instrument could result in electrical shock or other serious hazard and cause severe and permanent personal injury as well as damage to your equipment.

⚠ WARNING

This symbol points out a situation where incorrect operation could result in personal injury and equipment damage.

⚠ CAUTION

This symbol indicates that incorrect operation could lead to equipment damage.

Note:

The "notes" throughout the text point out very useful information.

1.5 Figures Used In the Manual

The following figures are included in the manual for illustration purposes.

continued

1.5 Figures Used In the Manual (cont.)

1.6 Product Description

The Tekmar AQUATek 50 is a menu-driven, microprocessor-controlled automatic sampler that works in conjunction with the Tekmar Purge and Trap Concentrator. It is designed to handle drinking water and wastewater* samples when no additional sample preparation is required. The unit processes up to 50 vials at a time, and allows new vials to be loaded during a run without interrupting the AQUATek 50 operation sequence.

With the AQUATek 50, you can change program parameter values and store four complete sets of values as "Method 1", "Method 2", "Method 3", and "Method 4" in the instrument's memory. The defaults for each method are the same, but you can customize each method independently to reflect a specific set of parameter values, including running blank samples at programmed intervals to ensure system integrity.

The AQUATek 50 accommodates Environmental Protection Agency (EPA)-specified 40 ml vials. With an external refrigerated recirculating bath (available from Tekmar but not included), samples are held at 4° C as stated in the EPA protocols. Before analysis, vials are moved to a zone where they warm to room temperature. Each sample then moves to a vertical position to allow particulates to settle for a programmed time. The AQUATek 50 moves the sample onto a fixed needle that has been swept with inert gas, such as helium or nitrogen. The vial is pressurized with inert gas, transferring the sample to a loop and finally to the Purge and Trap Concentrator.

An internal standard (fluorobenzene and 2-bromo-1-chloropropane in methanol, for example) may be added to the system through a fixed, interchangeable sampling loop.

A built-in filter/backflush system allows you to program the AQUATek 50 to rinse the sample lines and needle between cycles when running particulate-laden (wastewater) samples.

A "high priority" sample may be added to the AQUATek 50 without interrupting the current cycle. Details of this operation are in Section 5.10 of the manual.

* Particulate content in wastewater samples is not to exceed 14 mm above the bottom of the vial (when the vial is in a vertical position).

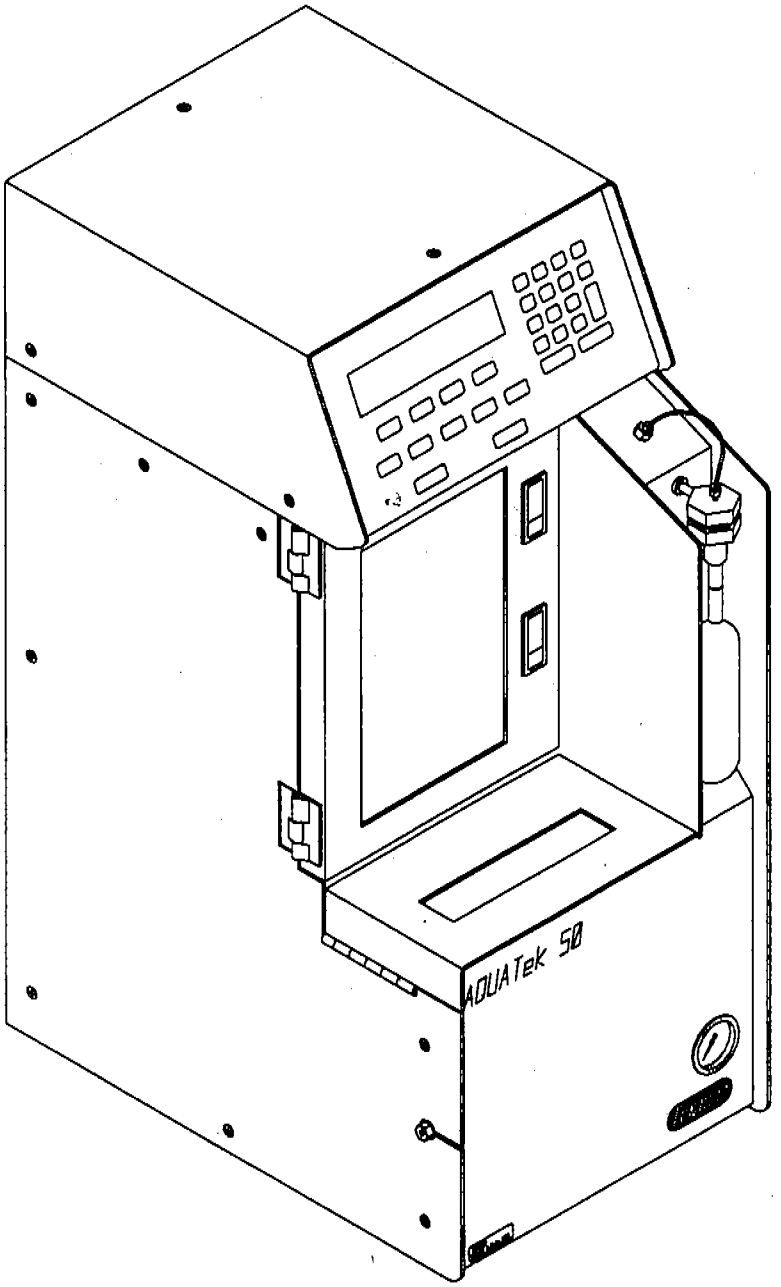


Figure 1-1 AQUATek 50

2.1 Safety Precautions

The AQUATek 50 meets Class 1 safety requirements.

⚠ WARNING

Electrical shock hazard inside. All panels must be securely fastened when the instrument is operating. ALWAYS UNPLUG THE INSTRUMENT FROM ITS POWER SOURCE BEFORE SERVICING.

⚠ CAUTION

This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the manual, it may cause interference to radio communications. This unit has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

⚠ CAUTION

To avoid clogging the AQUATek 50, the blank water generator shipped with your unit must be connected to a water supply. Failure to comply with this guideline may void your warranty.

⚠ CAUTION

Auto Drain or Sample Drain must be turned on at the concentrator before operating the AQUATek 50. Failure to do so may result in damage to the AQUATek 50 and the concentrator. Auto Drain or Sample Drain instructions are covered in Sec. 3.7.1.

2.2 Specifications

The AQUATek 50 meets the following design and operating specifications.

Sample Vials:	Nominal 40 ml capacity, hole cap with teflon-faced silicone septum, per EPA specification. 95 mm; 2 1/2 cm cap
Sample Chamber:	Fifty vial capacity water-jacketed sample vial chamber designed to provide storage of samples at 4° C per EPA specification when used with an external refrigerated recirculating water bath (available but not included - p/n 21-0240-000)
Sample Loops:	Stainless steel, 5, 10, or 25 ml volume. 5 ml standard
Internal Standard Loops:	Stainless steel, 5, 10, or 25 µl volume. 10 µl standard (serial #s 92214001 and greater); 5 µl standard (serial #s prior to 92214001).
Transfer line:	Pre-cleaned nickel, 1/16" O.D. x 0.040" I.D., length as required
Valving:	Two 2-position 6-port switching valves for sample and internal standard loop functions
	Seven 2-port solenoid valves for Sample Pressurize, Internal Standard Pressurize, Internal Standard Drain, Sample Transfer, Internal Standard Transfer, Purge Valve and blank water functions; two 3-port solenoid valves for backflushing filter and sample drain
Tubing:	1/16" nickel sample lines
Electronic Control:	CMOS 8-bit 6303 microprocessor with 64K ROM (Read Only Memory) and 2K RAM (Random Access Memory), parameter entry via a tactile response panel including a numeric keypad
Outputs:	Two-second 5 volt to ground for Purge Start
	Four-second closure for Purge Ready
	Two-second relay closure for GC Start, user selectable for beginning or end of Desorb mode
Inputs:	Four-second closure for advance to Desorb
	Four-second closure for advance to Prepurge

2.2 Specifications (cont.)

Fuse Ratings:

115V Unit

F1	Input Power (Line)	=	2.0 amp 250V (Time Delay)
F2	Transformer Secondary	=	3.0 amp 250V (Non-Time Delay)
F3	Transformer Secondary	=	3.0 amp 250V (Non-Time Delay)

230V Unit

F1	Input Power (Line)	=	1.25 amp 250V (Time Delay)
F2	Input Power (Neutral)	=	1.25 amp 250V (Time Delay)
F3	Transformer Secondary	=	3.0 amp 250V (Non-Time Delay)

Display: 64 x 240 pixel dot graphics LCD screen

BCD: Binary-coded decimal output of sample vial number

Environment Requirements:

Operating temperature: 10° to 30°C
Storage temperature: -20° to 60°C
Relative humidity: 10 to 90% with no condensation

Size:

Depth:	22 in. (56 cm)
Width:	14 in. (36 cm)
Height:	29 in. (74 cm)

Weight: Net Weight: 65 lbs. (30 kg), Shipping weight: 85 lbs. (39 kg)

Utilities:

Voltage:	115V ± 10%, 230 W	230V ± 10%, 288 W
Frequency:	50 or 60 Hz ± 1%	
Purge gas:	Ultra high purity (99.999%) helium or nitrogen, 20 to 200 psi. Hydrocarbon content <0.5 ppm.	

Water Sample Quality and Capacity:

- Water samples containing up to 14 mm particulate content (when measured from the bottom of a 40 ml vial in a vertical position).
- Capability to run particulate-laden samples with these added features:
  - Settle mode to allow particulates to settle before sampling
  - Filter and needle backflush capabilities
  - Blank water rinse function
  - Sample dilution of 20% to 100%
- As long as a sample meets the above particulate criteria, concentration of organics should not be a major problem. Since the AQUATek 50 handles the sample only in the liquid phase, carryover is not inherent to the instrument. The limiting factor for high concentration samples is the potential for carryover in the concentrator side of the system. The AQUATek 50 will not create additional carryover.

3.1 General Information

The system setup and installation sections are intended to be as thorough as possible. *If in doubt on any point*, contact Tekmar toll free at (800) 874-2004, or outside the U.S. at (513) 247-7000. If installation is not directed or performed by Tekmar personnel, the operator must be thoroughly familiar with the setup and installation sections of this manual and all installation, microprocessor, and operating procedures in the Tekmar concentrator manuals before proceeding.

Tekmar Company strongly recommends that the AQUATek 50 be kept *on at all times* (other than when it is being serviced, during power failure, etc.) for optimum unit longevity and reliability.

3.2 Preparing Your Work Space for the AQUATek 50

Place the AQUATek 50 on a sturdy, stable bench surface immediately adjacent to your concentrator. Allow enough space on the right side of the AQUATek 50 for the vial collection bin, or position the unit at the end of a work table where a large waste container can accommodate disposed vials. You will need to place a large (5 gallon is recommended) container at the rear of the AQUATek 50 to collect rinse water; otherwise, route to a drain.

3.3 Power Requirements

The 115V unit requires a 50 or 60 Hz single phase power source at 115V ± 10%. The 230V unit requires a 50 or 60 Hz single-phase power source at 230V ± 10%. For the 115V unit, the maximum current draw is 2 amps and maximum power consumption is 230 watts. For the 230V unit, the maximum current draw is 1.25 amps and maximum power consumption is 288 watts. The 115V unit power cord is terminated with a 3-prong straight blade plug and requires a matching receptacle. The 3-prong plug is a safety feature. Do not defeat its purpose by using it with an inappropriate receptacle.

Note: Make all pneumatic and water connections before powering up the instrument.

3.4 Unpacking the Instrument

Remove the accessory packages and the instrument from the shipping container.

Note: Carefully examine the instrument. If there is visible damage to the instrument or to the accessories, notify both the shipping carrier and Tekmar Company immediately. Do not install the unit until directed to do so by a Tekmar Representative. Failure to comply with these instructions may void your warranty on components damaged in shipment.

- **Do not return any materials to Tekmar Company without prior authorization.**
- **Save all shipping materials until proper operation of the instrument is verified.**

3.5 Overview of the AQUATek 50 Components

The major components of the AQUATek 50 are found on the front portion of the instrument, in the right interior of the unit, the left interior of the unit and on the back panel. The following pages describe and illustrate these components.

3.5.1 Front Section

The keypad, priority sample access door, vial cooler, and internal standard vessel are the major components on the front panel of the AQUATek 50. Each is described on the following pages.

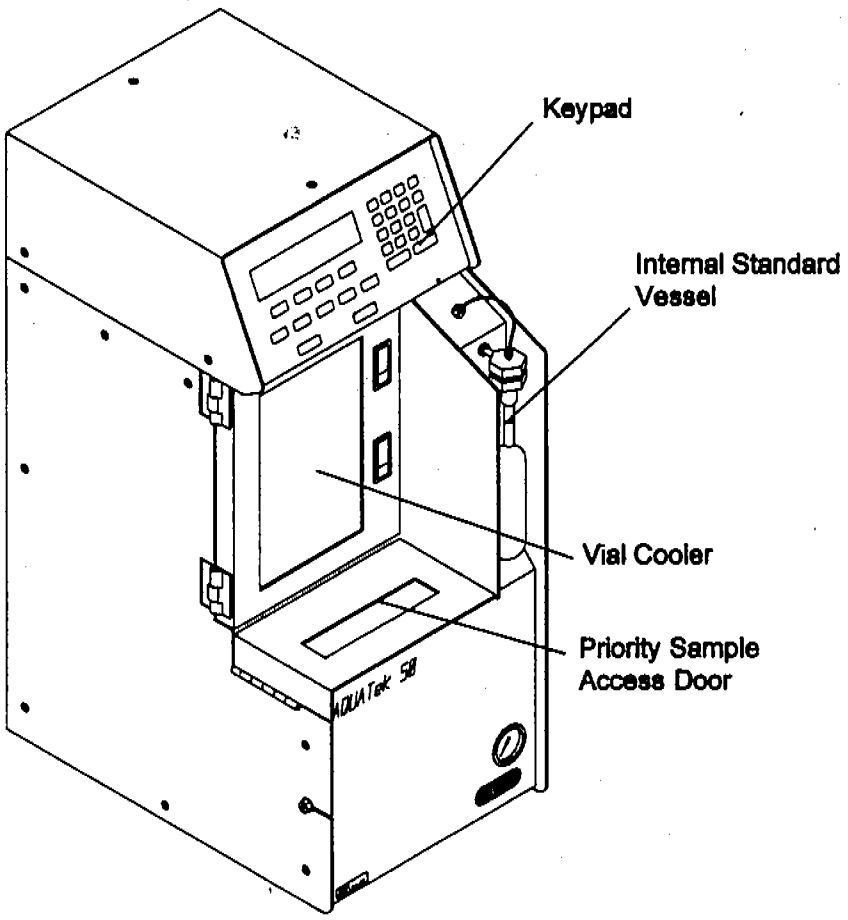


Figure 3-1 Tekmar AQUATek 50

3.5.1.1 Keypad

The AQUATek 50 keypad is the center of control for all operator tasks. Detailed explanations of the functions of each of the keys can be found in Section 5 of this manual.

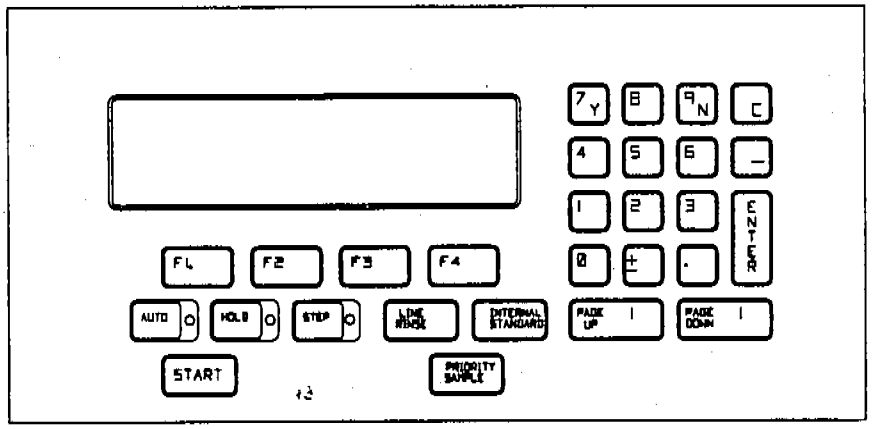


Figure 3-2 AQUATek 50 Keypad

3.5.1.2 Vial Cooler

The vial cooler accommodates up to 50 EPA-specified 40 ml vials in five rows of 10. It holds the vials in a ready state for processing by the autosampler.

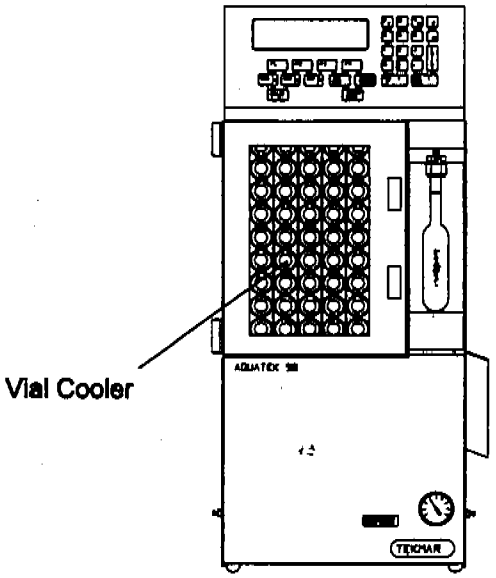


Figure 3-3 Vial Cooler

3.5.1.3 Priority Sample Access Door

The Priority Sample Door enables you to interrupt the original sampling cycle whenever you need to run a "high priority" vial. When the door is lifted, you can place the vial horizontally on the ramp. The vial slides into position immediately after the current vial is processed. A keypad prompt alerts the AQUATek 50 to process the priority sample before resuming the cycle.

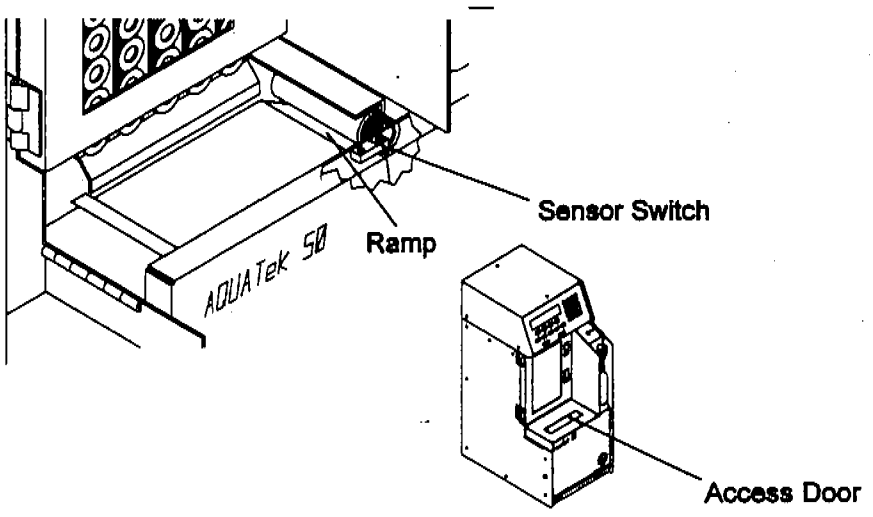


Figure 3-4 Priority Sample Access Door

3.5.1.4 Internal Standard Vessel

The internal standard vessel (p/n 14-4487-024) is a 100 ml capacity glass container with a 1/2" neck.

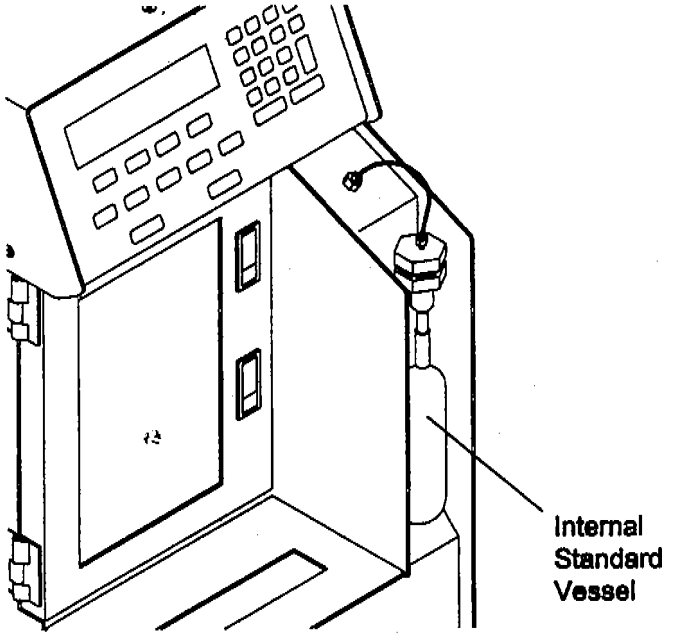


Figure 3-5 Internal Standard Vessel

> **⚠ CAUTION**
>
> **Even if you do not plan to use the Internal Standard, you must have the Internal Standard Vessel installed to ensure proper sample transfer.**

3.5.2 Right Interior AQUATek 50 (Lower Section)

The right interior (lower section) of the AQUATek 50 houses a number of electronic, hydraulic, pneumatic, and mechanical components. Those to be discussed in this section of the manual are:

1. Vial Tilt Mechanism
2. Vial Elevator
3. Vial Ejection Chute
4. Pressurization Gas Adjustment Screw

3.5.2.1 Vial Tilt Mechanism/ Elevator

The vial tilt platform mechanism brings the vial from a horizontal position (after it leaves the vial advancer tray) to a vertical position under the sample needle in preparation for sampling.

3.5.2.2 Vial Elevator

The Vial Elevator raises the vial up onto the needle for sampling.

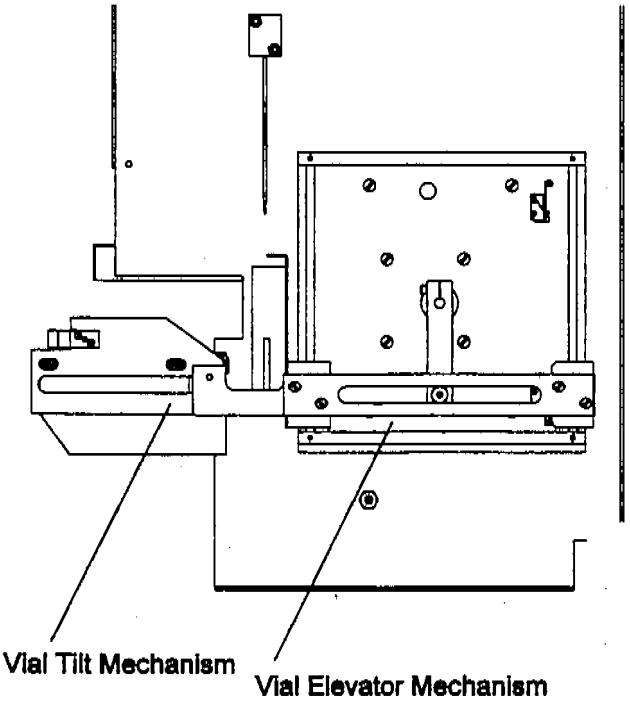


Figure 3-6 Vial Tilt Mechanism/Vial Elevator

3.5.2.3 Vial Ejection Chute

The Vial Ejection Chute sends the finished vials out of the AQUATek 50 into a container that you place below the chute.

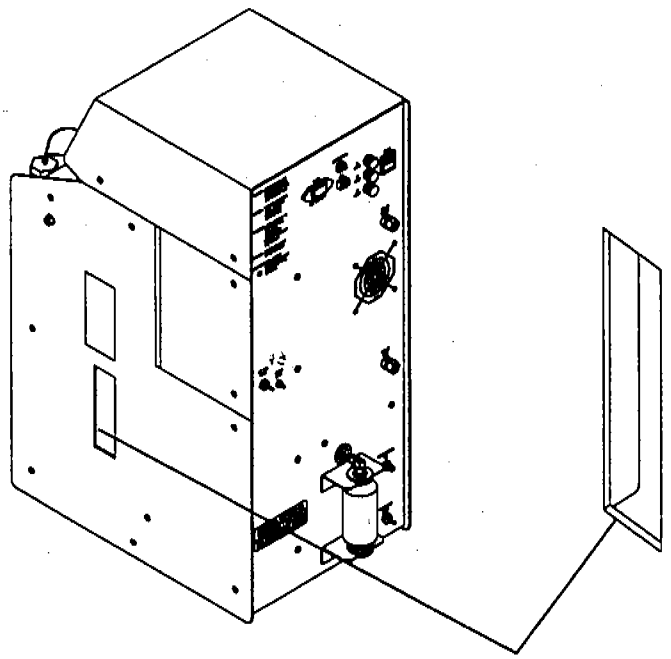


Figure 3-7 Vial Ejection Chute

3.5.2.4 Pressurization Gas Adjustment Screw

You will set the pressurization gas at this screw using a flat head screwdriver. Recommended setting is 20 p.s.i.

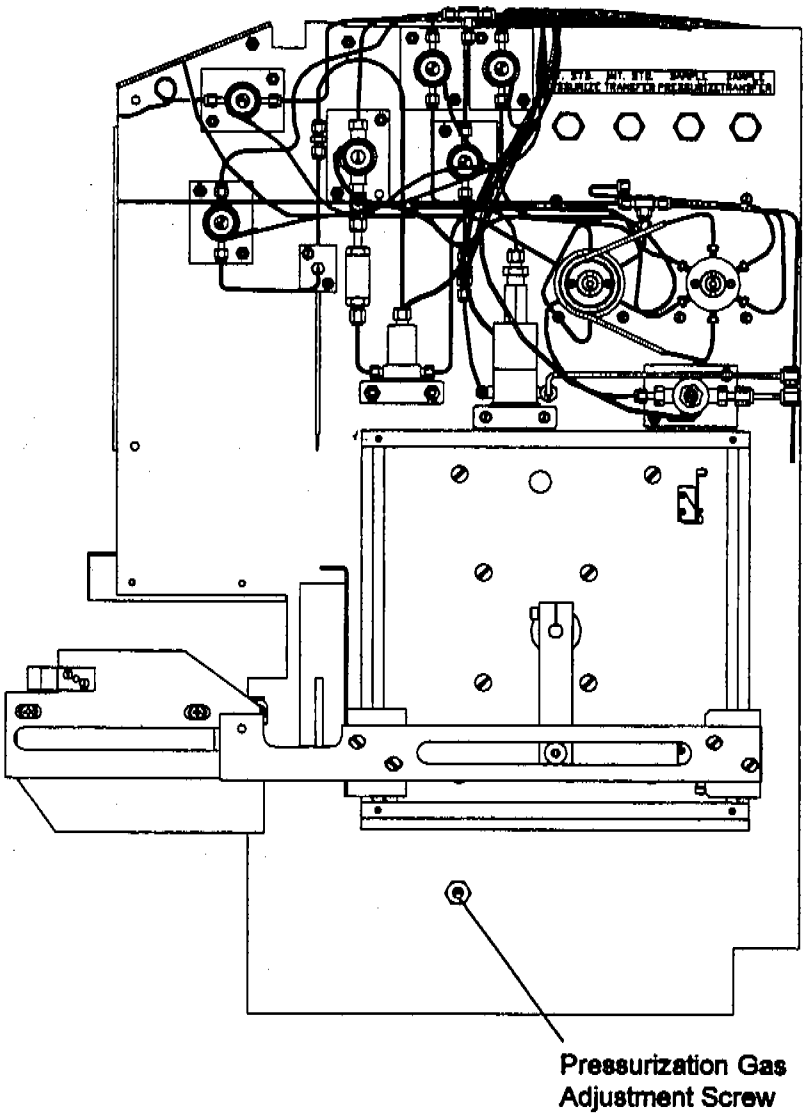


Figure 3-8 Pressurization Gas Adjustment Screw Location

3.5.3 Right Interior AQUATek 50 (Upper Section)

The right interior (upper section) of the AQUATek 50 consists of the following main components.

- Right door and interior components
- Sample transfer valve
- Internal standard transfer valve
- Internal standard pressurization valve
- Sample pressurization valve
- Sample needle block assembly
- Rinse water valve
- Internal standard drain valve
- Filter
- Purge Pressure Valve
- 3-Port Backflush Valve
- 3-Port Drain Valve

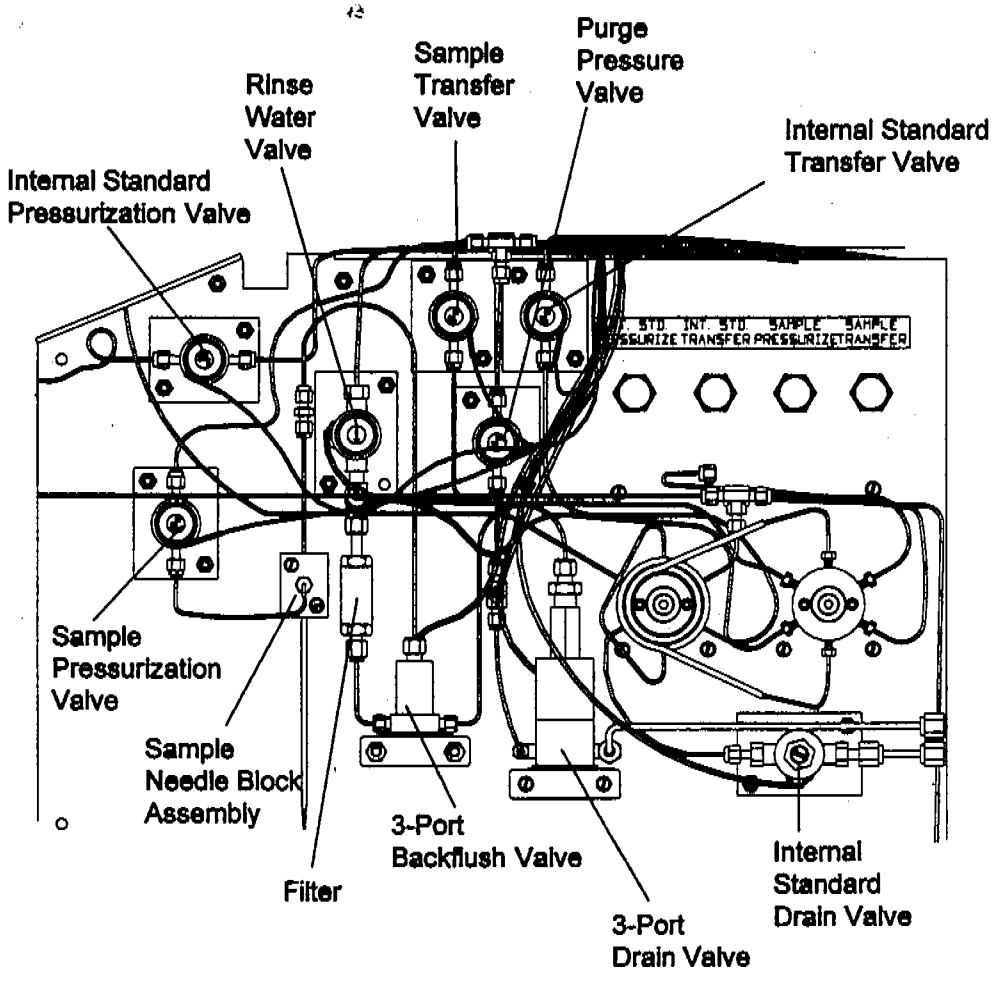


Figure 3-9 Right Top Interior Components

3.5.3.1 Right Door

The door on the upper right section of the AQUATek 50 provides access to the internal standard and sample flow controls; the 6-port internal standard valve; internal standard loop; sample loop; and 6-port sample valve.

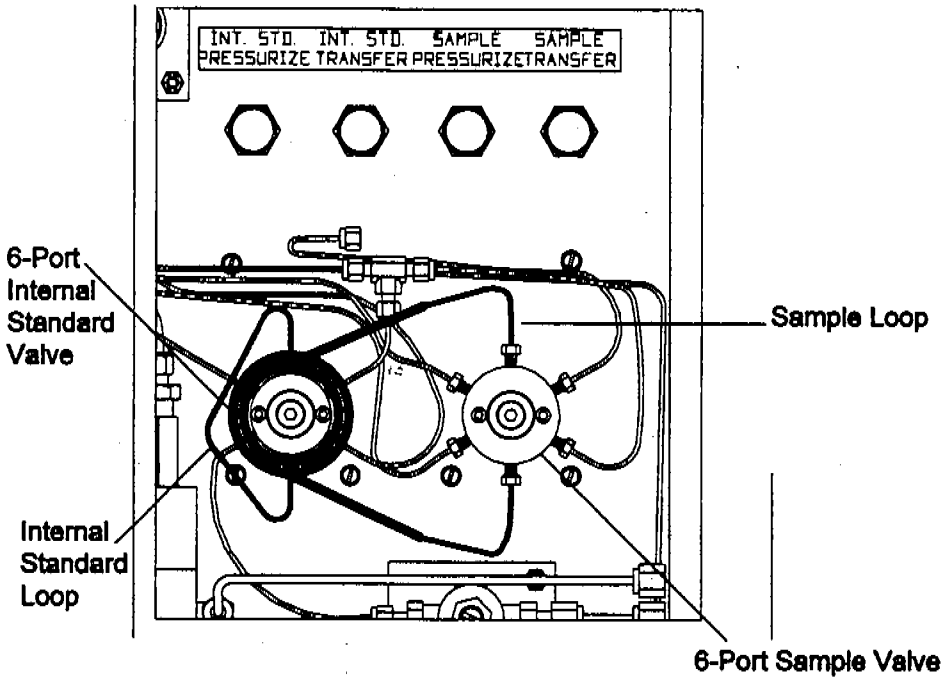


Figure 3-10 Right Door Interior Components

3.5.4 Left Interior-Lower Section

The left interior section of the AQUATek 50 contains these major components: pressure gauge for rinse water; pressure regulator for rinse water; advancer mechanism; vial advancer start-of-stroke sensor; left side transfer line bulkhead.

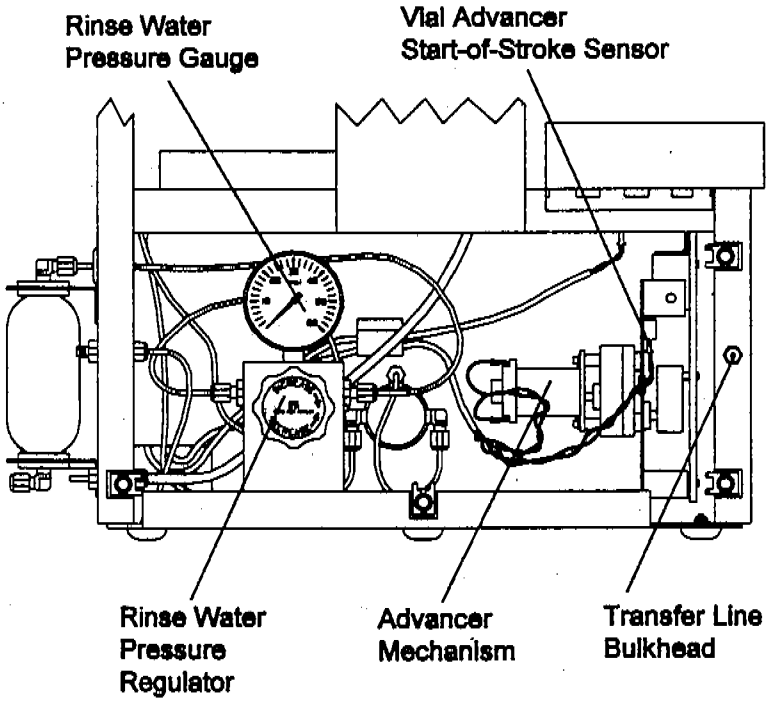


Figure 3-11 Lower Left Interior Components

3.5.5 Rear Panel

These major components are found on the rear panel:

- Fuses
- Concentrator I/O Connection
- BCD Output Connection
- Cooler Outlet Fitting
- Internal Standard Drain Bulkhead
- Sample Drain Bulkhead
- Cooler Inlet Fitting
- Blank Water Generator
- Pressurization Gas Fitting
- Rinse Water Inlet Connection
- Condensate Drain Fitting

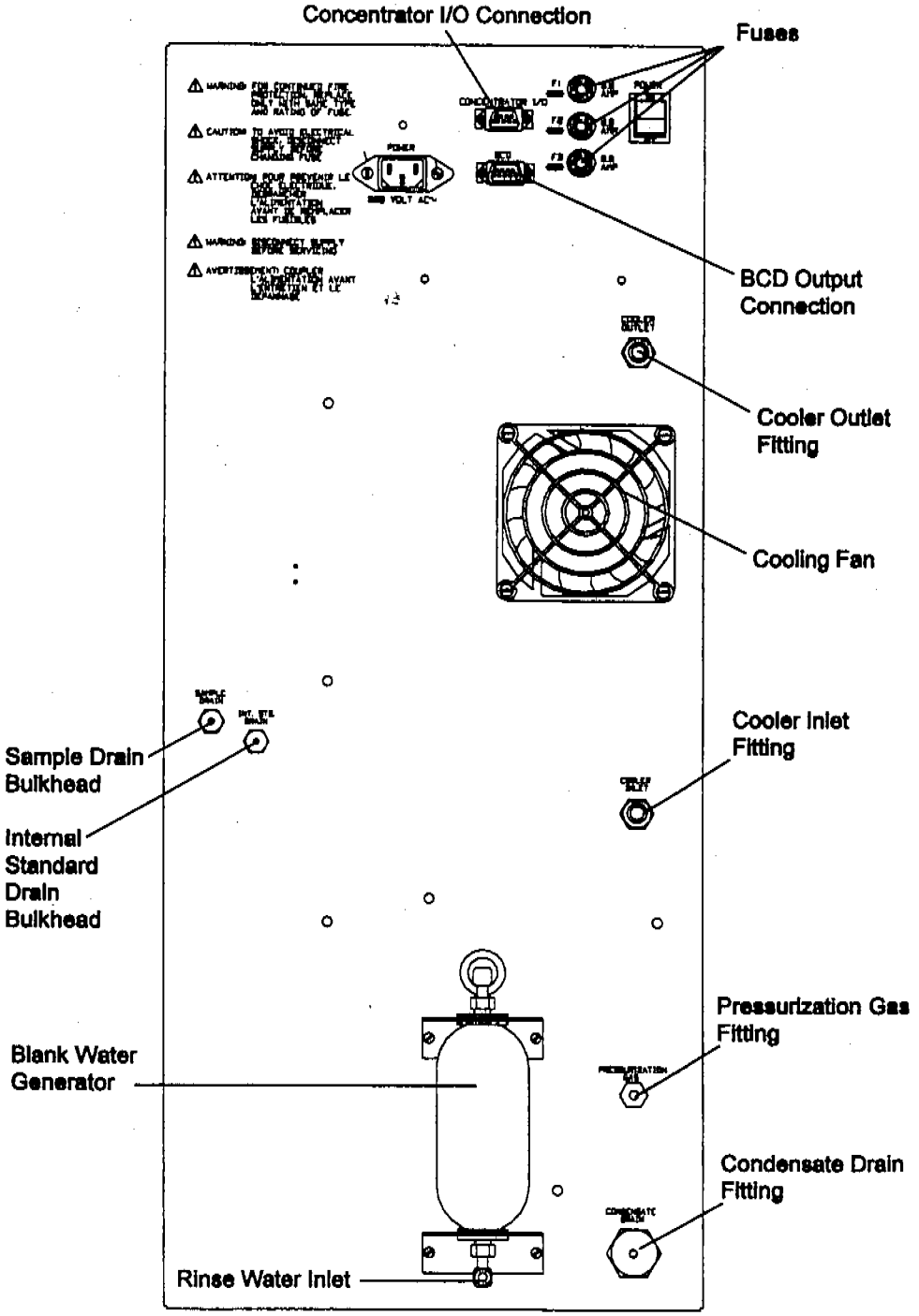


Figure 3-12 Rear Panel and Components

3.5.6 Electronics Section

The electronics section of the AQUATek 50 includes these major components: BCD I/O cable assembly; transformer; and multi-function PCB board.

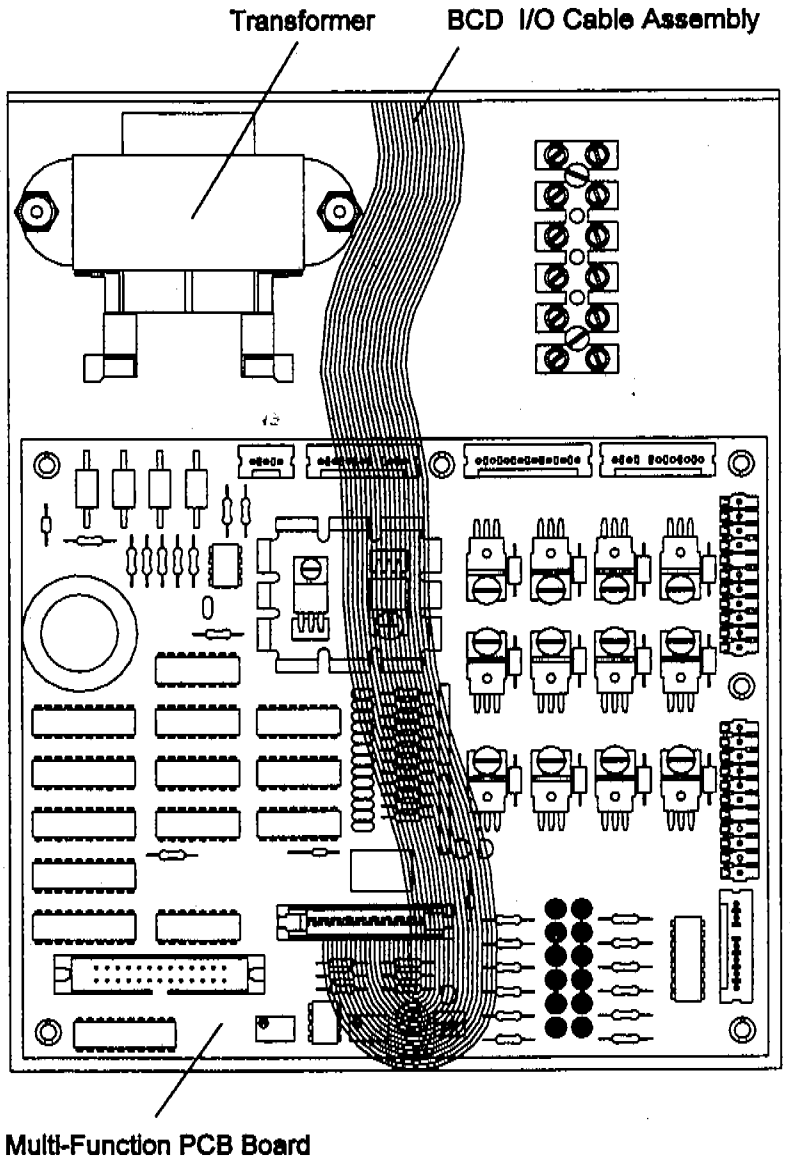


Figure 3-13 Electronics Section

3.5.7 CPU Board

The CPU (Central Processing Unit) is the "brains" of the AQUATek 50. It is located directly behind the keypad. Refer to the illustration below.

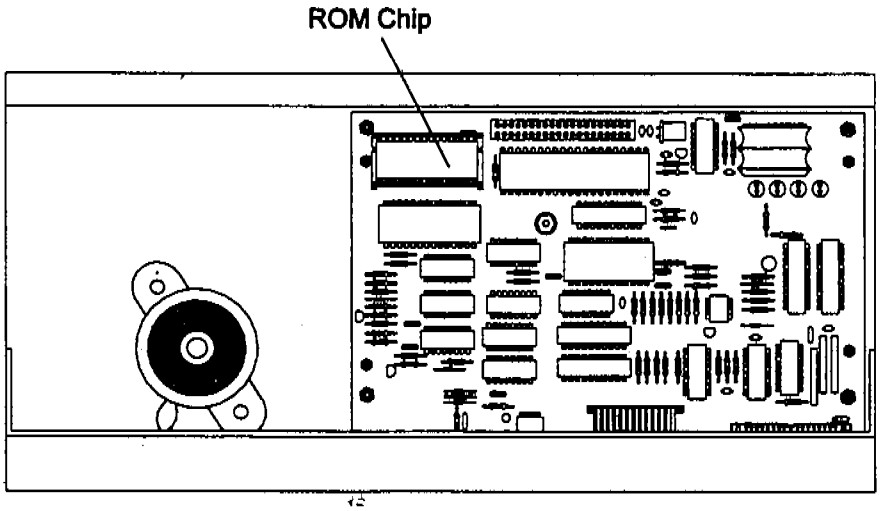


Figure 3-14 CPU Board

3.6 Pneumatic Connections

This section explains how to make gas connections from the AQUATek 50 to the Tekmar™ concentrators.

3.6.1 Connecting Pressurization Gas

The AQUATek 50 requires a high purity (99.999%) hydrocarbon tested (total hydrocarbon content of 0.5 ppm or better) helium or nitrogen gas supply at 20-200 p.s.i. This is normally supplied through a tee union from the same gas supply that the concentrator uses. The 1/8" tee union and 1/8" copper tubing needed for this connection are available in the AQUATek 50 Installation Kit (p/n 14-5094-000).

To connect the pressurization gas:

1. Turn off the gas supply to the concentrator.
2. Disconnect the 1/8" copper tubing from the outlet of the hydrocarbon trap between the supply tank and the back of the concentrator. Remove the 1/8" union.
3. Remove the 1/8" brass nuts and ferrules from the tee union and set them aside for later use.
4. Connect the tee union to the outlet of the hydrocarbon trap. Tighten the nut 3/4-turn past finger tight.

   Note: Notice the nut and ferrule on the outlet of the hydrocarbon trap. This is how all Swagelok ferrules should be oriented when "swaged".

5. Reconnect the line (removed in Step 2 above) to the tee union.
6. Using the 1/8" copper tubing and the fittings (removed in Step 3 above), swage a nut and ferrule onto one end of the tubing. It may be easier to use the 1/8" union removed in Step 2. Tighten the union 3/4-turn past finger tight and immediately remove the union. Check the ferrule to ensure a proper connection.
7. Connect this end of the tubing (the end that you just swaged the nut and ferrule on) to the remaining port of the tee union.
8. Route the tubing to the rear of the AQUATek 50 and trim as necessary. Tekmar recommends leaving a few extra feet of tubing so that you can easily move the unit when needed.
9. Swage a nut and ferrule (from the fittings saved in Step 3 or from the supplied assembly kit box) onto this end of the tubing using the union (from Step 2). Check for proper connection.
10. Connect the tubing to the Pressurization Gas bulkhead on the rear of the AQUATek 50.
11. Turn on the gas supply.

3.6.2 Pressurization Gas Adjustment

1. Locate the Pressurization Gas Adjustment Screw (refer to Figure 3-8 in this manual).

2. Using a flat head screwdriver, turn this screw clockwise while viewing the pressure gauge on the front of the AQUATek 50. Set the pressure at exactly 20 p.s.i.

3.6.3 Pneumatic Connections - AQUATek 50 to the Concentrator

1. Connect the transfer line:

   a. The transfer line can be routed out of the right or left side of the instrument. The unit is shipped with the left side transfer line connected. The left transfer line is connected to the tee union with a stainless steel nut. The right transfer line, which has a brass nut, is installed in the unit but is not plumbed. It is located adjacent to the tee union. To change this:

      1. Remove the right side panel of the AQUATek 50.

      2. Find the tee union connecting port #6 of the sample loop valve (vA) to port #5 of the internal standard loop valve (vB). The third connection of this union goes to the left transfer line.

      3. Disconnect the left transfer line and connect the right transfer line (with the brass nut).

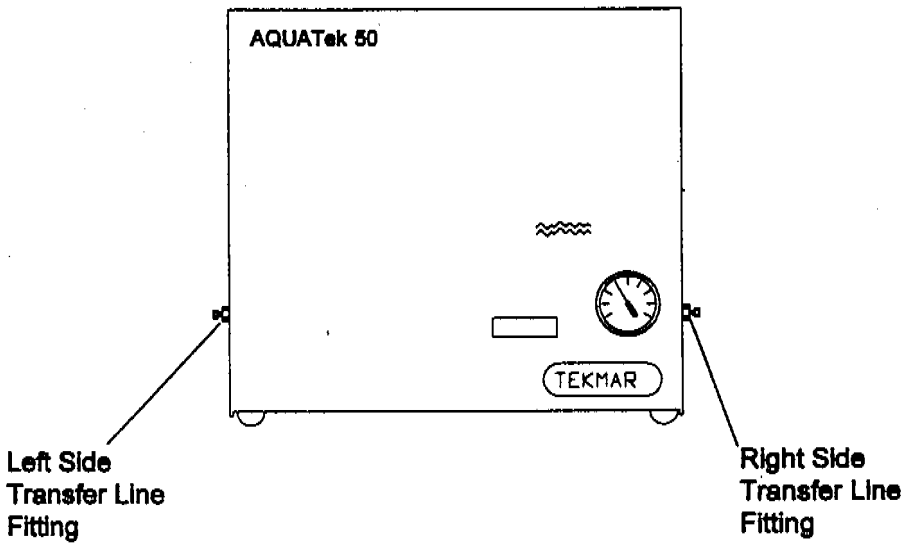


Figure 3-15 Lower Front of AQUATek 50 Transfer Line Fitting Locations

continued

3.6.3 Pneumatic Connections - AQUATek 50 to the Concentrator (cont.)

4. To connect a line to the glass sampler, use the 1/16" nickel tubing (p/n 14-3845-002), and the 1/16" Valco nut (p/n 14-0243-016) and ferrule (p/n 14-0241-016) supplied in the kit box. Uncoil the tubing.

   Note: The line to the glass sampler requires premium grade tubing for optimum performance. Trim the line as necessary.

5. Slide the 1/16" nut onto the tubing, then slide the 1/16" ferrule onto the tubing, so that the smallest end of the ferrule is pointing forward. Insert the tubing into the transfer line bulkhead until it stops. Tighten the nut no more than 3/4 turn past finger-tight.

   Note: Be sure the tubing extends approximately 2 mm through the ferrule.

6. Connect the other end of this line to the 1/4" - 1/16" reducing union (p/n 14-2261-116) supplied in the kit box. The appropriate ferrules are also included:

   - 1/16" Swagelok ferrule (p/n 14-0158-016)
   - 1/4" Teflon ferrule (p/n 12-0041-016)

   Note: the Swagelok ferrule is a two-part ferrule.

7. First slide the nut onto the transfer line, then slide the flat piece of the ferrule (with the ridge facing out) onto the transfer line.

8. Slide the cone end of the ferrule onto the transfer line with the smallest part facing out. Tighten the nut onto the union, making sure the tubing is seated in the union.

   Note: Be sure the tubing extends approximately 2 mm through the ferrule.

9. Use the 1/4" Teflon ferrule to connect the union to the side arm of the supplied glassware. Tighten the nut 1/4 turn past finger tight.

10. Install the glassware onto the concentrator using the instructions in your concentrator user manual.

3.7 Hydraulic Connections

Hydraulic connections are the same for the AQUATek 50/LSC 2000, AQUATek/3000 and AQUATek 50/LSC-2. The following instructions explain hook-up procedures.

1. The blank water generator is a stainless steel cylinder mounted on the lower center portion of the rear panel. See the illustration below.

2. Remove the shipping cap from the 1/4" fitting on the lower end of the filter.

3. Connect a pressurized (minimum 10 p.s.i.) water source to the bottom of the filter cylinder and turn on the water.

4. Visually inspect for leaks.

5. Remove the left side panel of the AQUATek 50 to access the pressure regulator at the bottom center of the unit.

6. Turn the water supply on and set the pressure to 15 p.s.i.

7. Reinstall the side panel.

> **⚠ CAUTION**
>
> **To avoid clogging the AQUATek 50, the blank water generator shipped with your unit must be connected to a water supply. Failure to comply with this guideline may void your warranty.**

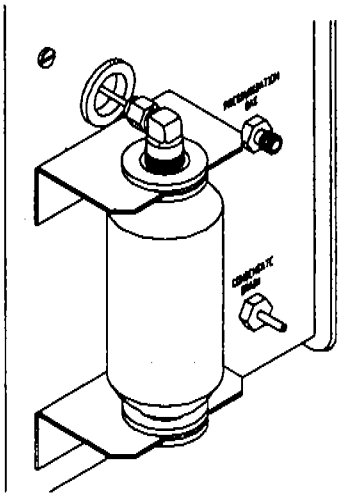


Figure 3-16 Blank Water Generator

3.7.1 Auto or Sample Drain Operation

LSC-2 Auto Drain
The AUTO DRAIN switch is located on the lower right section of the rear panel on the LSC-2. Flip it to the ON position.

2000 Auto Drain

1. In the Startup mode, press **F1 (Meth)** and enter the number of the Method you wish to use.
2. Press **F3 (Edit)** for the Method Parameter screen.
3. Press **PAGE DOWN** to view the Auto Drain parameter.
4. Press **F3 (->)** to place the highlighted box on the response for Auto Drain.
5. Press **ENTER.**
6. Press **F1 (ON)** to activate the Auto Drain feature. Selecting **ON** automatically changes the selection and returns the concentrator to the Method Parameter screen.

3000 Sample Drain (Auto Drain)
To turn on the Sample Drain, use default Method 14 or default Method 15. If you choose to edit the default Method(s), make sure you turn on the Sample Drain. See your 3000 manual for instructions on editing Methods.

Default Method 14 defines parameters for processing AQUATek 50 samples on the 3000. Default Method 15 defines parameters for processing AQUATek 50 samples on the ALS autosampler(s) with the 3000. Both Methods turn on the Sample Drain. See the 3000 manual for more information on selecting Methods.

To indicate the system configuration to be supported by the selected Method, choose either "AQUATek 50" or "AQUATek XX" from the Change Method Type Screen. Choose AQUATek 50 if you are using the AQUATek 50 with the 3000. Choose AQUATek XX if you are using the AQUATek 50 with the ALS autosampler(s) and the 3000. For more information, see Section 3.8.1 or refer to the 3000 manual.

⚠ CAUTION

Turn on Auto Drain or Sample Drain when running the AQUATek 50 with the Tekmar concentrator. If Auto Drain or Sample Drain is not turned on, the transferred samples will not drain from the concentrator sparger. This may cause damage to the AQUATek 50 and the concentrator. When using Auto Drain or Sample Drain, particulate matter in the sample vial should not exceed 14 mm above the bottom of the vial (when the vial is in a vertical position).

3.8 Electronic Connections

This section provides instructions for making electronic connections between the AQUATek 50 and the Tekmar concentrators and autosamplers.

3.8.1 Connecting the AQUATek 50 to the 2000 or 3000

1. Turn power off and unplug the AQUATek 50 and the concentrator.

2. Locate the interface cable (p/n 14-4352-086) in the assembly kit.

Note: To operate the 2000 with the AQUATek 50 and with this cable, your 2000 should have ROM version 1.8 or higher. If you have an older ROM version, please call Tekmar Customer Service at (800) 874-2004 to order a new ROM.

3. Insert the 9-pin "D" style connector into the receptacle labeled "Concentrator I/O" on the rear of the AQUATek 50 until it clicks into place (see Rear Panel diagram on page 3-12).

4. Locate the I/O or interface board on the rear of the concentrator. The board has two connectors extending out of its bracket. For the interface cable to work properly, the switches on the 2000 I/O board need to be set correctly. Referring to the second table on the following page, check the switch settings. Do not check switch settings on the 3000 I/O board: *configure* or program the 3000 to acknowledge the AQUATek 50. See the third table on the following page.

5. Disconnect the concentrator-to-GC interface cable from the larger of the two I/O board connectors on the rear of the concentrator. Plug the two-way connector from the interface cable (p/n 14-4352-086) into the open connector on the I/O board.

6. Secure the plug with the two retaining screws.

7. Piggyback the GC interface cable onto the connector that is now plugged into the I/O board on the back of the concentrator and secure it using the two retaining screws.

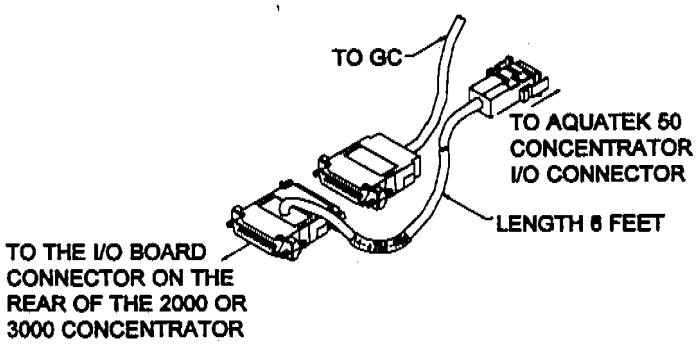


Figure 3-17 Piggyback the Cable

3.8.1 Connecting the AQUATek 50 to the 2000 or 3000 (cont.)

2000/25-Pin Connector	AQUATek 50/Concentrator I/O	
16 Jumper 19 —— 1 Jumper	Ground	—— 5 Green
2 ——	Purge Start	—— 7 White (Purge Permission output)
15 ——	Purge Ready	—— 1 Red (Advance to Prepurge input)
20 ——	Begin Desorb	—— 6 Black (Advance to Desorb input)

Correct Switch Settings on the I/O Board in the 2000

U012	U013
6 - closed	6 - open
* 4 - closed	2 - open
* 3 - open	
2 - closed	

* Desorb closure can be programmed for the beginning or end of Desorb on the concentrator.

Note: For the remaining switch settings, please refer to the documentation shipped with your GC interface cable.

Configuring the 3000 to Acknowledge the AQUATek 50

1. Press C to display the Method Commands Screen.
2. Press A (or press ENTER when A is highlighted with < > brackets) to display the Change Method Type Screen with the cursor on the third line.
3. Press any number key. The option in the type field toggles each time you press a number key. Choose AQUATek 50 or AQUATek XX by pressing ENTER when the desired option appears in the type field.

Concentrator Interface Signals

Purge Ready:	closure from concentrator
Purge Start:	5 volt to ground from AQUATek 50
Beginning of Desorb:	closure from concentrator
GC Start:	closure from concentrator

3.8.2 Connecting the AQUATek 50 to the LSC-2

Note: You must order the electronic interface cable (p/n 14-3783-000) for the LSC-2 and AQUATek 50 connection. Please call your Tekmar Service representative for information.

1. Turn off and unplug both units.

2. Insert the 9-pin "D" style connector into the receptacle labeled "Concentrator I/O" on the rear panel of the AQUATek 50 until it clicks into place.

3. Insert the 8-pin connector on the other end of this cable into the socket labeled "Computer Interface" on the rear panel of the concentrator.

4. Orient the cable so that the red wire is on the right, and the green wire is on the left. (Red is #1; White is #2, and Green is #3).

5. Connect the black and the blue wires to the T-2 terminal block located above the screw terminals on the rear of the concentrator.

Note:You may have to remove the rear panel to access the terminal block.

6. Connect the orange (or brown) wire to screw terminal #8 above the computer interface socket.

7. Early model concentrators may require a jumper wire between screw terminals 3 and 7 of the LSC-2 to enable the LSC-2 to step into the Purge mode when the AQUATek 50 goes to Sample Transfer.

Note: If you experience problems with any step in these procedures, please contact Tekmar Service at (800) 874-2004.

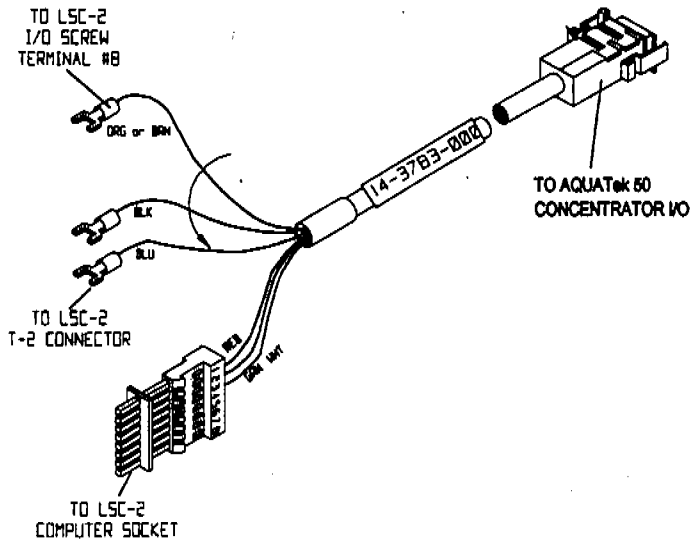


Figure 3-18 Cable, LSC-2 to AQUATek 50

3.8.2 Connecting the AQUATek 50 to the LSC-2 (cont.)

LSC-2 To AQUATek 50 Pin Out		
LSC-2/Computer Socket		***AQUATek 50/Concentrator I/O***
	Advance to Prepurge input	
3 Green	Ground	5 Green
2 White	Purge Ready	7 Ground
1 Red	Purge Ready	1 Red
LSC-2/T-2 Connector		***AQUATek 50/Concentrator I/O***
	Advance to Desorb input	
1 Black	Begin Desorb	6 Black
2 Blue	Begin Desorb	5 Blue
LSC-2-I/O Screw Terminal		***AQUATek50/Concentrator I/O***
	Purge permission output	
8 Orange	Advance to Prepurge	7 Orange

3.8.3 Connecting the AQUATek 50 to the 2016/2032

If your concentrator is connected to the AQUATek 50, additional electronic connections are not necessary to add the 2016/2032:

Note: To operate the AQUATek 50 with a concentrator and the 2016/2032, you must have Auto Drain installed on the autosampler. Please call Tekmar at (800) 543-4461 if your unit does not have Auto Drain.

1. Connect the AQUATek 50 via nickel transfer line to the autosampler glassware you've selected.

2. Install the AQUATek 50 glassware on the desired position(s) of the autosampler (2016 or 2032) sample mount.

3. If you have a 3000, configure the 3000 to acknowledge the AQUATek 50 and the autosampler(s). See Section 3.8.1.

4. Build two methods in your concentrator: one for the discrete positions on the 2016/2032; and one for the position you've selected for the AQUATek 50. For example:

   If you want to run discrete samples on positions 1-15 and run samples using the AQUATek 50 on the 16th position, you need to build two methods in the concentrator -- one method for positions 1-15 and one method for position 16.

   Note: If you have a 2000, enter a negative number for "Runs per Sample" in the method for position 16. For example, if you want to run 30 vials, enter -30 for Runs per Sample. The number "30" dictates the number of times the autosampler runs position 16. The negative sign automatically turns on the Auto Drain on the 2000 concentrator. If you have a 3000 concentrator, do not enter a negative number.

   In Method Scheduling, you could enter this configuration:

Start 1/Stop 15	=	Method 1
Start 16/Stop 16	=	Method 2

To run the AQUATek 50/concentrator/autosampler(s):

1. Press START on the concentrator.

2. Press START on the AQUATek 50.

3. If you have a 2000, make sure that the Auto Drain is on. If you have a 3000, make sure that the Sample Drain is on. See Section 3.7.1.

3.9 Installing the Internal Standard Vessel

The internal standard vessel (p/n 14-4487-024) is a glass container with a 1/2" neck. The vessel is mounted to the 1/2" fitting on the right side of the front of the instrument using the 1/2" Teflon ferrule (p/n 14-1301-016) and the 1/2" Swagelok nut (p/n 14-3354-016) included in the kit box. To install it:

1. Slide the nut and ferrule onto the vessel (see Figure 3-19 for proper orientation of the nut and ferrule).
2. Insert the vessel into the fitting and tighten the nut.
3. Pull the vessel down approximately 2 mm and tighten the nut 1/4 turn past finger-tight to avoid breaking the vessel.

   Note: Be sure you tighten the vessel finger-tight plus a 1/4-turn with a wrench, otherwise the internal standard may not transfer.

4. To install the internal standard needle assembly (p/n 14-3879-053), slide a 1/16" Swagelok nut (p/n 14-0159-016) and 1/16" Teflon ferrule (p/n 14-0442-016) onto the needle (see Figure 3-19).
5. Insert the internal standard needle assembly through the top of the 1/2" fitting, making sure the needle reaches the bottom of the vessel.
6. Tighten the 1/16" Swagelok nut no more than 1/4 turn past finger-tight.
7. Connect the other end of the needle assembly to the 1/16" female bulk-head union immediately above the glassware. Tighten the nut no more than 1/4-turn past finger tight.
8. Slide the acrylic safety cover (p/n 14-3504-000) into the slots in front of the vessel.

⚠ CAUTION

Even if you do not plan to use the Internal Standard, you must install the Internal Standard Vessel to ensure proper sample transfer.

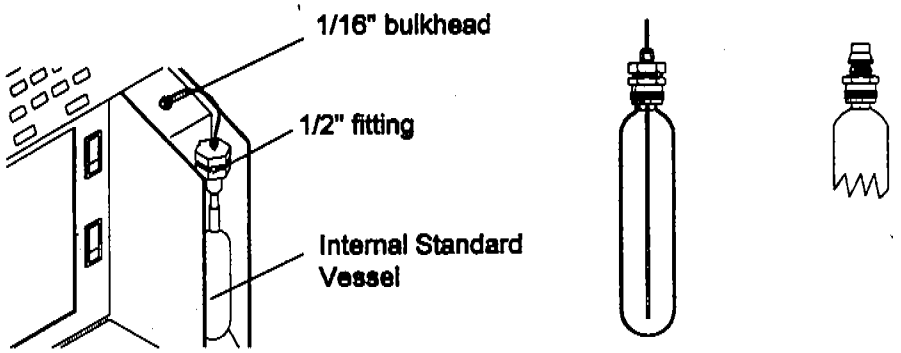


Figure 3-19 Internal Standard Vessel

3.10 Setting Flow Rates

There are four separate flow rates that must be accurately set for proper operation of the AQUATek 50. This section explains how to set these flows and lists recommended values.

Note: You will need to use the AQUATek 50 microprocessor to set flow rates. Before proceeding, please refer to Sections 4 and 5 to familiarize yourself with the microprocessor and power up instructions.

To get to the flow controllers, open the access door on the right side of the unit. The controllers are numbered 1 to 4 from front to back. These correspond to:

#1 = Internal Standard Pressurize

#2 = Internal Standard Transfer

#3 = Sample Pressurize

#4 = Sample Transfer

Note: The individual flow rates for the AQUATek 50 are preset at the factory. Setting the pressure at 20 p.s.i. should bring the flow rates to their proper values. Refer to Section 3.6.2 to set the pressure.

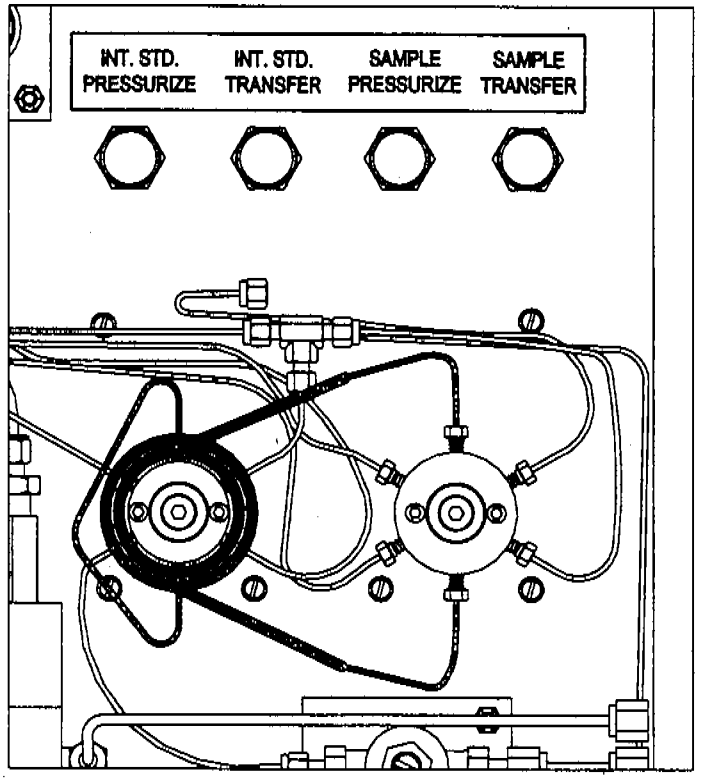


Figure 3-20 Access Door

3.10.1 Internal Standard Pressurize Flow Rate

The Internal Standard Pressurize flow rate can be set by either of two methods: dry gas flow or liquid flow.

Of these two methods, measuring liquid flow is the most precise, though setting the dry gas flow rate is faster and more convenient.

Liquid Flow Method

1. Place a full internal standard vessel on the unit.
2. Press INTERNAL STANDARD to turn on the pressurization flow.
3. Use a small (5-10 ml) graduated cylinder to collect the liquid as it exits the Internal Standard drain port on the rear panel.
4. Using a stopwatch, determine the time required to add 2 ml to the cylinder and calculate the flow rate.
5. The liquid flow should be between 0.5 and 1.0 ml/min.
6. Adjust the flow as necessary using controller #1.

⚠ CAUTION
Press INTERNAL STANDARD again to turn off the pressurization flow.

Dry Gas Flow Method

1. Place an empty internal standard vessel on the unit.
2. Press INTERNAL STANDARD to turn on the pressurization flow and measure this at the internal standard drain port on the rear of the unit.

Note: Wait at least five minutes after the Internal Standard is turned on before checking the flow out the drain.

Note: When running the unit, the flow rate measurement will read higher than actual flow. This is because the force of the liquid through the very small bore of the internal standard loop restricts the flow. As the loop volume increases, the back pressure eases. Because of this, larger loops require lower flows.

3.10.1 Internal Standard Pressurize Flow Rate (cont.)

3. Check the flow against these values:

Loop Size*	Flow Rate
5 µl	2.5 ml/min.
10 µl	2.0 ml/min.
25 µl	0.8-1.0 ml/min.

4. Press INTERNAL STANDARD again to turn off the flow.

3.10.2 Internal Standard Transfer Flow Rate

To set the Internal Standard Transfer flow rate, you must access the TEST program of the microprocessor.

1. From the Standby screen, press **F4 (Conf.)**.
2. Press **F2 (Test)**.
3. Press **F2 (Output)**.
4. Press **F2 (Sol)**.
5. Turn on the Internal Standard Transfer valve by pressing number **5** (for Loop Transfer), on the keypad.
6. Measure the flow exiting the transfer line. The recommended flow rate is 150 ml/min. for all loop sizes.
7. Adjust as necessary using the Internal Standard Transfer flow controller.
8. Turn the valve off by pressing number **5** again.

* 10 µl standard (serial #s 92214001 and greater); 5 µl standard (serial #s prior to 92214001).

3.10.3 Sample Pressurize Flow Rate

1. Open the priority sample door.

2. Place a clean, empty, capped vial on the priority sample ramp.

Note: To set the Sample Pressurize flow rate, you must access the TEST program of the microprocessor.

Note: If you are in the Solenoid Valve screen (from the previous instructions), press F4 (EXIT), then press F2 (Out), then F1 (Motor) and skip to step 7.

3. From the Standby screen, press **F4 (Conf.)**.

4. Press **F2 (Test)**.

5. Press **F2 (Output)**.

6. Press **F1 (Motors)**.

7. Turn the elevator on by pressing the number **3** (for Elevator), on the keypad.

8. Check through the right panel window to see when the vial is fully on the needle. The AQUATek 50 will beep. Press 3 again to stop the elevator.

9. Press **F4 (EXIT)**.

10. Press **F2 (Output)**.

11. Press **F2 (Sol.)**.

12. Turn on the sample pressurize valve by pressing **3** and **9**.

13. Measure the flow at the sample drain port on the rear of the unit. The flow rate should be approximately 100 ml/min. Adjust as necessary using the Sample Pressurize flow controller.

14. Turn off the flow by pressing **3** and **9** again.

15. Press **F4 (EXIT)**.

16. Press **F2 (Output)**.

17. Press **F1 (Motor)**.

18. Turn on the elevator by pressing **3**.

3.10.3 Sample Pressurize Flow Rate (cont.)

18. Be sure that you are clear of the elevator mechanism. The elevator will move down and eject the vial.
19. When the elevator reaches its lower limit of travel, press **3** to turn off the elevator.
20. Press **F4** three times to return to the Standby screen.

3.10.4 Sample Transfer Flow Rate

To set the Sample Transfer flow rate, you must access the TEST program of the microprocessor.

1. From the Standby screen, press **F4 (Conf.)**.
2. Press **F2 (Test)**.
3. Press **F2 (Outputs)**.
4. Press **F2 (Sol.)**.
5. Turn on the sample transfer valve by pressing **4 (Smpl Trans.)**.
6. Measure the flow at the end of the transfer line. The flow rate should be approximately 200 ml/min. Adjust as necessary using the Sample Transfer flow controller.
7. Turn off the valve by pressing **4** again.
8. Press **F4** three times to return to the Standby screen.
9. Close the access door.

3.11 Leak Checking After Initial Installation

The AQUATek 50 is not a leak prone system, however, it is very leak sensitive. Utmost care should be taken to ensure that it is leak tight. All fittings should be thoroughly leak checked.

Upon installation, fittings inside the unit should not need to be leak checked. However, when making changes (e.g. sample or internal standard loops) or troubleshooting, it will be neccesary to check internal fittings. Refer to Section 6.7 "Leak Checking Internal Fittings".

Note: Many lines in the AQUATek 50 handle both liquid and gas. Do not assume that because a fitting is liquid tight that it is also gas tight. Gases leak far more readily than liquids.

> **⚠ CAUTION**
>
> **Do not use any type of soap solution (e.g. Snoop or Detect) to leak check. If any of these solutions get into the lines, increased background and/or adsorption effects are likely to occur.**

Leak checking is best accomplished with a thermal conductivity-type electronic detector (Tekmar p/n 21-0076-000). Electronic detectors do not work well when using nitrogen as the supply gas. If possible, use helium when leak checking. If an electronic detector is not available, a 1:1 solution of isopropanol:water may be used, if done so sparingly.

Following initial installation check the following fittings:

- Gas supply connection on rear panel
- Transfer line output bulkhead union (check in Sample Transfer mode)
- Transfer line to glassware union (check in Sample Transfer mode)
- Internal standard vessel (press INTERNAL STANDARD on the keypad to turn on the gas supply)
- Glassware mount
- Internal standard dip tube connection to glassware mount and to bulkhead union input

3.12 Connecting the Drain Lines

1. Route the Internal Standard Drain and Sample Drain fittings to a sink or waste receptacle using appropriate tubing. 1/4" O.D. x 1/8" I.D. Tygon tubing (p/n 12-0315-002) is available in the AQUATek 50 Installation Kit (p/n 14-5094-000).

Note: These two drain streams may contain significant quantities of toxic compounds. This waste should be handled in a manner consistent with applicable regulations and Good Laboratory Practice procedures.

Note: Condensate drain taps the water condensation from the sample vial chamber. Usually there will not be enough condensate to drain. However, in high humidity situations, there may be enough condensate to flow. Using the 1/4" O.D. x 1/8" I.D. Tygon tubing, route this flow to an appropriate drain reservoir.

3.13 Connecting the Cooling Bath

An external cooling bath is required for subambient control of the sample storage chamber. Tekmar recommends the 2055 Refrigerated Recirculating Bath (p/n 21-0240-000). An Installation Kit (p/n 14-4362-000) for recirculating baths is also available from Tekmar.

To connect the bath:

1. Cut two lengths of gummed rubber tubing to a maximum of 5 ft. each.
2. Tighten two of the clamps down and slide them over one length of tubing.
3. Slide one end of the rubber tubing over the INLET stub of the AQUATek 50 so that approximately 3/4" of the bulkhead is covered by the tubing.
4. Slide the other end of the tubing over the OUTLET port of the cooling bath in the same manner as above.

Note: The stubs on the cooling bath are larger and the tubing may need to be slowly "worked" over the stub.

5. Once the tubing is in place, slide the hose clamps over the tubing and stubs about 1/8" from the end of the tubing.
6. Tighten the hose clamps down on the stubs to secure the tubing.
7. Repeat steps 2 through 6 to connect the OUTLET of the AQUATek 50 to the INLET of the cooling bath.
8. Visually check for leaks during operation.

3.14 Loading Vials

At this point in the installation you should have completed the following procedures:

- Pneumatic connections
- Hydraulic connections
- Electronic connections
- Setting flow rates
- Leak checking

Now you can load vials into the AQUATek 50. To do so:

1. Open the vial cooler door on the front of the unit.

2. Stack the prepared sample vials horizontally in the cooler chambers.

Note: Load vials cap-side out.

Note: Be sure you load at least one vial per chamber before adding a second vial to any chamber.

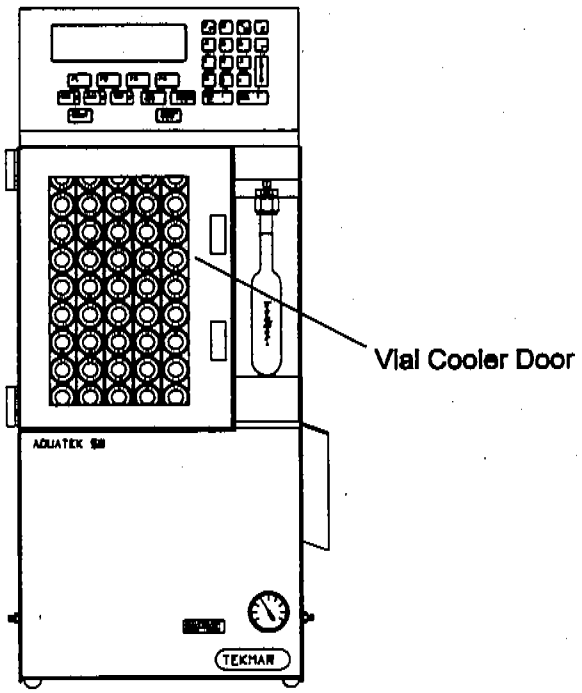


Figure 3-21 Vial Cooler Door

4.1 General Description

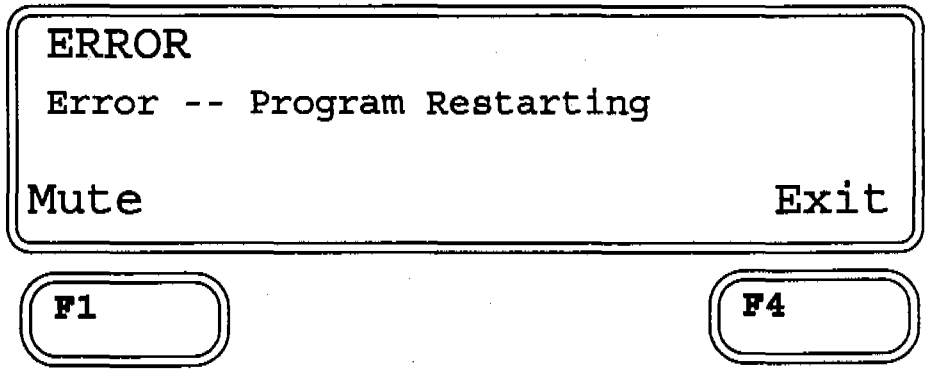
The AQUATek 50 microprocessor programmable control consists of:

- A microcontroller with 64K of program ROM (Read Only Memory) and 2K of RAM (Random Access Memory)
- A multi-function board that interfaces with the microcontroller for programmable control of the outputs and inputs
- A membrane keypad to modify program parameter values
- A 64 x 24 line LCD (Liquid Crystal Display) that displays the program steps being executed

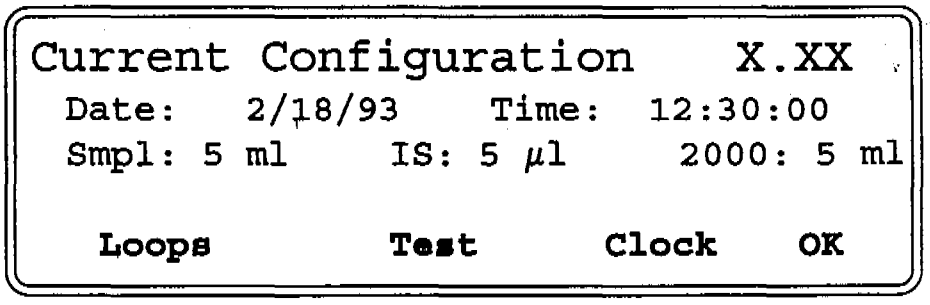
4.2 Microprocessor Operations

The controller uses a 6303 eight-bit CMOS-type microprocessor to manage the operation of the various functions of the system.

1. When you power up the AQUATek 50, an error screen appears. This is normal -- press **F1 (Mute)** then **F4 (Exit)** to continue.



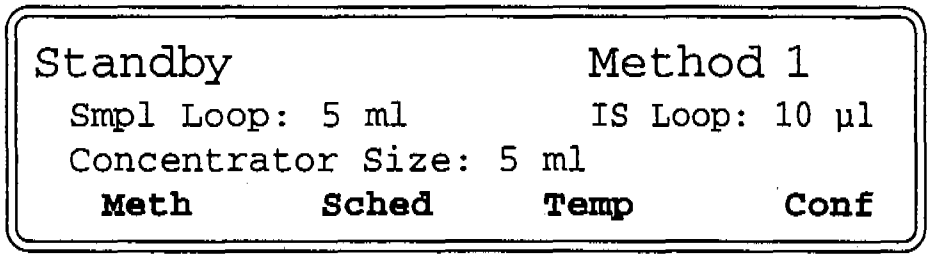
2. The Current Configuration screen comes up next.



continued

4.2 Microprocessor Operations (cont.)

3. If you press OK, the AQUATek 50 introductory screen will appear briefly and then the system will go to Standby mode.



Instructions for the microprocessor are stored in ROM. On each initial power-up, the program parameters are displayed. Most of the screens allow you to change parameters mid-stream. Battery back-up allows you to save any parameters that you've changed if a power failure occurs.

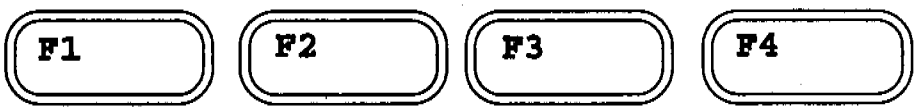
The program panel outlines:
- AQUATek 50 method parameters
- Sample and internal standard loops settings
- Sample chamber temperature and alarm settings
- Line rinse function
- Viewing angle
- Priority sample function
- Internal standard settings
- Error signals
- Help functions

You can change program parameter values and store four complete sets as "Method 1", "Method 2", "Method 3", and "Method 4" in the AQUATek 50 RAM. The defaults for each method are the same, but you can customize each method independently to reflect a specific set of parameter values. It is more convenient and efficient to store methods in the unit's memory this way.

continued

4.2 Microprocessor Operations (cont.)

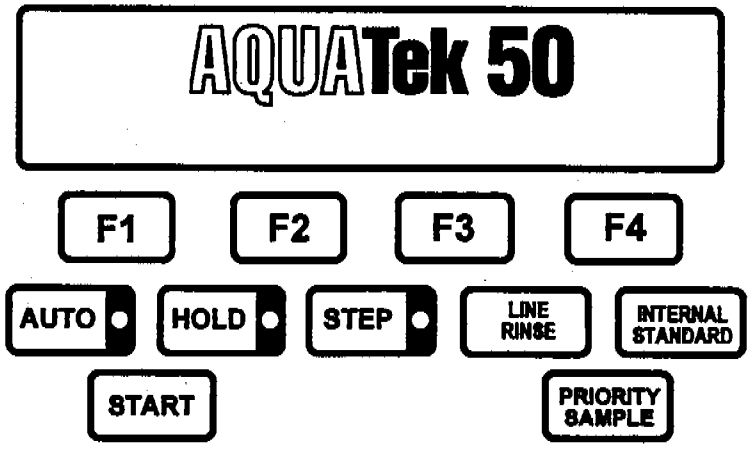
The commands for each program stage are located on the bottom line of the screen. Each command corresponds to the function key directly beneath it. There are four keys on the keyboard that are designated as function keys:



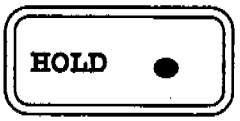
The **Enter** key (described in Section 4.3) also serves as a function (command) key.

4.3 Keypad Description

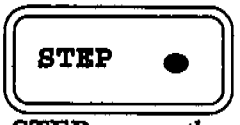
The AQUATek 50 keypad is the center of control for all operator tasks.



AUTO signals the system to proceed through the run automatically.



HOLD pauses the program until you press **STEP, AUTO** or **START.**



STEP moves the AQUATek 50 to the next system mode.

LINE RINSE manually activates a blank water rinse and flushes the sample loop and transfer line. For operating procedures, refer to Section 5.6.

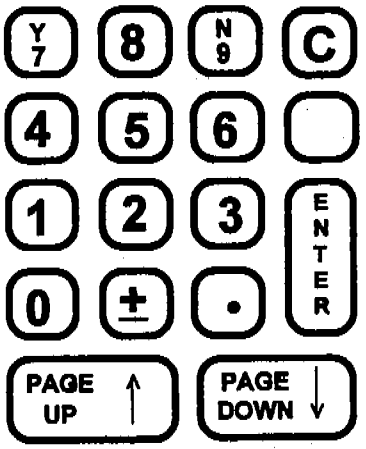
INTERNAL STANDARD pressurizes the internal standard vessel and flushes the internal standard loop. For operating procedures, refer to Section 5.5.

continued

4.3 Keypad Description (cont.)

START signals the AQUATek 50 to proceed from the Standby mode. A message or "prompt" appears on the screen to notify you that the unit is ready to process the sample vials.

PRIORITY SAMPLE activates the priority method allowing you to insert an important sample vial in the AQUATek 50 to be processed during a programmed run. For operating procedures, refer to Section 5.10.



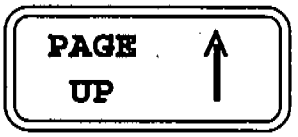
The numbered keys are used to change Method parameter values. Keys 7 and 9 are also used to enter "Yes" and "No" when building a method.

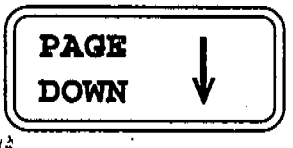
Clear or **<- (Backspace)** eliminates or changes a default or programmed parameter value.

continued

4.3 Keypad Description (cont.)

Press **ENTER** before each parameter value is keyed into the method. If the parameter value is okay, press **Enter** to return to the Method Parameters listing.





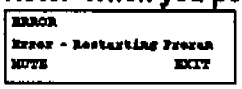
The **PAGE UP** and **PAGE DOWN** keys serve two separate functions:

1. To change the viewing angle of the screen so that it can be seen clearly from a sitting or standing position. This function is available only when **PAGE UP** or **PAGE DOWN** are not screen prompts as stated below.
2. Pressing **PAGE UP** or **PAGE DOWN** when the screen prompt "< PAGE UP/DOWN for more >" appears, allows you to view additional parameter listings (in Method Edit, for example).

4.4 Program Steps

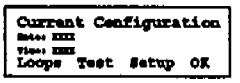
The following section describes each of the program steps in the AQUATek 50 microprocessor control.

Note: When you power up the AQUATek 50, an error screen appears.



This is normal -- press F1 (MUTE), then F4 (EXIT) to continue.

The Current Configuration screen will come up next:



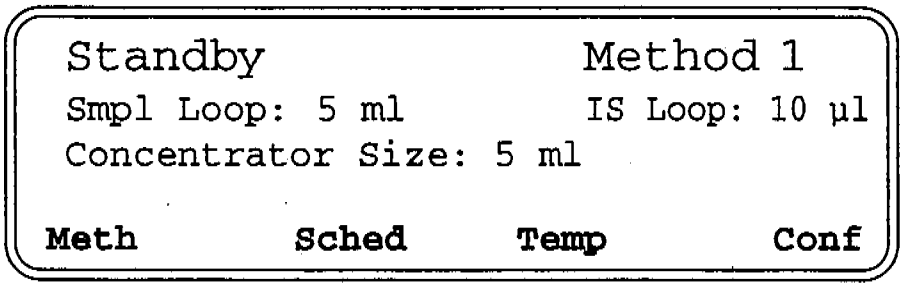
If you press OK, the Introductory screen will come up:

Then the program steps proceed as follows:

STANDBY

When the system is powered up, Standby establishes initial conditions for a sample run. After a run, initial conditions are recovered in Standby. The screen displays the sample loop and the internal standard loop size.

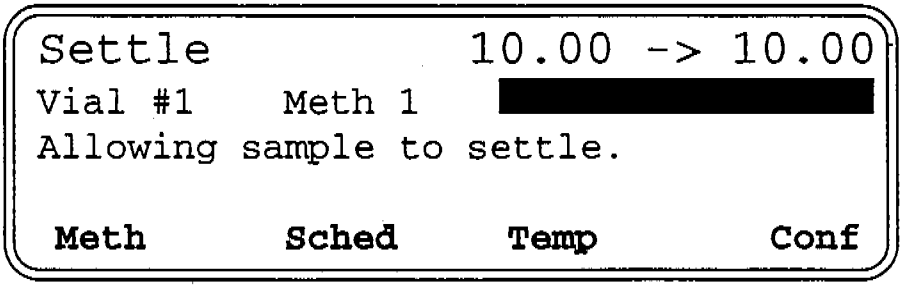
The system automatically proceeds to the Standby screen from the Introduction screen.



When you press START on the keypad, the AQUATek 50 positions the vial under the needle, then advances to the Settle Mode.

SETTLE

During Settle mode, vials are brought to a vertical position, allowing particulates to settle for a programmable amount of time.



continued

4.4 Program Steps (cont.)

WAITING FOR READY SIGNAL

When the Settle mode is completed, the AQUATek 50 waits for a Purge Ready signal from the concentrator and displays the following:

```
AQUATek 50 Automatic Operation
Vial #1                 Method 1
Waiting  for  Concentrator
READY Signal
   Meth      Sched     Temp      Conf
```

Note: The 3000 provides a Purge Ready signal only if it is configured to work with the AQUATek 50.

PREPURGE

In Prepurge mode, purge gas passes through the sample needle before the sample vial is positioned on the needle. This removes ambient air and residual rinse water from the needle, and assures that the sample is blanketed by inert gas when it is pressurized. The inert gas prevents contamination from lab air.

```
Prepurge                10   ->   30
Vial #1       Meth 1
Sweeping the sample needle.
   Meth      Sched     Temp      Conf
```

DILUTION LOOP FILL (optional)

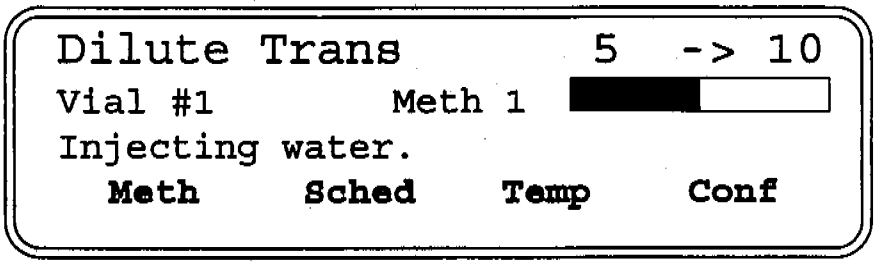
Dilution is only an option when running one sample per vial. See Section 5.8.1 for dilution information.

```
Dilute Fill             2.5 ->    8
 Vial #1       Meth 1
 Filling the sample loop.
 Meth         Sched     Temp      Conf
```

4.4 Program Steps (cont.)

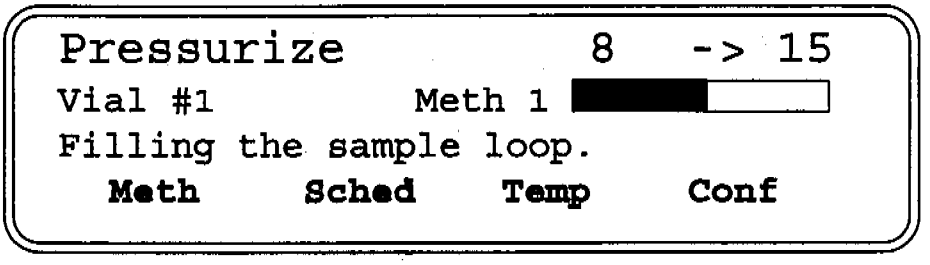
DILUTION TRANSFER (optional)

In Dilution Transfer, blank water and sample (in a pre-specified ratio that you set) are transferred to the concentrator.



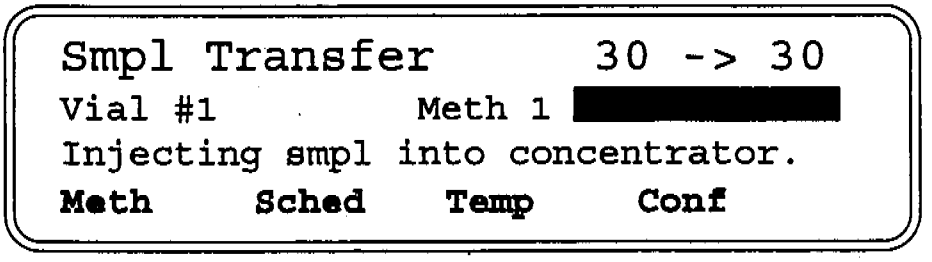
PRESSURIZE

In the Sample Pressurize mode, the sample is removed from the vial through the sample needle and transferred to the sample loop.



SAMPLE TRANSFER

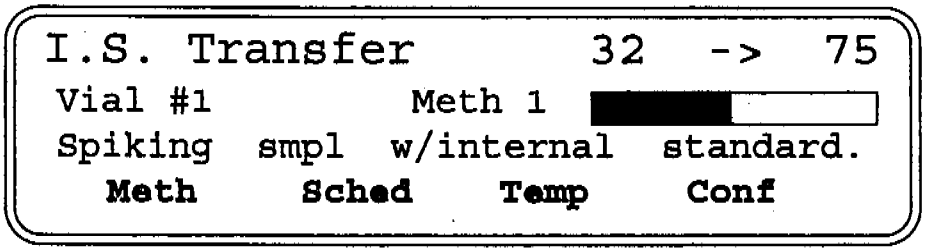
In this mode, the sample volume (e.g., 5 ml) is pushed from the loop and transferred into the sampler on the concentrator. At the beginning of Sample Transfer, the AQUATek 50 will signal the concentrator to begin purging.



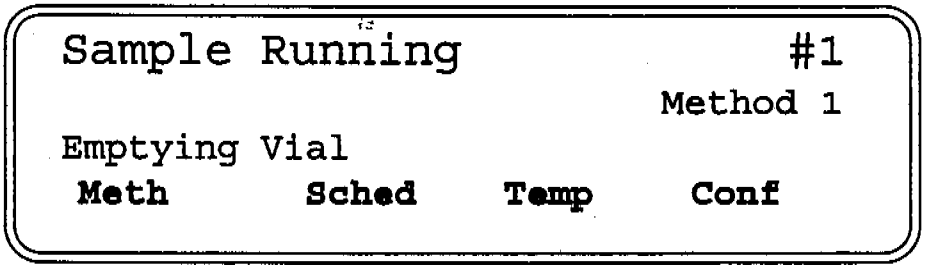
4.4 Program Steps (cont.)

INTERNAL STANDARD TRANSFER

This function transfers the internal standard volume (e.g., 5 µl) to the concentrator and spikes the sample. There is a 0 to 75-second range in Internal Standard Transfer times.

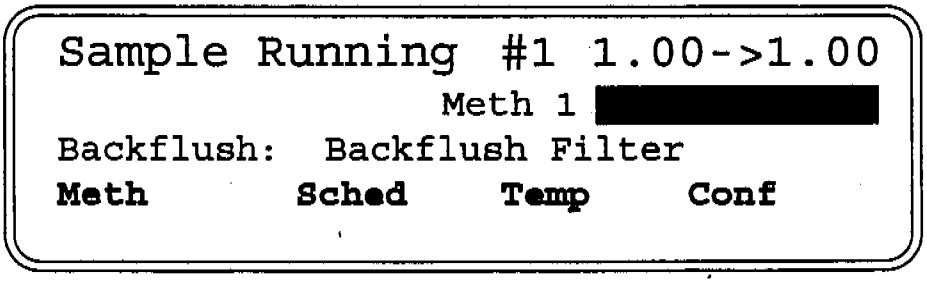


SAMPLE RUNNING



BACKFLUSH FILTER

In Backflush Filter Mode, rinse water is brought back through the filter (against the stream of the normal flow) to remove particulates that may have accumulated inside the filter.

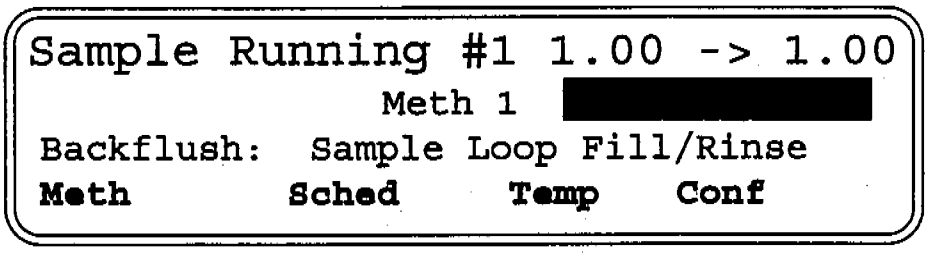


continued

4.4 Program Steps (cont.)

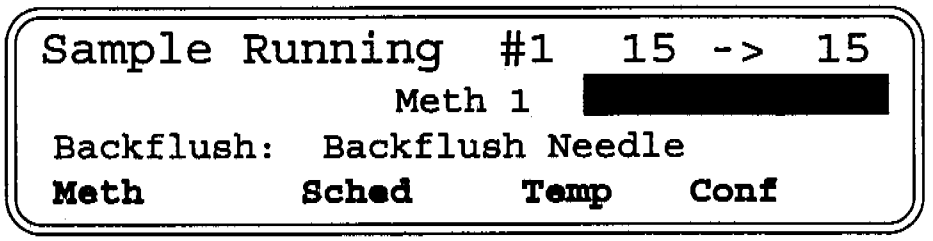
SAMPLE LOOP FILL RINSE

Water fills and rinses the sample loop.



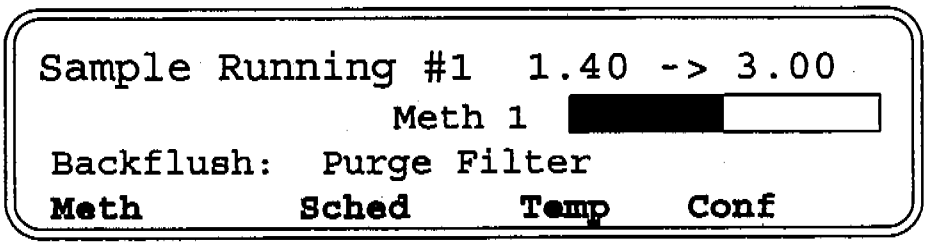
BACKFLUSH NEEDLE

Rinse water backflushes the vial and needle for 45 seconds to remove particulates that may have accumulated. Then the vial comes down off the needle to prevent water and particulates from being drawn back into the needle.



PURGE FILTER

Gas flows through the filter to dry it out and remove any leftover sample.

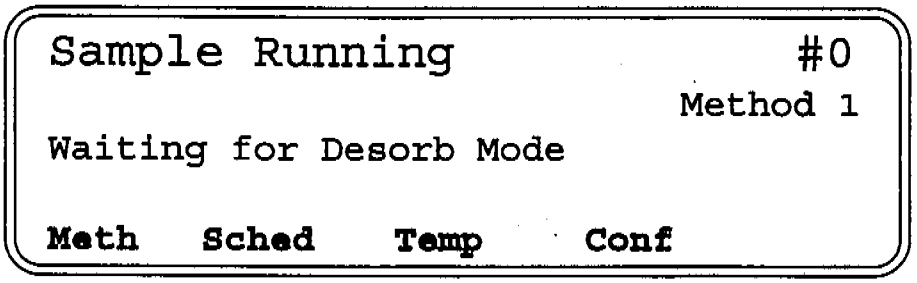


continued

4.4 Program Steps (cont.)

WAITING FOR DESORB

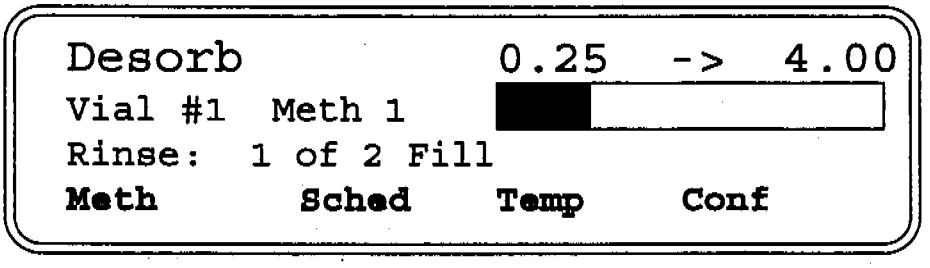
In this mode, the AQUATek 50 is waiting for the 3000 or LSC 2000 concentrator to step to Desorb mode. Once the GC is ready and the concentrator begins desorbing, the AQUATek 50 will display a series of Desorb mode screens as shown below.



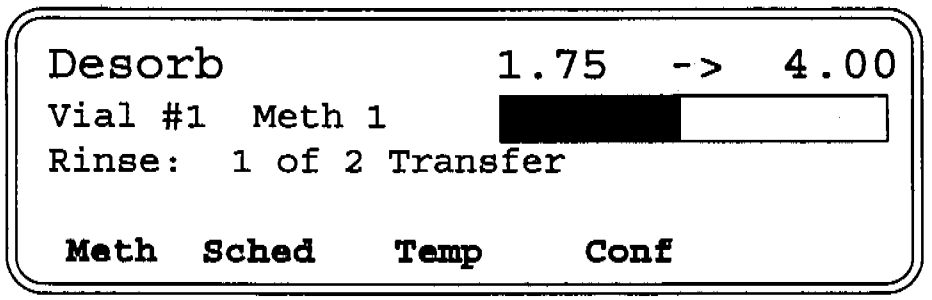
DESORB

During Desorb mode, the AQUATek 50 is in a hold pattern. Then it enters a Transfer Line Rinse mode while the concentrator begins its programmed method. The Desorb mode may be programmed to run up to nine transfer line rinses. The microprocessor automatically determines the maximum number of rinses that the AQUATek 50 can run under the conditions previously entered, and displays this value as the maximum.

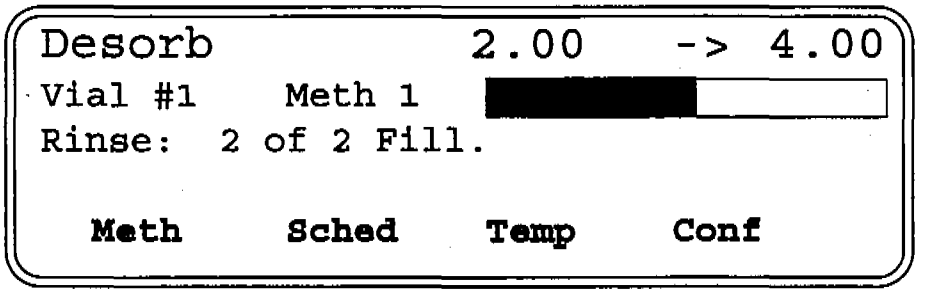
The AQUATek 50 desorb time must be the same as the desorb time set on the concentrator. This way, both units are ready for the next run at the same time.



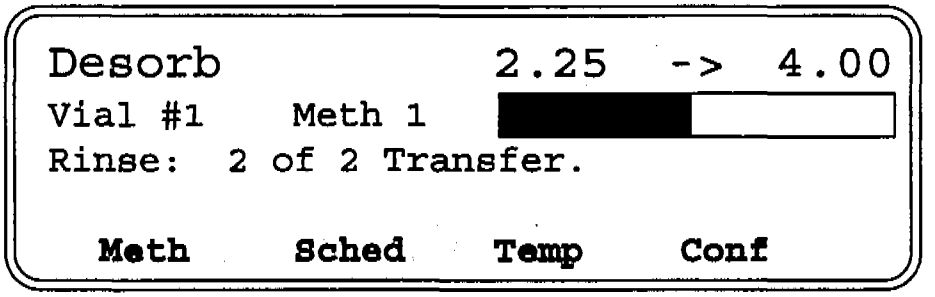
OR



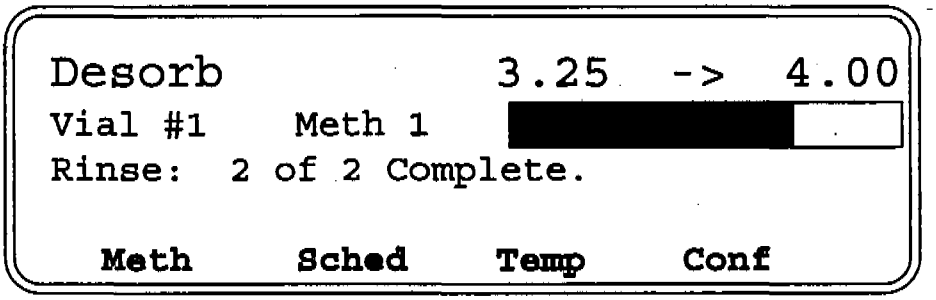
4.4 Program Steps (cont.)



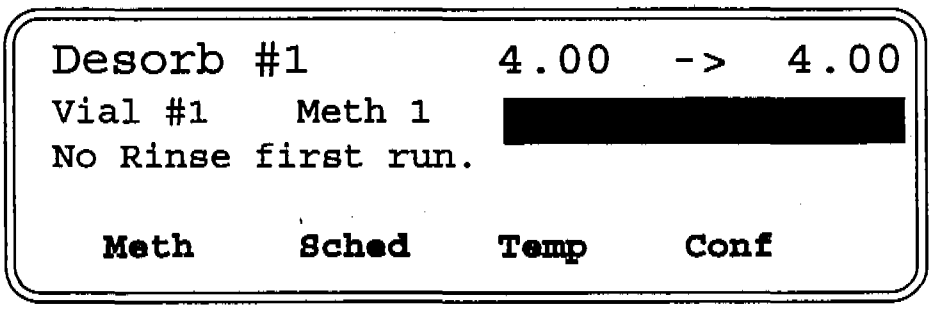
OR



OR



With Re-Sample on, the desorb screen will appear as shown below. (See Section 5.18.2 for details on the re-sample option.)

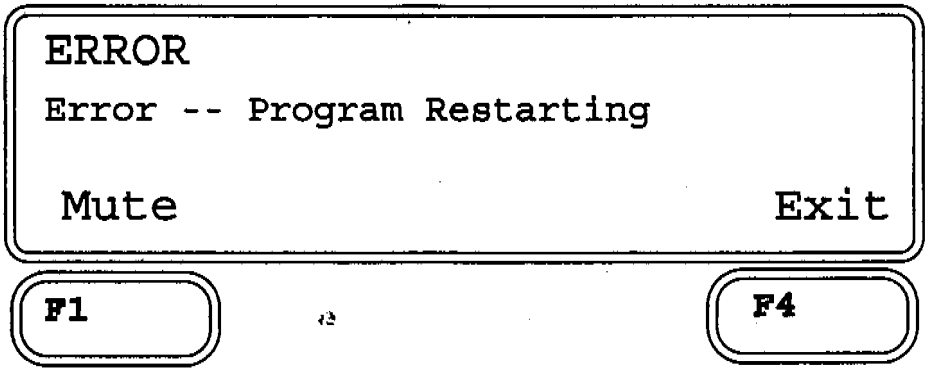


TRANSFER LINE RINSE

Transfer line rinse occurs during the Desorb mode.

5.1 Powering Up the System

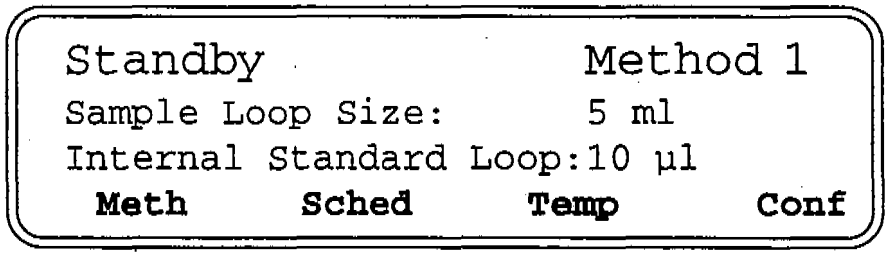
Be certain that all electronic, pneumatic, and hydraulic connections have been made and that you have set flows, leak checked, and loaded vials (see Section 3). If you are running an AQUATek 50 with a concentrator, turn on the concentrator before you turn on the AQUATek 50. This ensures that the sample vial count will be accurate. To turn on the AQUATek 50, flip the power switch on the left rear of the instrument. After you power up the AQUATek 50, an error screen appears.



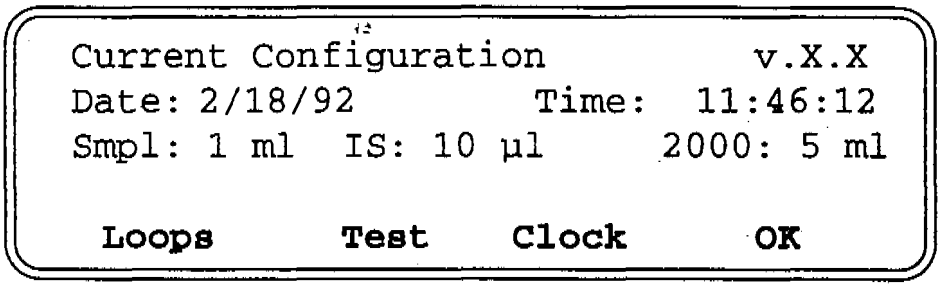
This is normal -- press **F1 (Mute)** then **F4 (Exit)** to continue configuring the instrument or running a method. Section 5.11 covers step-by-step procedures in running a sample.

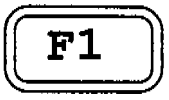
5.2 Setting Sample Loop Volume Values

This section explains how to configure your AQUATek 50 once you have physically changed the sample loop.

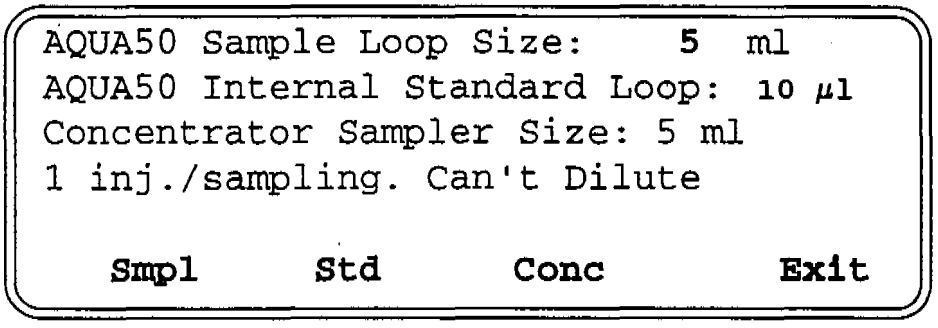


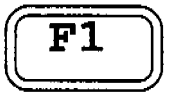
1. In the Standby mode, press **F4 (Conf)**. The Current Configuration screen appears.





2. To change the sample loop volume value, press **F1 (Loops)**. The Loops screen appears:





5.2 Setting Sample Loop Volume Values (cont.)

3. Press **F1** (Smpl). The Sample Loop Size screen reads:

```
Sample Loop Size:    (5) ml
     1    2   (5)   10  25   ml
Move cursor to desired value.
   Help     <-          ->     Exit
```

F2 **F3**

4. Use **F2** (**<-**) and **F3** (**->**) to move the box through the sample volumes to the corresponding value. The values will appear in the shaded box at the top of the screen.

5. Press **F4** (**Exit**) to enter the sample value into the method and to return to the Sampling Loops screen (shown below).

5.3 Setting Internal Standard Loop Volume Values

1. To change the internal standard volume*, press **F2** (**Std**) from the Sampling Loops screen.

```
AQUA50 Sample Loop Size:     5  ml
AQUA50 Internal Standard Loop: 5 µl
Concentrator Sampler Size: 5 ml
1 inj./sampling. Can't Dilute
 Smpl       Std       Conc     Exit
```

F2

2. The Internal Standard Loop Size screen appears:

```
I.S. Loop Size:      5  µl
                  5    10  25   µl
Move cursor to desired value.

   Help       <-        ->     Exit
```

F2 **F3**

* 10 µl standard (serial #s 92214001 and greater); 5 µl standard (serial #s prior to 92214001).

continued

5.3 Setting Internal Standard Loop Volume Values (cont.)

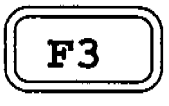
3. Press **F2** (<-) or **F3** (->) to move the cursor and highlight the desired internal standard volume. The value will appear in the shaded box at the top of the screen.

4. Press **F4** (**Exit**) to enter the internal standard value into the method and to return to the Sampling Loops screen.

5.4 Setting Concentrator Sampler Size

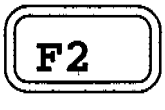
1. To change the concentrator sampler size, press **F3** (**Conc**) from the Sampling Loops screen.

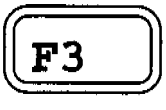
```
AQUA50 Sample Loop Size:     5 ml
AQUA50 Internal Standard Loop:  10 µl
Concentrator Sampler Size: 5 ml
1 inj./sampling. Can't Dilute
  Smpl      Std       Conc      Exit
```



2. The concentrator sampler size screen appears:

```
Concentrator Sampler Size:     5 ml

   5         10         25 ml

Move cursor to desired value.
 Help       <-           ->      Exit
```





3. Press **F2** (<-) or **F3** (->) to move the cursor and highlight the desired sampler size. The value will appear in the shaded box at the top of the screen.

4. Press **F4** (**Exit**) to enter the sampler size into the method and to return to the Sampling Loops screen.

5.5 Turning the Internal Standard On and Off

To manually turn the internal standard on, press **INTERNAL STANDARD** on the keypad once. An 'IS' will flash in the lower right hand corner of the screen shown. To turn the internal standard off, press the **INTERNAL STANDARD** key again.

When refilling or installing internal standard vessels, it is recommended that you:

a. Leave the internal standard on for one minute to flush the line each time you refill the vessel.
b. Leave the internal standard on for two minutes to flush the line when you install a *new and different* standard.

> **⚠ CAUTION**
>
> **Even if you do not plan to use the Internal Standard, you must install the Internal Standard Vessel to ensure proper sample transfer.**

5.6 Activating Manual Line Rinse

To flush the loop and transfer line before operating the AQUATek 50:

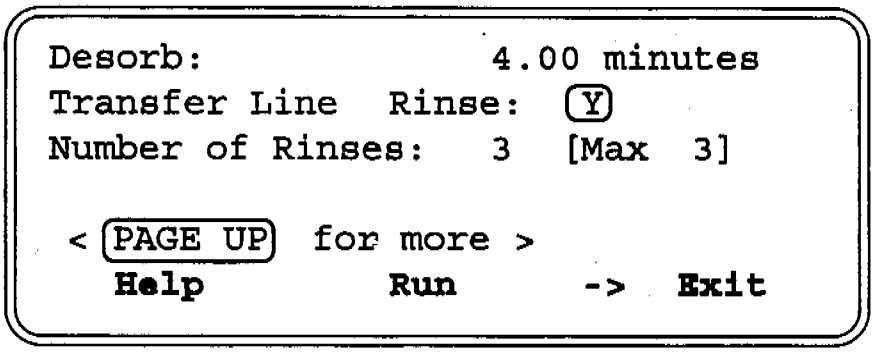
1. Press Line Rinse on the keypad twice.
2. After the sample transfers over, turn Auto Drain (Sample Drain) on at the concentrator.
3. When the sample is completely drained, turn Auto Drain (Sample Drain) off.

Note: Remember to turn Auto Drain (Sample Drain) back on before operating the Aquatek 50.

5.7 Setting Desorb and Rinse

The AQUATek 50 Desorb time must be identical to the desorb time set on the concentrator. This enables the two units to be ready for the next round of sample transfer and sample processing steps at the same time. The microprocessor automatically determines the maximum number of rinses that can be performed under the conditions entered and displays this value as the maximum.

1. Press **F1 (Meth)** for the Method Parameter screen and **Page Down** to the Desorb and Rinse parameters.



In this case, for example, you may choose up to three rinses. This is the recommended number of rinses in the concentrator Desorb time.

2. Set the "Number of Rinses" to the maximum value permitted.

5.8 Setting Method Parameters

This section of the manual covers setting method parameters on the AQUATek 50. It includes topics such as dilution, resampling, setting internal standard parameters, and the purge delay function.

The AQUATek 50 offers four methods. This lets you process your samples more efficiently by programming your methods according to sample volumes. The four methods will default to the values you select after you enter those values and exit back to Standby mode. Sample and internal standard loops must be changed manually and their corresponding volumes entered into memory (see Section 6.1).

The AQUATek 50 program steps in their order of sequence and their default values according to loop and sparger sizes are:

Program Steps	*Default Values*		
	5 ml loop 5 ml sparger	10 ml loop 25 ml sparger	25 ml loop 25 ml sparger
Settle	10 min.	10 min.	10 min.
Prepurge	30 sec.	30 sec.	30 sec.
Sample Pressurize*	15 sec.	15 sec.	35 sec.
Sample Transfer*	30 sec.	30 sec.	60 sec.
Internal Std. Fill	20 sec.	20 sec.	20 sec.
Internal Std. Transfer	75 sec.	75 sec.	75 sec.
Backflush Filter	1 min.	1 min.	1 min.
Smpl Loop Fill/Rinse	1 min.	1 min.	1 min.
Backflush Needle	45 sec.	45 sec.	45 sec.
Purge Filter	3 min.	3 min.	3 min.
Desorb	4 min.	4 min.	4 min.
Transfer Line Rinse	3 rinses	3 rinses	3 rinses

*Sample Pressurize and Sample Transfer default times as well as loop/ sparger configurations will vary further when you are using the Dilution feature on the AQUATek 50 (see Dilution Section 5.8.1).

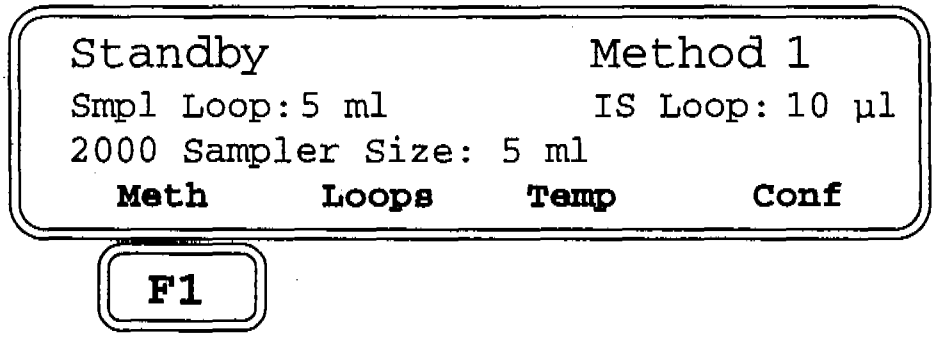
You can run the four AQUATek 50 methods with their default values, or modify the values for each of the program steps according to your particular application.

continued

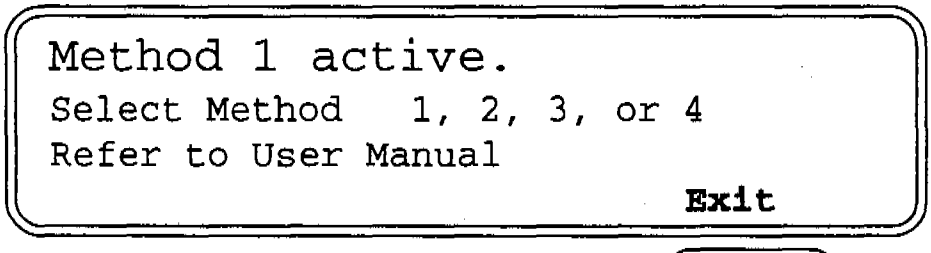
5.8 Setting Method Parameters (cont.)

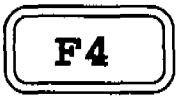
The following instructions use Method 2 as the example.

1. To switch from one method to another, start in the Standby mode. Method 1 comes up as the default method. To switch to Method 2, for example, press **F1 (Meth)**.

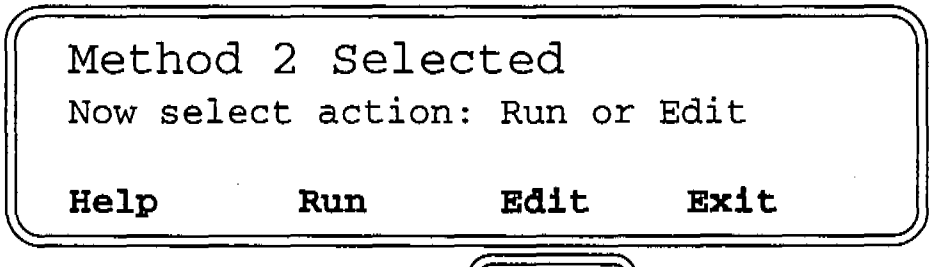


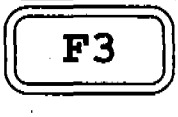
The following screen will appear:





2. Press **2** on the keypad to select Method 2. The following screen will appear:





5.8 Setting Method Parameters (cont.)

3. Press **F3 (Edit)** to access the Method Parameters screen:

```
        Method 2 Parameters

Re-sample: OFF
Dilute: OFF    By:  20%
Settle: 0.00 minutes
  < Page Down  for more >
Help        Run        ->        Exit
```

Note: If you want to use either the re-sample or dilution functions, you will need to use the arrow (-->) key to highlight "re-sample" or "dilution" and then press Enter. Dilution and re-sample are discussed later in sections 5.8.1 and 5.8.2, respectively.

4. From the Method Parameters screen, press **Page Down** on the keypad to view the available parameters. The following screen will appear:

```
Prepurge:  30  sec.
Sample Pressurize: 30 sec.
Sample Transfer: 30 sec.
Internal Standard Fill: 15 sec.
Internal Standard Trans: 75 sec.
<Page Up/Page Down for more>
  Help      Smpl      Std       Exit
```

Note: Set the Internal Standard Fill and Transfer Times to "0" if you do not want to "spike" your samples with internal standard. To run blank samples with and without internal standard, see Section 5.9, Scheduling Methods.

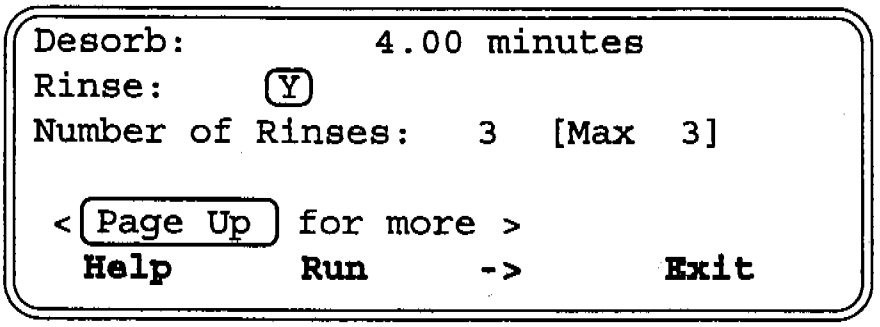
5. Press **Page Down** again to see the following screen:

```
Backflush: ON
Backflush Filter: 1.00 min.
Sample Loop Fill/Rinse: 2.00 min.
Purge Filter: 3.00 min.
<Page Up/Page Down for more>
  Help      Smpl      Std       Exit
```

continued

5.8 Setting Method Parameters (cont.)

6. Press **Page Down** again. The following screen will appear:



7. Press **F3 (->)** to move the shaded box to the parameter you wish to change. Enter the desired value for each parameter.

Note: F2 (Run) is offered when you enter the Method Parameter screen from Standby. You may begin a run in that method with the new parameters.

Pressing **F4 (Exit)** will enter the new parameters into the method, and will return you to the current mode.

5.8.1 Setting Method Parameters - Dilution

The AQUATek 50 offers dilution capability with either a 1 ml, 2 ml, or 5 ml loop. When diluting, there are five total transfers (of either the sample or blank water) to the sparger on the concentrator.

Note: To run dilution, you must have a 1, 2, or 5 ml sampling loop installed on the AQUATek 50. Instructions for changing the sampling loop can be found in Section 6 of this manual.

The table below shows the relationship between volume of sample/blank water transferred and percent dilution.

% Dilution	*1 ml Sample Loop		**2 ml Sample Loop		**5 ml Sample Loop	
	Amt. of Transfer (ml)		Amt. of Transfer (ml)		Amt. of Transfer (ml)	
	sample	blank H_2O	sample	blank H_2O	sample	blank H_2O
20	4	1	8	2	20	5
40	3	2	6	4	15	10
60	2	3	4	6	10	15
80	1	4	2	8	5	20
100	0	5	0	10	0	25

* When diluting, a 1 ml sample loop on the AQUATek 50 must be used along with a 5 ml sparger on the concentrator.

**2 and 5 ml sample loops on the AQUATek 50 must be used along with a 25 ml sparger on the concentrator.

Note: When diluting, the sample pressurize and sample transfer default values will differ from defaults for the standard loop/sparger configurations. These are the only defaults that change when diluting. The table below shows the three available configurations when diluting and the corresponding defaults for sample pressurize and sample transfer times.

Program Steps	*Dilution Default Values*		
	1 ml loop 5 ml sparger	2 ml loop 25 ml sparger	5 ml loop 25 ml sparger
Sample Pressurize	8 sec.	6 sec.	6 sec.
Sample Transfer	10 sec.	10 sec.	10 sec.

5.8.1 Setting Method Parameters - Dilution (cont.)

To enable dilution:

1. Install a 1 ml, 2 ml, or 5 ml loop on the AQUATek 50 and either a 5ml or 25 ml sparger on the concentrator.

2. After you have powered up your AQUATek 50 and exited out of the initial introductory (or error) screen, the Current Configuration screen appears:

3. The following instructions use the 1 ml loop and the 5 ml sparger as the example.

```
Current Configuration                v.X.X
Date: 7/04/93              Time:  0.08:30
Sample: 5 ml          Standard: 5 µl
Concentrator: 5 ml
  Loops     Test      Setup     OK
```

F1

4. Press **F1 (Loops)** from the Configuration screen. The following screen appears:

```
AQUA50 Sample Loop Size: 5 ml
AQUA50 Internal Standard Loop: 5 µl
2000 Sampler Size:        5 ml
 1 Inj/Sampling    Can't Dilute
  Smpl       Std       Conc      Exit
```

F1

5. Press **F1 (Smpl)**. The following screen will appear:

```
Sample Loop Size:      5 ml
       [1]    2    5    10    25 ml
  Move cursor to desired value.

     Help          <-          ->      Exit
```

F2 F3 F4

5.8.1 Setting Method Parameters - Dilution (cont.)

6. Press **F2** (<-) or **F3** (->) to move the cursor to the desired sample loop size. Then press **F4 (Exit)**. The following screen will come up:

```
AQUATek 50 Sample Loop Size: 1 ml
AQUA50 Internal Standard Loop: 5 µl
Concentrator Size:             5 ml
5 Injections per sampling.

Smpl        Std        Conc       Exit
```

F4

7. Press **F4 (Exit)**. The following screen will come up:

```
All methods set to new defaults
Sample Pressurize: 8 seconds
Sample Transfer: 10 seconds


                                Exit
```

F4

8. Press **F4 (Exit)**. This will bring you back to the Current Configuration screen.

```
Current Configuration                v.X.X
Date: 7/04/94              Time:  0.08:30
Sample: 5 ml          Standard: 5 µl
Concentrator: 5 ml
  Loops     Test      Setup     OK
```

F4

9. Press **F4 (OK)**. This will bring you back to the Standby screen.

continued

5.8.1 Setting Method Parameters - Dilution (cont.)

```
Standby                    Method 1
Smpl Loop:1 ml             IS Loop: 5 µl
2000 Sampler Size: 5 ml

  Meth      Loops     Temp      Conf
```

F1

10. Press **F1 (Meth)**. Select Method 1, 2, 3 or 4. Press **F3 (Edit)** to bring up the Method Parameters screen.

```
     Method 1 Parameters
Re-sample: NI
Dilute:    OFF
Settle:    10 Minutes
<Page Down For More>
  Help     Run       -->      Exit
```

F3

11. Press **F3 (->)** to highlight "dilute". Press **Enter**. The following screen will appear:

Note: Re-sample will show as "NI" for not installed when using dilution.

```
Current:   OFF
Dilute:    Choose ON/OFF


  ON       OFF       -->      Exit
```

F1

continued

5.8.1 Setting Method Parameters - Dilution (cont.)

12. Press **F1 (ON)** to activate dilution. This brings you back to the Method Parameters screen:

```
        Method 1 Parameters
Re-sample: NI
Dilute:    ON                  By 20%
Settle:    10 Minutes
<Page Down For More>
  Help     Run       -->       Exit
```

F3

13. Press **F3** (->) to select the **By: 20%** option. Press **Enter**. The following screen appears:

```
% of Dilution:       20

20    40    60    80    100%

Move cursor to desired value
              <-        ->        Exit
```

14. Move the cursor to the desired percentage and press **Enter**. Press **F4 (Exit)** to return to the Standby screen.

Note: The table on page 5-11 shows the relationship between percent dilution chosen and volume of sample/blank water transferred.

5.8.2 Setting Method Parameters - Resampling

Some purge and trap methods require that there be duplicate runs on a particular sample. The re-sampling feature on the AQUATek 50 allows you to extract a second sample and hold it in the sample loop immediately after the first sample is extracted and transferred to the concentrator.

Note: To use re-sampling, you must have a 5 or 10 ml sampling loop installed in the AQUATek 50. Instructions for changing the sampling loop can be found in Section 6 of this manual.

To activate re-sampling, use the following instructions. These instructions use Method 2 as the example:

1. From the Standby mode, press **F1 (Meth)**. The following screen appears:

```
Method 1 active.
Select Method   1, 2, 3, or 4
Refer to User Manual
                                Exit
```

2. Press **2** on the keypad to select Method 2. The following screen will appear:

```
Method 2 Selected
Now select action: Run or Edit

Help      Run      Edit      Exit
```

3. Press **F3 (Edit)** to bring up the Method Parameters screen:

```
   Method  2  Parameters

Re-sample: OFF
Dilute: NI
Settle: 10.00 minutes
 < [Page Down] for more >
Help      Run      ->      Exit
```

5.8.2 Setting Method Parameters - Resampling (cont.)

4. In the following screen, "Re-sample" will be highlighted. Press **Enter**. The following screen will appear:

```
Current:    OFF

Re-Sample:  Choose ON/OFF

 On    Off        ->        Exit
```

F1

5. Choose **On (F1)**. The system will automatically exit to the Method Parameters screen:

```
        Method  2  Parameters

Re-sample: ON
Dilute: NI
Settle: 10.00 minutes
 < Page Down for more >
Help        Run        ->        Exit
```

Note: You cannot dilute when using the re-sampling feature.

6. Verify that all of your other parameters are accurate by pressing Page Down to see more.

5.8.3 Setting Method Parameters - Purge Delay on the 2000

To ensure optimum analytical results, the LSC 2000 Concentrator offers a "Purge Delay" parameter that you set at the concentrator. Purge Delay reduces the amount of purge volume sent through the LSC 2000 trap, reducing breakthrough of highly volatile compounds while the 2000 waits for the sample transfer from the AQUATek 50.

Purge Delay opens the LSC 2000 vent valve before the purge valve and keeps it open from 1 to 299 seconds, depending upon the value you enter. To determine the proper Purge Delay value for your method, you should add the Internal Standard Transfer time and the Sample Transfer time. This will yield your Purge Delay time.

To get to the Purge Delay screen on the 2000, page down to the next screen from the method parameter set-up screen (after the Bake Out parameter). "2050 Sample Transfer" will appear. This is the Purge Delay parameter. Enter the appropriate value.

Note: Purge Delay requires the 2000 to have ROM version 2.1 or greater (p/n 14-5090-075) along with the new 64K processor. Please call Tekmar at (800) 874-2004 or (513) 247-7000 for ordering information.

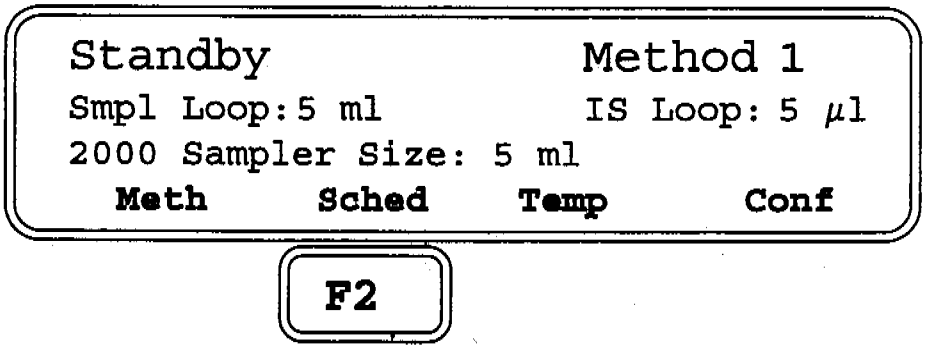
5.8.4 Setting Method Parameters - Sample Fill on the 3000

Sample Fill opens the 3000 vent valve and keeps it open for a designated time. This allows sample transfer from the AQUATek 50 to the 3000 or to the 2016 and/or 2032 autosampler(s).

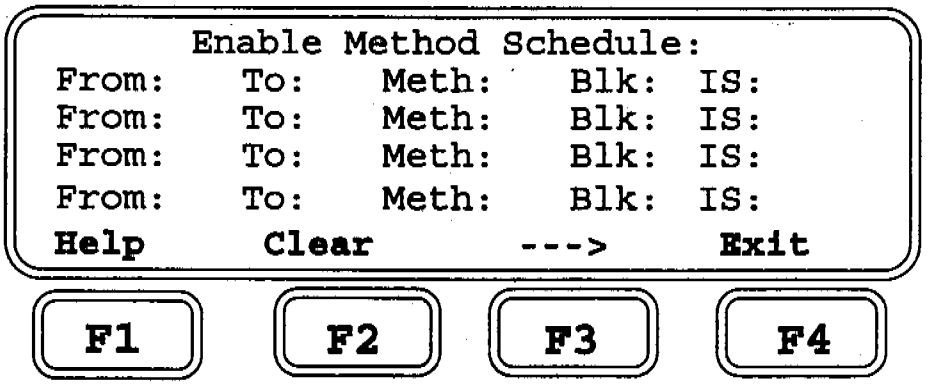
Methods 14 and 15 on the 3000 have a default value of 1.75 minutes for Sample Fill time. If you wish to change the default value, refer to the 3000 manual for instructions on editing methods. If you choose to edit a method, determine the proper Sample Fill time by adding the Internal Standard Transfer time and the Sample Transfer time. This will yield the Sample Fill time.

5.9 Scheduling Methods

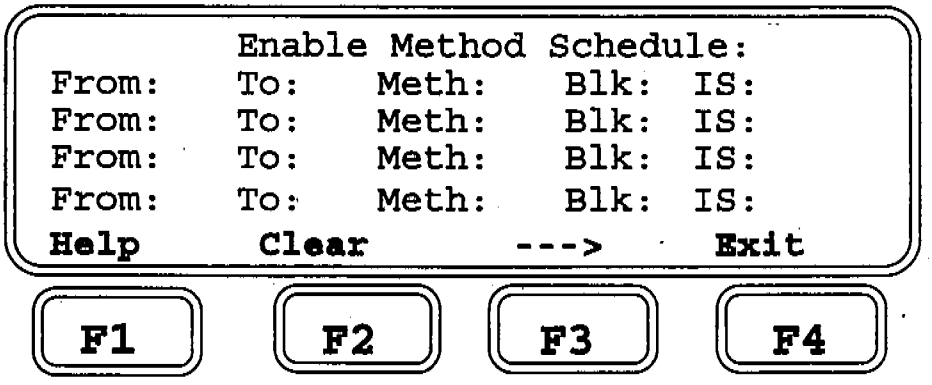
This section explains procedures for scheduling methods. It describes how to program the number of vials to be run, and how to run blank samples.



1. From the Standby screen, press **F2 (Sched)**. The following screen will appear:



2. The cursor will blink on "N" after "Enable Method Schedule". Press "Y" on the keypad to enable method scheduling.



3. Use **F3 (->)** to highlight the method schedule parameter you wish to change, such as "from". When you have done that, press **Enter**. The following screen will appear:

5.9 Scheduling Methods (cont.)

```
Current: 5
Minimum: 1                    Maximum: 50
From:

Help        Run        Edit            Exit
```

3. Enter your desired "from" value. Press **Enter**. The AQUATek 50 will return to the Method Scheduling screen and show the value you entered.

4. Do the same for the other parameters: "To", "Meth", and "IS".

5.9.1 Running Blanks

"Blk" on the Method Scheduling screen refers to blank intervals -- vials containing blank water only that are run to check system integrity. The AQUATek 50's method scheduling feature lets you program a blank to run after a specified number of sample vials. For example, you could run a method with a blank run between every sample for a maximum number of blanks, or after up to every 10 samples for a minimum number of blanks. (You can also choose not to run any blanks by entering "0" at "Blk" on the Method Scheduling screen.)

Note: You can also run blanks with or without internal standard.

To run blanks:

1. Highlight "Blk" in the Method Scheduling screen and press **Enter**. The following screen will appear:

```
Current: 5
Minimum: 1                    Maximum: 10
Blank Interval:
Run a blank after every # vials
Enter 0 for no blank runs
(Press ENTER for no change)
```

2. Use the keypad to "type" in the number for the place in the sequence where you want to run a blank. Enter "0" if you don't want to run blanks. If you type in the number 10, for instance, the AQUATek 50 will run a blank after every 10 samples.

continued

5.9.1 Running Blanks (cont.)

To run blanks and samples spiked with internal standard:

When setting method parameters, enter fill and transfer times for the internal standard. This way, both your samples and blanks will be spiked with internal standard during the method. See Section 5.8 on setting method parameters.

To run blanks and samples without internal standard:

When setting method parameters, enter "0" for Internal Standard fill and transfer times. This way, your blanks and samples will not be spiked with internal standard.

To run samples (but not blanks) with internal standard:

Press "N" for no at the IS prompt on the Method Scheduling screen.

After you have scheduled your methods, press **F4 (Exit)** to return to the Standby screen.

To run blanks (but not samples) spiked with internal standard:

If you would like to have your blanks, but not your samples, spiked with internal standard, you can do this:

1. Fill one or more 40 ml vials with blank water.
2. Manually place the vials in the vial cooler in the positions that you want them to run during the method.

> For example, if you want to run a blank after every five sample vials, place a blank water vial in position 6, then position 12, 18, etc.

3. In the Method Scheduling screen, configure Method 1 to run samples **without** internal standard (see Setting Method Parameters, Section 5.8).
4. Configure Method 2 to run **with** an internal standard transfer and fill time (see Setting Method Parameters, Section 5.8).

5.9.1 Running Blanks (cont.)

5. Configure Method 2 by entering a value for the blank and keying in "Y" after "IS" to tell the AQUATek50 to add internal standard. Here is an example Method Scheduling screen for blanks ***with*** internal standard, but samples ***without*** standard:

```
      Enable Method Schedule:   Y
From: 1  To: 5  Meth: 1  Blk: 0  IS: N
From: 6  To: 6  Meth: 2  Blk: 1  IS: Y
From: 7  To: 11 Meth: 1  Blk: 0  IS: N
From: 12 To: 12 Meth: 2  Blk:1   IS: Y
Help      Clear        --->      Exit
```

6. The AQUATek 50 will spike the blank vial at position 6 ***and the blank following it*** with internal standard. The rest of the run will proceed as you've set it up.

5.10 Priority Sample Interrupt

Priority Sample interrupts a sequence to process an additional sample without shuffling vials or interrupting the vial count.

1. Press the **PRIORITY SAMPLE** key.

```
          Priority Sample
Sequence will be interrupted to
run a priority sample.
Waiting for current run to end.
  Help                          Cancel
```

This screen is timed to appear for three seconds and then the current Method screen reappears.

In the lower left-hand corner of the screen will be a flashing 'PS' indicating that Priority Sample has been activated. For example, if the current sample was in Prepurge, the screen would look like this:

```
Prepurge          18    ->   30
Vial  #1  Meth 1
Sweeping the sample needle.

 P
 S  Meth     Sched     Temp      Conf
```

The current vial must complete its run before the priority sample can be processed. For example, if the current vial is in Desorb, the priority sample will be processed next.

continued

5.10 Priority Sample Interrupt (cont.)

When the current sample is finished, a beeper sounds and the following screen appears:

```
          Priority Sample
Ready to load sample.
Open sample door.
  Help          Mute          Cancel
```

F1 F4

2. To silence the beeper, open the priority sample access door. Once the door has been opened, the following screen appears:

```
          Priority Sample
Insert sample vial.
Close sample door.
  Help                        Cancel
```

3. Place the priority sample ***on the ramp*** and close the door.

Once the door is closed the following screen appears:

```
          Priority Sample
Sample vial loaded.
Press START to begin run or  F4
(Cancel) if no vial was inserted.
  Help                        Cancel
```

F1 F4

4. Press **START** to begin the sample process and bring the program back to the Start Up mode.

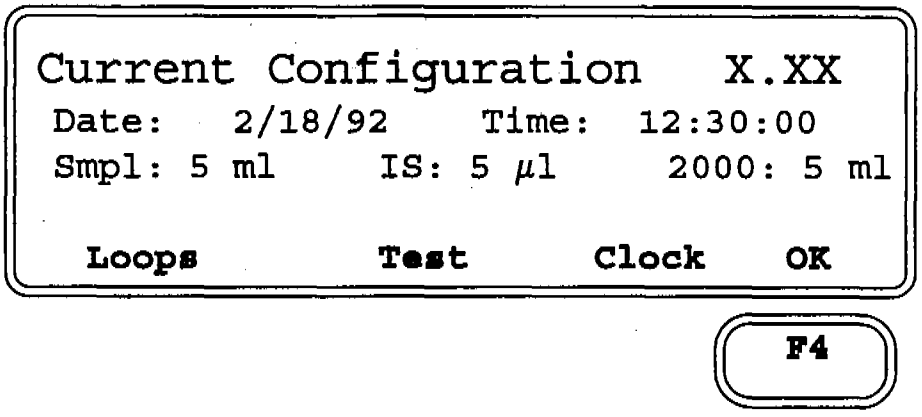
Note: Zero will be written to the BCD output and the vial count will not be affected. After the priority sample, the count will resume where it left off.

The Priority Sample screens will be the same as the normal screens except 'Priority' will appear where "Vial #1" would be.

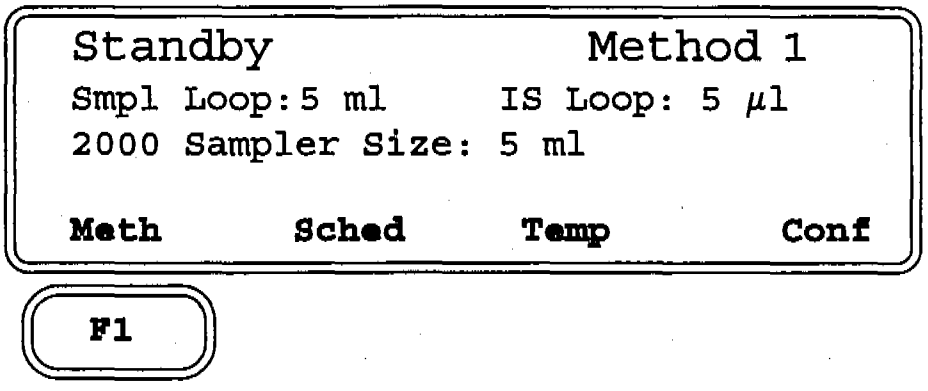
5. If you decide not to run a priority sample, press **F4 (Cancel)** to raise the elevator and advance the next vial for processing.

5.11 Step-by-Step Procedures - Typical Sampling Sequence

1. After you have powered up your AQUATek 50 and exited out of the initial introductory (or error) screen, the Current Configuration screen will be displayed:

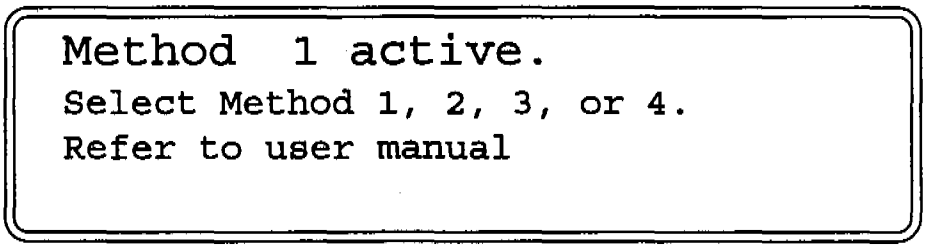


2. Press **F4 (OK)**. The introductory screen will come up again briefly and then the Standby screen will appear for Method 1. To set the time and date, see Section 5.14.



The AQUATek 50 system has four default Methods with values set for a 5 ml sample loop for a single vial.

3. To change the method number, press **F1 (Meth)**. The following screen will appear:



continued

5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)

4. Select a method number from the keypad. This screen appears:

```
Method  1 selected.

Now select action: Run or Edit

Help        Run        Edit       Exit
```

F2 F3

5. Press **F2 (Run)** to run Method 1 with default values. To change parameter values, press **F3 (Edit)**. The following screen will appear:

```
        Method 1 Parameters
Resample: OFF
Dilute: -NI-
Settle: 0.00 Minutes
<Page Down> for more
  Help      Run       -->       Exit
```

F4

6. Change parameter values in your selected method as desired, then press **F4 (Exit)** to store the new operating method. The Standby screen will come up:

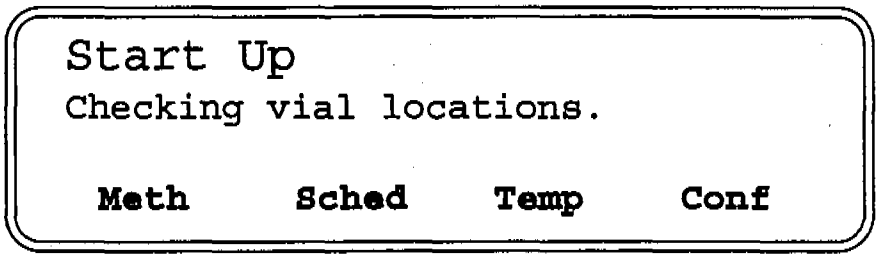
```
Standby                    Method 1
 Smpl Loop:5 ml      IS Loop: 5 µl
 2000 Sampler Size: 5 ml

 Meth       Sched      Temp       Conf
```

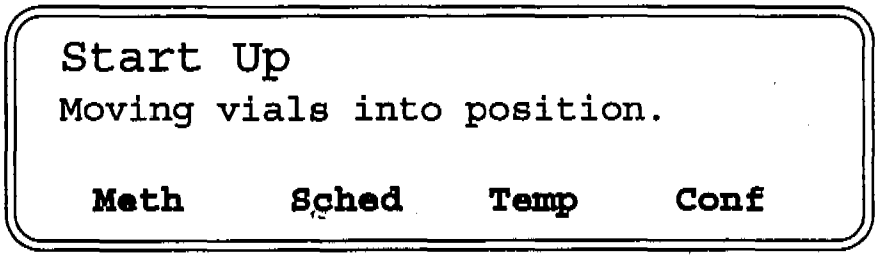
continued

5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)

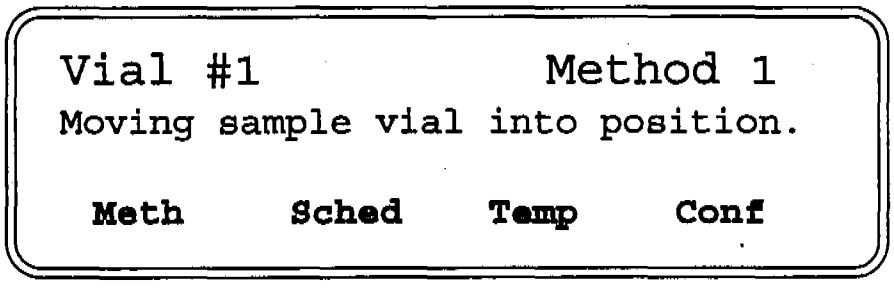
7. To run the method, press **Start**.

8. The following screens will appear:

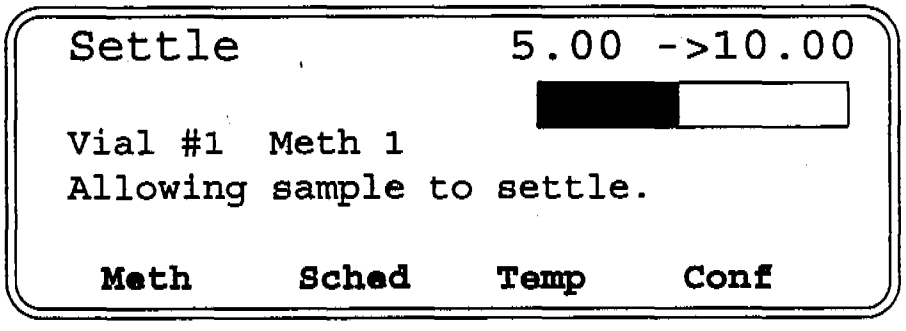




9. The AQUATek 50 checks to see if there are vials on the rack from a previous run. If one or more vials are present, an **ERROR** screen will appear (See Section 7.9.2). If there is no error, five vials will load on the rack and one will advance onto the ramp.



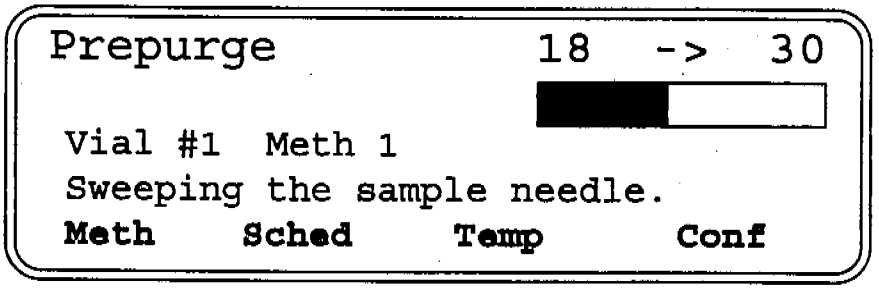
10. The AQUATek 50 enters the **Settle** mode, allowing particulates to settle at the bottom of the vial.



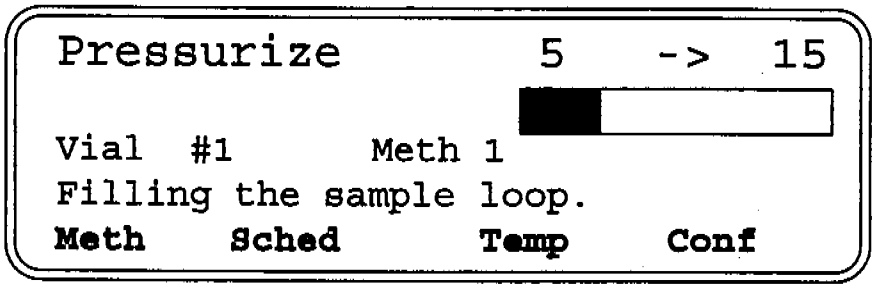
continued

5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)

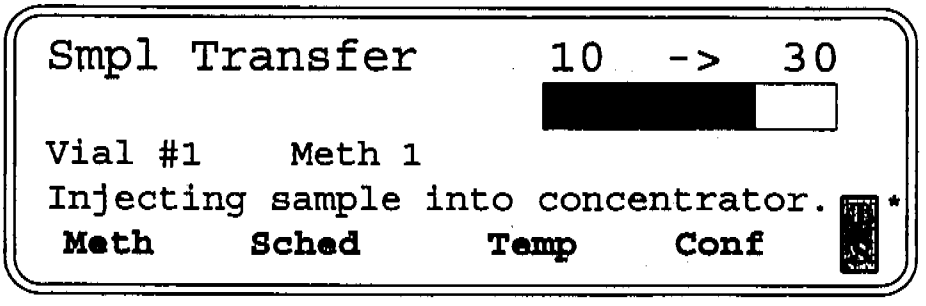
11. The AQUATek 50 enters the **Prepurge** mode, allowing helium gas to sweep the needle and remove leftover lab air or water.



12. The AQUATek 50 enters the **Pressurize** mode where pressure is applied to the inside of the sample vial through the top of the needle, pushing the sample through the bottom of the needle, out of the vial and into the sample loop.



13. At this point, the concentrator is signaled by the AQUATek 50 to step into Purge, and the transfer begins. The sample is transferred from the sample loop to the sparger on the sample concentrator.

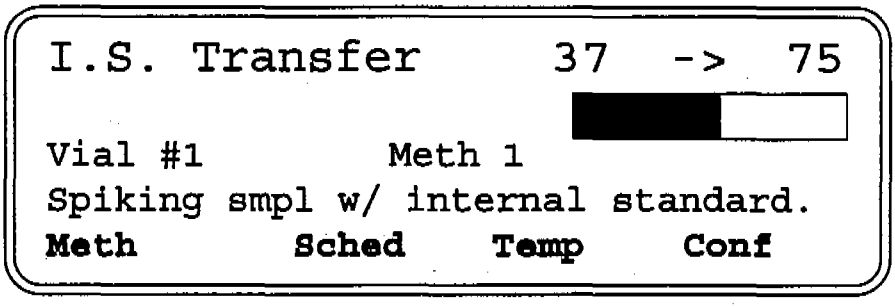


* **The flashing 'IS' in the lower right-hand corner indicates that the internal standard option is activated and that the loop is being filled.**

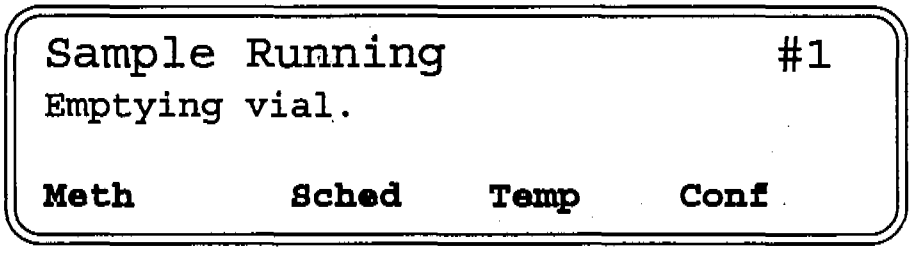
continued

5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)

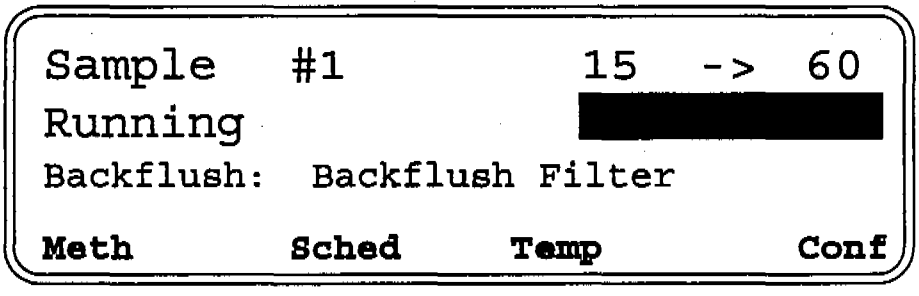
14. The internal standard transfers from the internal standard loop to the sparger on the sample concentrator.



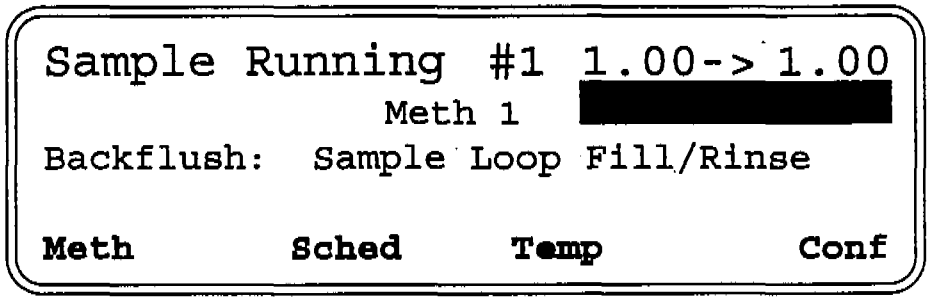
15. After these two transfers, the concentrator will begin processing the sample and the AQUATek 50 will display:



16. Next, rinse water is brought back through the filter (against the stream of the normal flow) to remove any particulate that may have accumulated inside the filter. The following screen appears:



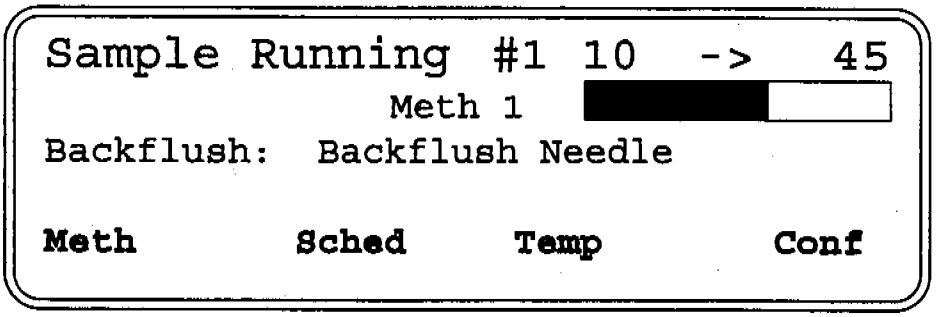
17. Water fills and rinses the sample loop. The following screen appears:



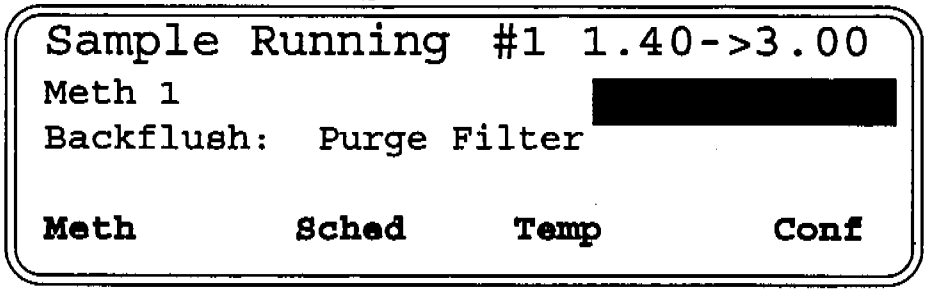
continued

5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)

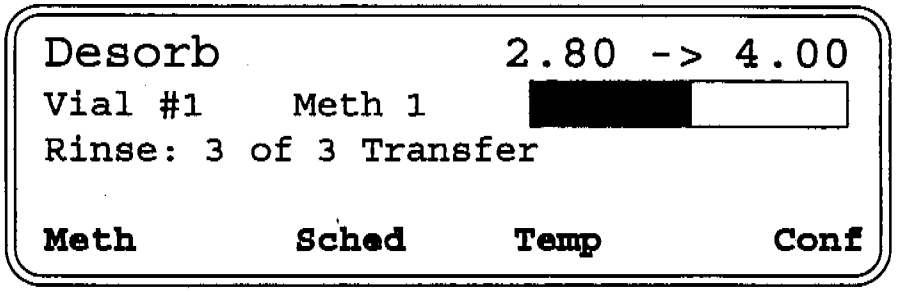
18. Rinse water backflushes into the vial/needle for 45 seconds to remove particulates that may have accumulated in the needle. After 45 seconds, the vial comes down off the needle to prevent water from being drawn back into the needle.



19. Gas flows through the filter to remove any leftover sample and to dry out the filter.



20. The AQUATek 50 will wait for a Desorb signal from the concentrator. When the AQUATek 50 receives the signal, the rinse cycle will be executed during the concentrator desorb cycle. The vial is drained and the needle and sample loop are flushed.

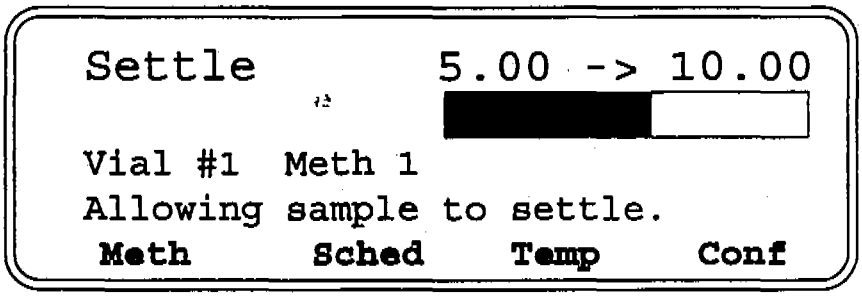


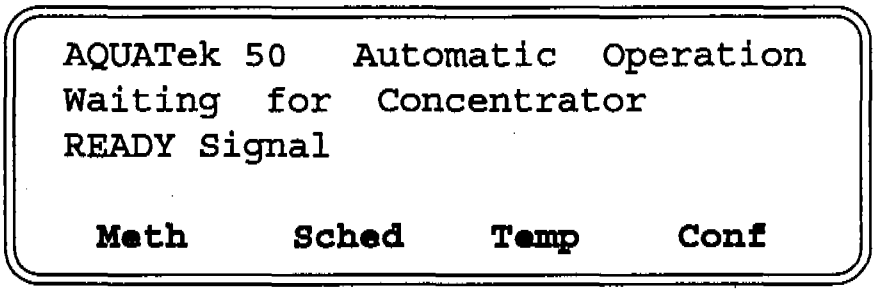
continued

5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)

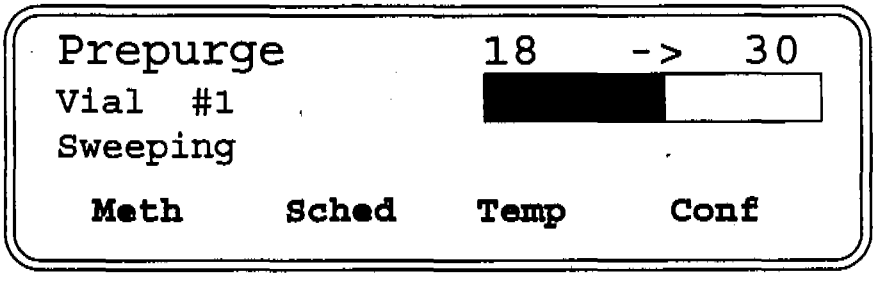
21. After these combined cycles are completed, the system returns to the Start Up screen to check vial locations:

22. The system enters the Settle mode, then waits for the concentrator ready signal. (To provide a ready signal, the 3000 must be configured to work with the AQUATek 50.)





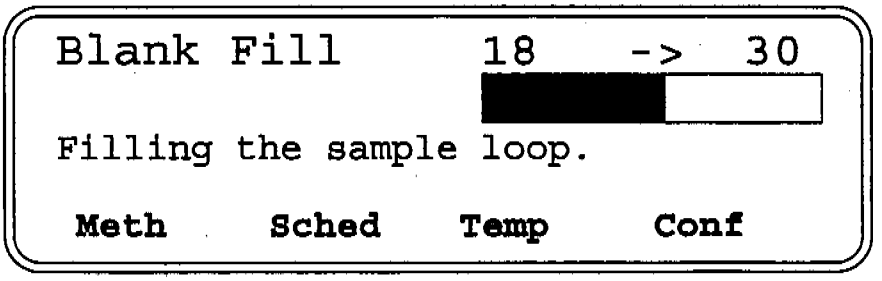
23. When the AQUATek 50 receives the Ready Signal, it proceeds to Prepurge and the cycle continues.

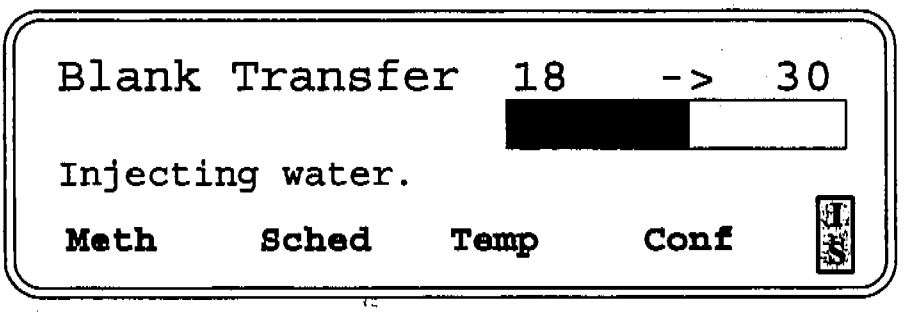


If you programmed your AQUATek 50 to run blank samples, the screens will look like this before the normal sampling cycle continues:

continued

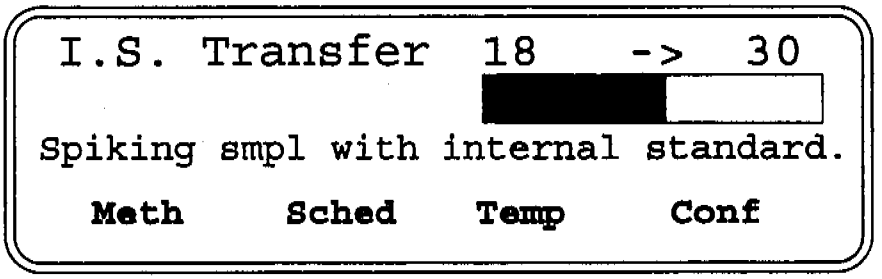
5.11 Step-by-Step Procedures - Typical Sampling Sequence (cont.)



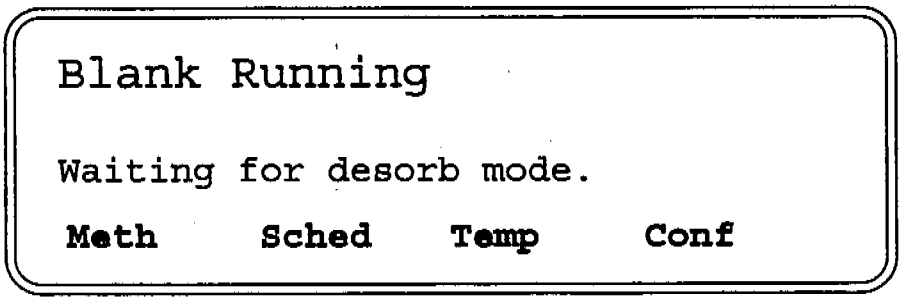


Note: If you have programmed the AQUATek 50 via the Method Parameters screen to spike blanks with internal standard, an "IS" will show in the bottom right hand corner of the above screen.

If you have internal standard programmed, the following screen will appear:



If you do not have internal standard programmed, the following screen will appear after the "Blank Transfer" screen:



The system then goes to Desorb mode, then back to the "Start-up, checking vial locations" screen before resuming the cycle.

5.12 General Operations

Several operator activities are included in this general overview: changing the viewing angle of the screen, setting the clock, adjusting the sample chamber temperature and running the diagnostic program.

5.13 Changing the Screen Viewing Angle

The viewing angle of the LCD screen can be adjusted to be seen clearly from a sitting or standing position.

1) Press **Page Up** to increase the angle of the screen and **Page Down** to decrease the angle.

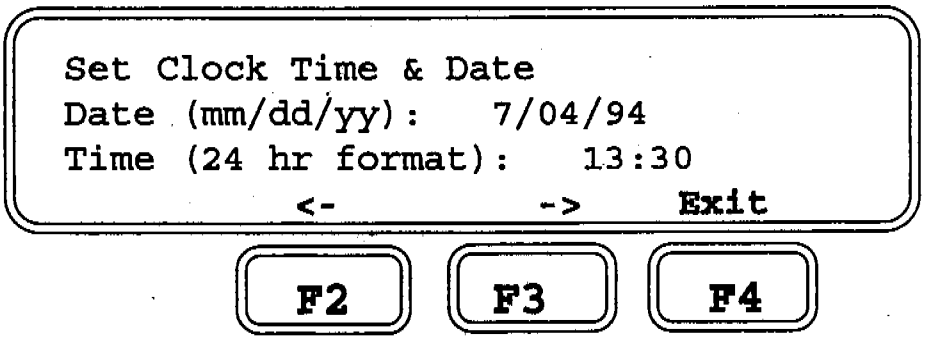
Note: You can either press the key down firmly for a continuous change in the angle or press and release the key for an incremental change in screen angle.

Note: The viewing angle cannot be adjusted while the unit is using the Page Up and Page Down functions for viewing Method Parameter options.

5.14 Viewing and Setting the Clock

The clock mode controls the date and time configured into the system. To edit the clock:

1. Press **F4 (Conf)** then **F3 (Clock)** to display the following screen:



2. Press **F2 (<-)** or **F3 (->)** to select the time value that needs to be changed.

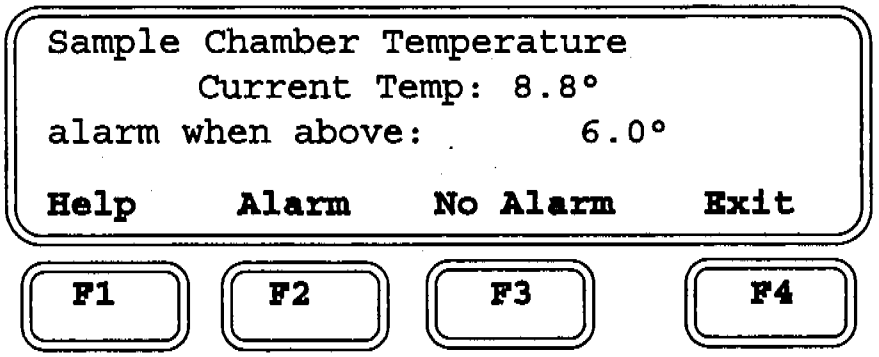
3. Press the desired digit on the keypad to enter it into system memory.

4. When all values are correct, press **F4 (Exit)** then **F4 (OK)** on the Current Configuration screen to get back to Start Up screen.

Note: If you press an invalid key while programming new time and date values, -> INVALID DIGIT/KEY <- lights up on the screen and the system beeps. When the message disappears you can re-enter the new values.

5.15 Adjusting the Sample Chamber Temperature

The water temperature of the cooling chamber is adjusted and maintained by a cooling bath connected to the AQUATek 50. The AQUATek 50 displays this temperature on the Sample Chamber Temperature screen. To view the temperature and the optional alarm, press **F3 (Temp)** from any program mode screen for the Sample Chamber Temperature screen.



The chamber temperature typically runs 2-4 degrees warmer than the bath setpoint, because of temperature loss from the water bath transfer lines. Adjust the temperature of the water bath according to the manufacturer's directions and make the necessary adjustments for the appropriate temperature reading on the Sample Chamber Temperature screen.

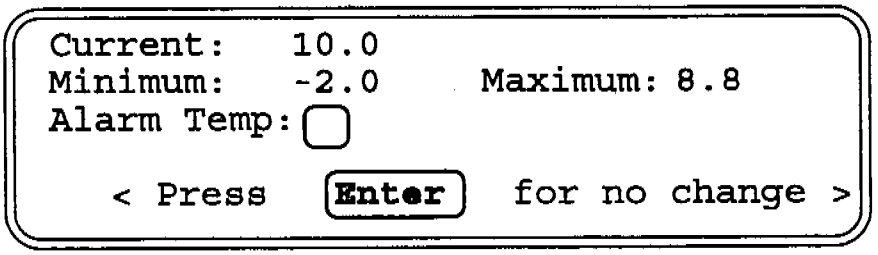
To maintain a chamber temperature of 4°C with a full load of 50 vials, a cooling capacity of approximately 300 watts at 4°C is required from the bath.

Note: If the actual temperature is over the maximum, the AQUATek 50 will display a current temperature of 8.8° until the temperature falls within a range of -2 ° to 8.8°. Temperatures outside this range will be displayed on the screen as 8.8°.

5.16 Sample Chamber Temperature Alarm

The optional alarm signals when the temperature goes above the programmed alarm temperature.

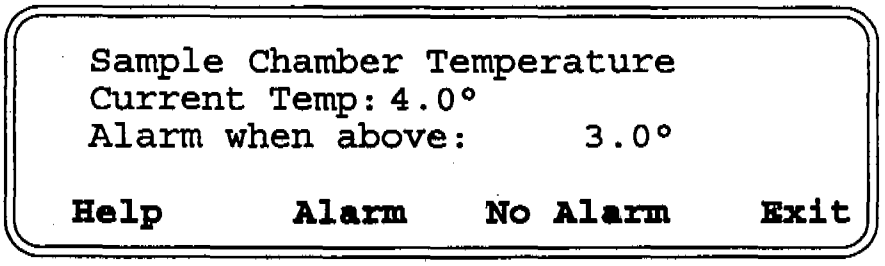
1. To set the temperature alarm, press **F2 (Alarm)**.



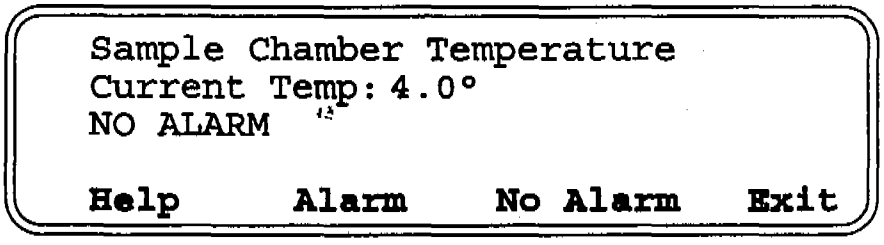
The minimum and maximum alarm settings are displayed.

5.16 Sample Chamber Temperature Alarm (cont.)

2. Press the desired digits for the alarm temperature and press **Enter** on the keypad. The Sample Chamber Temperature screen will display the new alarm setting.

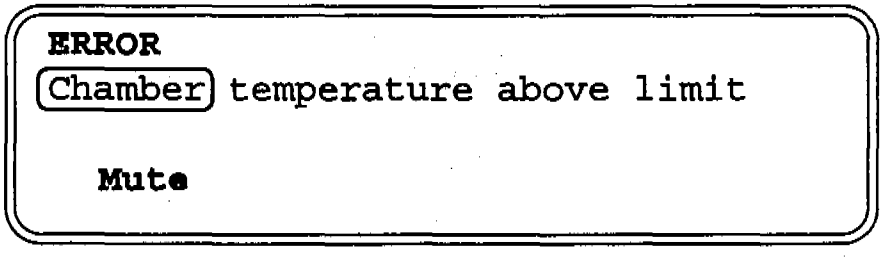


3. For no alarm signal, press **F3 (NoAlarm)**.



5.17 Sample Chamber Temperature Warning

When you power up, a warning screen appears when the temperature of the cooling chamber is above the limit:



Press **F1 (Mute)** to silence the alarm. See Section 5.15, Adjusting the Sample Chamber Temperature.

5.18 Summary of Operation

This section is an overview of the sequence of operation in an AQUATek 50 sampling cycle. It explains how the AQUATek 50 works, including the status of the valves during each mode. Color flow diagrams are included in this section. Section 5.11 of the manual covers step-by-step procedures for operating the AQUATek 50 from start-up to completion of a sampling run. The AQUATek 50 allows you to program the system to run either one sample per vial or two samples per vial, depending upon your requirements.

5.18.1 Summary of Operation - One Sample Per Vial

When running one sample per vial, the status of each of the valves is as designated in the following chart:

Modes	1	2	3	4	5	6	7	8	9	A	B	
Standby/Startup										L	L	
Settle										L	L	
Wait for Purge Ready Signal from Tekmar Concentrator.												
Prepurge			X				X	X		L	L	
If sample dilution is enabled, blank water will be transferred first. If it is not enabled, the AQUATek 50 will advance to Sample Pressurize.												
Dilution Loop Fill						X	X		X	L	L	
Dilution Transfer				X						I	L	
Sample Pressurize			X						X	L	L	
Sample Transfer	*	*		X						I	L	
Internal Standard Transfer					X					L	I	
Sample Running; while the Concentrator is in Purge mode and backflush option is on, the AQUATek 50 will continue with the following steps. If backflush is off, the AQUATek 50 waits for the desorb signal.												
Empty Vial (Sample Running)			X						X	L	L	
Backflush Filter						X	X			I	L	
Sample Loop Fill/Rinse						X	X		X	L	L	
Backflush Needle								X		L	L	
Purge Filter Mode							X	X		I	L	
Desorb - The AQUATek 50 waits for beginning of desorb from the Concentrator. If the line rinse option is on, the unit will continue with the next steps. If rinse is off, the system will advance to Drain.												
Sample Loop Fill/Rinse						X	X		X	L	L	
Transfer Line Rinse				X			X			I	L	

Legend: X=ON; I=INJECT; L=LOAD

Valve Designations

1 = Internal Standard Pressurize
2 = Internal Standard Drain
3 = Sample Pressurize
4 = Sample Transfer
5 = Internal Standard Transfer
6 = Rinse Water
7 = Backflush Control
8 = Purge Valve
9 = Drain
A = 6-port Sample Valve
B = 6-port Internal Standard

X = Valve Output is On
L = 6-Port Valve is In "Load" Position
I = 6-Port Valve is In "Inject" Position

*If default values are used, these valves will be activated the last 20 seconds of the run.

5.18.2 Summary of Operation - Re-sampling

(Running Two Samples with Backflush and Transfer Line Rinse Options)

When you have configured your AQUATek 50 to re-sample (run two samples per vial), rather than one, the instrument automatically changes the sequence of operation to accommodate the second sampling. In general terms, it works like this:

The vial comes up onto the needle. The needle extracts the first sample and sends the sample to the concentrator. Then the needle extracts a second sample and holds that sample in the sampling loop until the first sample is processed. If internal standard is used, the internal standard is then transferred to the concentrator and the AQUATek 50 resumes its normal sequence.

The following pages contain the valve output operational summary for each of the modes in re-sampling, as well as flow diagrams for each of the modes.

5.18.2 Summary of Operation - Re-sampling (cont.)

Here is the valve output operational summary for running two samples per vial.

Modes	1	2	3	4	5	6	7	8	9	A	B	
Standby/Startup										L	L	
Settle										L	L	
The AQUATek 50 waits for the "Purge Ready" signal from the Tekmar Concentrator.												
Prepurge			X				X	X		L	L	
Sample Pressurize #1		X						X	L	L		
The AQUATek 50 sends purge permission to Concentrator at the beginning of Sample Transfer mode.												
Sample Transfer #1	*	*		X						I	L	
Sample Pressurize #2		X						X	L	L		
Internal Standard Transfer #1					X					L	I	
Sample Running; while the Concentrator is in Purge, the AQUATek 50 continues with the following steps.												
The AQUATek 50 waits for the beginning of Desorb signal. No rinse allowed.												
The AQUATek 50 waits for Purge Ready from the Concentrator.												
Sample Transfer #2	*	*		X						I	L	
The AQUATek 50 sends purge permission to the Concentrator at the beginning of Sample Transfer.												
Internal Standard Transfer #2					X					I	I	
Sample Running; while the Concentrator is in Purge and the backflush option is on, the AQUATek 50 continues with the next steps. If backflush is off, the AQUATek 50 waits for the Desorb signal.												
Empty Vial		X						X	L	L		
Backflush Filter						X	X			I	L	
Sample Loop Fill/Rinse						X	X		X	L	L	
Backflush Needle								X		L	L	
Purge Filter							X	X		I	L	
The AQUATek 50 waits for beginning of Desorb from the Concentrator. If the line rinse option is on, the AQUATek 50 continues with the next steps. If line rinse is off, the system goes to Drain.												
Sample Loop Fill/Rinse						X	X		X	L	L	
Transfer Line Rinse				X			X			I	L	

Legend: X=ON; I=INJECT; L=LOAD

Valve Designations

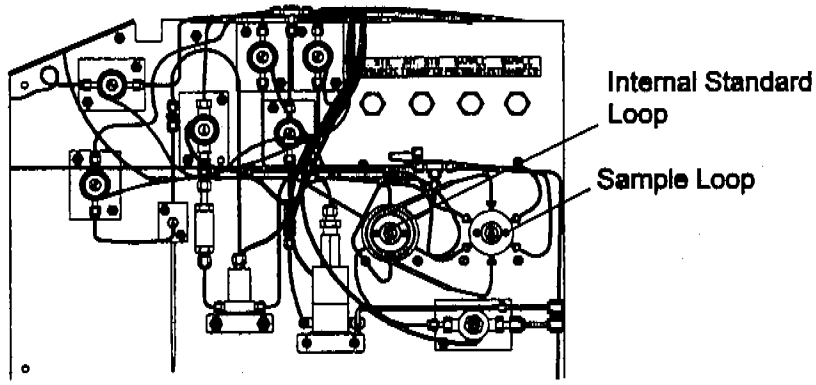
1 = Internal Standard Pressurize
2 = Internal Standard Drain
3 = Sample Pressurize
4 = Sample Transfer
5 = Internal Standard Transfer
6 = Rinse Water
7 = Backflush Control
8 = Purge Valve
9 = Drain
A = 6-port Sample Valve
B = 6-port Internal Standard

X = Valve Output is On
L = 6-Port Valve is in "Load" Position
I = 6-Port Valve is in "Inject" Position

*If default values are used, these valves will be activated the last 20 seconds of the run.

6.1 Changing Sample and Internal Standard Loops

Both the sample and internal standard loops are located behind the access door on the right side of the instrument.



To change the loops:

1. Rotate the two fasteners 90° and open the panel.
2. Remove the old loop(s) with a 1/4" open end wrench.
3. Install the new loop(s) with the coils looped in front of the valve.
4. Make sure the right access door will close before tightening the fittings.
5. Leak check the new loop(s) according to Section 3.
6. Close the door and tighten the retaining fasteners.
7. Configure your AQUATek 50 for the correct sample and internal standard loops according to Sections 5.2 and 5.3 of this manual.

6.2 Changing the Sample Filter

Note: Replace only with a 90-micron filter.

Note: The sample filter (p/n 14-5153-016) should be replaced every year.

1. Turn off power and gas supply to the unit. Remove the right side panel.
2. Use a 7/16" and two 9/16" wrenches to loosen the filter housing.
4. Remove the bottom nut (houses a washer and spring) and set aside.
5. Tap the filter housing on a table top to loosen the old fitting.
6. Place the open end of the new filter down into the housing. An arrow etched on the outside of the housing should point downward.
7. Reinstall the spring and bottom nut.
8. Reinstall the filter/housing onto the AQUATek 50, making sure the arrow on the outside of the housing is pointing upward.

6.3 Refilling the Blank Water Generator

With use, the granular activated carbon in the filter will become saturated with organics, allowing impurities to pass through.Tekmar recommends that the Blank Water Generator (p/n 14-3707-000) be replaced every six months.

6.4 Cleaning the Internal Standard Vessel

Clean glassware is essential to interference-free runs. This applies to flasks and cylinders as well as the internal standard vessel. The internal standard needle should also be cleaned on a routine basis. To effectively clean the glassware and needle:

a. Use dedicated glassware

b. Obtain an ultrasonic bath

c. Obtain a muffle furnace

Dedicated glassware refers to glassware that is used for concentrator work *only*. Glassware that is used for other procedures (such as extractions) often is not clean enough to use in trace applications.

An ultrasonic bath is ideal for saving time. A quick scrubbing followed by ultrasonics is easy and effective. Any of the glassware detergents recommended for use with an ultrasonic bath are acceptable. We recommend use of the Tekmar Ultrasonic Bath, p/n 21-0131-000.

A muffle furnace is an excellent device for cleaning glassware. Set the temperature to approximately 350-400°C (do not go too high, the glassware may melt) and allow the residue to oxidize. After the glassware has cooled, the remaining char is easily removed with a brush and a cleaning agent. We recommend the Tekmar Muffle Furnace, p/n 21-0206-000.

6.5 Cleaning the Vial Tilt Platform

Residue from the vial may collect on the vial tilt platform. Use a soft cloth and mild detergent to clean the platform periodically. This will ensure that the vials slide easily onto the platform.

6.6 Adjusting the Vial Tilt Platform

You may have to adjust the vial tilt mechanism to prevent vials from jamming. To do this:

1. Power up the AQUATek 50.
2. Press **F4 (Exit).**
3. Press **F2 (Test).**
4. Press **F2 (Outputs).**
5. Press **F1 (Motors).**
6. Press **3** on the keypad. The vial tilt mechanism will swing down.
7. Press **3** again to stop the travel.
8. Power down the instrument and remove the right side panel.
9. Refer to the diagram below. For minor adjustments to the vial tilt mechanism, use a Phillips screwdriver to loosen the screws on the mechanism. This will allow you to slide the vial tilt mechanism back and forth. For more major adjustments, use a regular slotted screwdriver to loosen all four screws on the guide arm as shown. The arm will slide back and forth as needed. Tighten screws when finished.
10. Reinstall the right side panel.

⚠ WARNING

Moving parts. Keep hands, clothing, and jewelry away from the moving mechanisms.

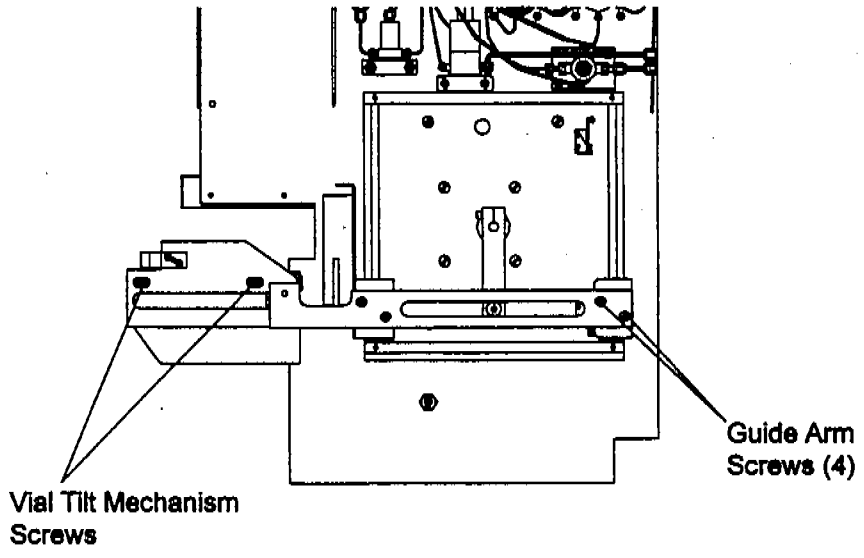


Figure 6-1 Vilt Tilt Adjustment

6.7 Leak Checking Internal Fittings

Refer to Section 3 to leak check after the initial installation of your AQUATek 50 to a concentrator. When making changes (e.g. sample or internal standard loops) or troubleshooting, it will be necessary to check some internal fittings. To do this, first remove the right side panel. Enter the test program of the microprocessor by pressing **F4 (Conf.)** and then pressing **F2 (Test)**.

6.7.1 Sample Handling System

1. Place a clean, empty, capped vial into the Priority Sample port and close the Priority Sample door.
2. Press **F2 (Outputs)**.
3. Press **F1 (Motors)**.
4. Turn the elevator on by pressing **3**.

> **⚠ WARNING**
>
> **Moving parts. Use caution when working around the elevator mechanism. Keep hands, clothing, and jewelry away from the elevator when the AQUATek 50 is on.**

5. First be certain that you do not place your hand near the elevator mechanism.
6. When the elevator reaches the top of its travel, the AQUATek 50 will beep. Press **3**.
7. Press **F4 (Exit)**.
8. Press **F2 (Outputs)**.
9. Press **F2 (Sol.)**.
10. Place an 1/8" cap nut (p/n 14-0678-116) on the sample drain fitting on the back of the unit.
11. The following fittings can now be checked:

    - outlet of sample pressurize valve
    - all three ports of the blank water tee union
    - output of the blank water valve
    - tube fitting and pipe fitting to the sample needle block
    - both ports of the sample needle outlet union
    - ports 1, 2, 3, and 4 of 6-port valve A
    - inlet of sample drain bulkhead

6.7.1 Sample Handling System (cont.)

12. Turn off the sample pressurize valve by pressing **3**.

13. Turn on the sample transfer valve by pressing **4**.

14. The following fittings can now be checked:

    - output of the sample transfer valve
    - ports 5 and 6 of 6-port valve A
    - all three ports of the transfer tee union
    - inside and outside connections of the transfer line bulkhead union
    - transfer line connections to the sampler

15. Turn off the sample transfer valve by pressing **4** again.

16. Press **F4 (Exit)**.

17. Press **F2 (Outputs)**.

18. Press **F1 (Motors)**.

19. Be sure you are clear of the elevator mechanism. Press **3** to start the elevator.

20. The elevator will move down and eject the vial. When the elevator reaches its lower limit of travel, the AQUATek 50 will beep.

21. Turn the elevator off by pressing **3** again.

22. Press **F4 (Exit)**.

23. Remove the cap nut from the sample drain bulkhead.

6.7.2 Internal Standard Handling System

1. Install a clean, dry internal standard vessel on the front panel mount, and install an internal standard dip tube.

2. Place a cap nut (p/n 14-0678-116) on the Internal Standard drain bulkhead.

3. Press **F2 (Sol.)**.

4. Turn on the internal standard pressurize and drain the valves by pressing **1** and **2** respectively.

6.7.2 Internal Standard Handling System (cont.)

5. The following fittings can now be checked:

   - outlet of the internal standard pressurize valve
   - inside connection for the internal standard mount fitting
   - internal standard glassware
   - dip tube connections to the mount and bulkhead union inlet
   - inside of the bulkhead union
   - ports 1, 2, 3, and 4 of 6-port valve B
   - inlet and outlet of the drain valve
   - inlet of the internal standard drain bulkhead union

6. Turn off the internal standard pressurize and drain valves by pressing **1** and **2** again.

7. Turn on the internal standard transfer valve by pressing **5**.

8. The following fittings can now be checked:

   - outlet of the internal standard transfer valve
   - ports 5 and 6 of 6-port valve B

9. The following fittings are checked when performing the Sample Transfer check, but can also be checked now:

   - all three ports of the transfer line tee union
   - inside and outside connections of the transfer line bulkhead union
   - transfer line connection to the sampler

10. Turn off the internal standard transfer valve by pressing **5**.

11. Remove the cap nut from the internal standard drain bulkhead.

12. Exit the test program by pressing **F4 (Exit)** twice.

13. Replace the right side panel before continuing to operate the AQUATek 50.

7.1 Overview of the Section

The first portion of this section of the manual explains:

- the AQUATek 50 diagnostics program
- components and the corresponding code numbers that appear on the screen during an error
- inputs and outputs

The latter part of Section 7 contains information on handling the most common trouble areas. If you need additional assistance with your instrument, please call the Tekmar Service Department at (800) 874-2004 or collect at (513) 247-7000. Please observe all warnings and cautions noted at the beginning of this manual.

⚠ CAUTION

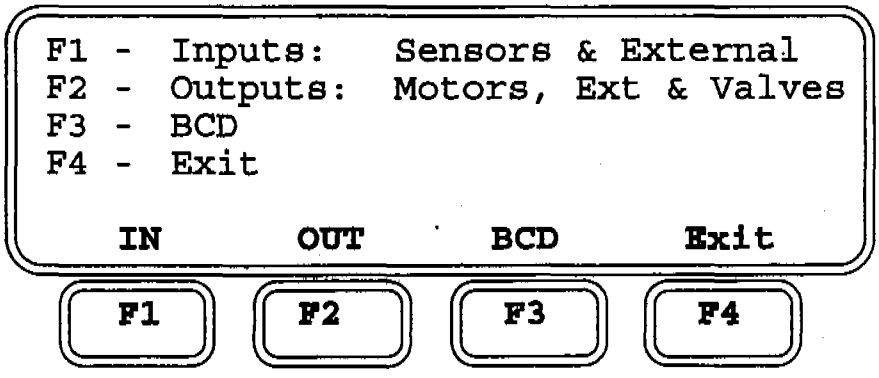
To prevent damage to the AQUATek 50, remove all vials from the unit before troubleshooting.

7.2 Diagnostics Program

The AQUATek 50 ROM has a diagnostics program which allows the user to verify the correct operation of individual inputs and outputs. The system must be in the Standby mode to access this program.

Press **F4 (Conf)** key then depress the **F2 (Test)** key.

The Diagnostics main menu will be displayed as:



Pressing **F4 (Exit)** from the diagnostics main menu will display the configuration screen.

7.2.1 AQUATek 50 Component Reference Designations

The following tables name the AQUATek 50 components and their corresponding reference designations.

Reference Designation	*Description*
Sensor Inputs	
S1	Ram Location
S2	Advancer Start of Stroke
S3	Vial Location on Ramp
S4	Elevator Upper Position
S5	Elevator Lower Position
S6	Cooler Door
S7	Valve Access Door
S8	Priority Sample Door
S9	Spare

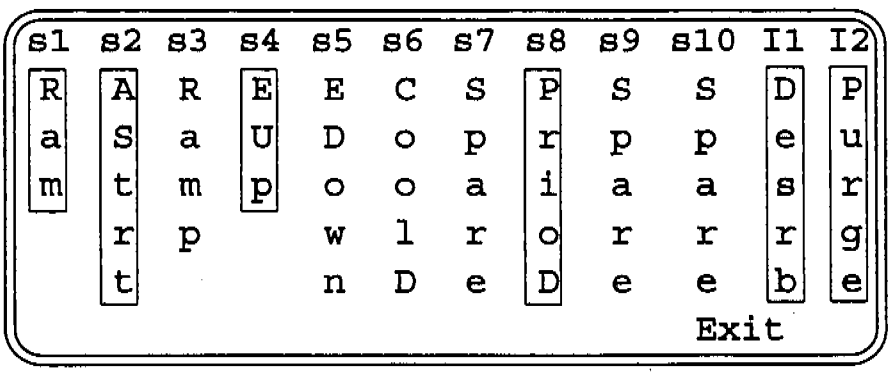
Motor Outputs	
MI	Ram
M2	Advancer
M3	Elevator

Solenoid Valves	
v1	Internal Std Pressurize
v2	Internal Standard Drain
v3	Sample Vial Pressurize
v4	Sample Loop Transfer
v5	Internal Std Loop Transfer
v6	Rinse Water Supply
v7	Backflush Valve
v8	Purge Valve
v9	Sample Drain

6-Port Valve Output	
vA	Sample Loop, 6-Port
vB	Internal Std Loop, 6-Port

7.2.2 Diagnostic Program Inputs

Press **F1 (In)** from the Diagnostics main menu to display the following input menu:



7.2.3 Diagnostic Program Outputs

1. Press **F2 (Out)** from the Diagnostics main menu to display the following Output menu:

```
F1 - Motors & External Output
F2 - Solenoid Valves
F3 - 6 Port Valves
  Motor     Sol.     6 Port   Exit
```

2. Press **F4 (Exit)** from the Output menu to display the Diagnostics main menu.

> **⚠ WARNING**
>
> **Moving parts present. All panels and doors to be installed. Do not open the priority sample door during any of the motor diagnostic tests.**

7.2.4 Motors and External Outputs

Press **F1 (Motor)** from the Output menu to display the following options:

```
m1   Ram                 e5  Start Output
m2   Advancer
m3   Elevator

 (press motor / ext # to toggle)
RO     RUN                            Exit
```

When a motor is running, an * will appear beside the R in "RO" at the lower left hand side of the screen above. If a motor is overloaded, an * will appear to the right of the O.

7.2.5 Solenoid Valve Outputs

Press **F2 (Sol.)** from the Output menu to display the following screen:

```
v1 IS Pressure     v5  IS Loop Transfer
v2 IS Drain        v6  Blank Water
v3 Smpl Press.     v7  Backflush
v4 Smpl Trans.     v8  Purge
                   v9  Smpl Drain
(press valve # to toggle)
                                  Exit
```

7.2.6 Switching Valve(s) Outputs

Press **F3 (6 Port)** from the Output menu to display the following options:

```
Load 1 (vA) Sample Loop
Load 2 (vB) Internal Standard Loop

 (press # to toggle)
                              Exit
```

7.2.7 Diagnostic BCD Program

1. Press **F3 (BCD)** from the Diagnostics main menu to display the following BCD option:

```
Current:   0
Minimum:   0        Maximum: 99
Value to Output:
(Press ENTER for no change)
```

This screen shows the current BCD value. You must enter a new value to be output or press **Enter** for no change. After pressing **Enter** the following screen is displayed:

```
BCD test
Value written: x x

                        Value    Exit
```

F3 **F4**

2. Press **F3 (Value)** to enter a new value to be written.

3. Press **F4 (Exit)** to return to the diagnostics main menu.

7.3 Display Problems

Press and hold the Page Up key for several seconds while viewing the display. If the display doesn't appear press and hold the Page Down key while viewing.

#1 No Display

A. Turn the unit off and check if fuses F1, F2, and F3 are still good?
- YES: Proceed to B.
- NO: Replace with same type and rating and try again.

B. Turn unit off & on. Does display appear?
- YES: System is reset.
- NO: Check input power transformer and wiring. Repair or replace CPU board.

7.4 Concentrator I/O Problems (for the 2000 with ROM v1.8 and above or 3000)

#1 AQUATek 50 does not wait for concentrator Purge Ready signal

A. Is J6 jumpered on Multi-function Board?
- YES: Proceed to B.
- NO: Move jumper from J5 to J6.

B. Remove I/O cable from rear panel of concentrator. Does unit wait for the ready signal?
- YES: Check concentrator Purge Ready signal. There should be constant contact closure during Purge Ready on pins #15 and #16.
- NO: Unplug I/O cable from AQUATek 50 then proceed to C.

C. Does unit wait for ready signal?
- YES: Replace I/O cable-LSC-2 (#14-3783-000) 2000 or 3000 (#14-4352-086).
- NO : Unplug 20-conductor ribbon cable from Multi-function Board. Proceed to step D.

7.4 Concentrator I/O Problems (#1 cont.)

D. Does unit now wait for ready signal?
- YES: Replace 20 conductor I/O cable (#14-3692-000).
- NO: Replace Multi-function Board (#14-3750-000).

#2 AQUATek 50 does not wait for beginning of Desorb signal

A. Is J4 jumpered on Multi-function Board?
- YES: Proceed to B.
- NO: Move jumper from J3 to J4.

B. Remove I/O cable from rear panel of concentrator. Does unit wait for Desorb signal?
- YES: Check concentrator for correct beginning of Desorb signal. There should be a 4 sec. contact closure on pins #19 and #20.
- NO: Unplug I/O cable from AQUATek 50. Proceed to Step C.

C. Does unit now wait for beginning of Desorb signal?
- YES: Replace I/O cable-LSC-2 (#14-3783-000) 2000 or 3000 (#14-4352-086).
- NO: Unplug 20-conductor ribbon cable from Multi-function Board. Proceed to step D.

D. Does unit now wait for beginning of Desorb signal?
- YES: Replace 20-conductor ribbon cable (#14-3692-000).
- NO: Replace Multi-function Board (#14-3750-000).

#3 AQUATek 50 does not step into Prepurge automatically

A. Are both units in Auto mode?
- YES: Proceed to B.
- NO: Press Auto Key(s).

B. Disconnect AQUATek I/O cable from concentrator.

7.4 Concentrator I/O Problems (#3 cont.)

For LSC-2

Jumper Pins #1 and #3 on 8-Pin connector at concentrator end of I/O cable. Does unit step into Prepurge?	YES:	Check concentrator for correct Purge Ready signal.
	NO:	Proceed to step C.
Does D.C. voltage drop from 5V to 0V for approximately 2 seconds?	YES:	Problem is with cable connection.
	NO:	Disconnect I/O cable from AQUATek 50. Proceed to step C.

For 2000 or 3000

Jumper Pins #15 and #16 on 25-pin "D" type connector at concentrator end of I/O cable. Does unit step into Prepurge?	YES:	Check concentrator for constant contact closure during Purge Ready on pins #15 and #16.
	NO:	Proceed to step C.
C. Disconnect concentrator I/O cable from AQUATek 50. Jumper pins #1 and #5 of concentrator I/O receptacle. Does unit now step into Prepurge?	YES:	Replace I/O cable- (#14-4352-086)
	NO:	Problem with Ribbon cable (#14-3692-086) or the Multi-function Board.
A. Is concentrator in Auto Mode?	YES:	Proceed to step B.
	NO:	Select Auto Mode.

#4 Concentrator does not step to Purge

B. Disconnect I/O cable from concentrator. Check D.C. voltage while stepping the AQUATek 50 from Pressurize to Sample Transfer.

For LSC-2

Check for 5 volts D.C. across pin #3 of 8-pin connector and the orange or brown wire from screw terminal #8. Voltage should drop to 0 volts when the AQUATek 50 steps from Pressurize to Sample Transfer.

C. Does D.C. voltage drop from 5V to 0V for approximately 2 seconds?	YES:	Problem is with concentrator.
	NO:	Disconnect I/O cable from AQUATek 50. Proceed to step D.

7.4 Concentrator I/O Problems (#4 cont.)

For 2000 or 3000

Check D.C. voltage between pins #1 and #2 on 25-Pin "D" type connector at concentrator end of I/O cable.

Does D.C. voltage drop from 5V to 0V for approximately 2 seconds?	YES:	Problem is with concentrator.
	NO:	Disconnect I/O cable from AQUATek 50. Proceed to step D.
D. Does D.C. voltage drop from 5V to 0V between pins #5 and #7 on 9-pin concentrator receptacle for 2 seconds, when unit is stepped from Pressurize to Sample Transfer?	YES:	Replace I/O cable- (#14-4352-086)
	NO:	Problem is with ribbon cable (#14-3692-086) or the Multi-function Board. Proceed to E.
E. Does D.C. voltage drop between pins #16 and #17 on 20-pin header on Multi-function Board from 5V to 0V for 2 seconds when unit is stepped from Pressurize to Sample Transfer?	YES:	Replace I/O cable (#14-3692-000).
	NO:	Replace Multi-function Board (#14-3750-000).

#5 AQUATek 50 does not step to Desorb

A. Are both units set-up for Auto Operation mode?	YES:	Proceed to step B.
	NO:	Select Auto mode(s).

B. Disconnect AQUATek 50 I/O cable from concentrator.

For LSC-2

Short spade lug terminals (the black and blue wires) together. Does unit proceed to Desorb?	YES:	Check concentrator for beginning of Desorb signal. There should be constant contact closure across the T-2 connector during Desorb.
	NO:	Proceed to C.

7.4 Concentrator I/O Problems (#5 cont.)

For 2000 or 3000

Jumper pins #19 and #20 of I/O cable together. Does unit now step into Desorb?	YES:	Check concentrator for beginning of Desorb signal.
	NO:	Proceed to C.
C. Disconnect I/O cable from AQUATek 50. Jumper pins #5 and #6 of the 9-pin concentrator I/O receptacle Does unit now step to Desorb?	YES:	Replace I/O cable-(#14-4352-086).
	NO:	Problem with ribbon cable (#14-3692-086) or Multi-function Board.

7.5 BCD Interface Problems

This section is used when there is a discrepancy between the vial count displayed on the screen and the BCD signal.

Pin Out for BCD Output Cable (#14-3871-000)

BCD Output	*Wire Color*	*BCD Receptacle (9-Pin)*
Ground	Black	1
BCD Bit 1	White	2
BCD Bit 3	Red	3
BCD Bit 5	Green	4
BCD Bit 7	Brown	5
BCD Bit 0	Blue	6
BCD Bit 2	Orange	7
BCD Bit 4	Yellow	8
BCD Bit 6	Purple	9

7.5 BCD Interface Problems (cont.)

Pin out - AQUATek 50 20-Conductor Multi-Function Board

BCD 9-Pin Plug	*20-Pin Header On I/O Board*	
1	Ground	2
2	BCD Bit 1	4
3	BCD Bit 3	6
4	BCD Bit 5	8
5	BCD Bit 7	10
6	BCD Bit 0	3
7	BCD Bit 2	5
8	BCD Bit 4	7
9	BCD Bit 6	9

BCD Conversion Chart

TEN's	ONE's	
0 0 0 0	0 0 0 0	= 00
0 0 0 1	0 0 0 1	= 11
0 0 1 0	0 0 1 0	= 22
0 0 1 1	0 0 1 1	= 33
0 1 0 0	0 1 0 0	= 44
0 1 0 1	0 1 0 1	= 55
0 1 1 0	0 1 1 0	= 66
0 1 1 1	0 1 1 1	= 77
1 0 0 0	1 0 0 0	= 88
1 0 0 1	1 0 0 1	= 99
Bit 4	Bit 0	
Bit 5	Bit 1	
Bit 6	Bit 2	
Bit 7	Bit 3	

0 = 0 volts D.C. or Low 1 = 5 volts D.C. or High

Examples of BCD Output Signals

Ten's	*One's*		
0 0 1 0	0 1 1 1	=	#27
0 1 0 0	0 0 0 1	=	#41
0 1 0 1	0 0 0 0	=	#50
0 0 0 0	0 0 0 0	=	# 0
BIT (7)(6)(5)(4)	(3)(2)(1)(0)		

7.6 BCD Signal Diagnosis

Note: When Priority Sample is being run, the BCD signals 0. After Priority Sample is completed, the count resumes where it left off.

To diagnose a BCD signal error use the following procedure.

A. Is signal correct at output end of BCD cable?	YES:	Problem is not with AQUATek 50.
	NO:	Proceed to step B.
B. Is signal correct at BCD plug on rear panel of AQUATek 50?	YES:	Replace BCD cable (#14-3871-000).
	NO:	Proceed to step C.
C. Is signal correct at 20-pin header of Multi-function Board?	YES:	Replace ribbon cable (#14-3692-000).
	NO:	Replace Multi-function Board (#14-3750-000).

7.7 Valve Actuation Problems

#1 Sample was not transferred to concentrator

To follow the troubleshooting information in this section, set the autosampler and concentrator in Auto Operation mode and set the concentrator in Purge during the Sample Transfer.

A. Are flow rates and pressure setting correct?	YES:	Proceed to step B.
	NO:	Refer to AQUATek 50 Manual, Section 3.
B. Load an empty vial into unit using priority sample procedure (see Section 5.10) and step unit to Pressurize. Place unit in Hold mode. Is there gas flow from sample drain bulkhead?	YES:	Proceed to step I.
	NO:	Proceed to step C.
C. Unplug connector from positions v3 and v9 on Multi-function Board. Do valves v3 and v9 deactivate?	YES:	Proceed to step E.
	NO:	Proceed to step D.

7.7 Valve Actuation Problems (#1 cont.)

D. Verify D.C. voltage at headers v3 and v9 on Multi-function board. Is voltage approximately 12V DC?	YES: NO:	Replace valve v3 and/or v9. Replace Multi-function Board (#14-3750-000).
E. Is there gas flow going into port #3 of the 6-port valve?	YES: NO:	Proceed to step F. Check the needle filter and the flow path for a clog or leak.
F. Is there gas flow coming out port #2 of the 6-port valve (vA)?	YES: NO:	Proceed to G. Check the Sample Loop or the 6-port valve for a clog.
G. Step unit from Pressurize to Sample Transfer. Did the 6-port valve vA actuate?	YES: NO:	Proceed to J. Remove 6-port logic cable from the valve vA and proceed to H.
H. Check for 5V DC on orange wire to chassis ground of 6-pin connector on valve end of cable. When unit is stepped to Sample Transfer, does voltage drop to 0V for one second?	YES: NO:	Trouble may be with the 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures. Remove 6-port logic cable from header P6 on the Multi-function Board. Proceed to I.
I. Check for 5V DC on pin associated with orange wire of connector P6 on the multi-function board? Does the voltage drop to 0V for one second when the unit is stepped to Sample Transfer?	YES: NO :	Replace 6-port valve logic cable (#14-3897-000). Replace Multi-function Board (#14-3750-000).
J. While unit is in Hold, step unit to Sample Transfer. Disconnect transfer line from AQUATek 50. Is there gas flow from the transfer bulkhead?	YES: NO:	This condition would indicate a block or a leak in the transfer line. Proceed to step K.

7.7 Valve Actuation Problems (#1 cont.)

K. Unplug connector #23 from v4 on Multi-function Board. Does valve v4 deactivate?	YES: Proceed to step M. NO: Proceed to step L.
L. Verify D.C. voltage at header v4 on Multi-function Board. Is voltage approximately 12V DC?	YES: Replace valve v4 (#14-3683-200). NO: Replace Multi-function Board (#14-3750-000).
M. Is there gas flow coming into Port#5 of the 6-port valve vA?	YES: Proceed to step N. NO: Check the plumbing and the flow path for a clog or a leak.
N. Step unit from Sample Transfer to I.S. Transfer. Did the 6-port valve (vA) rotate?	YES: Normal operation NO: Remove 6-port logic cable from valve vA. Proceed to step O.
O. Step unit to sample transfer and check for 5V DC on green wire to chassis ground of 6-pin connector on valve end of cable. Does voltage go to 0V for one second when unit is stepped to Internal Standard Transfer?	YES: Trouble may be with 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures NO: Remove 6-port logic cable from header P6 on Multi-function Board. Proceed to step P.
P. Check for 5V DC on pin associated with green wire on connector P6 of multi-function board. Does voltage go to 0V for one second when unit is stepped to Internal Standard Transfer?	YES: Replace 6-port valve logic cable (#14-3897-000). NO: Replace Multi-function Board (#14-3750-000).

7.7 Valve Actuation Problems (cont.)

#2 *Internal Standard was not transferred to concentrator*

A. Are flow rates and pressure setting correct?	YES: NO:	Proceed to step B. Refer to AQUATek 50 manual Section 3.
B. Load empty I.S. vessel. Place unit in Hold. Step unit to Pressurize. Is there gas flow from I.S. drain?	YES: NO:	Proceed to step I. Proceed to step C.
C. Unplug connector from v1 on Multi-function Board. Does valve v1 actuate?	YES: NO:	Proceed to step E. Proceed to step D.
D. Verify DC voltage at header v1 on Multi-function Board. Is voltage approximately 12V DC?	YES: NO:	Replace valve v1 (#14-3683-000). Replace Multi-function Board (#14-3750-000).
E. Unplug connector from v2 on Multi-function Board. Does valve actuate?	YES: NO:	Proceed to step G. Proceed to step F.
F. Verify DC voltage at header v2 on Multi-function Board is approximately 12V DC?	YES: NO:	Replace valve v2 (#14-5137-050). Replace Multi-function Board (#14-3750-000).
G. Is there gas flow going into Port #3 of the 6-port valve vB?	YES: NO:	Proceed to step H. Check the plumbing and the flow path for a clog or leak.
H. Is there gas flow going out of port #2 of the 6-port valve vB?	YES: NO:	Proceed to I. Check the Internal Standard Loop and the 6-port valve for a clog or a leak.

7.7 Valve Actuation Problems (#2 cont.)

I.	Step unit from Pressurize to I.S. Transfer. Did the 6-port valve (vB) actuate?	YES: Proceed to step L. NO: Remove the 6-port valve logic cable from valve vB. Proceed to step J.
J.	Check for 5V DC on red wire to chassis ground of 6-pin connector on valve end of cable. Does voltage drop to 0V for one second when unit is stepped to Internal Standard Transfer?	YES: Trouble may be with 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures. NO: Remove the 6-port logic cable from header P6 on Multi-function Board. Proceed to step K.
K.	Check for 5V DC on pin associated with red wire to chassis ground connector P6 of multi-function board. Does voltage drop to 0V for one second when unit is stepped to Internal Standard Transfer?	YES: Replace 6-port valve logic cable (#14-3897-000). NO: Replace the Multi-function Board (#14-3750-000).
L.	While unit is in Hold, step unit to I.S. Transfer. Disconnect transfer line from AQUATek 50. Is there gas flow from the transfer bulkhead?	YES: This condition would indicate a blocked transfer line. NO: Proceed to step M.
M.	Unplug connector from v5 on Multi-function Board. Does valve v5 actuate?	YES: Proceed to step O. NO: Proceed to step N.
N.	Verify DC voltage at header v5 on Multi-function Board. Is voltage approximately 12V DC?	YES: Replace valve v5 (#14-3683-300). NO: Replace Multi-function Board (#14-3750-000).
O.	Step the unit out of Internal Standard Transfer. Did the 6-port valve (vB) actuate?	YES: Normal operation. NO: Remove the 6-port logic cable from valve vB and proceed to step P.

7.7 Valve Actuation Problems (#2 cont.)

P. Step the unit to Internal Standard Transfer and check for 5V DC on black wire to chassis ground of 6-pin connector on valve end of cable. Does voltage go to 0V for one second when the unit is stepped out of Internal Standard Transfer?	YES:	The trouble may be with the 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures.
	NO:	Remove the 6-port logic cable from header P6 on Multi-function Board and proceed to Q.
Q. Check for 5V DC on pin associated with black wire on connector P6 of Multi-function Board. Does voltage go to 0V for one second when the unit is stepped out of Internal Standard Transfer?	YES:	Replace 6-port valve logic cable (#14-3897-000).
	NO:	Replace Multi-function Board.

#3 Unit won't backflush the filter

Step the unit to the Backflush Filter mode and press the Hold key.

A. Is there rinse water exiting to the sample drain?	YES:	Normal operation.
	NO:	Check the rinse water supply and proceed to B.
B. Disconnect the v6 connector from the multi-function Board. Does the valve v6 activate?	YES:	Proceed to step D.
	NO:	Proceed to step C.
C. Is there voltage at the v6 connector of the Multi-function Board?	YES:	Replace the valve v6.
	NO:	Check the fuses. If they're okay, replace the Multi-function Board.
D. Disconnect the v7 connector from the Multi-function Board. Does the valve v7 actuate?	YES:	Check plumbing and flow path for a clog or leak.
	NO:	Proceed to E.
E. Is there 12V DC at the v7 connector of the Multi-function Board?	YES:	Replace the v7 valve.
	NO:	Replace the Multi-function Board.

7.7 Valve Actuation Problems (cont.)

#4 Unit won't backflush the needle

Step the unit to Backflush Needle mode and press the Hold key.

A. Is there gas flow out of the valve v8?	YES: Proceed to step D. NO: Proceed to step B.
B. Disconnect the v8 connector from the Multi-function Board. Did the valve v8 actuate?	YES: Check for a clog in valve v8 or gas supply. NO: Proceed to step C.
C. Is there voltage at the v8 connector of the Multi-function Board?	YES: Replace valve v8. NO: Replace the Multi-function Board.
D. Is there gas flow out of port #1 of the 6-port valve vA?	YES: Proceed to step E. NO: Check for a clog in 6-port valve vA. Proceed to valve vA actuation problems. If not clogged, proceed to 7.7, #1, step G.
E. Is there flow into port #4 of the valve vA?	YES: Proceed to step F. NO: The sample loop is clogged. Sonicate or replace the sample loop.
F. Is there flow out of the #3 port of the 6-port valve vA?	YES: Proceed to G. NO: The 6-port valve or sample loop is clogged.
G. Is there flow out of the normally open port of valve v7?	YES: Check needle for a clog. NO: Proceed to H.
H. Is there flow out of the filter?	YES: Proceed to I. NO: Check filter for a clog. Sonicate or replace filter.
I. Disconnect connector v7 from the Multi-function Board. Did valve v7 actuate?	YES: Replace Multi-function Board (#14-3750-000). NO: Check valve v7 for a clog or leak.

7.7 Valve Actuation Problems (cont.)

#5 *Sample Loop is not flushed during Rinse Fill of Desorb mode*

A. Is water supply to blank water filter on?	YES:	Proceed to step B.
	NO:	Turn on water supply.
B. Is water pressure regulator at correct setting?	YES:	Proceed to step D.
	NO:	Correct pressure setting. Proceed to step C.

C. If you cannot achieve correct pressure setting, there may be a blocked line or filter.

D. From the Standby screen, turn the line rinse on. Do you see rinse water exiting the sample drain fitting?	YES:	Normal operation.
	NO:	Proceed to step E.
E. Disconnect connector v6 from the Multi-function Board. Did valve v6 actuate?	YES:	Proceed to step G.
	NO:	Proceed to F.
F. Check D.C. voltage between pins on header v6. Is voltage approximately 12V DC?	YES:	Replace valve v6.
	NO:	Replace Multi-function Board (#14-3750-000).
G. Is 6-port valve (vA) in load position? Check output screen -- see section 7.2.6.	YES:	Proceed to step H.
	NO:	Proceed to J.
H. Disconnect connector v9 from Multi-function Board. Did valve v9 actuate?	YES:	Check 6-port valve and sample loop for clog.
	NO:	Proceed to I.
I. Check for voltage between the pins on header v9. Is there approximately 12V DC?	YES:	Replace valve v9.
	NO:	Replace the Multi-function Board.
J. Step the unit to Sample Transfer. Did the 6-port valve vA rotate?	YES:	Proceed to H.
	NO:	Remove the 6-port valve logic cable from valve vA and proceed to step J.

7.7 Valve Actuation Problems (#5 cont.)

K. Check for 5V DC on orange wire to chassis ground of 6-pin connector on the valve end of the cable. Does voltage drop to 0V for one second when unit is stepped to Sample Transfer?	YES:	The trouble may be with the 6-port valve. Contact the Tekmar Service Dept. for further troubleshooting.
	NO:	Remove the 6-port logic cable from header P6 on the Multi-function Board. Proceed to L.
L. Check for 5V DC on pin associated with orange wire of connector P6 of Multi-function board. Does voltage drop to 0V for one second when unit switches from Rinse:Fill to Rinse:Transfer?	YES:	Replace 6-port valve logic cable (#14-3897-000).
	NO:	Replace Multi-function Board (#14-3750-000).

#6 Sample Loop is not transferred during Rinse Transfer of Desorb mode

A. Turn on the line rinse - after 10 seconds, does the rinse water exit the sample drain and sample transfer line?	YES:	Normal operation.
	NO:	Proceed to B.
B. Unplug connector #23 from v4 on Multi-function Board. Does valve v4 actuate?	YES:	Proceed to step D.
	NO:	Proceed to step C.
C. Is there approximately 12V DC voltage at header v4 on the Multi-function Board?	YES:	Replace valve v4 (#14-3683-200).
	NO:	Replace Multi-function Board (#14-3750-000).
D. Does the 6-port valve vA rotate when the unit goes to the Rinse Transfer mode?	YES:	Check plumbing and flow path.
	NO:	Proceed to step E.
E. When unit is in Rinse: Transfer is the rinse water exiting the sample drain?	YES:	Remove the 6-port logic cable from valve vA. Proceed to step F.
	NO:	Normal operation.

7.7 Valve Actuation Problems (#6 cont.)

F. Check for 5V DC on orange wire to chassis ground of 6-pin connector on valve end of cable. Does voltage drop to 0V for one second when unit switches from Rinse:Fill to Rinse:Transfer?

YES: Trouble may be with 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures.

NO: Disconnect 6-port logic cable from Header P6 on Multi-function Board. Proceed to step G.

G. Check for 5V DC on pin associated with orange wire of connector P6 of multi-function board. Does voltage drop to 0V for one second when unit switches from Rinse:Fill to Rinse:Transfer?

YES: Replace 6-port logic cable (#14-3897-000).

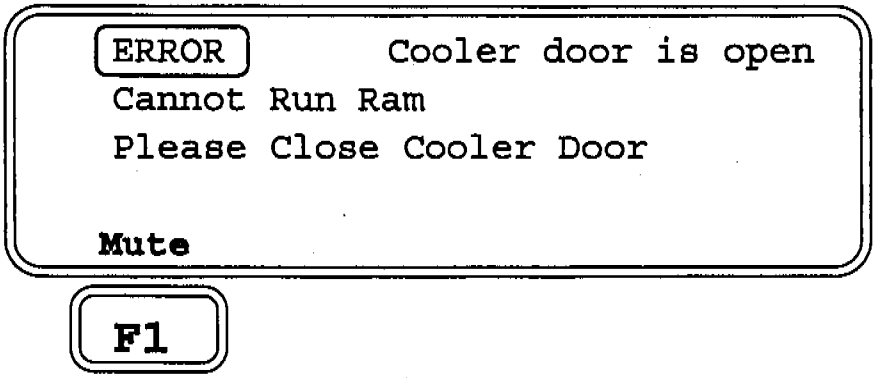
NO: Replace Multi-function Board (#14-3750-000).

7.8 Mechanisms and Sensor Errors

Motors are 12V DC. Sensors are snap action with actuators. The sensors are wired normally open.

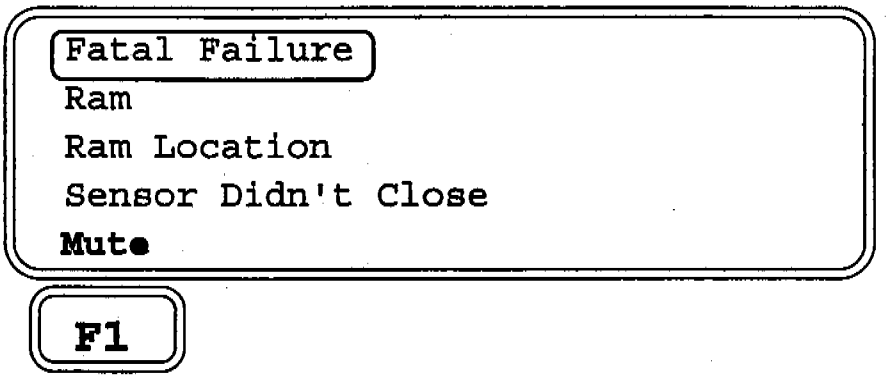
7.8.1 Cooler Door Sensor Error

The cooler door must be closed for the vial ram mechanism to operate. If it is open before the ram moves, the error screen will come up:



7.8.1 Cooler Door Sensor Error (cont.)

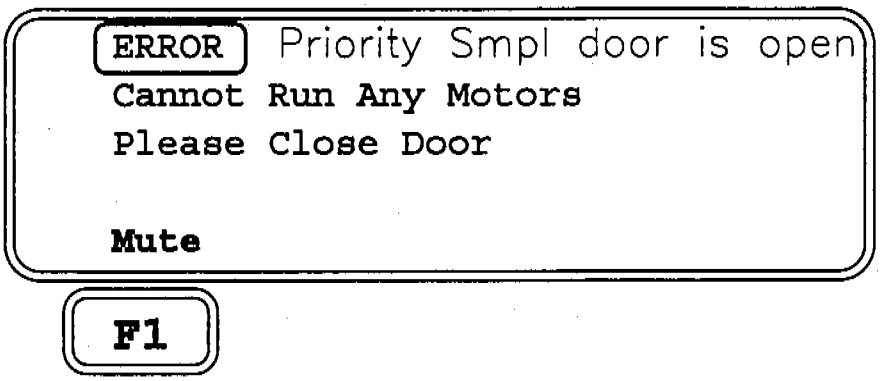
If the door opens during ram movement, a fatal failure screen will come up:



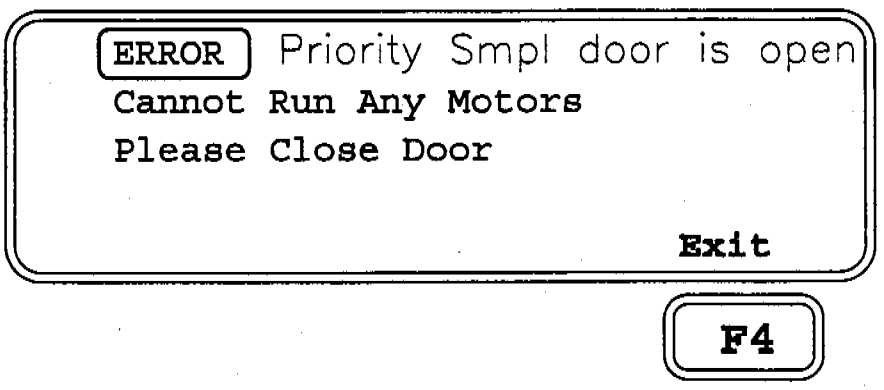
1. Press **F1 (Mute)** to silence the alarm.
2. Close the cooler door.
3 Press **F4 (Exit)** to exit error mode and try again.

7.8.2 Priority Sample Door Sensor Error

The Priority Sample door must be closed for all mechanisms to operate. If the door should open while the elevator is running, the mechanism will stop and an alarm will sound. The following screen will appear:



1. Press **F1 (Mute)** to silence alarm.



2. Press **F4 (Exit)** to exit the error mode and try again.

7.9 Mechanism Errors

7.9.1 Vial Advancer Errors

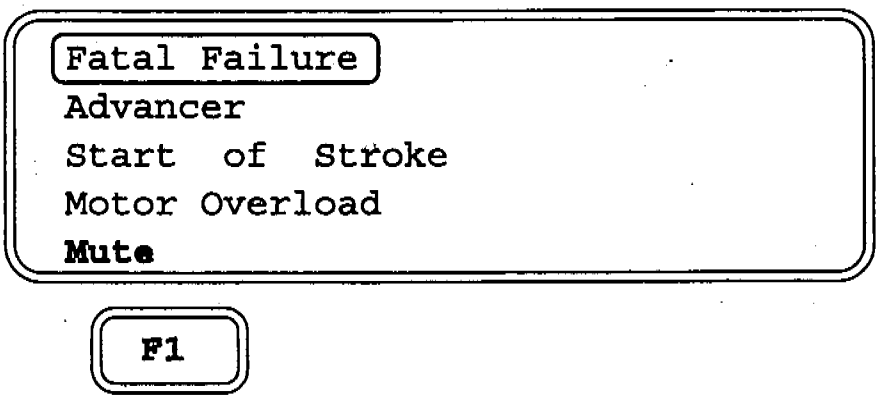
There is a circuit which will detect a motor overload. This overload would be caused by one of the following:

1. A faulty motor

2. A mechanical jam due to mechanism misalignment

3. A faulty multi-function board

At the time of the failure there will be an audible alarm and the following type of screen will be displayed:

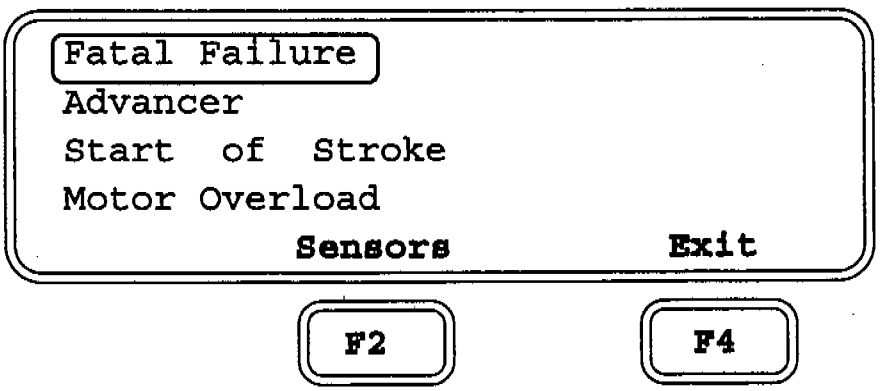


#1 Motor Overload Errors

1. Press **F1 (Mute)** to silence alarm.

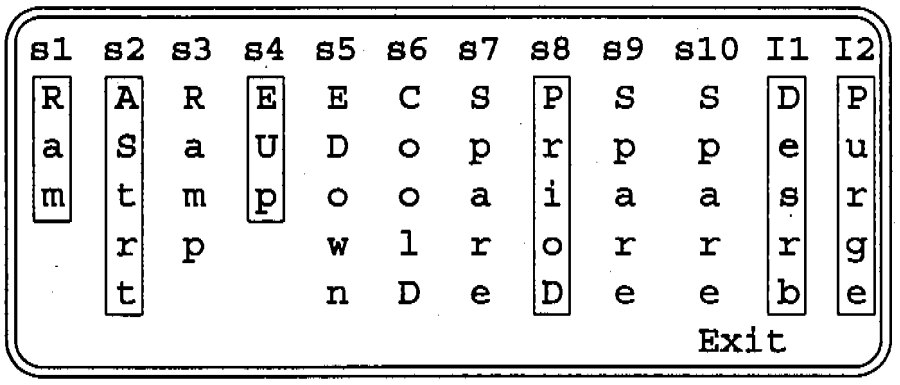
**** DO NOT PANIC ****

The circuitry will detect an overload and cut all power to the motor.



7.9.1 Vial Advancer Errors (#1 cont.)

2. Press **Sensors (F2)** to access the sensor screen:



Note: If a valve indicated on the sensor screen is highlighted, it is closed.

3. Do not press **F4 (Exit)** until the situation is examined.

⚠ CAUTION

Pressing F4 (Exit) will cause the mechanism to try to advance the next vial.

DIAGNOSIS:

A. Lift the Priority Sample Door. Is there more than one vial on the ramp?
   - YES: Proceed to D.
   - NO: Switch S3 (vial on ramp) is okay. Proceed to B.

B. The failure is due to a mechanical jam. Was failure caused by vial wedged in mechanism?
   - YES: Remove vials and restart.
   - NO: Proceed to C.

C. Motor overload is due to misalignment of assembly. Remove assembly and make necessary adjustments.

D. Failure is cause by S3 (vial on ramp) sensor. Press "Sensors" and press down on ramp switch "S3". Does "S3" on the screen darken?
   - YES: Remove vials and restart.
   - NO: Proceed to E.

7.9.1 Vial Advancer Errors (#1 cont.)

E. Unplug cable #16 on header P9 on the Multi-function board. Is there continuity across pin #3 and #4 of the plug when sensor S3 is activated?

YES: Replace the Multi-function Board.

NO: Replace sensor (#14-4705-028).

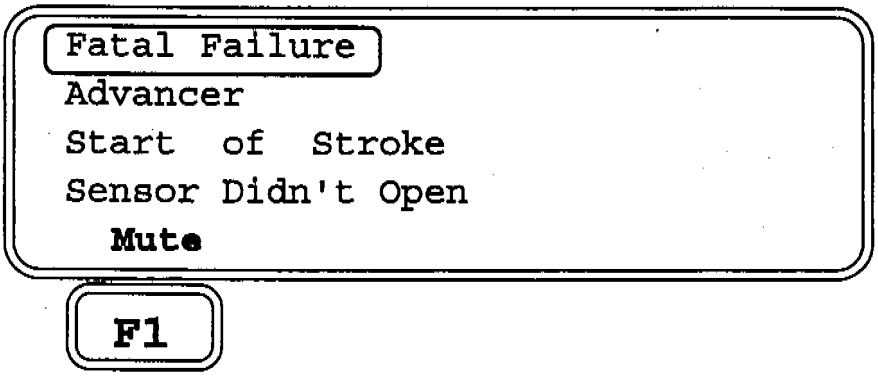
#2 *Start of Stroke Sensor Error*

The S2 (start of stroke) sensor is wired normally open. Lift the Priority Sample Door, and remove vials from the rack. There are two types of potential errors:

1. Start of stroke sensor didn't open.

2. Start of stroke sensor didn't close.

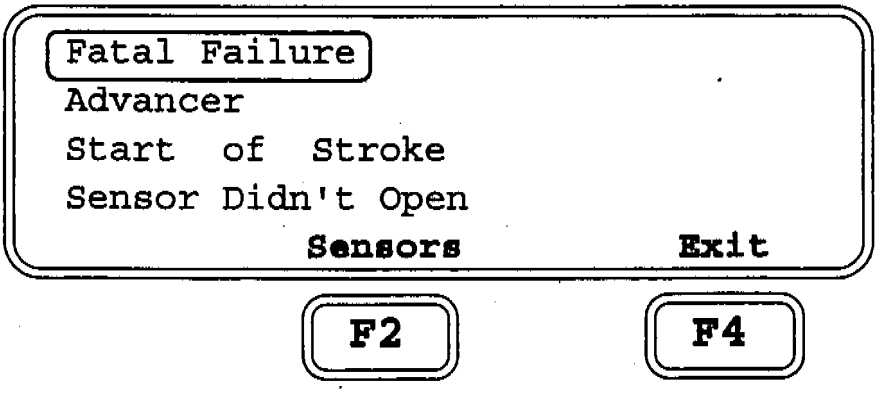
If the sensor didn't open, the screens and diagnostic procedures are:



1. Press **F1 (Mute)** to silence alarm.

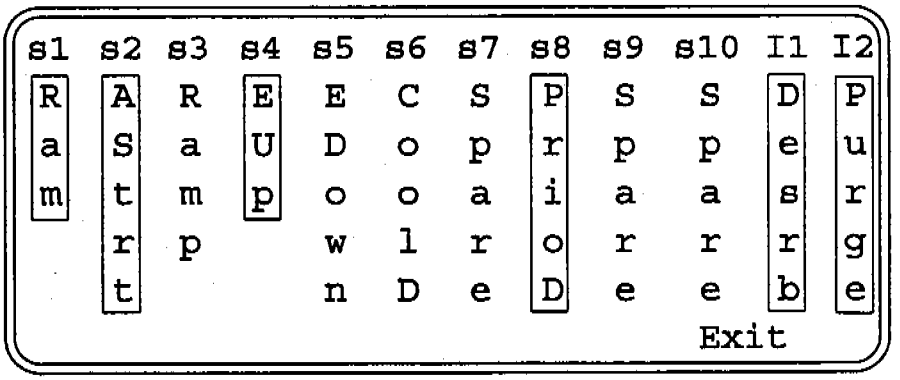
**** DO NOT PANIC ****

The circuitry is not functioning correctly, but will not cause damage to the unit at this point.



7.9.1 Vial Advancer Errors (#2 cont.)

2. Press **Sensors (F2)** to access the sensor screen:



3. Do not press **F4 (Exit)** until the situation is examined.

CAUTION

Pressing F4 (Exit) before thoroughly examining the situation may result in damage to the AQUATek 50.

DIAGNOSIS:

A. Did advancer motor turn on?	YES:	Proceed to B.
	NO:	Check fuses and proceed to F.
B. Did lever arm move off of S2?	YES:	Proceed to C.
	NO:	Proceed to D.
C. Exit to the test screen "Sensors" Is S2 darkened?	YES:	Replace the sensor.
	NO:	Proceed to D.
D. Unplug cable #18 from header on Multi-function Board. Is there continuity across pins #4 and #5 of plug when S2 is not actuated?	YES:	Replace sensor P5 (#14-4705-028).
	NO:	Proceed to E.

E. Failure is due to misalignment and/or sensor. Remove mechanism and make necessary adjustments.

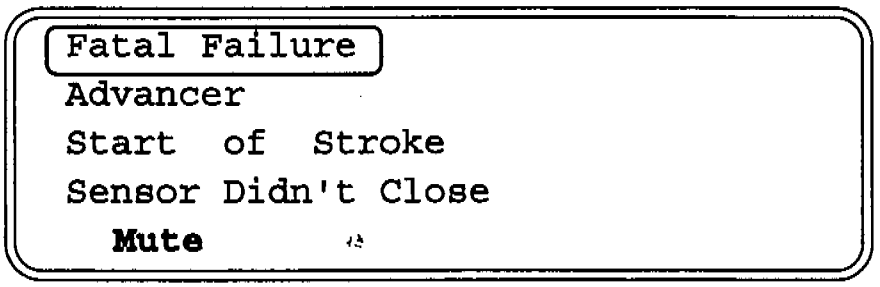
F. Unplug cable #18 from P5 header on Multi-function Board. Is there approximately 12V DC across pins 1 and 2 on header P5 when **F4 (Exit)** is pressed?	YES:	Proceed to step G.
	NO:	Replace the Multi-function Board (#14-3750-000).

7.9.1 Vial Advancer Errors (#2 cont.)

G. Plug cable #18 on P5 header on Multi-function Board. Unplug cable #18 leads from advancer motor (M2). Is there approximately 12V DC at motor end of cable when **F4 (Exit)** is pressed?

YES: Replace motor (#14-3553-018).
NO: Replace cable (#14-3680-000).

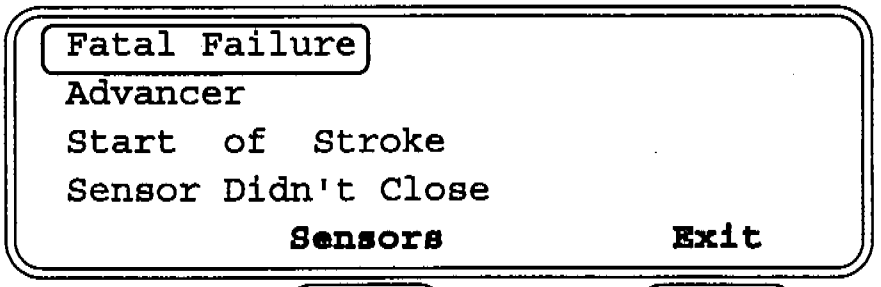
If the sensor didn't close, the screens and diagnostic procedures are:



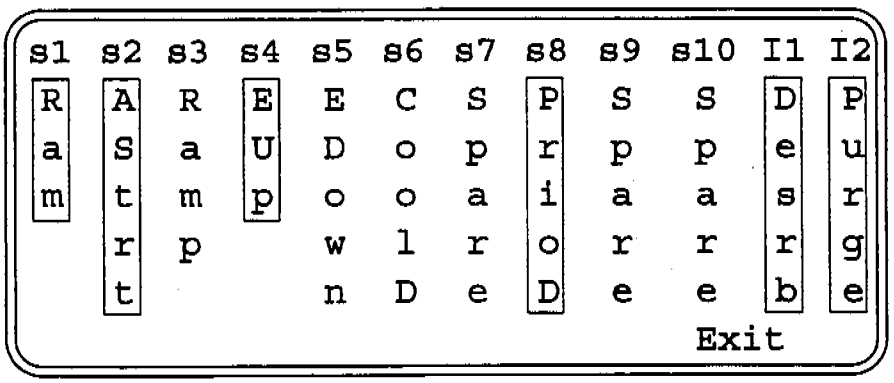
1. Press **F1 (Mute)** to silence the alarm.

**** DO NOT PANIC ****

The circuitry is not functioning correctly, and will not cause damage to the unit at this point.



2. Press **Sensors (F2)** to access the sensor screen:



7.9.1 Vial Advancer Errors (#2 cont.)

3. Do not press **F4 (Exit)** until the situation is examined.

> **⚠ CAUTION**
>
> **Pressing F4 (Exit) before thoroughly examining the situation may result in damage to the AQUATek 50.**

DIAGNOSIS:

A. Does vial advancer actuate S2 on return stroke and is there continuity across terminals common and normally open of sensor? Press **F4 (Exit)** to verify.	YES: NO:	Proceed to B. Check fuses and proceed to C.
B. Unplug cable #18 from header P5 on Multi-function Board. Is there continuity between Pins 1 & 2 of cable when S2 is actuated?	YES: NO:	Replace Multi-function Board. Replace the sensor.
C. Failure is due to misalignment of mechanism and/or sensor. Remove and make necessary adjustments.		

7.9.2 Ram Errors

There is a circuit which will detect a motor overload caused by jamming of the ram mechanism. At the time of the failure there will be an audible alarm and the following screens will come up:

```
Fatal Failure
Ram
Ram Location
Motor Overload
  Mute
```

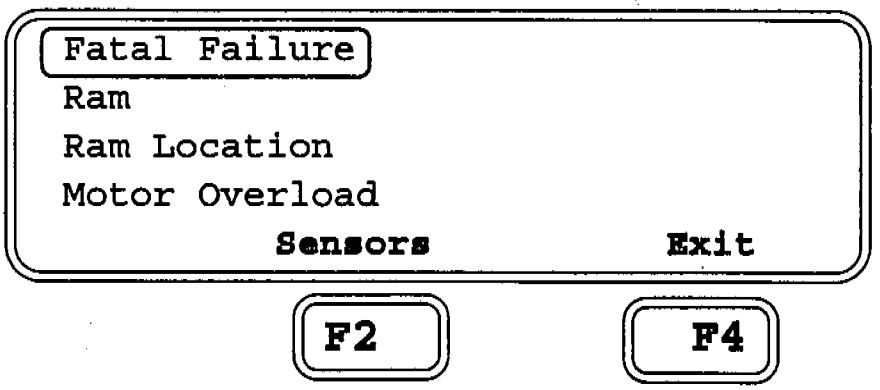
F1

1. Press **F1 (Mute)** to silence the alarm.

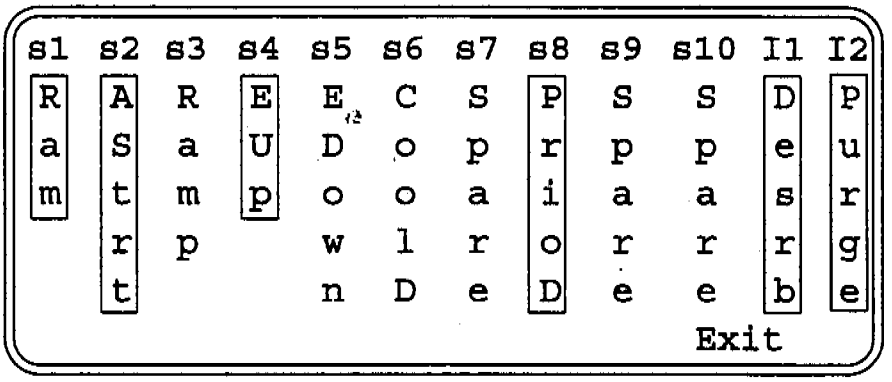
**** DO NOT PANIC ****

The circuitry will detect an overload and cut all power to the motor.

7.9.2 Ram Errors (cont.)



2. Press sensors (F2) to access the sensor screen:



3. Do not press **F4 (Exit)** until the situation is examined.

> **⚠ CAUTION**
>
> **Pressing F4 (Exit) before thoroughly examining the situation may result in damage to the AQUATek 50.**

DIAGNOSIS:

A. Lift the Priority Sample Door. Is the ram trying to push a row of vials onto the rack when the rack already has vials on it?

YES: The ram location sensor may be faulty or misaligned. Refer to Section 7.9.1.

NO: Check for foreign objects, or misalignment of mechanism and proceed to B.

B. Connect an amp meter in series with the ram motor (m1). Press **F4 (Exit)** to activate the ram motor. Does the motor draw more than 750 milliamps?

YES: This would indicate a bad motor or the mechanism is misaligned. Replace motor or make necessary adjustments.

NO: Replace Multi-Function Board.

7.9.3 Ram Sensor Errors

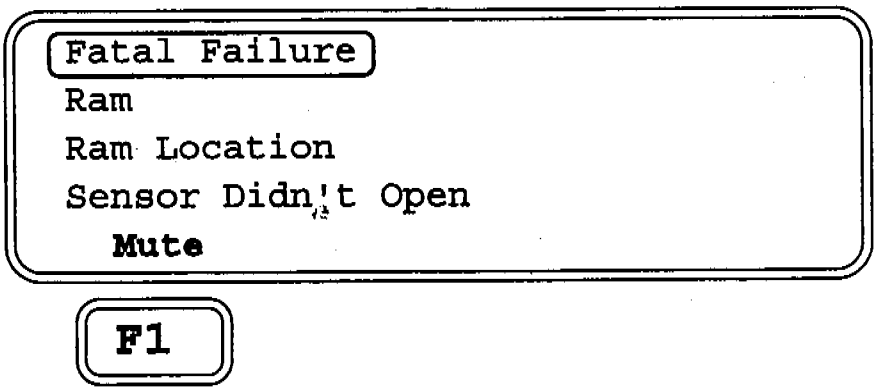
The Ram location sensor (S1) is wired to be normally open. Two types of errors can occur with this sensor:

1) Ram location sensor didn't open.

2) Ram location sensor didn't close.

#1 Sensor Didn't Open

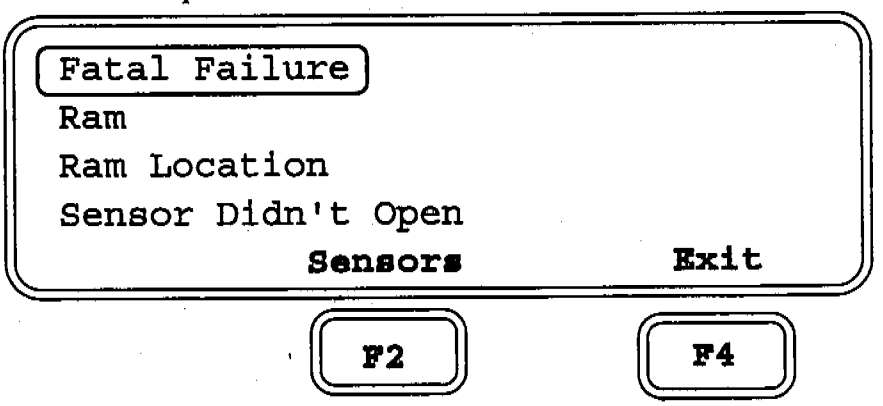
If a ram location sensor didn't open, an error occurs and the following screen will appear:



1. Press **F1 (Mute)** to silence the alarm.

**** DO NOT PANIC ****

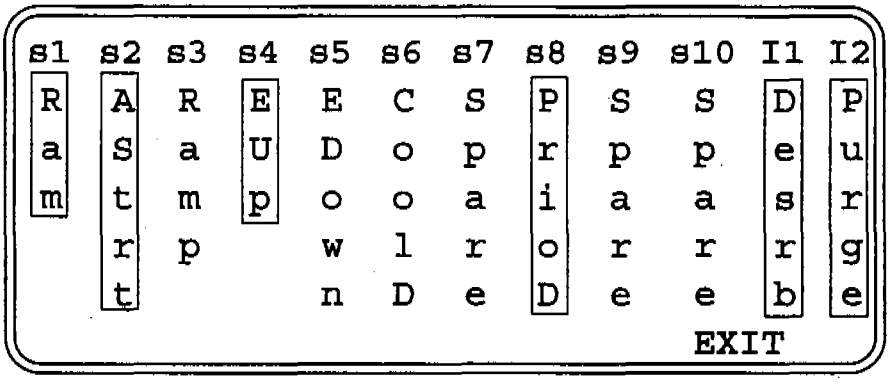
The circuitry is not functioning correctly, and will not cause damage to the unit at this point.



2. Press **F2 (Sensors)** to access the sensor screen:

continued

7.9.3 Ram Sensor Errors (cont.)



3. Do not press **F4 (Exit)** until the situation is examined.

> **⚠ CAUTION**
>
> **Pressing F4 (Exit) before thoroughly examining the situation may result in damage to the AQUATek 50.**

DIAGNOSIS:

A. Did Ram Motor turn on?
- YES: Proceed to step B.
- NO: Proceed to step E.

B. Did Ram move off of sensor (S1)?
- YES: Proceed to step C.
- NO: Proceed to step D.

C. Unplug cable #16 from header P9 on the Multi-function Board. Is there continuity between pins #1 and #2 when Ram sensor (S1) in not actuated?
- YES: Replace Ram Sensor (S1)(#14-3565-028 and #14-4705-028).
- NO: Proceed to step D.

D. Failure is due to misalignment of mechanism and/or sensor. Remove mechanism and make necessary adjustments.

E. Unplug cable #15 from P9 on Multi-function Board. Is there approximately 12V DC between pins #1 and #2 on header P9 when **F4 (Exit)** is pressed?
- YES: Proceed to step F.
- NO: Replace Multi-function Board (#14-3750-000).

continued

7.9.3 Ram Sensor Errors (cont.)

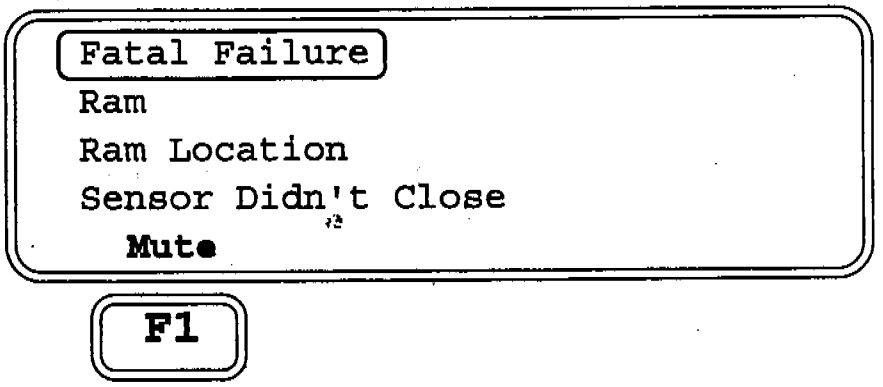
F. Plug cable #15 back on header P9 of Multi-function Board. Unplug cable #15 leads from Ram motor (M1). Is there approximately 12V DC at motor end of cable when **F4 (Exit)** is pressed?

YES: Replace Ram motor (M1) (#14-3553-018).

NO: Replace motor (#14-4748-086).

##2 *Sensor Didn't Close*

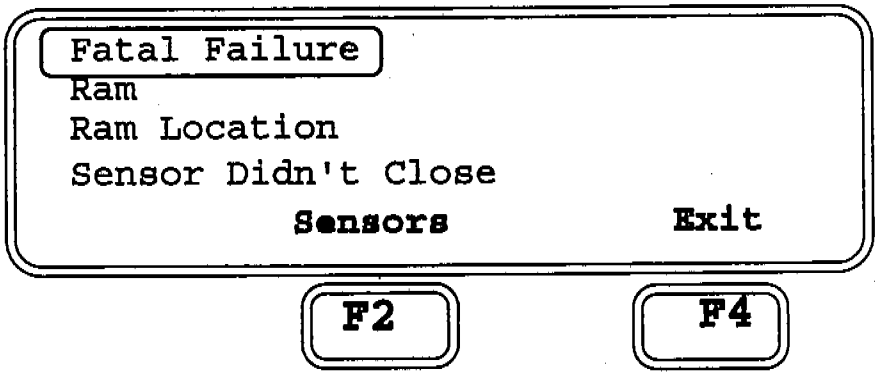
If the sensor didn't close, the screens and diagnostic procedures are:



1. Press **F1 (Mute)** to silence alarm.

**** DO NOT PANIC ****

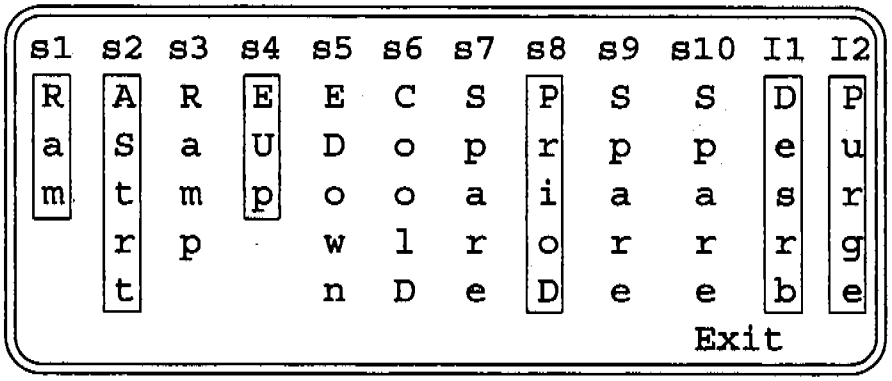
The circuitry is not functioning correctly, and will not cause damage to the unit at this point.



continued

7.9.3 Ram Sensor Errors (cont.)

2. Press **Sensors (F2)** to access the sensor screen:



3. Do not press **F4 (Exit)** until the situation is examined.

> **⚠ CAUTION**
>
> **Pressing F4 (EXIT) before thoroughly examining the situation may result in damage to the AQUATek 50.**

DIAGNOSIS:

A. Does vial ram actuate (S1) on return stroke and is there continuity across terminals common and normally open of sensor? Press **F4 (EXIT)** to verify.
   YES: Proceed to step B.
   NO: Proceed to step C.

B. Unplug cable #16 from header P9 on Multi-function Board. Is there continuity between pins #1 and #2 of cable when S1 is actuated?
   YES: Replace Multi-function Board (#14-3750-000).
   NO: Replace sensor (#14-4705-028).

C. Failure is due to misalignment of mechanism and/or sensor. Remove and make necessary adjustments.

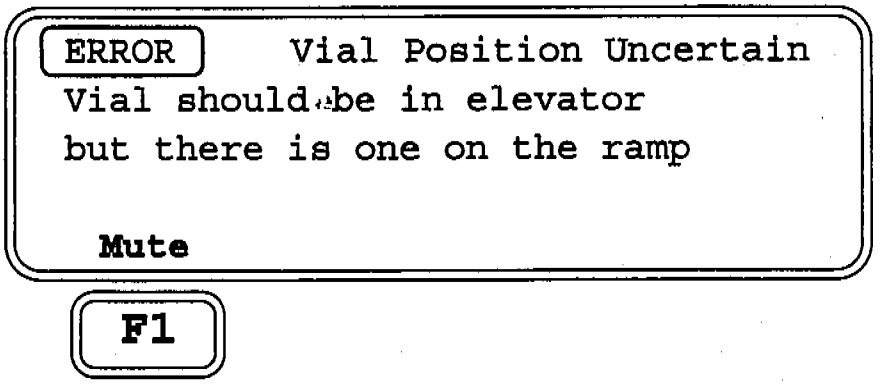
7.9.4 Vial Location On Ramp Error

The ramp sensor (S3) is wired normally open. This error is caused by either of the following:

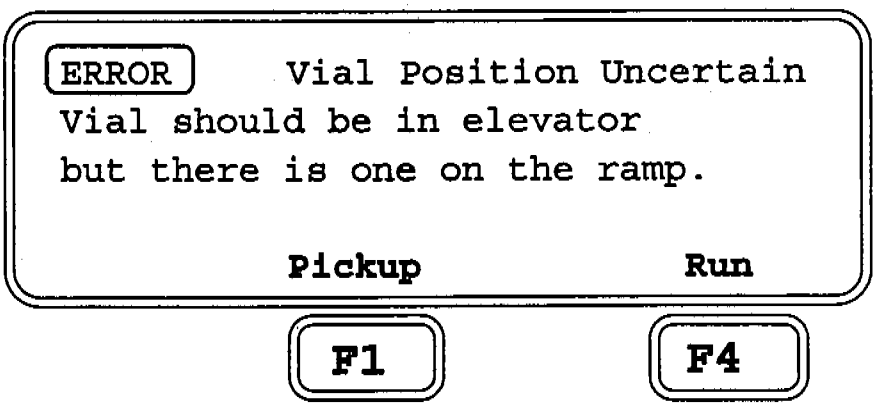
1) Two vials were positioned on the ramp.
When the first vial was positioned on needle, the sensor still detected a vial on the ramp.

2) There was one vial on the ramp and the unit did not load the vial into the elevator.

When you see this error, you will hear the alarm and the following screens will appear:



1. Press **F1 (Mute)** to silence alarm.



2. Press **F2 (Pickup)** if the vial is NOT in the elevator. The AQUATek 50 will try again to load the vial on the elevator. Check vial tilt platform for misalignment. Make necessary adjustments.

3. Press **F4 (Run)** to run the vial in the elevator. The advancer mechanism will not operate until the vial on the ramp is run next. Check for proper operation of sensor (S3).

7.9.4 Vial Location On Ramp Error (cont.)

⚠ WARNING

The following steps must be performed with the right side panel off. Make sure all foreign objects (i.e. fingers, cables, tools) are clear of the elevator mechanism. Failure to do so may result in injury to the operator and/or damage to the unit.

7.9.5 Elevator Mechanism Errors

Proceed with the following steps only if you have read and understand the previous warning!!!

- Elevator Motor = M3
- Elevator Up Sensor = S4
- Elevator Down Sensor = S5
  (Elevator motor rotates clockwise when viewing the output shaft side).

7.9.6 Elevator Motor Overload Failures

There is a circuit which will detect a motor overload caused by any of the following:

1) Vial jammed in the mechanism.

2) Faulty motor or circuitry.

3) Mechanism misalignment.

When overload occurs the following screen will appear:

```
Fatal Failure
Elevator
Up
Motor overload
Mute
```

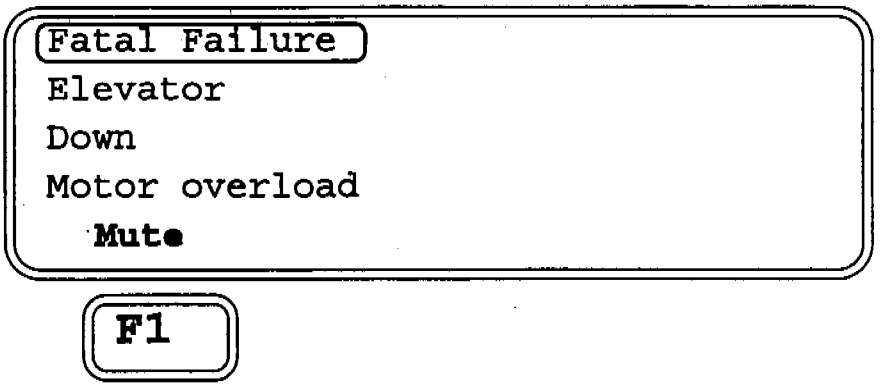
F1

1. Press **F1 (Mute)** to silence alarm.

2. Press **F4 (Exit)** to exit error mode and try again. If this failure occurs,

7.9.6 Elevator Motor Overload Failures (cont.)

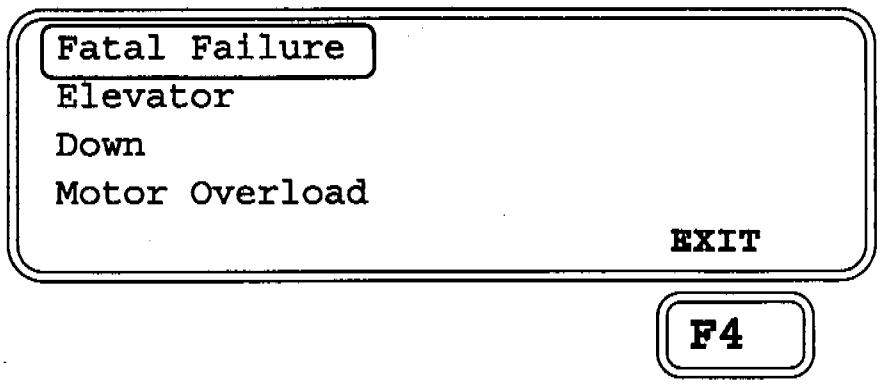
it usually indicates that the current vial (if any) has not started the sampling process.



1. Press **F1 (Mute)** to silence alarm.

**** DO NOT PANIC ****

The circuitry is not functioning correctly, but will not cause damage to the unit at this point.



2. Press **F4 (EXIT)** to exit error mode and try again. If this failure occurs, it usually indicates that the current vial (if any) has completed the sampling process.

continued

7.9.6 Elevator Motor Overload Failures (cont.)

DIAGNOSIS:

A. Is there a vial or foreign object jammed in ejection chute?	YES: NO:	Remove obstruction. Remove right side panel. Proceed to step B.
B. Is there a vial jammed between divider wall and vial tilt platform?	YES: NO:	Proceed to step D. Proceed to step C.
C. Is there a vial jammed between vial tilt platform and elevator?	YES: NO:	Proceed to step D. Proceed to step F.

D. If the vial cannot be easily removed, then remove the cam follower from elevator. This will enable the vial tilt platform to be lowered and vial to be removed. Proceed to step E.

E. When replacing the cam follower in the elevator, the elevator should be in the down position. The cam follower should be adjusted so that the vial tilt platform has a slight (3° to 5°) downward tilt.

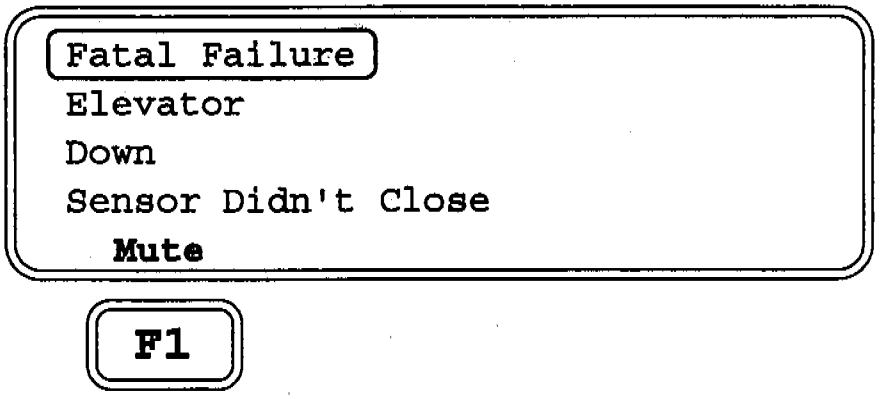
F. Connect an amp meter in series with the elevator motor (m3). Load a vial onto the tilt platform. Does the motor draw more than 750 milliamps?	YES: NO:	This indicates a bad motor or misaligned mechanism. Replace motor or make necessary adjustments. Replace Multi-function Board.

7.9.7 Elevator Sensor Failures

When there is an elevator sensor failure it will be caused by any of the following:

1. Elevator down sensor didn't close.
2. Elevator down sensor didn't open.
3. Elevator up sensor didn't close.
4. Elevator up sensor didn't open.

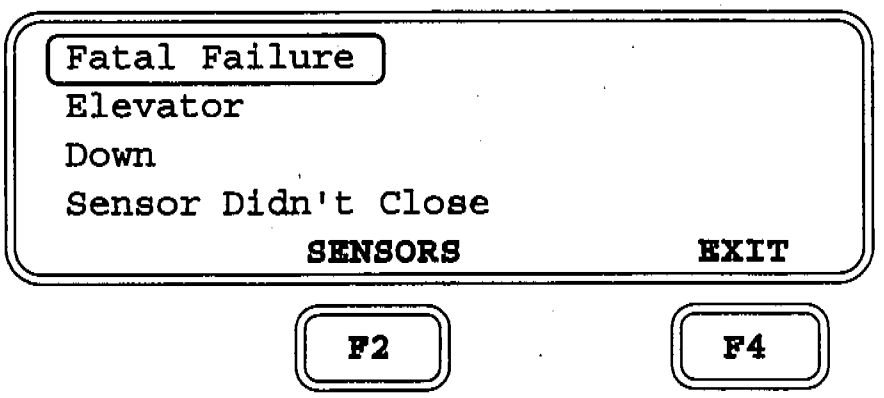
The "elevator down sensor didn't close" error screens and diagnostic procedures are as follows:



Press **F1 (Mute)** to silence alarm.

**** DO NOT PANIC ****

The circuitry is not functioning correctly, but will not cause damage to the unit at this point.



Do not press **F4 (EXIT)** until the situation is examined.

7.9.7 Elevator Sensor Failures (cont.)

⚠ CAUTION

Pressing F4 (EXIT) before thoroughly examining the situation may result in damage to the AQUATek 50.

DIAGNOSIS:

⚠ WARNING

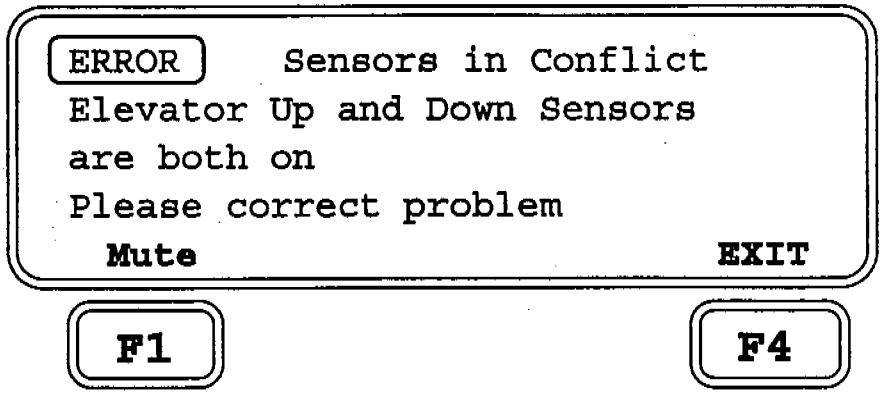
The following steps must be performed with the right side panel off. Keep all foreign objects (i.e. fingers, cables, tools) clear of the elevator mechanism. Failure to do so may result in injury to the operator and/or damage to the unit. Proceed to Step A only if you have read and understand this warning.

A. Does elevator actuate elevator down sensor (S5) when it reaches bottom of stroke?	YES: NO:	Proceed to step B. Proceed to step D.
B. Check for continuity between normally open and common terminals on sensor when depressed. Is there continuity?	YES: NO:	Proceed to step C. Replace sensor (#14-4705-028).
C. Remove cable #14 from header P4. Is there continuity between pins #4 and #5 of cable when sensor is actuated?	YES: NO:	Replace Multi-function Board (#14-3750-000). Replace cable (#14-3899-000).

D. Failure is likely to be due to a misalignment of the mechanism and/or sensor. Make necessary adjustments.

7.9.8 Elevator Down Sensor Didn't Open

The "elevator down sensor did not open" error screens and diagnostic procedures are as follows:



Press **F1 (Mute)** to silence the alarm.

**** DO NOT PANIC ****

The circuitry is not functioning correctly, and will not cause damage to the unit at this point.

Do not press **F4 (EXIT)** until the situation is examined.

⚠ CAUTION

Pressing F4 (EXIT) before thoroughly examining the situation may result in damage to the AQUATek 50.

⚠ WARNING

The following steps must be performed with the right side panel off. Keep all foreign objects (i.e. fingers, cables, tools) clear of the elevator mechanism. Failure to do so may result in injury to the operator and/or damage to the unit. Proceed to Step A only if you have read and understand this warning.

A. Did elevator motor rotate?	YES:	Proceed to step B.
	NO:	Proceed to step F.
B. Did elevator move off of elevator down sensor?	YES:	Proceed to step C.
	NO:	Proceed to step E.
C. Unplug cable #14 from header P4 on Multi-function Board. Is there continuity across pins #4 and #5?	YES:	Replace sensor (#14-4705-028).
	NO:	Proceed to step E.

7.9.8 Elevator Down Sensor Didn't Open (cont.)

D. Failure is due to a misalignment of the mechanism and/or sensor. Remove the mechanism and make the necessary adjustments.

E. Unplug cable #13 from P4 on Multi-function Board. Is there approximately 12V DC between pins #1 and #2 on header P4 when **F4 (EXIT)** is pressed?

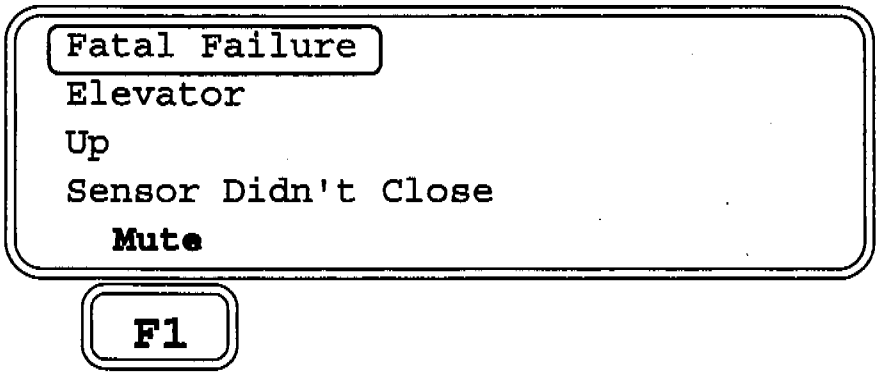
YES: Proceed to step F.
NO: Replace Multi-function Board (#13-3750-000).

F. Plug cable #13 back onto header of P4 of Multi-function Board. Unplug cable #13 from elevator motor (M3). Is there approximately 12V DC between leads at motor end of cable #13?

YES: Replace motor (M3) (#14-3553-018).
NO: Replace cable (#14-3898-000).

7.9.9 Elevator Up Sensor Didn't Close

The "elevator up sensor didn't close" error screens and diagnostic procedures are as follows:



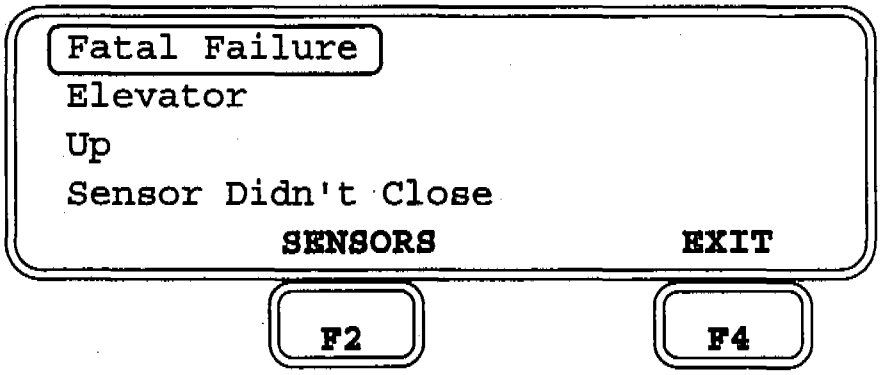
Press **F1 (Mute)** to silence alarm.

**** DO NOT PANIC ****

The circuitry is not functioning correctly, and will not cause damage to the unit at this point.

continued

7.9.9 Elevator Up Sensor Didn't Close (cont.)



Do not press **F4 (EXIT)** until the situation is examined.

⚠ CAUTION

Pressing F4 (EXIT) before thoroughly examining the situation may result in damage to the AQUATek 50.

⚠ WARNING

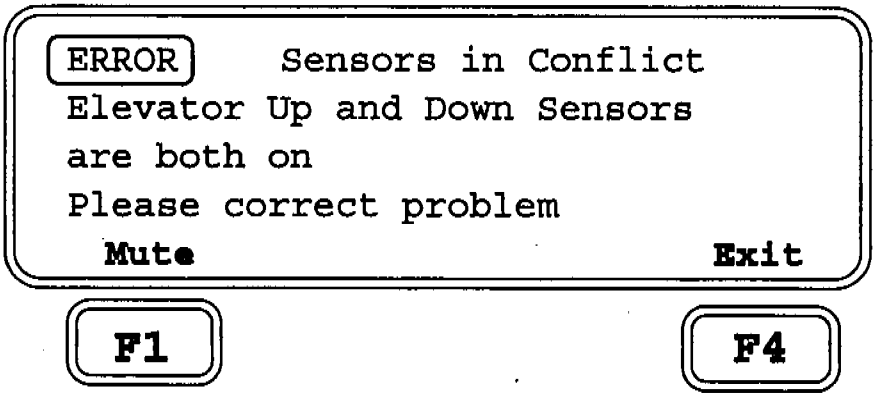
The following steps must be performed with the right side panel off. Keep all foreign objects (i.e. fingers, cables, tools) clear of the elevator mechanism. Failure to do so may result in injury to the operator and/or damage to the unit. Proceed to Step A only if you have read and understand this warning.

A. Does elevator actuate elevator up sensor (S4) when it reaches top of stroke?	YES: NO:	Proceed to step B. Proceed to step D.
B. Check for continuity between normally closed and common terminals on sensor. Is there continuity when sensor is depressed?	YES: NO:	Proceed to step C. Replace sensor (#14-4705-028).
C. Remove cable #14 from header P4. Is there continuity between pins #1 and #2 of cable when sensor is not actuated?	YES: NO:	Replace Multi-function Board (#14-3750-000). Replace cable. (#14-3899-000).

D. Failure is likely to be due to the misalignment of the mechanism and/or sensor. Make the necessary adjustments.

7.9.10 Elevator Up Sensor Didn't Open

The "elevator up sensor didn't open" error screens and diagnostic procedures are as follows:



Press **F1 (Mute)** to silence alarm.

**** DO NOT PANIC ****

The circuitry is not functioning correctly and will not cause damage to the unit at this point.

Press **F4 (Exit)** to exit and try again.

⚠ CAUTION

Pressing F4 (Exit) before thoroughly examining the situation may result in damage to the AQUATek 50.

DIAGNOSIS:

⚠ WARNING

The following steps must be performed with the right side panel off. Keep all foreign objects (i.e. fingers, cables, tools) clear of the elevator mechanism. Failure to do so may result in injury to the operator and/or damage to the unit. Proceed to Step A only if you have read and understand this warning.

continued

7.9.10 Elevator Up Sensor Didn't Open (cont.)

A. Did elevator motor rotate?
YES: Proceed to step B.
NO: Proceed to step E.

B. Did elevator move off of elevator up sensor?
YES: Proceed to step C.
NO: Proceed to step D.

C. Unplug cable #14 from Multi-function Board. Is there continuity across pins #1 and #2?
YES: Replace sensor P4 (#14-4705-028).
NO: Proceed to step E.

D. Failure is due to a misalignment of the mechanism and/or sensor. Remove the mechanism and make necessary adjustments.

E. Unplug cable #13 from P4 on Multi-function Board. Is there approximately 12V DC between pins #1 and #2 on header P4 when **F4 (Exit)** is pressed?
YES: Proceed to step F.
NO: Replace Multi-function Board (#14-3750-000).

F. Plug cable #13 back onto header P4 of Multi-function Board. Unplug cable #13 from elevator motor (M3). Is there approximately 12V DC between leads at motor end of cable #13?
YES: Replace motor (M3) (#14-3553-018).
NO: Replace cable (#14-3898-000).

7.10 Intermittent and Erroneous Faults and Errors

Such problems may be due to a faulty ROM chip. Re-boot the system or replace the ROM. Continue to monitor system performance.

7.11 Analytical Problems

1. Disconnect the AQUATek 50 from the concentrator and verify proper performance of the concentrator.

2. The unit may be contaminated or an electro-mechanical problem may exist. Call the Tekmar Service Department for assistance.

8.1 How to Contact Tekmar Service

Tekmar's factory service facilities are located in Cincinnati, Ohio. Our Sales Division can be contacted by calling toll free (800) 543-4461. Our Service Department can be reached toll free at (800) 874-2004 in the U.S. and Canada or at (513) 247-7000. Service Representatives can help identify the cause of a problem and determine the best way to expedite repair.

8.2 Replacement Parts

All replacement parts for the AQUATek 50 are described in this section. Please include the model and serial number of your instrument when ordering spare parts.

SAMPLE HANDLING

14-4817-024	Sparger, 5 ml Fritless, right introduction stem
14-4818-024	Sparger, 25 ml Fritless, right introduction stem
14-3544-024	Sparger, 5 ml Fritted, with left introduction stem
14-3546-024	Sparger, 25 ml Fritted, with left introduction stem
14-3544-124	Sparger, 5 ml Fritted, with right introduction stem
14-3546-124	Sparger, 25 ml Fritted, with right introduction stem
14-4825-024	Sparger, 5 ml Fritless, with pocket heater (2000 only)
14-4826-024	Sparger, 25 ml Fritless, with pocket heater (2000 only)
14-4006-024	Sparger, 5 ml Fritted, with pocket heater (2000 only)
14-4007-024	Sparger, 25 ml Fritted, with pocket heater (2000 only)
14-3765-024	Sparger, 5 ml Fritted, for LSC-2
14-3766-024	Sparger, 25 ml Fritted, for LSC-2
14-4487-024	Internal Standard Vessel
14-3823-000	Septa (3.18 mm) (pkg. of 72, uncleaned)
14-3916-024	40 ml Vial kit (3.18 mm) (pkg. 72, pre-cleaned)
14-3917-024	40 ml Vial kit (3.18 mm) (pkg. 720, pre-cleaned)

ELECTRONICS

14-3750-000	Multifunction Board (before S/N 9304011)
14-3750-100	Multifunction Board (after S/N 9304011)
14-4962-490	CPU/Display Board (w/o ROM)
14-5139-075	ROM
14-4962-390	CPU/Display/ROM
14-5193-083	Switch Panel
14-5193-000	Switch Panel Assembly (including Switch Panel, CPU, Display, ROM, and Buzzer)
14-2984-000	Buzzer
14-3817-000	Microprocessor Cable
14-3871-000	Cable, BCD
14-4352-086	Cable, Interface AQUATek 50 to 2000 or 3000
14-3783-000	Cable, Interface AQUATek 50 to LSC-2
14-3692-000	Cable, Ribbon, Internal I/O
14-3897-000	Cable, 6-Port Valve Logic (vA & vB)
14-3680-000	Cable, Advancer Motor (M2) (before S/N 9304011)
14-4748-086	Cable, Ram Motor/Sensor (before S/N 9304011)
14-3898-000	Cable, Elevator Motor (M3) (before S/N 9304011)

8.1 Replacement Parts (cont.)

ELECTRONICS (cont.)

14-3899-000	Cable, Elevator Sensors (S4 & S5)
14-3903-000	Cable, Ram Location (S1) and Vial on Ramp (S3)
14-4777-000	Assy, Priority Sample Door Sensor

FITTINGS

14-2261-116	Union, Reducing, 1/4"-1/16", w/o ferrules
14-1301-016	Ferrule, 1/2", Teflon, Swagelok
14-3098-016	Ferrule, 1/2", Teflon, Valco
14-1418-016	Ferrule, 1/4", Brass
12-0041-016	Ferrule, 1/4", Teflon
12-0044-016	Ferrule, 1/8", Teflon
14-0442-016	Ferrule, 1/16", Teflon, Swagelok
14-3142-016	Nut, 1/2", Knurled, Swagelok
14-3181-016	Nut, 1/8", Valco
12-0069-016	Nut, 1/8", Brass
14-0243-016	Nut, 1/16", Short, SS, Valco
14-0159-016	Nut, 1/16", Swagelok
14-0052-016	Brass tee, 1/8"
14-5584-016	Nut, Cap, 1/8" for leak checking

TUBING

14-4127-000	Sample Needle Assembly
14-3705-067	Sample Loop, 5 ml
14-3882-067	Sample Loop, 10 ml
14-3883-067	Sample Loop, 25 ml
14-3885-067	Internal Standard Loop, 10 µl
14-3886-067	Internal Standard Loop, 25 µl
14-0546-002	Tubing, Copper, 1/8"
14-1313-002	Tubing, Copper, 1/4"
14-3845-002	Tubing, Nickel, 1/16", for transfer line
12-0315-002	Tubing, Tygon, .25 O.D. (priced per foot)
13-0056-002	Tubing, Tygon, 5/16"

MECHANISMS

14-3564-100	Advancer
14-3554-100	Ram
14-5751-000	Elevator
14-5750-000	Vial Tilt Platform Assembly
14-5710-018	Elevator Motor and Cable
14-5710-118	Ram Motor and Cable
14-5710-218	Advancer Motor and Cable

VALVES

14-5138-150	Valve, 2-Port, v1 #20 Int. Std. Pressure
14-5137-050	Valve, 2-Port, v2 #21 Int. Std. Drain
14-5138-250	Valve, 2-Port, v3 #22 Sample Pressure
14-5138-350	Valve, 2-Port, v4 #23 Sample Transfer
14-5138-450	Valve, 2-Port, v5 #24 Int. Std. Transfer
14-5138-050	Valve, 2-Port, v6 #25 Rinse Water
14-5142-050	Valve, 3-Port, v7 #26 Backflush

Note: Internal Standard Loop, 5 µl, is not available; substitute10 µl

8.1 Replacement Parts (cont.)

VALVES (cont.)

14-5138-550	Valve, 2-Port, v8, #32 Purge Pressure
14-5143-050	Valve, 3-Port, v9 #27 Drain Valve
14-3482-050	Valve, 6-Port Internal Standard (vB), 110V
14-3983-050	Valve, 6-Port Sample (vA), 110V
14-1719-050	Valco Board Assembly for 6-Port Valve, 110V
14-4010-050	6-Port Valve Actuator w/ Boards, 110V
14-3826-050	6-Port Valve Body and Slider, 6-Port Sample (vA)
14-3826-050	6-Port Valve Body and Slider, 6-Port Sample (vB)
14-3959-050	Flow Controller for Internal Standard Pressure
14-4781-050	Flow Controller for Sample Pressure, Sample Transfer, and Int. Std. Transfer

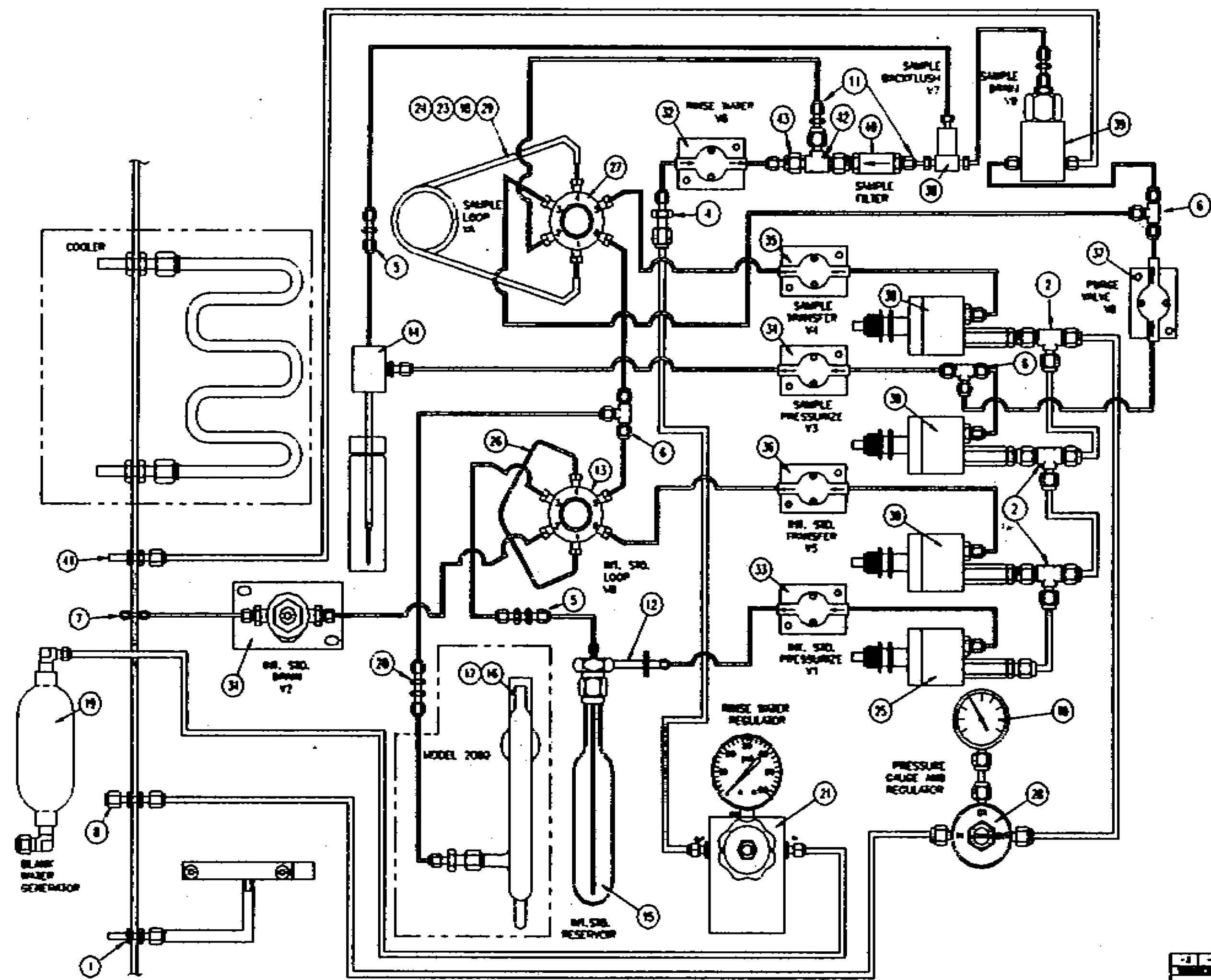
FILTERS & TRAPS

14-3707-000	Rinse Water Filter Assembly
14-3887-000	Refill Kit for Blank Water Filter
14-5153-016	Filter, 90-micron

MISCELLANEOUS

14-3565-028	Switch, Snap Action w/Short Actuator Arm
14-2397-028	Switch, Power
14-3695-038	Transformer, Stepdown, 120V-12V
14-4704-028	Auxiliary Actuator, Roller Lever
14-4705-028	Switch, Sub-miniature, Basic
14-1282-034	Fuse Holder
14-1219-034	Fuse, 3 Amp AGC (priced each pkg. of 5) 110V & 230V
14-0139-034	Fuse, 2 Amp (110V only)
14-0592-034	Fuse, 1.25 MDL (230V only)
14-0599-138	Transformer 230V-115V Assy
14-5200-074	Instruction Manual

Tekmar



43	[illegible]	14-5399-016	CONNECTOR, FEMALE 1/8 NPT-1/16
42	[illegible]	14-5398-016	TEE, MALE RUN 1/8 NPT-1/8 TUBE
41	[illegible]	14-5194-016	BULKHEAD, 1/8-1/8 TUBE STUD SS
40	[illegible]	14-5153-016	FILTER, COMPACT INLINE, 90
39	[illegible]	14-5143-050	VALVE ASSY, 3PORT, V-9, 12 VDC
38	[illegible]	14-5142-050	VALVE ASSY, 3PORT, V-7, 12 VDC
37	[illegible]	14-5130-550	VALVE ASSY, 2-PORT, V8, 12VDC
36	[illegible]	14-5130-450	VALVE, 2-PORT ANGAR ASSY 12VDC
35	[illegible]	14-5130-350	VALVE, 2-PORT ANGAR ASSY 12VDC
34	[illegible]	14-5130-250	VALVE, 2 PORT ANGAR ASSY 12VDC
33	[illegible]	14-5130-150	VALVE, 2-PORT ANGAR ASSY 12VDC
32	[illegible]	14-5130-050	VALVE ASSY, 2PORT, V-6, 12 VDC
31	[illegible]	14-5137-050	VALVE ASSY, 2PORT, V-2, 12VDC
30	[illegible]	14-4701-050	VALVE, FLOW CONTROLLER, 1/8"
29	[illegible]	14-4302-067	LOOP, SAMPLE, 1 ML KIT
28	[illegible]	14-4167-000	PRESSURE REGULATOR ASSY.
27	[illegible]	14-3903-050	6-PORT SWITCHING VALVE .030
26	[illegible]	14-3973-067	10 ML SAMPLE LOOP
25	[illegible]	14-3959-050	FLOW CONTROLLER, 0-10 C.C.
24	[illegible]	14-3883-067	25 ML SAMPLE LOOP FOR ALS 2050
23	[illegible]	14-3882-067	10 ML SAMPLE LOOP KIT
22	[illegible]	14-3845-002	NICKEL TUBING, 1/16 OD .040 ID
21	[illegible]	14-3829-000	ASSY, RINSE WATER REG.
20	[illegible]	14-3785-016	1/16" BULKHEAD UNION S.S.
19	[illegible]	14-3707-000	RINSE WATER FILTER ALS 2050
18	[illegible]	14-3705-067	5 ML SAMPLE LOOP KIT
17	[illegible]	14-3544-124	SPARGER, SML FRIT, RIGHT INPUT
16	[illegible]	14-3544-024	SML FRIT, SPARGER LEFT INPUT
15	[illegible]	14-3541-024	VESSEL, INTERNAL STANDARD
14	[illegible]	14-3523-053	NEEDLE, SAMPLE, ASSY., 2050
13	[illegible]	14-3482-050	VALVE, 6-PORT W/ACTUATOR
12	[illegible]	14-2087-016	1/2 ML 1/16 SAMPLE MOUNT ASSY
11	[illegible]	14-1484-016	FIT SS 1/16 TO-1/16 STUD SSTEP
10	[illegible]	14-1096-000	PRESSURE GAUGE ASSY
9	[illegible]	14-0546-002	TUBING, COPPER 1/8"
8	[illegible]	14-0356-016	1/8 BULK HD.-FILTER ASSY
7	[illegible]	14-0264-016	FITTING,1/16BULKHEAD,SS
6	[illegible]	14-0102-016	UNION TEE, 1/16
5	[illegible]	14-0051-016	UNION, 1/16-1/16 S.S.
4	[illegible]	14-0050-016	UNION,REDUCING,1/8-1/16 S.S.
3	[illegible]	12-0302-002	TUBING,[illegible] 1/8"O.D. NICKLE
2	[illegible]	12-0071-016	TEE, 1/8", BRASS
1	[illegible]	12-0064-016	BULKHEAD, 1/8"-1/8", TUBE STUB

FLOW DIAGRAM, AQUATEK 50

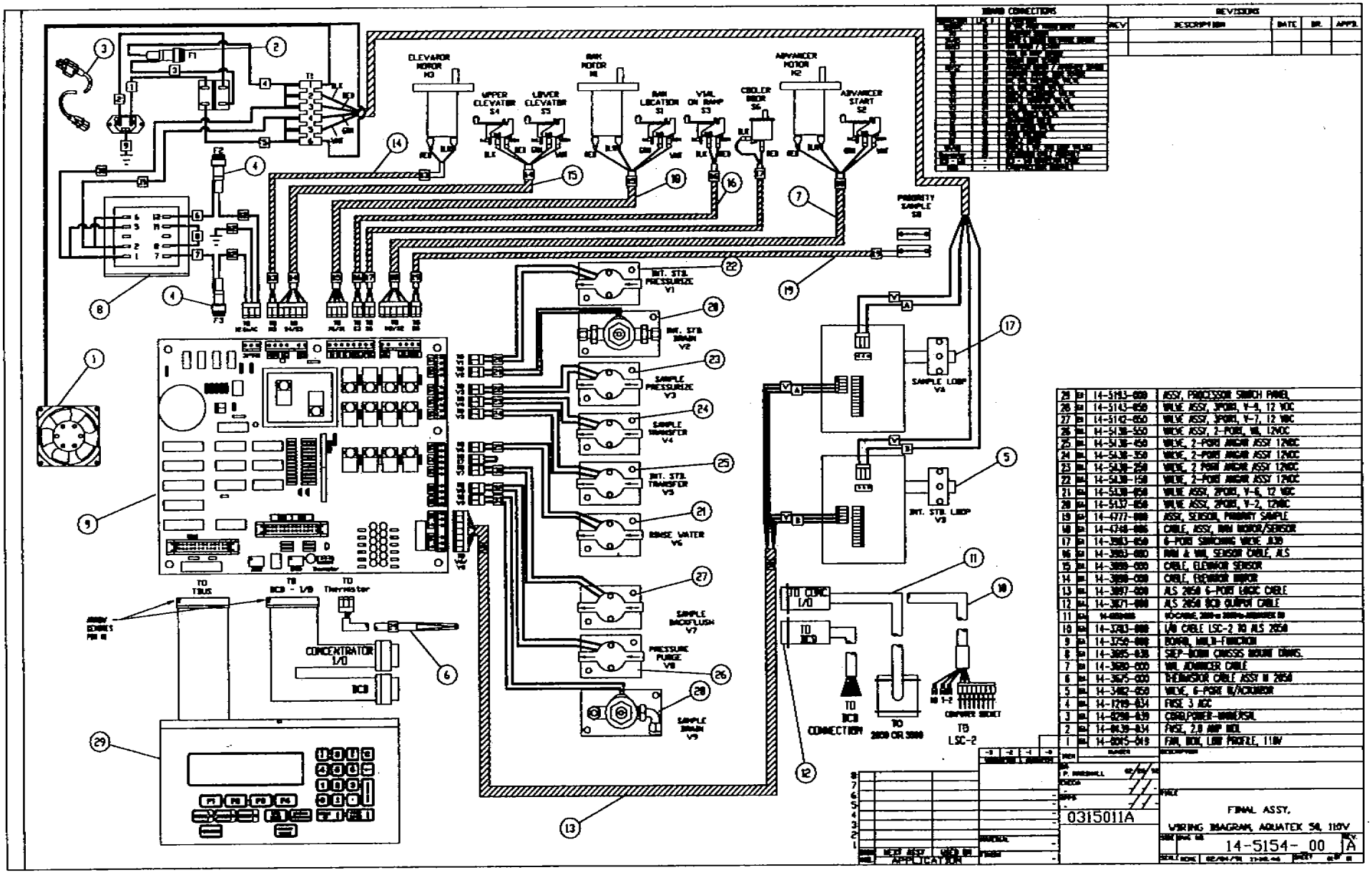
0384301B

14-5200-174 B

APPLICATION

AQUATek 50 Flow Diagram

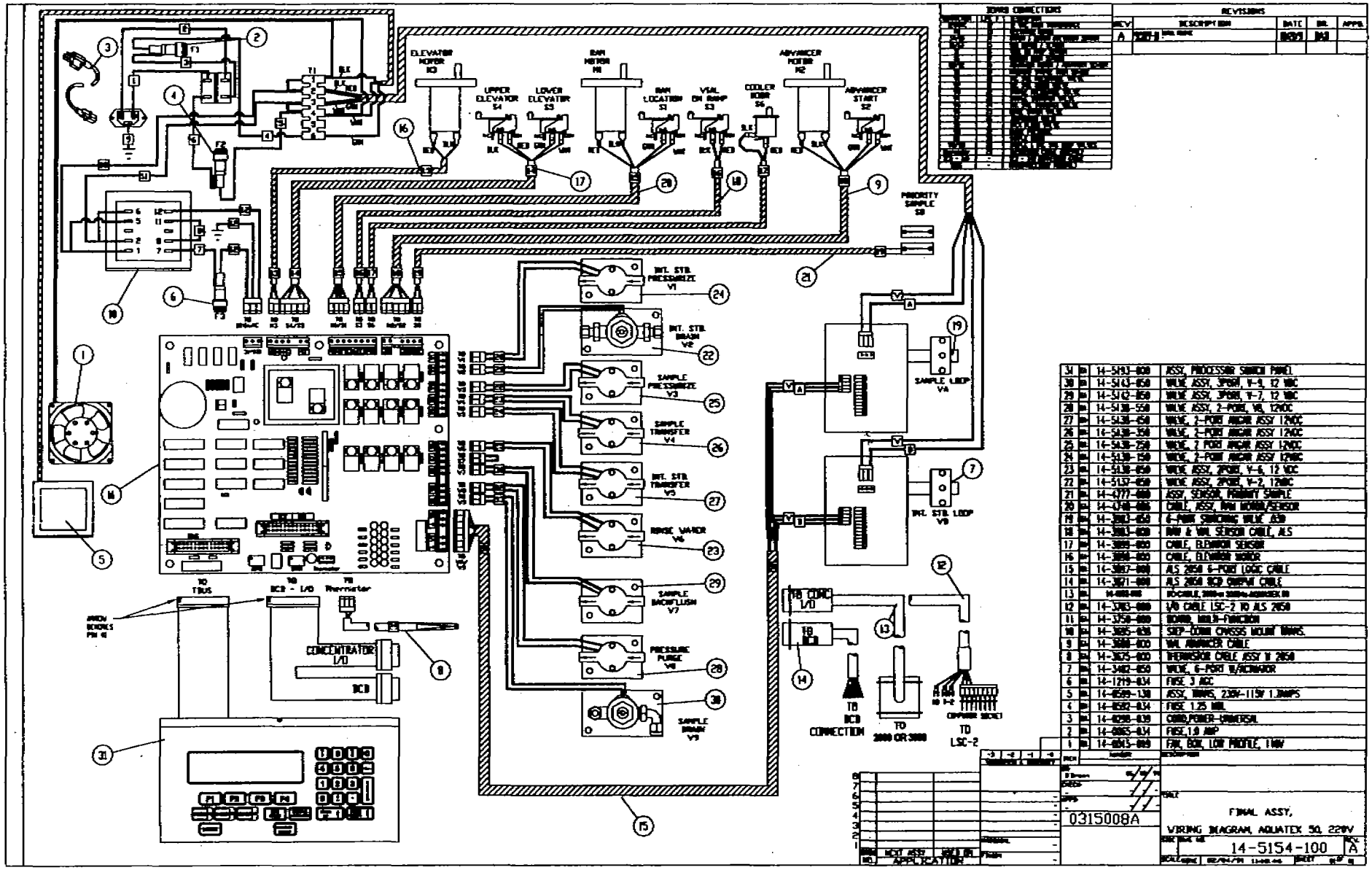
Tekmar



29	EA	14-5193-000	ASSY, PROCESSOR SWITCH PANEL
28	EA	14-5143-050	VALVE ASSY, 3PORT, V-4, 12 VDC
27	EA	14-5142-050	VALVE ASSY, 3PORT, V-7, 12 VDC
26	EA	14-5138-550	VALVE ASSY, 2-PORT, V6, 12VDC
25	EA	14-5138-450	VALVE, 2-PORT ANGLE ASSY 12VDC
24	EA	14-5138-350	VALVE, 2-PORT ANGLE ASSY 12VDC
23	EA	14-5138-250	VALVE, 2 PORT ANGLE ASSY 12VDC
22	EA	14-5138-150	VALVE, 2-PORT ANGLE ASSY 12VDC
21	EA	14-5138-050	VALVE ASSY, 3PORT, V-6, 12 VDC
20	EA	14-5137-050	VALVE ASSY, 3PORT, V-2, 12VDC
19	EA	14-4777-000	ASSY, SENSOR, PRIMARY SAMPLE
18	EA	14-4748-000	CABLE, ASSY, BAR MOTOR/SENSOR
17	EA	14-3983-050	6-PORT SWITCHING VALVE ASSY
16	EA	14-3983-000	BAR & VIAL SENSOR CABLE, ALS
15	EA	14-3888-000	CABLE, ELEVATOR SENSOR
14	EA	14-3888-000	CABLE, ELEVATOR MOTOR
13	EA	14-3887-000	ALS 2050 6-PORT LOGIC CABLE
12	EA	14-3871-000	ALS 2050 BCB OUTPUT CABLE
11	EA	14-4000000	WIRING, 2000 or 3000 to ADVANCER BD
10	EA	14-3783-000	I/O CABLE LSC-2 TO ALS 2050
9	EA	14-3750-000	BOARD, MULTI-FUNCTION
8	EA	14-3695-030	SHIP-BOARD CHASSIS MOUNT BRKTS.
7	EA	14-3680-000	VIAL ADVANCER CABLE
6	EA	14-3675-000	THERMISTOR CABLE ASSY W 2050
5	EA	14-3482-050	VALVE, 6-PORT W/ACTUATOR
4	EA	14-1719-034	FUSE 3 AGC
3	EA	14-0298-039	CORD/POWER-UNIVERSAL
2	EA	14-0439-034	FUSE, 2.0 AMP MDL
1	EA	14-0045-049	FAN, BOX, LOW PROFILE, 110V

AQUATek 50 110V Wiring Diagram

Tekmar



AQUATek 50 220V Wiring Diagram

Tekmar

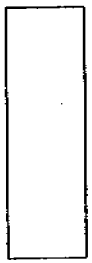
Nut (1/4" Brass)
14-1797-616

Ferrule (1/4" Brass)
14-1418-616

Ferrule (1/16" Teflon)
14-9442-616

Ferrule (1/8" Brass)
12-6044-616

Ferrule (1/16" Valco)
14-6241-616



Internal Standard Cover
14-3584-680

Ferrule (1/16" S.S.)
14-0158-616

Ferrule (1/4" Teflon)
12-6041-616

Nut (1/16" S.S.)
14-0159-616

Nut (1/8" Brass)
12-6089-616

Short Nut (1/16" Valco)
14-6243-616

Internal Standard Vessel
14-4467-024

Nut (Swagelok 1/2")
14-3364-616

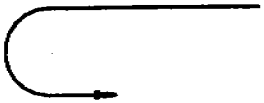
Fuse (2.0 AMP MDL)
14-6139-034

Fuse (3 AMP AGC)
14-1219-034

Reducing Union (1/4"-1/16")
14-2281-116

Ferrule (Swagelok 1/2" Teflon)
14-1381-616

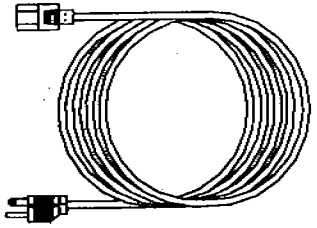
Sml Frit Spargepoint Input
14-3544-124



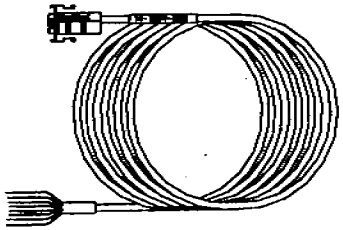
Internal Standard Needle
14-3579-653

Nickel Tubing
14-3845-082

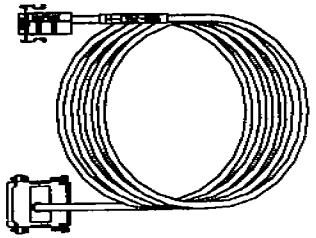
ProClaim Vial
14-3819-624



Power Cord
14-6286-639



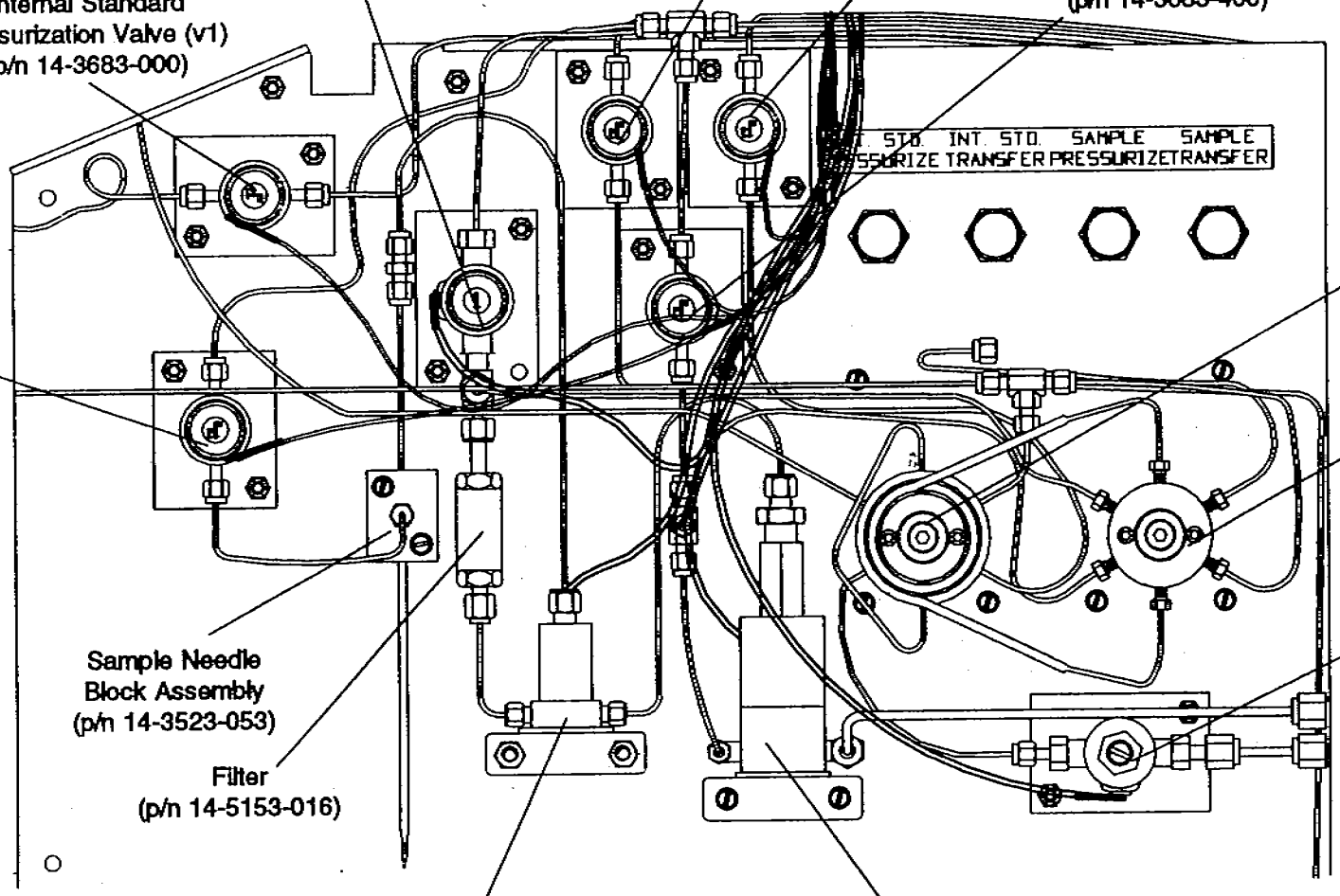
BCD Output Cable
14-3871-600



I/O Cable (2600 or 3000)
14-4352-666

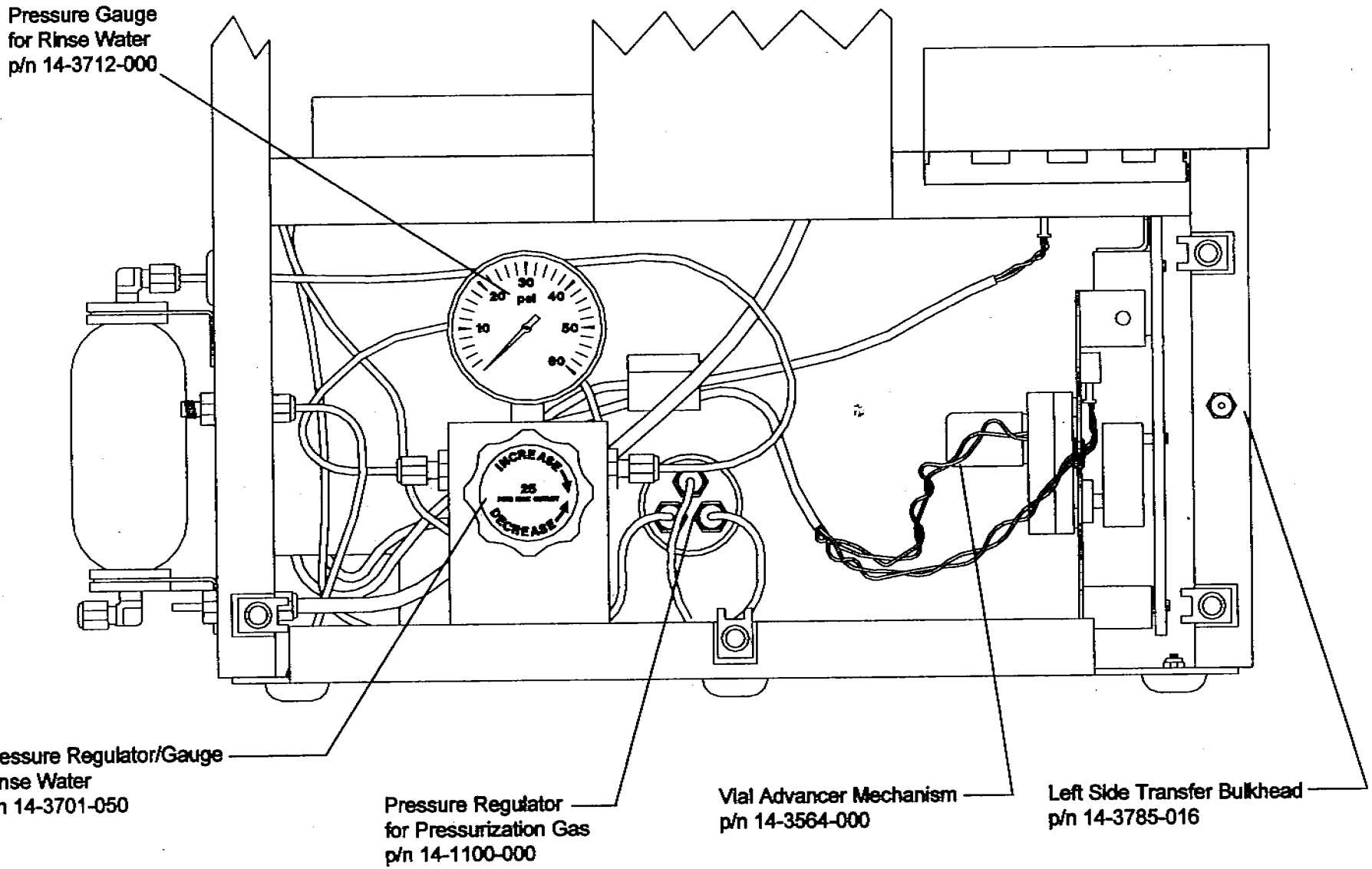
AQUATek 50 Assembly Kit Components

Tekmar



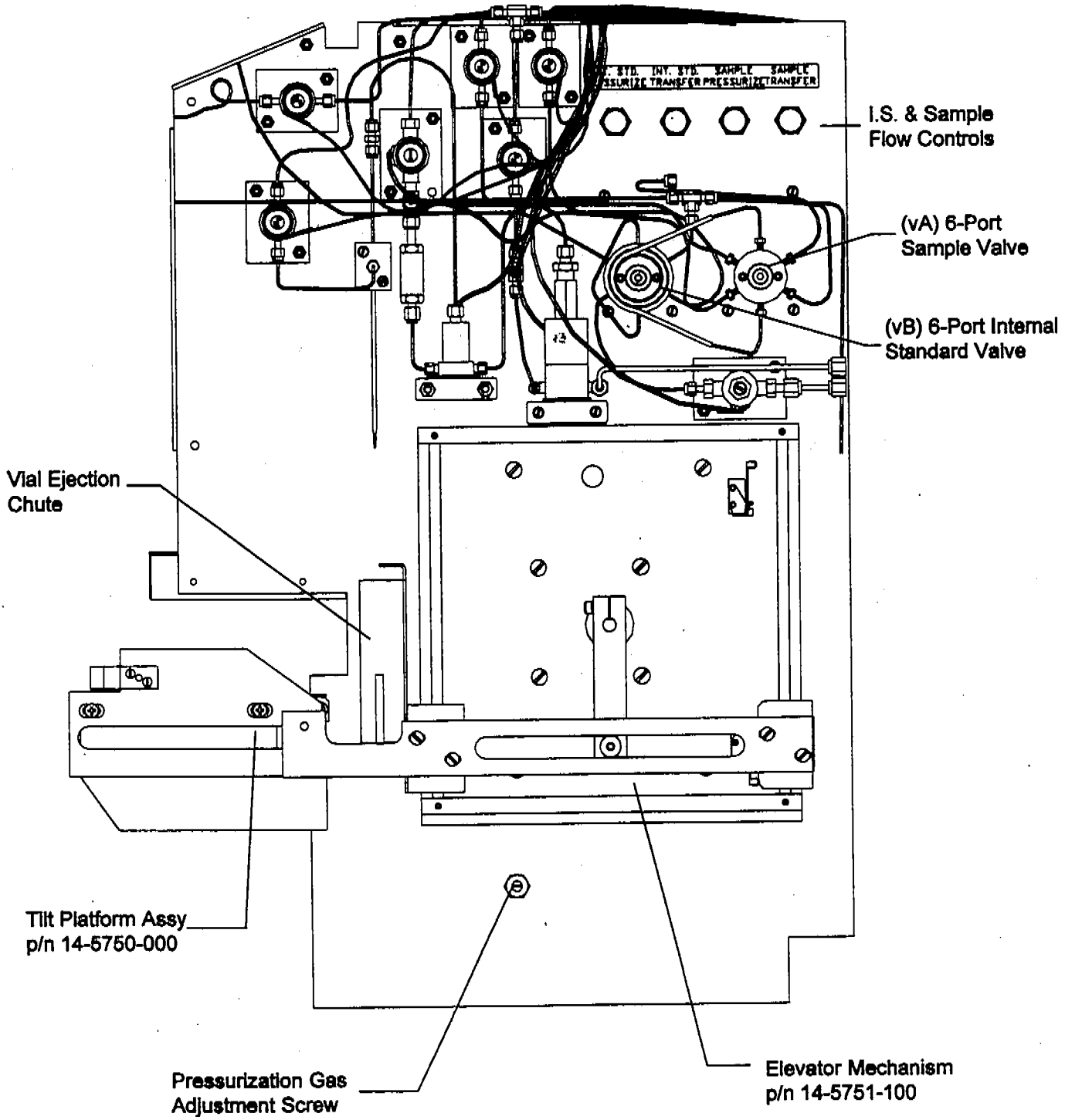
AQUATek 50 Right Top Interior Components

Tekmar



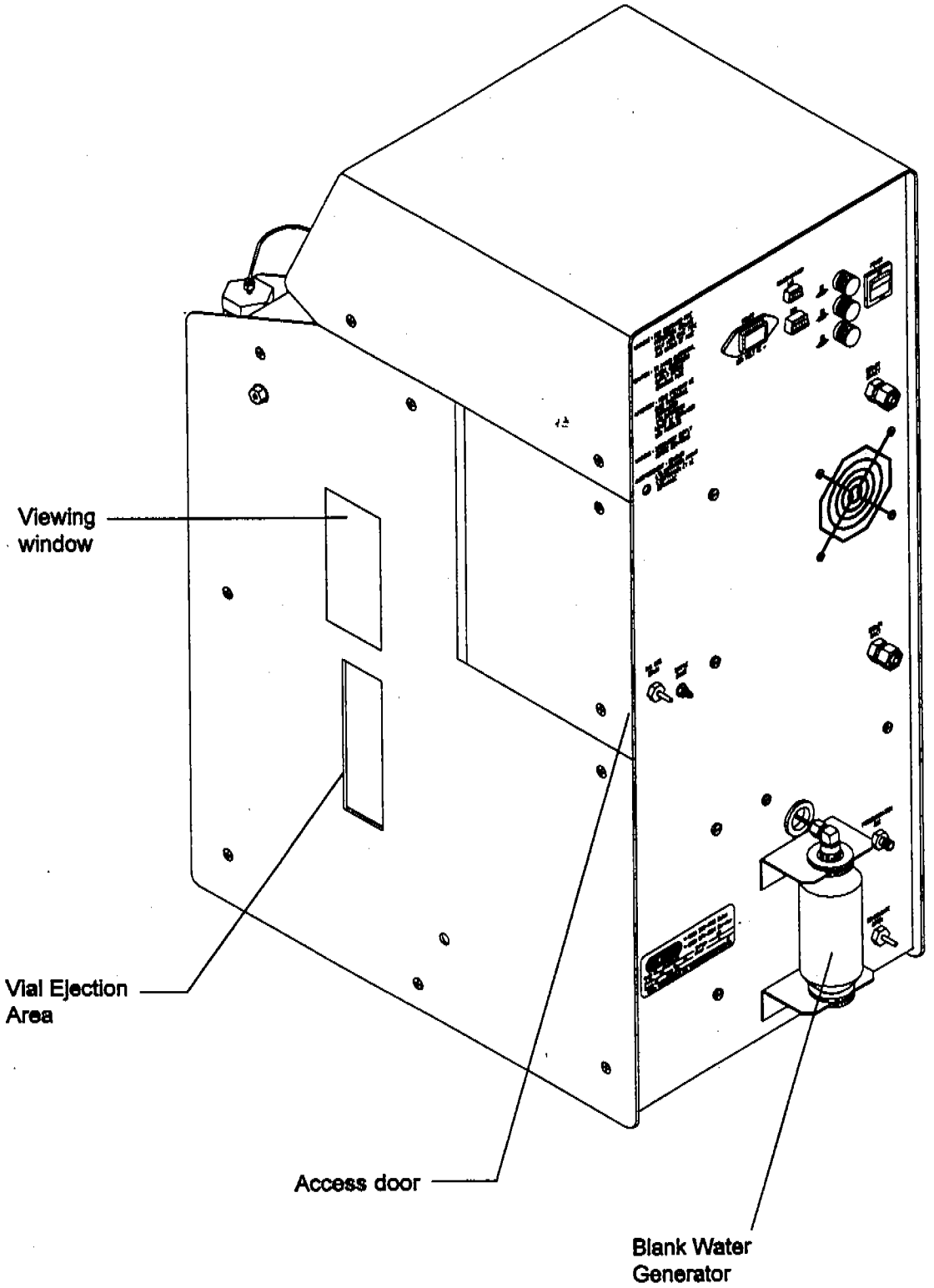
AQUATek 50 Lower Left Interior Components

Tekmar



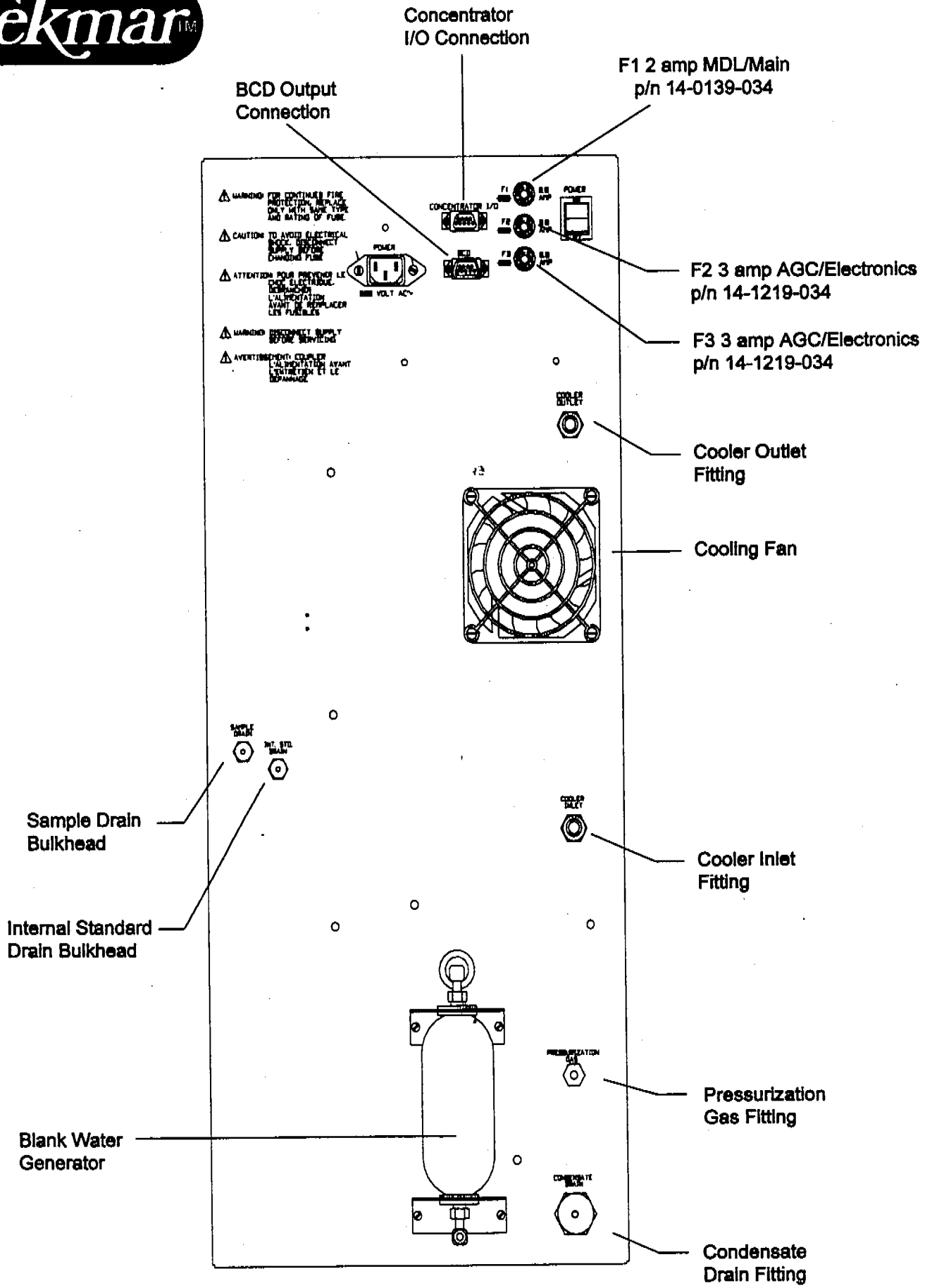
AQUATek 50 Right Interior

Tekmar™



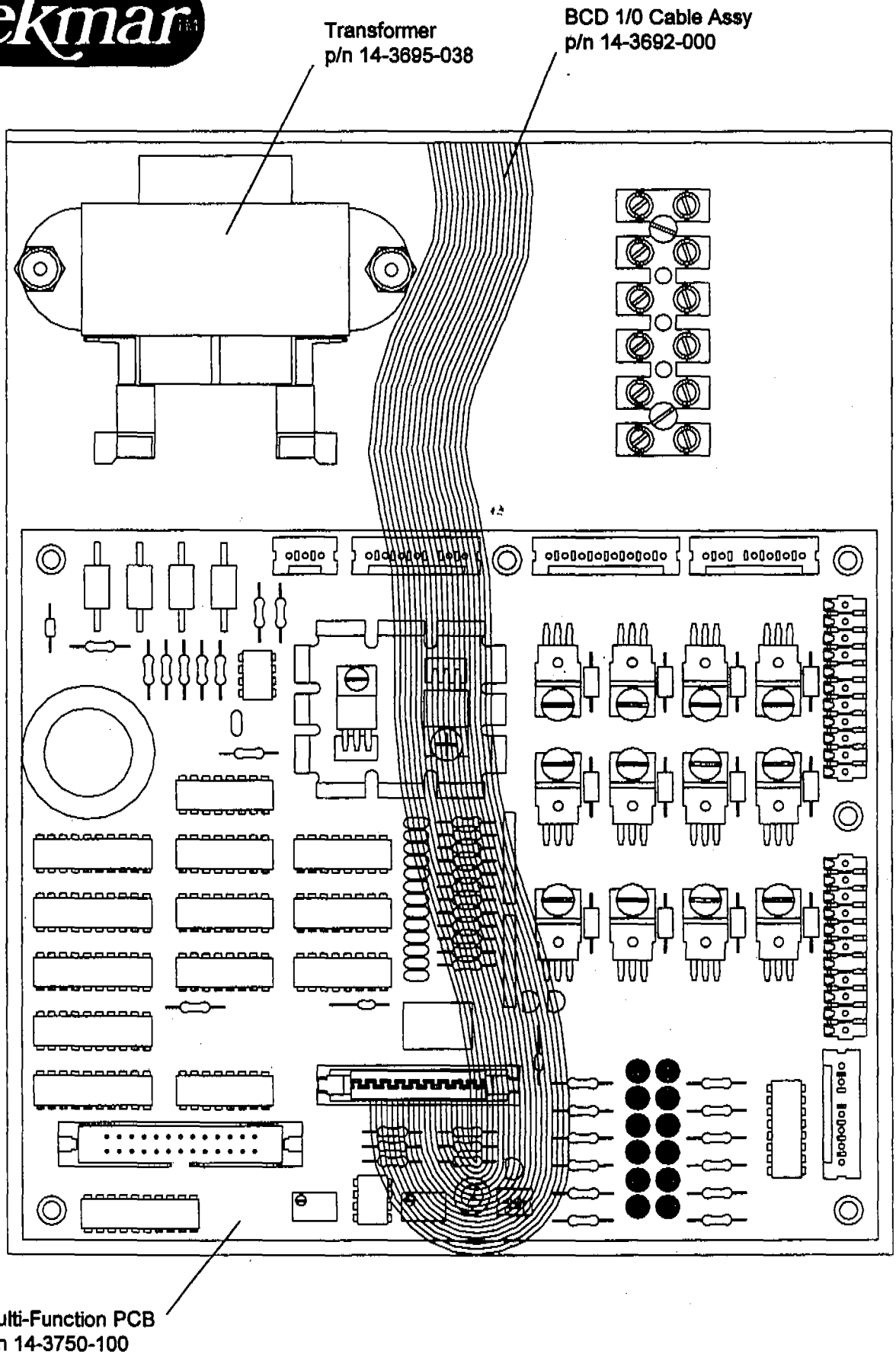
AQUATek 50 Right and Rear Views

Tekmar™

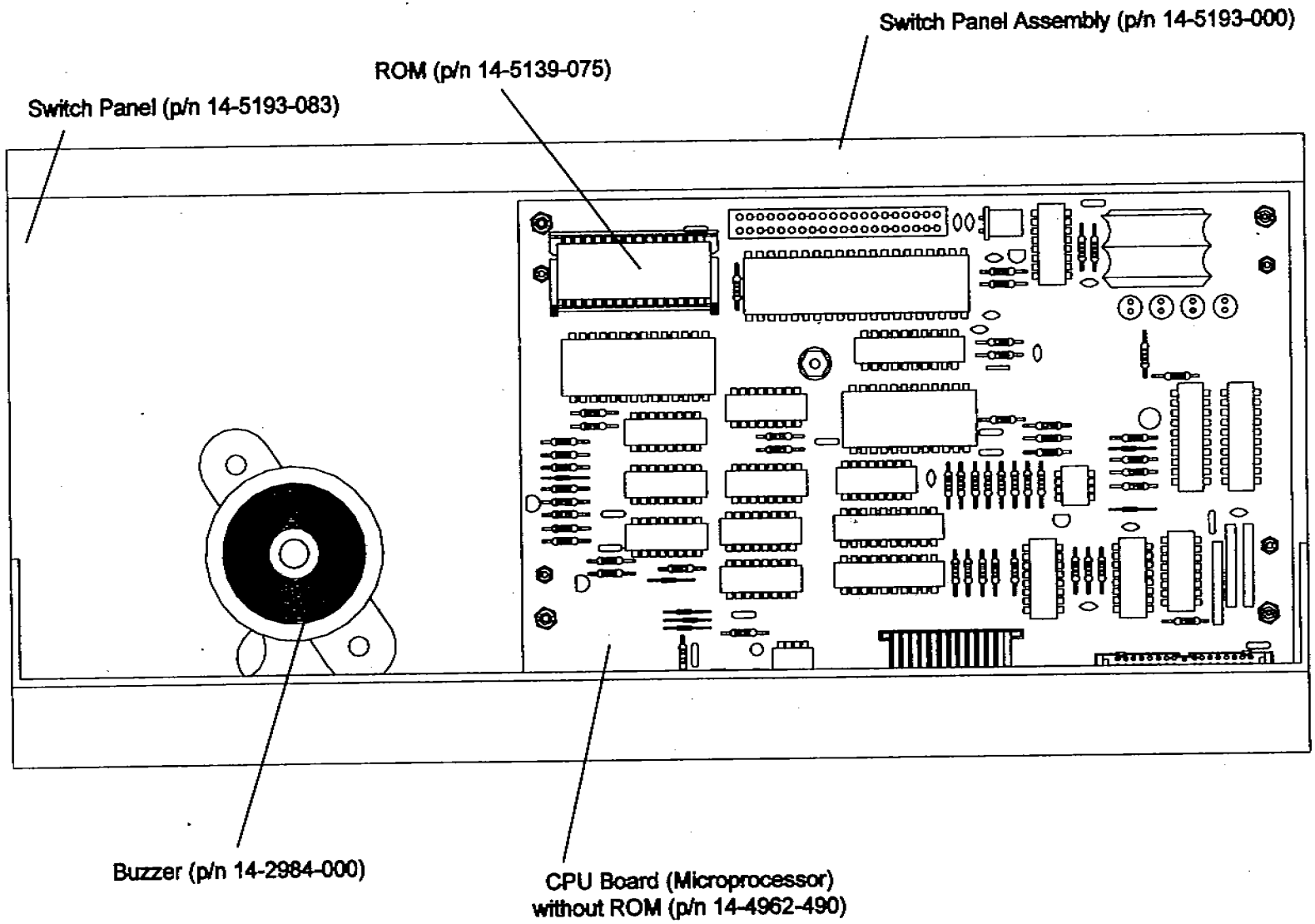


AQUATek 50 Rear Panel

Tekmar

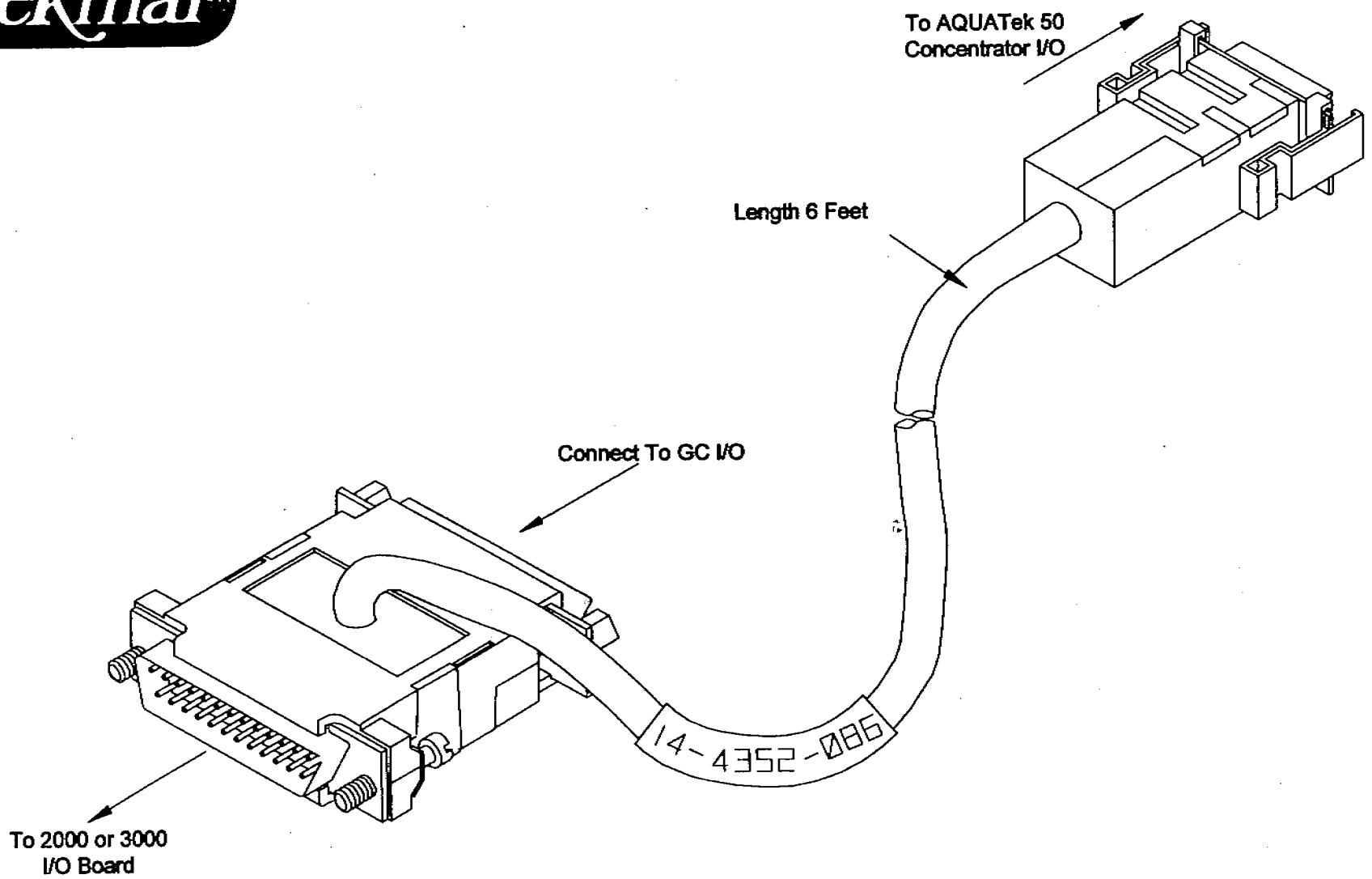

Transformer
p/n 14-3695-038
BCD 1/0 Cable Assy
p/n 14-3692-000
Multi-Function PCB
p/n 14-3750-100

Tekmar



AQUATek 50 CPU Board

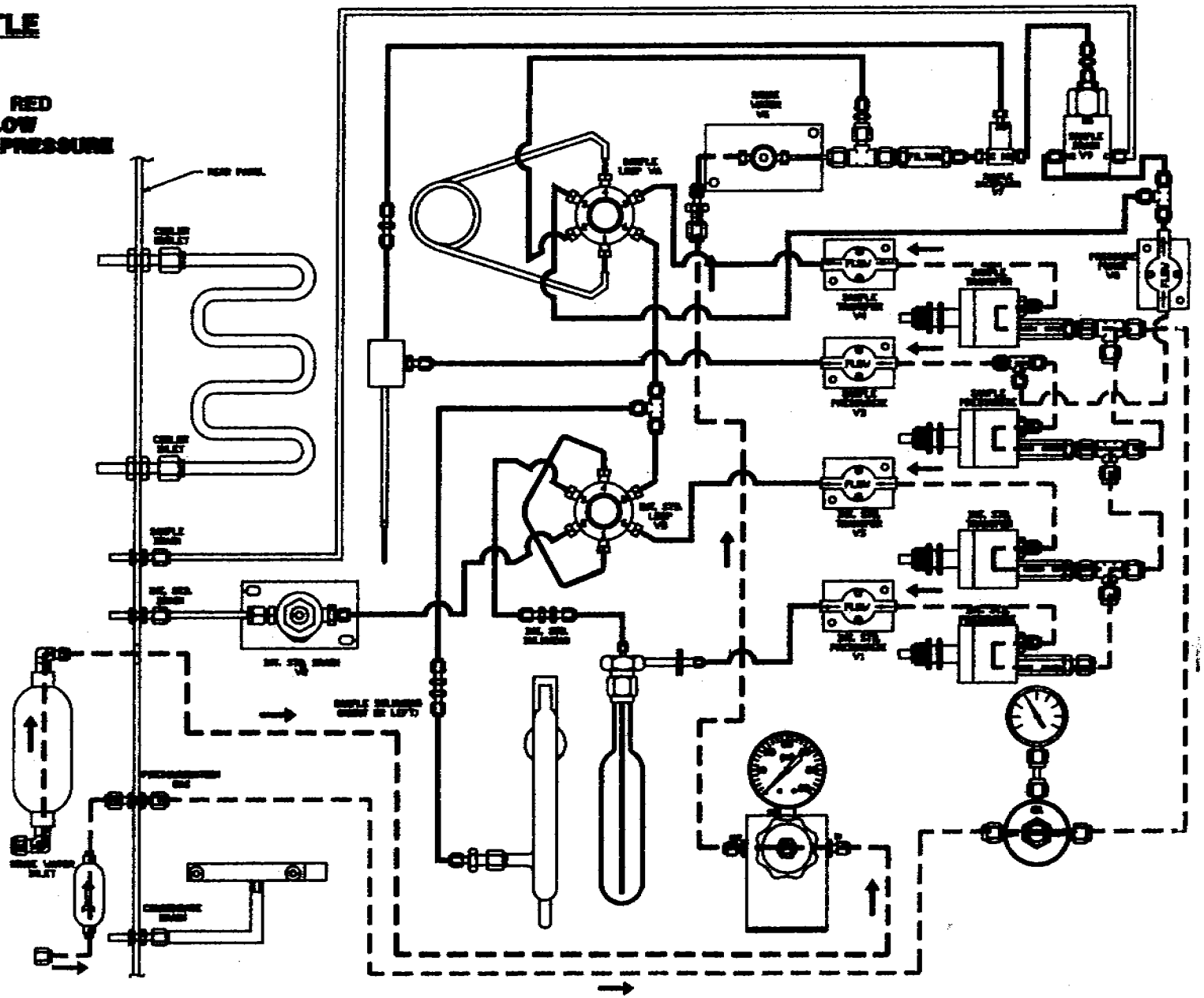
Tekmar



AQUATek 50 2000 or 3000 Interface Cable

STANDBY/SETTLE

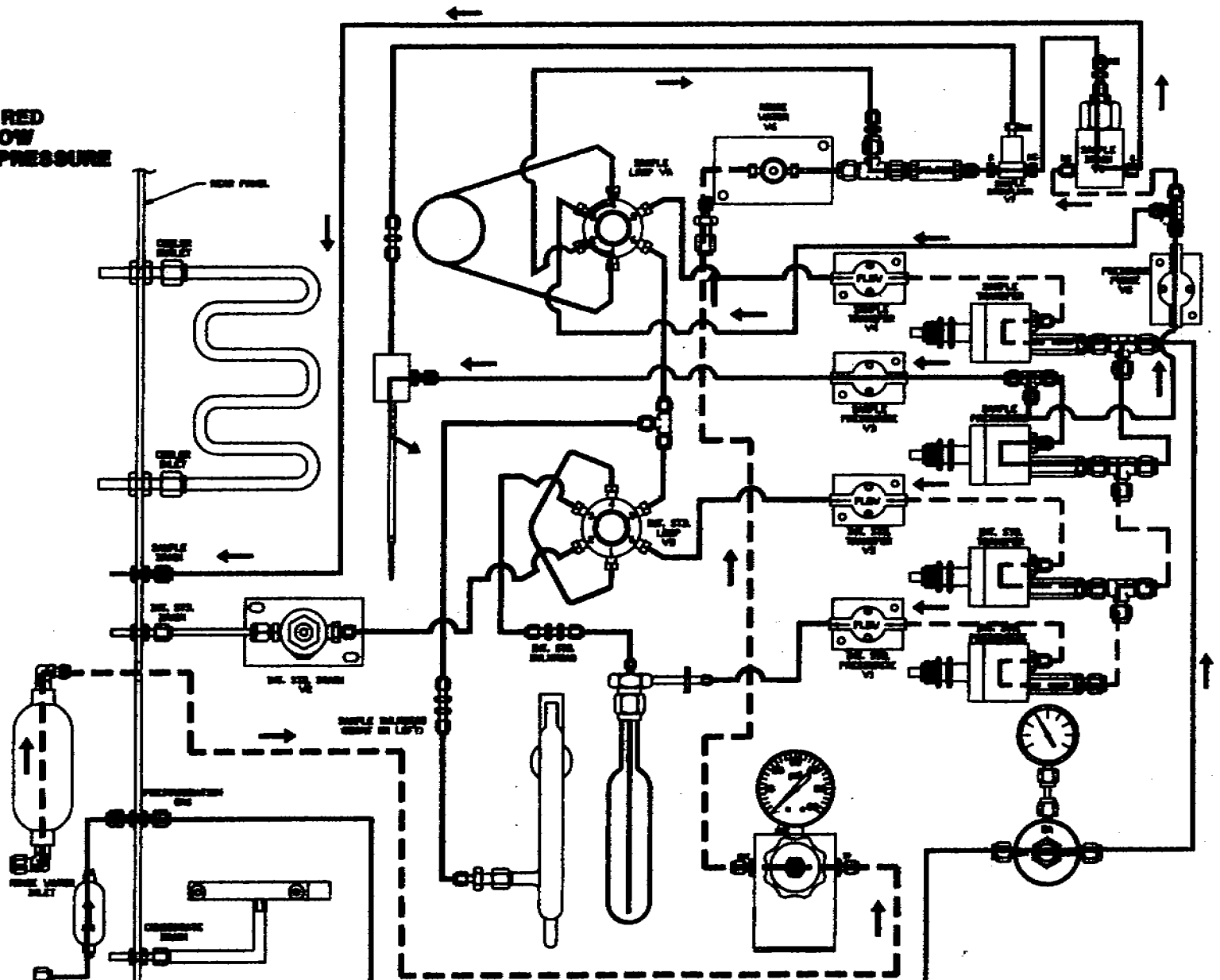
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315101_

PREPURGE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



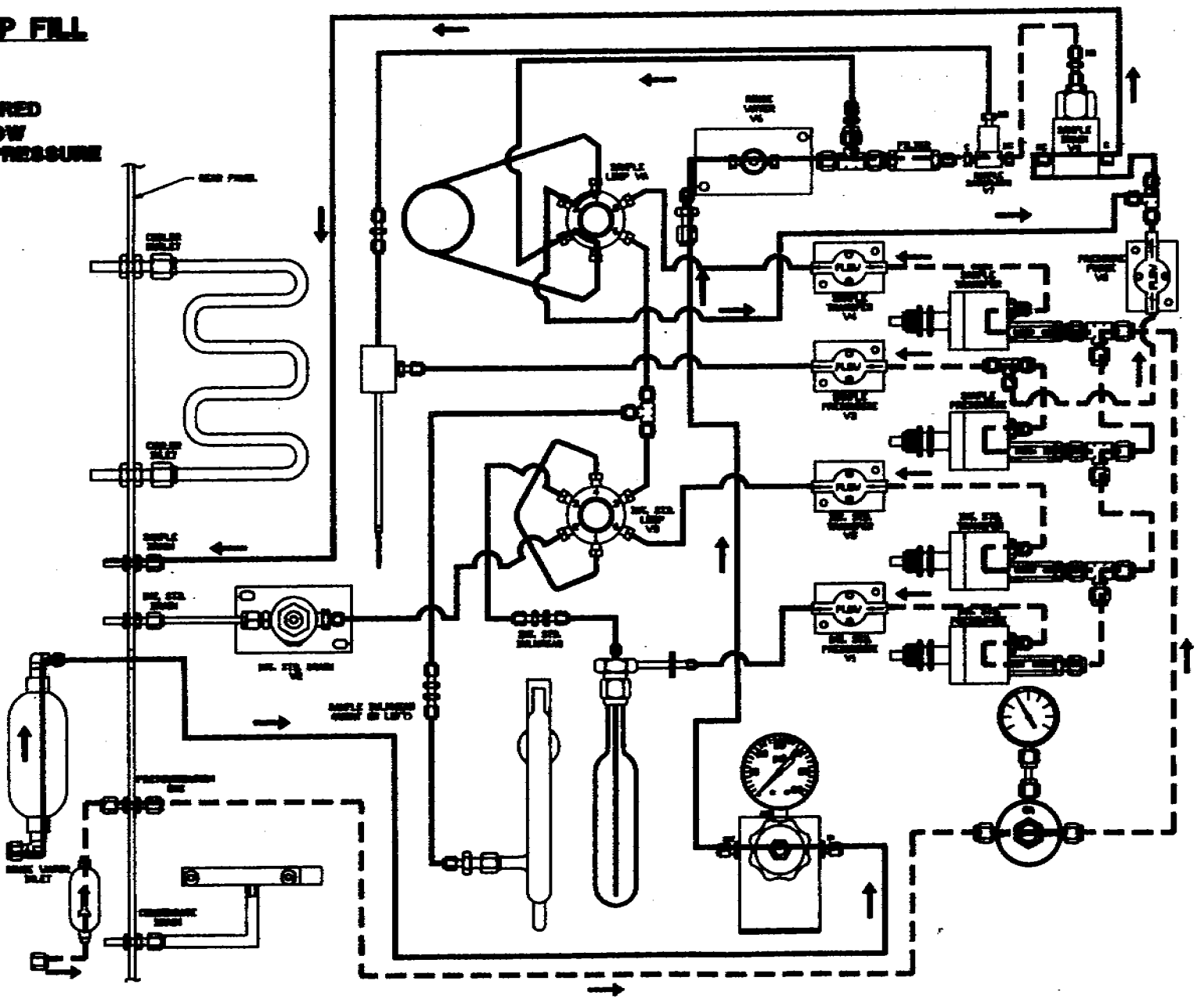
0315102_

PREPURGE

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

DILUTION LOOP FILL

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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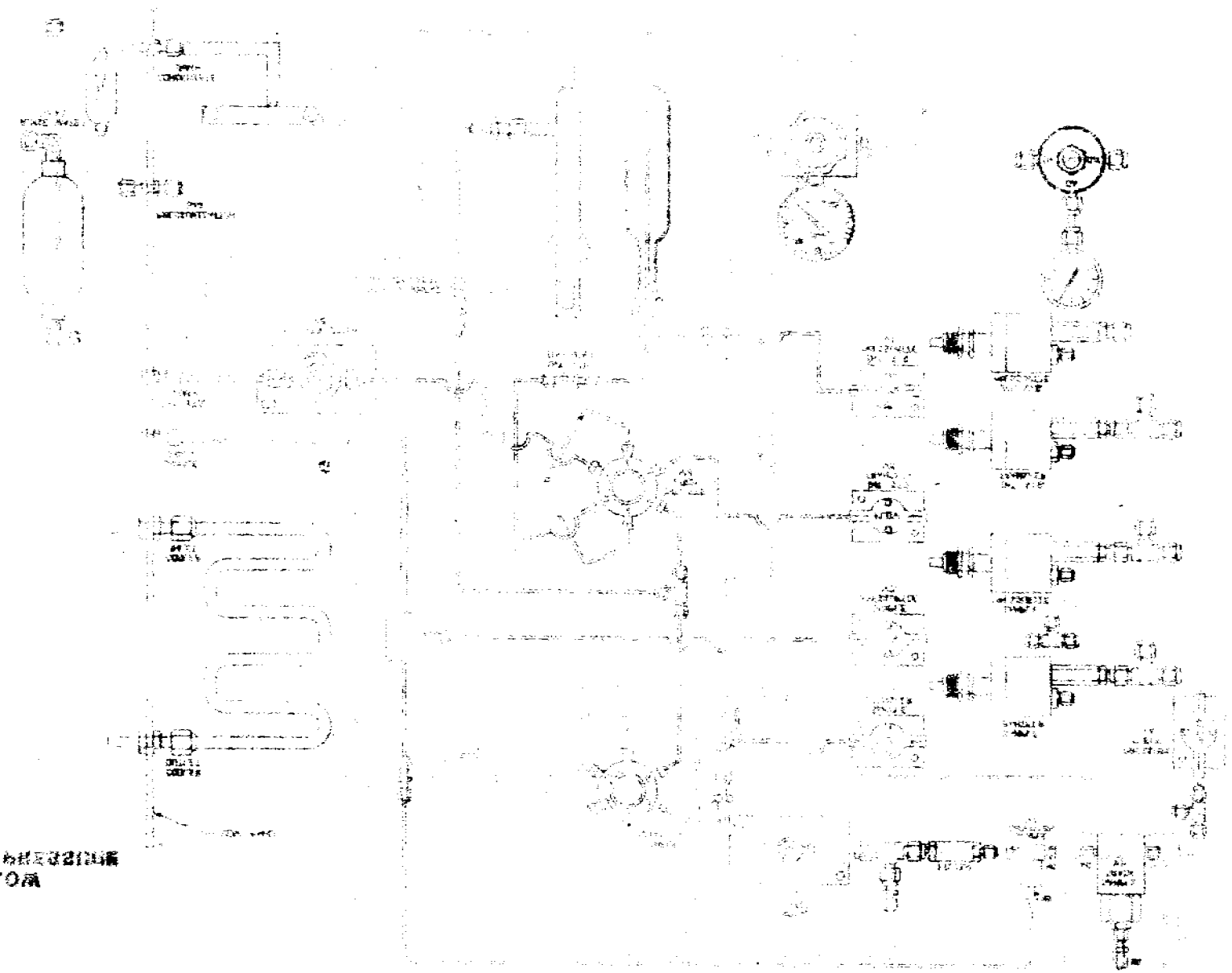
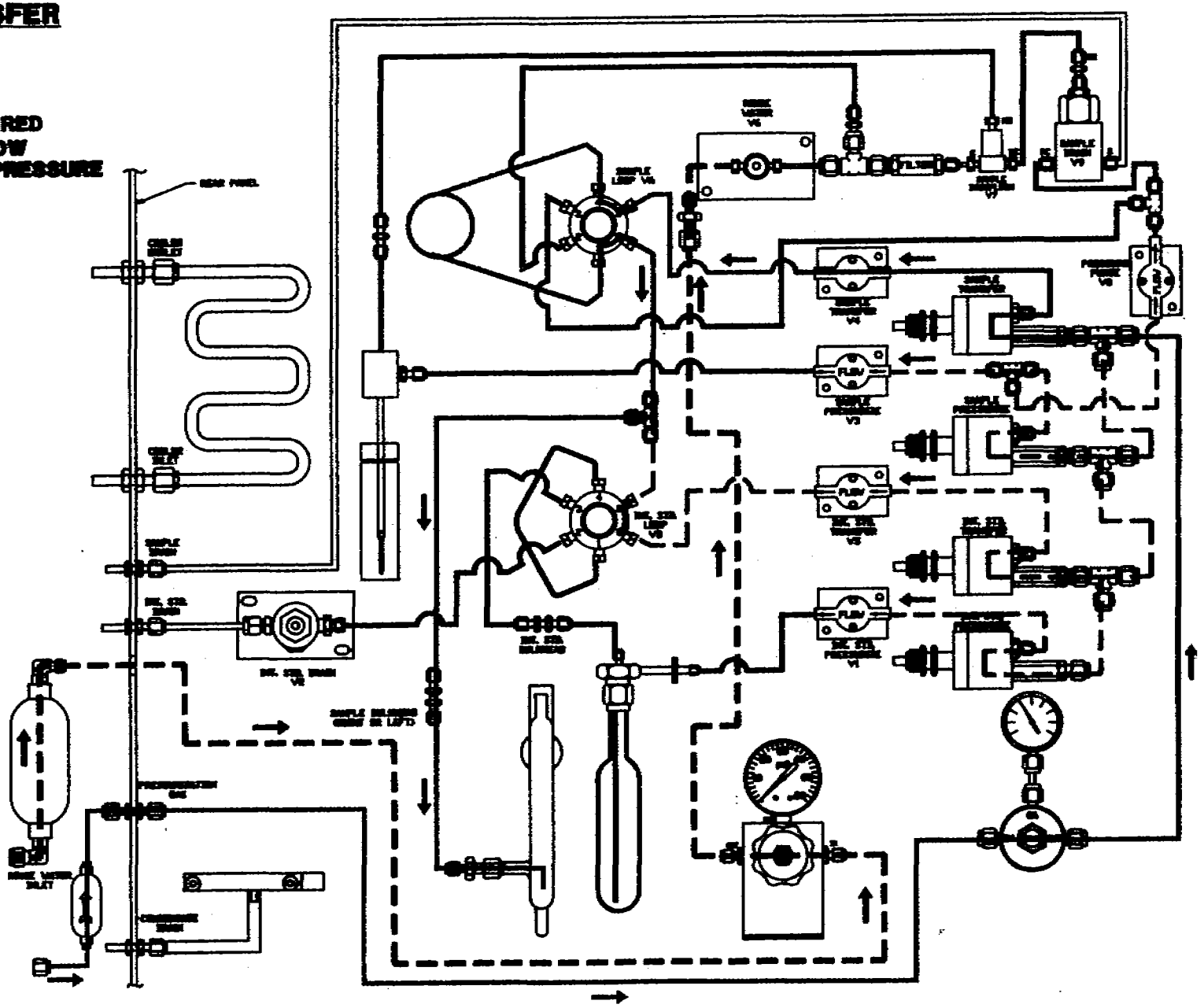


DILUTION TRANSFER

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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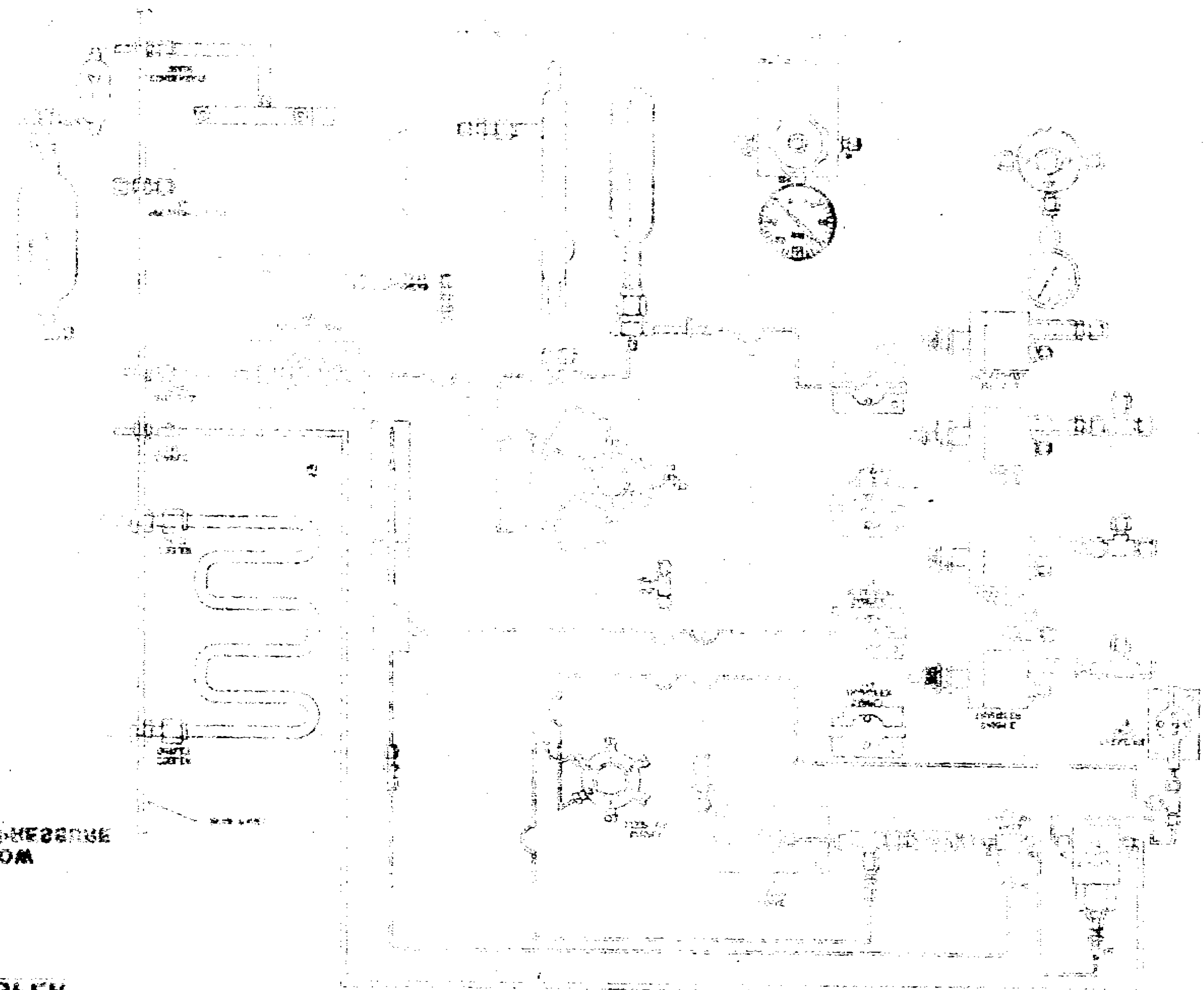
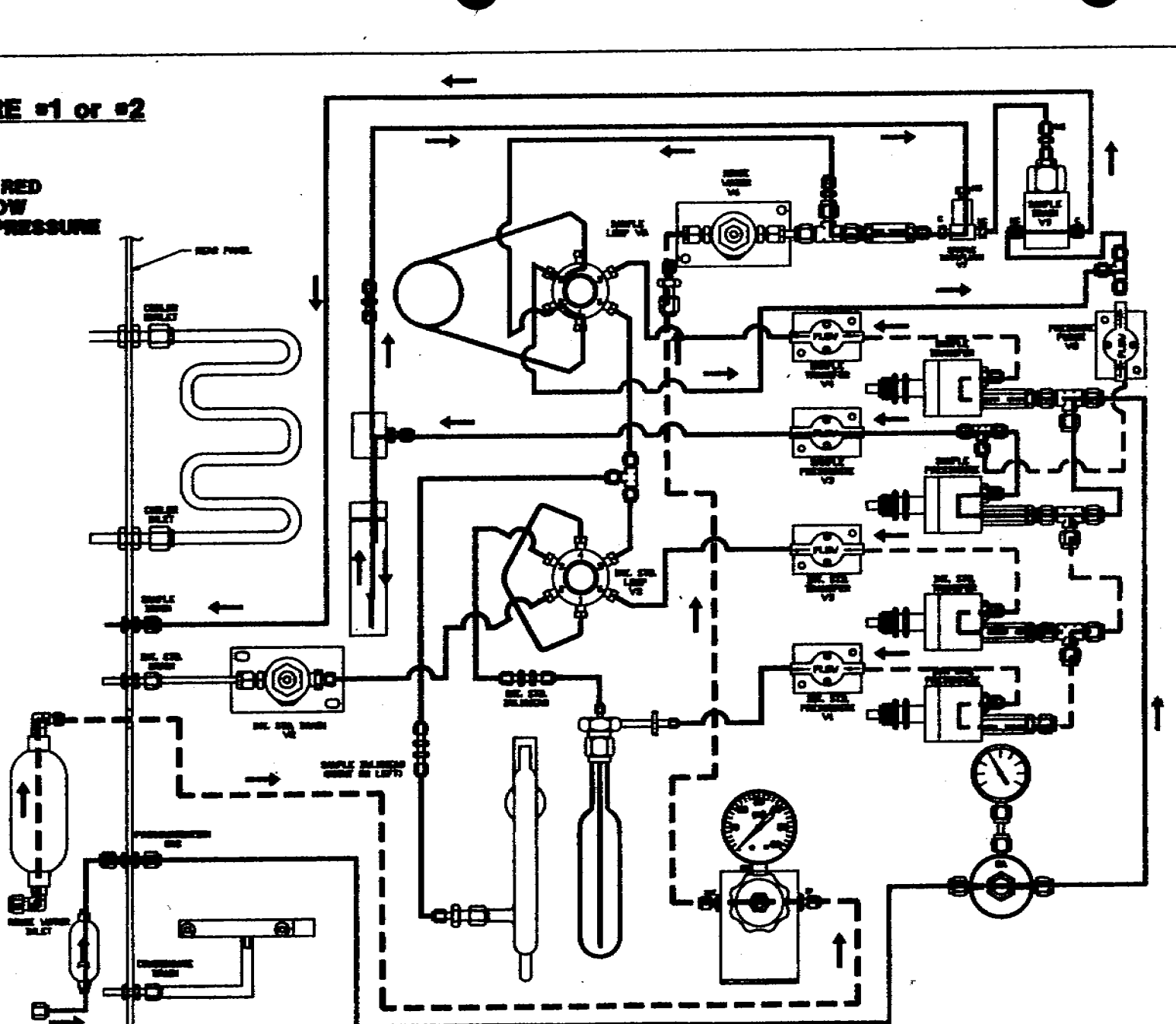


DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

DILUTION TRANSFER

SAMPLE PRESSURE #1 or #2

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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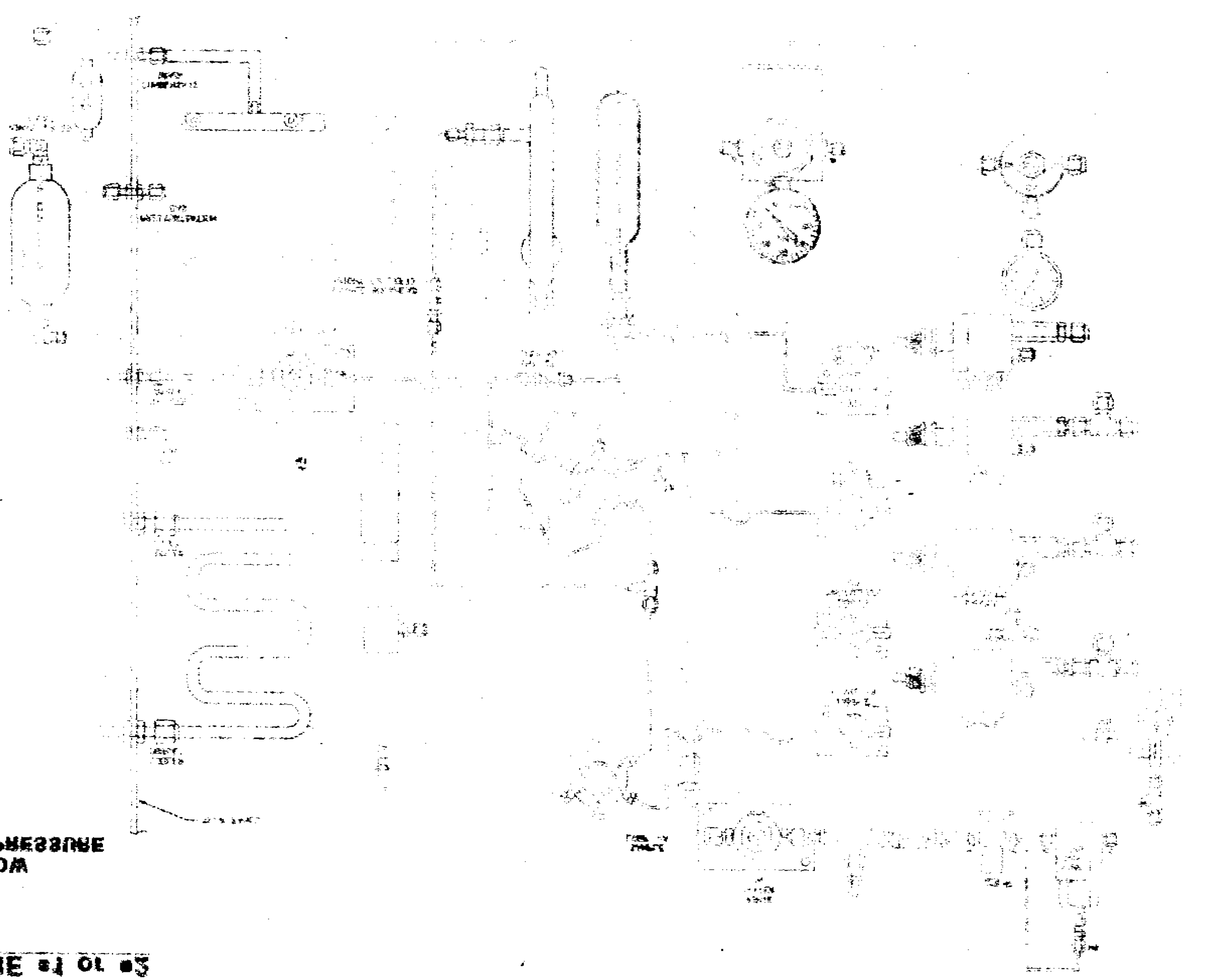
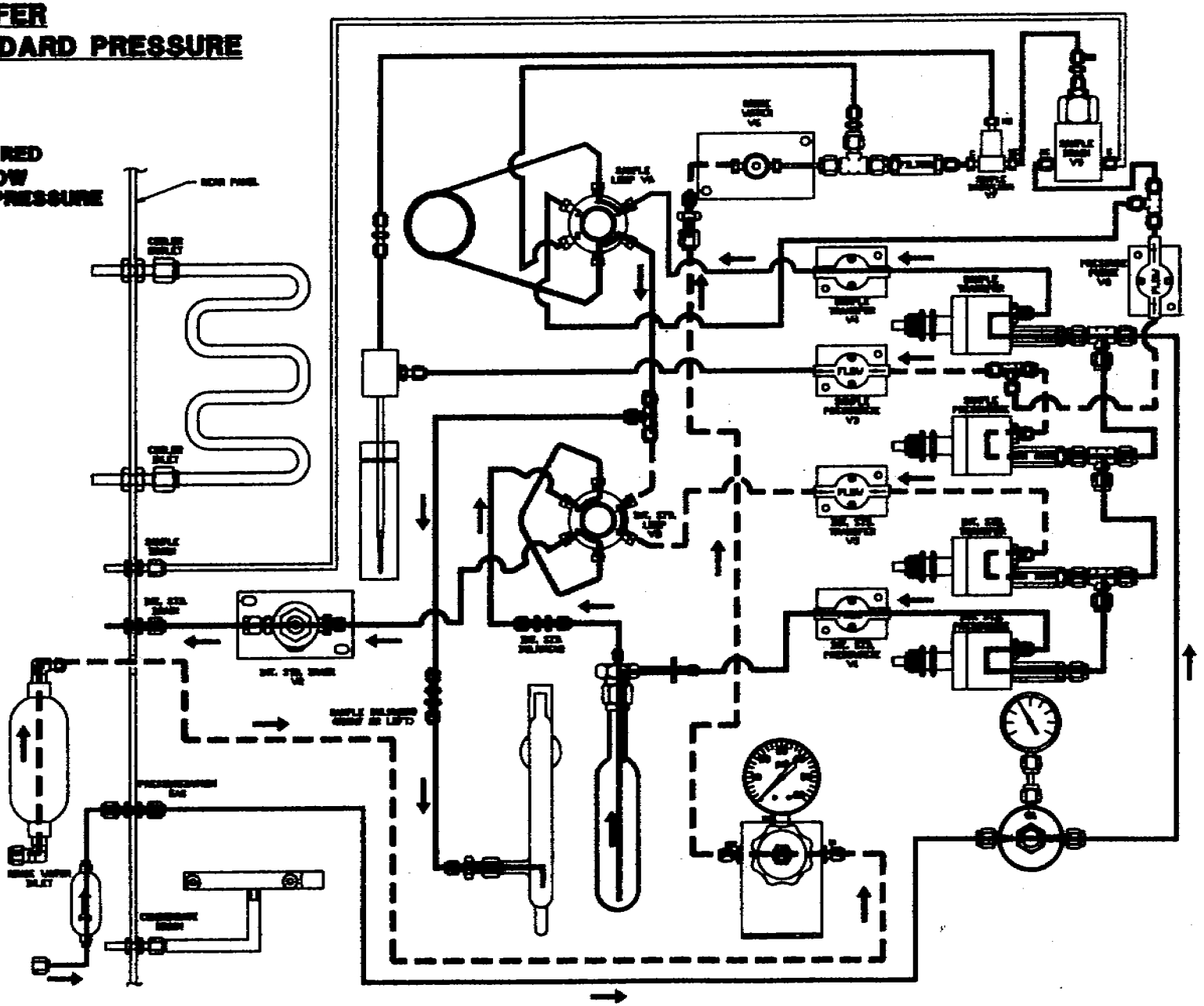


DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

SAMPLE PRESSURE #1 of #2

SAMPLE TRANSFER
INTERNAL STANDARD PRESSURE

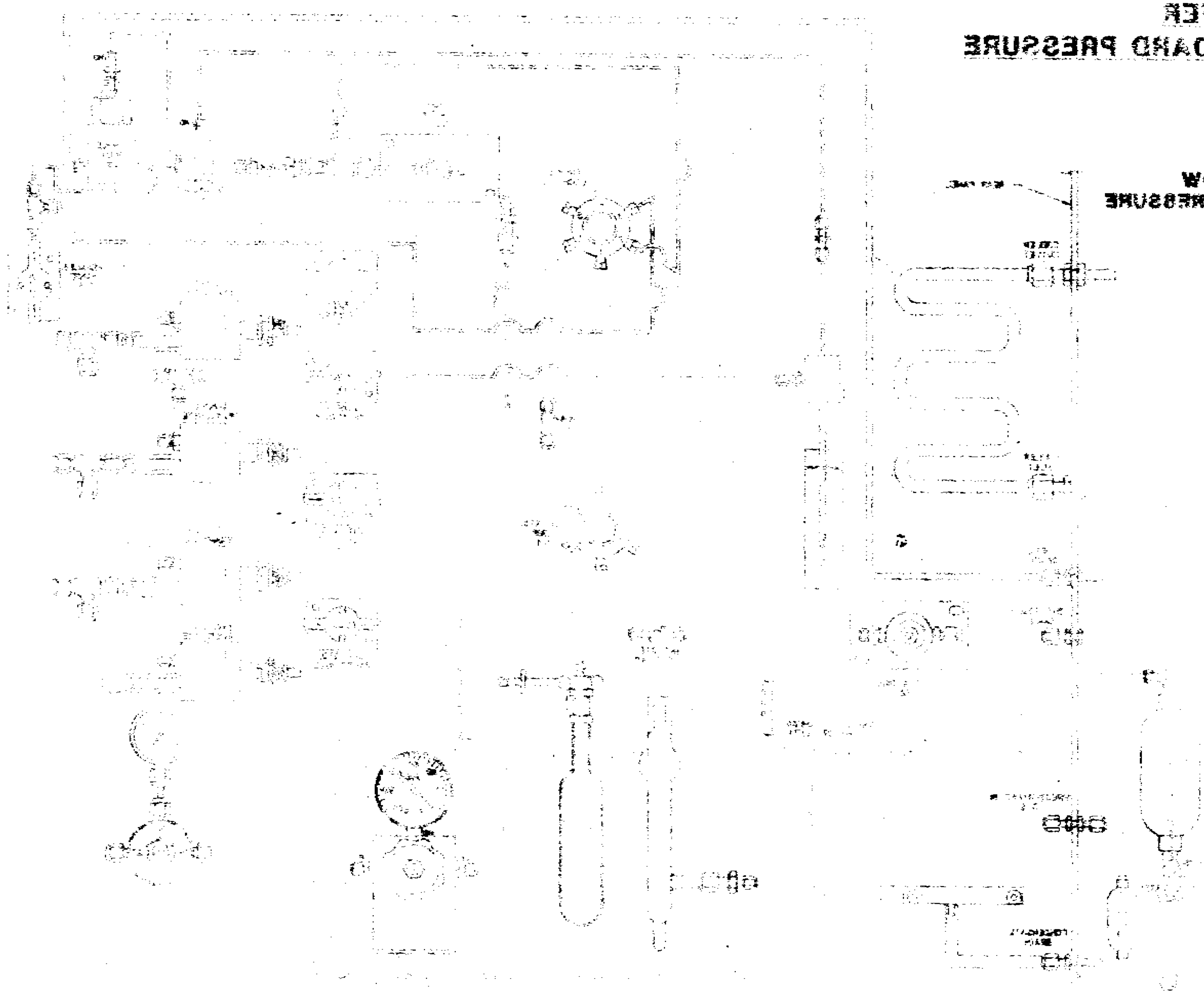
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315106_

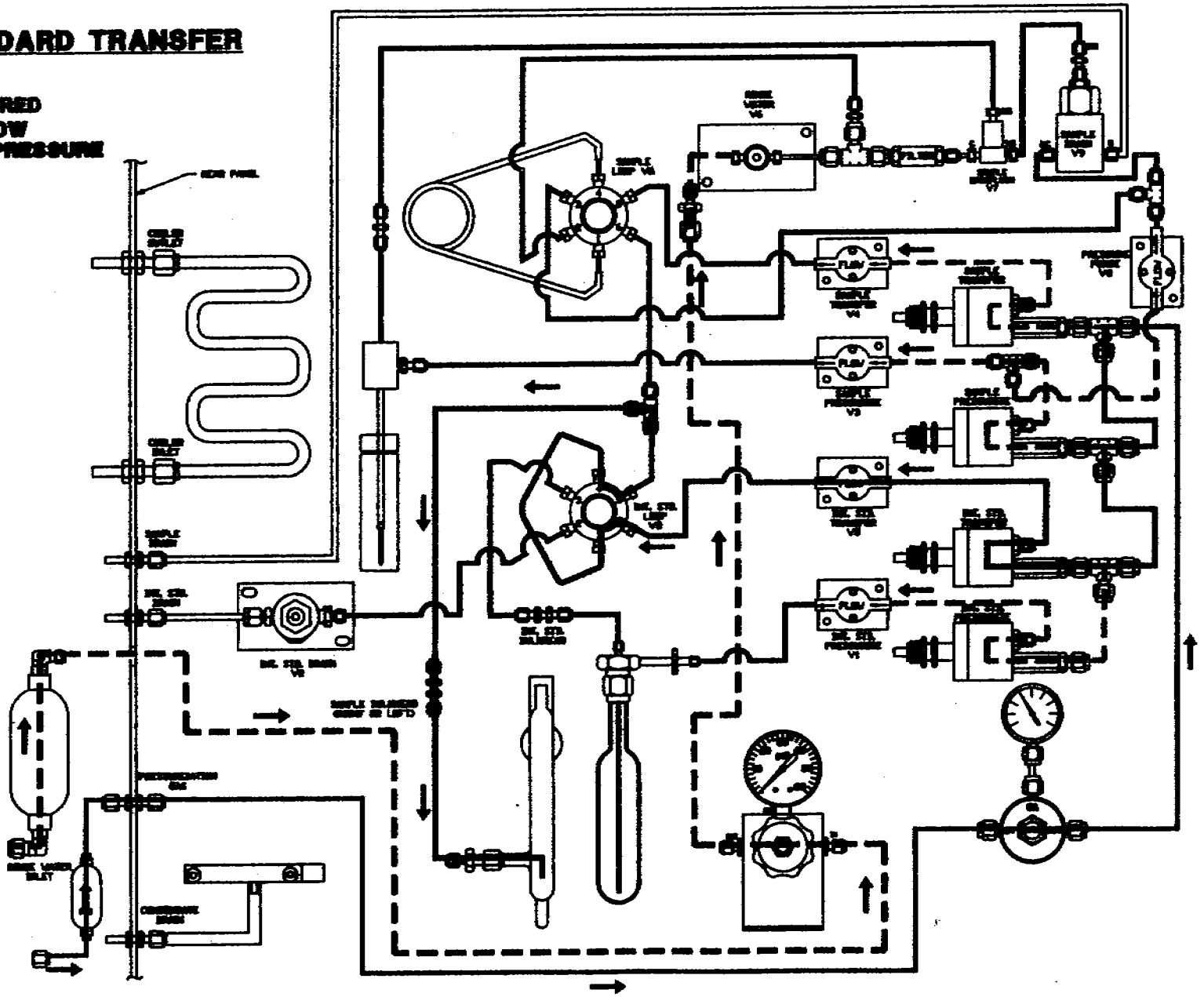
SAMPLE TRANSFER
INTERNAL STANDARD PRESSURE

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



INTERNAL STANDARD TRANSFER

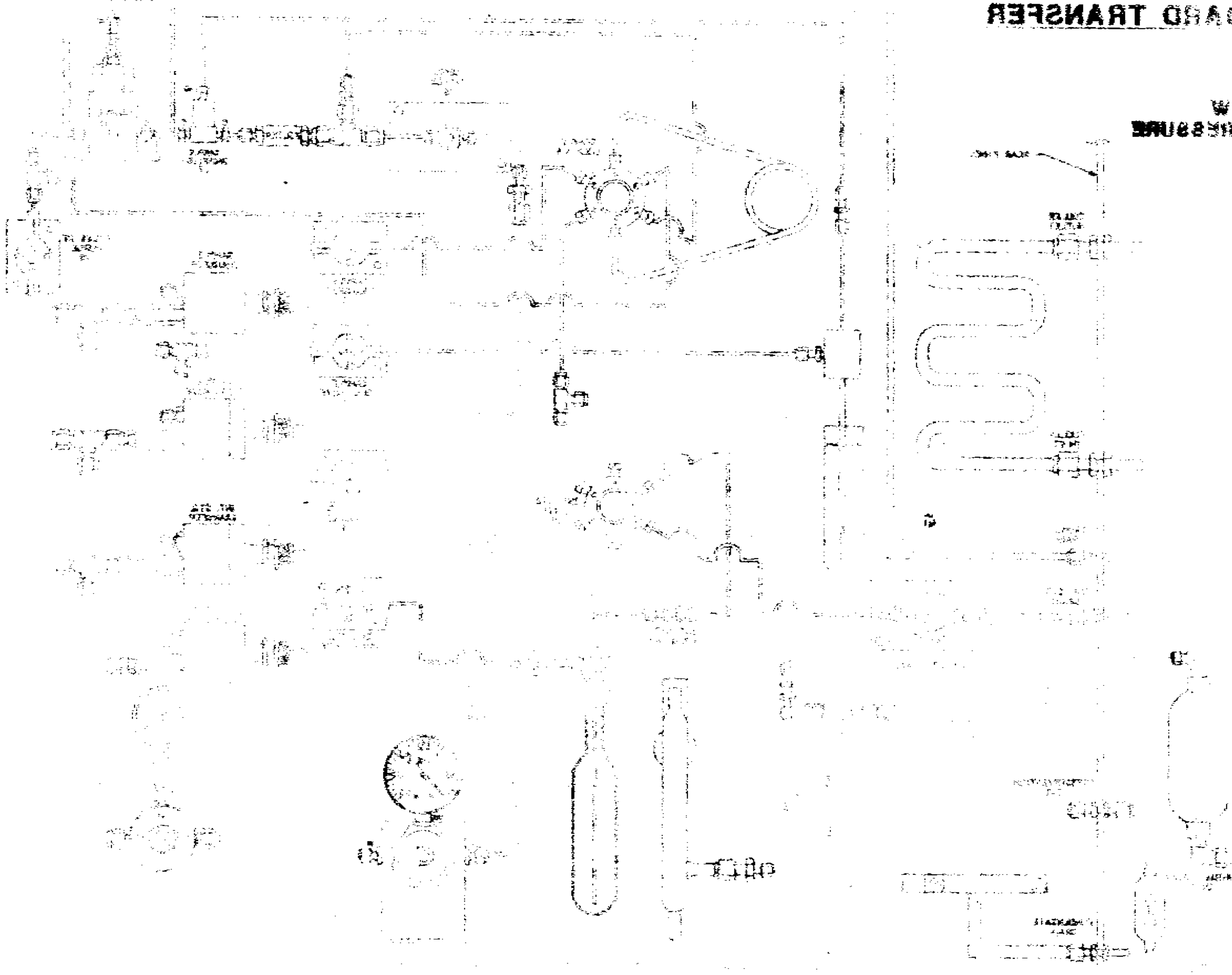
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315107_

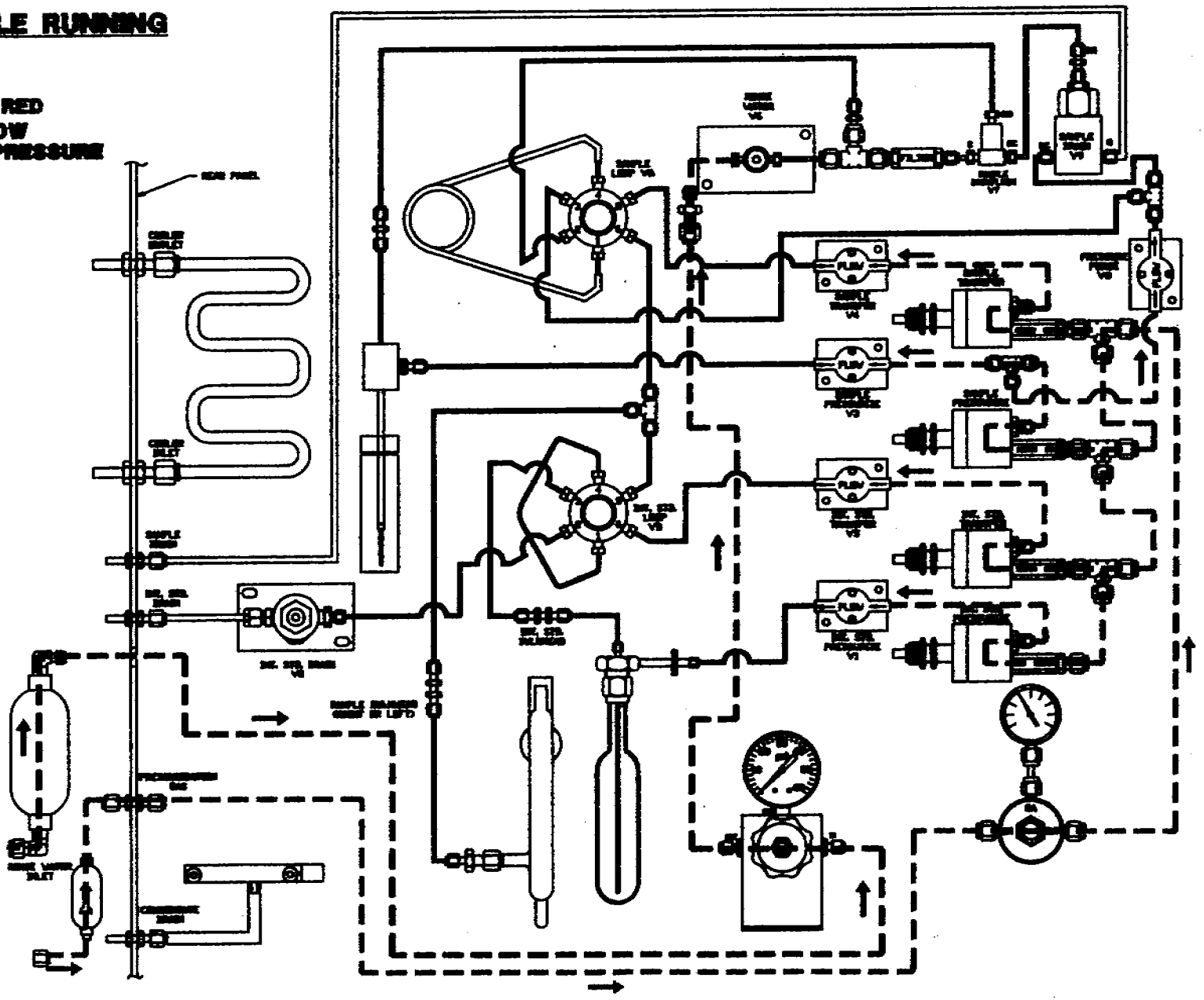
INTERNAL STANDARD TRANSFER

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

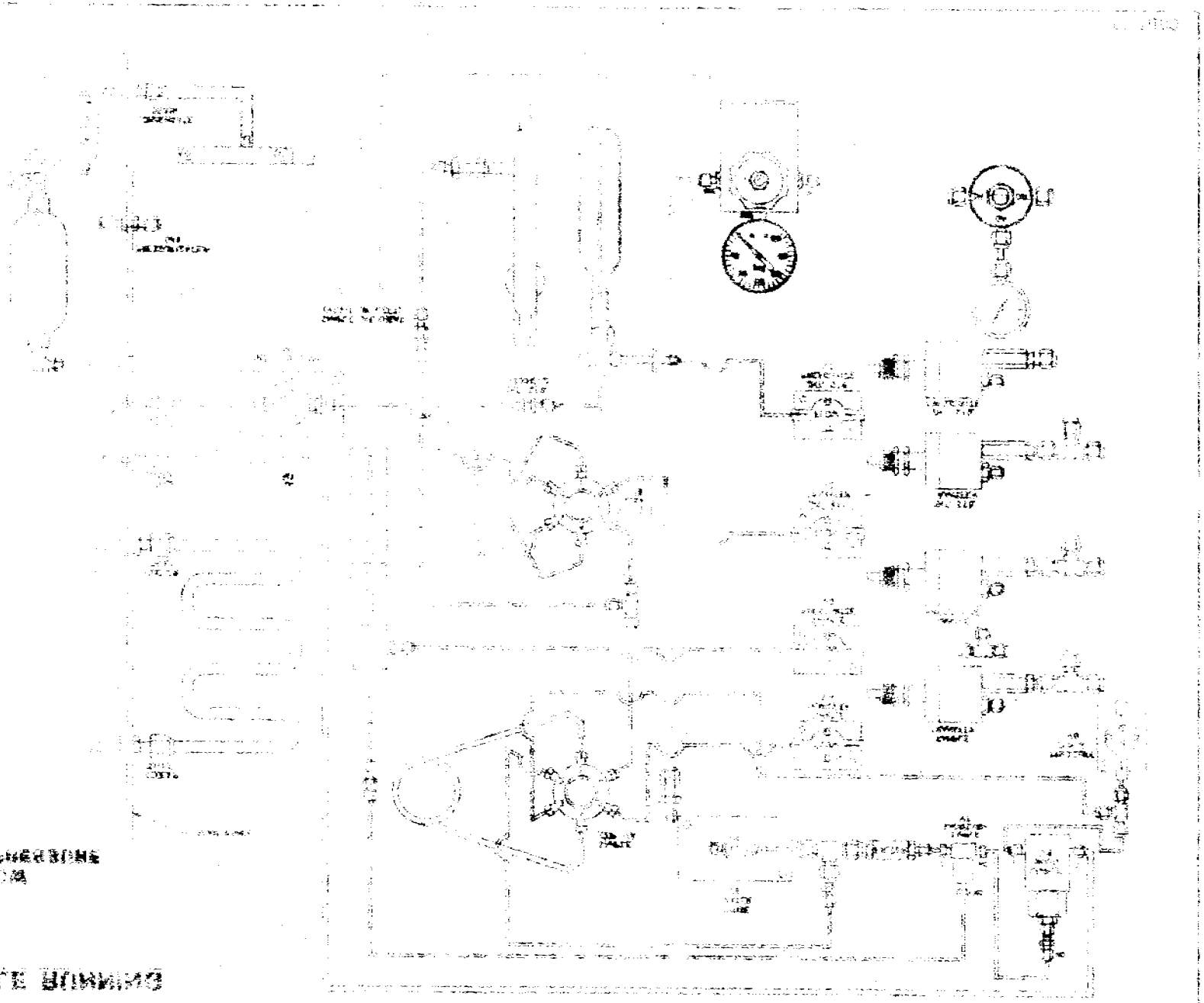


STANDBY/SAMPLE RUNNING

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

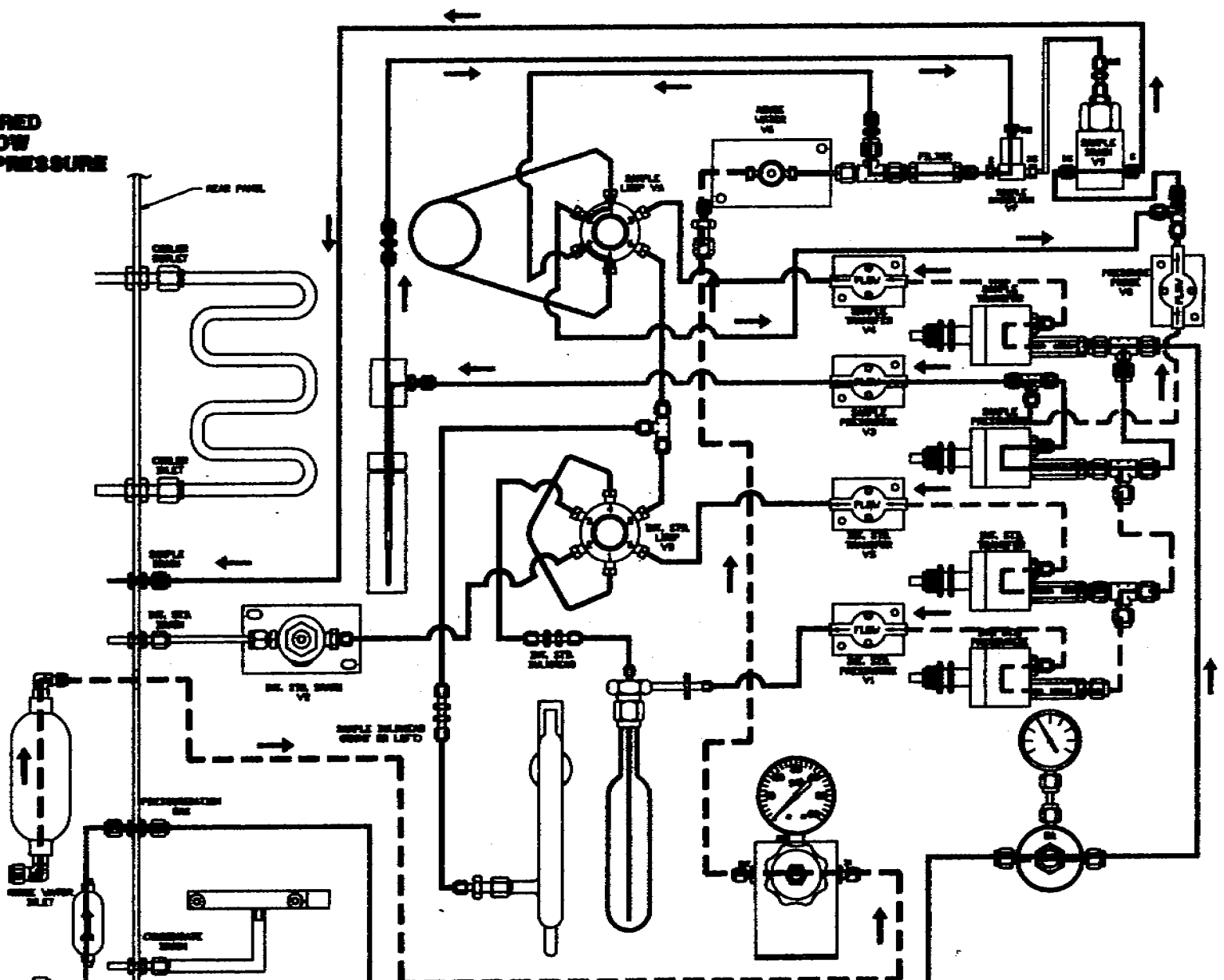


0315108_



EMPTY VIAL

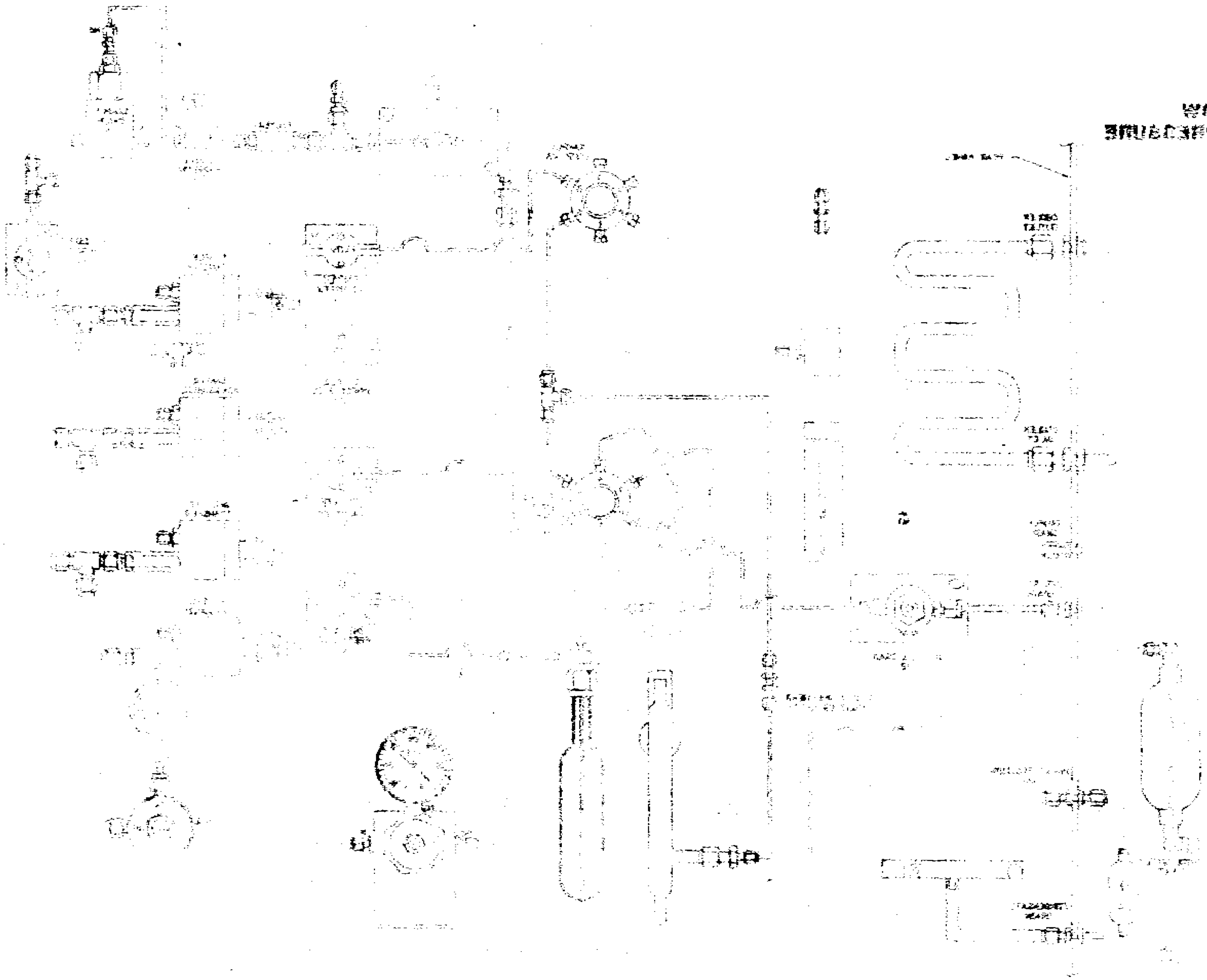
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315109_

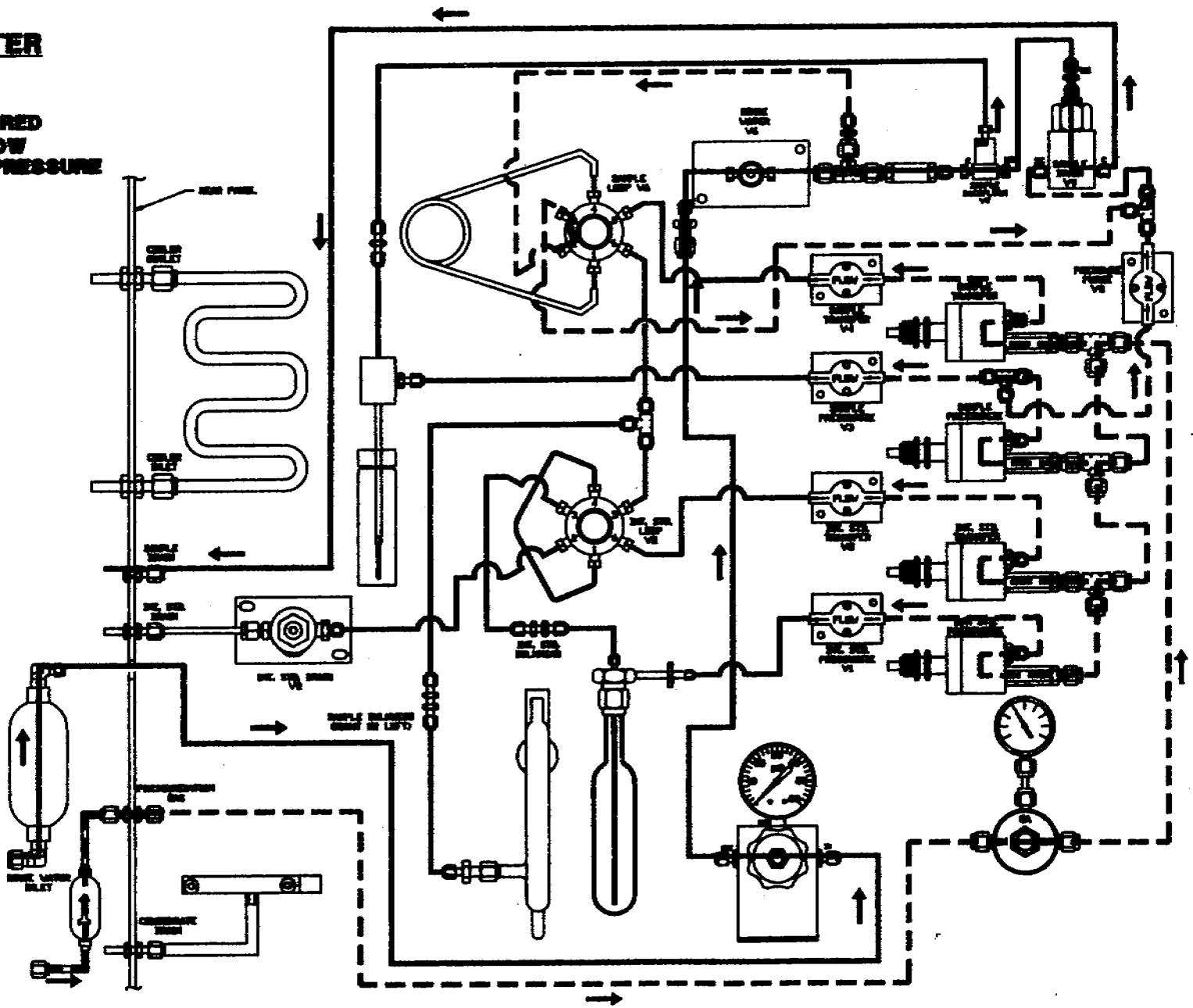
EMPTY VIAL

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

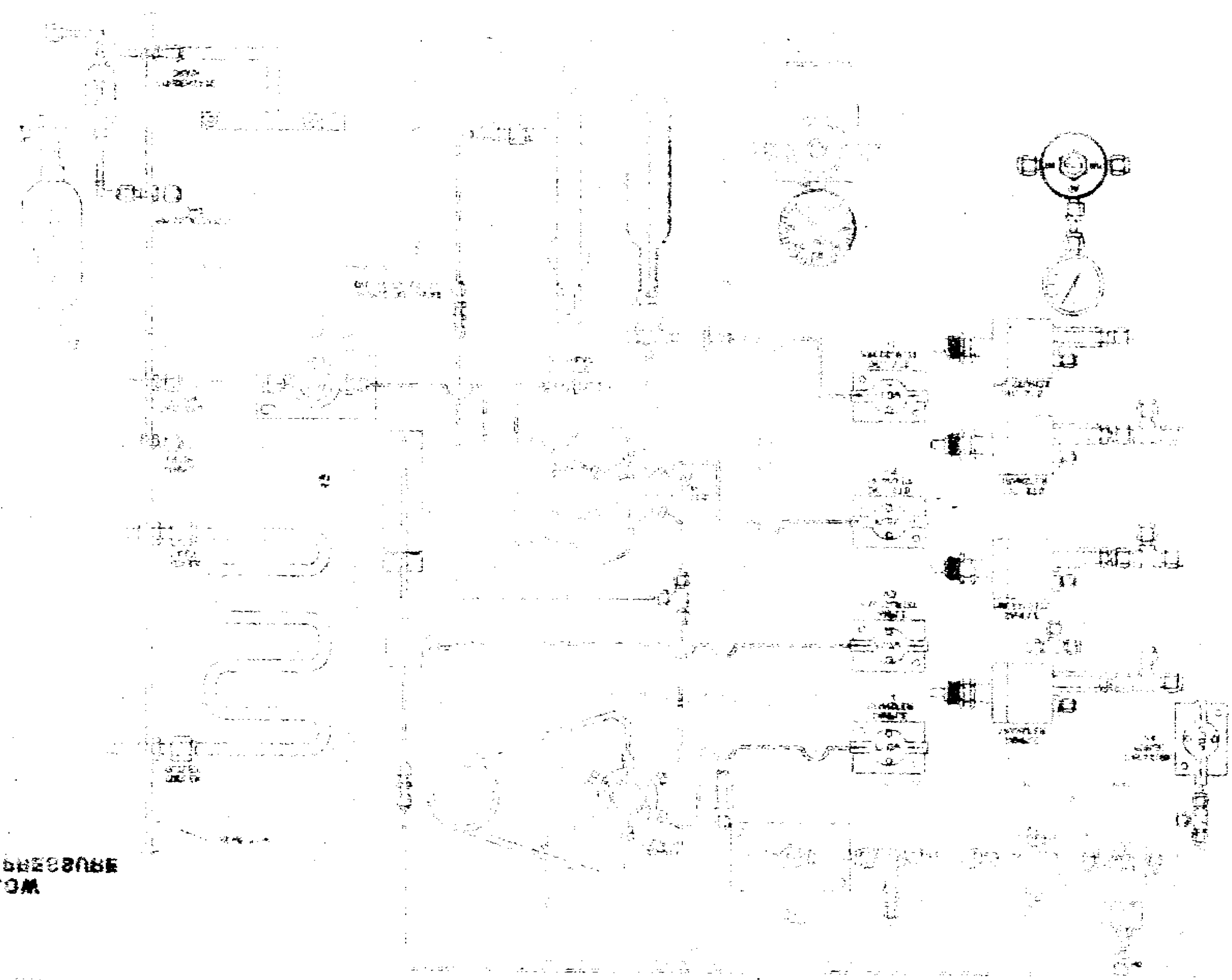


BACKFLUSH FILTER

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315110_

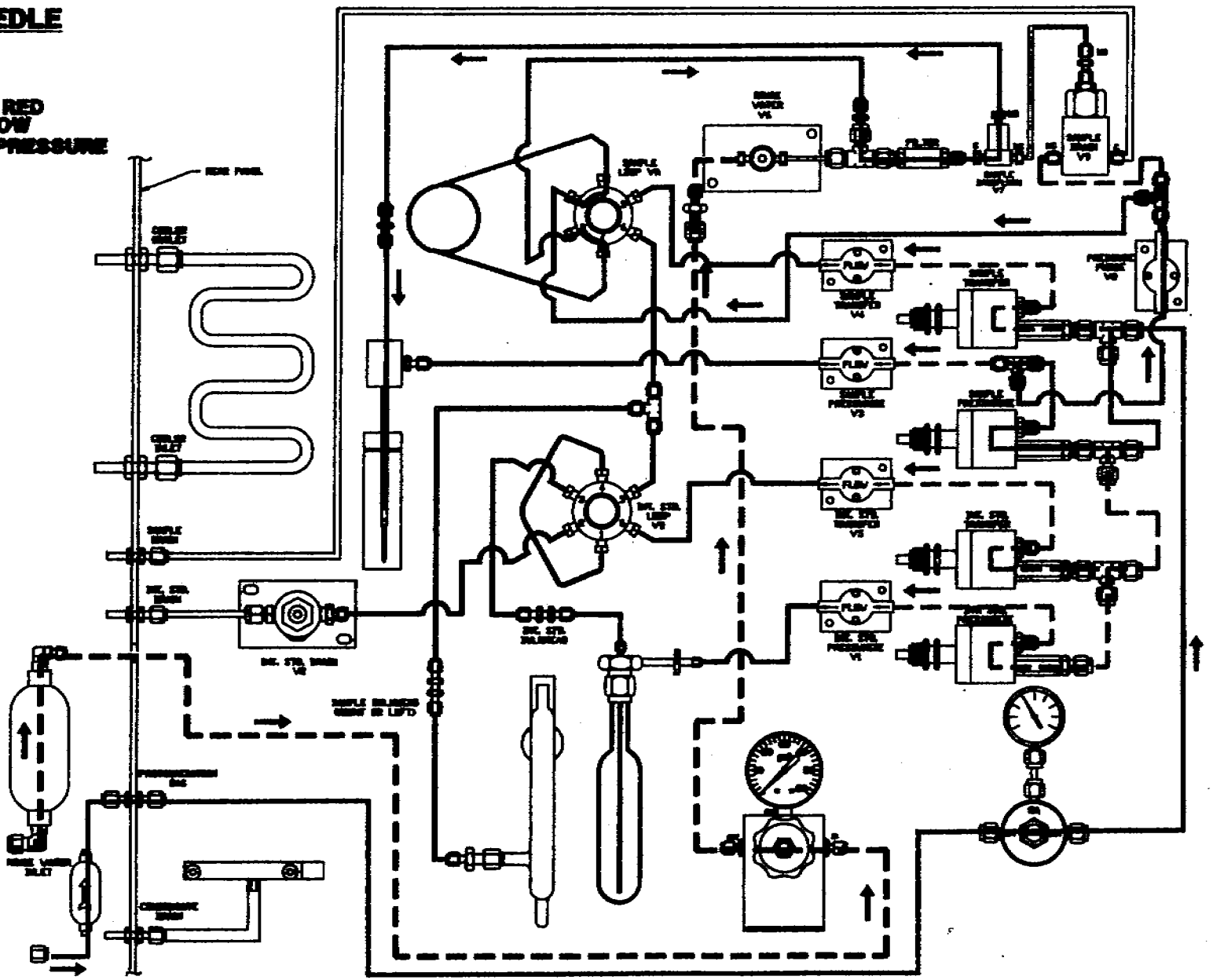


DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

BACKFLUSH FILTER

BACKFLUSH NEEDLE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



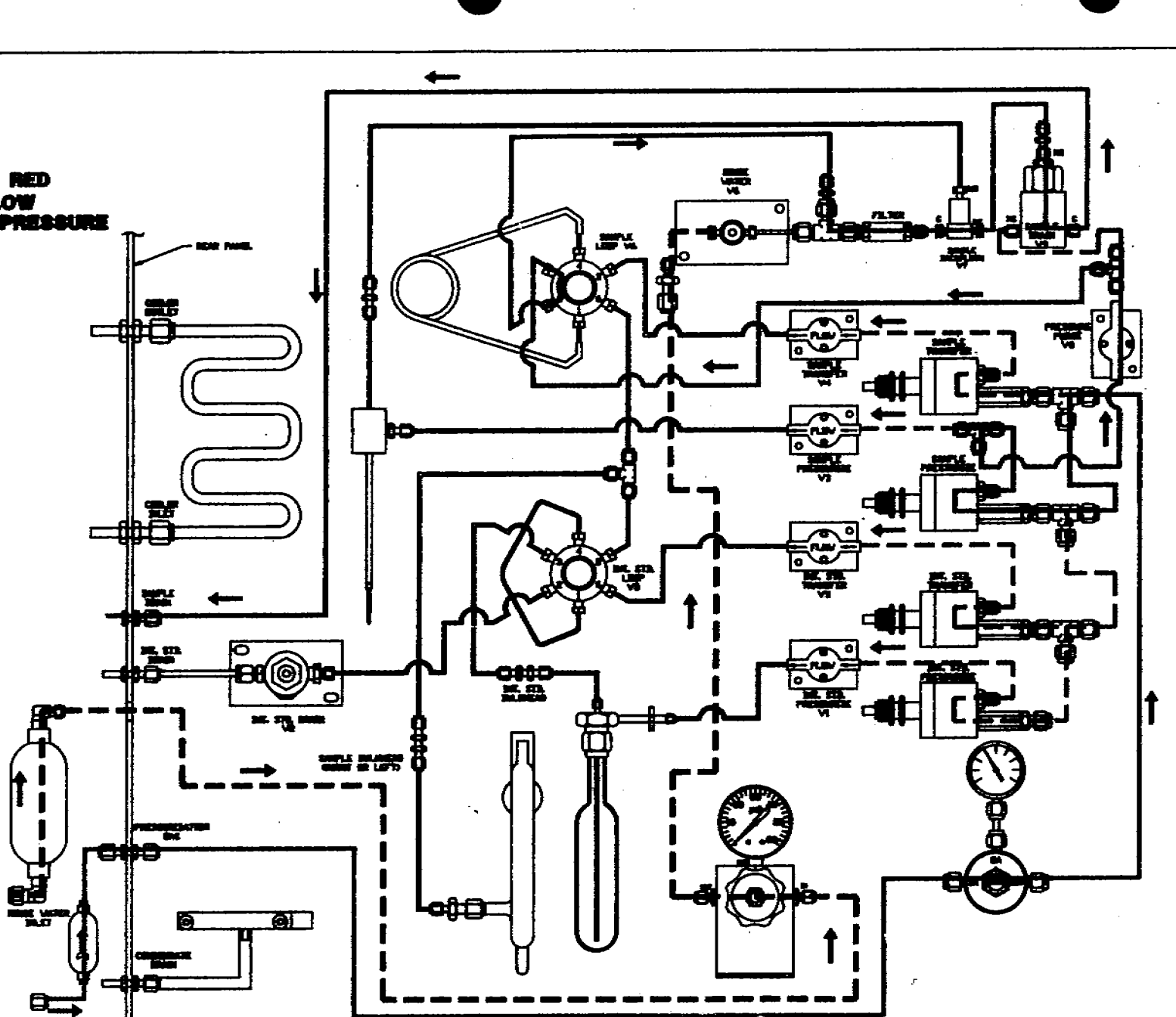
0315112_

DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

BACKFLUSH NEEDLE

PURGE FILTER

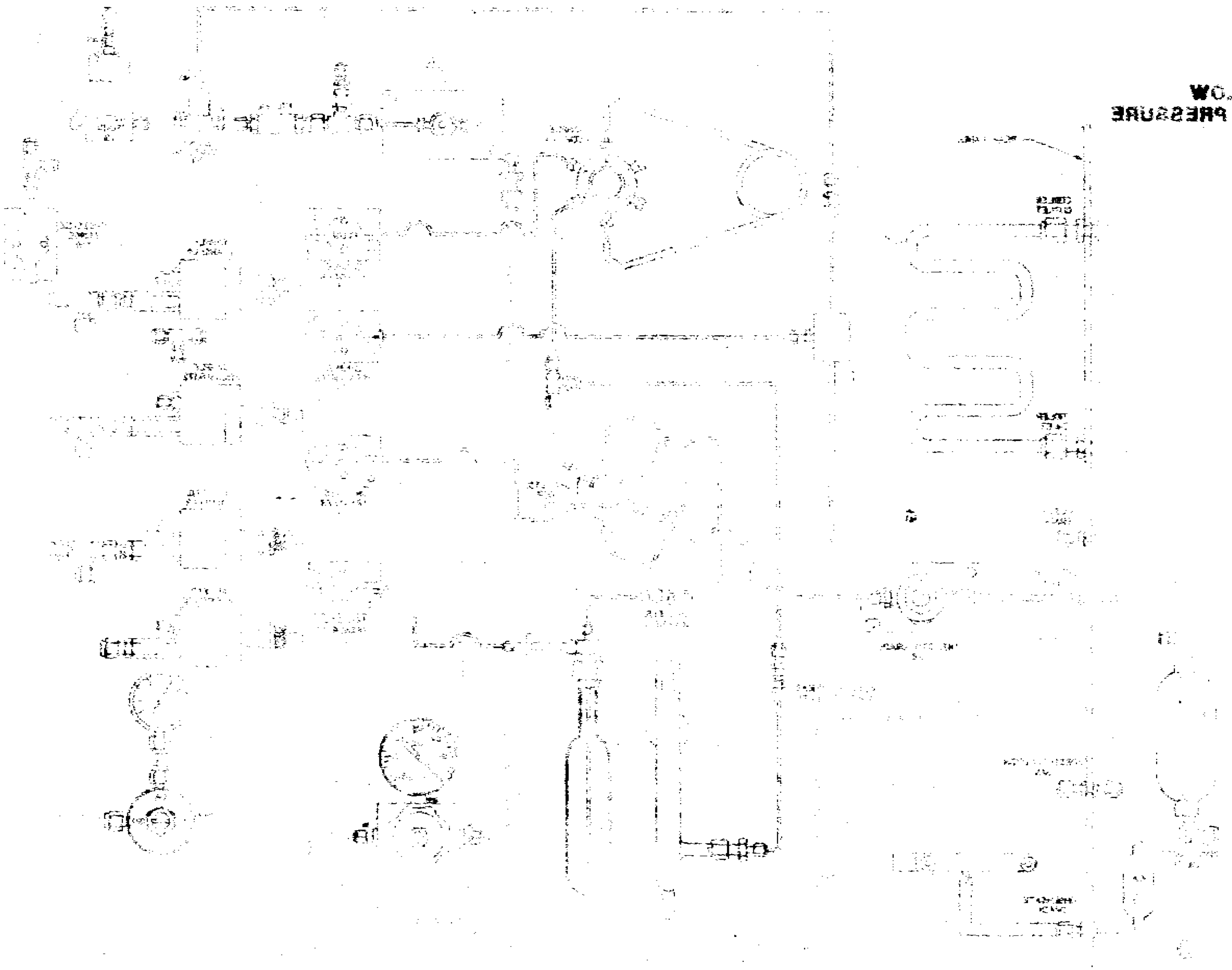
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315113_

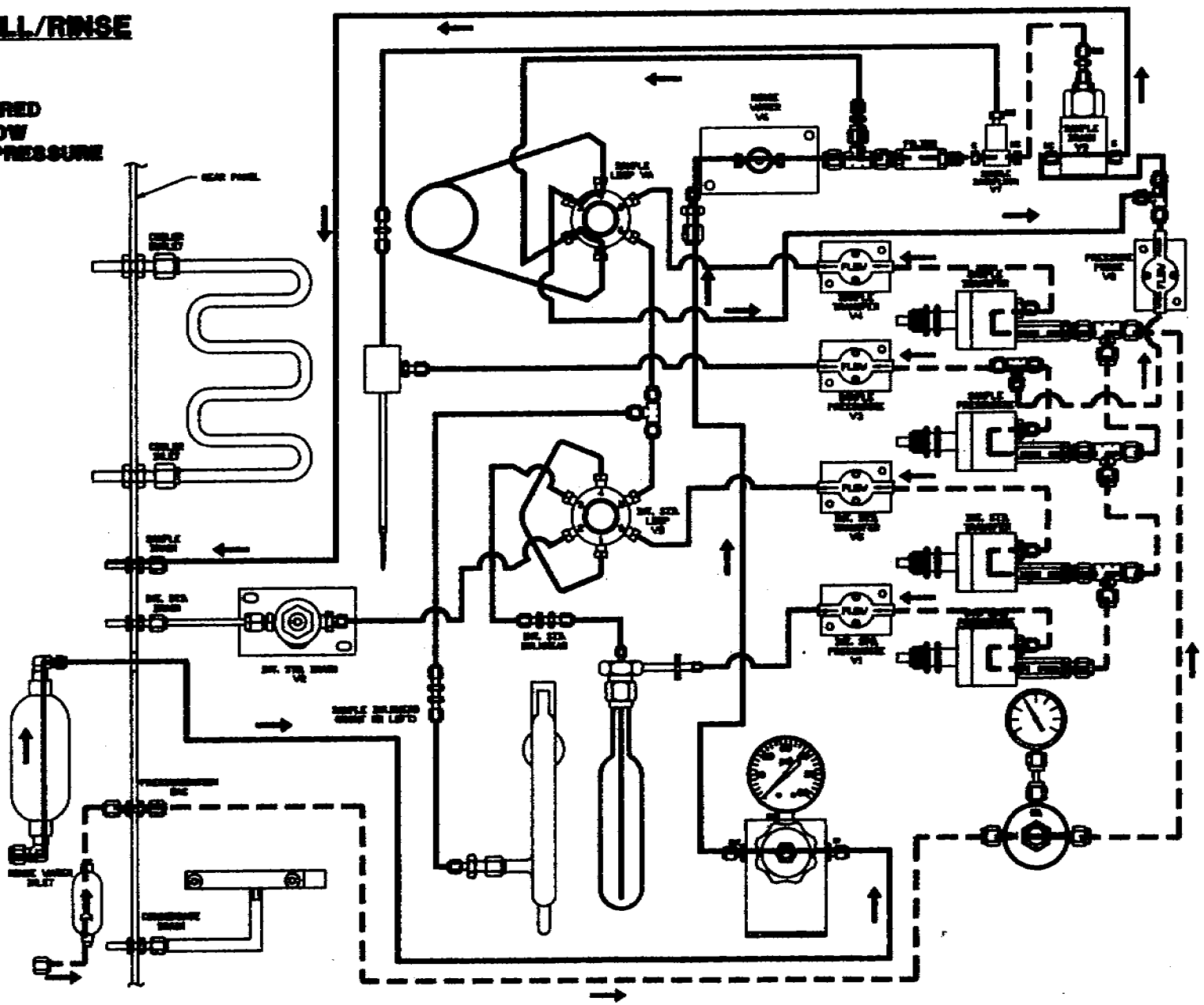
PURGE FILTER

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



SAMPLE LOOP FILL/RINSE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

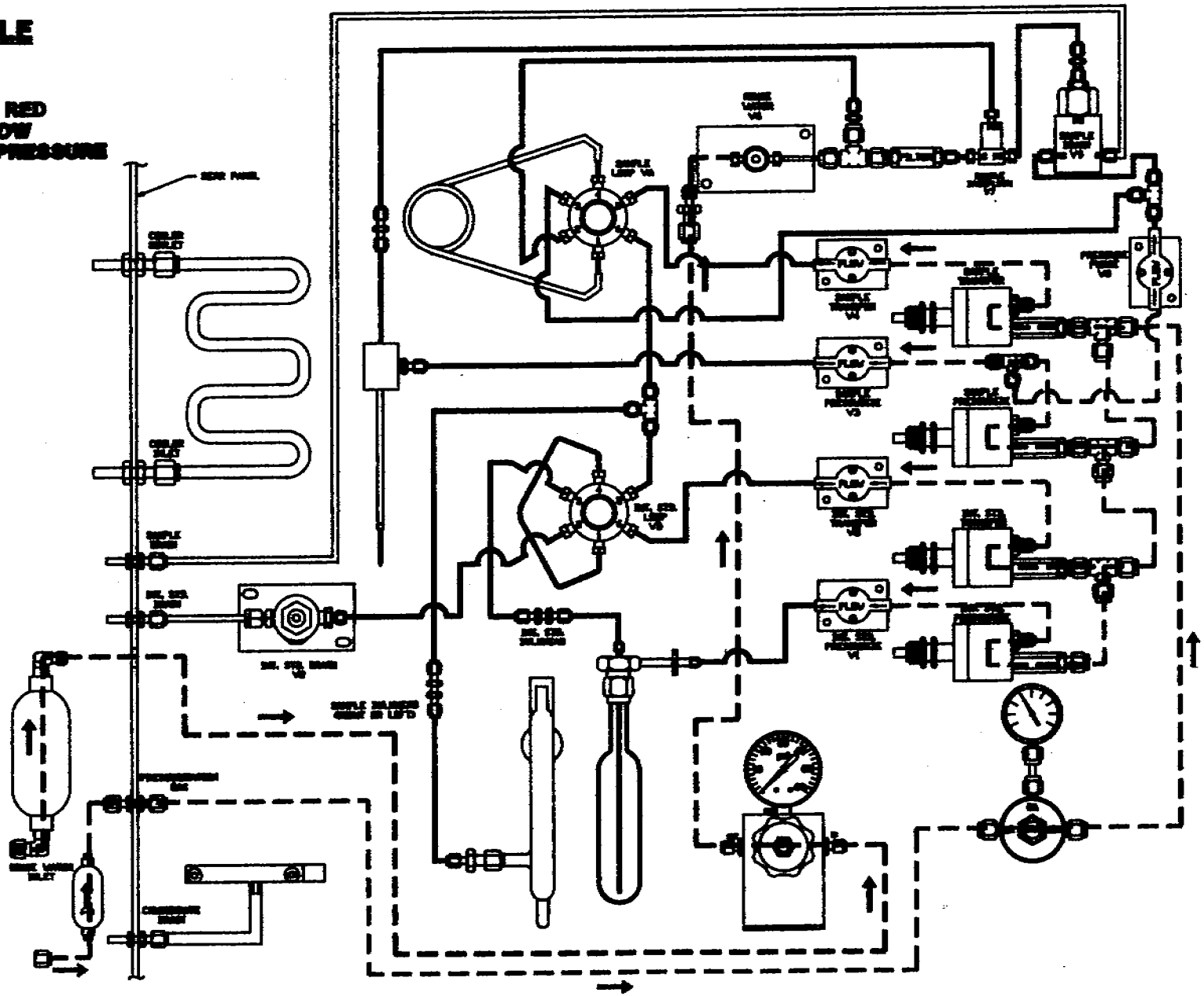


0315111_

SAMPLE TOOL FIXTURE

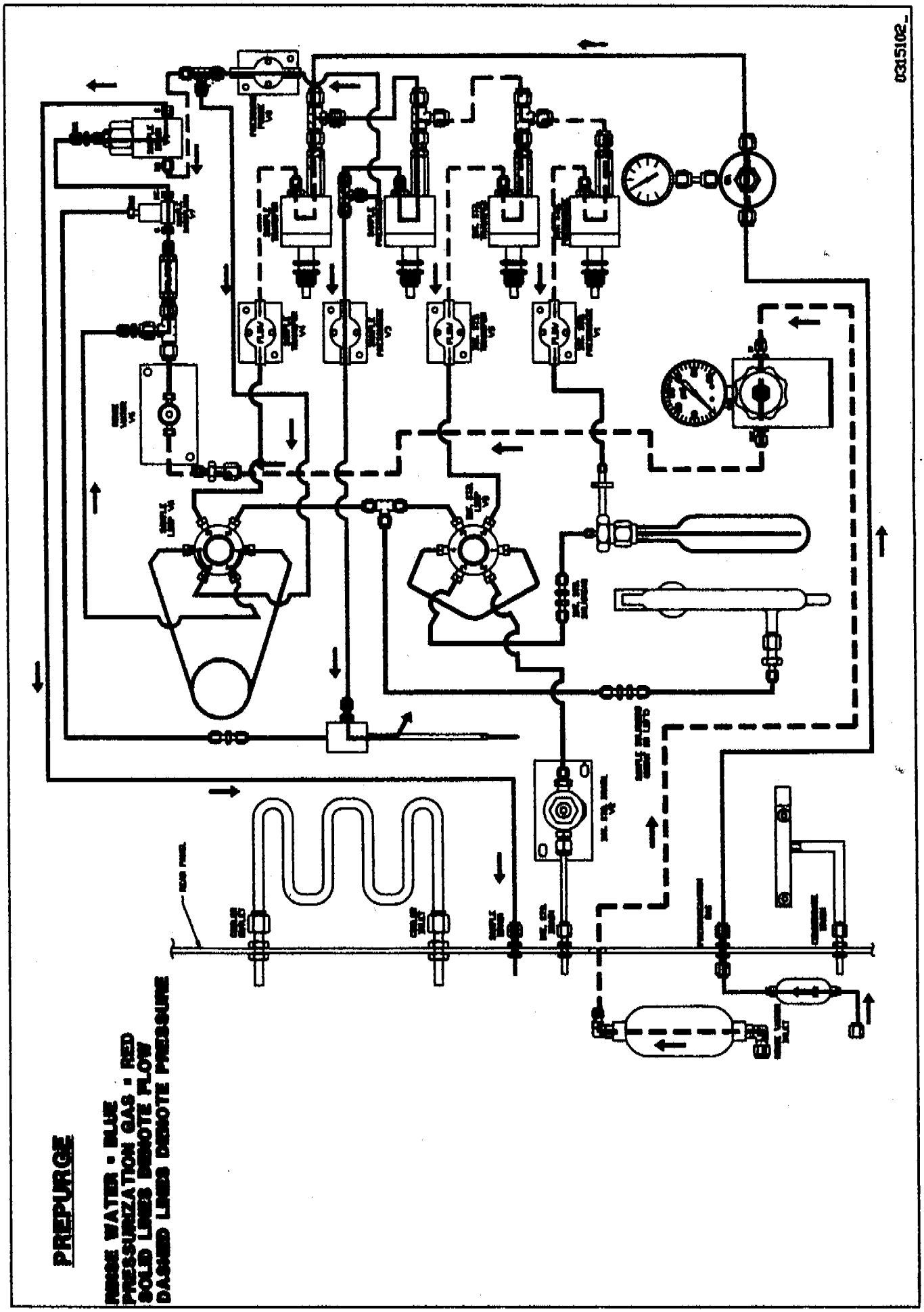
STANDBY/SETTLE

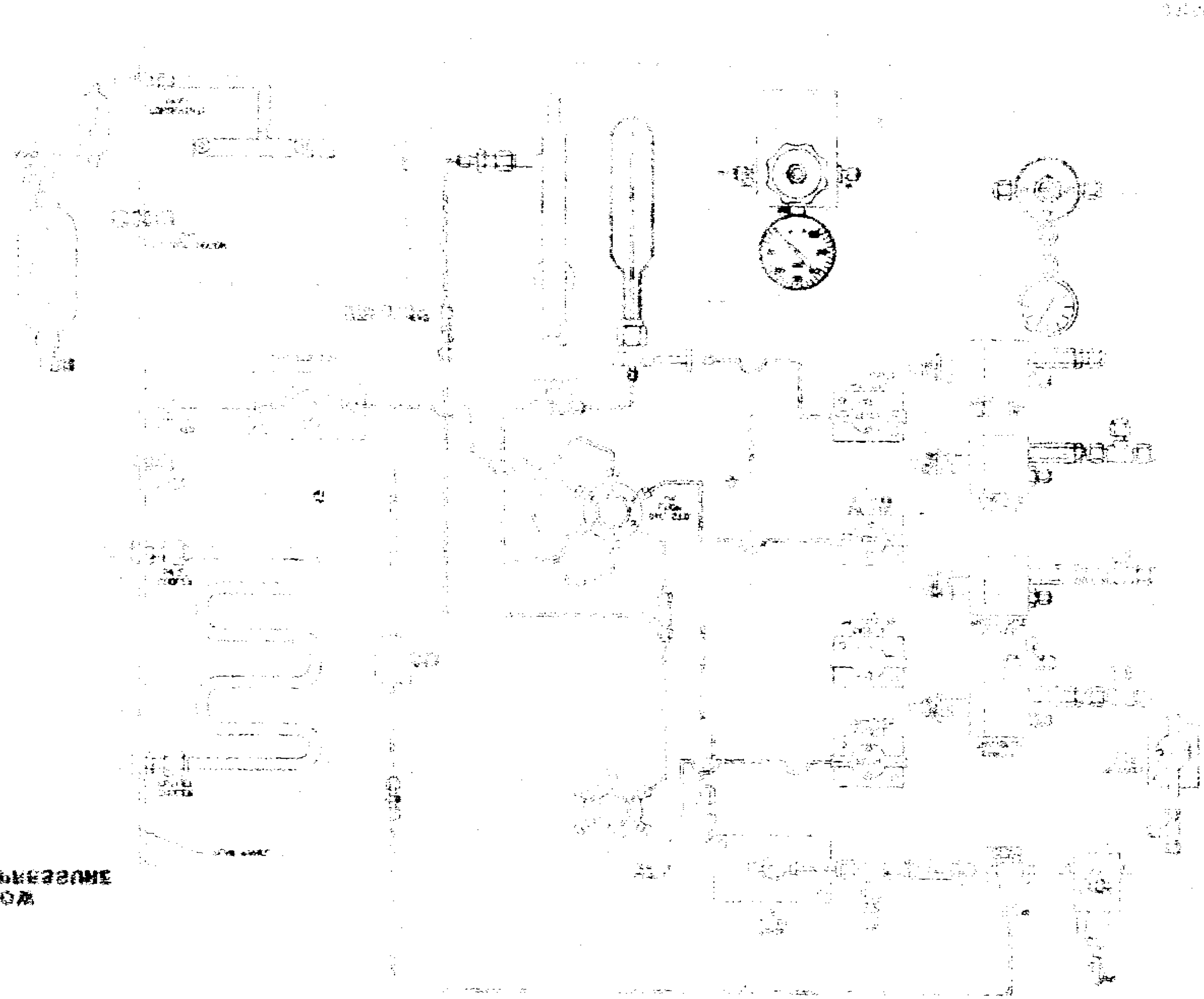
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315101_

STANDARD LITE


0315102_
PREPURGE
RINSE WATER - BLUE
PRESSURIZATION GAS - RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

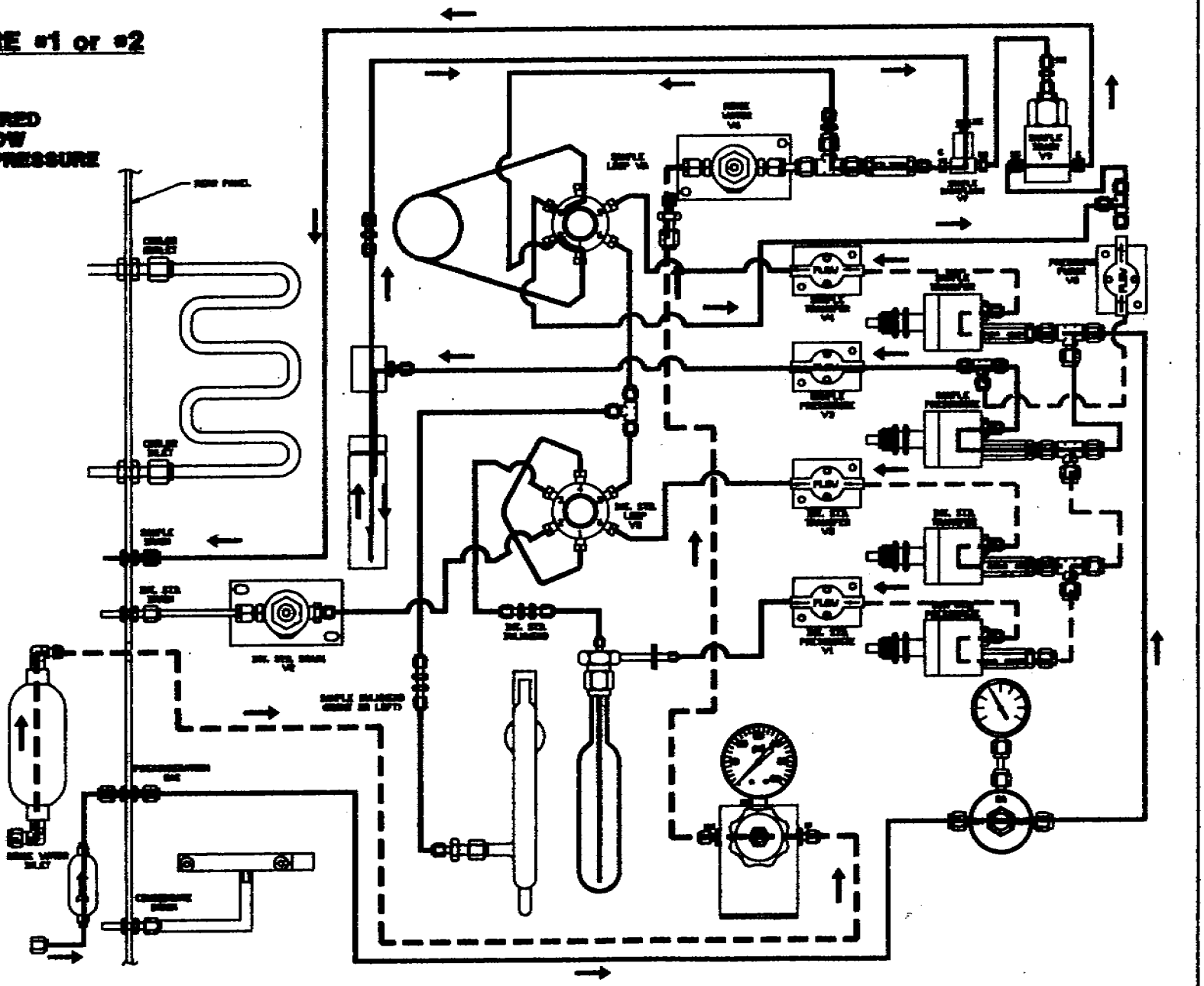


DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

PREPURGE

SAMPLE PRESSURE #1 or #2

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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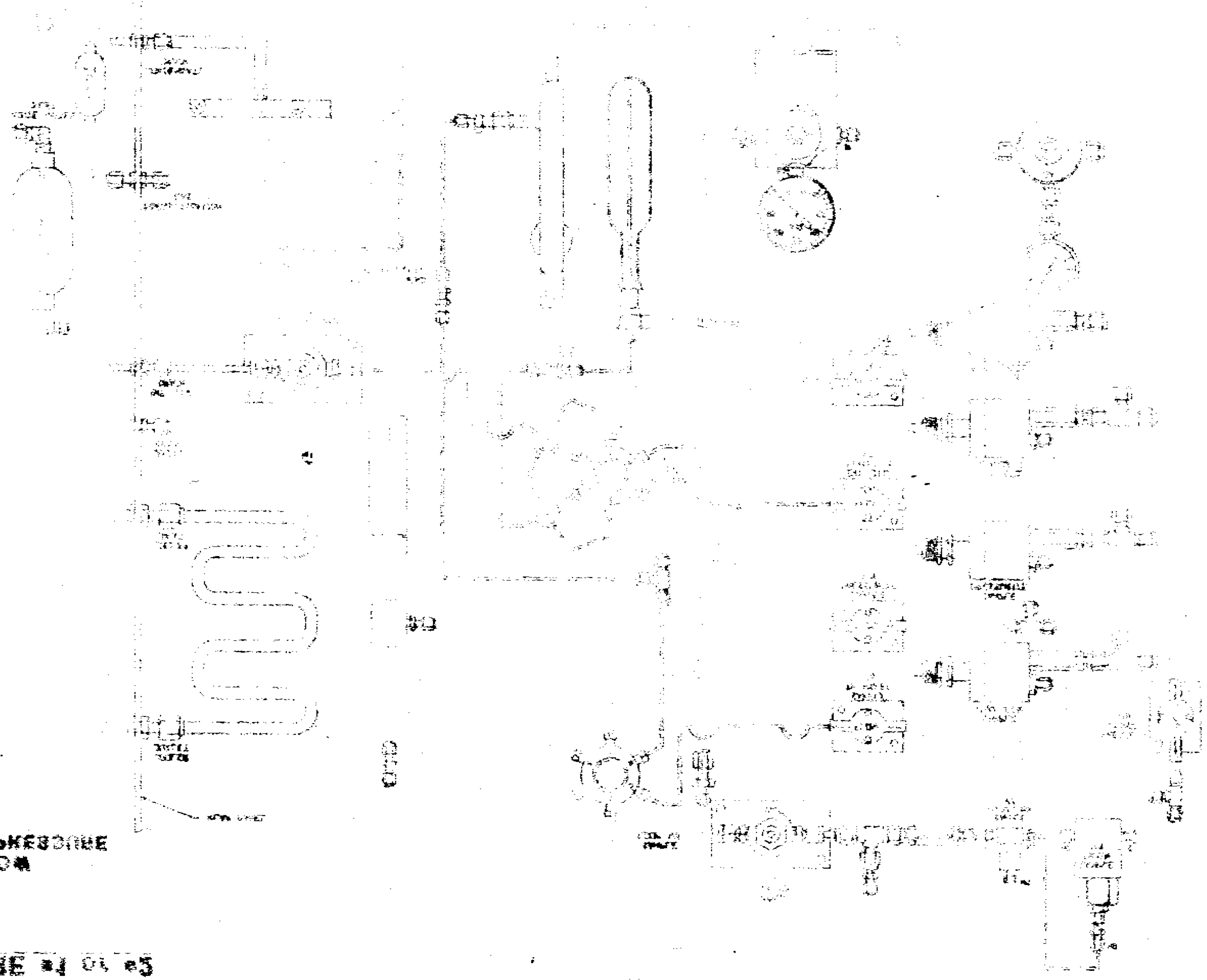
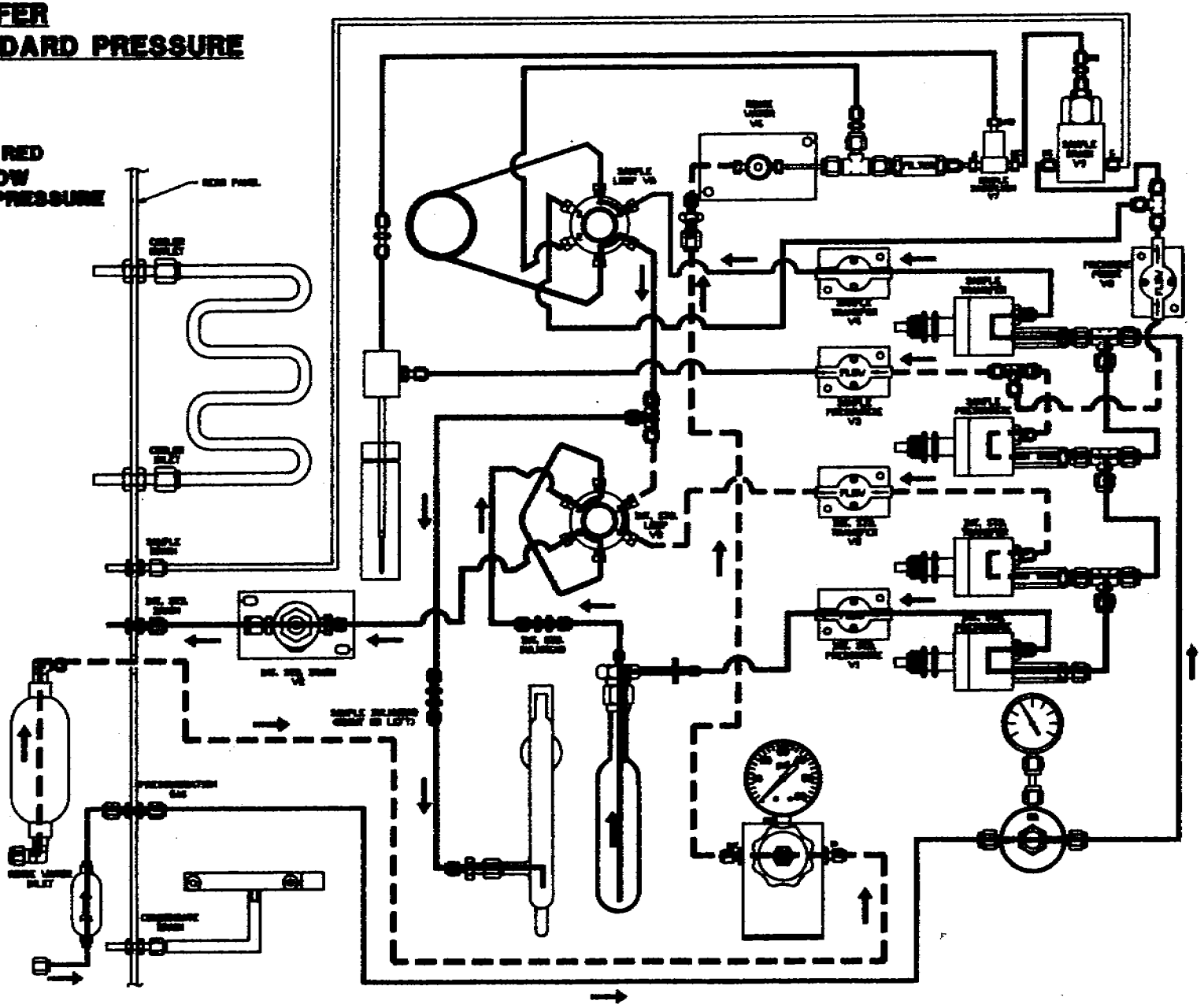


DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

SAMPLE PRESSURE #1 OF #2

SAMPLE TRANSFER
INTERNAL STANDARD PRESSURE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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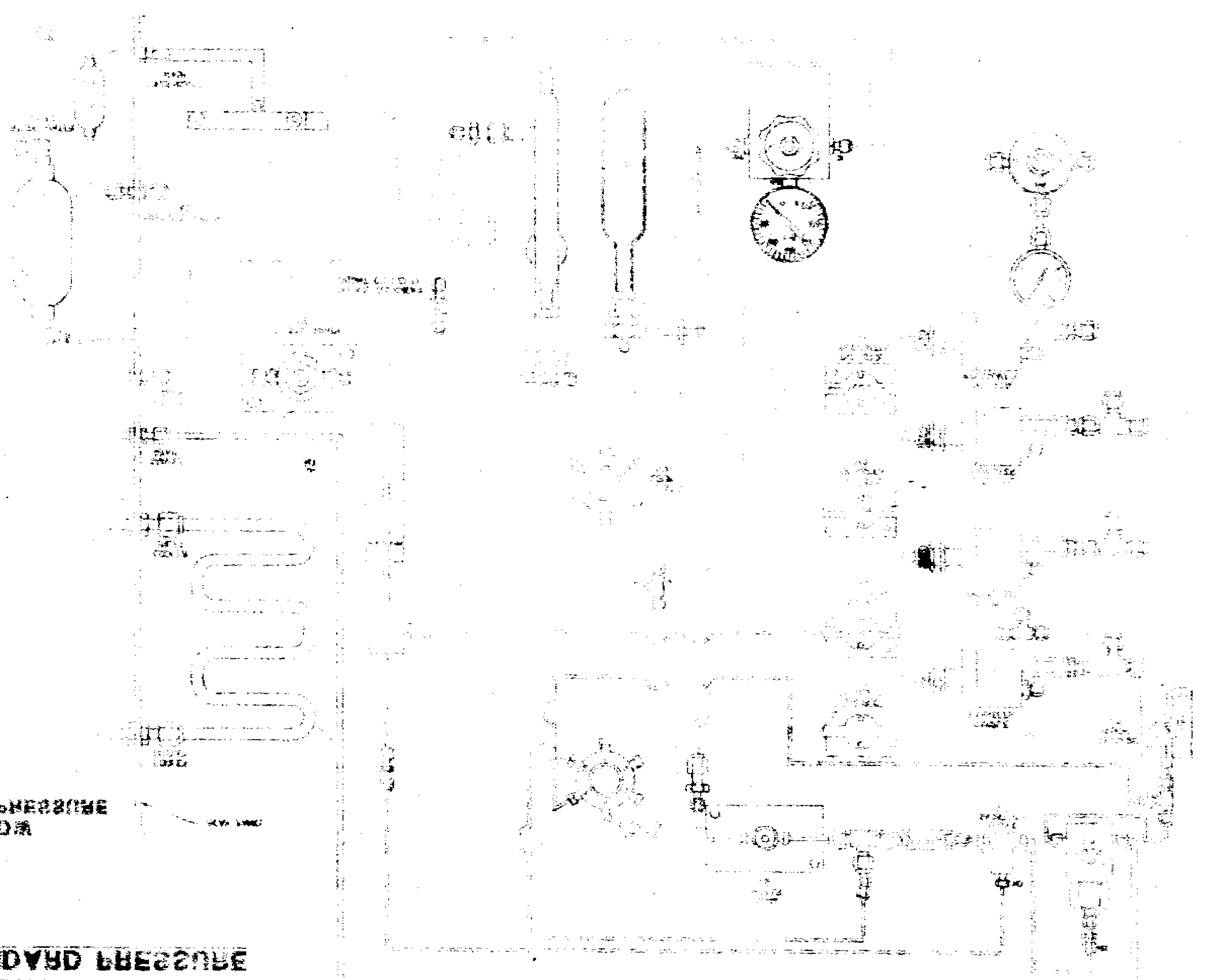
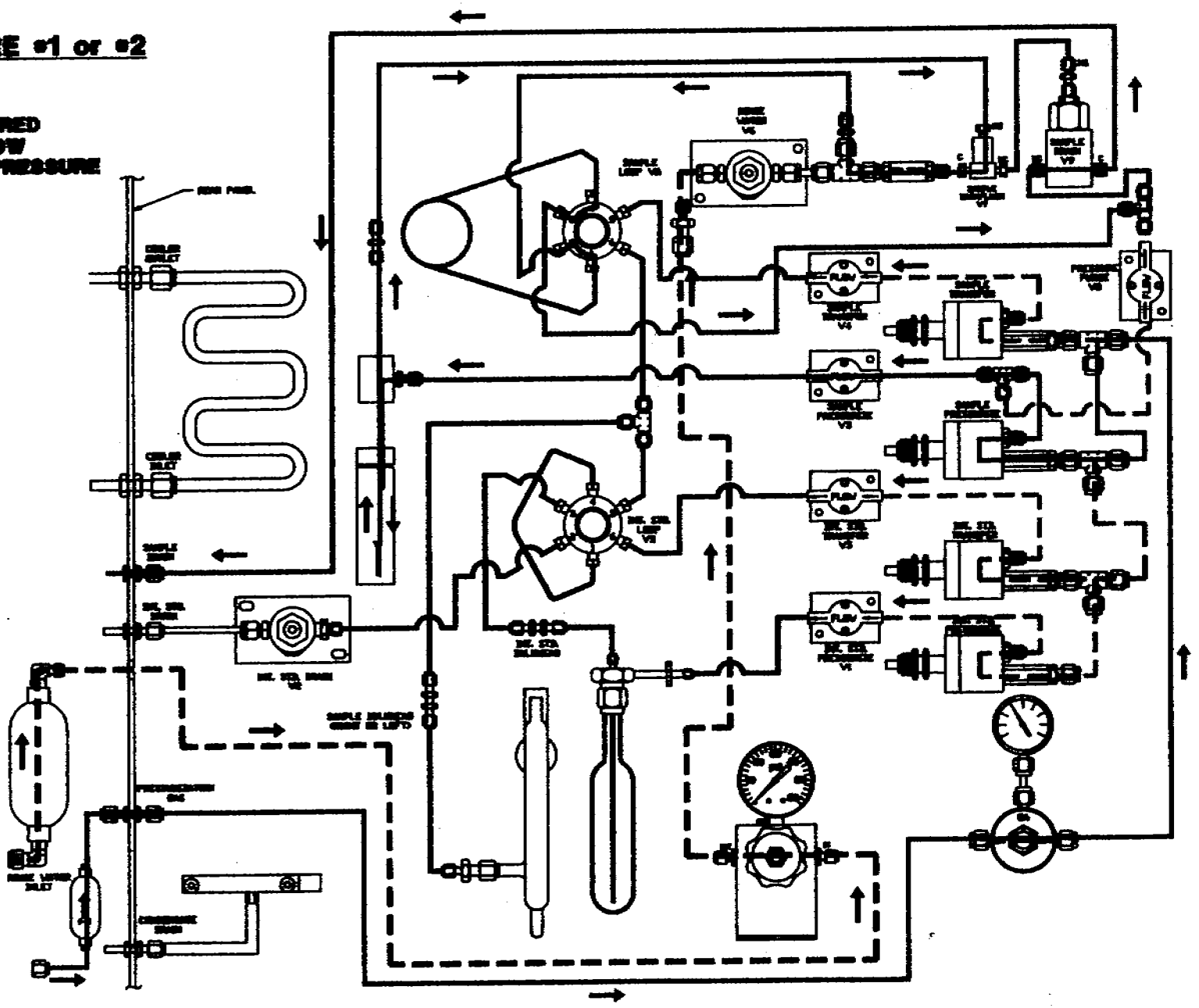


SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

SAMPLE TRANSFER
INTERNAL STANDARD PRESSURE

SAMPLE PRESSURE #1 or #2

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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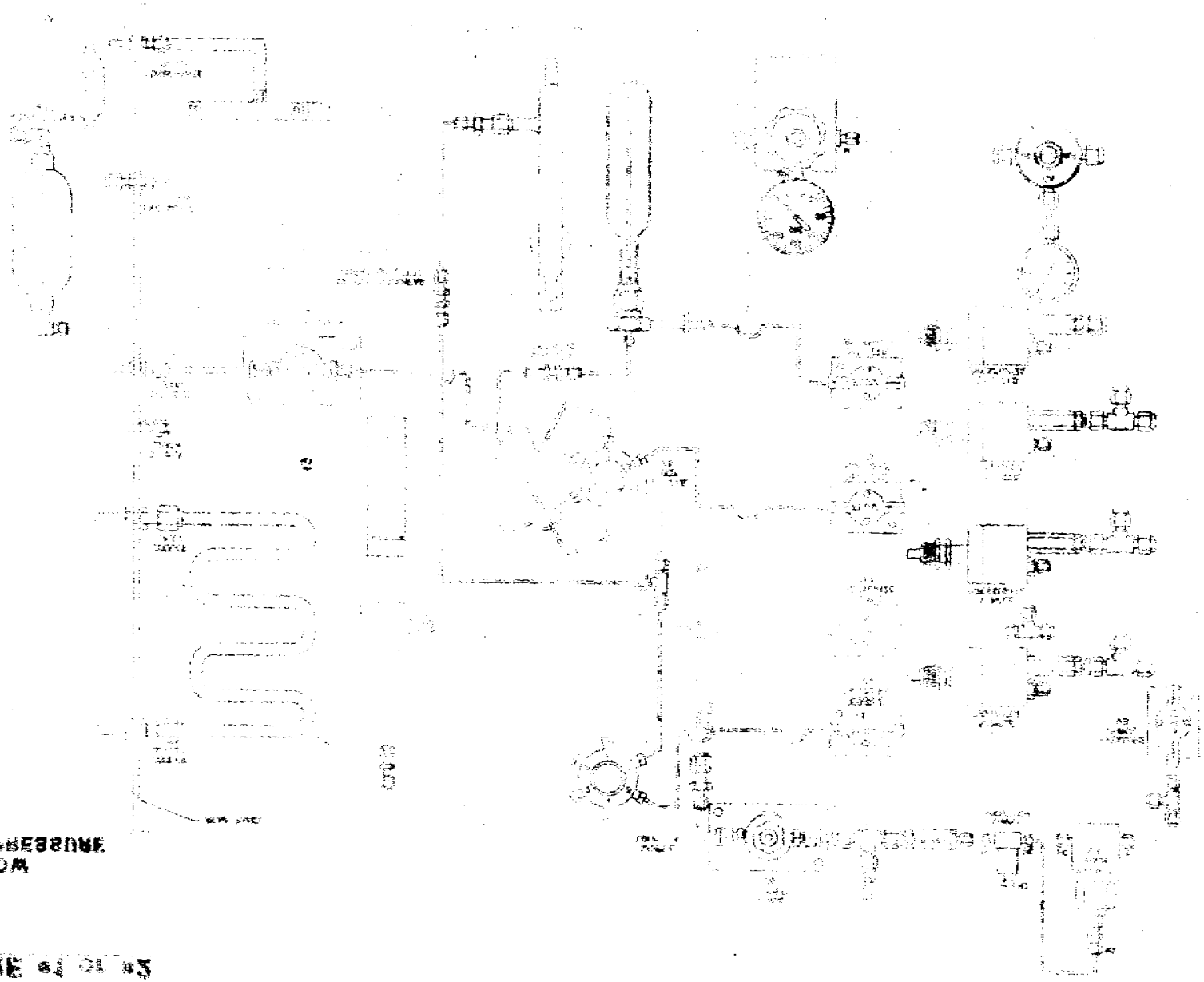
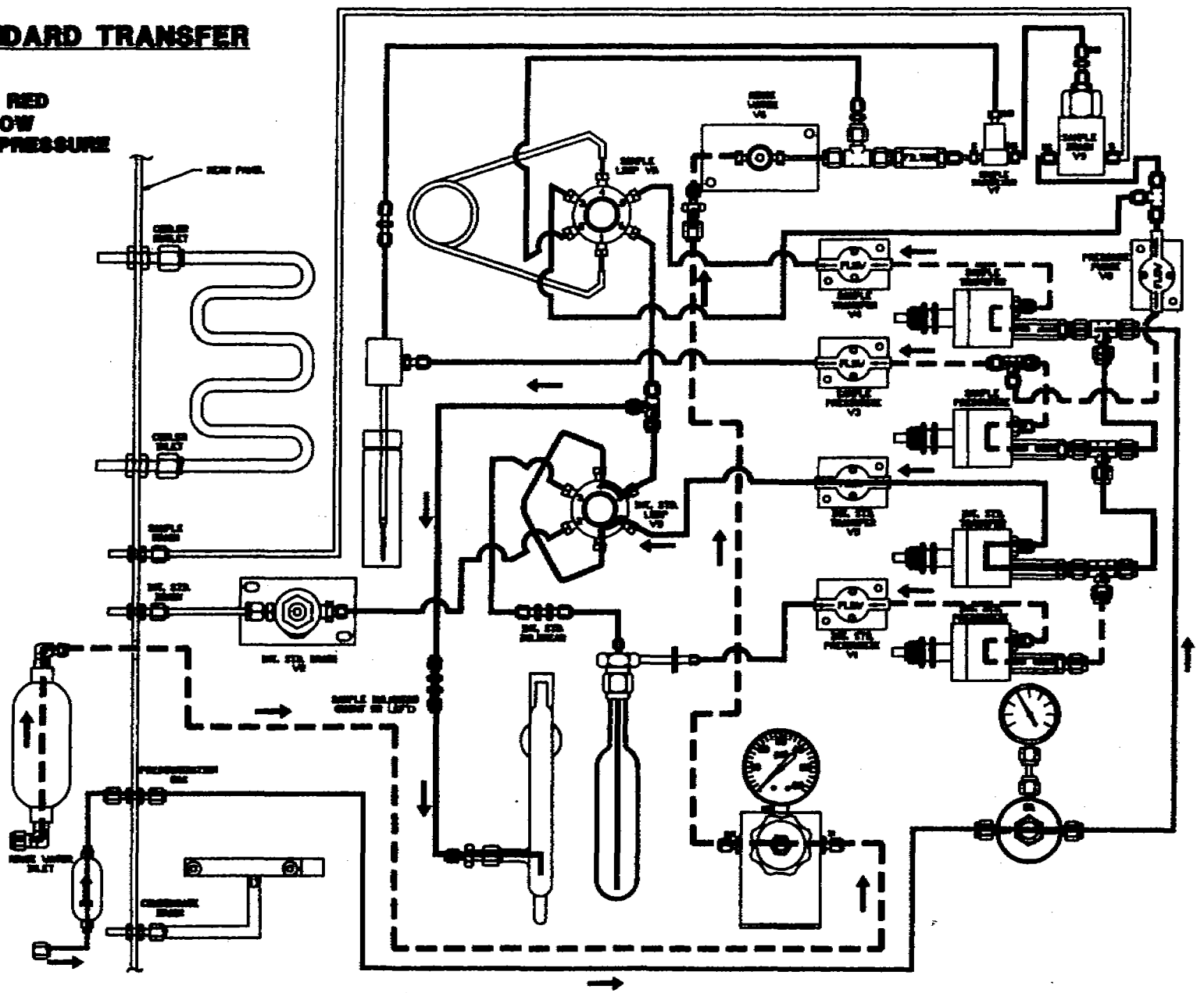


INTERNAL STANDARD TRANSFER

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



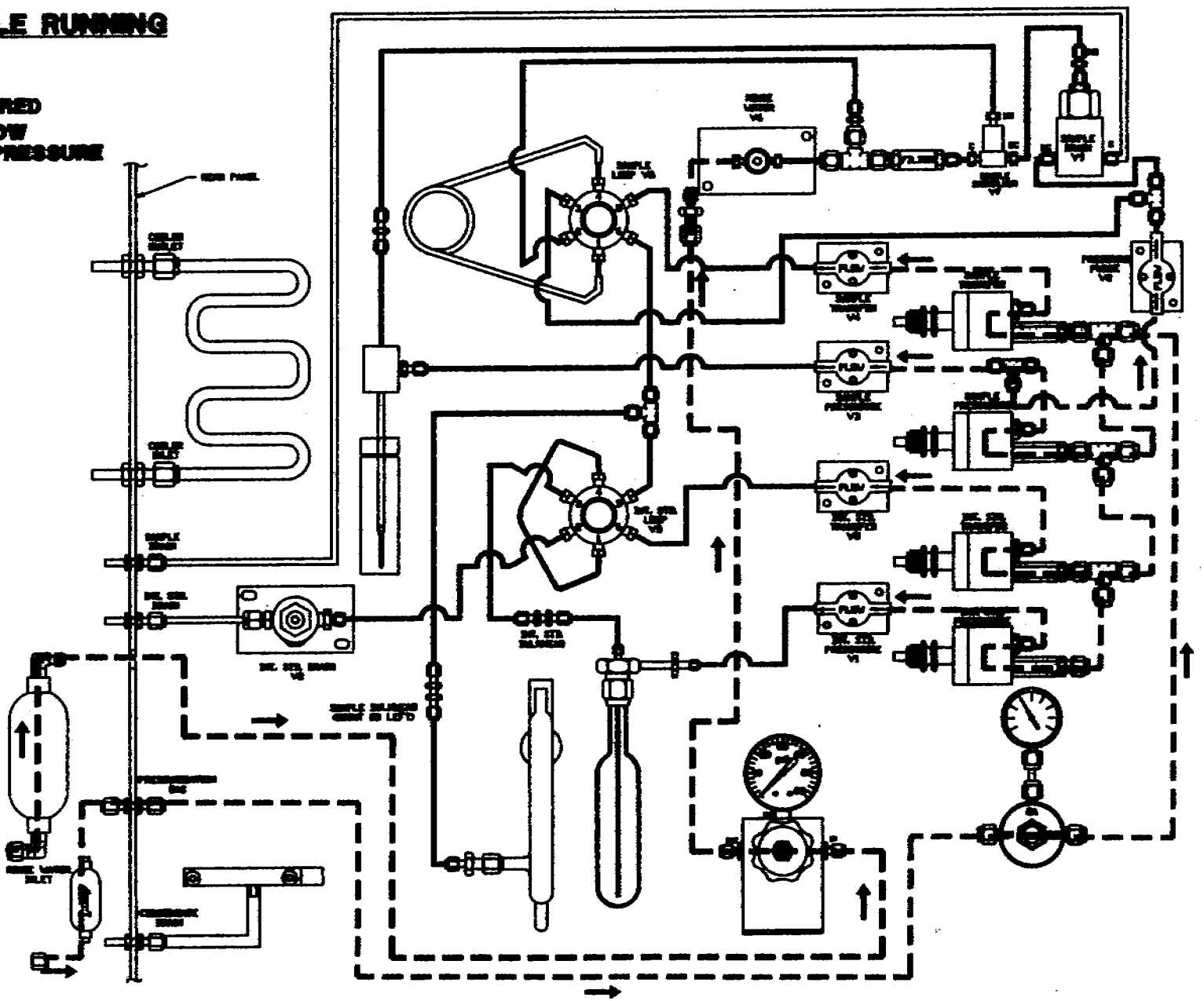
0315107_

INTERNAL STANDARD TRANSFER

SOLID LINES DENOTE EXISTING PIPING
WORK

STANDBY/SAMPLE RUNNING

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

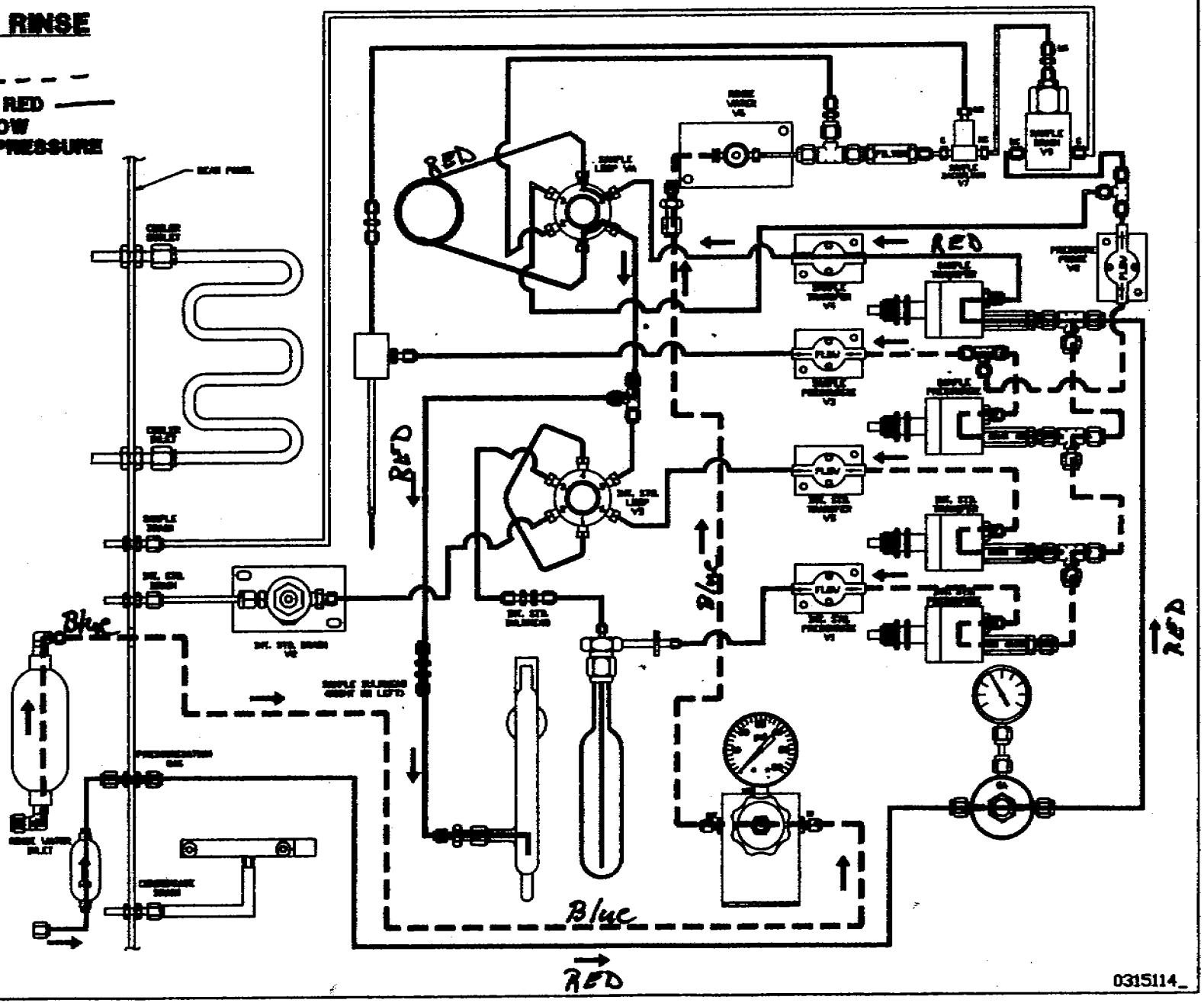


0315108_

STANDARD SAMPLE PANEL
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

TRANSFER LINE RINSE

RINSE WATER • BLUE - - - -
PRESSURIZATION GAS • RED ——
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



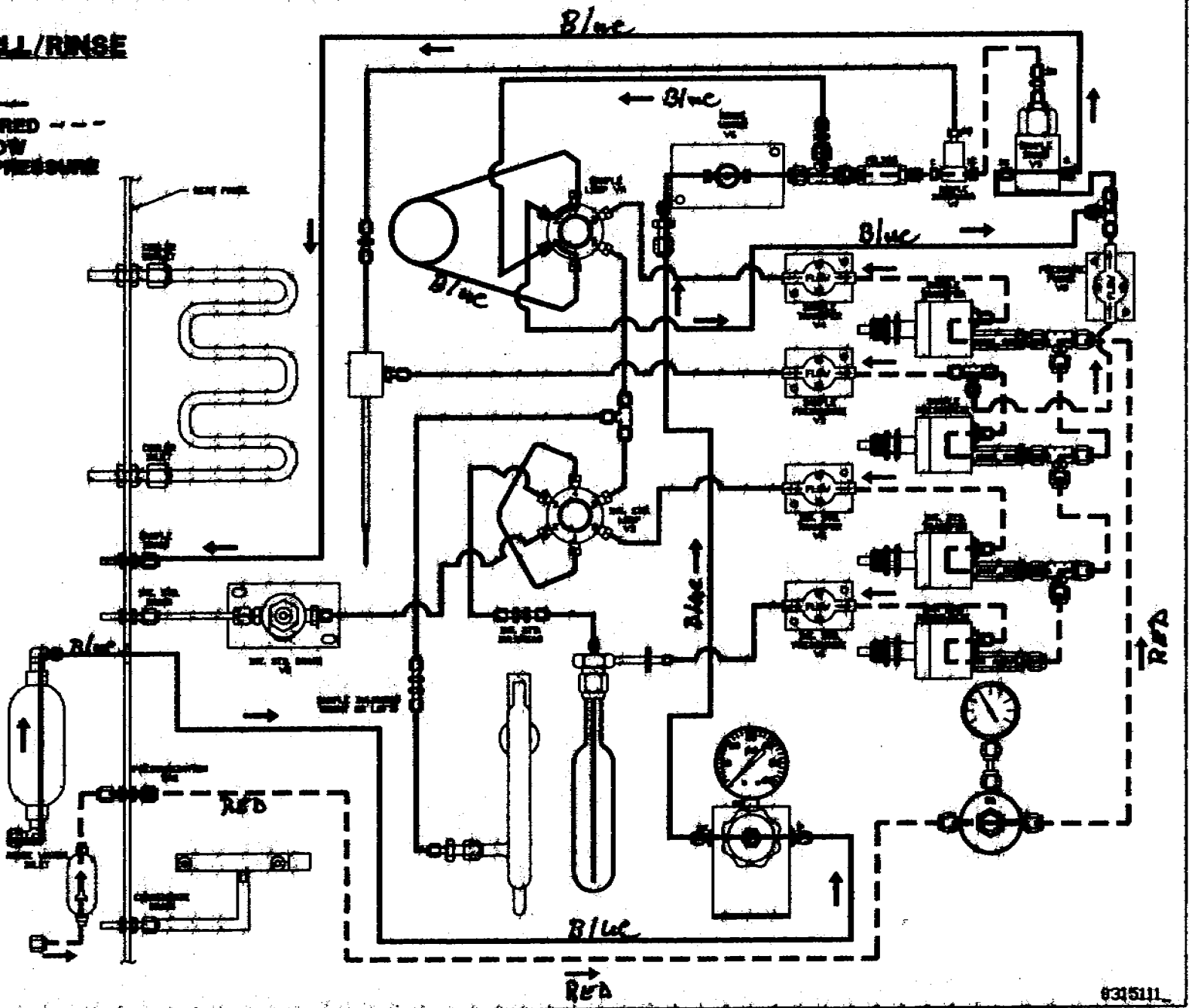
0315114_

TRANSFER LINE RINSE

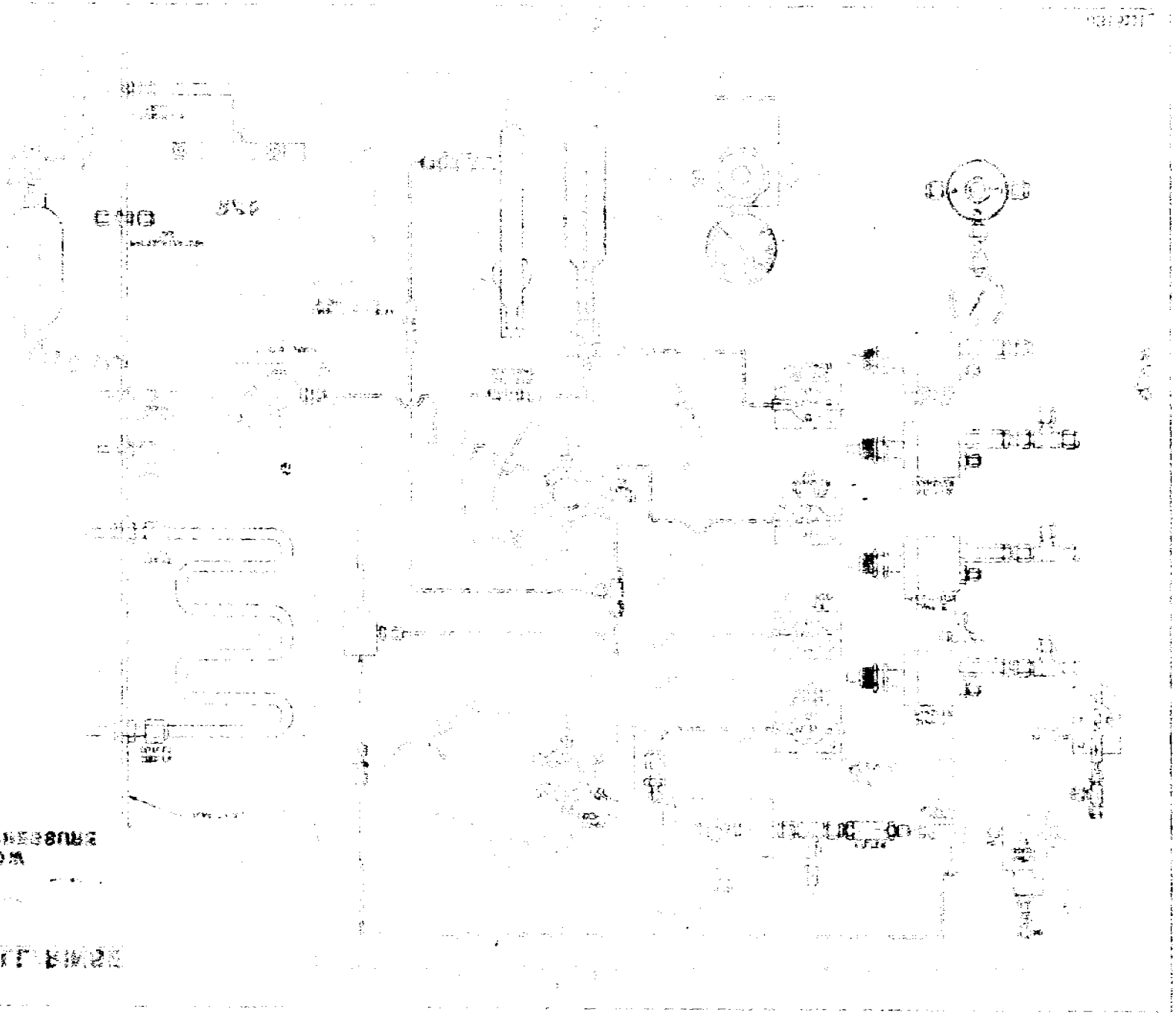
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

SAMPLE LOOP FILL/RINSE

RINSE WATER = BLUE ——
PRESSURIZATION GAS = RED - - -
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

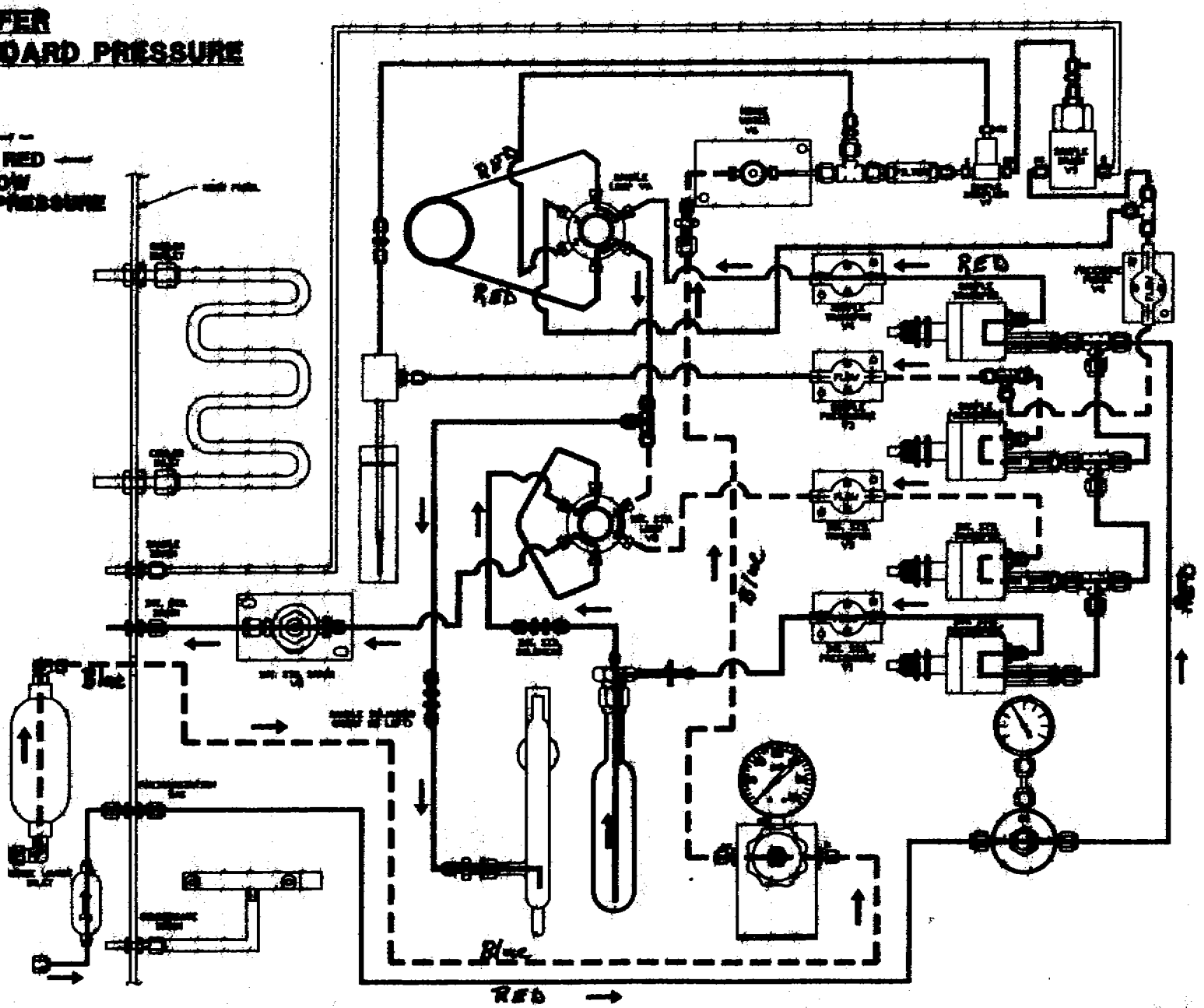


6315111



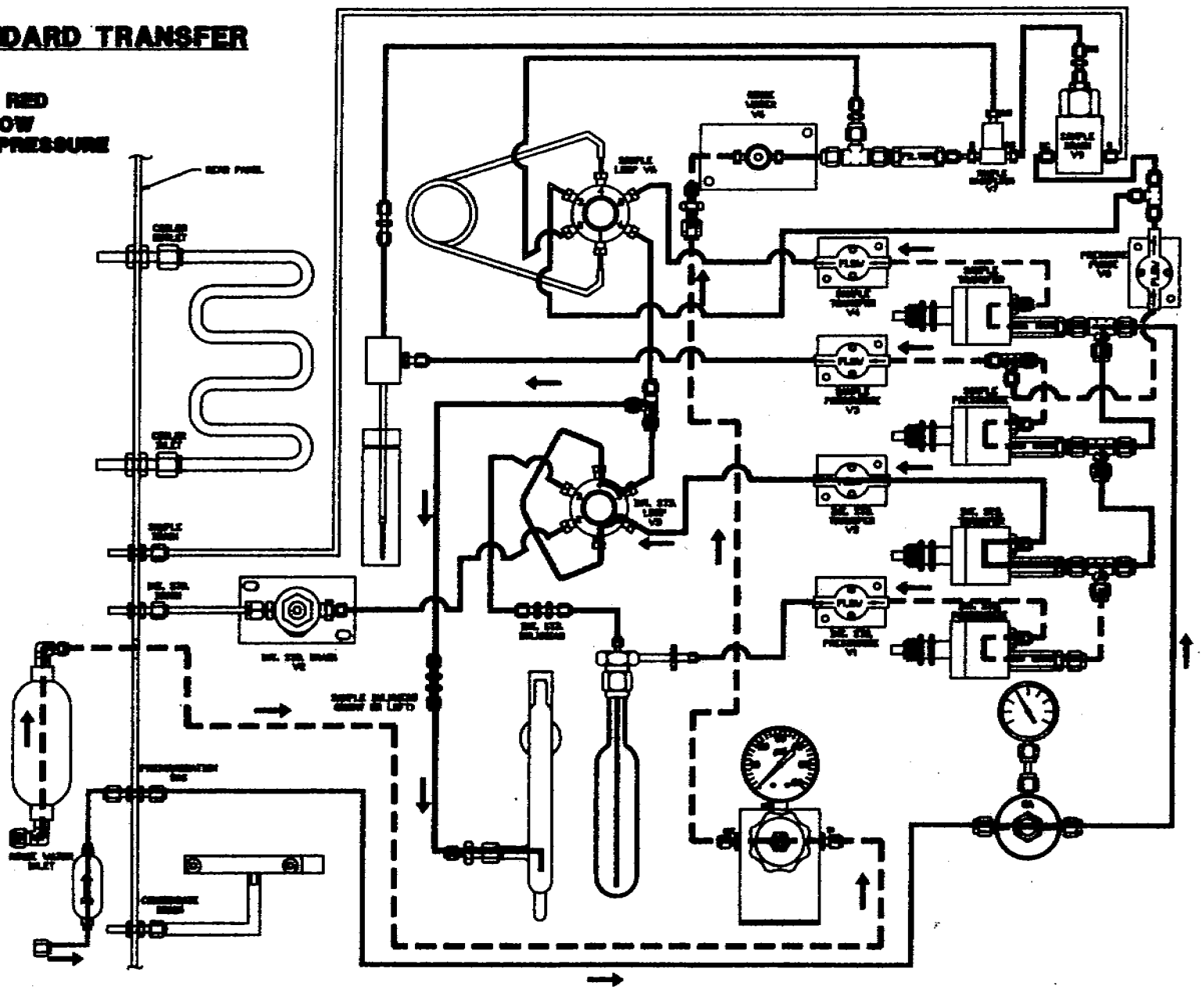
SAMPLE TRANSFER
INTERNAL STANDARD PRESSURE

RINSE WATER - BLUE
PRESSURIZATION GAS - RED
SOLID LINES REMOTE FLOW
DASHED LINES REMOTE PRESSURE



INTERNAL STANDARD TRANSFER

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



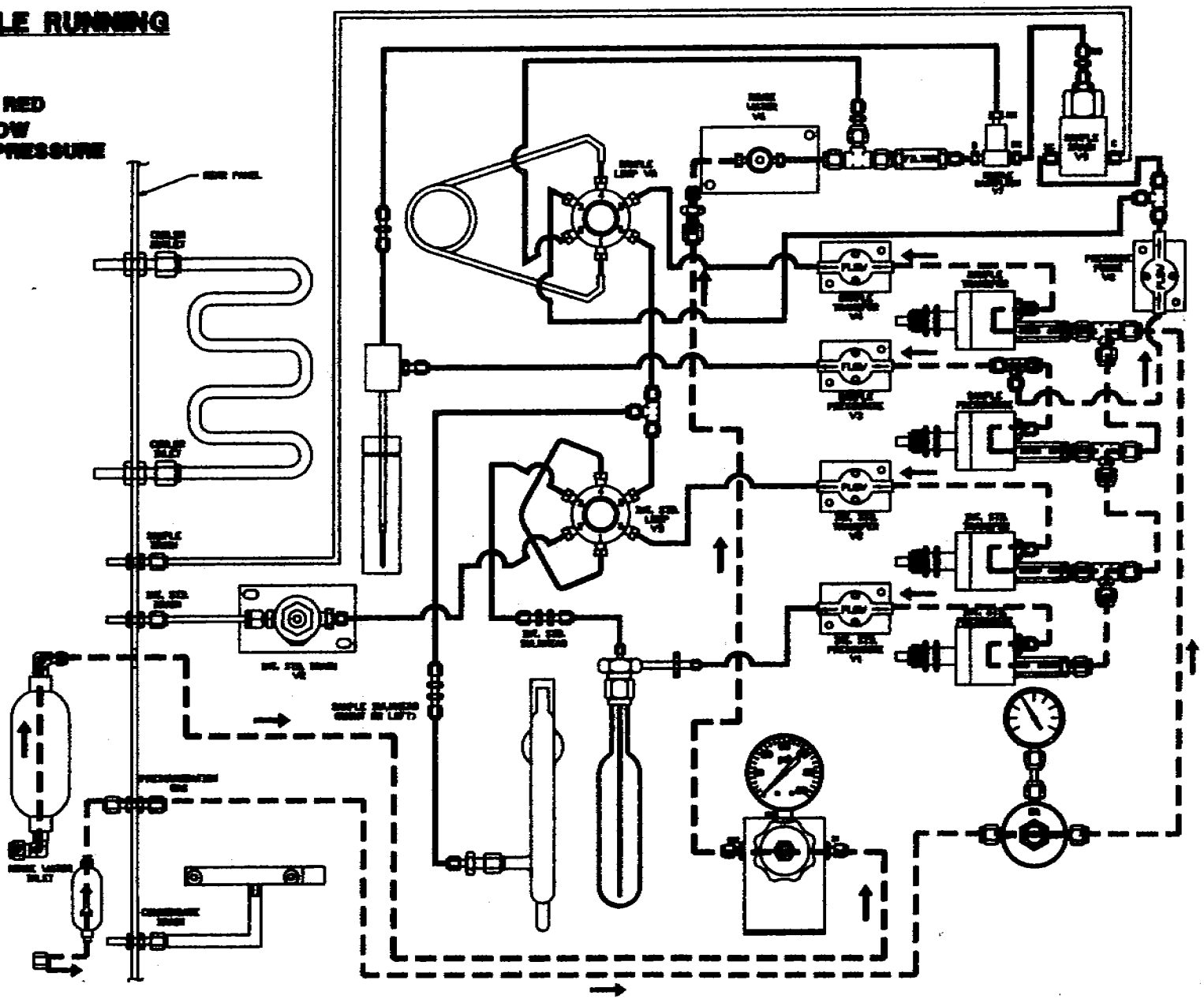
0315107_

INTERNAL STANDARD TRANSFER

SOLID LINES REMOTE FLOW
DASHED LINES REMOTE PRESSURE

STANDBY/SAMPLE RUNNING

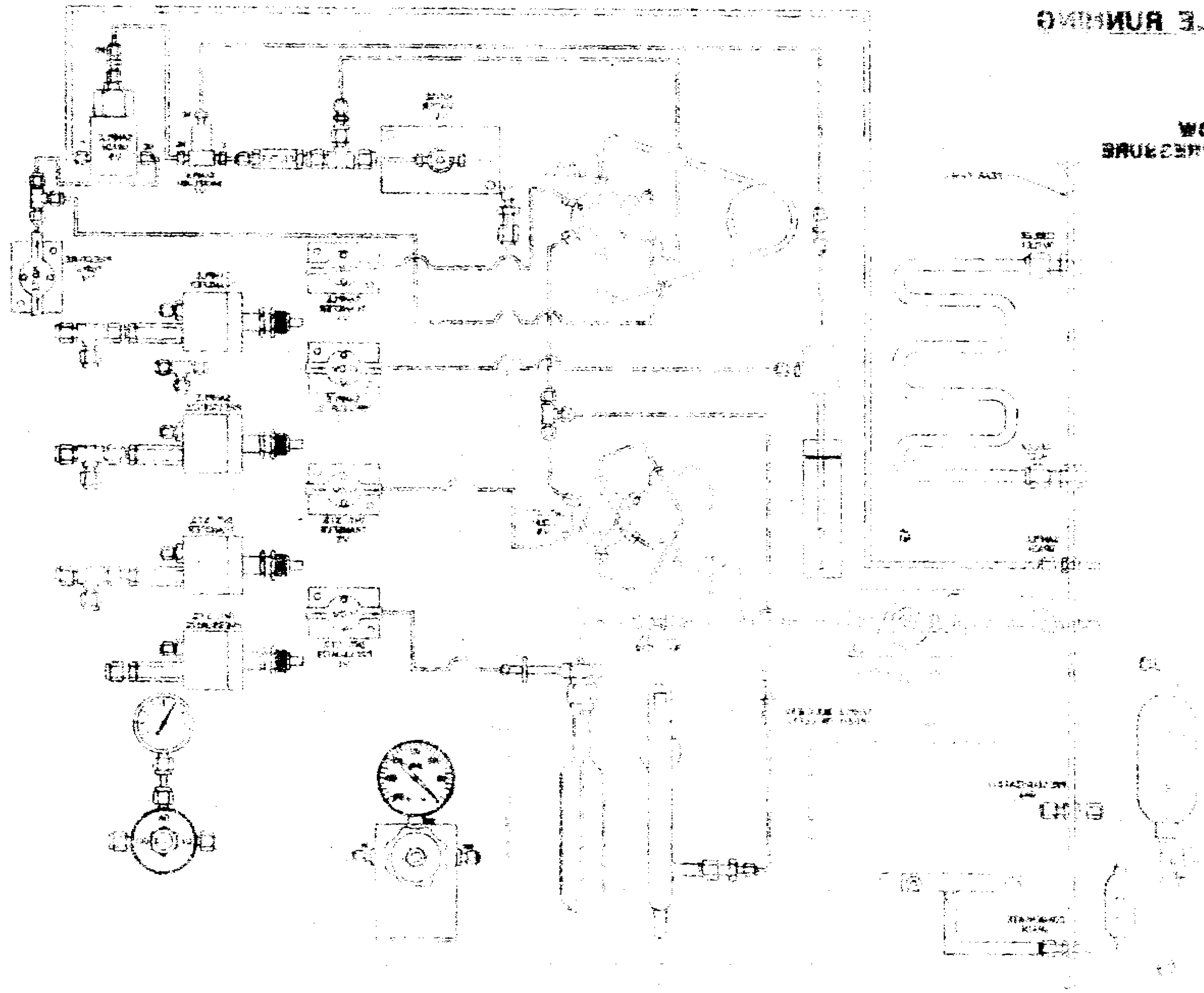
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315108_

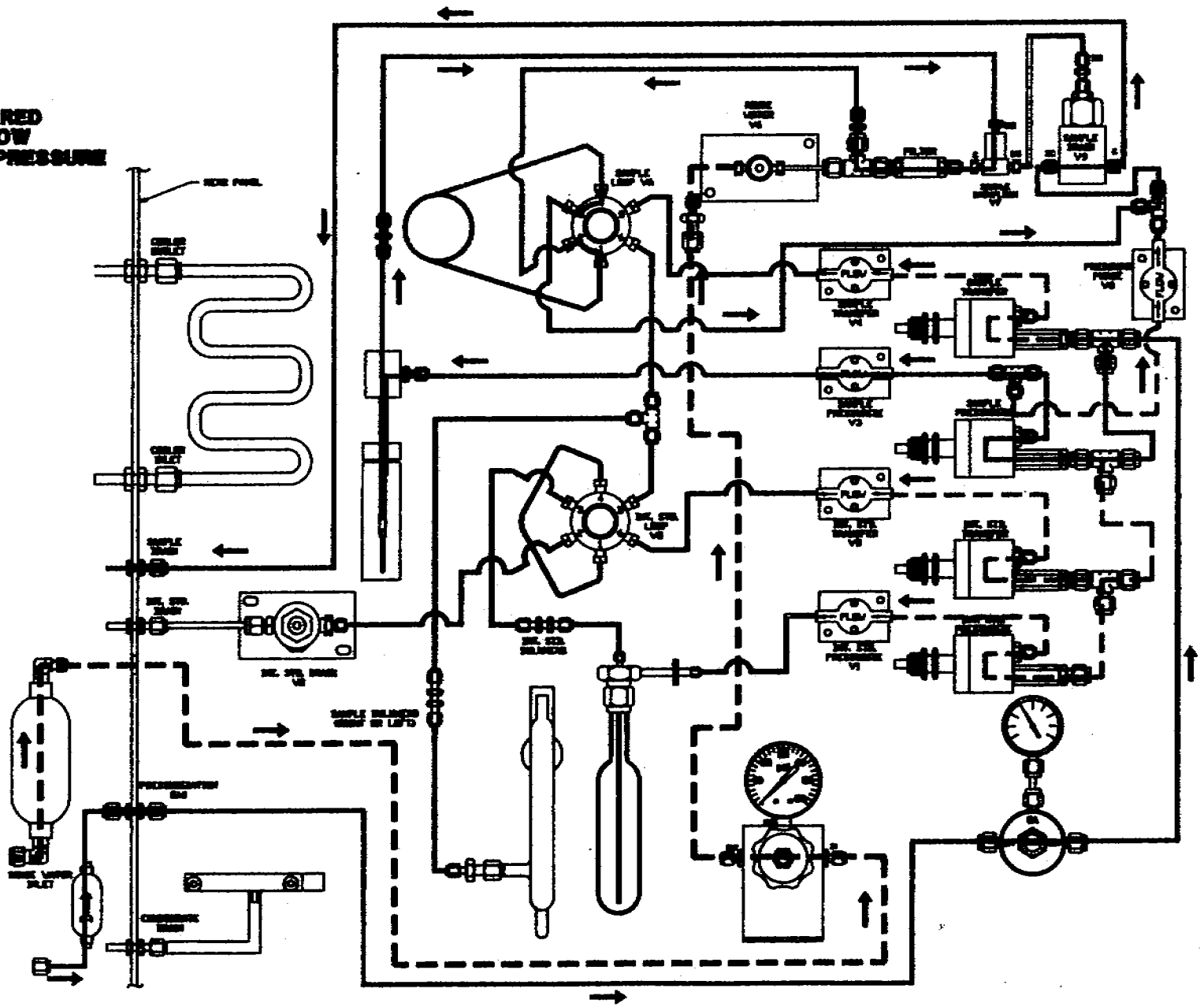
STANDBY/SAMPLE RUNNING

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



EMPTY VIAL

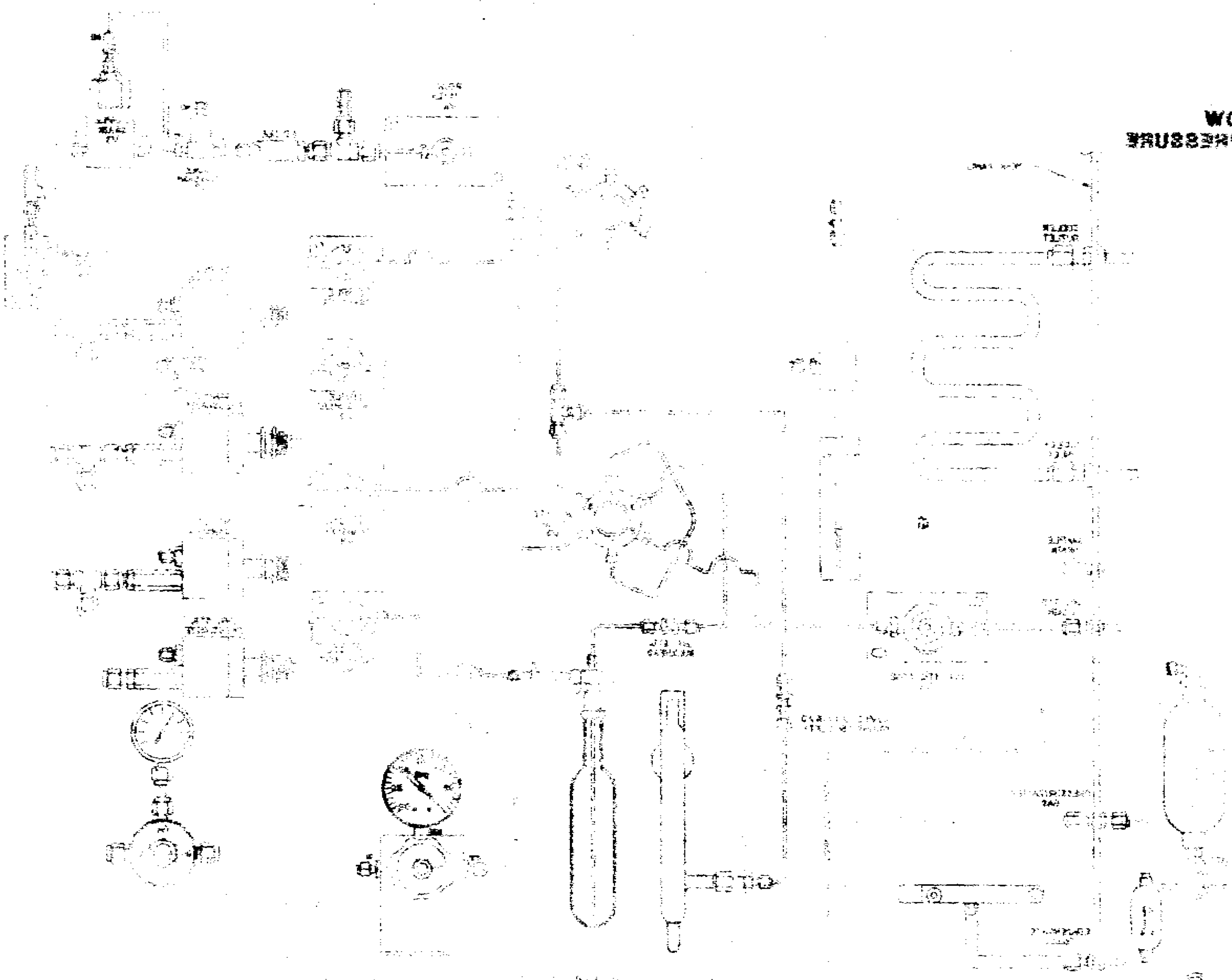
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



0315109_

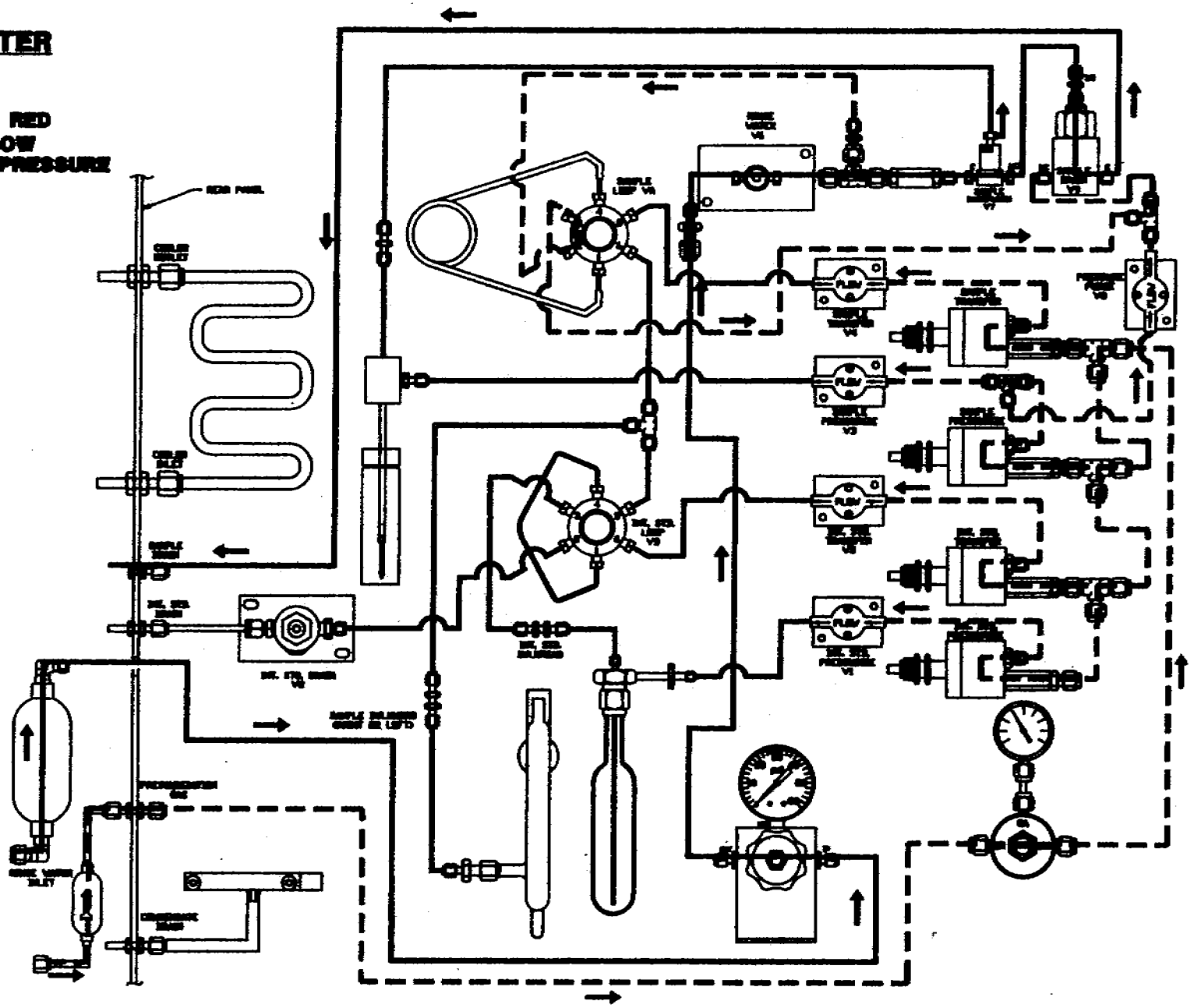
EMPTY VIAL

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



BACKFLUSH FILTER

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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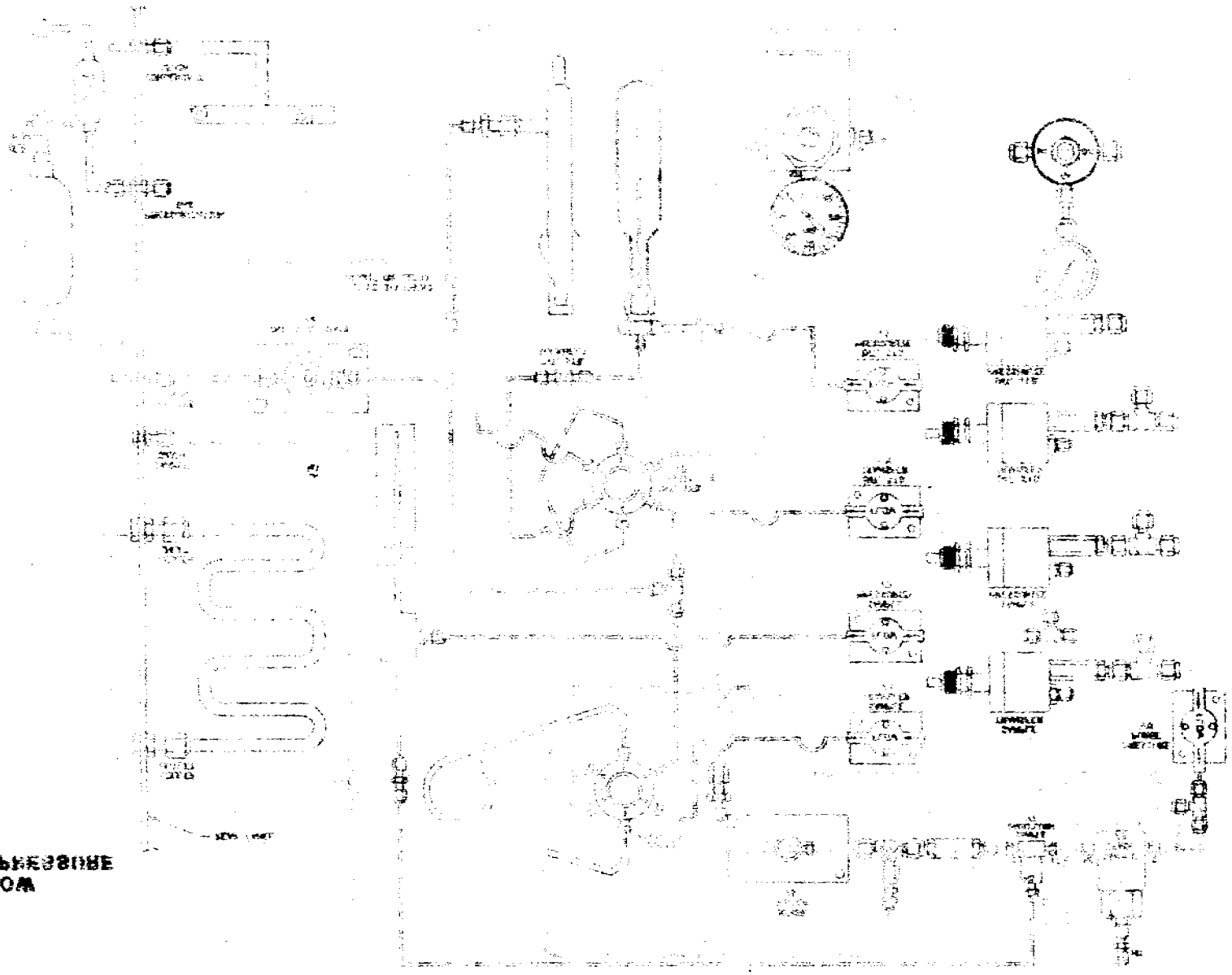
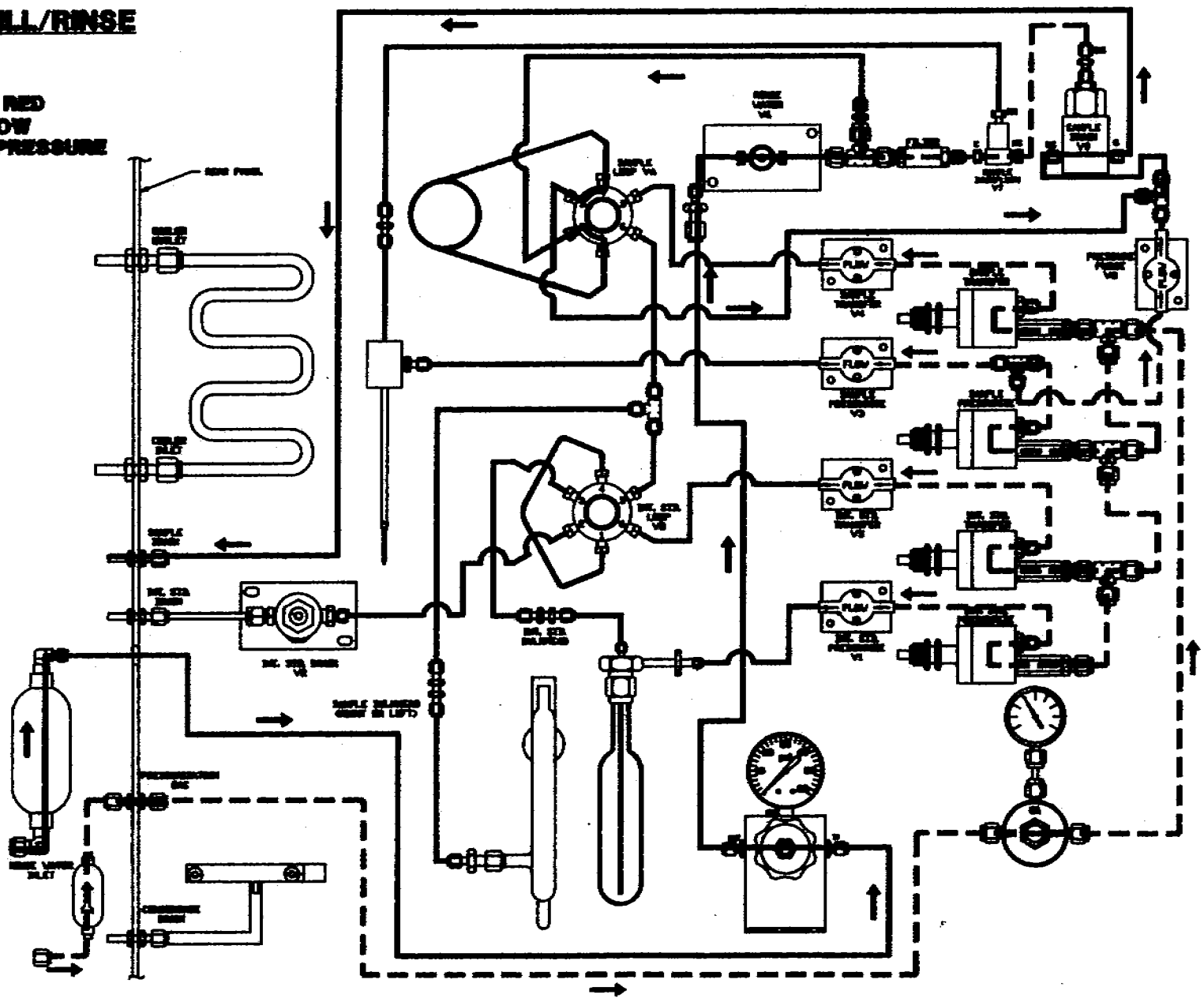


DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

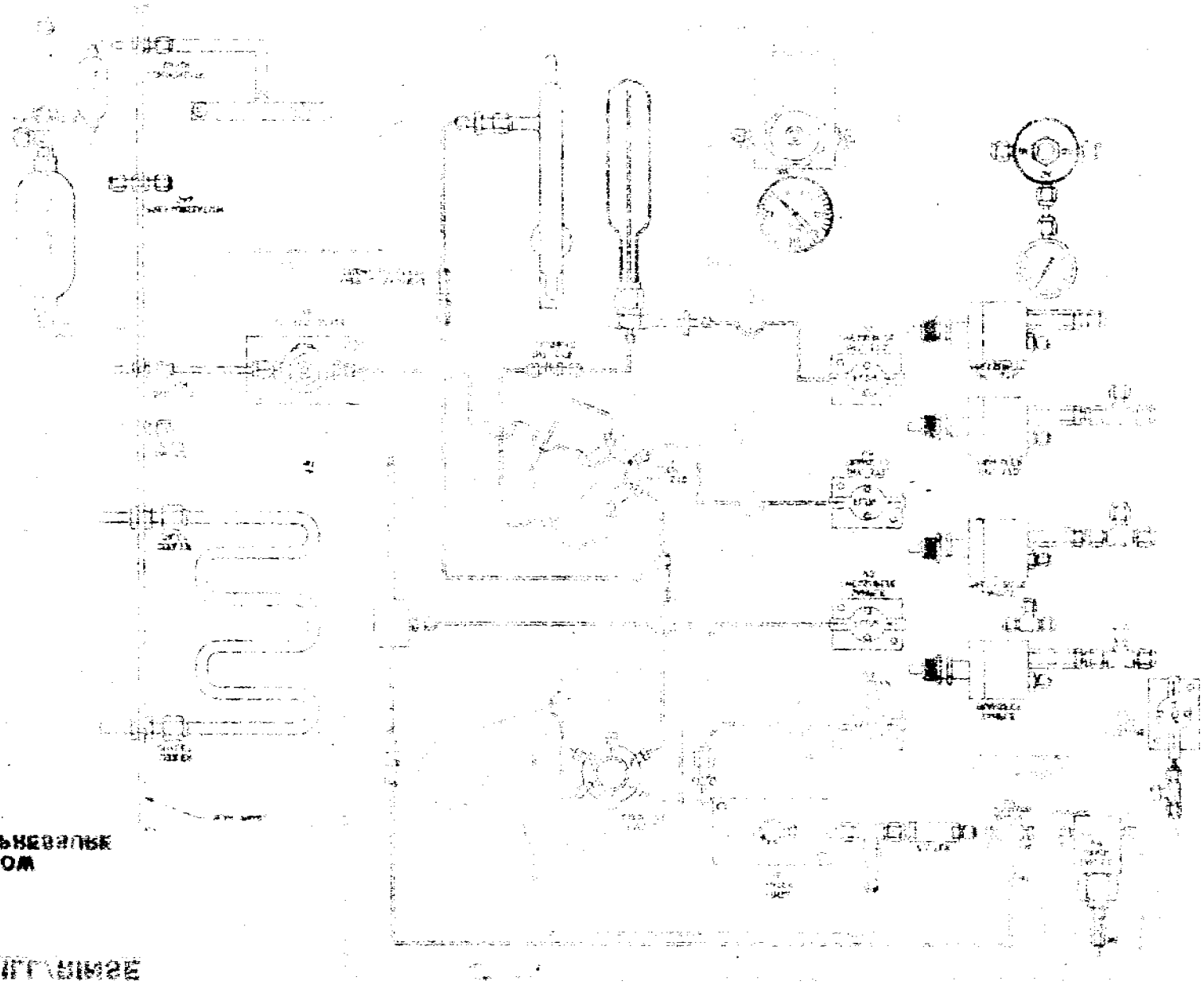
BACKFLUSH FILTER

SAMPLE LOOP FILL/RINSE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

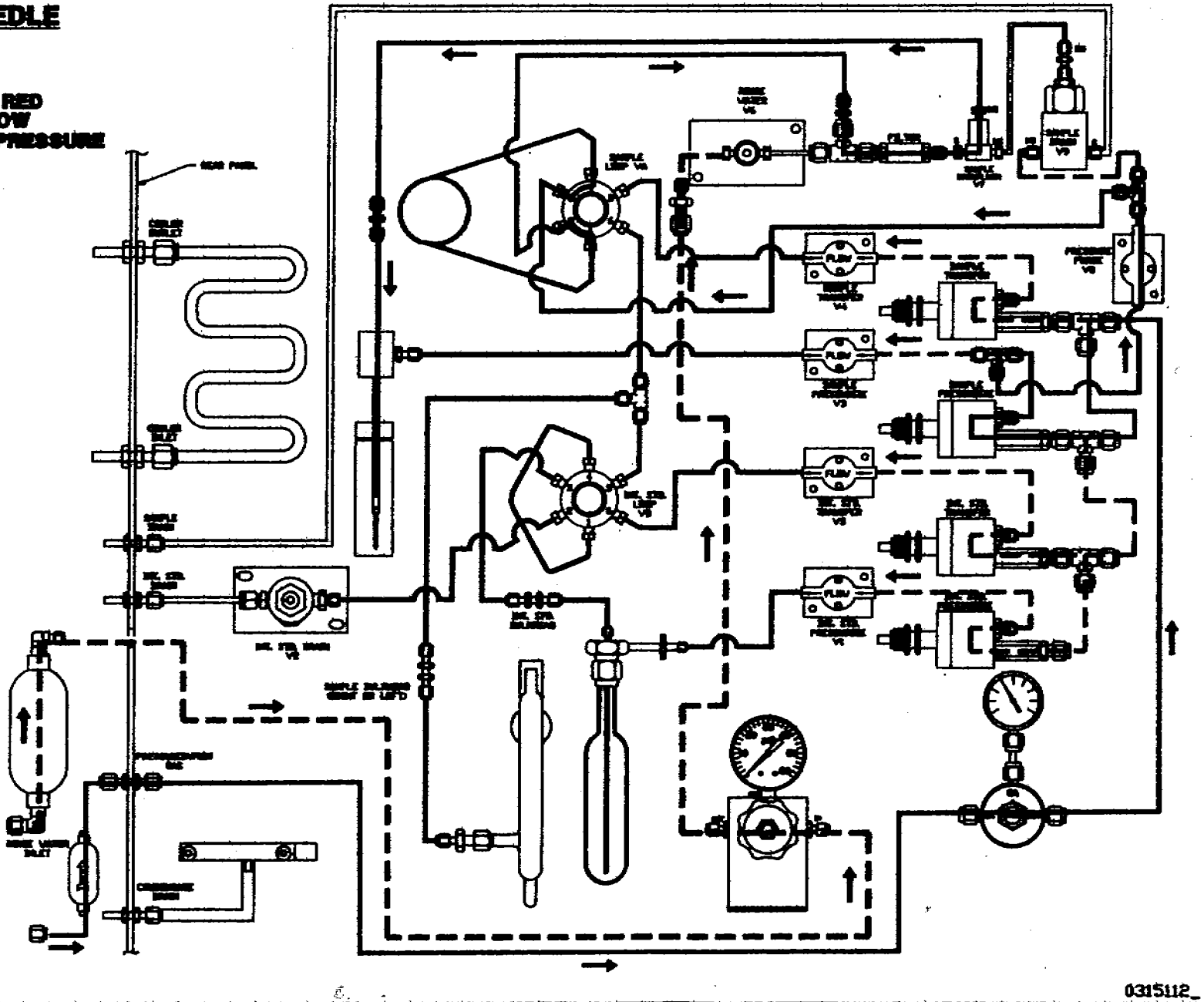


0315111_



BACKFLUSH NEEDLE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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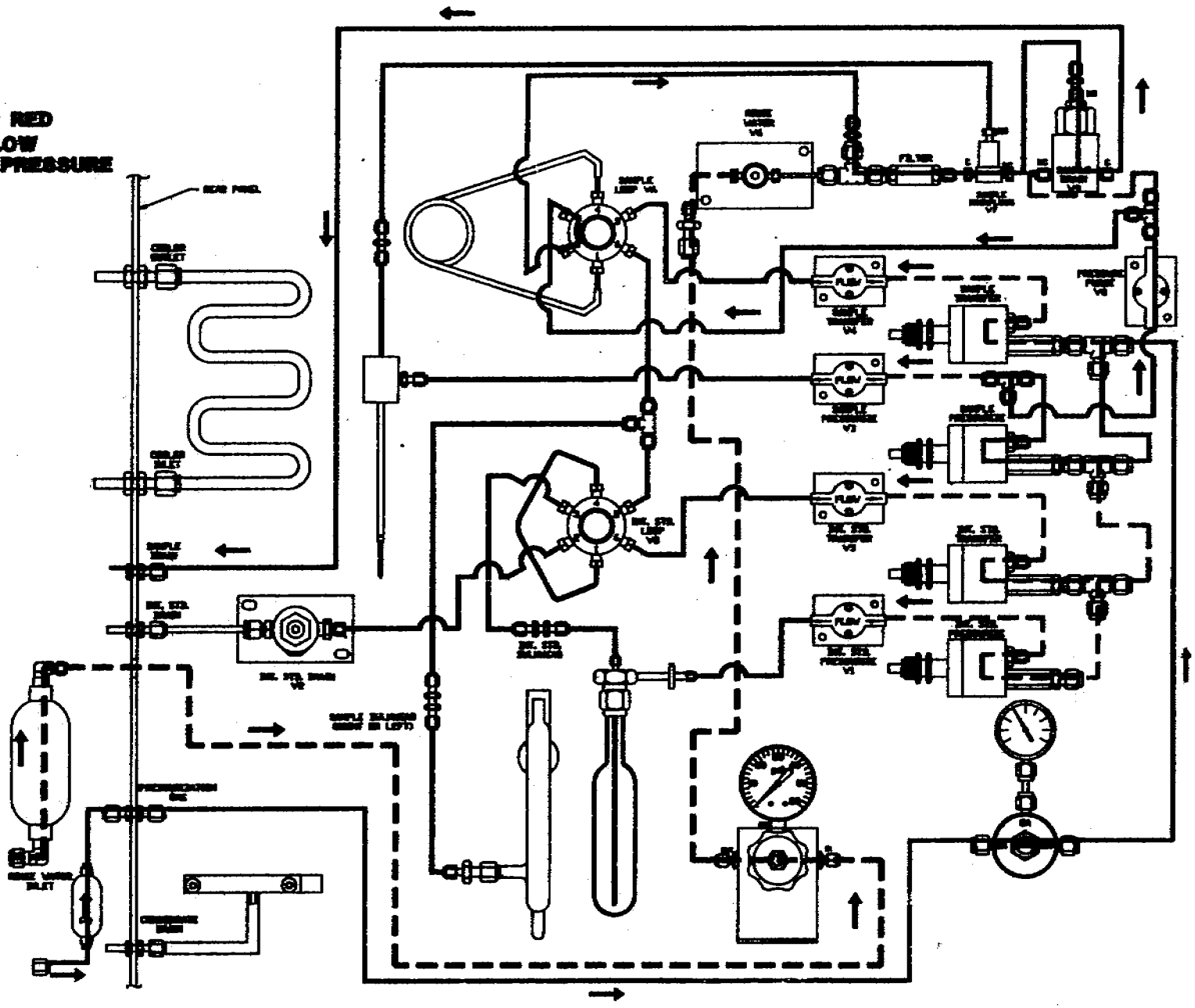
BACKFLUSH NEEDLE

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE

PURGE FILTER

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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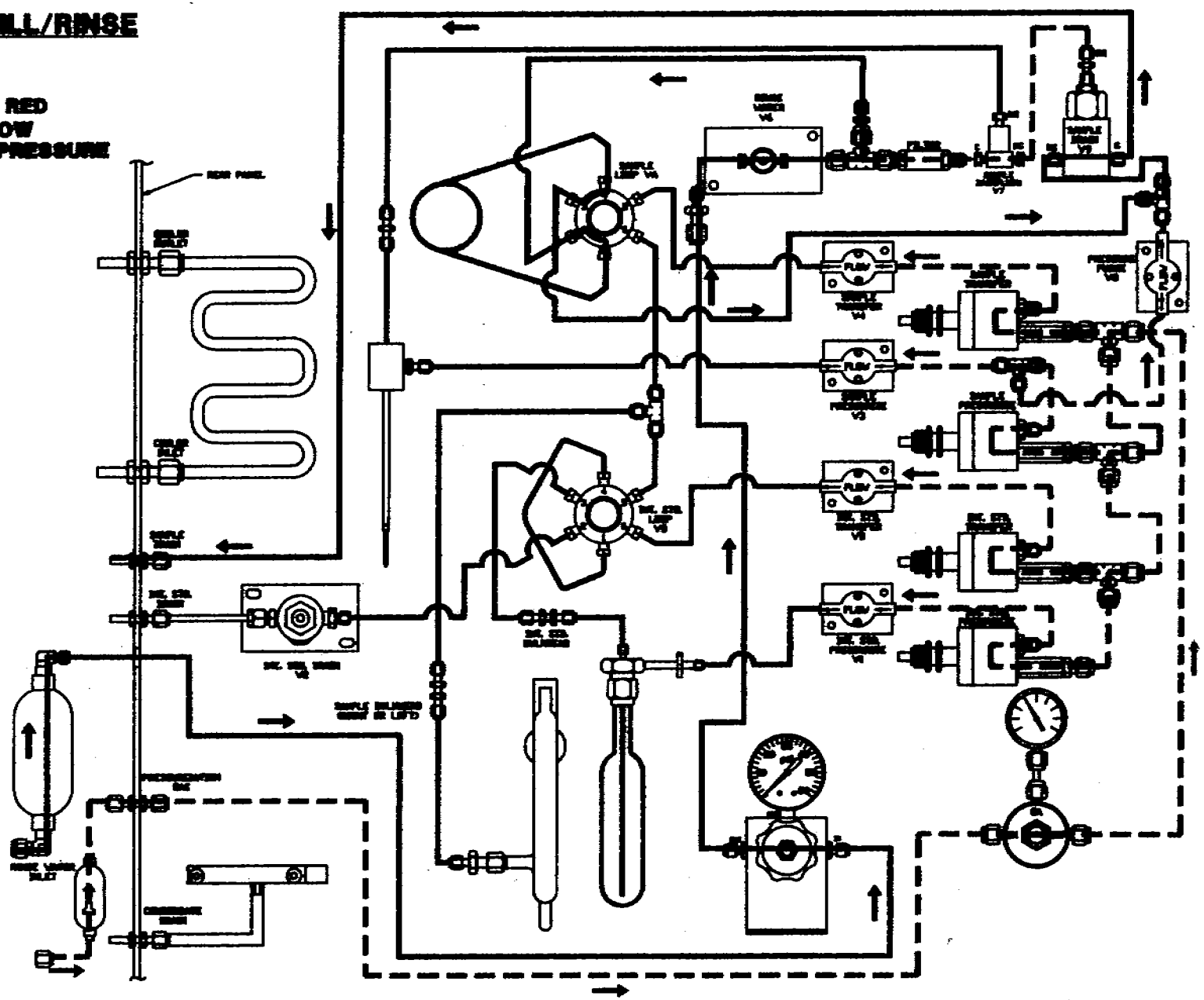
DASHED LINES DENOTE PRESSURE
SOLID LINES DENOTE FLOW

BYPASS FILTER

SAMPLE LOOP FILL/RINSE

RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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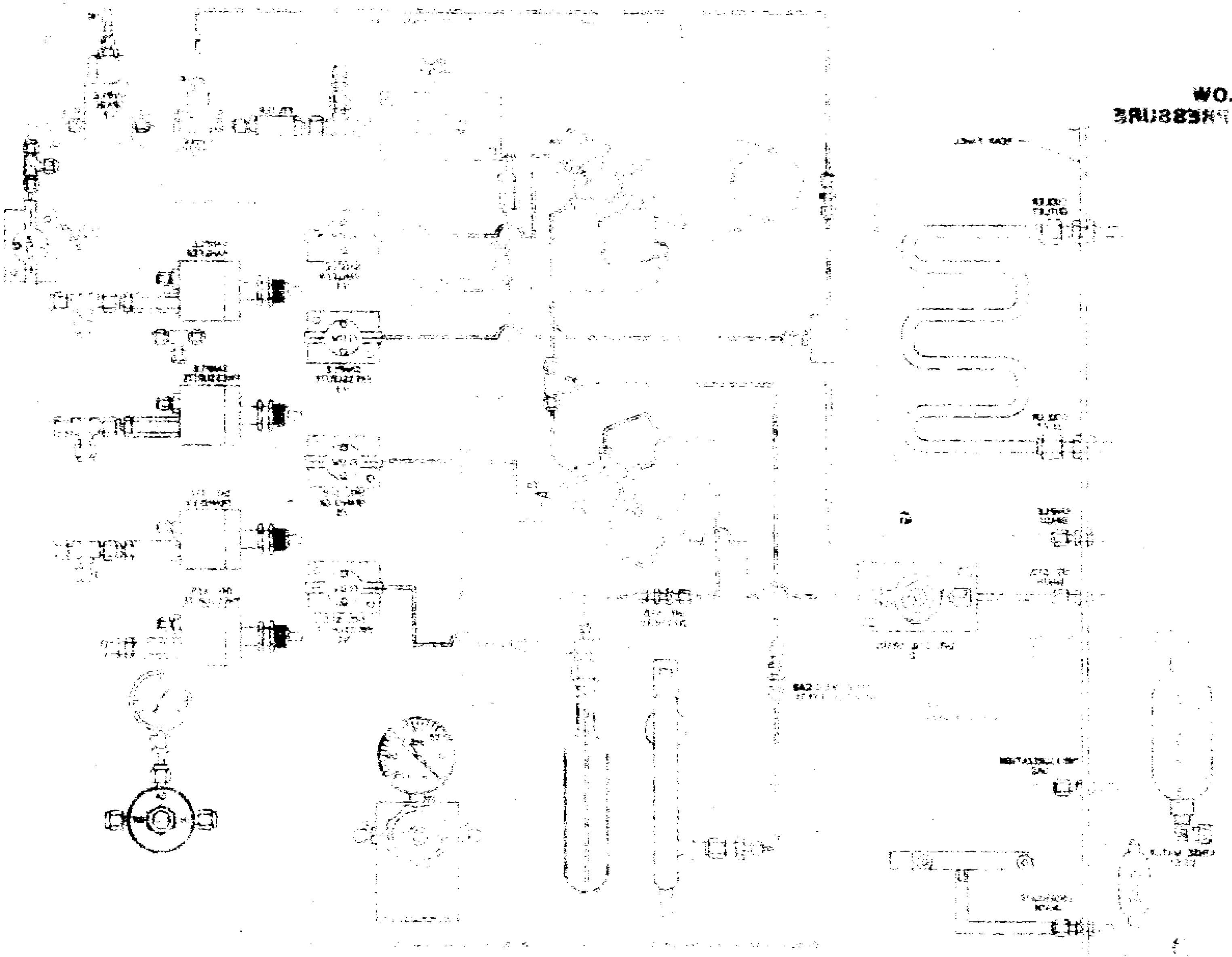
SAMPLE LOOP FILL/RINSE

SOLID LINES DENOTE FLOW
DASHED LINES DENOTE PRESSURE



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