

Tekmar[®]

LSC 2000 QUICK START GUIDE

This concise guide is intended to enable an operator who is already familiar with purge and trap systems to quickly understand and operate an LSC 2000. Detailed explanations of all operations can be found in the complete user manual.

NOTE: A blank trap tube is installed in all new LSC 2000s. Replace the blank trap with a packed trap before running samples.

POWER UP

When first powered up the LSC 2000 performs a series of self tests. These tests take approximately a minute. Tests may be skipped by pressing F4 (Skip). If the sample heater or capillary interface modules are not installed, the tests for them **MUST** be skipped manually. When the self tests are complete, the Configuration screen appears. Enter the current date and time by pressing F2 (Clock). Installed accessory modules can be turned on and off by pressing F3 (Inst.). The unit now goes to the Start Up mode for Method 1.

METHODS

Up to four methods can be stored in the memory of the LSC 2000. When powered up, the unit automatically goes to Method 1. (The default values for Method 1 are those specified in the EPA's Method 601.) To go to another Method or to modify the parameter values for a Method, press F1 (Meth). The system asks which Method (1-4) you wish to use. Press the appropriate digit on the keypad. If you wish to run this method, press F2 (Run). If you wish to view or change parameter values, press F3 (Edit).

NOTE: If this is the initial power up or if this is a power up after a power failure that resulted in memory loss, the "Parameters Invalid" screen will appear, indicating that the system is loading the parameter default values into Random Access Memory (RAM). Press F4 (Exit) to leave the "Parameters Invalid" screen.

If you pressed F2 (Run), the system will go to Start Up mode in the Method you chose. If you pressed F3 (Edit), the system will go to the parameter listing for the Method you chose. To move the cursor use F3 (->) or <- (Backspace). To view the next section of the parameters listing (there are 5 "pages"), press PAGE DOWN. To change a parameter value, move the cursor the desired parameter and press ENTER. Press the

appropriate digits to input the new value and press ENTER again. To leave the Method Parameters Listing, press F4 (Exit).

AUTOMATIC OPERATION

When all of the temperature zones have stabilized the LSC 2000 goes to Standby mode. Press AUTO to cause the unit to run automatically. An LED will light up, confirming automatic status. When all of the applicable parameter values have been met, the unit proceeds to Purge Ready mode. Here, the LSC 2000 is ready to purge the sample. Inject the sample through the sample valve and press START. Purge, Prepurge, or Preheat (as applicable) will begin immediately. The unit then proceeds through all the steps in the program. If a GC interface is not installed, the unit will stop at Desorb Ready. Press STEP to advance the unit to Desorb Preheat. To pause operation during the program, press HOLD. To resume operations, press AUTO. Press STEP to advance from one mode to the following mode.

Viewing Angle Adjustment

The viewing angle of the LCD screen can be adjusted to optimize readability in a variety of unit setup conditions. Press PAGE UP to increase the angle of the screen and PAGE DOWN to decrease the angle. Press the key down firmly for a continuous change in the angle or press and release the key for an incremental change.

NOTE: The viewing angle cannot be adjusted while the unit is in a mode where PAGE UP and PAGE DOWN provide other functions (for example, while editing the Method Parameters Listing).

STEP TO STANDBY

This key functions as an abort command, cancelling any run in progress and returning it to Standby mode. Since this key cancels a run, it must be pressed again to confirm. This sequence avoids the possibility of stopping a run due to an inadvertent keystroke.

STEP TO BAKE

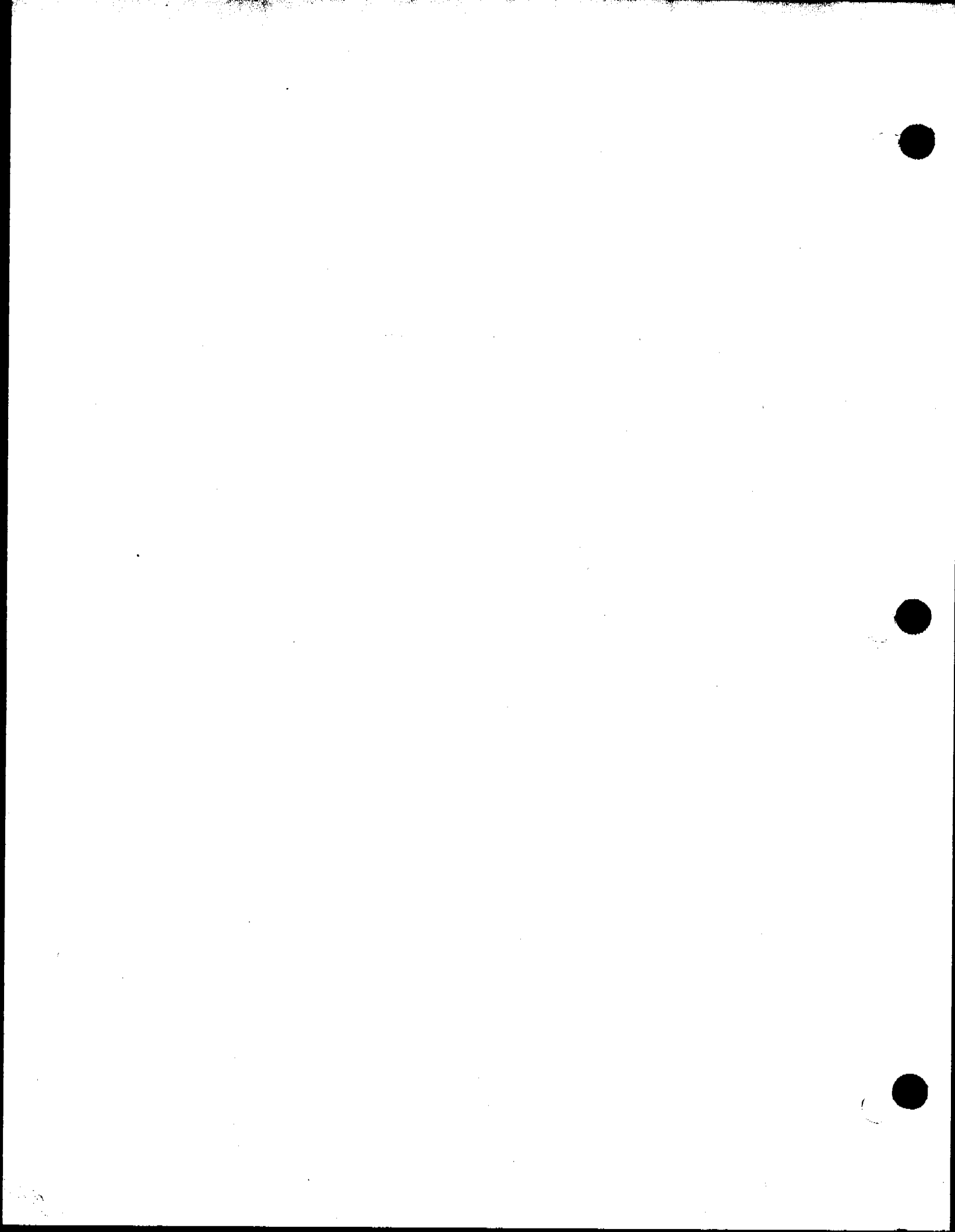
This key causes the unit to go directly to Bake mode, bypassing all intermediate modes. Step To Bake is mostly used to condition traps.

DRAIN

This key activates the sampler drain mechanism. When the drain is open, a flashing "D" will appear on the screen between F3 and F4. Press DRAIN again to close the drain.

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LSC 2000
INSTRUCTION MANUAL



How To Use This Manual

This manual is organized for optimum use as a reference guide. Tutorials are included for those who prefer to follow a determined set of steps to accomplish a task. The manual sections are arranged as follows:

Section 1 - Safety Information

This section gives important warnings and cautions that must be heeded when using the LSC 2000. Unit specifications are described in detail.

Section 2 - System Setup

Included in this section are general considerations for system setup and maintenance of the unit.

Section 3 - System Installation

This section details how to completely install an LSC 2000, as well as how to connect the LSC 2000 to certain popular gas chromatographs and accessory modules.

Section 4 - Microprocessor Programmable Control

This section illustrates the physical qualities of the microprocessor's keypad and screens, as well as outlining how to do a run, how to program the microprocessor to handle four separate Methods and how to configure the system to acknowledge peripherals.

Section 5 - Routine Operating Procedures

The purpose of this section is to detail the normal operating procedures of the LSC 2000. The procedures described are general and are offered as a guide for familiarizing the operator with the unit.

Section 6 - General Maintenance

Routine maintenance procedures necessary to the efficient and safe operation of the LSC 2000 are outlined in this section.

Section 7 - Troubleshooting

Potential problems with the unit itself and with results the unit produces are discussed in this section. The electronic and pneumatic functions of the 2000 are covered.

Section 8 - LSC 2000 Figures

Photographs, charts, and line drawings are included to enhance understanding of the 2000's gas flow paths, replaceable parts, etc.

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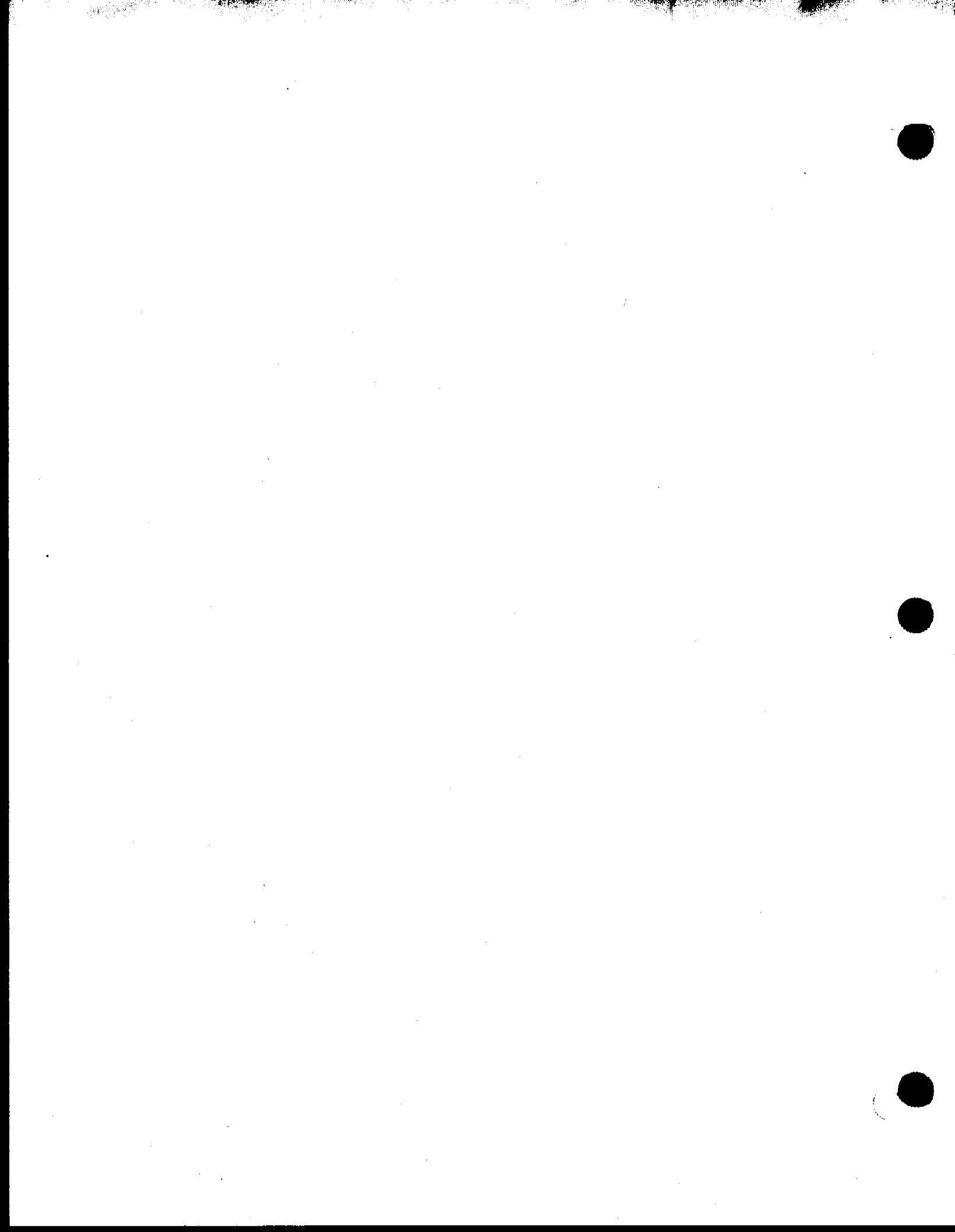
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SECTION 1
SAFETY INFORMATION



1.1 Warnings

The LSC 2000 meets Class 1 safety requirements.

= WARNING =

This instrument contains a heater. Touching the heater while in operation could cause a burn. When operating the LSC 2000, keep the trap heater door closed. The heater is on and hot in the following operating modes:

DESORB PREHEAT
DESORB
TRAP BAKE

The transfer line heater is on whenever the line heater set point is above 30°C. When working near this line, turn the unit off to prevent contact with the hot line.

= WARNING =

Potentially lethal voltage exists inside this instrument. The trap heater door and the panels must be closed when the instrument is in operation.

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. As temporarily permitted by regulation it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference. 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

Furnace:	Ambient to 400°C, rise rate approximately 200°C/min.
Traps:	0.123" ± 0.002" OD x 12" long x 0.010" wall thickness stainless steel standard. Optional traps include 0.125" O.D. x 1.8 mm I.D. x 12" long glass-lined stainless steel, 0.125" O.D. x 1.8 mm I.D. x 18" long glass or glass-lined stainless steel, U-shaped.
Samplers:	5 or 25ml sampler volume. All glass construction using medium porosity glass frits. Includes manual 3-way valve for sample load/drain. Optional 5 or 25ml needle sparge sampler.
Valving:	Motor-actuated 6-port valve contained in oven for purge and desorb cycles, variable ambient to 300°C. Solenoid-operated 2- and 3-port valves for purge, dry purge, drain, bake and vent functions. Solenoid valves are rated to 20 psi.
Tubing:	All sample lines are 1/16" glass-lined stainless steel or fused silica (0.32mm or 0.53mm I.D.), heated, variable ambient to 300°C. Sample flow pathway fittings are gold-plated. The transfer line is available in a 36", 48", or 60" length. Mount temperature is ambient to 200°C.
Electronic Control:	CMOS 8 bit 6303 microprocessor with 32K ROM (Read Only Memory) and 2K RAM (Random Access Memory). Parameter entry is via a tactile response panel including a numeric keypad.
Outputs:	Two second contact closure or contact opening, available at the Start of Desorb and at the End of Desorb.
Inputs:	Accepts contact closure, contact opening, or TTL input to advance from Purge Ready to Purge and from Desorb Ready to Desorb Preheat.
Display:	64 x 240 pixel dot graphics LCD screen.

Serial Interface:

RS232C serial communications port permits parameter output. Baud rate variable 150 to 19200, software selectable.

Environment Requirements:

Operating temperature: 19° to 30°C
Storage temperature: -20° to 60°C
Relative humidity: 10 to 90% with no condensation.

Size:

Depth 14" (356mm), Width 11" (280mm),
Height 22-3/4" (578mm).

Weight:

Net 40 lbs., Shipping weight 50 lbs.

Utilities:

Voltage: 120V ± 10%, 960W
Frequency: 50 or 60 Hz + 1%
Purge gas: Ultra high purity (99.999%) helium or nitrogen, 20 to 200psi. Hydrocarbon content <0.5 ppm.



SECTION 2
SYSTEM SETUP



2.1 Unpacking the System

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 continue the installation 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.

*** ATTENTION ***

The LSC 2000 is delivered with a blank trap installed. This prevents the damage that would be done to a packed trap if the unit was powered up with no purge gas flow present. ***Replace the blank trap with a packed trap before running a sample.***

2.2 Recommended Operation

Tekmar Company strongly recommends that the LSC 2000 be kept *on at all times* (other than when it is being serviced, during power failure, etc.) for best possible unit longevity and reliability.

Frequent power down and power up causes undue wear and tear of the unit. Repeated expansion and contraction of components as they are heated and cooled compromises the integrity of the unit's parts. This physical stress manifests itself most often in two ways. First, gas fittings are more likely to leak (this is particularly true of the ferrules that seal the glass lines in the valve oven). Second, undue stress is put on the unit heaters each time they go from room temperature to set temperature. This stress may eventually cause deterioration of the heated lines. Maintain the LSC 2000 at as constant a running state as possible and it will provide years of reliable service.

2.3 General Information

The system setup and installation sections are intended to be as thorough as possible. However, certain items will vary depending upon the make and model of the gas chromatograph and the data system used. If in doubt on any point, please contact Tekmar toll free at (800) 543-4461, in Ohio (800) 344-8569, or in Canada call collect (513) 761-0633 for assistance. When 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 relevant sections of the gas chromatograph manual before proceeding.

2.4 Site Preparation

Place the instrument on a sturdy, stable bench surface immediately adjacent to the gas chromatograph. Be sure that it is located on the side closest to the intended injection port. Allow sufficient space at the rear of the instrument for easy access and ample air circulation. Allow approximately 2 ft. of clearance to the left of the instrument for easy access to the valve oven during installation if the LSC 2000 is located to the right of the GC.

2.5 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 110V unit, the maximum current draw is 8 amps and maximum power consumption is 960 watts (when accessories are included). For the 220V unit, the maximum current draw is 4 amps and maximum power consumption is 880 watts (when accessories are included). The 110V 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 circumvent its purpose by using it with an inappropriate receptacle.

*Make all pneumatic connections **before** the instrument is powered up.*

2.6

Kit Box
Assembly

Each LSC 2000 is accompanied with a kit box assembly which contains parts and tools needed to install the unit. *Check to be sure that all necessary items are included before beginning installation:*

<input type="checkbox"/> Tenax trap, 12", (#1)		#12-0083-003
<input type="checkbox"/> Tenax/Silica gel trap, 12", (#2)		#12-0084-003
<input type="checkbox"/> Fritted sparger, 5ml		#14-2337-024
<input type="checkbox"/> 3-port valve assembly		#14-3128-000
<input type="checkbox"/> Long nut, Valco, 1/16"		#14-0242-016
<input type="checkbox"/> Ferrule, Teflon, Valco, 1/16"	(2)	#14-3097-016
<input type="checkbox"/> Wago tool for thermocouple connector		#14-3046-035
<input type="checkbox"/> Hydrocarbon trap assembly		#14-1362-000
<input type="checkbox"/> Drain line assembly		#14-3367-002
<input type="checkbox"/> Purge line assembly		#14-2988-000
<input type="checkbox"/> Syringe, 5ml, w/luer connector		#14-0069-052
<input type="checkbox"/> Syringe, 10ml		#14-0089-052
<input type="checkbox"/> Union, brass, 1/8"		#12-0073-016
<input type="checkbox"/> Union, SS, Swagelok, 1/16",w/o ferr.		#14-3404-016
<input type="checkbox"/> Ferrule, 0.5mm graphitized vespel	(5)	#14-0540-016
<input type="checkbox"/> Ferrule, 0.8mm graphitized vespel	(5)	#14-2074-016
<input type="checkbox"/> Ferrule, 1/16" graphitized vespel	(5)	#14-2931-016
<input type="checkbox"/> Fused silica tubing, 0.32mm I.D. x 5M		#14-3592-002
<input type="checkbox"/> Fused silica tubing, 0.53mm I.D. x 5M		#14-3591-002
<input type="checkbox"/> Fuses (20 total)		
<input type="checkbox"/> 1.0 amp (110V & 220V unit)	(5)	#14-0065-034
<input type="checkbox"/> 8.0 amp (110V unit)	(5)	#14-3043-034
<input type="checkbox"/> 4.0 amp (220V unit)	(5)	#14-3361-034
<input type="checkbox"/> 2.0 amp (110V & 220V unit)	(5)	#14-0140-034
<input type="checkbox"/> Cap nut, brass, Swagelok, 1/16"		#14-2792-016
<input type="checkbox"/> Ferrule, Teflon, Valco, 1/2"	(2)	#14-3098-016
<input type="checkbox"/> Sample nut, Valco, 1/2"		#14-3181-016
<input type="checkbox"/> Sample Heater		#14-3308-000
<input type="checkbox"/> Wrench, Allen		#14-0067-027
<input type="checkbox"/> Power cord, universal		#14-0298-039
<input type="checkbox"/> Screwdriver, Phillips head		#14-2987-000
<input type="checkbox"/> Sample mount wrench		#14-3145-000

Six tools are necessary for installation of the 2000 that are *not Included* in the kit box. Make sure you have them on hand.

Open-end wrench, 7/16"	(2)
Open-end wrench, 5/16"	(2)
Open-end wrench, 1/4"	(1)
Flathead screwdriver	(1)

2.7 Glassware Installation

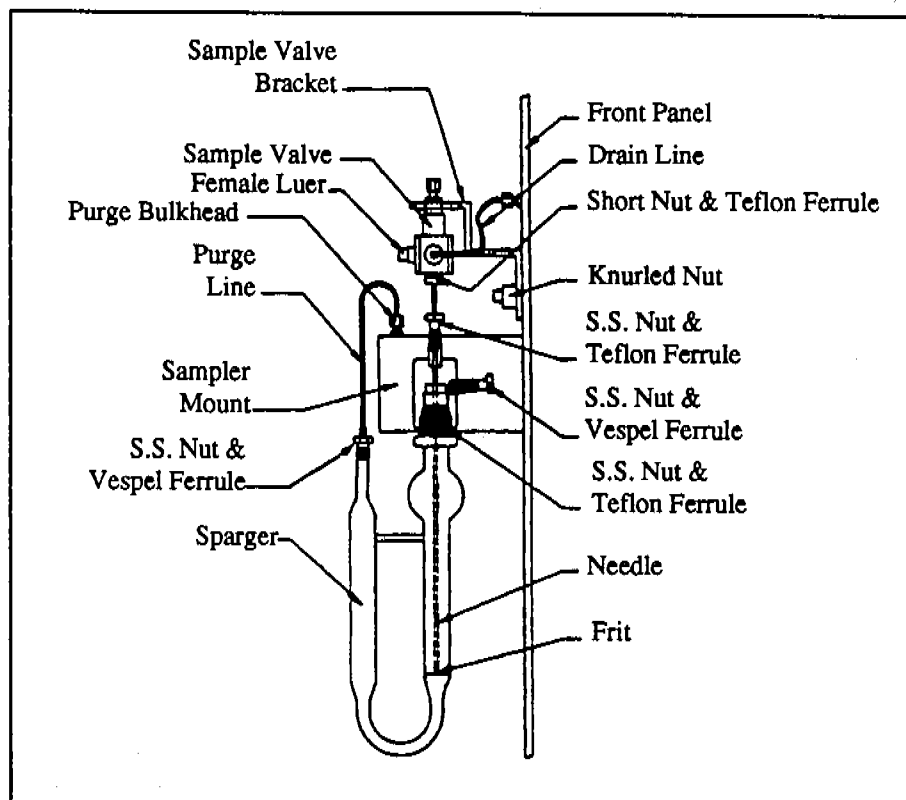
Fritted Disc Sparger

Attach the sampler body at the bottom port of the sampler mount. Slide the sampler all the way through the nut and ferrule until it contacts the inside lip of the fitting, then back the sampler out approximately 1/16". Tighten the fitting 1/4 turn past finger tight. Slide the sample needle into the top of the mount until the tip of the needle just touches the bottom of the sampler. Tighten the stainless steel nut and teflon ferrule into the top of the sampler mount to secure the needle.

NOTE: Take care when tightening the fitting. Overtightening will damage the teflon ferrule and may cause a leak.

Slide the sample valve bracket assembly over the front panel studs. Tighten the sampler needle into the bottom part of the sample valve. Secure the valve bracket with the two knurled nuts provided.

NOTE: If you need a part number for a component shown here, please refer to the Flow Diagram in Section 8.



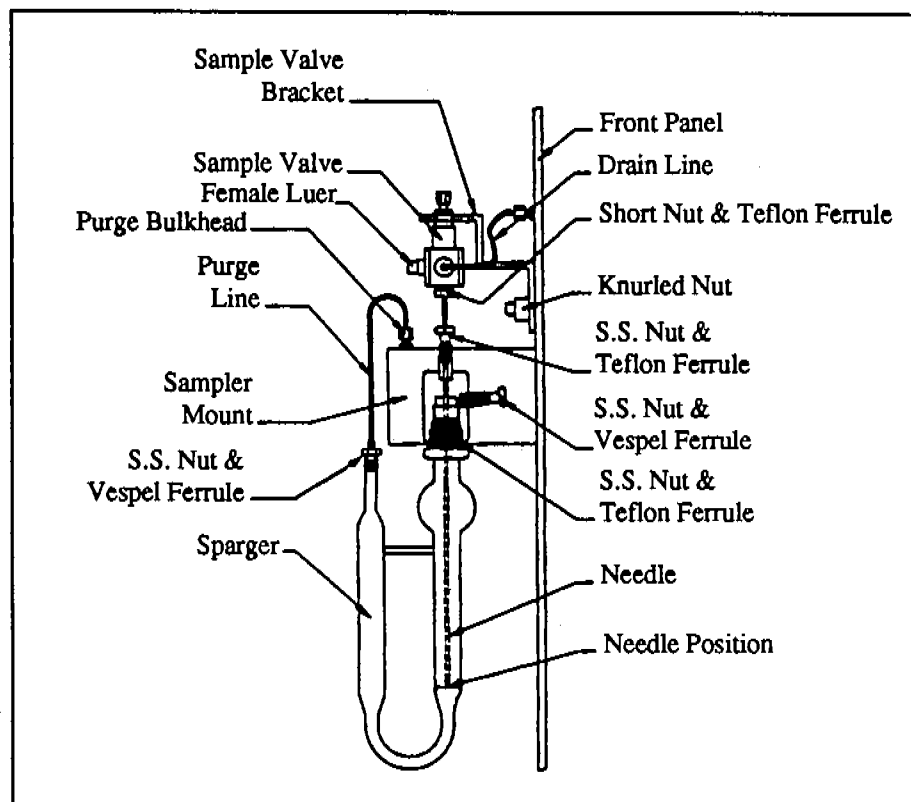
2.7 Glassware In- stallation (cont.)

Attach the purge line to the bulkhead union which is immediately to the right of the sampler mount. Carefully insert the septum on the other end of this line into the glassware. It may be helpful to wet the septum first to make insertion easier. Attach the drain line to the fitting labeled "Drain". Connect the other end of this line to the port on the left side of the sample valve. Leak check according to Section 3.3.

Needle Sparger

Needle sparger glassware is installed in the same fashion as fritted disc glassware except that the sampler needle should be adjusted so that the needle is as close to the bottom of the glassware as possible without obstructing the orifice.

NOTE: For analyses that do not require the addition of water, remove the sample needle before adding the sample to the glassware. (This keeps the sampler needle clean for applications where it will actually be used). Remove the stainless steel nut and teflon ferrule at the top of the sample mount and replace them with a plug nut.



NOTE: If you need a part number for a component shown here, please refer to the Flow Diagram in Section 8.



SECTION 3
SYSTEM INSTALLATION

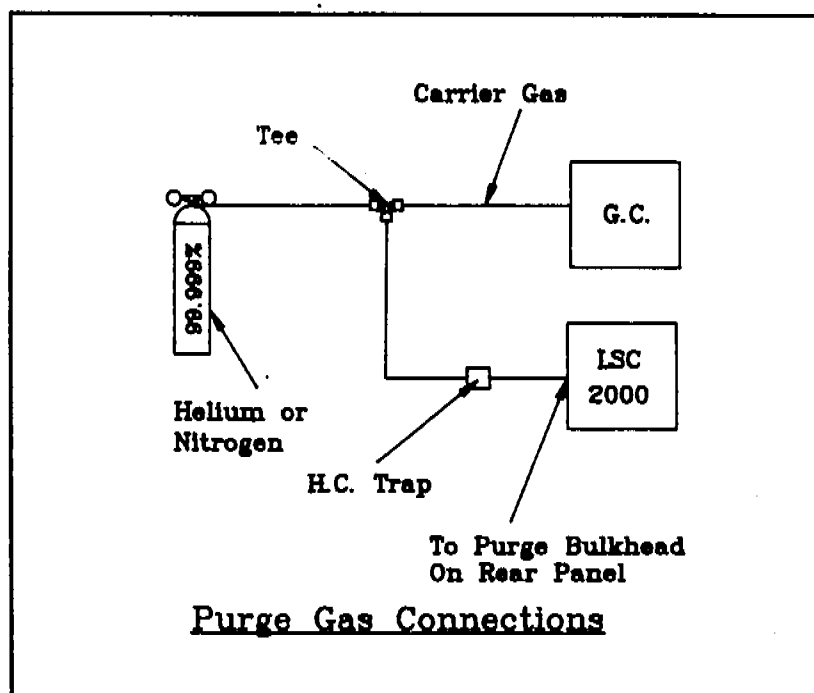


3.1 Purge Gas Connection

NOTE: Complete all the pneumatic connections before powering up the system.

The concentrator requires a high purity (99.999%, hydrocarbon-tested, or better) helium or nitrogen (do not use argon/methane) gas supply at 20-200 psi. This is usually supplied via a tee union from the same tank that supplies the GC carrier gas. Connect the purge gas line to the hydrocarbon trap included in the kit box assembly. Continue the Purge gas line from the hydrocarbon trap to the fitting marked "Purge" at the rear of the concentrator. Turn on the gas supply, set the purge pressure on the front of the LSC 2000 to 20 psi, and do a leak check (See Section 3.3).

NOTE: It may be most convenient to leak check all fittings simultaneously after installation is complete.

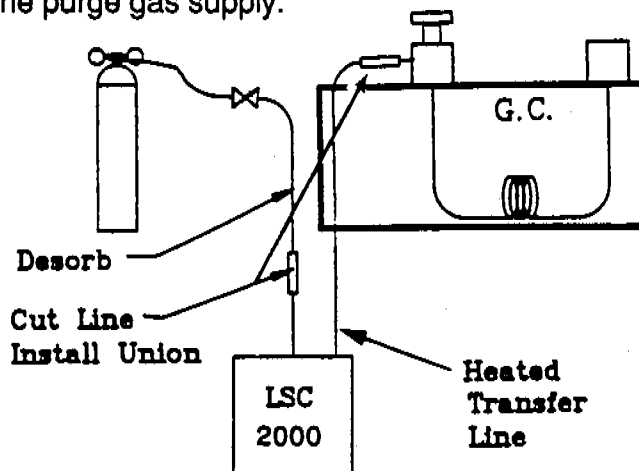


3.2 Pneumatic Interconnection to the Gas Chromatograph

Different chromatographs require different means of connection. Installation instructions for specific gas chromatographs are supplied with the cable interfaces necessary to your particular system configuration. To properly complete an installation, it is helpful to understand exactly how the GC will operate with the concentrator attached.

**3.2
Pneumatic
Interconnection
to the Gas
Chromatograph
(cont.)**

When the GC is connected to a concentrator, the GC continues to supply and control the carrier gas. Note that the carrier gas supply is always independent of the purge gas supply.



The carrier gas will be rerouted out of the GC to the concentrator close to where it would normally enter the body of the injection port. The carrier gas now passes through the 6-port valve in the concentrator and returns via the heated transfer line.

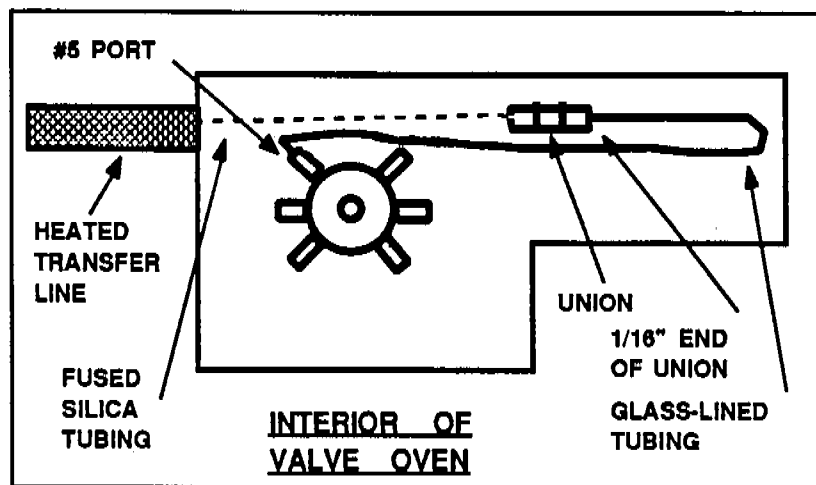
No controls are placed on the carrier gas during its loop through the concentrator. Normal GC function is unimpaired by installation of a concentrator (except when a Capillary Interface is being used. See your Capillary Interface Manual for further information). The transfer line is either connected to the line entering the injection port where the carrier gas is normally supplied (for packed and some wide-bore capillary columns) or is passed through a capillary interface and then directly into a capillary column.

CAUTION: This instrument contains glass-lined tubing, which is extremely fragile. If the tubing is bent, it will fracture. (Glass-lined tubing can be identified by its blackened appearance.)

Uncoil the line heater. Normally only one transfer line is included with the LSC 2000, depending on how the instrument was ordered.

**3.2.1
Connection of
the Heated
Transfer Line**

3.2.1 Connection of the Heated Transfer Line (cont.)



Pass a length of fused silica tubing through the heated transfer line. The internal diameter (I.D.) of the fused silica should be as small as possible without restricting the carrier gas flow. For packed columns use 0.53mm I.D., for 0.32mm and larger capillary columns use 0.32mm, for all others use 0.20 mm. Remove the left side panel by turning its four Phillips head screws 1/4 turn each. Slide the panel straight back and then lift it out to the left, away from the unit. Remove the furnace cover by turning the two front panel screws, then sliding the cover forward and out. Remove the valve oven cover by turning the two Phillips head screws at the top of the oven 1/4 turn with the long-handled screwdriver supplied in the Kit Box and by unscrewing the two flathead screws at the bottom of the valve cover. Locate the glass-lined tubing coming out of the #5 port on the 6-port valve. (See LSC 2000 Valve Oven Diagram) Install the 1/16" stainless steel Swagelok union to the free end of the glass-lined tubing, being sure to include a 1/16" graphitized vespel ferrule. Slide the fused silica tubing (in the diameter appropriate to your application) through the heated transfer line (on the back of the unit) until it enters the valve oven. Connect this fused silica tubing to the free end of the union you have just installed, using another graphite/vespel ferrule which matches the size of the fused silica you have chosen. Leave the valve oven cover off until all of the fittings have been leak checked (See Section 3.3).

3.2.2 Connection to the GC Carrier Gas Supply

If a column is already installed in the GC, turn off the oven and allow it to cool to room temperature. The carrier gas supply will be interrupted during installation so the column must be cool to avoid damage. Determine which injection port will be interfaced. Remove the covers around the injector to expose the tubing which supplies the carrier gas. This line must be opened either by disconnecting a union (if present) or by cutting the tubing. If no union is present, or if the tubing from the injector to the union exceeds a reasonable length, the cut should be made as close as possible to the injector body, allowing enough length to install a Swagelok union. Connect a piece of 1/8" copper tubing to the line that was originally connected to the injection port (i.e. the line that is supplying the carrier gas). Connect the other end of this copper tubing to the bulkhead union on the rear of the concentrator labeled "Desorb". Briefly turn on the carrier gas and confirm the presence of flow at the end of the heated transfer line. This can easily be determined by holding the end of the line in a small beaker of water. If there is flow, the installation is correct to this point. If no flow exists, there is a wrong connection, a large leak, or a broken line. Carefully examine the installation until the problem is located.

3.2.3 Connection to Packed Column Injection Ports

NOTE: This section includes wide-bore capillary columns installed in packed column injectors with adaptors.

Locate the stainless steel line entering the injection port (See Section 3.2.2). Connect the heated transfer line from the concentrator to this stainless steel line. Since the injection port line is metal, trim the tubing back to minimize any unheated length. Using 1/16" stainless steel ferrules, connect the tubing to a stainless steel union only, and connect this to the line entering the injector. Since the heated transfer line from the concentrator is fused silica, use a graphitized vespel ferrule. The transfer line should be secured in a manner which removes all strain from the

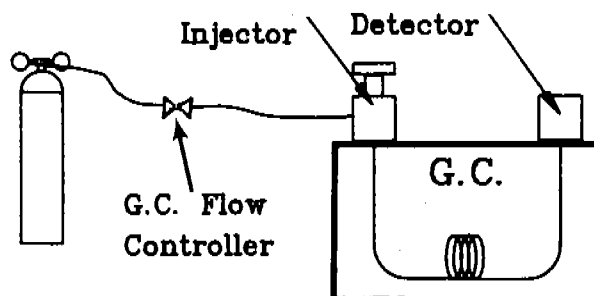
3.2.3 Connection to Packed Column Injection Ports (cont.)

fused silica tubing. Carefully leak check all of the fittings according to Section 3.3.

The fittings that should be checked include: The carrier gas to the concentrator, the Desorb bulkhead union, the transfer line to the 6-port valve, and the transfer line to the injector. If the injection port is equipped with a septum purge function, this must be turned off or capped. If the septum purge is active it will act as a leak and will result in a loss of sensitivity on concentrator runs.

3.2.4 Connection to Capillary Columns

There is a variety of methods by which installation to capillary columns may be accomplished. If an injection port is used, e.g. wide bore column with adaptors in a packed injector, or a capillary injector operated with subambient temperature, refer to Section 3.2.3. In some cases it may be desirable to connect the transfer line directly to the end of the column. This connection should be made inside the oven. Use a fused silica transfer line only. The line should be of a size equal to or smaller than the I.D. (internal diameter) of the column. Route the transfer line through any convenient opening in the oven (unused injection ports are suitable and handy, for example) until the heater butts against the outside of the oven. If no ready-made openings are available, small holes can usually be drilled through the oven insulation near the injectors or the detectors. Connect the transfer line to the column using a zero dead volume union. Make this connection as described in Section 3.5. Anchor the transfer line with a clamp to prevent the fused silica tubing from being broken where it enters the oven.



Normal G.C. Configuration

**3.2.5
Connection to
the Capillary
Interface**

These instructions have been revised. Please refer to the directions in the Capillary Interface Accessory Instruction Manual in the Accessories Section of this manual.

**3.2.6
Connection
Points on a
Specific Gas
Chromatograph**

Pneumatic connection points on gas chromatographs are specific to each particular make and model of gas chromatograph available. Instructions for pneumatically connecting an LSC 2000 to a particular gas chromatograph accompany the interface cables necessary to the installation you described when you placed your order. If you did not specify the type of G.C. being used with your system you will need to call Tekmar to order an interface cable.

3.3 Leak Checking

The 2000 is not a leak prone system, however, it is very leak sensitive. Utmost care should be taken to ensure that the system is leak tight. All fittings should be thoroughly leak checked.

The simplest and most effective way to leak check a system is by bubble leak check. Place a 1/16" Swagelok cap nut (included) on the LSC 2000 vent fitting and tighten it wrench tight. Put 5ml of organic free water in the purge vessel. Press **STEP** to advance the unit to Purge mode. Press **HOLD** to keep the system in Purge mode. This procedure causes the system to pressurize. Time the bubbling in the purge vessel.

If the bubbling stops between 2 to 5 minutes, the system is leak tight and no further leak checking is necessary. In this case, press **STEP TO STANDBY** twice and return the unit to Auto mode.

If the bubbling stops before 2 minutes has elapsed, it is likely that there is a leak upstream of the purge vessel (before the gas flow reaches the purge vessel). If a leak is indicated, leave the system in purge with the cap on the vent. Capping the vent causes an increase in pressure which will exaggerate the leak and make it easier to find.

NOTE: First make sure the leak is not at the capped vent. The Swagelok nut may be worn out.

If the bubbling continues after 5 minutes, a leak downstream of the purge vessel is indicated (after the gas flow leaves the purge vessel).

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

3.3 Leak Checking (cont.)

Leak checking is best accomplished with an electronic thermal conductivity detector.

NOTE: Electronic detectors do not work well when using nitrogen as the purge gas. If possible use helium when leak checking.

If an electronic leak detector is not available, a 1:1 solution of isopropanol:water may be used, if done so sparingly.

- 1) Remove the trap cover at the front left side of the unit. Check the fittings at the top and the bottom of the trap.
- 2) Check the 5 fittings around the glassware on the front of the unit.
 - a. purge glassware fitting
 - b. purge bulkhead (at unit)
 - c. sample glassware fitting
 - d. sample needle nut
 - e. sample valve 3 port
- 3) Check the purge bulkhead and the sample bulkhead fittings on the inside of the front panel of the LSC 2000.
- 4) Remove the valve oven cover and check the 10 fittings inside the valve oven. (See LSC 2000 Valve Oven Diagram) The trap cover must be off to remove the left side panel that covers the valve oven cover.
- 5) Remove the right side panel and check the 18 Swagelok fittings inside the unit. (See Swagelok Leak Check Diagram)

3.4 Changing the Trap

New Installations

The LSC 2000 is delivered with a blank trap installed. This prevents the damage that would be done to a packed trap if the unit was powered up with no purge gas flow present. *Replace the blank trap with a packed trap before running a sample.*

**3.4
Changing the
Trap (cont.)**

How to identify a trap

Traps can be identified by a number stamped on the nut at the bottom of the trap. These numbers are:

<u>Trap Number</u>	<u>Part Number</u>	<u>Type of Trap</u>
0	14-1168-003	Blank
1	12-0083-003	Tenax
2	12-0084-003	Tenax/Silica Gel
3	14-0124-003	Tenax/Silica Gel/ Charcoal
4	14-1457-003	Tenax/Charcoal
5	14-2366-003	OV1/Tenax/Silica Gel/Charcoal
6	14-1755-003	OV1/Tenax/Silica Gel
9	Custom	

How to change a trap

- 1) Remove the trap door at the front end of the left panel.
- 2) ***Make sure the trap is not hot.***
- 3) If you have already powered up the unit, make sure the system is in Purge Ready or Standby.
- 4) Loosen the nut at the top of the trap one full turn but do not remove it completely.

NOTE: The nut at the top of the trap should have been fastened finger tight and loosened easily. If not, the ferrule may need to be replaced.

- 5) Hold the bottom fitting in place with a 7/16" wrench while using a 7/16" wrench to turn the nut at the bottom of the trap counter-clockwise until the fitting is disengaged.
- 6) Grasp the trap furnace and trap and carefully pull the trap straight down and out of the upper trap fitting.
- 7) Grasp the trap furnace in one hand and the lower trap fitting with the other hand and pull the trap out of the furnace.
- 8) Slide a packed trap into the trap furnace sleeve.
- 9) Reconnect the top and bottom fittings. Take care

3.4 Changing the Trap (cont.)

not to tighten the top fitting past finger tight as this may result in damage to the teflon ferrule.

- 10) While holding the fitting in place with a 7/16" wrench, tighten the brass nut at the bottom with another 7/16" wrench one-eighth turn past finger tight.

- 11) Put the trap door back on.

Before samples can be run, the new trap must be thermally conditioned. Refer to Conditioning a New Trap, Section 6.2.

3.5 Handling Fused Silica Tubing

Making connections with fused silica tubing is far more difficult than doing so with metal tubing. Although fused silica is flexible, it is also brittle and breakable. Care must be taken not to bend the tubing too far or it will fracture. (The minimum bend radius of fused silica tubing is: 3.5" for 0.53mm, 3.0" for 0.32mm, and 2.75" for 0.25mm I.D. tubing.) Also, the tubing must not be scratched or it is likely to break under the stress of bending or vibration that would normally have no effect.

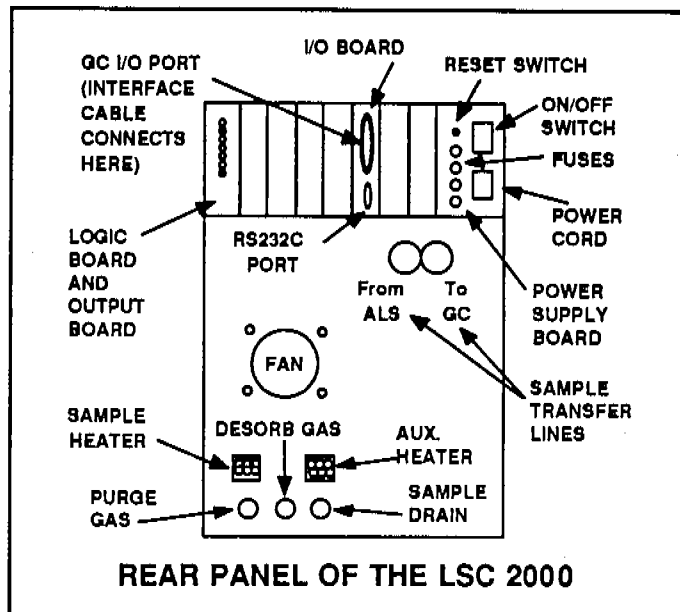
When making a connection with fused silica tubing, use the appropriate size graphite, vespel, or graphitized vespel ferrule. Tekmar Company recommends graphitized vespel for its ease of use and reliable sealing characteristics. Place the nut and ferrule on the tube, then carefully remove a short (1-2cm) section of tubing. This ensures that no ferrule particles remain inside the tubing; these can cause severe adsorption and carryover. Cut the tubing by scoring it with a diamond-tipped pencil or another suitable device (a razor blade works well). Pull the tubing apart by lightly bending it from the side opposite the score. Make the connection with the fitting and tighten it approximately one half turn past finger tight. It may be necessary to secure the center of the union to the column cage (a bent paper clip is handy for this purpose) so that stress caused by the weight of the union is relieved.

3.6 Connecting the Drain Tubing

Attach a length of 1/8" I.D. plastic tubing to the fitting marked "Drain" on the back of the LSC 2000. Run this line to a sink or waste bottle.

3.7 Electronic Interconnection to the Gas Chromatograph

Electronic connection points on gas chromatographs are specific to each particular make and model of gas chromatograph available. Instructions for connecting an LSC 2000 to a particular gas chromatograph accompany the interface cable necessary to your specific LSC 2000 to GC setup. Every customer is encouraged to specify the setup he or she plans to use when the order for the LSC 2000 is placed so that Tekmar personnel can configure the LSC 2000 to electronically acknowledge your GC and so that it will be ready for use when it arrives. If you did not specify your setup, you will need to order an interface cable to interconnect the 2000 with your GC (If you will be using more than one GC with the 2000 you will need an interface cable for each different GC) When you receive your cable **you will also need to set the DIP switches on your LSC 2000's I/O board** to acknowledge your GC. Complete installation instructions are included with every interface cable and should be added to your LSC 2000 User Manual for future reference. Check Section 7.1.3 for further information about DIP switch settings.



3.8 Replacing the Microprocessor ROM

It may be necessary to replace the microprocessor ROM chip in order to upgrade the operating parameters of the LSC 2000. When purchasing accessories for your LSC 2000, it may have been verified that an upgraded ROM chip was required. The accessories to the LSC 2000 require a minimum version of 1.3E on the ROM. Versions 1.3E or greater will appear printed in the upper right hand corner of the Configuration screen (press **F4 (Conf)** in Start Up screen). There will be no display of versions previous to 1.3E. The upgraded ROM chip should be included in a kit box assembly with your accessory. Please read the instructions carefully before attempting to replace the chip.

- 1) Unplug the power cord from the LSC 2000.
- 2) Remove the side panel adjacent to the pressure regulator and gauge.
- 3) On the ceiling of the lower compartment is a green/yellow ground wire coming from the Control Module (upper compartment). Disconnect this with a 5/16" wrench.
- 4) Remove the 4 retaining screws located on the sides of the Control Module (see the LSC 2000 Electronics Module Connection diagram) and carefully remove this module by lifting straight up on the module, making sure to guide the ground wire through the thermal barrier and retaining clip.
- 5) Lay the module on its top so that the boards and ROM chips are visible.

NOTE: The microprocessor board and display are mounted to the interior side of the keypad. The ROM chip resides on the microprocessor board. The location of the ROM chip is labeled on the LSC 2000 CPU Board & Keypad diagram. The ROM chip is mounted in a Z.I.F. (Zero Insertion Force) socket. The Z.I.F. socket has a lever at the one end which, when in the down position, applies force to the pins of the chip to make a connection. When the lever is in the Up position, it relieves the force on the pins and disconnects the chip for easy removal or insertion.

3.8 Replacing the Microprocessor ROM (cont.)

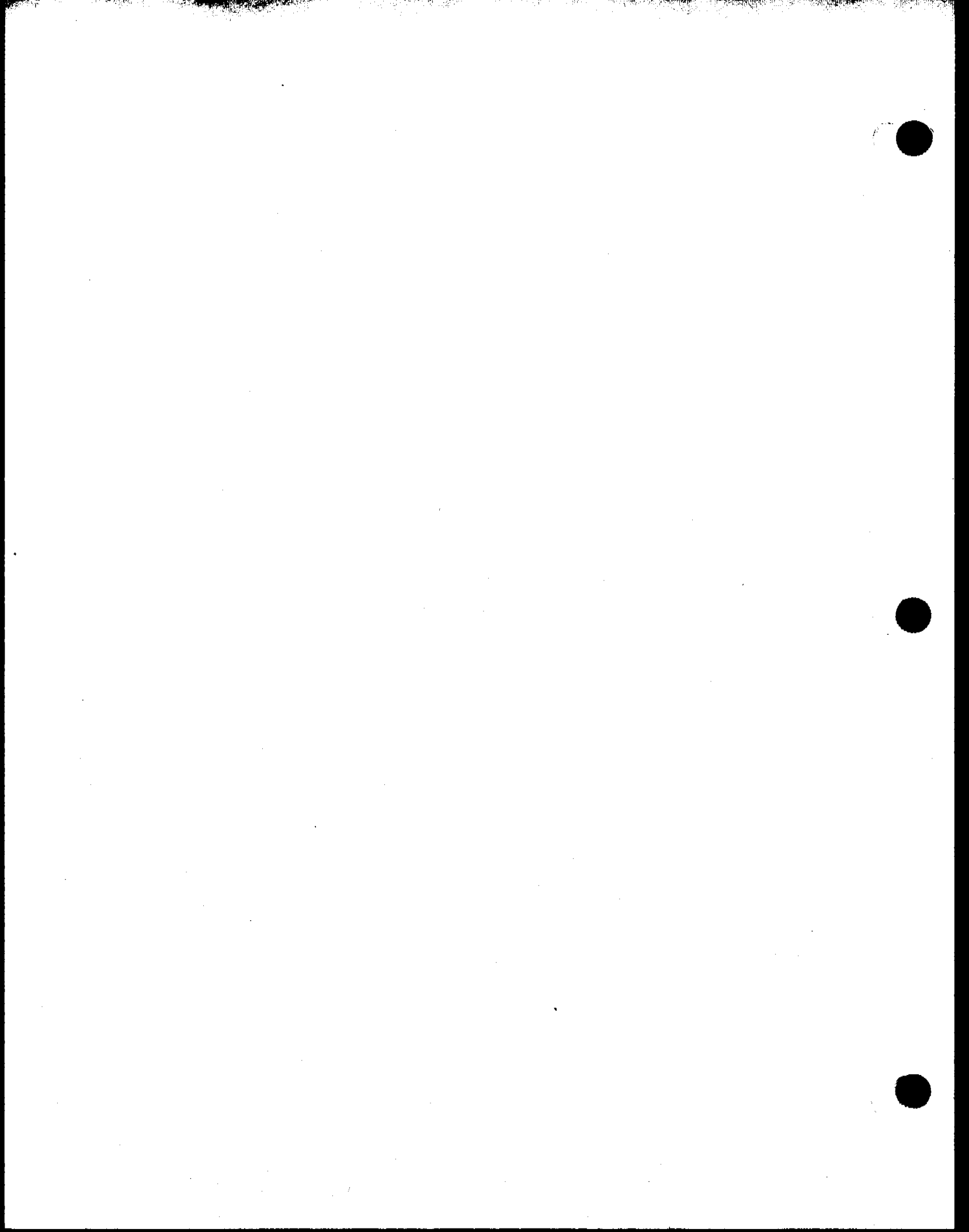
***** IMPORTANT *****

The ROM chip is a static sensitive chip. Use caution when handling the chip. Do not touch the pins of the chip.

- 6) To remove the old ROM, lift up the lever on the Z.I.F. socket and remove the chip by holding each end of the ROM chip and pulling it straight out.
- 7) Take note that the ROM chip has a u-shaped groove at one end. This end of the chip goes toward the lever of the Z.I.F. socket. Insert the new ROM chip holding the ends of the chip.
- 8) Align the pins on the chip with the sockets and carefully insert the chip, *making sure not to bend the pins*, until it seats. With finger pressure still being applied, push the Z.I.F. lever down to lock the ROM chip in place.
- 9) To replace the Electronic Control Module on the unit, follow the removal procedure in reverse, making sure you run the green/yellow ground wire thru the retaining clip and down thru the hole to the lower compartment.

NOTE: It will be necessary to re-program all parameters once the instrument has been re-installed.

SECTION 4
MICROPROCESSOR
PROGRAMMABLE CONTROL



4.1 General Description

The LSC 2000 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, heater thermocouples),
- a membrane keypad with which values for program parameters may be modified,
- and a six line LCD (Liquid Crystal Display) that displays the various 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 LSC 2000
Automatic Concentrator 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 the purging, desorption, and cryofocusing functions that are currently being used in EPA procedures, along with the default values for the set times and temperatures associated with each step. (See Section 4.2, "Program Panel").

The controller allows value modifications to be made to the program parameters after power-up, storing the changes in RAM. The controller can store 4 complete sets of program parameters in RAM; these are labeled Method 1, 2, 3, and 4. The defaults for each of the four methods are the same. However, each

**4.1.1
The
Microprocessor
(cont.)**

method can be modified independently to reflect a specific set of parameter values. Because they are stored in the unit's memory, customized methods allow for greater convenience and more efficient process time. After the system displays the introductory screen, it performs self tests. Following self tests, it will display the Method 1 Start Up screen:

Start Up	Method 1
Line: 80 ^o > 100	Valve: 80 ^o > 100
BOT: 75 ^o > 100	Capillary
Mount: 75 ^o > 200	Int: 99 ^o > 100
Meth ALS	Temp Conf



The commands available for each program stage are located on the bottom line of the screen. Each command corresponds to the function key found directly beneath it. There are four keys on the keyboard that are designated as function keys. A fifth key, **ENTER**, also serves as a function (command) key, but it will be discussed when we get to "Modifying A Program," Section 4.5.

**4.1.2
Serial
(RS232C)
Output**

The controller has a serial port that allows communications between the system and a printer. The port will provide the following data in ASCII-coded output:

- 1) Method listing: Output occurs whenever Method is chosen.
- 2) Error/fault messages: Output whenever a condition such as "heater fault", or "power fail", etc. are encountered.
- 3) Running state transitions: Outputs clock time whenever the program makes a transition from one program to the next, starting with Start Up. The name of the program stage is also sent.

4.1.2
Serial
(RS232C)
Output (cont.)

Reviewing and Changing the Baud Rate

To use a printer with the LSC 2000, the baud rate of the printer and the LSC 2000 serial port must match. From the Start Up screen, press **F4 (Conf)** to see the Current Configuration screen.

Current Configuration
 Date: 11/01/87 Time: 12:30:00
 Baud: 1200 ALS 2016: NO ALS 2032: NO
 (PAGE DOWN for more)
Help LSC Inst. OK

Press **F2 (LSC)** to get the LSC screen:

Press **F2 (Clock)** to change time/date
 Refer to Manual Section 4.4.5
 Press **F3 (Baud)** to change the baud rate
 Refer to Manual Section 4.1.2
Exit

Press **F3 (Baud)** to see the array of values for the serial port baud rate:

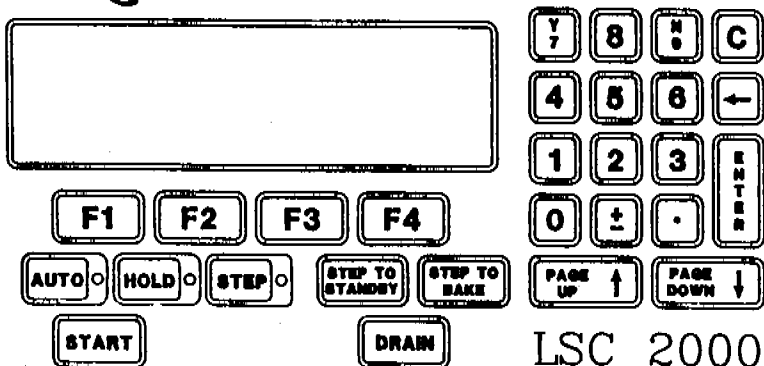
Baud Rate: 1200
 150 300 600 1200
 2400 4800 9600 19200
 <- -> **Exit**

Press **F2 (<-)** or **F3 (->)** to highlight the desired baud rate. Press **F4 (Exit)** to go to the Method screen.

4.1.3
Keypad
Description

The LSC 2000 keypad is the center of control for all operator tasks.

Tekman



4.1.3
Keypad
Description
(cont.)

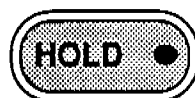
The components of the keypad and their use follow.



The function keys correspond directly to commands found on the bottom line of the Liquid Crystal Display (LCD) screen. The commands available at any given time depend upon the actual program step the system is performing.



Press **AUTO** to signal the system to proceed through the run automatically.



Press **HOLD** to interrupt the system at any point during a run. The system will not proceed until the operator presses **STEP**, **AUTO**, **START**, **STEP TO BAKE**, or **STEP TO STANDBY**.

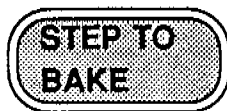


Press **STEP** and release it to cause the system to immediately proceed to the next system mode.



Press **STEP TO STANDBY** to cause the system to go directly to Standby mode from whichever mode it is performing when **STEP TO STANDBY** is pressed. This command feature avoids 'wear and tear' of the 6-port valve and also avoids start up of the GC. Since this command terminates the run in progress, the system will display a screen asking you to confirm that you really want to abort the run. This screen setup ensures that a run is not aborted due to an inadvertent keystroke.

4.1.3 Keypad Description (cont.)



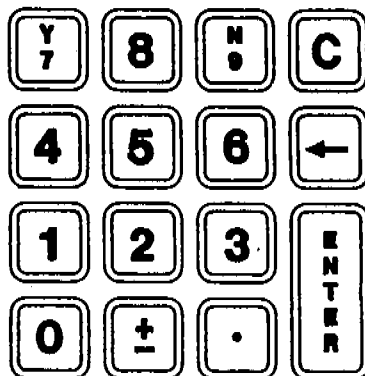
Pressing **STEP TO BAKE** causes the system to go directly to Bake mode from whichever mode it is performing. This feature allows the trap to be cleaned immediately, and therefore, to be prepared for another run. It is also useful for conditioning new traps.



Press **START** to signal the LSC 2000 to proceed from Purge Ready mode. A message or "prompt" appears on the LCD screen to tell the operator that the unit is ready to load the sample.

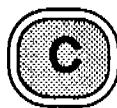


Press **DRAIN** to manually open and close the drain, causing the system to drain the sample from the unit. This feature offers the operator greater control over the exact moment a sample is drained. This is useful when the AUTO DRAIN option is turned off to enable a second run to be performed, for example.



Press the numbered keys on the numeric keypad to change the values assigned to system Method parameters. Keys 7 and 9 are also used to enter "Yes" and "No" when configuring the system to acknowledge instruments that are attached to it.

4.1.3 Keypad Description (cont.)



Press **CLEAR** or **<- (BACKSPACE)** to change or eliminate a value entered from the keypad. The value in question must be highlighted by a shaded box to be accessed from the keypad.



Press **ENTER** to fix into system memory values that have been input from the keypad. In an instance where 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. Press **PAGE DOWN** or **PAGE UP** to change the Viewing Angle of the LCD screen so that it can be seen clearly from an operator's sitting or standing position. When the screen prompt **<PAGE UP/DOWN for more>** appears, the keys **PAGE UP** and **PAGE DOWN** function to allow viewing of additional parts of a listing (in Method Edit, Configure, or Instrumentation, for example).

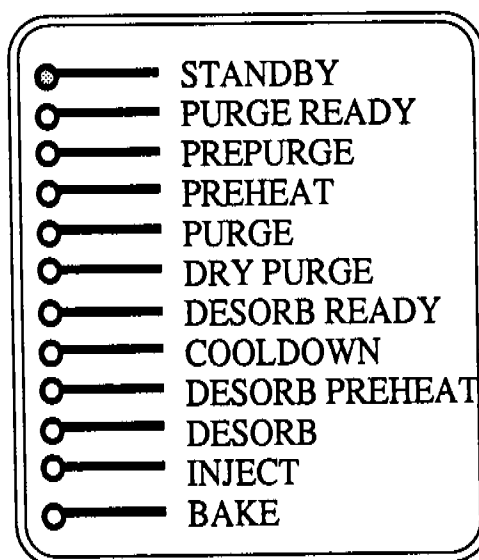
4.2 Program Panel

The program panel consists of purge, desorption, cryofocusing, and bake procedures complete with default values for each of the program steps. Each of four methods can be run as is, or the values for each of the program steps can be modified.

NOTE: Prepurge and Preheat can only be run when the Sample Heater is installed.
Cooldown and Inject can only be run when the Capillary Interface is installed.

4.2.1 Program Panel Description

The program panel is located on the front of the unit next to where the sample is mounted. It lists the program steps in sequence and has LEDs (light-emitting diodes) that indicate which program step is being performed. Whenever the unit is turned on, all modes on the program panel will illuminate red except one. A green LED lights up to indicate the mode the unit is in currently. If a particular mode on the panel corresponds to an accessory that is not installed, the corresponding LED will not illuminate.



4.2.2 Program Steps

The following describes the tasks that are being performed by the system during each of the program steps:

• STANDBY

When the system is powered up, Standby establishes initial conditions for a sample run. After a run, initial conditions are recovered in this step. The LCD window displays the Line temperature, BOT (Bottom Of Trap) temperature, Mount temperature (where the sample glassware is attached), and the Valve temperature. The display shows the actual temperature to the left of the '>' symbol (which changes as the components heat up) and the set value to the right of the '>' symbol. If a Capillary Interface has been installed, "Capillary Int." will be followed by the actual temp. as it cools, and the set temperature.

4.2.2
Program Steps
(cont.)

Start Up		Method 1	
Line: 80° > 100		Valve: 80° > 100	
BOT: 75° > 100		Capillary	
Mount: 35° > 40		Int: 99° > 100	
Meth	ALS	Temp	Conf

The system automatically proceeds to the Standby screen, which is the second phase of Standby mode.

Standby		Method 1	
Trap: 33°		Set: < 30°	
Sample: 21°			
Meth	ALS	Temp	Conf

NOTE: The LSC 2000 is programmed to come up in **HOLD** as a safety measure. Press **AUTO** to cause the unit to proceed.

When all five parameters have reached their set temperatures, the Standby light on the Program Panel goes out and the Purge Ready light goes on.

• **PURGE READY**

The Purge Ready Step serves as a signal to the operator that proper conditions have been met and the unit is ready to purge the sample. At this point, the unit will pause until **START** is pressed.

Purge Ready		Method 1	
Trap: 29°		Sample: 21°	
Ready for sample to be loaded.			
Press START to begin run			
Meth	ALS	Temp	Conf

NOTE: If a sample heater is not installed, the sample temperature reads the temperature inside the unit.

4.2.2
Program Steps
(cont.)

• **PREPURGE**

Prepurge mode functions only when a sample heater is installed. In this mode, the purge gas is turned on before a sample is heated. This process removes oxygen from the sampler and assures that the sample is blanketed by inert gas when it is heated. The inert gas prevents oxidation of the heated sample.

Prepurge		3.51 > 4.00		
Trap: 27°				
Sample : 21°		Method 1		
Meth	ALS	Temp		Conf

• **PREHEAT**

Preheat mode functions only when a sample heater is installed. This mode heats the sample in a static condition, i.e., without purge gas flow. This process allows the sample temperature to equilibrate before purging, which enhances quantitative reproducibility.

Preheat		4.53 > 5.00		
Sample: 70°				
Set: 70°		Method 1		
Meth	ALS	Temp		Conf

• **PURGE**

In Purge mode, volatiles are removed from the sample by passing purge gas through it.

Purge		0.23 > 12.00		
Trap: 25°				
Sample: 70°		Method 1		
Meth	ALS	Temp		Conf

**4.2.2
Program Steps
(cont.)**

• DRY PURGE

In Dry Purge mode, the purge gas remains on, but flows only through the trap, bypassing the sample. This process causes water in the trap to be removed.

NOTE: If the trap contains silica gel, water in the trap cannot be removed.

Dry Purge		0.23 > 5.00	
Trap: 25°		III	
		Method 1	
Meth	ALS	Temp	Conf

• DESORB READY

In Desorb Ready the unit signals that it is ready to send the sample to the G.C.

Desorb Ready		Method 1	
		Run 1 of 1	
Waiting for GC ready signal.			
Press STEP if interface is not installed (NI).			
Meth	ALS	Temp	Conf

• COOLDOWN

Cooldown mode occurs only when a Capillary Interface is installed. In this mode, the sample is cryofocused (frozen) in the Interface trap in order to improve peak shape during the injection. This process concentrates the injection in order to make it most compatible with capillary column use.

Cap Cooldown		Method 1	
Valve: 100°		-100° > -120°	
Set: 100°		Injector > Set	
Meth	ALS	Temp	Conf

4.2.2
Program Steps
(cont.)

• **DESORB PREHEAT**

In Desorb Preheat mode, the trap is heated before the 6-port valve is switched, so that the trap is hot before the analytes are backflushed. This process improves the quality of the injection of the sample before it goes into the G.C.

Desorb Preheat	Method 1
	79° > 175°
	Trap > Set
Meth	ALS Temp Conf

• **DESORB**

In Desorb mode the sample is injected into the G.C.

Desorb	1.10 > 4.00
Trap: 175°	
Set: 180°	Method 1
Auto Drain: ON	
Meth	ALS Temp D Conf

NOTE: The flashing 'D' between (Temp) and (Conf) on the LCD screen indicates that the drain is open. Press **DRAIN** to close or open the drain.

• **INJECT**

Inject mode occurs only when a Capillary Interface is installed. In this step, the Interface trap is heated to release the analytes into the GC column.

Inject	0.16 > 0.50
Injector: 100°	
Set: 200°	Method 1
Meth	ALS Temp Conf

• **BAKE**

In Bake mode the trap is cleaned for the next run.

Bake	0.30 > 8.00
Trap: 100°	
Set: 225°	Method 1
BGB: OFF	
Meth	ALS Temp Conf

4.3 Powering Up the System

4.3.1 Running Self Tests

Upon routine power up, the system conducts self tests to confirm that all its heated components are working properly. Default values are loaded into RAM from ROM when either Run or Edit is chosen from the Method menu.

To conduct self tests the system briefly turns on each heater in succession. When the thermocouple for a particular heater registers a temperature increase, the system advances to the next heater.

**Tekmar LSC 2000
Automatic Concentrator System**

Self Test in Progress

Basic LSC

Line: ok

BOT: ok

Trap: ok

Help

Valve: skipped

Mount: 22^o

Skip

Self Test in Progress

Capillary Interface

Cryo trap: ok

Injector: ok

Help

Skip

Self Test in Progress

Sample Heater

Sample: 22^o

Help

Skip

Self tests may be skipped at any time by pressing **F4 (Skip)**. Pressing **F4 (Skip)** will cause the system to advance to the test for the next heater. However, the system responds to skipping a self test in the same

4.3.1 Running Self Tests (cont.)

manner that it does a failed self test. Both of these conditions require operator intervention.

FAILURE

Basic LSC

Line: ok

BOT: ok

Trap: ok

Help

Valve: skipped

Mount: ok

Ignore

Retest

Press **F3 (Ignore)** to acknowledge that the test was purposefully skipped. If an error message appears for a heater that was not skipped, press **F4 (Retest)** to rerun the self tests on that set of heaters.

NOTE: If the accessory modules for a Sample Heater or a Capillary Interface are not installed, the tests for these modules **MUST** be manually skipped.

When the self tests are complete the system goes to the Current Configuration screen:

Current Configuration

Date: 11/01/87

Time: 12:30:00

Baud: 1200 ALS 2016: NO

ALS 2032: NO

(PAGE DOWN for more)

Help

LSC

Inst

OK

4.3.2 Changing the Viewing Angle of the Screen

The viewing angle of the LCD screen can be adjusted to optimize readability in a variety of unit setup conditions. Press **PAGE UP** to increase the angle of the screen and **PAGE DOWN** to decrease the angle. Press the key down firmly for a continuous change in the angle or press and release the key for an incremental change.

NOTE: The viewing angle cannot be adjusted while the unit is in a mode where **PAGE UP** and **PAGE DOWN** provide other functions (for example, while editing the Method Parameters Listing).

4.3.3 Loading the Method Default Values Into RAM

Up to four methods can be stored in the memory of the LSC 2000. When powered up, the unit automatically goes to Method 1. (The default values for Method 1 correspond to EPA Method 601.) To go to another Method or to modify the parameter values for a Method, press **F1 (Meth)**. The system asks which Method (1-4) you wish to use. Press the appropriate digit on the keypad. If you wish to run this method, press **F2 (Run)**. If you wish to view or change parameter values, press **F3 (Edit)**.

If this is the initial power up (or if this is a power up after a power failure that resulted in memory loss), the "Parameters Invalid" screen will appear, indicating that by pressing **(Run)** or **(Edit)** you have cued the system to load the parameter default values into Random Access Memory (RAM). Press **F4 (Exit)** to leave the "Parameters Invalid" screen.

If you pressed **F2 (Run)**, the system will go to Start Up mode in the Method you chose. If you pressed **F3 (Edit)**, the system will go to the parameter listing for the Method you chose. To move the cursor use **F3 (->)** or **<- (Backspace)**. To view the next section of the parameters listing (there are 5 "pages"), press **PAGE DOWN**. To change a parameter value, move the cursor to the desired parameter and press **ENTER**. Press the appropriate digits to input the new value and press **ENTER** again. To leave the Method Parameters Listing, press **F4 (Exit)**.

Once these procedures have been accomplished, the system will retain the default or modified Method values in memory (except in certain cases of power failure).

4.4 Running a Default Program

The LSC 2000 system includes four default programs, or Methods, that are set according to the standards and procedures established by the United States Environmental Protection Agency. To run a sample using the EPA parameter values already configured into the system, start by using Method 1. When the LSC 2000 is powered up, the introductory screen appears first:

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4.4.1 Performing a Run Using Method 1

The system proceeds automatically to the Method 1 program.

Start Up		Method 1	
Line: 80° > 100		Valve: 80° > 100	
BOT: 75° > 100		Capillary	
Mount: 35° > 40		Int: 99° > 100	
Meth	ALS	Temp	Conf

Standby		Method 1	
Trap: 33°		Set: < 30°	
Sample: 21°			
Meth	ALS	Temp	Conf

When the unit has met the parameter values set for Method 1, it goes to Purge Ready and displays the Trap and Sample temperatures. The unit pauses at this point until the operator presses **START** on the keypad.

Purge Ready		Method 1	
Trap: 29°		Sample: 21°	
Ready for sample to be loaded, Press START to begin run			
Meth	ALS	Temp	Conf