ALS 2050

INSTRUCTION MANUAL

7 *TROUBLESHOOTING*

8 *DIAGRAMS*

1.1 Warnings

The ALS 2050 meets Class 1 safety requirements.

= WARNING =

Potentially lethal voltage exists inside this instrument. ***ALWAYS UNPLUG THE UNIT FROM ITS POWER SOURCE BEFORE SERVICING.***

= WARNING =

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 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.

1.2 Specifications (cont.)

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: 120V ± 10%, 360 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:

- Particulate-free water samples.
- Limited in handling particulates by inherent difficulty of pushing solids through tubing, valves, etc.
- Slight degree of particulate loading can be handled, depending upon the particle size and concentration:
  1) If individual particles *cannot* be seen even when the sample is cloudy, it can be run in the ALS 2050 with the mandatory use of blank water rinses.
  2) If individual particles *can* be seen, the sample *cannot* be run in the ALS 2050. Use a discrete sampler system for these types of samples.
- As long as a sample meets the above particulate consideration, concentration of organics should not be a major problem. Since the ALS 2050 handles the sample only in the liquid phase, there is no carry over inherent to the instrument. The limiting factor for high concentration samples is the potential for carryover in the concentrator side of the system. The ALS 2050 will not create any additional carry over.

2.1 Unpacking the Unit

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

***** IMPORTANT *****

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 for 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.*

2.2 Recommended Operation

Tekmar Company strongly recommends that the ALS 2050 be kept *on at all times* (other than when it is being serviced, during power failure, etc.) for best possible unit longevity and reliability.

2.3 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) 761-0633. 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 of the LSC-2 or LSC 2000 manuals before proceeding.

2.4 Power Requirements

The 110V unit requires a 50 or 60 Hz single phase power source at 120V $\pm$ 10%. The 220V unit requires a 50 or 60 Hz single phase power source at 220V $\pm$ 10%. For the 120V unit, the maximum current draw is 3 amps and maximum power consumption is 360 watts. For the 220V unit, the maximum current draw is 1.5 amps and maximum power consumption is

2.6 Establishing Auto Drain on the Concentrator (cont.)

5) Press **F1 (ON)** to activate the Auto Drain feature. Selecting **ON** automatically changes the selection and returns to the Method Parameter screen.

3.1 General

This section contains instructions to connect the ALS 2050 to your LSC 2000 or LSC-2 concentrator. It is intended to be as thorough as possible. However, certain specific items may not be adequately covered for your particular installation. If in doubt on any point, please feel free to call us, toll free at (800) 874-2004, or outside the U.S. at (513) 761-0633. When installation is not performed or directed by Tekmar personnel, the installer must be thoroughly familiar with this section and all relevant sections of the LSC 2000 and LSC-2 manuals before proceeding. It is strongly recommended that this section be read through *in total* before beginning installation.

3.2 Site Preparation

As previously stated in Section 2, place the ALS 2050 on a sturdy, stable bench surface immediately adjacent to your LSC-2 or LSC 2000. Allow approximately 12" on the right side of the unit for the vial collection bin, or you may position the unit at the end of a work table disposing the vials into a large waste container.

3.3 Electronic Connections

The electronic connections of the ALS 2050 do not interact or interfere in any manner with the interface between the concentrator and the GC.

3.3.1 Connecting the LSC 2000 to the ALS 2050

1) Locate the electronic interface cable (#14-3784-000) in the kit box assembly.

2) Insert the nine pin "D" style connector into the receptacle labeled CONCENTRATOR I/O on the rear of the ALS 2050 until it clicks into place (See Rear View diagram, Section 8).

3) Remove the GC interface cable from the LSC 2000.

4) Plug the other end of the cable from the ALS 2050 into the port labeled GC I/O on the LSC 2000 and secure the plug with the two retaining screws.

5) Plug the GC interface cable into the back of the ALS 2050 cable and secure it using the two retaining screw.

3.5 Connecting the Drain Lines

Refer to the Rear View diagram in Section 8. INT. STD. DRAIN and SAMPLE DRAIN fittings should be routed to a sink or waste receptacle using the 1/8" Tygon plastic tubing (#12-0315-002).

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.

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 1/8" Tygon plastic tubing, route this flow to an appropriate drain reservoir.

3.6 Connecting the Cooling Bath

An external cooling bath is required for subambient control of the sample storage chamber. Connect the output of the bath pump to the fitting marked COOLER INLET. Connect the fitting labeled COOLER OUTLET to the return line of the bath. These transfer lines should be insulated for best performance.

3.7 Replacing the Concentrator Sampler

1) Remove the glass sampler from the concentrator.

2) Two new 5 ml samplers are included with the ALS 2050:

   a) 1/2" mount fitting w/ left side inlet port for the LSC 2000 (#14-3544-024)

   b) 1/2" mount fitting w/ right side inlet port for the LSC 2000 (#14-3544-124)

3) Install the sampler with a port that faces the side towards the ALS 2050.

4) Carefully install the 1/4" to 1/16" reducing union (#14-2261-116) to the side port of this sampler using the 1/4" teflon ferrules (#12-0041-016).

3.8.1 Internal Standard Pressurize Flow Rate (cont.)

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: When actually running the unit, the flow rate will be considerably less than measured. This is because forcing liquid through the very small bore of the internal standard loop restricts the flow. As the loop volume is increased, the backpressure eases. Because of this, *larger* loops actually require *lower* flows.

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.

3) Press INTERNAL STANDARD again to turn off the flow.

3.8.2 Internal Standard Transfer Flow Rate

Setting the Internal Standard Transfer flow rate requires operation through 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 I.S. Inject), on the keypad.

6) Measure the flow exiting the transfer line. The recommended flow rate is 150 ml/min. for all loop sizes.

7) Turn the valve off by pressing number **5** again.

3.8.3 Sample Pressurize Flow Rate (cont.)

14) Press **F2 (Sol.)**.
15) Turn on the sample pressurize valve by pressing **3**.

16) Measure the flow at the sample drain port on the rear of the unit. The flow rate should be approximately 100 ml/min.

17) Turn off the flow by pressing **3** again.

18) Press **F4 (EXIT)**.

19) Press **F1 (Motor)**.

20) Turn on the elevator by pressing **3**.

21) Be sure that you are clear of the elevator mechanism, then depress the side panel sensor. The elevator will move down and eject the vial.

22) When the elevator reaches its lower limit of travel, release the sensor.

23) Turn the elevator off by pressing **3**.

24) Press **F4 (EXIT)** .

25) Reinstall the side panel.

3.8.4 Sample Transfer Flow Rate

Setting the Sample Transfer flow rate requires operation through the TEST program of the microproccessor.

NOTE: If you are in the Solenoid Valve screen (from the previous instructions), press **4** to turn on the sample transfer valve, and skip to step 5.

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

2) Press **F2 (Test)**

3) Press **F2 (Outputs)**.

4) Press **F2 (Sol.)**.

3.10 Installing the Internal Standard Vessel

The internal standard vessel (#14-4487-024) is a glass container with a 1/2" neck size.

1) Mount the vessel to the gold plated fitting on the right side of the front of the instrument using Teflon ferrules (#14-1301-016) (See Right Interior diagram).

2) Tighten finger tight only.

3) Insert the internal standard needle assembly (#14-3879-053) through the top of the gold-plated fitting, making sure the needle reaches the bottom of the vessel.

4) Tighten the 1/16" fitting on this line.

5) Connect the other end of the line to the 1/16" female bulkhead union immediately above the glassware.

6) Slide the acrylic safety cover (#14-3504-000) into the slots in front of the vessel.

3.11 Changing the Sample and/or Standard Loop (cont.)

Both the Sample Loop and Internal Standard loop are located behind the access panel on the right side panel of the unit (See Right Door diagram in Section 8). To change the loops:

1) Remove the two fasteners, and open the panel.

NOTE: The sample valve is the valve in the farther rearward position. The internal standard valve is in the forward position. The loops are located across valve ports 1 and 4 of each valve.

2) First remove the old loop with a 1/4" open end wrench.

3) Install the new loop with the coils looped in front of the Internal Standard valve.

4) Check to be certain that the chamber door can be fully closed before tightening the fittings.

5) Leak check the new loops according to Section 3.13.

6) Close the door and reinstall the retaining fasteners.

3.13 Leak Checking After Initial Installation (cont.)

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

Upon 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 to turn on gas supply)
- ❒ Internal standard dip tube connection to glassware mount and to bulkhead union input

4.1 General Description

The ALS 2050 microprocessor programmable control consists of:

- an 8 bit microprocessor with 32K of program ROM (Read Only Memory), 2K of RAM (Random Access Memory), and analog input through which the microprocessor receives information from its peripheral devices (for example, temperature thermocouples)
- a membrane keypad to modify program parameter values
- a six line LCD (Liquid Crystal Display) that displays the steps of program execution.

4.1.1 The Microprocessor

The controller uses a 6303 eight bit CMOS-type microprocessor to manage the operation of the various functions of the system. The introductory system screen looks like this:

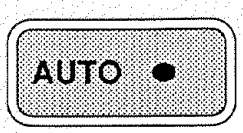
Tekmar ALS 2050
Vial Sampling System

Instructions for the microprocessor are stored in ROM and on each initial power-up the basic program parameters are displayed for running or modification. Battery back-up retains modified parameters when power failure occurs.

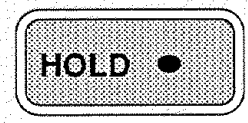
The program panel outlines:

- ALS 2050 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

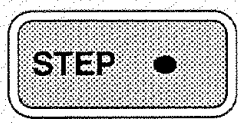
4.1.2 Keypad Description (cont.)



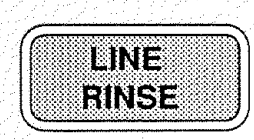
AUTO signals the system to proceed through the run automatically.



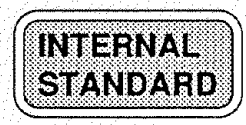
HOLD interrupts the system at any point during a run. After the ALS 2050 Desorb/Rinse step, you must refer to the program panel on the LSC-2 or LSC 2000 to view which program step is in progress. The program will not proceed until the operator presses **STEP**, **AUTO** or **START.**



STEP makes the system proceed to the next ALS 2050 system mode.

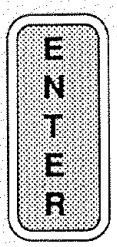


LINE RINSE manually activates a blank water rinse and flushes the sample loop. To activate, press LINE RINSE once. To deactivate, press the key again. For operating procedures, refer to Section 4.9.3.

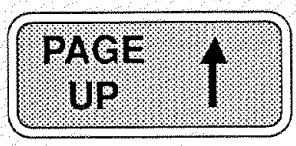


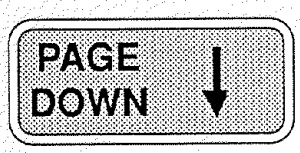
INTERNAL STANDARD causes the internal standard vessel to be pressurized and the internal standard loop to be flushed. To activate, press INTERNAL STANDARD once. To deactivate, press the key again. For operating procedures, refer to Section 4.9.2.1.

4.1.3 Keypad Description (cont.)



You must press **ENTER** after each parameter value is keyed into the method. When no change to a parameter value is necessary, press **ENTER** to return to the Method Parameters listing.





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

1) Pressing these keys will change the viewing angle of the screen so that it can be seen clearly from an operator's 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 viewing of additional parts of parameter listings (in Method Edit, for example).

4.2 Program Steps

The program steps and their default values consists of:

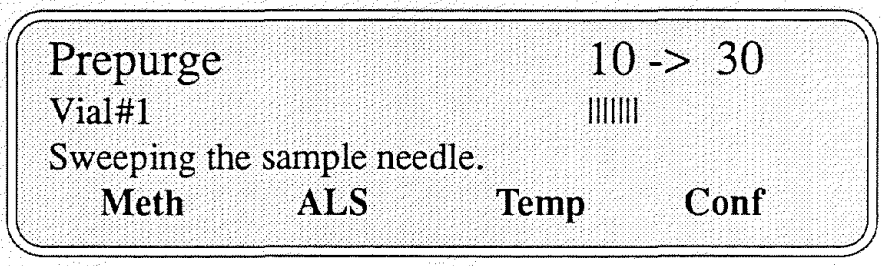
• Prepurge:	30 sec.
• Sample Pressurize	30 sec.
• Sample Transfer	30 sec.
• Internal Standard Transfer	75 sec.
• Desorb	4 min.

The two methods can be run as they are, or the values for each of the program steps can be modified.

4.2 Program Steps (cont.)

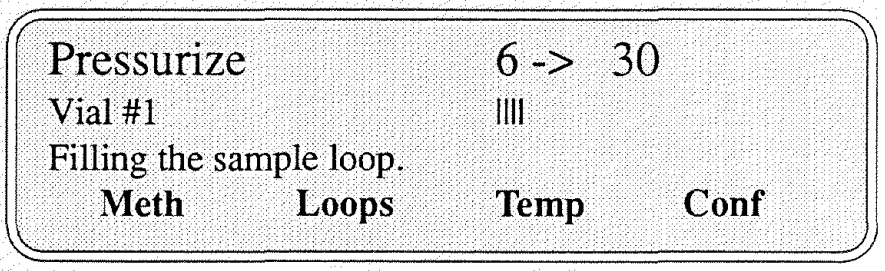
• PREPURGE

The Prepurge mode function allows the purge gas to pass through the sample needle before the sample vial is positioned for pressurization. This removes ambient air from the needle and assures that the sample is blanketed by inert gas when it is pressurized. The inert gas prevents contamination due to the ambient air.



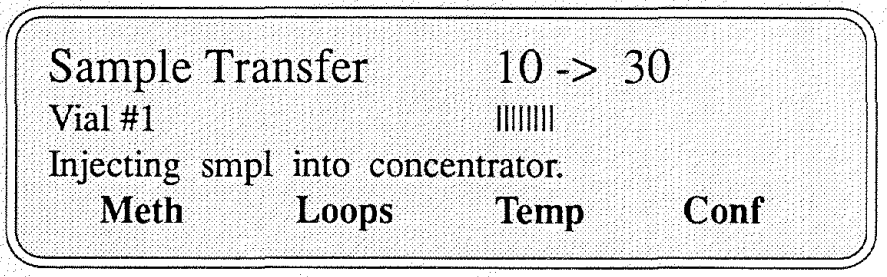
• SAMPLE PRESSURIZE

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

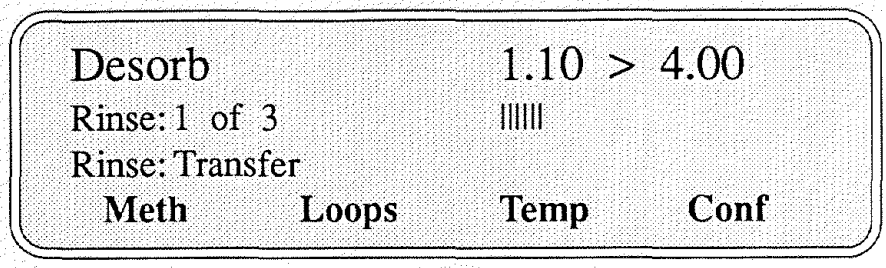


• SAMPLE TRANSFER

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 ALS 2050 will signal the LSC-2 or LSC 2000 to begin purging.

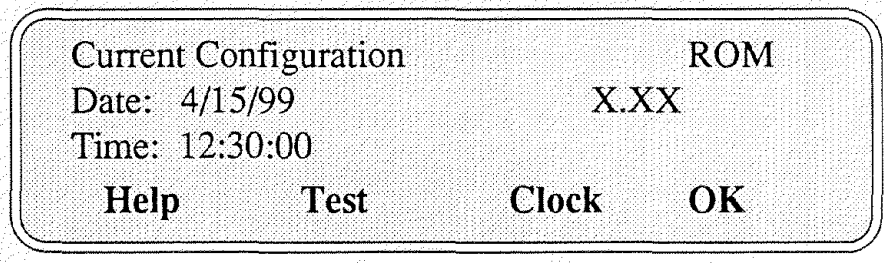


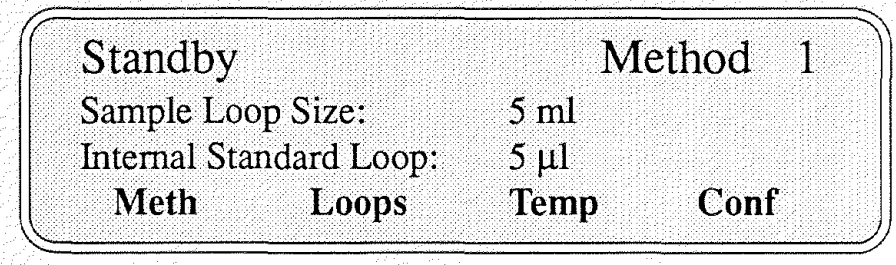
4.2 Program Steps (cont.)



4.3 Powering Up the System

Upon powering up the ALS 2050, the Current Configuration screen will be displayed. Pressing **F4 (OK)** will bring up the Introductory screen and then the Standby screen in Method 1. To set the time and date and GC Start signal see Section 4.6.



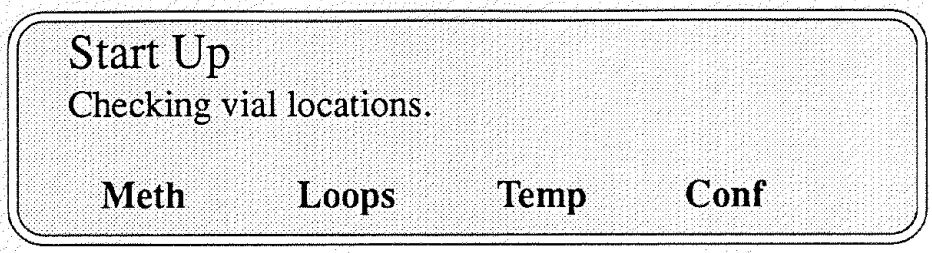


To go to another Method or to modify the parameter values for a Method, press **F1 (Meth)**. The system asks which Method you wish to use. Press the appropriate digit on the keypad.

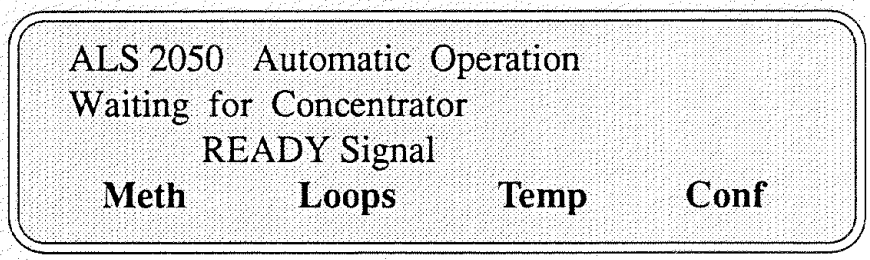
To change parameter values, press **F2 (Loops)** or **F3 (Temp)**. After changing parameter values in a Method, press **F4 (Exit)** to store the new operating Method. To run a method, press **Start**.

4.3.2 Running a Default Program (cont.)

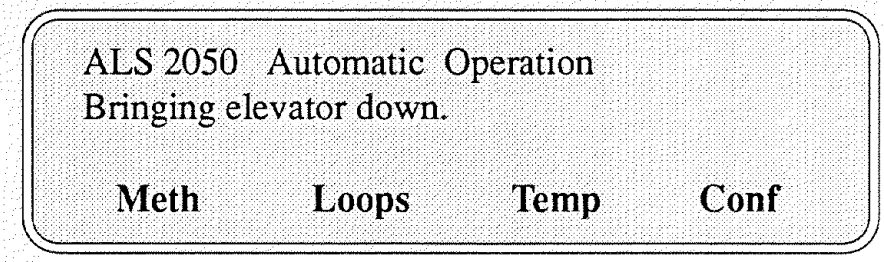
5) Press **Start** on the keypad to begin the transfer proccess.



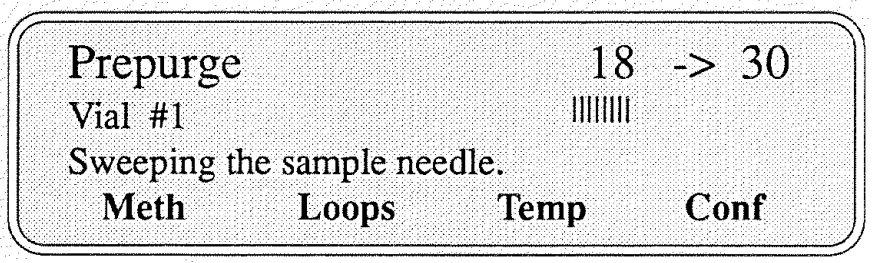
At this point, the ALS 2050 checks to see if there are no sample vials on the vial rack from a previous run. If there are vials on the ramp, an ERROR screen will appear (See Section 4.3.2.1). If there is no error, then 5 vials are loaded on the rack and one is advanced onto the ramp. The ALS 2050 now pauses for a Purge Ready signal from the LSC-2 or LSC 2000.



After the sample concentrator signals Purge Ready, the ALS 2050 will immediately step into:



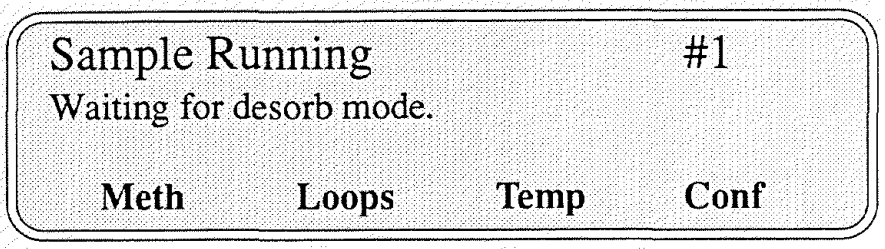
The elevator is lowered and accepts the vial. At this point Prepurge begins.



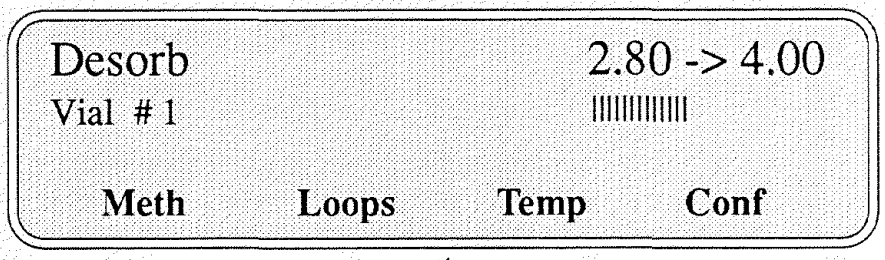
After the Prepurge cycle, the vial is positioned on the needle.

4.3.2 Running a Default Program (cont.)

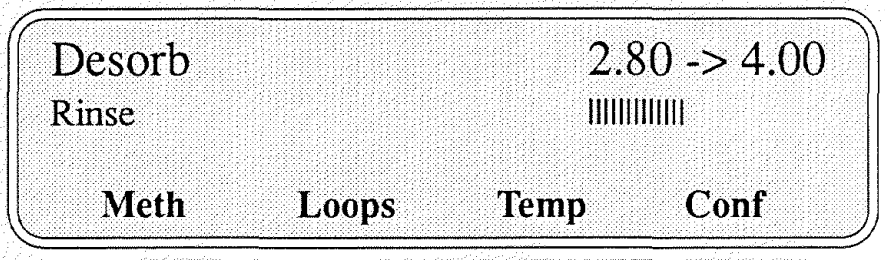
After these two transfers, the concentrator will begin processing the sample and the ALS 2050 will display:

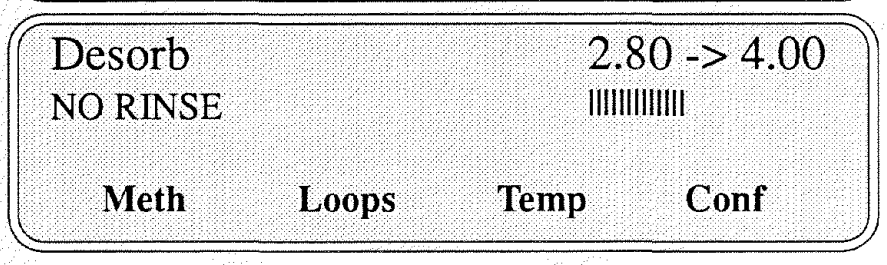


The ALS 2050 will wait for a Desorb signal from the concentrator. When the signal is received by the ALS 2050, the ALS 2050 rinse cycle will be executed during the concentrator desorb cycle. The vial is drained and the needle, sample loop, and standard loop are flushed. One of the following screens will be viewed:

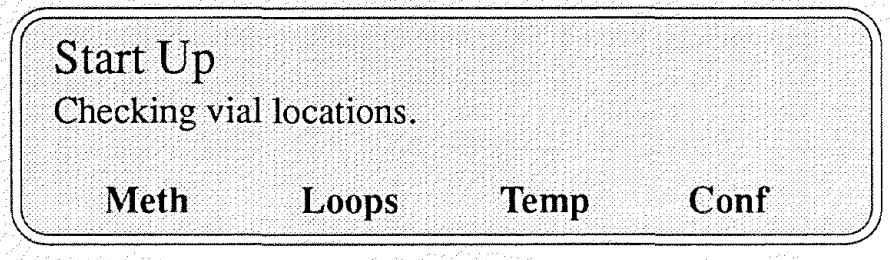


then





After these combined cycles have run their course, the system will return to the Start Up screen to check vial locations:



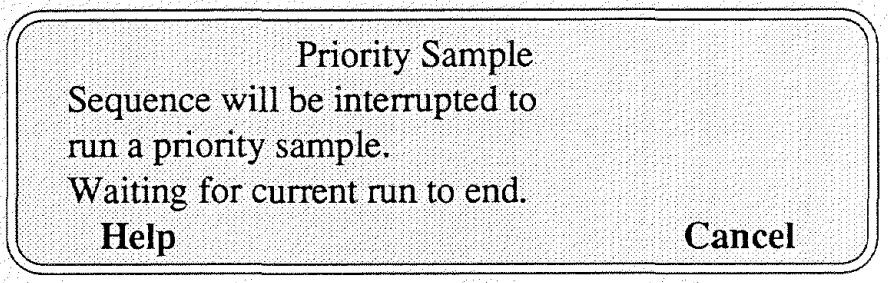
4.4 Interrupting a Run

If a run must be interrupted at any time, press **HOLD** to cause the unit to pause. Pressing **HOLD** will stop the run until **AUTO** is pressed. Pressing **AUTO** will continue the step that was interrupted.

4.5 Priority Sample

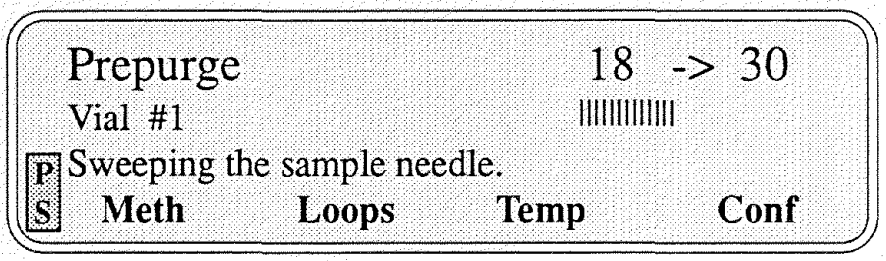
Priority Sample interrupts a run to process an additional sample without shuffling vials or interrupting the vial count.

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



This screen is timed to appear for 3 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 be viewed as:



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

4.6 Clock and GC Start Signal

The Configuration screen allows the operator to set the current date and time (Section 4.6.1) and also to configure the GC start signal to either the beginning or end of Desorb. The GC start signal from the LSC 2000 is overridden by the ALS 2050. This signal must now be set and programmed through the ALS 2050. The GC start signal from the LSC-2 will override the GC setting on the ALS 2050. See Section 4.6.2 for setting th GC start signal.

1) To view the current configuration screen press **F4 (Conf)** during any program mode:

```
Current Configuration                ROM
Date:   4/15/99                      X.XX
Time:   12:30:00
GC Start:     Beginning of Desorb
  Help          Test          Setup      OK
```

2) If time, date, and GC start signal are all correct press **F4 (OK)** to return to the Start Up mode.

3) Press **F3 (Setup)** to change the parameters on the following screen:

```
F2 (Clock)    To change the tome & date
              refer to Manual Section 4.6.1
F3 (GC-IO)    To change the GC start parameters
              refer to Manual Section 4.6.2
                   Clock      GC-IO      EXIT
```

4.6.1 Viewing and Setting the Clock

The clock mode controls the date and time set into the system.

1) To edit the clock press **F2 (Clock)** to display the following screen:

4.6.2 Setting the GC Start Signal (cont.)

3) When the value is correct, press **F4 (EXIT)** and then **F4 (OK)** on the Current Configuration screen to get back to the Startup screen.

NOTE: If an invalid key is pressed while programming a new GC Start signal, **-> INVALID DIGIT/KEY <-** lights up on the screen and the system beeps. When the message disappears you may re-enter the new values.

4.7 Running the Diagnostic Program

The ALS 2050 ROM has a diagnostic program which allows the operator to verify the correct operation of individual inputs and outputs. To access this program the system must be in the Standby mode.

```
Standby                          Method  1
Sample Loop Size:          5 ml
Internal Standard Loop:    5 µl
  Meth      Loops      Temp      Conf
```

1) Press **F4 (Conf)**.

2) Press **F2 (Test)** in the Configuration screen.

If the system is not in standby mode, the Test option is not available. For operating procedures, refer to Troubleshooting, Section 7.1.

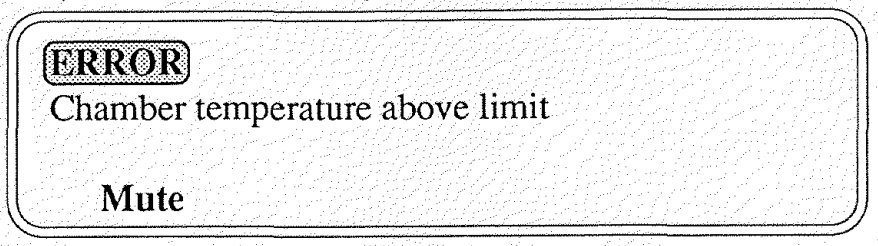
4.8 Sample Chamber Temperature

The water temperature of the cooling chamber is adjusted and maintained by a cooling bath connected to the ALS 2050. The ALS 2050 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.

```
Sample Chamber Temperature
          Current Temp:    4.0°
alarm when above:          6.0°
  Help      Alarm      No Alarm      Exit
```

4.8.3 Sample Chamber Temperature Warning

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

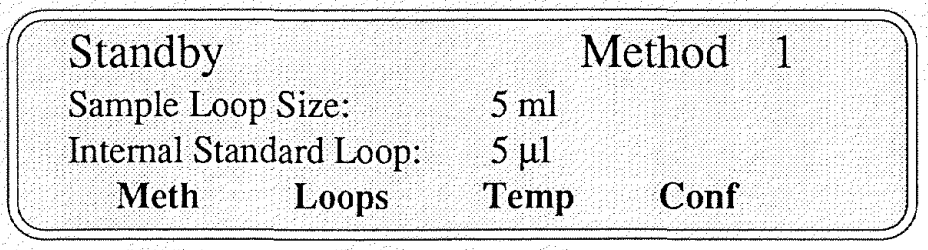


Press **F1 (Mute)** to view the Sample Chamber Temperature screen. See Section 4.8.1, Adjust the Sample Chamber Temperature.

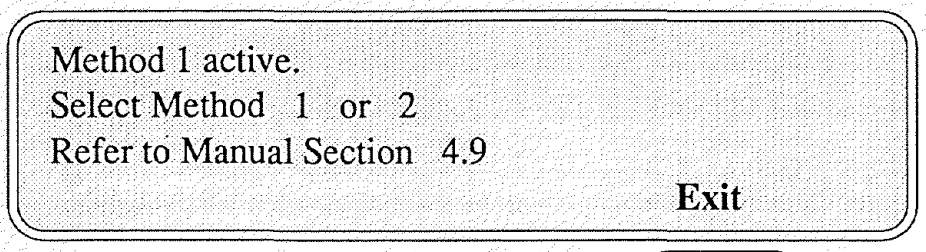
4.9 Setting Method Parameters

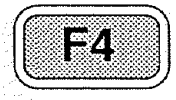
Two methods are offered (defaults for 5 ml sample loops) This gives you the ability to process your samples more efficiently by programming one method for one size sample volume (with or without a standard) and program another method with another size sample volume (with or without a standard). The two methods will default to the values you select once they are entered and you exit back to the Standby mode. The sample and internal standard loops must be changed manually and their corresponding volumes entered into memory (See Section 5.1 and 4.9.1).

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 press **F1 (Meth)**.



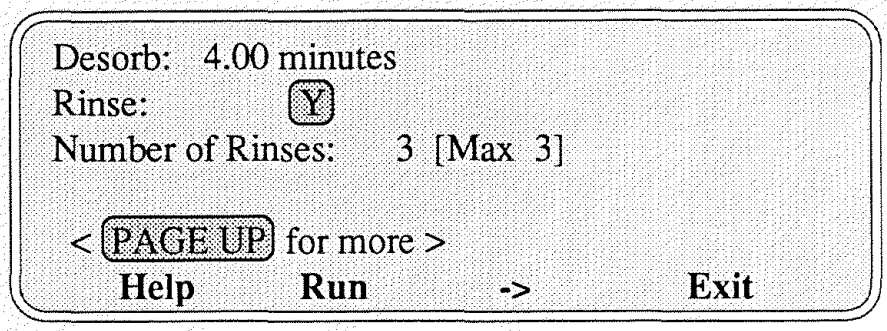
The following screen will appear:





4.9 Setting Method Parameters (cont.)

4) Press **PAGE DOWN** on the keypad to view the Desorb and Rinse parameters. See Section 4.9.3 to set these parameters.



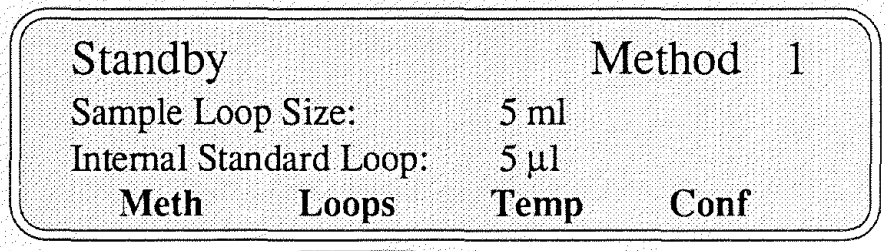
5) Press **F3 (->)** to move the shaded box to the parameter you wish to change. Enter the desired value for each parameter.

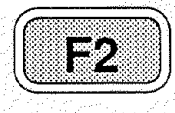
NOTE: **F2 (Run)** is offered when you enter the Method Parameter screen from Standby. You may begin a run in that method with the new parameters.

If you entered the Method Parameter screen during a run, you have an **F4 (Exit)** option only. Pressing this will enter the new parameters into the method, and will return you to the cycle that you left.

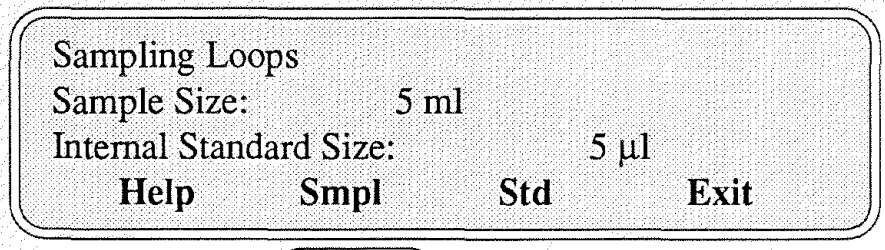
4.9.1 Setting Sample Loop Volume Values

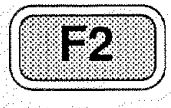
1) In the Standby mode, press **F2 (Loops)**.





2) The Sampling Loops screen appears. To change the sample volume value, press **F2 (Smpl)**.





4.9.2.1 Turning the Internal Standard On and Off

2) Use **F3 (<-)** and **F4 (->)** to move the white box through the internal standard volumes to the corresponding value. The values will appear in the shaded box at the top of the screen.

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

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

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

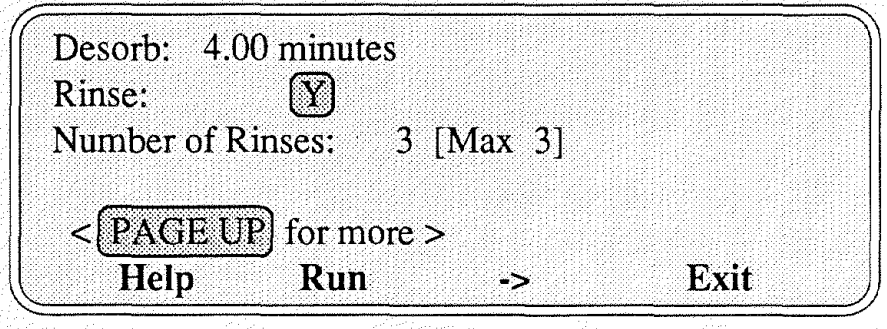
a) Leave the internal standard on for 30 seconds to flush the line each time you refill the vessel.

b) Leave the internal standard on for 1 minute to flush the line when you install a *new and different* standard.

4.9.3 Setting Desorb and Line Rinse

The ALS 2050 Desorb time must be set for the same desorb time allotted to the LSC-2 or LSC 2000. The identical timing coordinates the two units to be ready for the next round of sample transfer and sample processing steps. 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 3 rinses. This is the maximum number of rinses which can be performed in the allotted desorb time programmed for the LSC-2 or LSC 2000. In general, if a water supply is installed, set the "Number of Rinses" to the maximum value permitted. While rinses may not

4.10.1 Reprogramming Parameters After a Power Failure (cont.)

POWER FAIL
Power fail during cycle

Exit

POWER FAIL
Error -- program restarting

Exit

If power failure occurs during the Standby mode, the processor assumes that the unit was turned off intentionally, so when power is restored, the current configuration screen is displayed:

Current Configuration ROM
Date: 4/15/99 X.XX
Time: 12:30:00
Help **Test** **Clock** **OK**

Press **F4 (Exit)** to return to the Introductory screen.

5.1 Changing Sample and Internal Standard Loops

Both the sample and internal standard loops are located behind the access panel on the right side panel.

To change the loops:

1) Rotate the two fasteners 90º and open the panel.

NOTE: The sample valve is the valve in the farthest rearward position. The internal standard valve is in the forward position. The loops are located across valve ports 1 and 4 of each valve.

2) First remove the old loop with a 1/4" open end wrench.

3) Install the new loop with the coils looped in front of the Internal Standard valve.

4) Check to be certain that the chamber door can be fully closed before tightening the fittings.

5) Leak check the new loops according to Section 3.1.3.

6) Close the door and reinstall the retaining fasteners.

5.2 Refilling the Blank Water Generator

With use, the granular activated carbon in the filter will become saturated with organics, and impurities will pass through. The carbon is not easily regenerated, so it is normally replaced with new carbon.

1) Turn off the water supply.

2) Disconnect the lines entering both the top and bottom of the filter.

3) Remove the filter from the unit.

4) Remove the pipe thread fitting on one end of the filter, and pour out the carbon.

NOTE: The carbon tends to clump together when wet, so removal of all the carbon may take some shaking and/or rinsing.

5.4 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 dip tube should also be cleaned on a routine basis. To effectively clean the glassware and tube, Tekmar recommends:

a) Using dedicated glassware

b) Obtaining an ultrasonic bath

c) Obtaining 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 a godsend for saving time. A cursory scrubbing followed by ultrasonics is far more effective and much less labor intensive. Any of the glassware detergents recommended for use with an ultrasonic bath are acceptable. We recommend use of the Tekmar Ultrasonic Bath, #13-0081-000.

A muffle furnace is excellent for cleaning glassware that nothing else can touch. Set the temperature to approximately 350-400°C (do not go too high, the glassware may melt) and allow the residues to be oxidized. After the glassware has cooled, the remaining char is easily removed with a brush and a cleaning agent. We recommend the Tekmar Muffle Furnace, #13-0080-000.

5.5 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 assure that the vials will slide easily on the platform.

6.1 Ordering Replacement Parts

Tekmar's factory service facilities are located in Cincinnati, Ohio. Our Sales division may be contacted by calling toll free (800) 543-4461. Our Service Department may be reached at (800) 874-2004. They can help locate the cause of a problem and determine the best way to expedite repair. All replacement parts for the ALS 2050 are described in this section. Please include the model and serial number of your instrument when ordering spare parts.

SAMPLE HANDLING

14-3546-024	Sparger, 25 ml Fritted, w/left introduction stem for LSC 2000
14-3546-124	Sparger, 25 ml Fritted, w/right introduction stem for LSC 2000
14-4007-024	Sparger, 25 ml Fritted, for the LSC 2000 w/Sample Heater
14-3544-024	Sparger, 5 ml Fritted, w/left introduction stem for LSC 2000
14-4006-024	Sparger, 5 ml Fritted, for LSC 2000 w/Sample Heater
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
14-2983-000	CPU/Display Board
14-3751-000	ROM
14-3818-000	CPU/Display/ROM
14-3235-000	Switch Panel
14-3816-000	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
14-3784-000	Cable, Interface ALS 2050/LSC 2000
14-3783-000	Cable, Interface ALS 2050/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)
14-3688-000	Cable, Ram Motor (M1) (before S/N 90150001)
14-4748-086	Cable, Ram Motor/Sensor (after S/N 90150001)
14-3898-000	Cable, Elevator Motor (M3)
14-3899-000	Cable, Elevator Sensors (S4 & S5)
14-3900-000	Cable, Priority Sample Door Sensor (S8) (before S/N 90150001)

6.1 Ordering Replacement Parts (cont.)

VALVES

14-3683-000	Valve, 2-Port, v1 #20 Int. Std. Pressure
14-3685-000	Valve, 2-Port, v2 #21 Int. Std. Drain
14-3683-100	Valve, 2-Port, v3 #22 Sample Pressure
14-3683-200	Valve, 2-Port, v4 #23 Sample Transfer
14-3683-300	Valve, 2-Port, v5 #24 Int. Std. Transfer
14-3687-000	Valve, 2-Port, v6 #25 Rinse Water
14-3482-050	Valve, 6-Port Internal Standard (vB), 110V
14-3998-050	Valve, 6-Port Internal Standard (vB), 220V
14-3983-050	Valve, 6-Port Sample (vA), 110V
14-3999-050	Valve, 6-Port Sample (vA), 220V
14-3363-050	Valco Board Assembly for 6-Port Valve, 110V
14-3365-050	Valco Board Assembly for 6-Port Valve, 220V
14-4010-050	6-Port Valve Actuator w/ Boards, 110V
14-4012-050	6-Port Valve Actuator w/ Boards, 220V
14-3826-050	6-Port Valve Body and Slider, 6-Port Int. Std. (vA)
14-3826-050	6-Port Valve Body and Slider, 6-Port Sample (vB)
14-3687-000	Valve, Blank Water Assembly
14-4734-050	Valve, Drain Assembly
14-3793-000	Valve, NRS Assembly for Sample Pressure and Transfer, and also for Int. Std. Transfer
14-3959-050	Flow Controller for Internal Standard Pressure
14-4781-050	Flow Controller for Sample Pressure, Sample Transfer, and Int. Std. Transfer (after S/N 90150001)

FILTERS & TRAPS

14-3707-000	Blank Water Filter Assembly
14-3887-000	Refill Kit for Blank Water Filter
14-3955-003	Internal Standard Filter

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 (after S/N 90150001)
14-4705-028	Switch, Sub-miniature, Basic (after S/N 90150001)
14-1282-034	Fuse Holder
14-1219-034	Fuse, 3 Amp AGC (priced each pkg. of 5)
14-0955-034	Fuse, 1.5 Amp MDL (priced each Pkg. of 5)
14-3824-000	Instruction Manual

**** IMPORTANT!!! ****

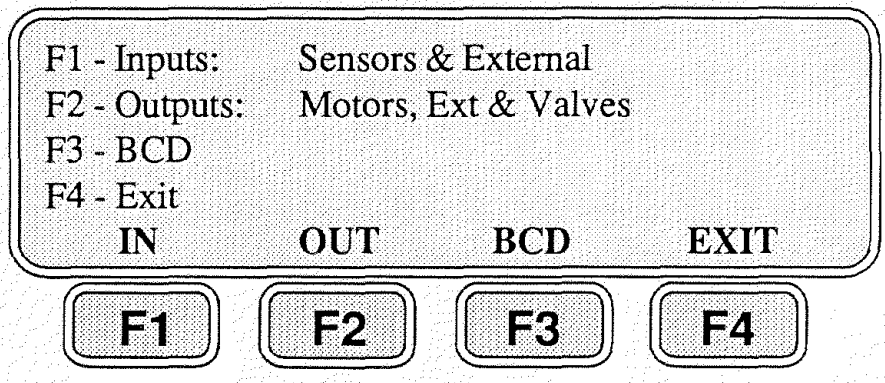
When troubleshooting the ALS 2050, it is recommended that *all* vials be removed from unit.

7.1 Diagnostics Program

The ALS 2050 R.O.M. 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.

1) 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.

7.1.1 ALS 2050 Component Reference Designations

The following are lists of the ALS 2050 components with their corresponding reference designation.

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

7.1.3 Diagnostic Program Outputs

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
```

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

7.1.3.1 Motors and External Outputs

= WARNING =

DO NOT OPEN THE PRIORITY SAMPLE DOOR DURING ANY OF THE MOTOR DIAGNOSTIC TESTS DUE TO POTENTIAL HAZARD OR INJURY!!

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

```
m1   Ram                    e5   Start Output
m2   Advancer               e6   GC Start
m3   Elevator
m4   Spare
(press motor / ext # to toggle)
  R              O                        EXIT
```

7.1.3.2 Solenoid Valve Outputs

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

```
v1   IS Pressure        v5   IS Inject
v2   IS Drain           v6   Blank Water
v3   Smpl Press.        v7   Spare
v4   Smpl Trans.        v8   Spare
(press valve # to toggle)
                                   EXIT
```

7.2 Display Problems

#1 No Display

A. Are fuses F1, F2, F3 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 : Replace the CPU board or the power supply.

7.3 Interface Problems to Concentrator or GC

The concentrator interface signals are as follows:

Purge Ready:	4 sec. closure from concentrator
Purge Start:	2 sec. 5 volt to ground from ALS 2050
Beginning of Desorb:	4 sec. closure from concentrator
GC Start:	2 sec. contact closure from ALS 2050 – user selectable for beginning or end of Desorb

LSC-2 To ALS 2050 Pin Out

LSC-2/Computer Socket		ALS 2050/Concentrator I/O
3 Green ———	Ground	——— 3 Green
2 White ——	Purge Ready	—— 7 Ground
1 Red ———	Purge Ready	—— 1 Red
		Advance to Purge input

LSC-2/T-2 Connector		ALS 2050/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		ALS 2050/Concentrator I/O
8 Orange —	Advance to Purge Input	— 7 Orange
	Purge permission input	

7.3.1 Concentrator I/O Problems

#1 Unit does not wait for concentrator

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 ready signal?	YES: Check concentrator Purge Ready signal. NO: Unplug I/O cable from ALS 2050 then proceed to C.
C. Does unit wait for ready signal?	YES: Replace I/O cable on LSC-2 (#14-3783-000) or LSC-2000 (#14-3784-000). NO : Unplug 20 conductor ribbon cable from Multi-function Board. Proceed to step D.
D. Does unit now wait for concentrator ready signal?	YES: Replace 20 conductor I/O cable (#14-3692-000). NO: Replace Multi-function Board (#14-3750-000).

#2 Unit 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 signal?	YES: Check concentrator for correct beginning of desorb signal. NO: Unplug I/O cable from ALS 2050. Proceed to Step C.

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

C. Disconnect concentrator I/O cable from ALS 2050. Jumper pins #1 and #3 of concentrator I/O receptacle. Does unit now step into Prepurge?

YES: Replace I/O cable on LSC-2 (#14-3783-000) or LSC 2000 (#14-3784-000).
NO: Unplug the 20-conductor ribbon cable from Multi-function Board. Proceed to step D.

D. Jumper Pins #20 and #16 on 20 pin header of Multi-function Board. Does unit now step into Prepurge?

YES: Replace the 20-conductor I/O cable (#14-3692-000).
NO: Replace Multi-function Board. (#14-3750-000)

#4 Concentrator does not step to Purge

A. Is concentrator in Auto Mode?

YES: Proceed to step B.
NO: Select Auto Mode.

B. Disconnect I/O cable from concentrator. Check D.C. voltage while stepping ALS 2050 from Pressurize to Sample Transfer.

For LSC-2

Check D.C. voltage between pins #1 and #3 on 8 pin connector at concentrator end of I/O cable.

For LSC 2000

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 5 volts to 0 volts for approximately 2 seconds?

YES: Problem is with concentrator.
NO: Disconnect I/O cable from ALS 2050. Proceed to step C.

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

C. Disconnect I/O cable from ALS 2050. Jumper pins #6 and #3 of concentrator I/O receptacle. Does unit now step to Desorb?

YES: Replace I/O cable on LSC-2 (#14-3783-000) or LSC 2000 (#14-3784-000).
NO: Unplug the 20-conductor ribbon cable from Multi-function Board. Proceed to step D.

D. Jumper Pins #16 and #19 on 20 pin header on Multi-function Board. Does unit step into Desorb now?

YES: Replace the 20-conductor I/O cable (#14-3692-000).
NO: Replace Multi-function Board (#14-3750-000).

7.3.2 GC Interface Problems

NOTE: This section only applies to an ALS 2050 that is being used in conjunction with a LSC 2000. If the LSC 2000 is switched for single sample operation, the ALS 2050 I/O cable must be disconnected from the LSC 2000 to allow for proper GC start signals.

#1 GC does not receive proper Start signal

A. Is GC Start signal set to be sent at the proper time; start or end of Desorb?

YES: Proceed to step B.
NO: Refer to manual Section 4.6.2

B. Remove GC interface cable from 25 pin "D" type connector on concentrator end of ALS 2050 to LSC 2000 I/O cable. Is there a contact closure across pins #21 and #22 when:

I. ALS 2050 is stepped into Desorb (if unit is set for beginning of Desorb signs)?

II. ALS 2050 is stepped from Desorb (if unit is set to end of Desorb signal)?

YES: The problem is not with the ALS 2050. Please verify GC and GC I/O cable.
NO: Remove I/O cable from ALS 2050 to LSC 2000 from the back of the ALS 2050 and proceed to step C.

7.4 BCD Interface Problems (cont.)

Pin Out for ALS 2050 20 cond. I/O cable (#14-3692-000).

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)		

7.5 Valve Actuation Problems (#1 cont.)

D. Verify D.C. voltage at header v3 on Multi-function Board. Is voltage approximately 12V DC?	YES: Replace valve v3 (#14-3683-100). NO: Replace Multi-function Board (#14-3750-000).
E. Is adjusting screw on 6-port valve vA visible through access hole?	YES: Proceed to step F. NO: Check plumbing and flow path.
F. Step unit from Pressurize to Sample Transfer. Is adjusting screw now visible?	YES: Replace 6-port valve logic cable (#14-3897-000). NO: Remove 6-port valve logic cable from valve vA. Proceed to step G.
G. Check for continuity between pins #3 and #4 of 6 pin connector on valve end of cable. Is there a pulse when unit is stepped to Sample Transfer?	YES: Trouble may be with the 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures. NO: Remove 6-port logic cable from header P6 on the Multi-function Board. Proceed to step H.
H. Check for continuity between pins #1 and #3 on header P6. Is there a pulse when unit is stepped to Sample Transfer?	YES: Replace 6-port valve logic cable (#14-3897-000). NO : Replace Multi-function Board (#14-3750-000).
I. While unit is in Hold, step unit to Sample Transfer. Disconnect transfer line from ALS 2050. Is there gas flow from the transfer bulkhead?	YES: This condition would indicate a blocked transfer line. NO: Proceed to step J.

7.5 Valve Actuation Problems (cont.)

#2 Internal Sample was not transferred to concentrator

A. Are flow rates and pressure setting correct?	YES: Proceed to step B. NO: Refer to ALS 2050 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: Proceed to step K. NO: Proceed to step C.
C. Unplug cable #20 from v1 on Multi-function Board. Does valve v1 actuate?	YES: Proceed to step E. NO: Proceed to step D.
D. Verify DC voltage at header v1 on Multi-function Board. Is voltage approximately 12V DC?	YES: Replace valve v1 (#14-3683-000). NO: Replace Multi-function Board (#14-3750-000).
E. Unplug connector #27 from v2 on Multi-function Board. Does valve actuate?	YES: Proceed to step G. NO: Proceed to step F.
F. Verify D.C. voltage at header v2 on Multi-function Board is approximately 12V DC?	YES: Replace valve v2 (#14-3685-000). NO: Replace Multi-function Board (#14-3750-000).
G. Is adjusting screw on 6-port valve vB visible through access hole?	YES: Proceed to step H. NO: Check plumbing and flow path, including Int. Std. filter (#14-3955-003)

7.5 Valve Actuation Problems (#2 cont.)

N. Is adjusting screw on valve vB visible through access hole?	YES: Check plumbing and flow path including I.S. filter (#14-3955-003). NO: Proceed to step O.
O. Step unit from I.S. Transfer to Sample Running. Is adjusting screw now visible?	YES: Replace 6-port logic cable from valve (#14-3897-000). NO: Proceed to step P.
P. Check for continuity between pins #3 and #5 of 6 pin connector on valve end of cable. Is there a pulse when unit is stepped to Sample Transfer?	YES: Trouble may be with 6-port valve. Contact Tekmar Service Dept. for further trouble-shooting procedures. NO: Remove 6-port logic cable from header P6 on Multi-function Board. Proceed to step Q.
Q. Check for continuity between Pins #6 and #7 on Header P6. Is there a pulse when unit is stepped to Sample Transfer?	YES: Replace 6-port valve logic cable (#14-3897-000). NO: Replace Multi-function Board (#14-3750-000).

#3 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 correct pressure setting cannot be achieved this would indicate a blocked line or filter.

D. Edit Method Parameters changing Sample Pressurize, Sample Transfer, and Desorb times to maximum values. Turn rinse on. Load vial into unit using Priority Sample procedure (Section 4.5). Place Unit In Hold. Step to Desorb. Proceed to step E.

7.5 Valve Actuation Problems (cont.)

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

A. Edit method to 5 seconds on Sample Pressurize and maximum values on Sample Transfer and Desorb times. Turn on the rinse feature. Load the vial into unit using priority sample procedure (Section 4.5). Place unit in Hold. Step unit to Desorb. Proceed to step 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. Verify D.C. voltage at Header v4 on Multi-function Board. Does valve v4 actuate?
- YES: Replace Valve v4 (#14-3683-200).
- NO: Replace Multi-function Board (#14-3750-000).

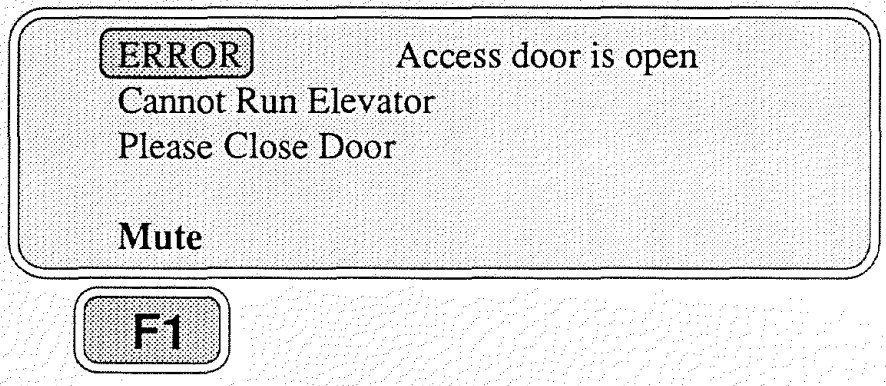
D. Is adjusting screw on 6-port valve vA visible through access hole when unit is in Rinse: Transfer mode?
- YES: Check plumbing and flow path.
- NO: Proceed to step E.

E. When unit is in Rinse: Fill mode, is adjusting screw on 6-port valve vA visible?
- YES: Replace 6-port valve logic cable (#14-3897-000).
- NO: Remove 6-port logic cable from valve vA. Proceed to step F.

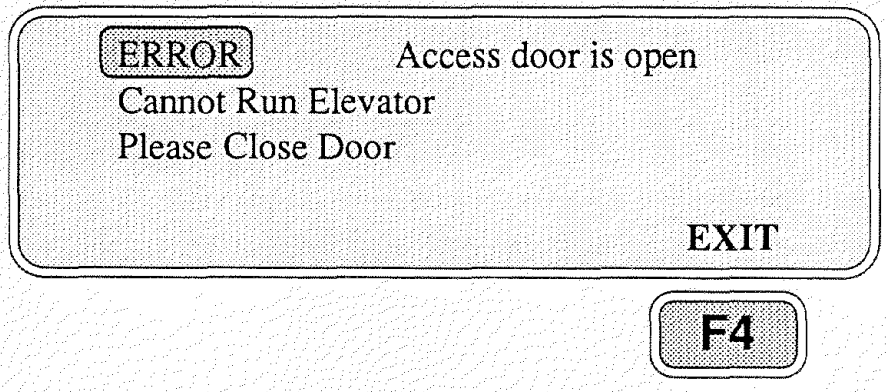
F. Check for continuity between Pins #3 and #5 of 6 pin connector on valve end of cable. Is there a pulse when unit switches from Rinse: Fill to Rinse: Transfer?
- YES: Trouble may be with 6-port valve. Contact Tekmar Service Dept. for further troubleshooting procedures.
- NO: Disconnect 6-port logic cable from Header P6 on Multi-function Board. Proceed to step G.

7.6.2 Valve Access Door Sensor Error

The access door must be closed for the vial elevator mechanism to operate. If the door should open while the elevator is running, the mechanism will stop and an audible alarm will sound with the following screens displayed:



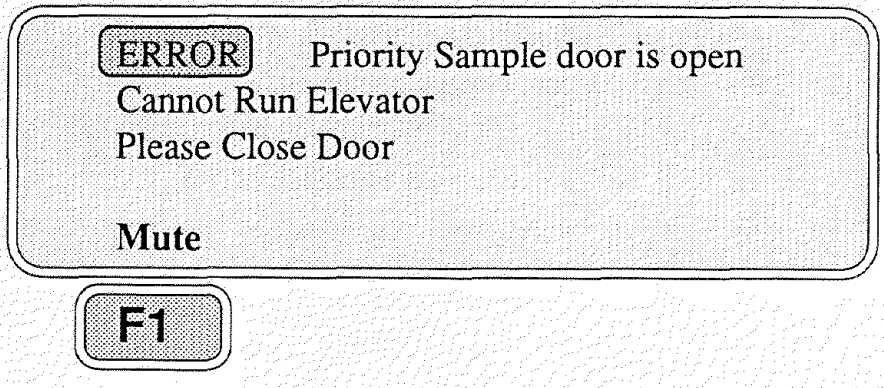
Press **F1 (Mute)** to silence the alarm.



Press **F4 (EXIT)** to exit error mode and try again.

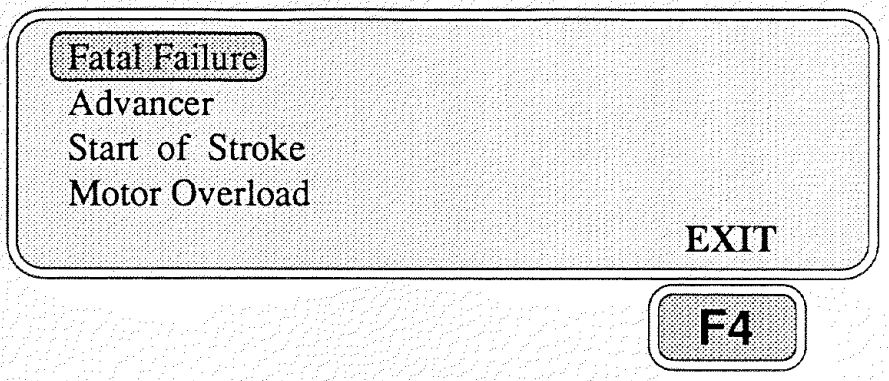
7.6.3 Priority Sample Door Sensor Error

The Priority Sample door must be closed for the vial elevator mechanism to operate. If the door should open while the elevator is running, the mechanism will stop and an audible alarm will sound with the following screens displayed:



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

7.6.4.1 Motor Overload Error (cont.)



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

= WARNING!!! =

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

DIAGNOSIS:

A. Remove vial rack cover plate, & left side panel. Is there more than one vial on ramp?
- YES: Proceed to D.
- NO: Switch S3 (vial on ramp) is O.K. Proceed to step 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 step 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. Unplug cable #16 on header P9 on Multi-function Board. Is there continuity across pin #3 and #4 of plug when sensor S3 is activated?
- YES: Remove vials and restart.
- NO: Replace sensor (#14-3565-028 before S/N 90150001) (#14-4704-028 and #14-4705-028 after S/N 90150001)

7.6.4.2 Start of Stroke Sensor Error (cont.)

DIAGNOSIS:

A. Did advancer motor turn on?	YES: Proceed to step B. NO: Proceed to step E.
B. Did lever arm move off of S2?	YES: Proceed to step C. NO: Proceed to step D.
C. Unplug cable #18 from header on Multi-function Board. Is there continuity across pins #4 and #5 of plug when S2 is <u>not</u> actuated?	YES: Replace sensor P5 (#14-3565-028 before S/N 90150001) (#14-4704-028 and #14-4705-028 after S/N 90150001) NO: Proceed to step D.

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

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

Sensor didn't close the screens and the diagnostic procedures are as follows:

Fatal Failure
Advancer
Start of Stroke
Sensor Didn't Close
Mute

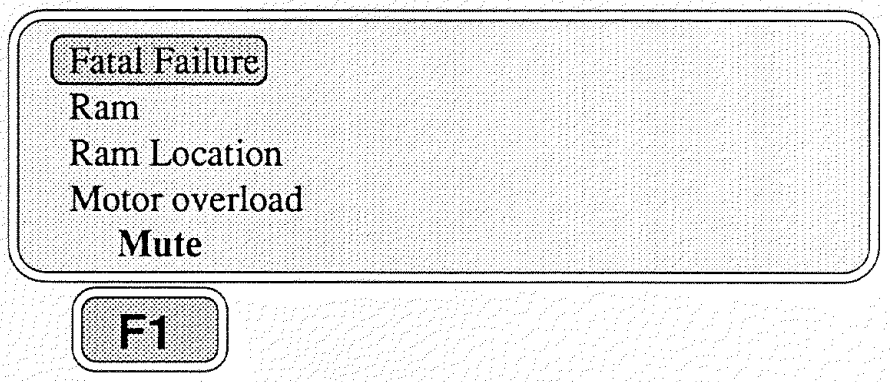
Press **F1 (Mute)** to silence alarm.

7.6.5 Ram Mechanism Errors

Refer to:
- Ram Motor = Mot 1
- Ram Location Sensor = S1

7.6.5.1 Ram Motor Overload

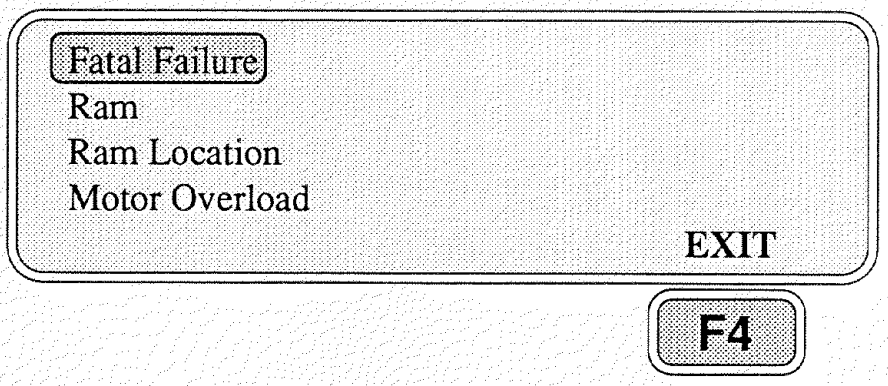
There is a circuit which will detect a motor overload. This overload would be caused by jamming of the Ram mechanism. At the time of the failure there will be an audible alarm and the following screens:



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

** **DO NOT PANIC** **

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

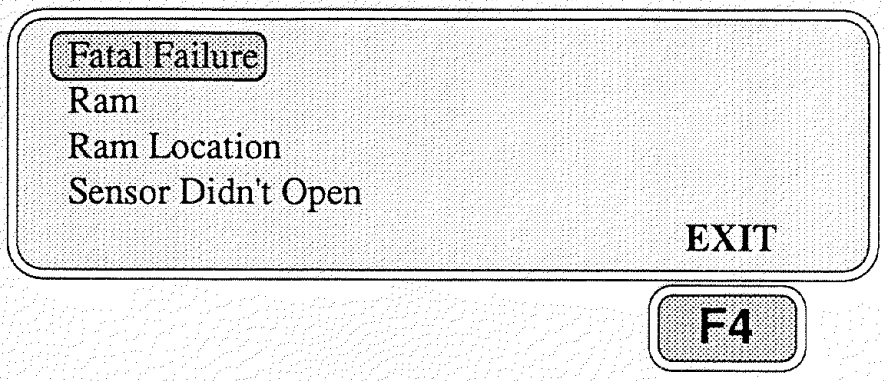


Do not press **F4 (EXIT)** until the situation is examined.

= **WARNING!!!** =

Pressing **F4 (EXIT)** before thoroughly examining the situation may result in damaging the ALS 2050.

7.6.5.2 Ram Sensor Errors (cont.)



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

= WARNING!!! =

Pressing **F4 (EXIT)** before thoroughly examining the situation may result in damaging the ALS 2050.

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 <u>not</u> actuated?	YES: Replace Ram Sensor (S1)(#14-3565-028 before S/N 90150001) (#14-4704-028 and #14-4705-028 after S/N 90150001). 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).

7.6.5.2 Ram Sensor Errors (cont.)

DIAGNOSIS:

A. Does vial drawer actuate S1 on return stroke and is there continuity across terminals com. and N.O. 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 when actuated?

YES: Replace Multi-function Board (#14-3750-000).
NO: Replace sensor (#14-3565-028 before S/N 90150001) (#14-4704-028 and #14-4705-028 after S/N 90150001)

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

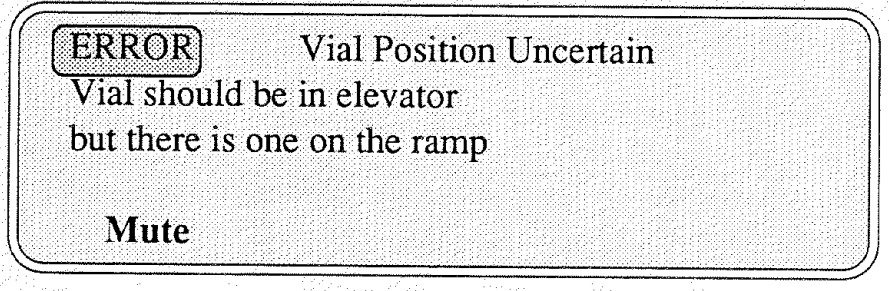
7.6.6 Vial Location On Ramp Error

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

1) Two vials were positioned on 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.

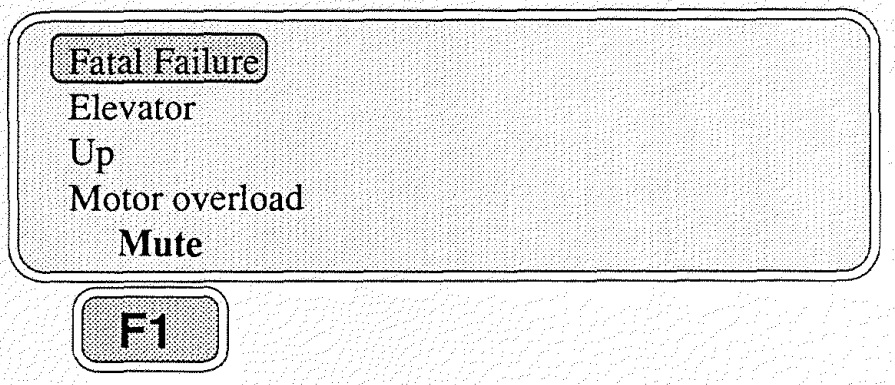
When this error is encountered there will be an audible alarm with the following screens displayed:



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

7.6.7.1 Elevator Motor Overload Failures (cont.)

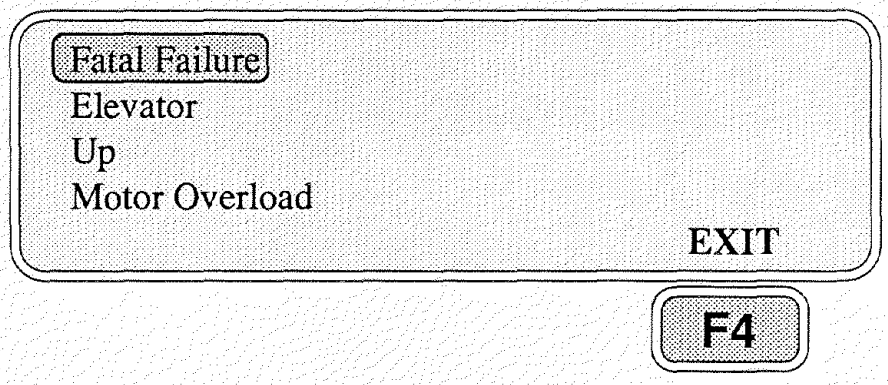
When overload occurs the following screen will appear:



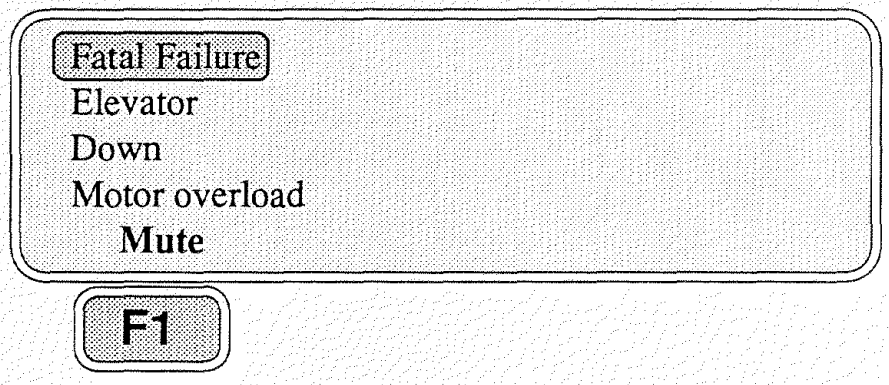
Press **F1 (Mute)** to silence alarm.

** **DO NOT PANIC** **

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



Press **F4 (EXIT)** to exit error mode and try again. If this failure occurs, it usually indicates that the current vial (if any) has not started the sampling process.



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

7.6.7.1 Elevator Motor Overload Failures (cont.)

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.

7.6.7.2 Elevator Sensor Failures

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

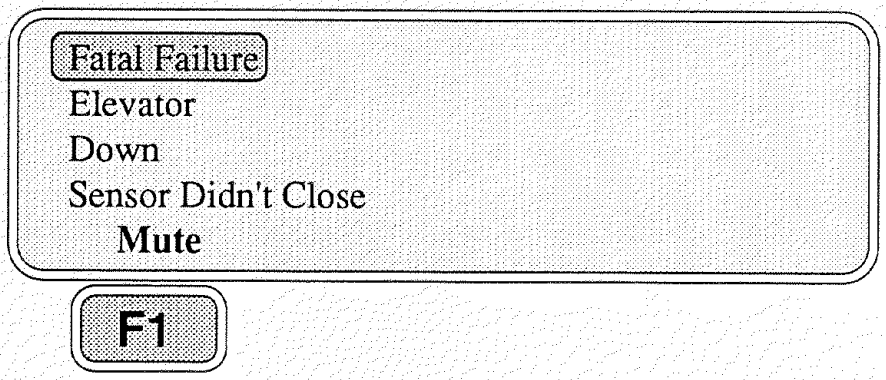
1) Elevator down sensor didn't close.

2) Elevator down sensor didn't open.

3) Elevator up sensor didn't close.

4) Elevator up sensor didn't open.

Elevator down sensor didn't close error screens and diagnostic procedures are as follows:



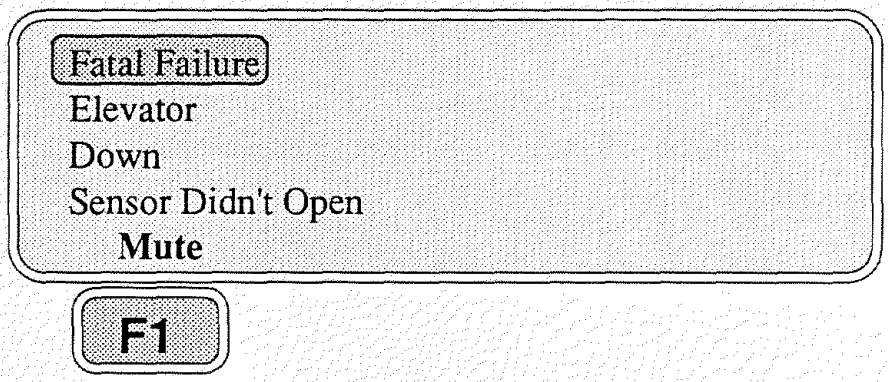
Press **F1 (Mute)** to silence alarm.

** DO NOT PANIC **

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

7.6.7.3 Elevator Down Sensor Didn't Open

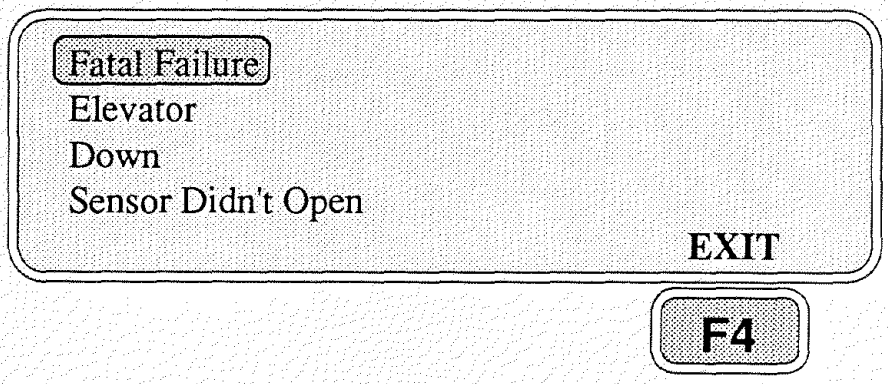
Elevator down sensor did not open. The error screens and the diagnostic procedures are as follows:



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.



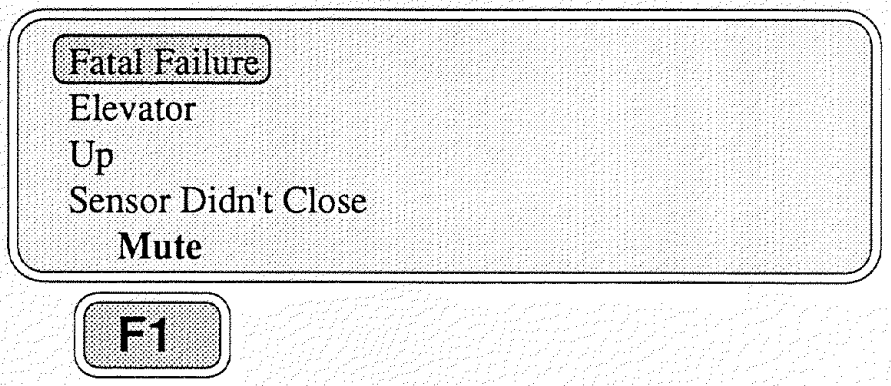
Do not press **F4 (EXIT)** until the situation is examined.

= WARNING!!! =

Pressing **F4 (EXIT)** before thoroughly examining the situation may result in damaging the ALS 2050.

7.6.7.4 Elevator Up Sensor Didn't Close

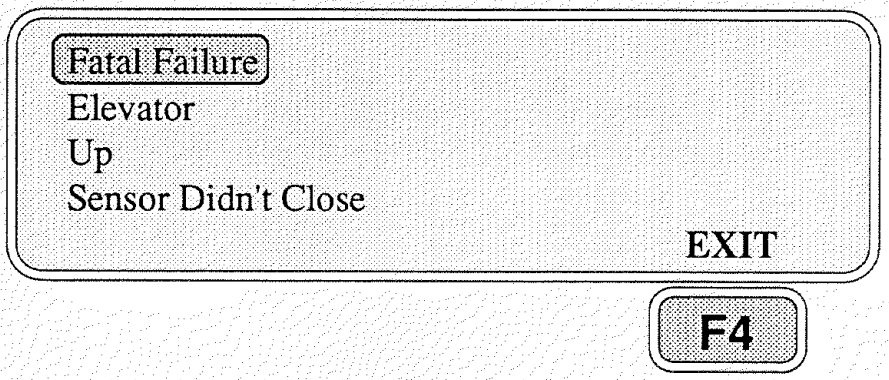
The elevator up sensor didn't close the error screens and the diagnostic procedures are as follows:



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.



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

= WARNING!!! =

Pressing **F4 (EXIT)** before thoroughly examining the situation may result in damaging the ALS 2050.

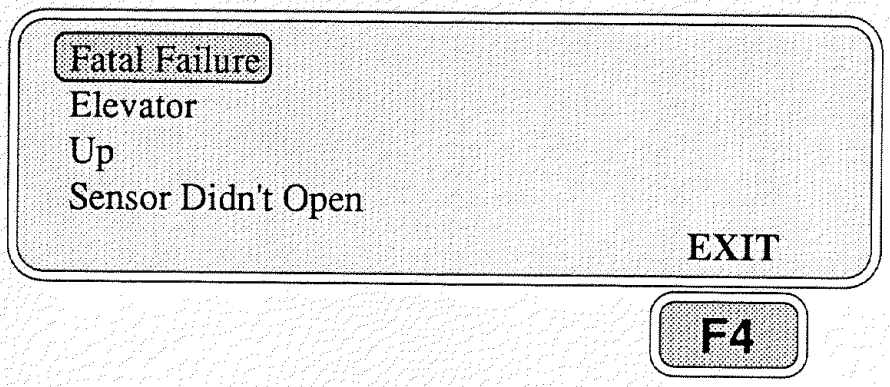
= WARNING!!! =

These 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. **Proceed to Step A only if you have read and understand this warning!!!**

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

**** 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.

= WARNING!!! =

Pressing **F4 (EXIT)** before thoroughly examining the situation may result in damaging the ALS 2050.

DIAGNOSIS:

= WARNING!!! =

These 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. **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 E.
B. Did elevator move off of elevator down 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 (#14-3565-028 before S/N 90150001) (#14-4704-028 and #14-4705-028 after S/N 90150001). NO: Proceed to step E.

7.7.1 Sample Handling System (cont.)

5) First be certain that you do not place your hand near the elevator mechanism.

6) Manually depress the safety switch. The elevator will now lift the vial onto the sampling needle assembly.

7) When the elevator reaches the top of its travel, release the microswitch. The elevator will now stop.

8) Turn the elevator off by pressing **3** again.

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

10) Press **F2 (Outputs)**.

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

12) Place a cap nut on the sample drain fitting on the back of the unit.

13) 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

14) Turn off the sample pressurize valve by pressing **3**.

15) Turn on the sample transfer valve by pressing **4**.

7.7.2 Internal Standard Handling System (cont.)

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

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**.

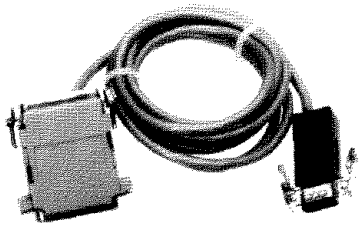
8) The following fittings can now be checked:

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

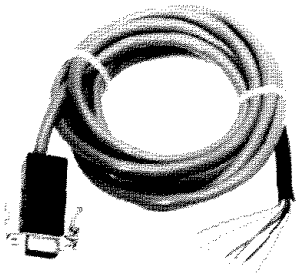
9) The following fittings are checked when performing the Sample Transfer check, but can also be checked now:

- ❒ 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

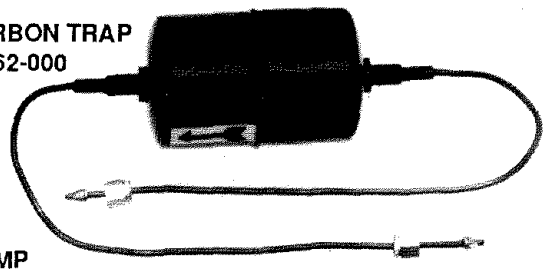
INTERFACE CABLE
ALS 2050 to LSC 2000
14-3784-000



BCD CABLE
14-3871-000

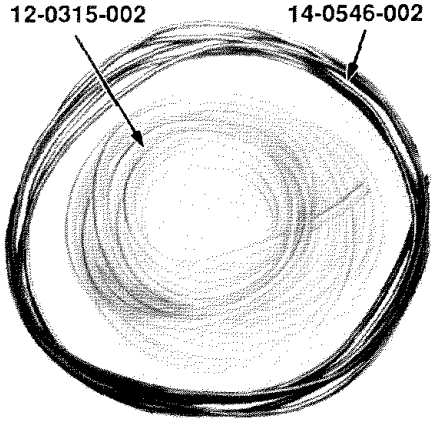


HYDROCARBON TRAP
14-1362-000



TYGON TUBING
12-0315-002

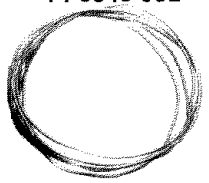
COPPER TUBING (1/8")
14-0546-002



FUSE 3.0 AMP
14-1219-034

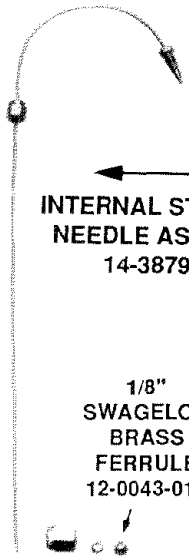
FUSE 1.5 AMP
14-3926-034

NICKEL TUBING (1/16")
14-3845-002



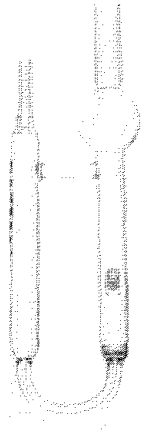
1/2" TEFLON FERRULE
14-3098-016

1/2" SWAGELOK NUT
14-1301-016



INTERNAL STANDARD
NEEDLE ASSEMBLY
14-3879-053

INTERNAL STANDARD
VESSEL
14-4487-024



FRITTED SPARGER
(Right-Side Intro.)
for LSC 2000
14-3544-124

FRITTED SPARGER
(Left-Side Intro.)
for LSC 2000
14-3544-024

1/8"
SWAGELOK
BRASS
FERRULE
12-0043-016

1/8"
SWAGELOK
BRASS NUT
12-0069-016

1/16"
SWAGELOK
S.S. FERRULE
14-0241-016

1/16"
VALCO
S.S. NUT
14-0243-016

1/4"
SWAGELOK
S.S. NUT
14-2087-016

1/4"
TEFLON
FERRULE
12-0041-016

1/4"-1/16"
REDUCING
UNION
14-2261-116

1/16"
S.S.
FERRULE
14-0241-016

1/16"
SWAGELOK
S.S. NUT
14-0243-016

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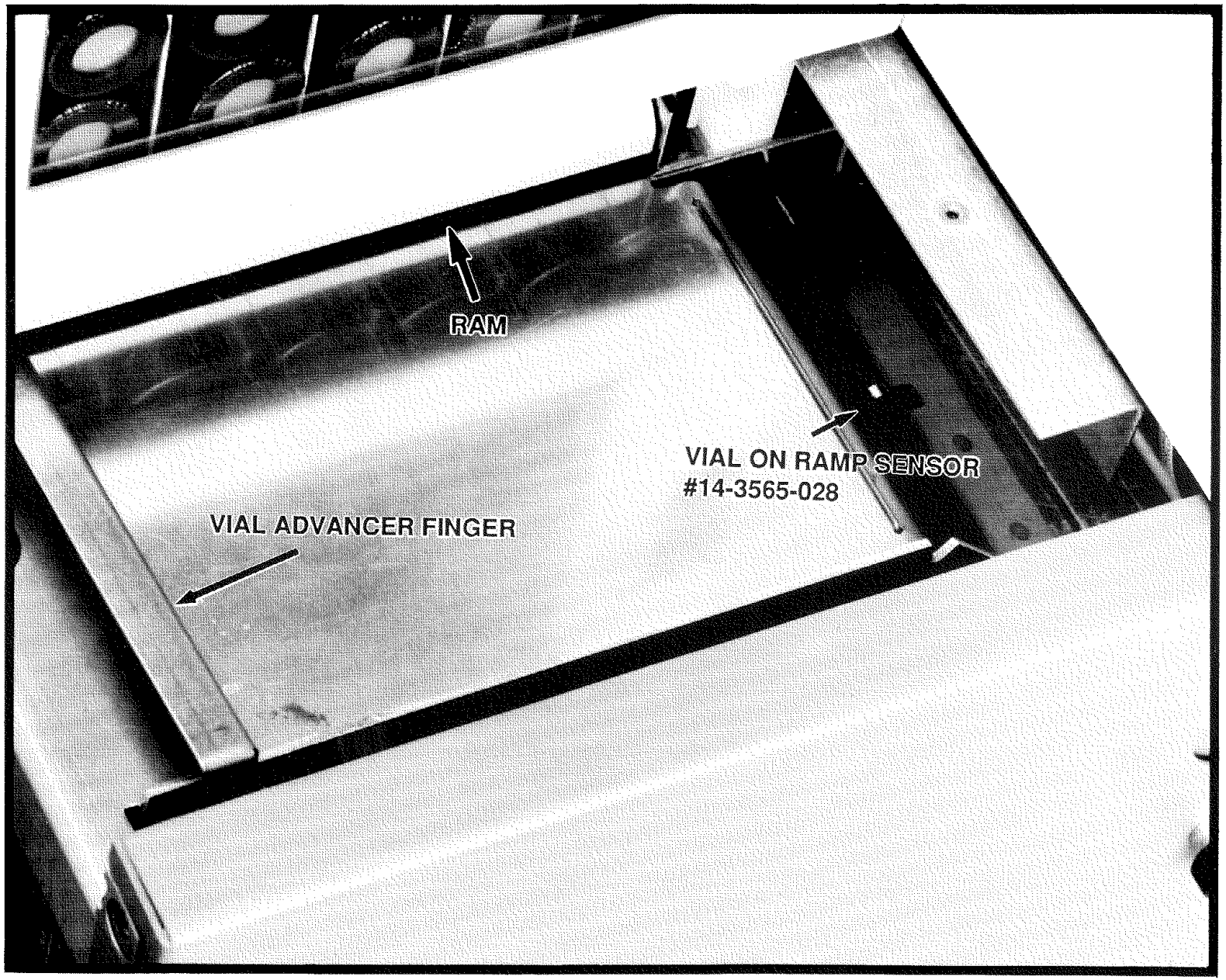
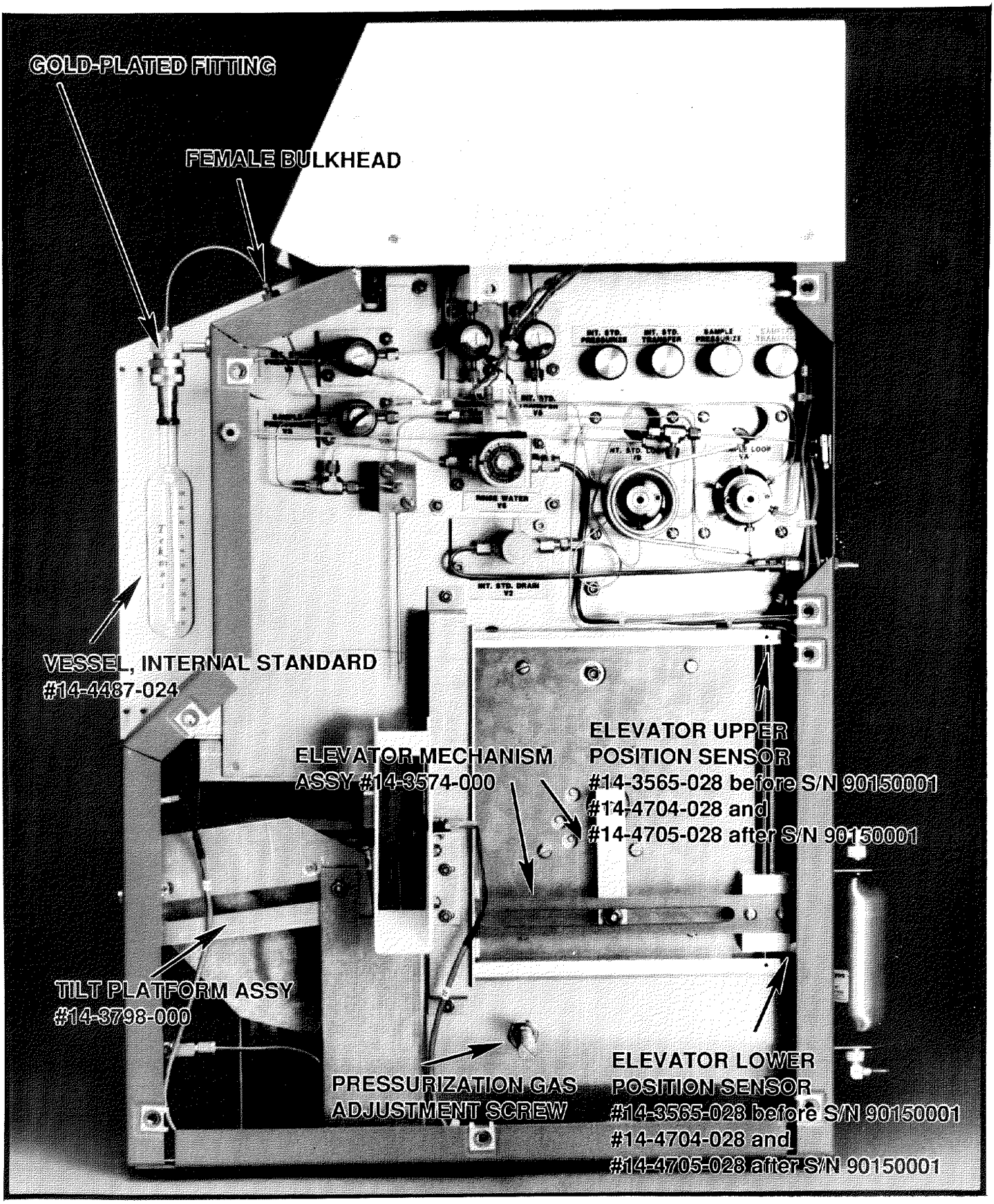
ALS 2050 KIT BOX ASSEMBLY

Tekmar®



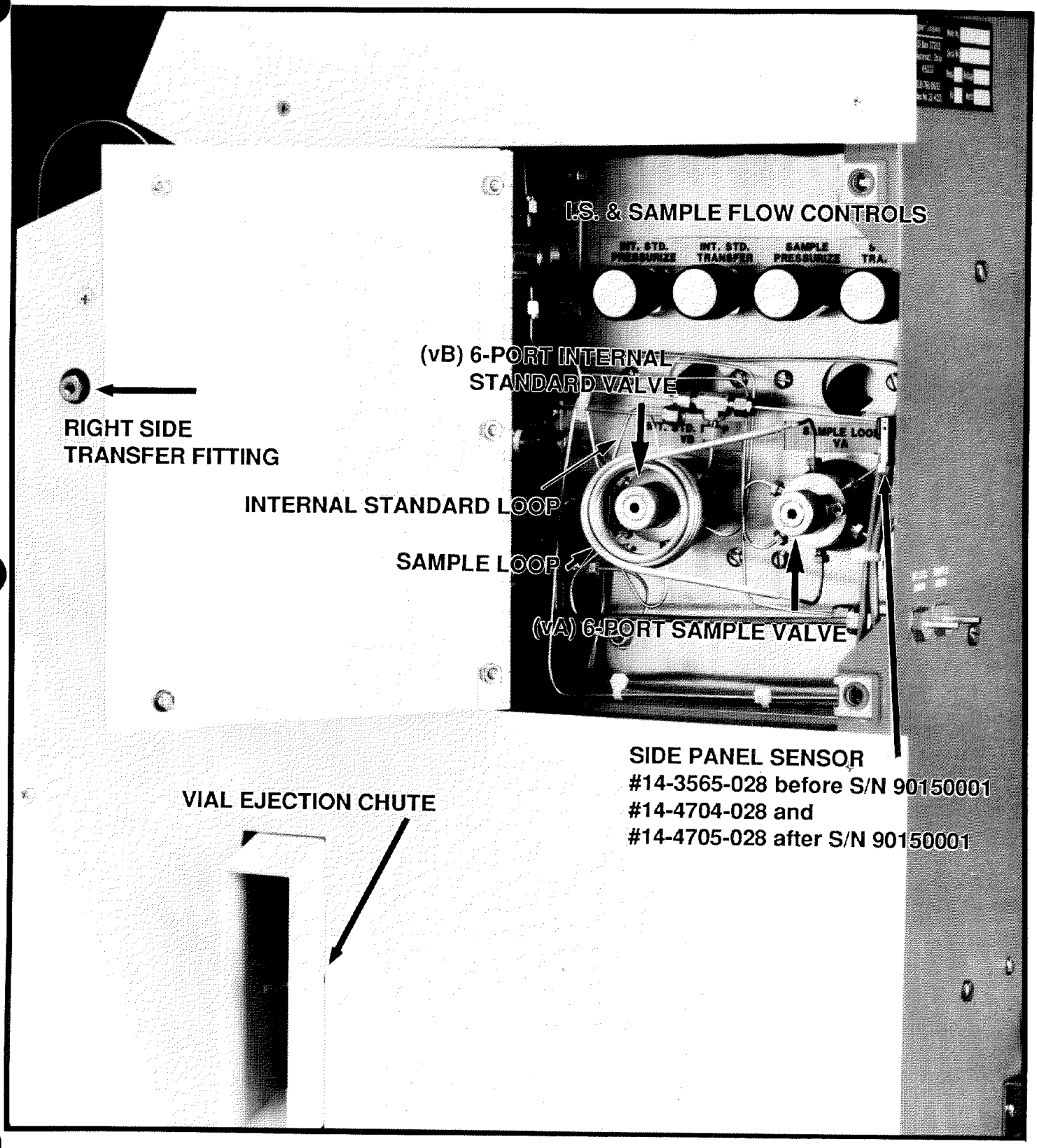
ALS 2050 VIAL TRAY W/ COVER REMOVED

Tekmar®



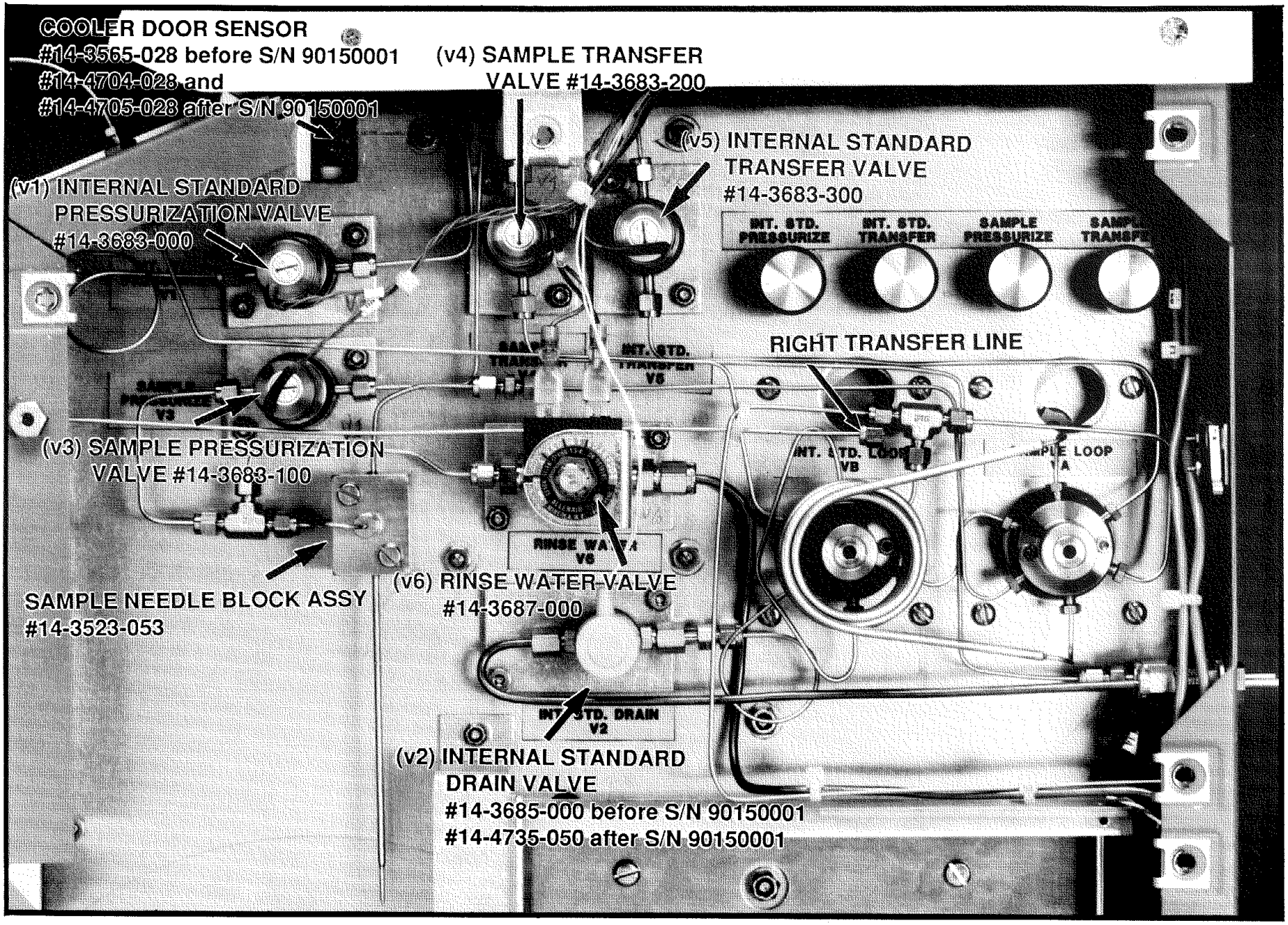
ALS 2050 RIGHT INTERIOR

Tekmar®



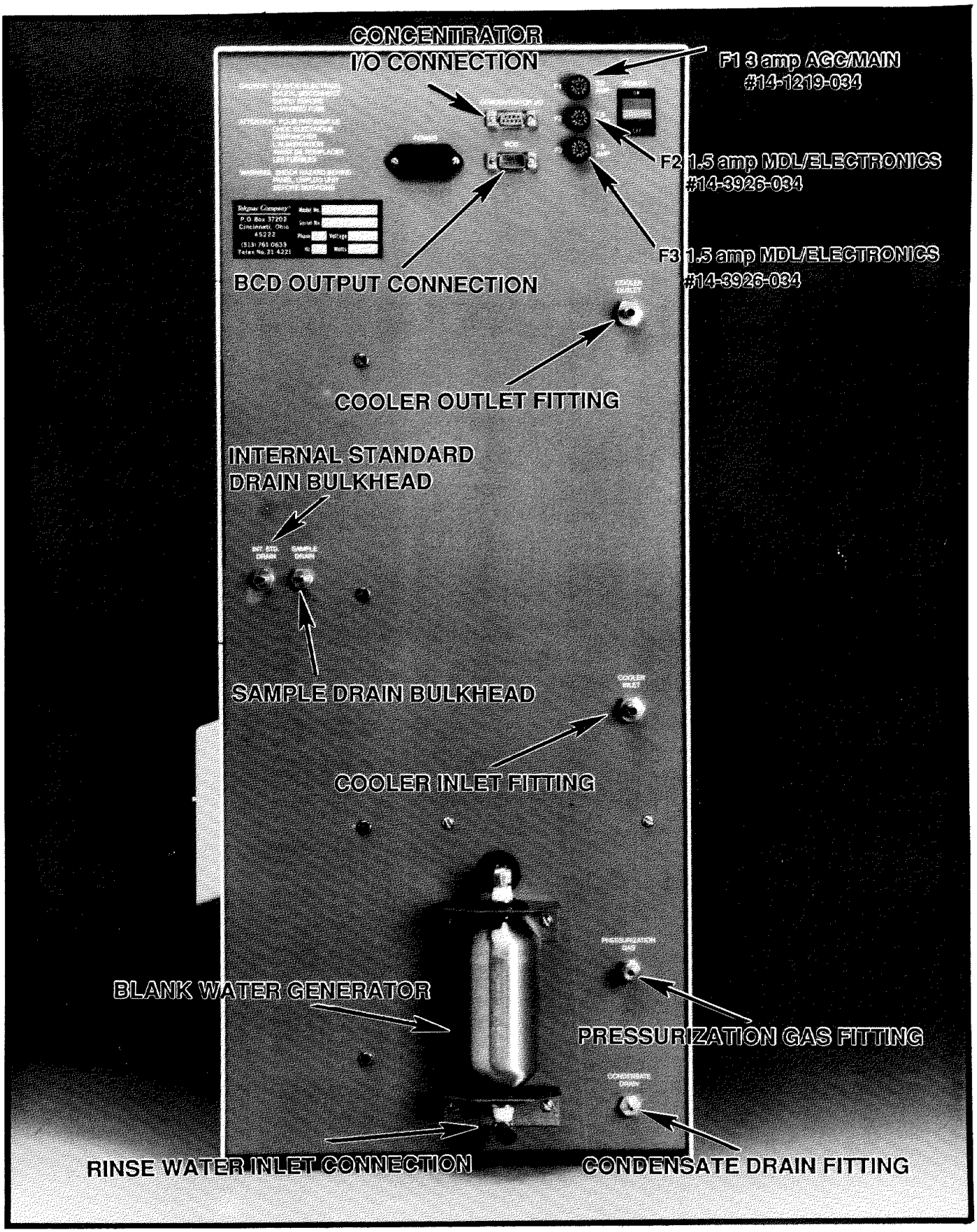
ALS 2050 RIGHT DOOR

Tekmar®



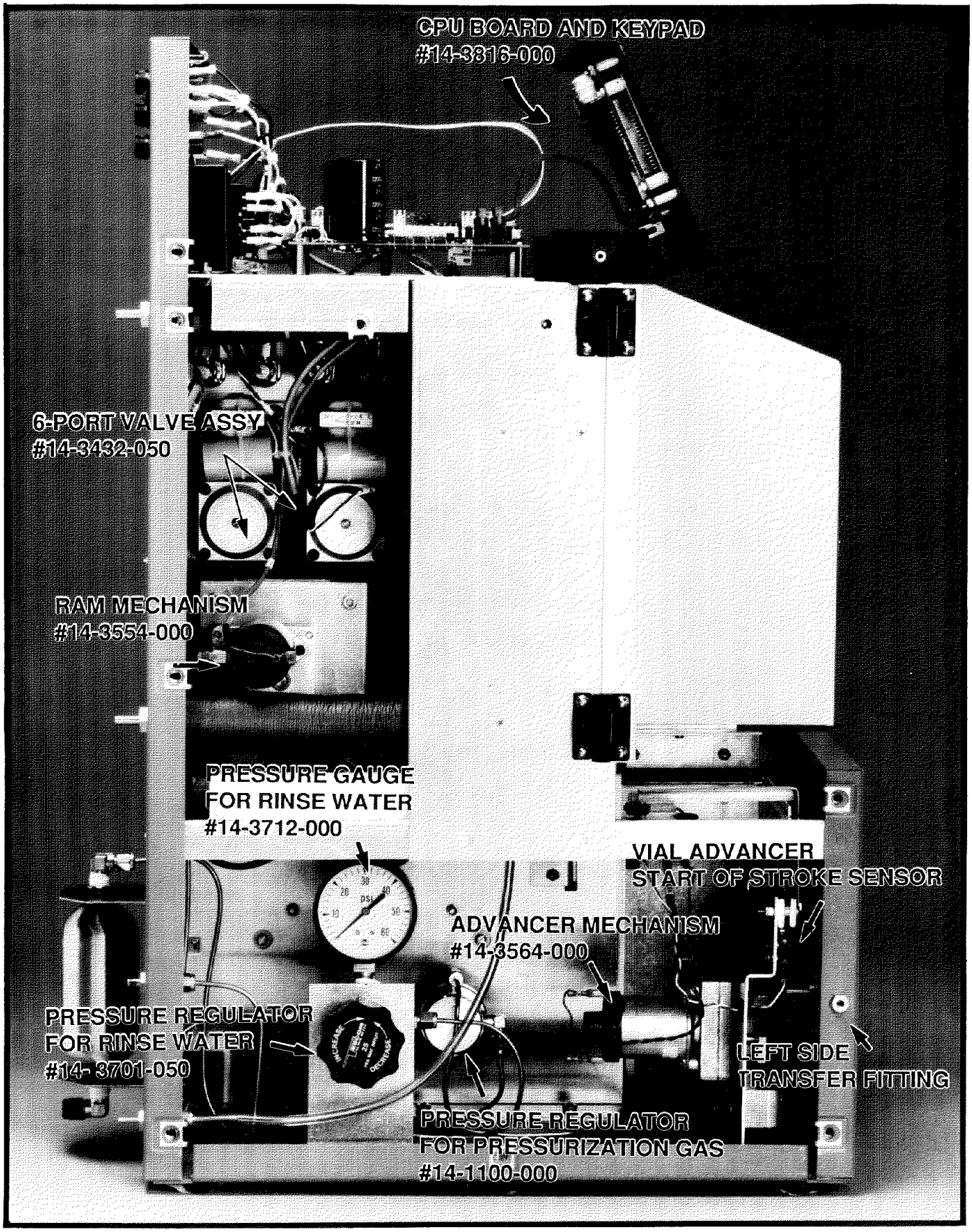
ALS 2050 RIGHT TOP INTERIOR

Tekmar®



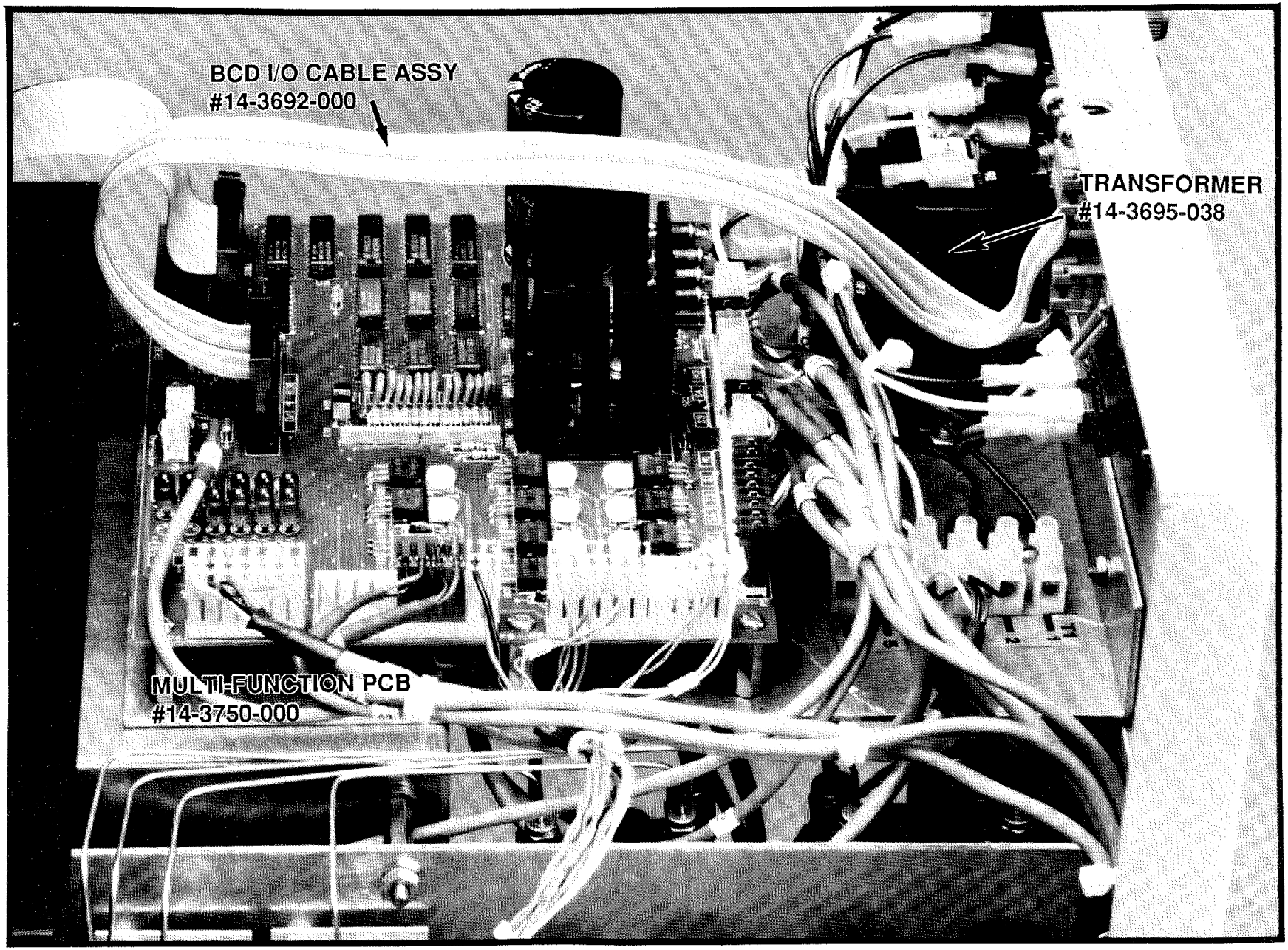
ALS 2050 REAR VIEW

Tekmar®

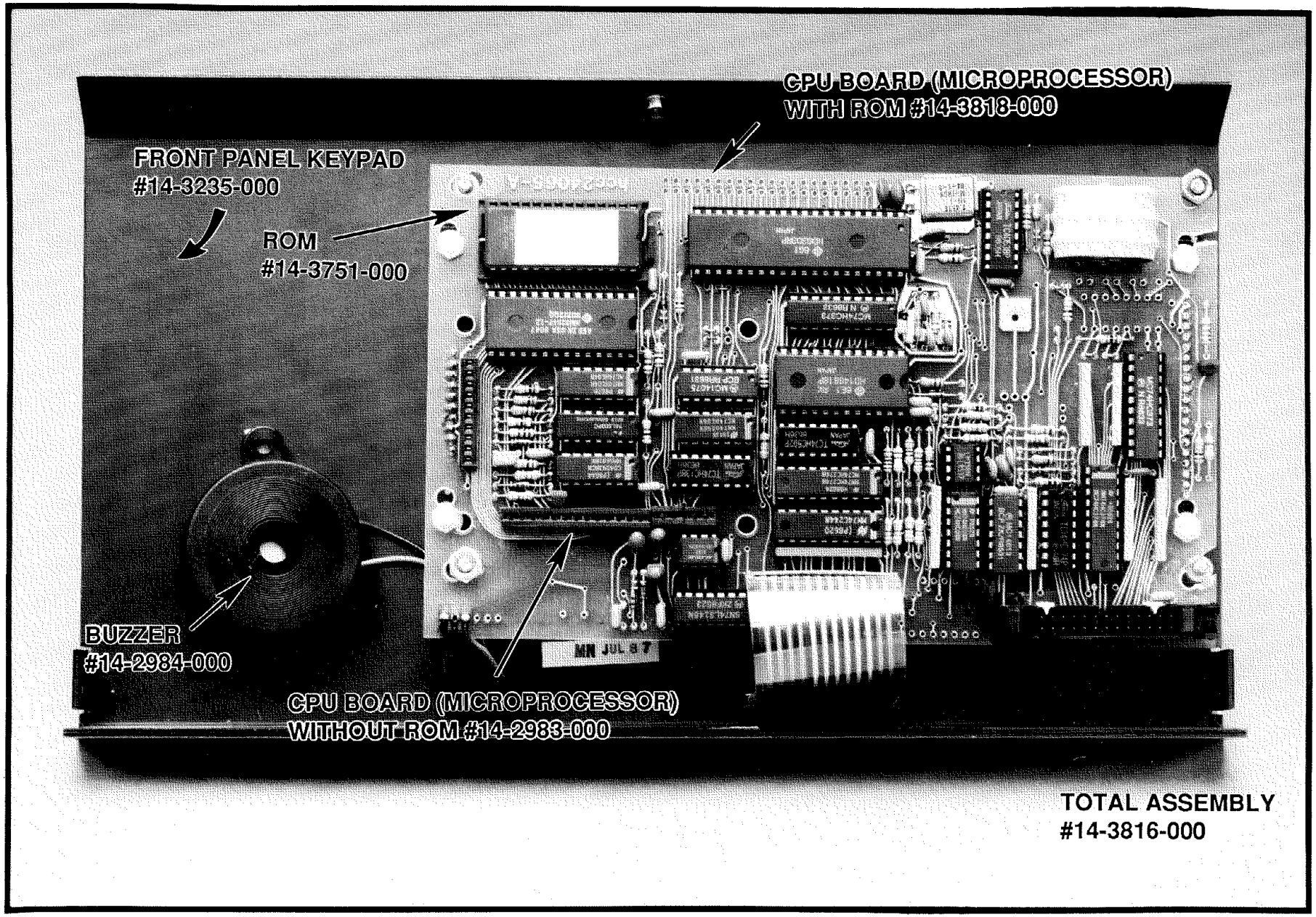


ALS 2050 LEFT INTERIOR

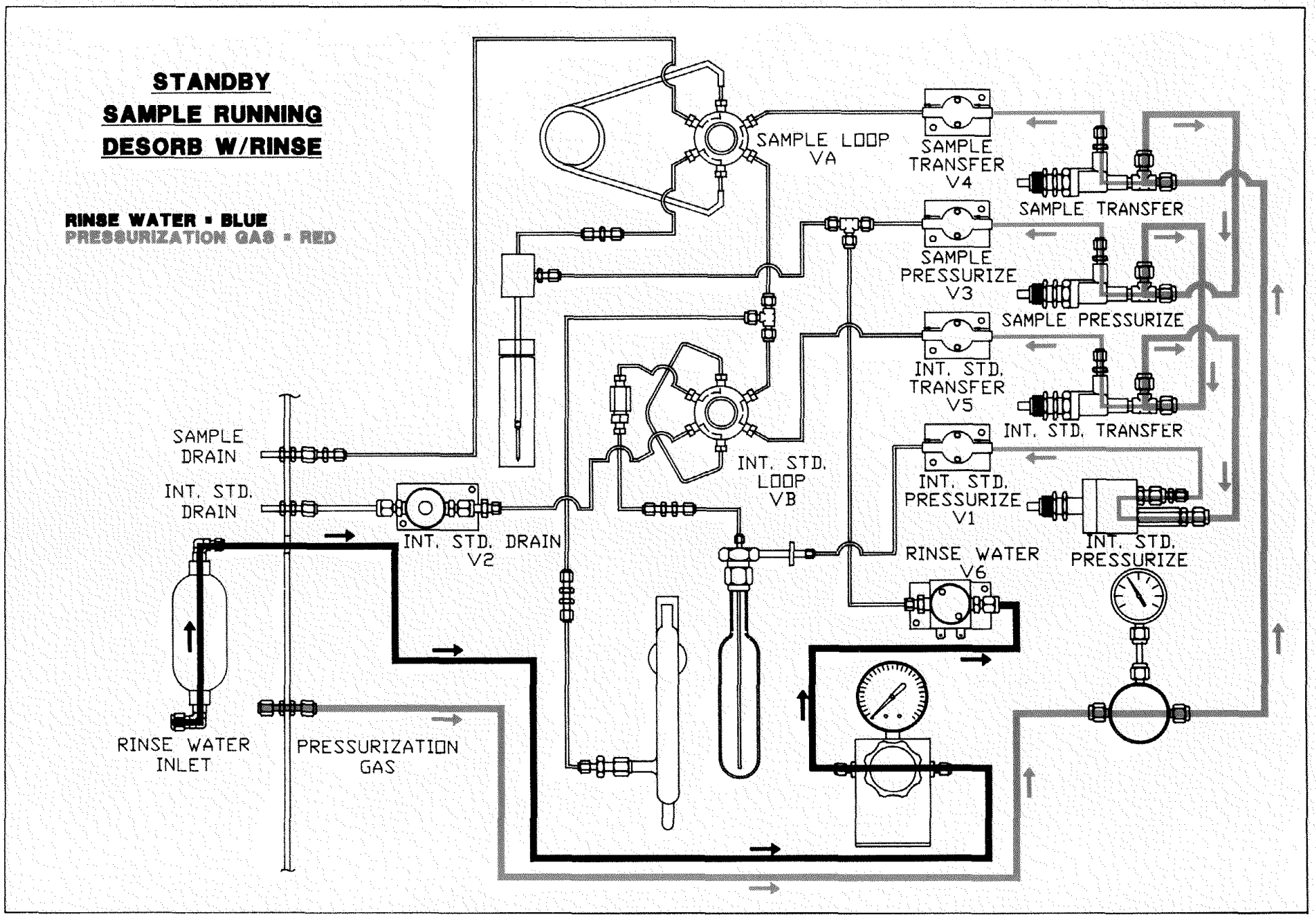
Tekmar®

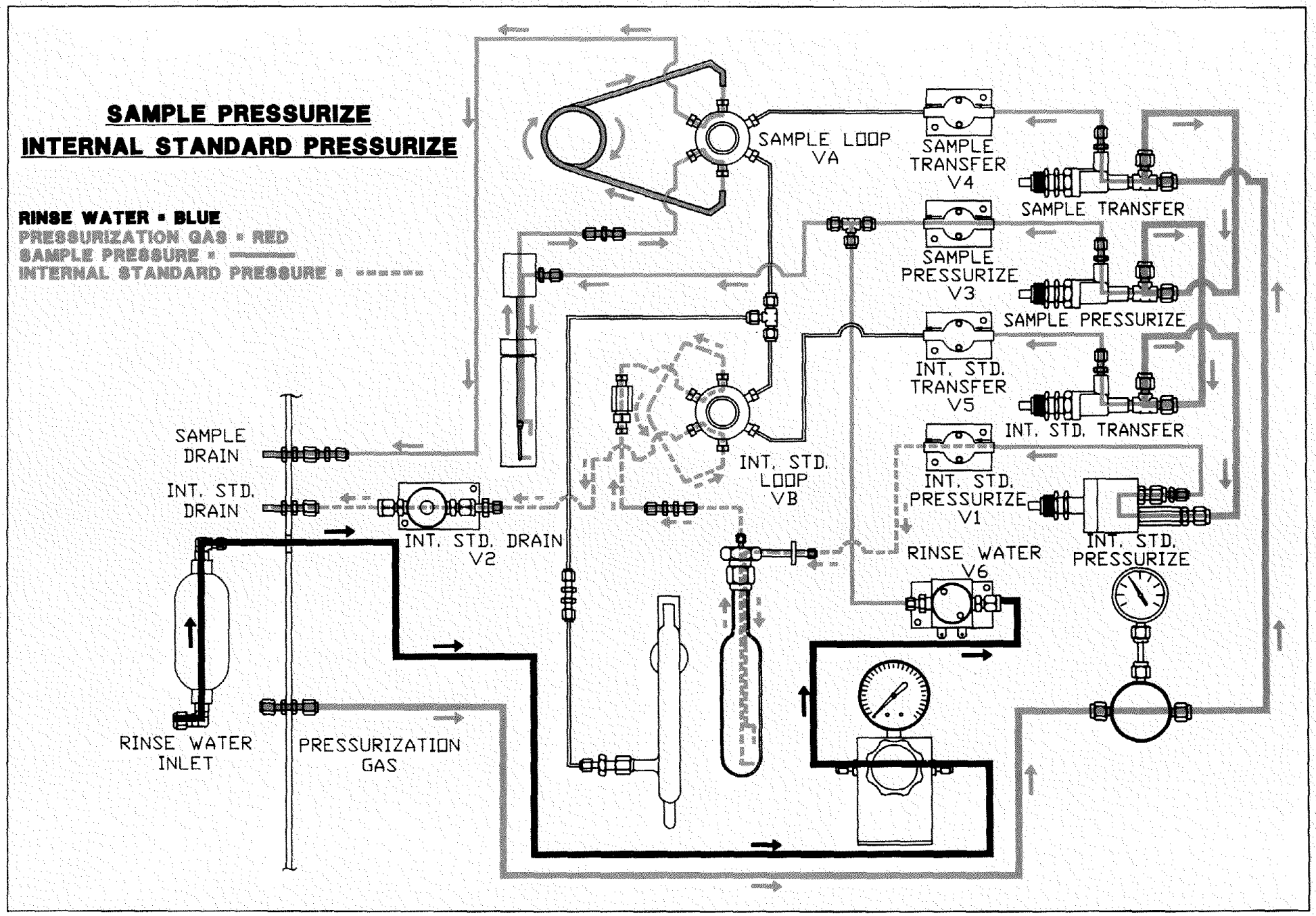

BCD I/O CABLE ASSY
#14-3692-000
TRANSFORMER
#14-3695-038
MULTI-FUNCTION PCB
#14-3750-000

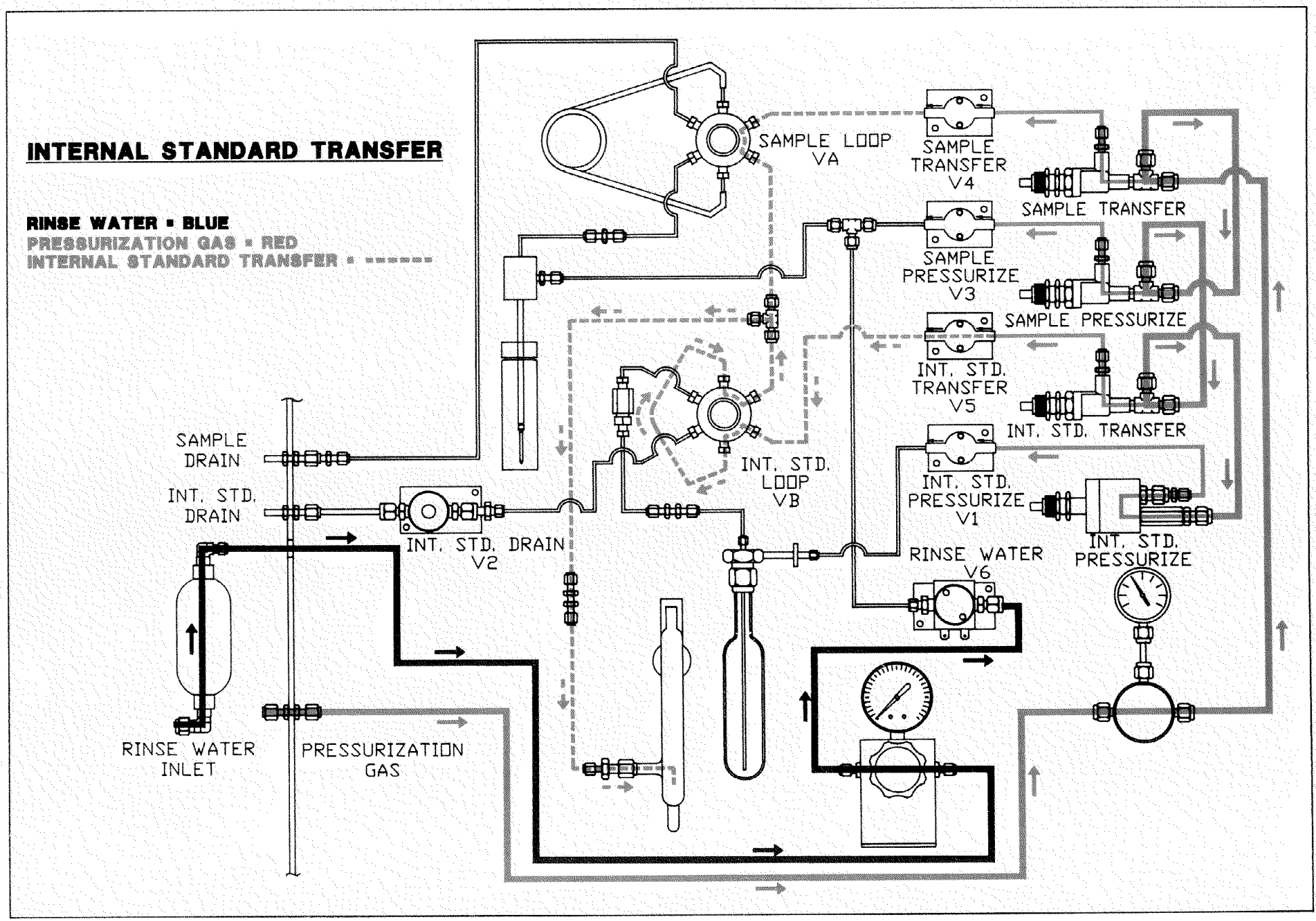
Tekmar®

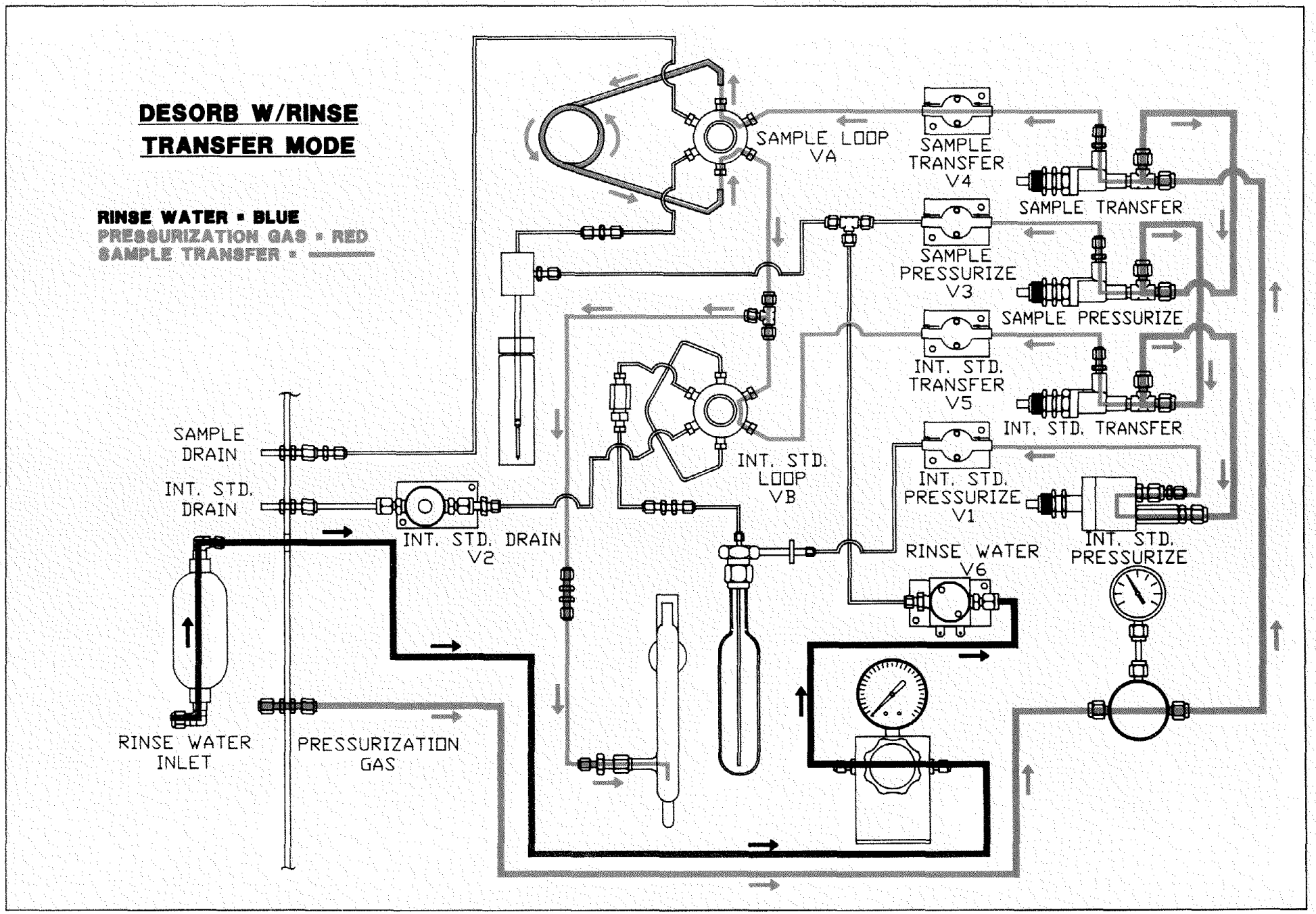


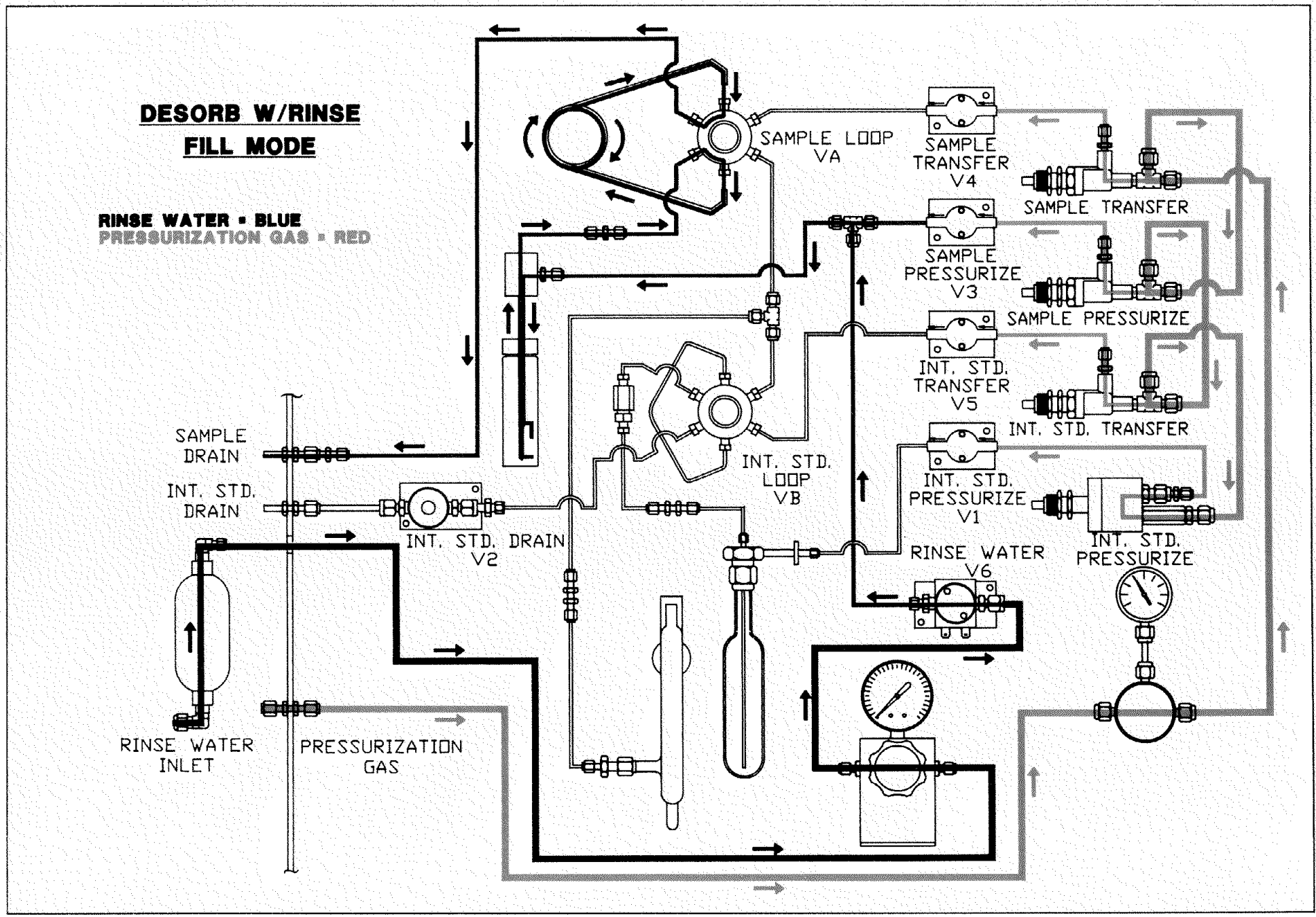
ALS 2050 CPU BOARD AND KEYPAD

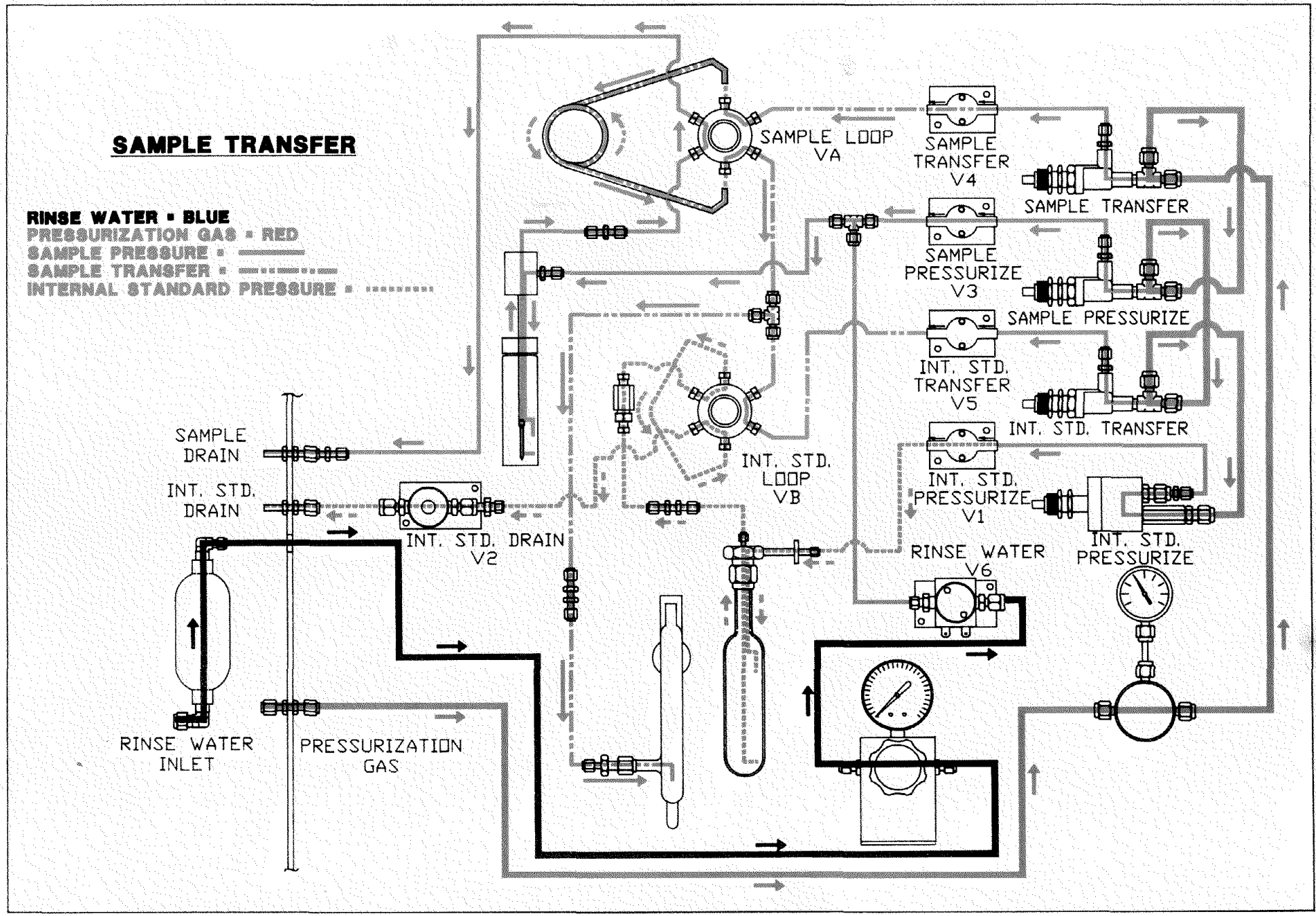

STANDBY
SAMPLE RUNNING
DESORB W/RINSE
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SAMPLE LOOP VA
SAMPLE TRANSFER V4
SAMPLE TRANSFER
SAMPLE PRESSURIZE V3
SAMPLE PRESSURIZE
INT. STD. TRANSFER V5
INT. STD. TRANSFER
INT. STD. LOOP VB
INT. STD. PRESSURIZE V1
INT. STD. PRESSURIZE
SAMPLE DRAIN
INT. STD. DRAIN
INT. STD. DRAIN V2
RINSE WATER V6
RINSE WATER INLET
PRESSURIZATION GAS

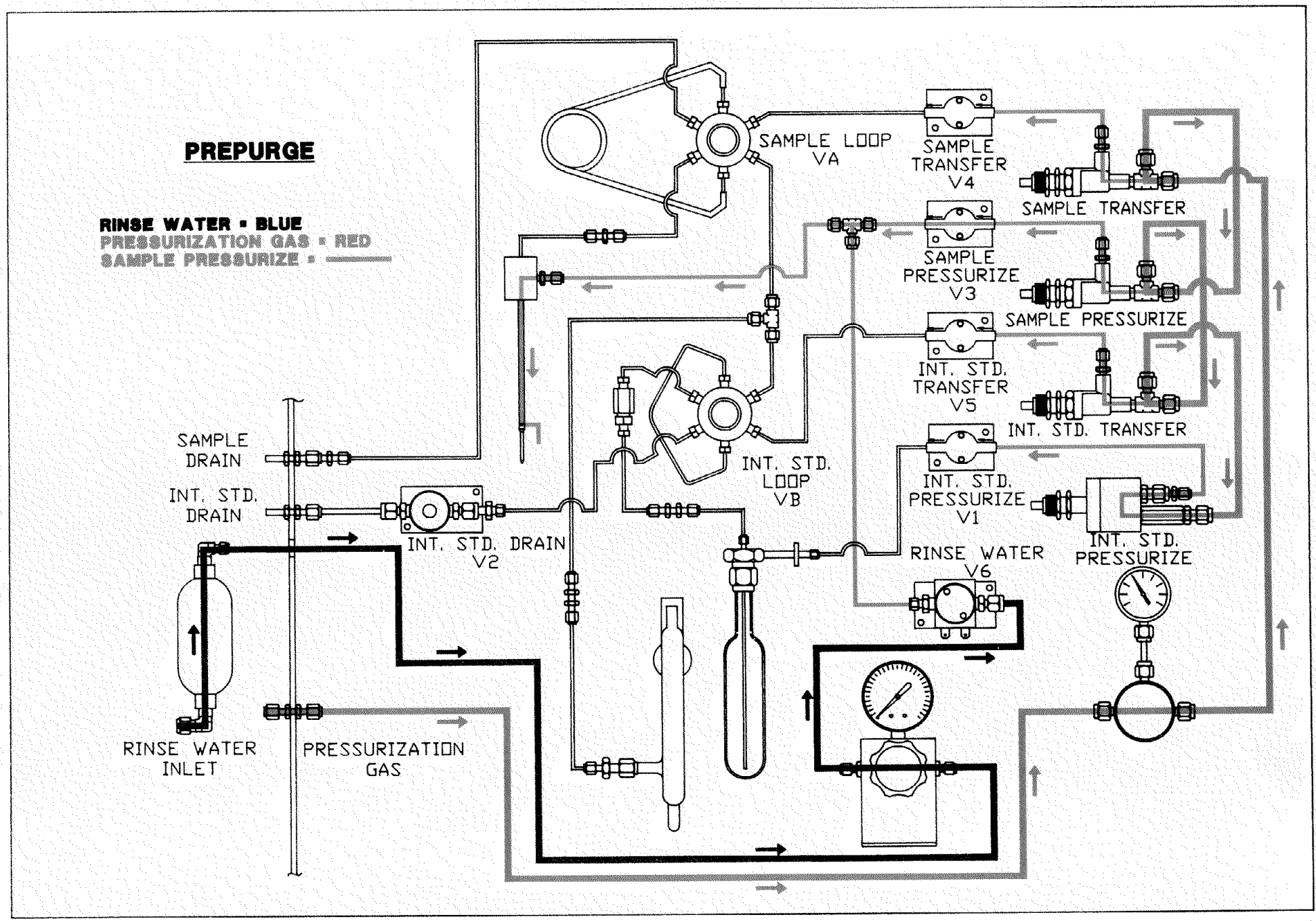

SAMPLE PRESSURIZE
INTERNAL STANDARD PRESSURIZE
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SAMPLE PRESSURE = ———
INTERNAL STANDARD PRESSURE = - - - - - -
SAMPLE LOOP VA
SAMPLE TRANSFER V4
SAMPLE TRANSFER
SAMPLE PRESSURIZE V3
SAMPLE PRESSURIZE
INT. STD. TRANSFER V5
INT. STD. TRANSFER
INT. STD. LOOP VB
INT. STD. PRESSURIZE V1
INT. STD. PRESSURIZE
SAMPLE DRAIN
INT. STD. DRAIN
INT. STD. DRAIN V2
RINSE WATER V6
RINSE WATER INLET
PRESSURIZATION GAS


INTERNAL STANDARD TRANSFER
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
INTERNAL STANDARD TRANSFER = - - - - - -
SAMPLE LOOP VA
SAMPLE TRANSFER V4
SAMPLE TRANSFER
SAMPLE PRESSURIZE V3
SAMPLE PRESSURIZE
INT. STD. TRANSFER V5
INT. STD. TRANSFER
INT. STD. LOOP VB
INT. STD. PRESSURIZE V1
INT. STD. PRESSURIZE
SAMPLE DRAIN
INT. STD. DRAIN
INT. STD. DRAIN V2
RINSE WATER V6
RINSE WATER INLET
PRESSURIZATION GAS


DESORB W/RINSE
TRANSFER MODE
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SAMPLE TRANSFER = ——
SAMPLE LOOP
VA
SAMPLE
TRANSFER
V4
SAMPLE TRANSFER
SAMPLE
PRESSURIZE
V3
SAMPLE PRESSURIZE
INT. STD.
TRANSFER
V5
INT. STD. TRANSFER
INT. STD.
LOOP
VB
INT. STD.
PRESSURIZE
V1
INT. STD. PRESSURIZE
SAMPLE
DRAIN
INT. STD.
DRAIN
INT. STD. DRAIN
V2
RINSE WATER
V6
RINSE WATER
INLET
PRESSURIZATION
GAS


DESORB W/RINSE
FILL MODE
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SAMPLE LOOP
VA
SAMPLE
TRANSFER
V4
SAMPLE TRANSFER
SAMPLE
PRESSURIZE
V3
SAMPLE PRESSURIZE
INT. STD.
TRANSFER
V5
INT. STD. TRANSFER
INT. STD.
LOOP
VB
INT. STD.
PRESSURIZE
V1
INT. STD.
PRESSURIZE
SAMPLE
DRAIN
INT. STD.
DRAIN
INT. STD. DRAIN
V2
RINSE WATER
V6
RINSE WATER
INLET
PRESSURIZATION
GAS


SAMPLE TRANSFER
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SAMPLE PRESSURE = ——
SAMPLE TRANSFER = —·—·—
INTERNAL STANDARD PRESSURE = ·····
SAMPLE LOOP VA
SAMPLE TRANSFER V4
SAMPLE TRANSFER
SAMPLE PRESSURIZE V3
SAMPLE PRESSURIZE
INT. STD. TRANSFER V5
INT. STD. TRANSFER
INT. STD. LOOP VB
INT. STD. PRESSURIZE V1
INT. STD. PRESSURIZE
SAMPLE DRAIN
INT. STD. DRAIN
INT. STD. DRAIN V2
RINSE WATER V6
RINSE WATER INLET
PRESSURIZATION GAS


PREPURGE
RINSE WATER = BLUE
PRESSURIZATION GAS = RED
SAMPLE PRESSURIZE = ——
SAMPLE LOOP VA
SAMPLE TRANSFER V4
SAMPLE TRANSFER
SAMPLE PRESSURIZE V3
SAMPLE PRESSURIZE
INT. STD. TRANSFER V5
INT. STD. TRANSFER
INT. STD. LOOP VB
INT. STD. PRESSURIZE V1
INT. STD. PRESSURIZE
SAMPLE DRAIN
INT. STD. DRAIN
INT. STD. DRAIN V2
RINSE WATER V6
RINSE WATER INLET
PRESSURIZATION GAS

Tekmar®

VALVE DESIGNATIONS

v1 = Internal Standard Pressurize
v2 = Internal Standard Drain
v3 = Sample Pressurize
v4 = Sample Transfer
v5 = Internal Standard Transfer
v6 = Rinse Water
vA = Sample Loop Valve
vB = Internal Standard Loop Valve

MODES	v1	v2	v3	v4	v5	v6	vA	vB
Standby							L	L
Prepurge		✳					L	L
Pressurization w/I.S.	✳	✳	✳				L	L
Pressurization w/o I.S.			✳				L	L
Sample Transfer	✳	✳	✳	✳			T	L
Int.Std. Transfer			✳		✳		L	T
Sample Running			#				L	L
Desorb w/ rinse								
a) fill loop						✳	L	L
b) transfer				✳		✳	T	L
c) rinses comp.			✳				L	L
Desorb w/o rinse			✳				L	L

✳ = Output is On

= Output is on for first minute of Sample Running mode

L = Multiport Valve is in Loop Configuration

T = Multiport Valve is in Transfer Configuration

ALS 2050 VALVE OUTPUT OPERATIONAL SUMMARY

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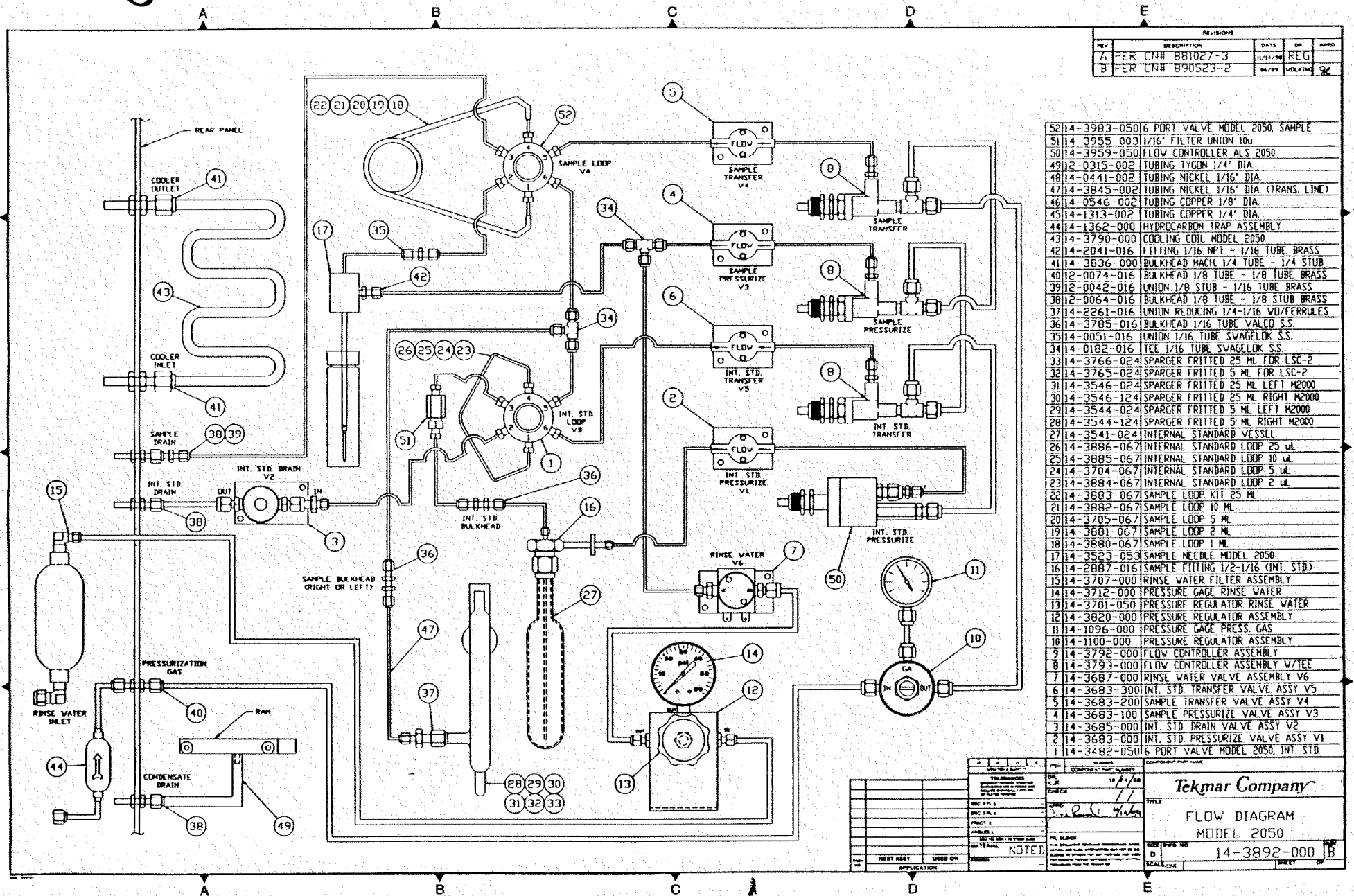


REVISIONS				
REV	DESCRIPTION	DATE	BY	APPD
A	PER CN# 881027-3	11/14/88	REG	
B	PER CN# 890523-2	06/89	VOLKING	

52	14-3983-050	6 PORT VALVE MODEL 2050, SAMPLE
51	14-3955-003	1/16" FILTER UNION 10u
50	14-3959-050	FLOW CONTROLLER ALS 2050
49	12-0315-002	TUBING TYGON 1/4" DIA.
48	14-0441-002	TUBING NICKEL 1/16" DIA.
47	14-3845-002	TUBING NICKEL 1/16" DIA. (TRANS. LINE)
46	14-0546-002	TUBING COPPER 1/8" DIA.
45	14-1313-002	TUBING COPPER 1/4" DIA.
44	14-1362-000	HYDROCARBON TRAP ASSEMBLY
43	14-3790-000	COOLING COIL MODEL 2050
42	14-2041-016	FITTING 1/16 NPT - 1/16 TUBE BRASS
41	14-3836-000	BULKHEAD MACH. 1/4 TUBE - 1/4 STUB
40	12-0074-016	BULKHEAD 1/8 TUBE - 1/8 TUBE BRASS
39	12-0042-016	UNION 1/8 STUB - 1/16 TUBE BRASS
38	12-0064-016	BULKHEAD 1/8 TUBE - 1/8 STUB BRASS
37	14-2261-016	UNION REDUCING 1/4-1/16 WO/FERRULES
36	14-3785-016	BULKHEAD 1/16 TUBE VALCO S.S.
35	14-0051-016	UNION 1/16 TUBE SWAGELOK S.S.
34	14-0182-016	TEE 1/16 TUBE SWAGELOK S.S.
33	14-3766-024	SPARGER FRITTED 25 ML FOR LSC-2
32	14-3765-024	SPARGER FRITTED 5 ML FOR LSC-2
31	14-3546-024	SPARGER FRITTED 25 ML LEFT M2000
30	14-3546-124	SPARGER FRITTED 25 ML RIGHT M2000
29	14-3544-024	SPARGER FRITTED 5 ML LEFT M2000
28	14-3544-124	SPARGER FRITTED 5 ML RIGHT M2000
27	14-3541-024	INTERNAL STANDARD VESSEL
26	14-3886-067	INTERNAL STANDARD LOOP 25 uL
25	14-3885-067	INTERNAL STANDARD LOOP 10 uL
24	14-3704-067	INTERNAL STANDARD LOOP 5 uL
23	14-3884-067	INTERNAL STANDARD LOOP 2 uL
22	14-3883-067	SAMPLE LOOP KIT 25 ML
21	14-3882-067	SAMPLE LOOP 10 ML
20	14-3705-067	SAMPLE LOOP 5 ML
19	14-3881-067	SAMPLE LOOP 2 ML
18	14-3880-067	SAMPLE LOOP 1 ML
17	14-3523-053	SAMPLE NEEDLE MODEL 2050
16	14-2887-016	SAMPLE FITTING 1/2-1/16 (INT. STD.)
15	14-3707-000	RINSE WATER FILTER ASSEMBLY
14	14-3712-000	PRESSURE GAGE RINSE WATER
13	14-3701-050	PRESSURE REGULATOR RINSE WATER
12	14-3820-000	PRESSURE REGULATOR ASSEMBLY
11	14-1096-000	PRESSURE GAGE PRESS. GAS
10	14-1100-000	PRESSURE REGULATOR ASSEMBLY
9	14-3792-000	FLOW CONTROLLER ASSEMBLY
8	14-3793-000	FLOW CONTROLLER ASSEMBLY W/TEE
7	14-3687-000	RINSE WATER VALVE ASSEMBLY V6
6	14-3683-300	INT. STD. TRANSFER VALVE ASSY V5
5	14-3683-200	SAMPLE TRANSFER VALVE ASSY V4
4	14-3683-100	SAMPLE PRESSURIZE VALVE ASSY V3
3	14-3685-000	INT. STD. DRAIN VALVE ASSY V2
2	14-3683-000	INT. STD. PRESSURIZE VALVE ASSY V1
1	14-3482-050	6 PORT VALVE MODEL 2050, INT. STD.

NEXT ASSY | USED ON | APPLICATION

MATERIAL NOTED

Tekmar Company

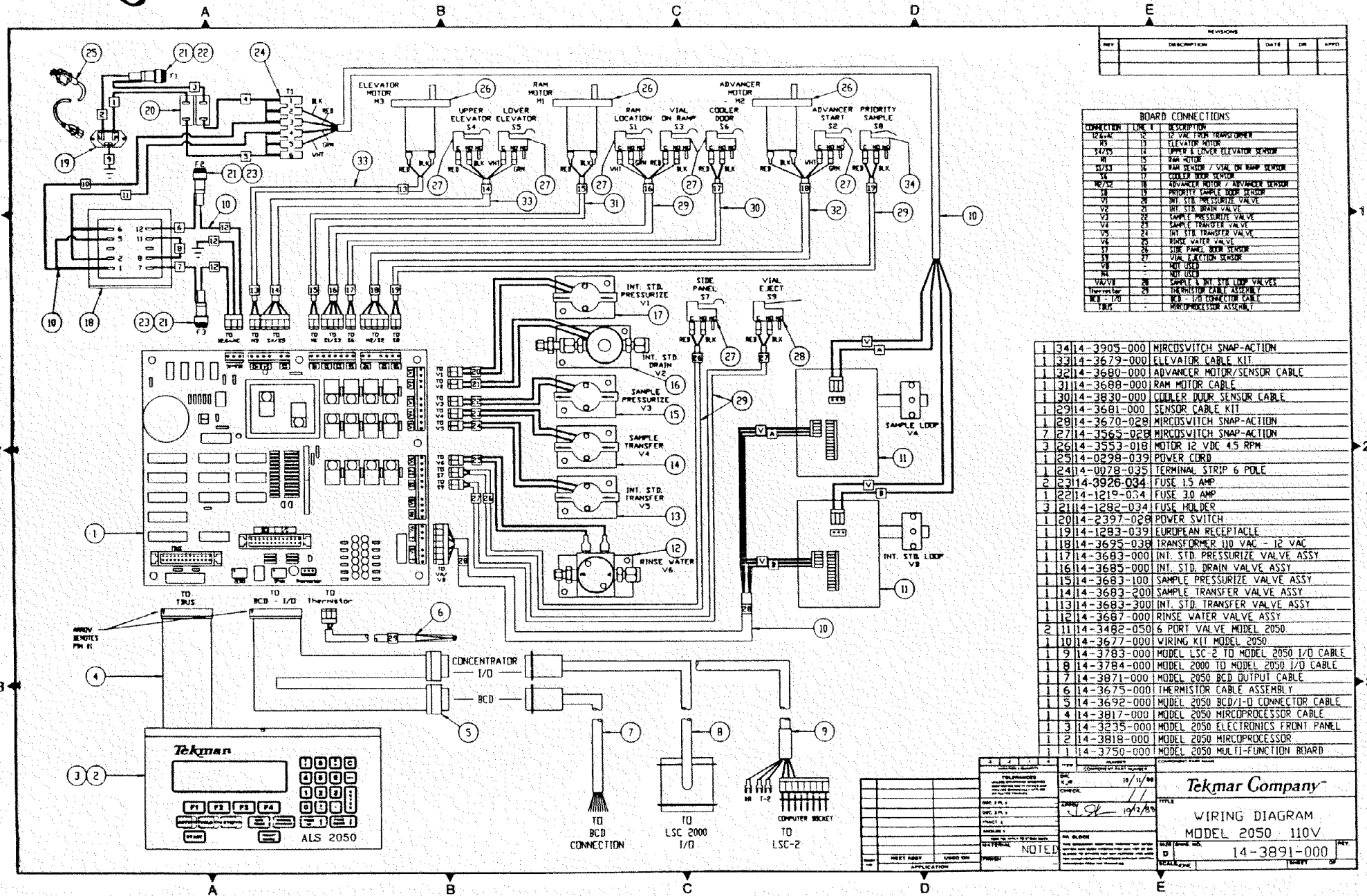
TITLE: FLOW DIAGRAM MODEL 2050

SIZE D | DWG NO 14-3892-000 | REV B

SCALE NONE | SHEET OF

ALS 2050 FLOW DIAGRAM

Tekmar®



REVISIONS				
REV	DESCRIPTION	DATE	DR	APPD

BOARD CONNECTIONS		
CONNECTION	LINE #	DESCRIPTION
12&24AC	12	12 VAC FROM TRANSFORMER
M3	13	ELEVATOR MOTOR
S4/S5	14	UPPER & LOWER ELEVATOR SENSOR
M1	15	RAM MOTOR
S1/S3	16	RAM SENSOR / VIAL ON RAMP SENSOR
S6	17	COOLER DOOR SENSOR
M2/S2	18	ADVANCER MOTOR / ADVANCER SENSOR
S8	19	PRIORITY SAMPLE DOOR SENSOR
V1	20	INT. STD. PRESSURIZE VALVE
V2	21	INT. STD. DRAIN VALVE
V3	22	SAMPLE PRESSURIZE VALVE
V4	23	SAMPLE TRANSFER VALVE
V5	24	INT. STD. TRANSFER VALVE
V6	25	RINSE WATER VALVE
S7	26	SIDE PANEL DOOR SENSOR
S9	27	VIAL EJECTION SENSOR
V8	-	NOT USED
M4	-	NOT USED
VA/VB	28	SAMPLE & INT. STD LOOP VALVES
Thermistor	29	THERMISTOR CABLE ASSEMBLY
BCD - I/O	-	BCD - I/O CONNECTOR CABLE
TRUS	-	MICROPROCESSOR ASSEMBLY

1	34	14-3905-000	MICROSWITCH SNAP-ACTION
1	33	14-3679-000	ELEVATOR CABLE KIT
1	32	14-3680-000	ADVANCER MOTOR/SENSOR CABLE
1	31	14-3688-000	RAM MOTOR CABLE
1	30	14-3830-000	COOLER DOOR SENSOR CABLE
1	29	14-3681-000	SENSOR CABLE KIT
1	28	14-3670-028	MICROSWITCH SNAP-ACTION
7	27	14-3565-028	MICROSWITCH SNAP-ACTION
3	26	14-3553-018	MOTOR 12 VDC 4.5 RPM
1	25	14-0298-039	POWER CORD
1	24	14-0078-035	TERMINAL STRIP 6 POLE
2	23	14-3926-034	FUSE 1.5 AMP
1	22	14-1219-034	FUSE 3.0 AMP
3	21	14-1282-034	FUSE HOLDER
1	20	14-2397-028	POWER SWITCH
1	19	14-1283-039	EUROPEAN RECEPTACLE
1	18	14-3695-038	TRANSFORMER 110 VAC - 12 VAC
1	17	14-3683-000	INT. STD. PRESSURIZE VALVE ASSY
1	16	14-3685-000	INT. STD. DRAIN VALVE ASSY
1	15	14-3683-100	SAMPLE PRESSURIZE VALVE ASSY
1	14	14-3683-200	SAMPLE TRANSFER VALVE ASSY
1	13	14-3683-300	INT. STD. TRANSFER VALVE ASSY
1	12	14-3687-000	RINSE WATER VALVE ASSY
2	11	14-3482-050	6 PORT VALVE MODEL 2050
1	10	14-3677-000	WIRING KIT MODEL 2050
1	9	14-3783-000	MODEL LSC-2 TO MODEL 2050 I/O CABLE
1	8	14-3784-000	MODEL 2000 TO MODEL 2050 I/O CABLE
1	7	14-3871-000	MODEL 2050 BCD OUTPUT CABLE
1	6	14-3675-000	THERMISTOR CABLE ASSEMBLY
1	5	14-3692-000	MODEL 2050 BCD/I-O CONNECTOR CABLE
1	4	14-3817-000	MODEL 2050 MICROPROCESSOR CABLE
1	3	14-3235-000	MODEL 2050 ELECTRONICS FRONT PANEL
1	2	14-3818-000	MODEL 2050 MICROPROCESSOR
1	1	14-3750-000	MODEL 2050 MULTI-FUNCTION BOARD

Tekmar Company

TITLE: WIRING DIAGRAM MODEL 2050 110V

SIZE D | DRWG. NO. 14-3891-000 | REV

MATERIAL: NOTED

ALS 2050 WIRING DIAGRAM