AEROTrap 6000

User Manual

Tekmar Company
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Essential Instructions

Please read this page before proceeding!

Tekmar designs, manufactures, and tests its products to meet many national and international standards. Because the AEROTrap 6000 is a sophisticated technical product, you must correctly install, use, and maintain it to ensure that it continues to operate within normal specifications. Also, you must adhere to and integrate the following instructions into your safety program when installing, using, and maintaining the 6000. Failure to follow the correct instructions may invalidate the warranty.

- Read all instructions before installing, operating, and servicing the 6000. Follow all warnings, cautions, and instructions marked on and supplied with the unit and in this User Guide. If you do not understand any of the instructions, contact your Tekmar representative for clarification.
- Educate your personnel in the proper installation, operation, and maintenance of the 6000.
- To ensure correct performance, only qualified personnel should install, operate, update, program, and maintain the 6000.
- Install the 6000 as specified in the installation sections of this manual and according to applicable local and national codes. Connect all products to the correct electrical and pressure sources.
- When replacement parts are required, ensure that qualified people use only Tekmar-supplied replacement parts. Unauthorized parts and procedures can affect the 6000's performance and jeopardize safety. Using look-alike substitutions may result in fire, electrical hazards, or incorrect operation.
- Ensure that all protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

Scope of the Manual

This manual describes the AEROTrap 6000 and tells you how to:

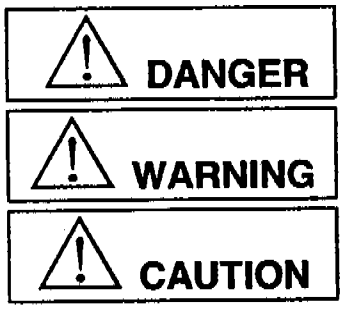
- Unpack and set up the unit.
- Program the 6000 for standard and custom operation.
- Prepare, load, and run samples.
- Perform routine maintenance procedures and simple troubleshooting.
- Order parts and service from Tekmar.

How the User Guide Is Organized

The *AEROTrap 6000 User Manual* is organized into a preface, nine chapters, an appendix, and an index.

- **Read This First!** gives essential instructions to be read by all AEROTrap 6000 users and provides an overview of the *User Guide* organization and conventions.
- **Section 1.0 Introduction** provides a general description of the concentrator, its specifications, functions, and possible safety hazards.
- **Section 2.0 Getting Started** tells you how to unpack, check, and get ready to install the 6000. It also describes the unit's major components.
- **Section 3.0 Setting Up the 6000** gives instructions for connecting the 6000 to the GC, installing any required electronic components or accessories, and leak-checking the installation.
- **Section 4.0 Understanding Operating Steps** describes 6000 operation, outlines operating sequences, and defines the parameters for each operating step.
- **Section 5.0 Using the Terminal Keypad and Screen** tells how to use the hand-held terminal, read the status screens, and power up and configure the 6000.
- **Section 6.0 Programming the 6000** describes the default operating sequences set at the factory and tells you how to create customized operating sequences by changing time and temperature parameters.
- **Section 7.0 Scheduling and Running Samples** gives instructions for setting up method schedules and running samples with the 6000.
- **Section 8.0 Maintaining the 6000** tells how to perform routine operating and maintenance procedures for the 6000.
- **Section 9.0 Service and Parts** lists the parts shipped with the 6000, provides a replacement parts list, and tells you when and how to contact Tekmar Service.
- The Appendix consists of diagrams and reference information.

Conventions in the User Guide



Note:

In this *User Manual*, certain typefaces and symbols have specific meanings. Paragraphs containing important safety information are marked with the following symbols:

This symbol alerts you to a situation where incorrect operation could cause serious personal injury and damage to your equipment.

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

This symbol points out a situation where incorrect operation could damage your equipment or lead to an error.

This symbol points out important information.

1.1 Overview

This section describes the AEROTrap 6000, defines its basic functions and system configurations, provides technical specifications, and outlines safety considerations for its use.

1.2 Product Description

The AEROTrap 6000 (Figure 1-1) is a concentrator that allows automatic processing of air samples for analysis by gas chromatography.

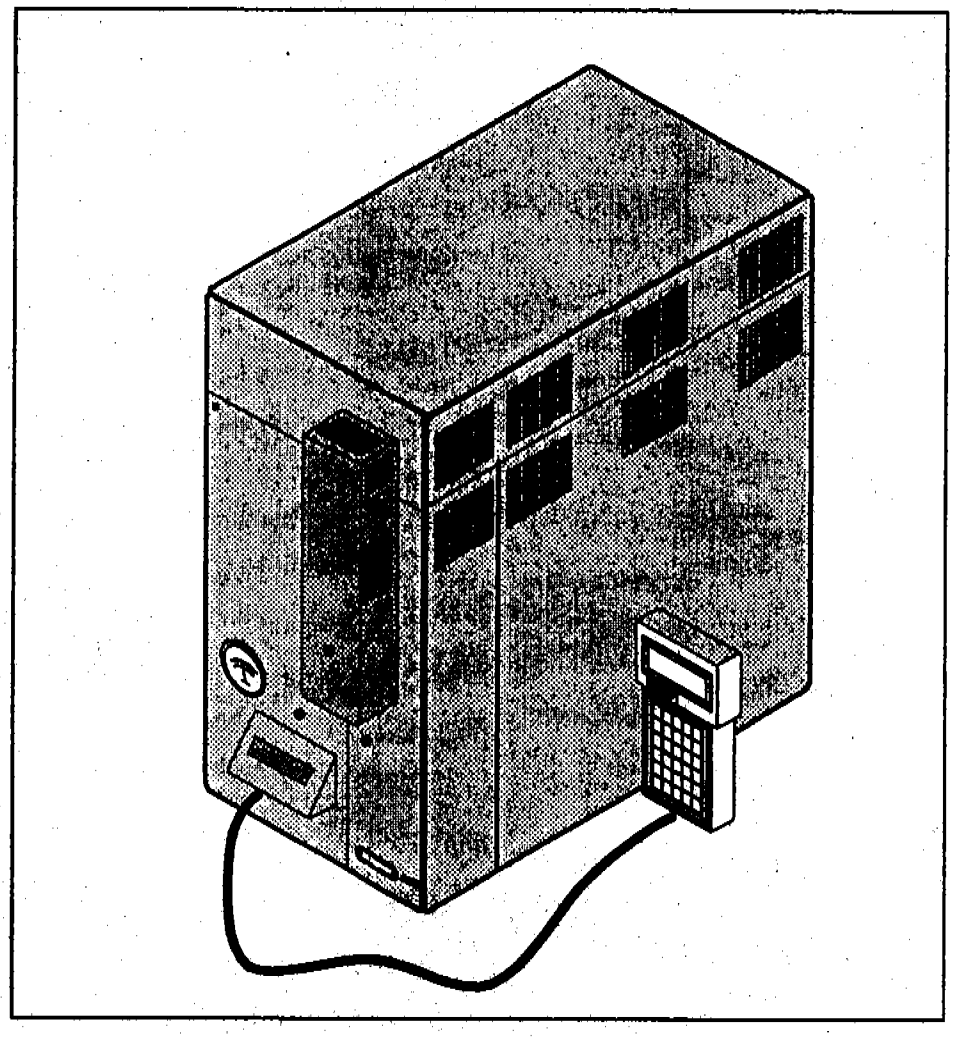


Figure 1-1. AEROTrap 6000

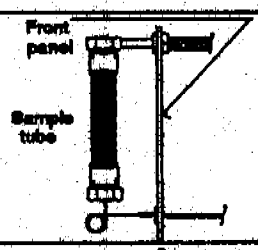
The basic unit is equipped with a single sample tube-and-heater assembly and a hand-held terminal (purchased separately). It can be set up in several different configurations to run up to 32 samples, as described in Section 1.4 System Configurations.

You can also program the 6000 to run different sample sequences. Please refer to Section 6.0 Programming the 6000 for information about customizing operating sequences.

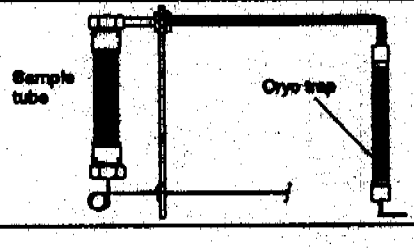
1.3 Concentrator Functions

The AEROTrap 6000 desorbs volatile organic compounds from sorbent-packed sample tubes or canisters. Then it concentrates them for delivery to a gas chromatograph. Figure 1-2 illustrates the steps in the process:

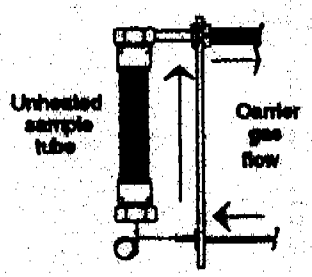
1. A tube holding the sample to be analyzed is loaded on the front panel of the 6000.



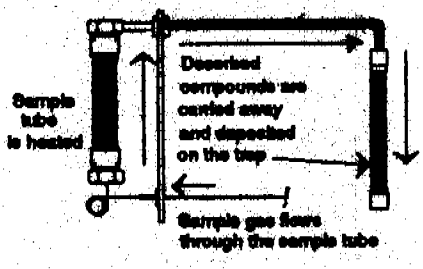
2. A cryogenic trap inside the concentrator is cooled with liquid nitrogen to a temperature as low as -190°C.



3. Sample (or *sweep*) gas flows through the unheated sample tube to sweep oxygen and water vapor away from the sample. The user can schedule this step before or after the internal trap is cooled.



4. The sample tube is heated to release organic analytes from the sorbent packing. Sample/sweep gas flows through the tube to carry analytes out of the tube and deposit them on the internal trap.



5. The internal trap is then heated to desorb the concentrated analytes from the trap. The heated trap is backflushed with gas to deliver a tight band of organic analytes to the gas chromatograph.

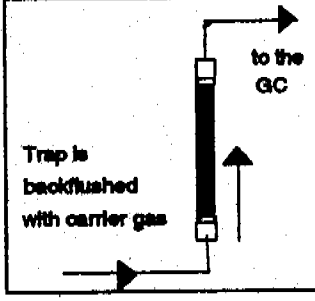


Figure 1-2. 6000 Functions

1.4 System Configurations

1.4.1 AEROTrap 6000 with AEROTrap Autosamplers

The basic unit processes a single sample (according to protocols based on USEPA TO-1 or TO-2) and delivers the resulting analytes to a gas chromatograph. You may also purchase other Tekmar accessories which can extend and enhance 6000 functions.

AEROTrap 6016/6032 Autosamplers make it possible for the 6000 to process up to 32 samples automatically using the configuration shown in Figure 1-3.

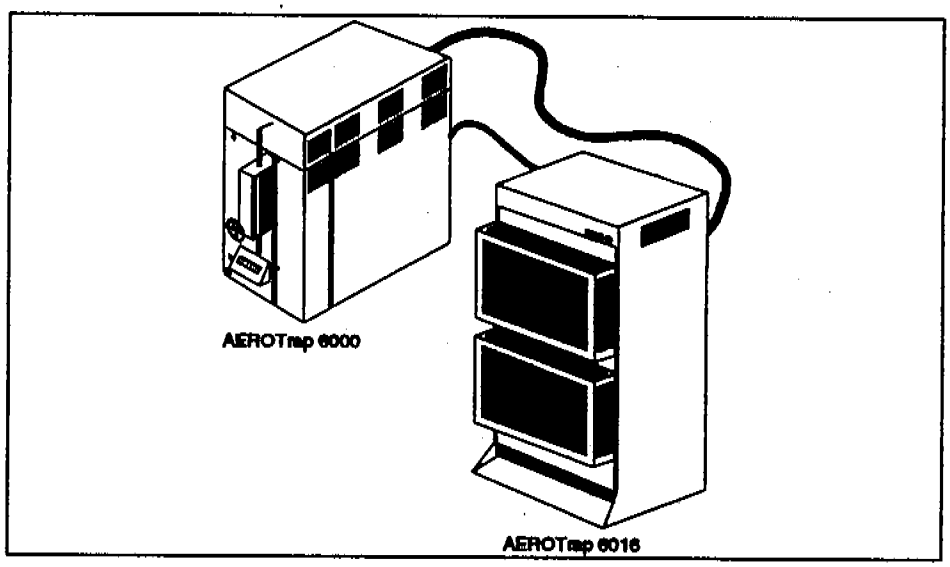


Figure 1-3. **AEROTrap 6000 with an Autosampler**

Connected to AEROTrap autosamplers, the 6000 can desorb samples from up to 16 tubes (with the AEROTrap 6016) or up to 32 tubes (with the AEROTrap 6016 and 6032). The autosamplers also process samples according to protocols based on USEPA TO-1 and TO-2.

1.4.2 AEROTrap 6000 with Cryofocusing Module

Most air applications require analysis on narrow-bore capillary columns (0.32 mm I.D. or less). For better component resolution on a narrow-bore column, Tekmar recommends that you use the AEROTrap 6000 with a *Cryofocusing Module*.

- Highly volatile components desorbed from the internal trap of the 6000 are refocused and condensed in the trapping area of the Cryofocusing Module as carrier gas passes through the module to the GC.
- The Cryofocusing Module freezes the condensed components in a narrow, *cryofocused* band on the column.
- Then the Cryofocusing Module is heated and flushed with carrier gas to release the analytes already on the GC column.

1.4.3 Other Configurations

The 6000 can also be set up to measure:

- VOCs in ambient air, using a canister collector according to USEPA TO-14 protocol.
- VOCs in ambient air according to modified USEPA TO-1, TO-2, and TO-14 methods.

1.5 Product Specifications

This *User Manual* provides specifications for the AEROTrap 6000 and the Cryofocusing Module. Please refer to the *AEROTrap 6016/6032 User Guide* for Autosampler specifications.

Sample Tubes:

Sample tubes are available in the materials and sizes shown in Table 1-1.

Length (in inches)	Size	Material of Construction	Outside Diameter (OD)
7	¼"	stainless steel	0.247 ± 0.001 inches
7	½"	stainless steel	0.497 ± 0.001 inches
7	6 mm	glass	6 mm
7	12 mm	glass	12 mm

Table 1-1. **Sample Tube Sizes**

Sample Tube Heater:

Sample tube heaters are available in two sizes: $^{17}/_{32}$" I.D. for ½" sample tubes, and $^{9}/_{32}$" I.D. heaters for ¼" sample tubes.

Internal Trap:

The internal trap is available as:

- A 6-inch-long, stainless steel tube, ⅛" outside diameter, packed with glass beads (installed in the unit).
- An open-bore, 6-inch-long, glass-lined stainless steel tube, ⅛" outside diameter (to be packed by the user).

Valving:

A 115V motor-actuated 6-port switching valve.
12 VDC-solenoid-actuated, 2- and 3-port sample, sample bypass, and vent valves.
A 12-VDC, solenoid-actuated liquid nitrogen valve for internal trap coolant.

Tubing:

All sample lines are $^{1}/_{16}$" nickel tubing.
The transfer line is 60"-long fused silica tubing.

Heating Systems:

The following components are heated:

- Sample lines and switching valve; by valve-oven heater, from ambient to 300°C
- Sample tube; by a separate heater, from ambient to 420° C.
- Transfer line; by a separate heater, from ambient to 300°C.
- Internal trap is heated to 420° C and cooled down to -190° C (with liquid nitrogen coolant).

Moisture Control System	A modular ambient condensate system that operates at temperatures ranging from 5°C above ambient to 350°C removes moisture from the gas stream going to the GC.
Electronic Control:	Microprocessor - Motorola 68000, running at 12 MHz. CPU memory - 128K ROM; 64K RAM (expandable to 128K).
Data Input and Display:	The 6000 accepts parameter values entered via RS232C serial interface using: • A hand-held terminal connected directly to an I/O port; or • PC keyboard input with optional Teklink® software running in Microsoft Windows® 3.x. The 6000 uses a two-line, 40-character LCD screen.
Utility Requirements:	The 6000 uses: • 115V/230V (± 10%) at 50 - 60 (±1%) Hz frequency. • Ultra-high purity helium (99.999%) as sample gas, supplied at 20 to 60 p.s.i.g. pressure. • Liquid nitrogen as coolant, supplied at 20 to 75 p.s.i.g. pressure (75 p.s.i.g recommended).
Weight:	Each concentrator weighs approximately 37 pounds.
Dimensions:	The 6000 is 19" (48.2 cm) high, 9" (22.8 cm) wide, and 18" (45.7 cm) deep.
Expansion Capability:	The 6000 has four (4) expansion slots on the motherboard available for accessory interfaces.

1.5.1 The Cryofocusing Module

The optional Tekmar Cryofocusing Module meets the following design and operating specifications:

Cryofocus Trap: 90 mm long

Trap Temperature Range: -190° C. to +420° C.
Settable in 1° C. increments
-600° C/min, gradient heated

Tubing: Can cryofocus on a fused-silica column or on an uncoated fused-silica pre-column, from 0.20 mm to 0.53 mm I.D.

Mounting: A position-adjustable bracket for mounting on any GC.

Utility Requirements: The Cryofocusing Module uses:
- 115V/230V (± 10%) at 50 - 60 (±1%) Hz frequency; 600 VA power.
- Liquid nitrogen as coolant, supplied at 20 to 70 p.s.i.g. pressure.

Fuse Ratings: 5A Rectifier Fast Blow Fuse/250V for 120V units
2A non-time delay fuse/250V for 220V units

Size/Weight:

Measurements	Cryofocus	Valve
Width	4.3 in (110 mm.)	4.5 in (114 mm.)
Depth	4.3 in (110 mm.)	2.4 in (70 mm.)
Height	8.8 in (220 mm.)	4.2 in (108 mm)
Weight	2.5 lb.	1.5 lb.

Table 1-2. **Cryofocusing Module Sizes**

1.6 Safety Precautions

Please read, understand, and follow all the precautions described in this section before you set up, install, or operate the AEROTrap 6000 and any of its accessories. Tekmar is not liable for any damage or injury resulting from failure to follow the instructions in this manual or failure to exercise appropriate care and caution in the installation, operation, checking, and adjustment of the equipment described in this *User Manual*.

1.6.1 Electrical Warning

Both the concentrator and the Cryofocusing Module generate potentially lethal voltage.

⚠ DANGER

- ***Always unplug an instrument from its power source and disconnect all I/O cables before servicing.***
- ***Secure all panels when an instrument is operating. All covers must be closed when the unit is in operation.***

1.6.2 Heater Burns

The AEROTrap 6000 and the Cryofocusing Module both contain heaters. The sample heaters in the 6000 can be as hot as 420° C. when the unit is in operation.

⚠ WARNING

Do not touch a heater when either unit is ON. Touching the heated surfaces could cause a burn.

1.6.3 Coolant Delivery Pressure

The 6000 and the Cryofocusing Module use liquid nitrogen coolant.

⚠ CAUTION

If coolant delivery pressure exceeds 75 p.s.i.g., a relief valve on the cryogenic valve assembly will vent the excess pressure.

2.1 Overview

This section describes:

- The prerequisites and site preparation for an AEROTrap 6000 installation.
- Unpacking and checking your AEROTrap 6000 shipment.
- The major components of the AEROTrap 6000.

Equipment installation and operation will be easier if you use the illustrations to identify and locate the described components on your unit.

2.2 Getting Ready for Installation

Please read the instructions in this section before you begin to assemble the instrument. If you have any questions about site requirements for installing and operating the concentrator, please call the Tekmar Service Department.

2.2.1 Operating Environment

The AEROTrap 6000 operates at temperatures between 19°C to 60°C. with humidity levels between 10% and 90%. Generally speaking, an environment with temperature and humidity that are reasonably constant and comfortable for an operator is an environment in which the concentrator will perform reliably.

⚠ CAUTION

Keep the concentrator away from corrosive substances - gas, liquid, or solid - to avoid material and/or component damage.

The 6000 requires a clear surface area at least 18" (46 cm) deep and 15" (38 cm) wide, with no shelves or overhanging obstructions above. The surface must be able to support at least 40 pounds.

⚠ WARNING

To avoid any type of interference with 6000 operation, maintain at least two inches of unobstructed space around the unit. Move all other equipment outside the two-inch perimeter.

2.2.2 Power Requirements

After selecting and clearing a location for the concentrator, check the availability of the required grounded outlets. The AEROTrap 6000 uses 115V/230V (± 10%) power at 50 - 60 (±1%) Hz frequency, with one grounded, three-pronged receptacle for the main power cord. Each additional accessory you plan to use may also require one or more grounded outlets.

2.2.3 Gas Supply Requirements

Concentrator operation requires the availability of ultra-high purity helium (as sample/sweep gas) and liquid nitrogen (as coolant). Check the following items:

2.2.3 Gas Supply Requirements, cont.

1. Helium purity must be 99.999%, 0.5% hydrocarbon tested.
2. Gas pressure at the source must be high enough to:
   - Allow at least 20 p.s.i. pressure drop at every flow or pressure regulator.
   - Travel the distance from the source to the concentrator.
   - Provide the required gas pressure at the concentrator. 6000 operation requires helium at 20 to 60 p.s.i.g. and liquid nitrogen at 20 to 75 p.s.i.g.

Note: ***For best results, Tekmar recommends using liquid nitrogen at 75 p.s.i.g.***

3. Gas supply tubing diameter depends on the maximum pressure drop allowable for your setup. If the helium and/or nitrogen supplies are close to the concentrator, you may use ⅛" diameter tubing. However, you may want to use larger diameter supply lines, typically ¼", to reduce pressure drop under the following circumstances:
   - The gas supply is a long way from the concentrator.
   - A single source supplies several instruments.
   - A single source will be subjected to high demand for gas.
4. Gas supply tubing lengths must be adequate. Be generous when cutting lengths of tubing for local supply lines; a relatively long coil of tubing between the supply and the instrument allows you to move the instrument (to reach rear cover panels, for example) without disconnecting the plumbing.
5. Gas line fittings and regulators must be the correct size and type. Consult your local gas supplier for type and size of cylinder valves; then select compatible pressure regulators based on the required valves. Keep these considerations in mind:
   - To reduce high source pressures to the pressure required by the concentrator, use high-quality pressure regulators with stainless steel diaphragms. Tekmar recommends using a single, two-stage regulator, rather than two single-stage pressure regulators to meet the concentrator's pressure specification.
   - On/off valves, while not essential, are very useful when mounted on the outlet fitting of a two-stage regulator.
   - Avoid pipe thread connections in your gas supply lines. If you must use them, seal them with instrument-grade Teflon tape.

⚠ CAUTION

Always use instrument-grade Teflon tape to seal thread connections. DO NOT USE pipe dope or lower grades of Teflon tape; volatile materials in the dope and/or low-grade tape will contaminate the tubing.

2.3 Unpacking the Concentrator

Please read the instructions in this section before you begin to assemble the instrument. If you have any questions about assembly, please call the Tekmar Service Department.

⚠ CAUTION

Failure to follow these instructions may void your warranty for components damaged in shipment.

1. Remove the AEROTrap 6000 kit box and the concentrator from the shipping carton. Each concentrator is shipped with a *kit box* and an optional installation kit which contain the parts needed to set up and install the unit. Section 9.0 Service and Parts lists the items in the kit boxes and installation kit.
2. Compare the contents of the kit box and/or installation kit against the packing list that accompanies your shipment. Check for each listed item.
   - If an item is missing, call the Tekmar Customer Service Department toll-free at (800) 543-4461; outside the US and Canada, call (513) 247-7000.
   - If any shipped item is damaged, immediately notify the shipping carrier and the Tekmar Customer Service Department of its condition.
3. Examine the concentrator carefully. If it is damaged, notify the shipping carrier and Tekmar immediately. Do not continue installation until a Tekmar representative authorizes you to do so.
4. Save all shipping materials until you verify that the instrument operates correctly.
5. DO NOT return the concentrator unless authorized to do so by a Tekmar representative.

2.4 Major Components

The AEROTrap 6000 (Figure 2-1) consists of a concentrator unit with a sample tube and heater assembly and an optional hand-held terminal.

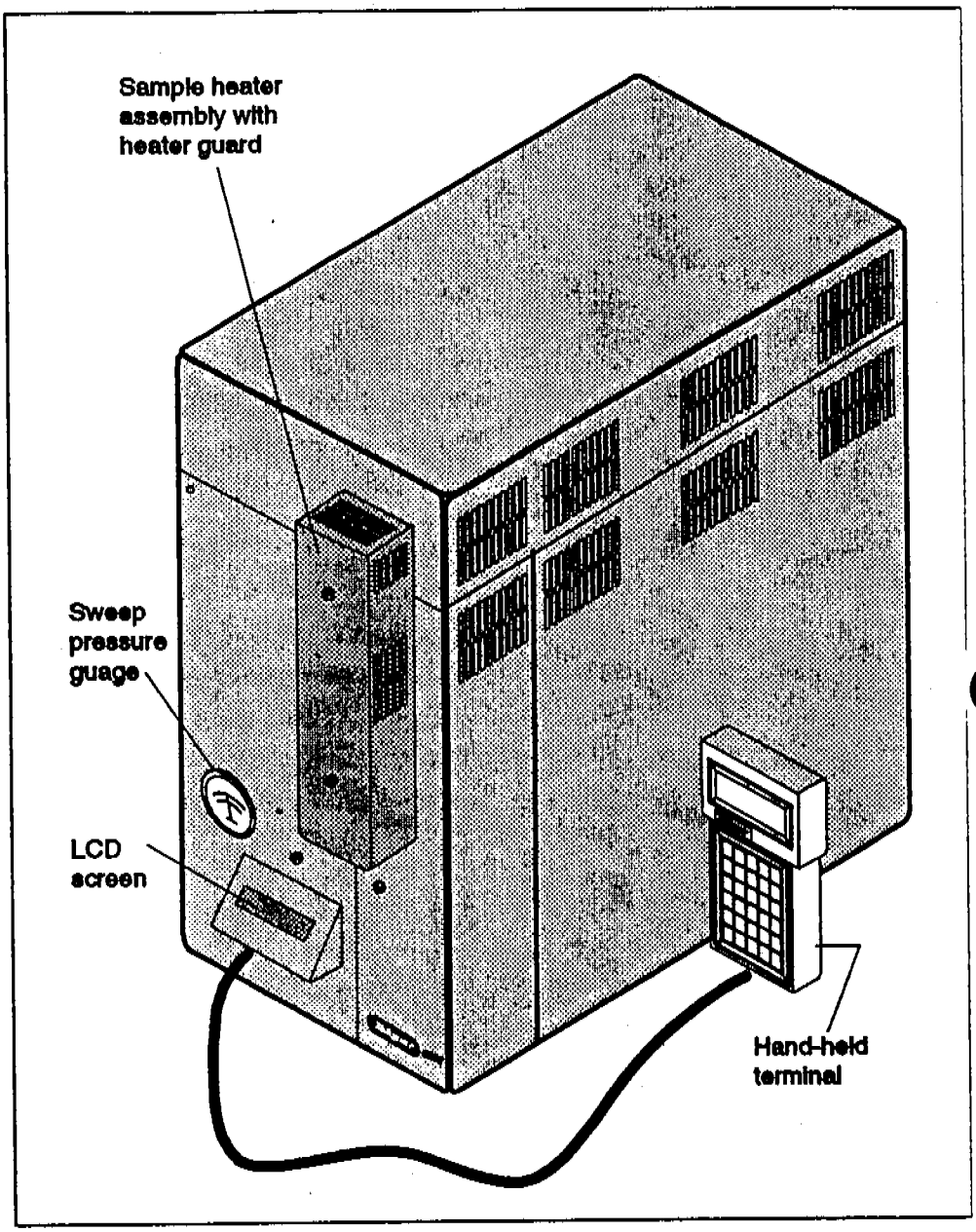


Figure 2-1. AEROTrap 6000

2.4.1 Hand-held Terminal

The hand-held terminal is a four-line, 20-character wide, LCD display and a keypad. The display can consist of *data-entry screens* for programming and entering data, *menu* and *action screens* for selecting options and commands, and *status screens* for viewing during operation.

Section 5.0 Using the Terminal Keypad and Screen describes the keypad and screen in greater detail.

2.4.2 Front-Panel Display

The front-panel display provides status information during concentrator operation.

- The Sweep Pressure gauge shows the current sample/sweep gas pressure (in p.s.i.g.)
- The LCD screen displays information about the concentrator's current operating step. The first line displays the step name, the number of the currently active method (or operating sequence), and the number for the position of the currently active sample. The bottom line displays the current measurement for the most significant operating step parameter.

2.4.3 Sample Heater Assembly

The front panel holds a single sample tube-and-heater assembly, as illustrated in Figure 2-2.

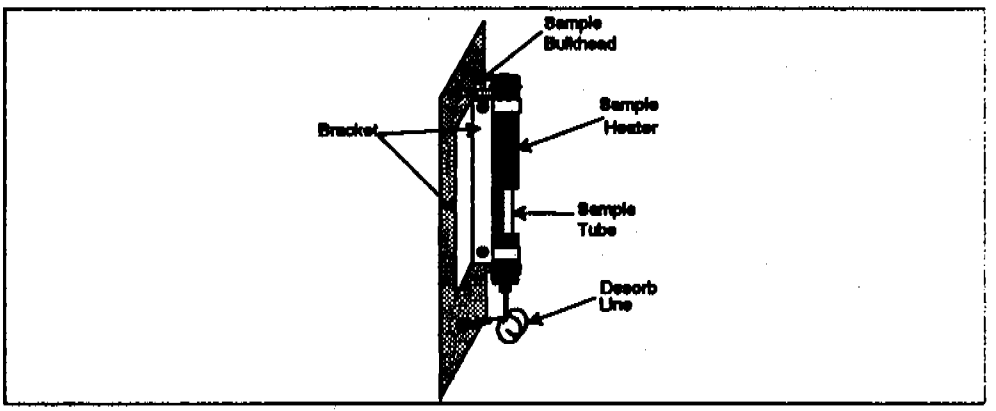


Figure 2-2. **Sample Tube and Heater Assembly**

The 6000 can accommodate either one ¼" x 7" or one ½" x 7" heater, depending on the size of the sample tube to be used. The sample bulkhead and heater are mounted on the front panel at the factory; the sample tube assembly is shipped separately for you to attach when you install your concentrator.

A metal shroud covers the sample heater to guard against heater burns. **The sample heater will not be activated unless the heater guard is in place.**

> ⚠ ***WARNING***
>
> ***The heater guard does not cover the desorb line assembly at the bottom of the sample tube. The line assembly can get very hot. DO NOT touch it while the concentrator is in operation.***

2.4 Major Components, cont.

Figure 2-3 shows a right-side view of the AEROTrap 6000 with the outer panels cut away to show the internal trap, bottom of trap, moisture control system, and electronic components.

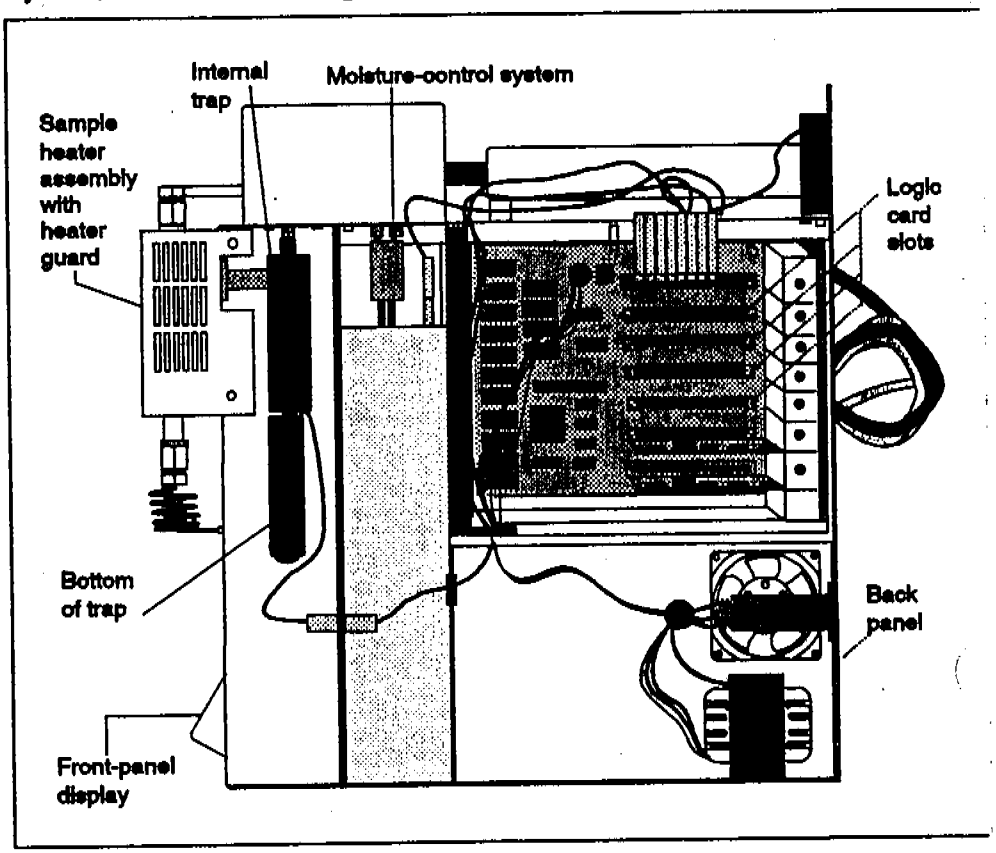


Figure 2-3. **AEROTrap 6000 (Right Side)**

2.4.4 Moisture-Control System

During sampling, moisture condenses inside the sample tube or canister. The moisture-control system is designed to remove moisture from the sample flow before it reaches the GC column.

2.4.5 Internal Trap

A compartment to the right of the sample heater assembly holds the internal trap: a 6-inch long, ⅛" diameter tube packed with glass beads. This trap is cooled with liquid nitrogen (as low as -190°C) to freeze analytes, drop them out of the sample stream, and deposit them in the trap.

2.4.6 Electronic Components

Concentrator operations are controlled by a bank of logic cards mounted in the rear half of the unit (see Figure 2-4). The main logic card holding the controlling ROM chips is in the bottom slot. The board in the top slot reads thermocouple temperatures. The other five slots accommodate logic boards that make it possible for the AEROTrap 6000 to communicate with a personal computer and to operate with one or more autosamplers or other accessories.

2.5 Gas Inlets and Outlets

Figure 2-4 illustrates the concentrator's rear panel, showing the gas inlets for three independent gas flows: sample/sweep gas, carrier gas, and coolant.

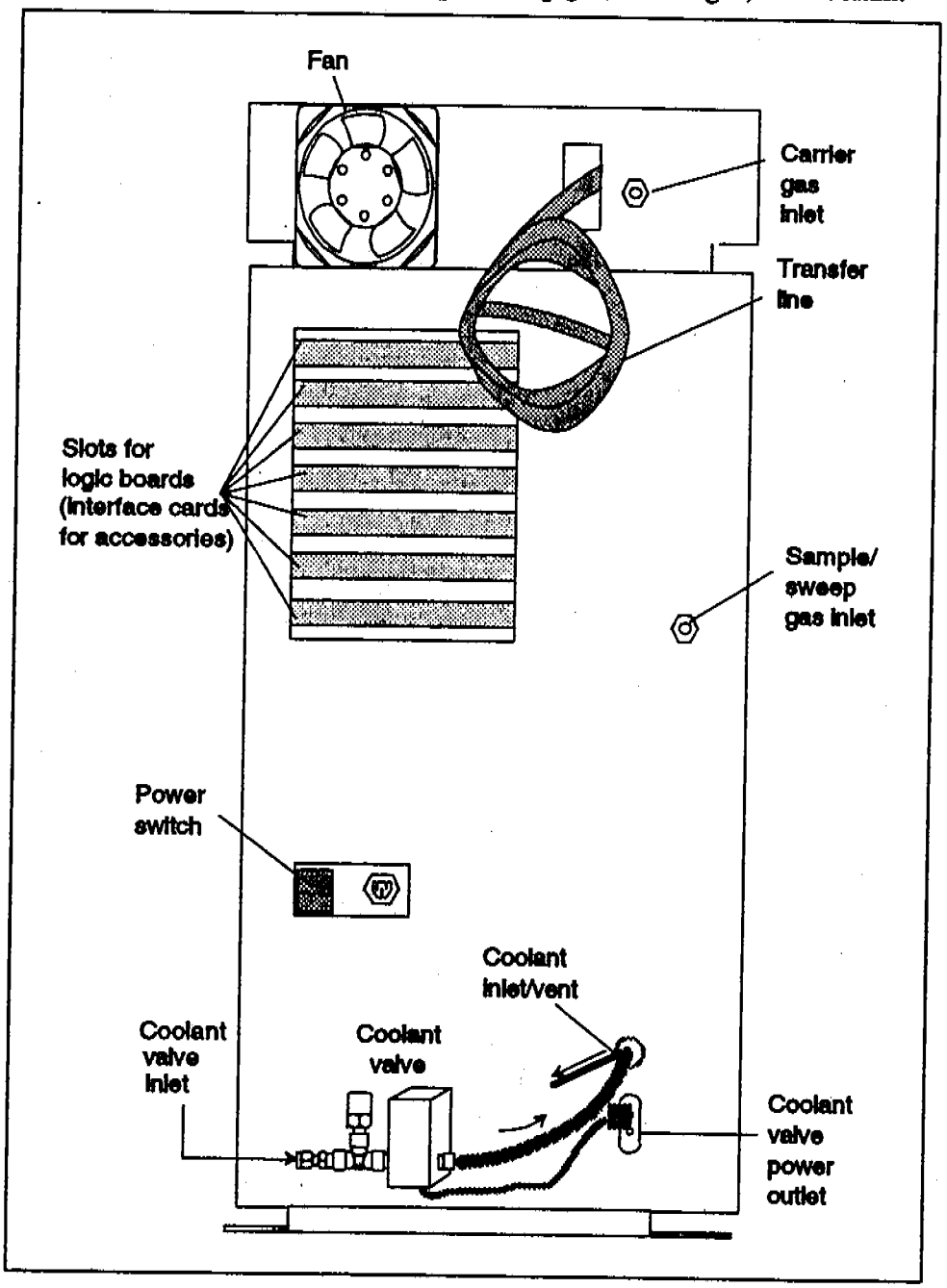


Figure 2-4. AEROTrap 6000 Rear Panel

2.5.1 Sample/Sweep Gas Inlet

Sample/sweep gas (ultrahigh-purity helium) flows through the heated sample tube to carry organic analytes over onto the internal trap. (Nitrogen can be used as sample/sweep gas, but it may contain more impurities.) The helium or nitrogen enters the back panel at the opening labeled SAMPLE.

Depending on the concentrator's operating mode, sample/sweep gas flows through the sample tube (to carry analytes to the internal trap), or it bypasses the sample tube to circulate in a passive circuit and flow out the front-panel sample/sweep gas vent.

Tekmar recommends a sample sweep/sample desorb flow of 40 ml./min. ± 5 ml. for 10 minutes to achieve a 400 ml sample desorb volume when using either 1/4-inch or 1/2-inch sample tubes or traps.

2.5.2 Carrier Gas Inlet

Carrier gas is high-purity helium (or nitrogen) used to desorb volatile analytes off the internal trap and carry them through the transfer line back to the GC. Carrier gas enters the back panel at the opening labeled CARRIER. Depending on the concentrator's current operating mode, carrier gas flows through the trap and carries volatile analytes over to the GC, or it makes a passive circuit through the concentrator and returns, unchanged, to the GC through the transfer line.

2.5.3 Coolant Inlet and Outlet

Liquid nitrogen coolant enters the concentrator through the coolant inlet on the back of the unit. The inlet line is attached to a coolant valve which is supplied with the 6000. The coolant line runs over to the area of the internal trap; then it exits at the coolant vent.

2.6 6000 Valves and Lines

The valves visible from the top of the unit are:

- Two adjustable *regulating valves* near the back of the unit. They control the pressure and flow of sample/sweep gas entering the 6000 through the sample/sweep gas inlet.
- The *sample sweep* and *sample bypass valves*. Sample/sweep gas flows from the flow controller to the sample sweep valve. When the sample valve is closed, sample/sweep gas flow is cut off. An open sample sweep valve directs flow to the sample bypass valve, which routes it either to the sample tube or to the sample tee.
- The *sample tee* accepts flow from the sample tube or from the sample bypass valve and directs it to the six-port valve.
- The *six-port valve* inside the valve oven has two settings that control the direction of sample/sweep and carrier gas flow through the concentrator.

Figure 2-5 shows a top view of the 6000, with the top panel removed to show the sweep flow and sweep pressure regulating valves, the valve oven, six-port valve, sample tee, and transfer line to the GC.

2.6 6000 Valves and Lines, cont.

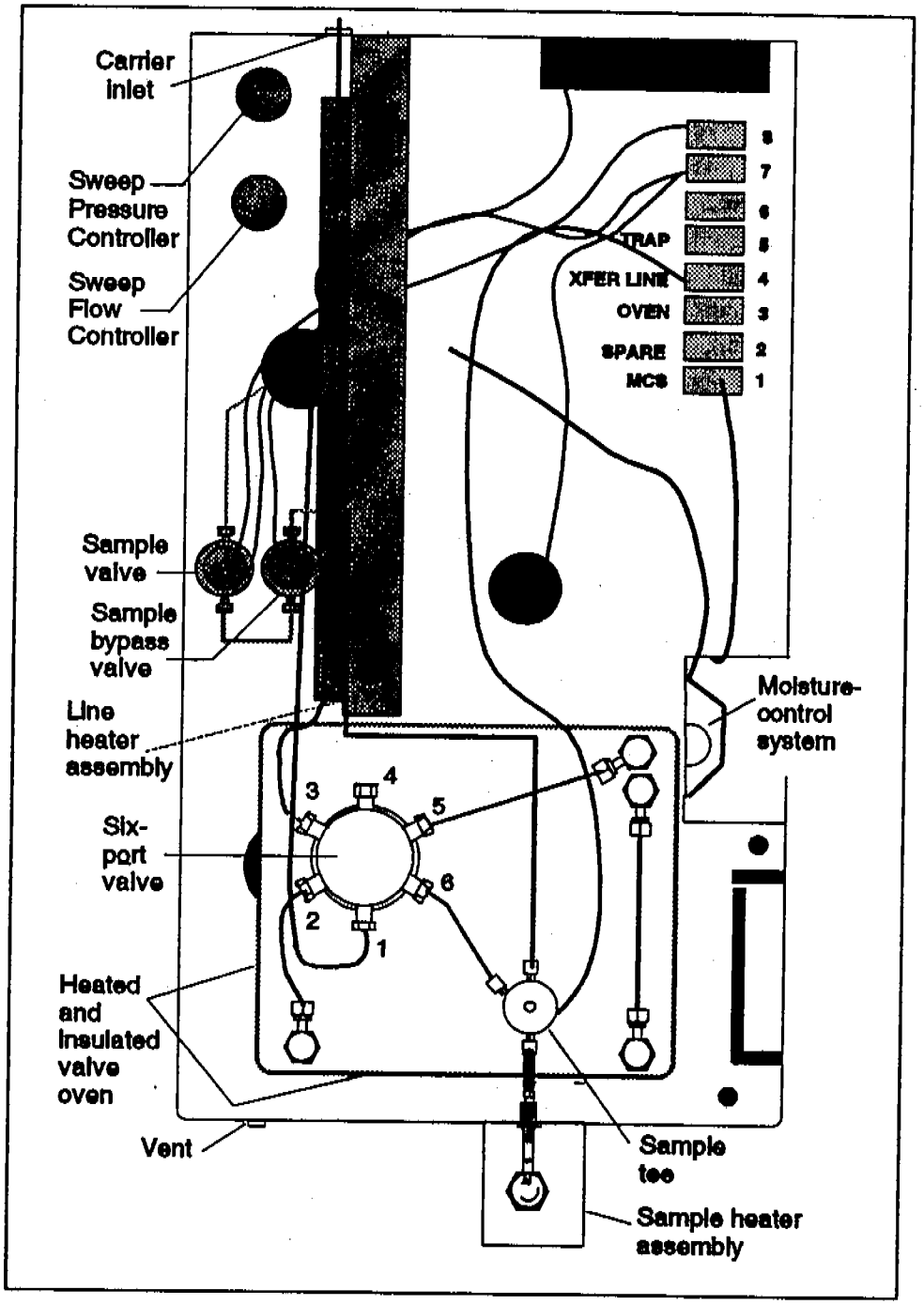


Figure 2-5. AEROTrap 6000 (Top View)

Please refer to Section 4.0 **Understanding Operating Steps** for a description of steps that control operation of the valves and lines that direct sample/sweep gas, carrier gas, and coolant flow.

2.7 Autosamplers

The AEROTrap 6000 can operate with one or two autosamplers to process up to 32 samples automatically. For instructions about using the AEROTrap 6000 with the AEROTrap autosamplers, please refer to the *AEROTrap 6016/6032 User Guide*.

2.8 Cryofocusing Module

If your GC uses narrow-bore capillary columns (0.32 mm ID or smaller), Tekmar recommends using a *Cryofocusing Module* (available as a separate purchase) with the AEROTrap 6000.

3.1 Overview

This section provides instructions for:

- Connecting the AEROTrap 6000 to the GC (electronically and pneumatically).
- Installing a Cryofocusing Module and other accessories.
- Leak-checking the installation.

Table 3-1 outlines the steps to follow to set up the 6000 and refers you to sections of the *User Manual* that will help you.

For Instructions to:	Read this section:
Understand the 6000's general operation.	1.3 Concentrator Functions 1.4 System Configurations
Select a location for the installation.	2.2.1 Operating Environment
Check utility requirements for the 6000 and the Cryofocusing Module (if required)	2.2.2 Power Requirements 2.2.3 Gas Supply Requirements
Unpack the 6000 and inspect the components.	2.3 Unpacking the 6000 2.4 Major Components 2.5 Gas Inlets and Outlets 2.6 Valves and Lines 2.7 Autosamplers 2.8 Cryofocusing Module
Install the sample tube assembly.	3.3.3 Installing the Sample Tube
Make pneumatic connections.	3.2.1 Connect the Sample Gas Line 3.2.2 Install the Transfer Line 3.2.3 Connect to the GC and Carrier Gas Supply 3.2.4 Connect the Coolant Lines
Make electronic connections	3.4.1 Install Logic Cards 3.4.2 Connect to Accessories 3.4.3 Connect to the GC
Leak-check the system.	3.5.1 General Instructions 3.5.2 Leak-check Procedures

Table 3-1. Set-Up Instructions

3.2 Making Pneumatic Connections

The 6000 requires three independent gas flows:

- *Carrier gas* flows from the GC to the carrier gas inlet on the 6000, through the 6000, and back to the GC via a heated transfer line.
- *Sample/sweep gas* flows from the sample gas source to the 6000 sample inlet, through the sample tube, over the internal trap, and out the 6000 vent).
- *Coolant gas* (liquid nitrogen) enters the 6000 through the coolant inlet, flows over to the area of the internal trap, and exits through the coolant vent.

You may use a single gas supply as the source for both sample/sweep and carrier gas; however, the flows MUST be independent of each other. Figure 3-1 illustrates a GC connected to a carrier gas supply. You can tap into the carrier gas supply line to provide carrier and sample/sweep gas for the 6000.

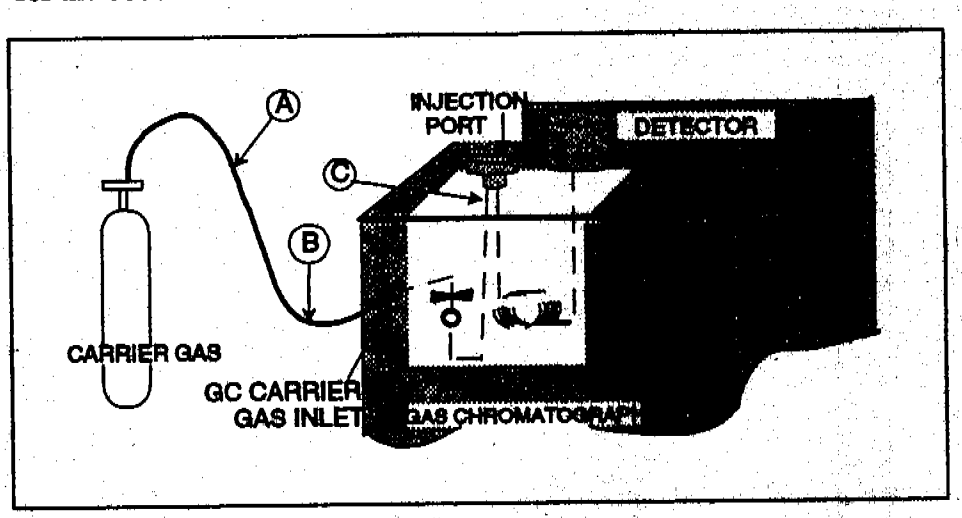


Figure 3-1. Gas Chromatograph Connections

The following sections tell you how to connect the 6000 and the GC pneumatically:

- To provide sample/sweep gas to the 6000, tee off the supply line at point A (Figure 3-1). Follow the instructions in Section 3.2.1.
- To install the transfer line, follow the instructions in Section 3.2.2.
- To provide carrier gas flow and connect the 6000 to the GC, cut the gas supply line at points B and C (Figure 3-1) to divert carrier gas flow through the 6000 and back to the GC via the 6000 transfer line.
  - If you will use a Cryofocusing Module or a direct column connection, follow the instructions in Section 3.2.3.1.
  - If you want to keep the GC injection port free for direct injections, follow the instructions in Section 3.2.3.2.

3.2.1 Connect the Sample/Sweep Gas Line

Sample/sweep gas is usually supplied via a tee union from the tank supplying the GC carrier gas.

1. If there is no tee in the carrier gas supply line to the GC, install one (as illustrated in Figure 3-2).
2. Run the sample/sweep gas line from the tee to the fitting marked SAMPLE in the concentrator's rear panel.

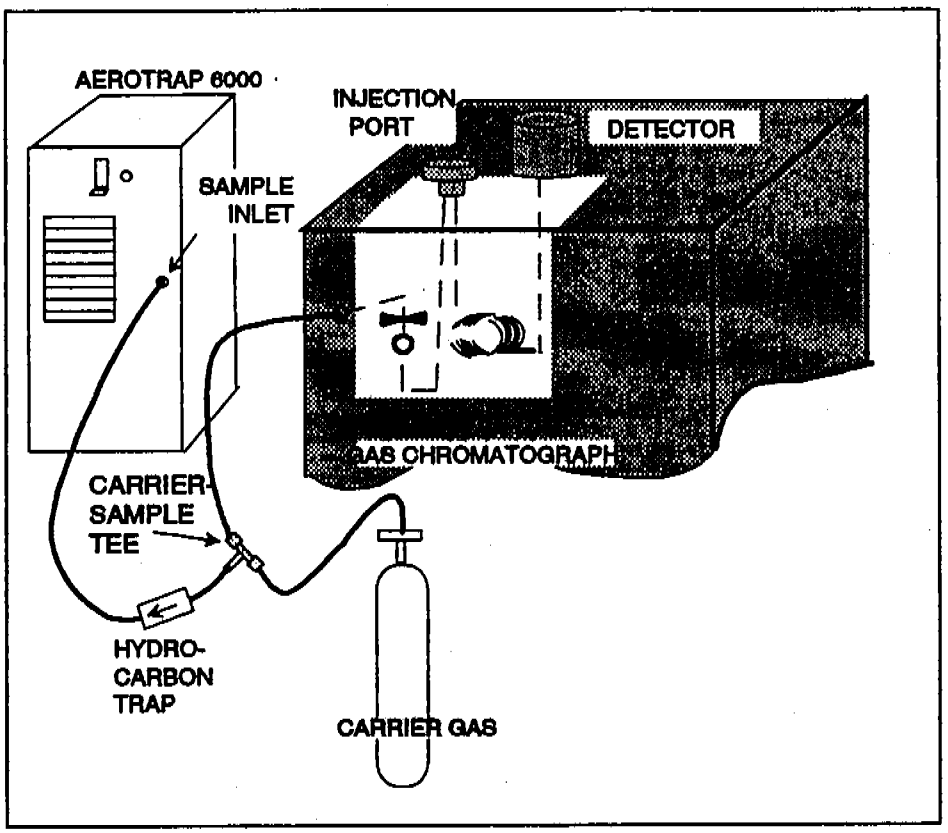


Figure 3-2. Connecting to a Sample Gas Supply

Note: ***If there is no hydrocarbon trap on the carrier gas supply, install the trap provided in the 6000 kit box, as shown in Figure 3-2.***

3.2.2 Install the Transfer Line

A fused-silica transfer line carries desorbed analytes from the 6000 internal trap to the GC. The transfer line (provided in the 6000 kit box) fits inside the line heater assembly (see Figure 3-3). To install the line:

1. Remove the top covers.
   - Loosen the two 1/4-turn screws on the right-front panel.
   - Slide the panel forward and then to the right to remove it.
   - Loosen the two ¼-turn screws on the sample heater cover; then pull the cover forward to remove it.
   - Slide the top panel forward; then lift it up and off.
   - Loosen the thumb screw on the front of the valve oven; then lift the oven cover to remove it.

3.2.2 Install the Transfer Line, cont.

2. Assemble the transfer line.
   - Uncoil the fused-silica tubing from the kit box. The transfer line is in the kit box: P/N 14-0539-002 is 0.32 mm I.D.; P/N 14-2072-002 is 0.53 mm I.D. (for use with a megabore column).
   - CAREFULLY slide the fused-silica tubing through the line heater assembly past the end of the line heater. Figure 3-3 illustrates the positions of the line heater assembly and the valve oven.

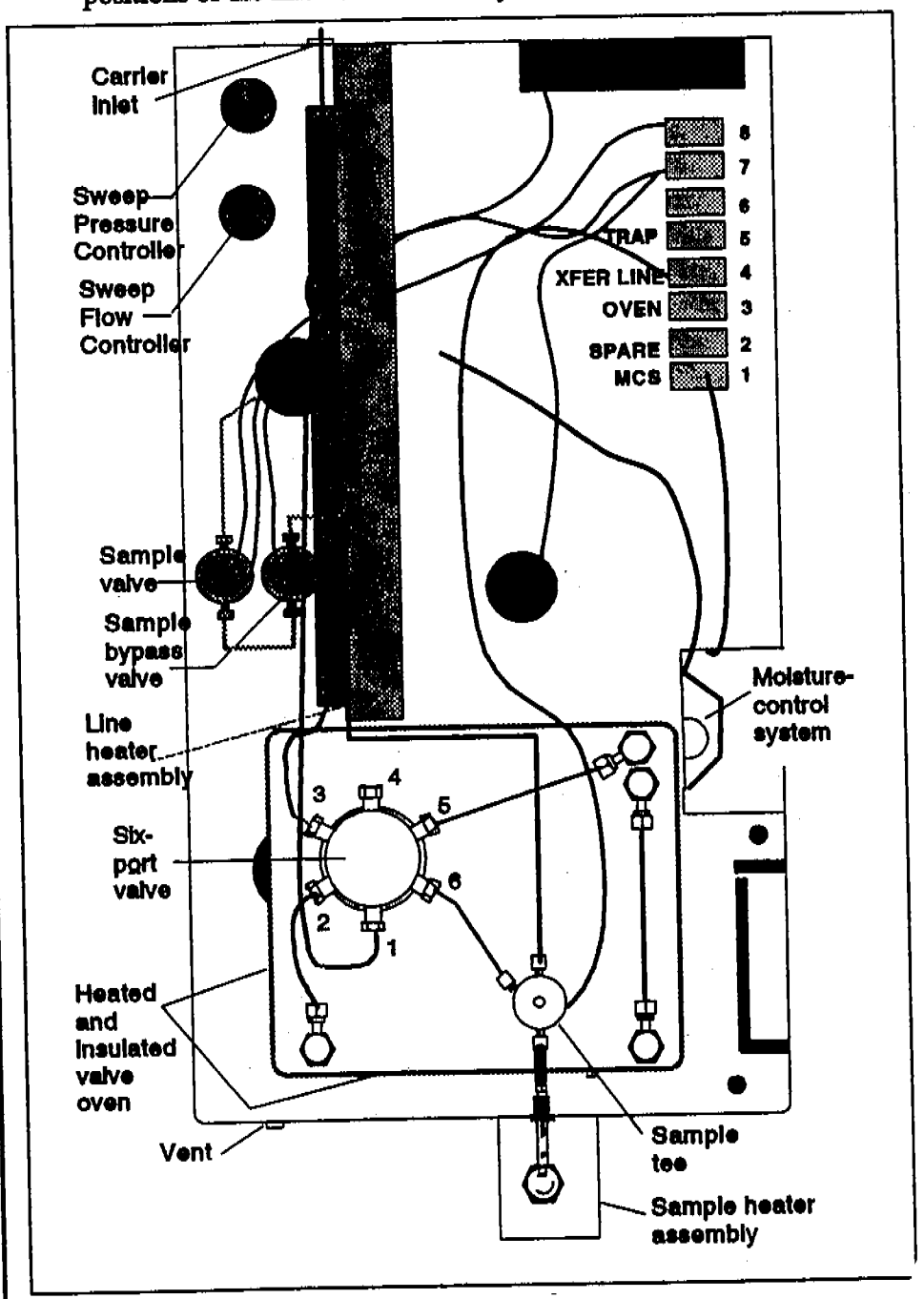


Figure 3-3. Installing the Transfer Line

3.2.2 Install the Transfer Line, cont.

> **⚠ CAUTION**
>
> ***BE VERY CAREFUL when you handle fused-silica tubing. Do not bend the tubing too far or too sharply; it will fracture.***

3. Slide a 1/16" Valco nut and a graphitized vespel ferrule (both included in your kit box) onto the tubing, as illustrated in Figure 3-4.

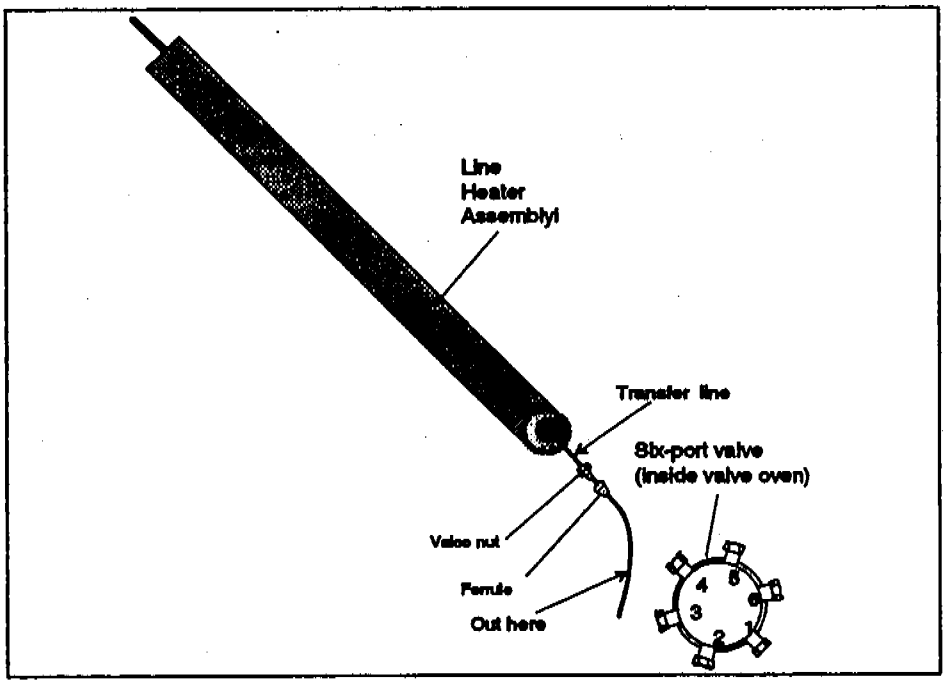


Figure 3-4. **Fused-silica Tubing and Fittings**

4. Use a diamond-tipped pencil or razor blade to score the tubing about 1 inch from the end (as shown in Figure 3-4).
5. Bend the tubing from the side opposite the score until it breaks. Check the cut to make sure it is smooth and even.

> **⚠ CAUTION**
>
> ***The cut must be smooth and even. It is important to USE A MAGNIFYING GLASS to check for smoothness.***

6. Insert the transfer line into the open port (port 4) of the six-port valve. Slide the fittings into the port and tighten them to a quarter turn past finger-tight.

3.2.3 Connect to the GC and Carrier Gas Supply

When you connect the 6000 to the gas chromatograph, you can:

- Make a direct-column connection (using an optional Cryofocusing Module, if desired), or
- Connect to the GC carrier gas inlet and leave the injection port free for direct sample injections.

3.2.3.1 Making a Direct-Column Connection

Figure 3-5 shows the connections required to make a direct-column connection to the GC, either with or without the optional Cryofocusing Module. (If you plan to use a Cryofocusing Module, you must make a direct-column connection to the GC.) Because the narrow-bore (0.32 mm or less) columns used for most air applications require the use of a Cryofocusing Module, direct-column connection to the GC (as illustrated in Figure 3-5) will be the most common configuration.

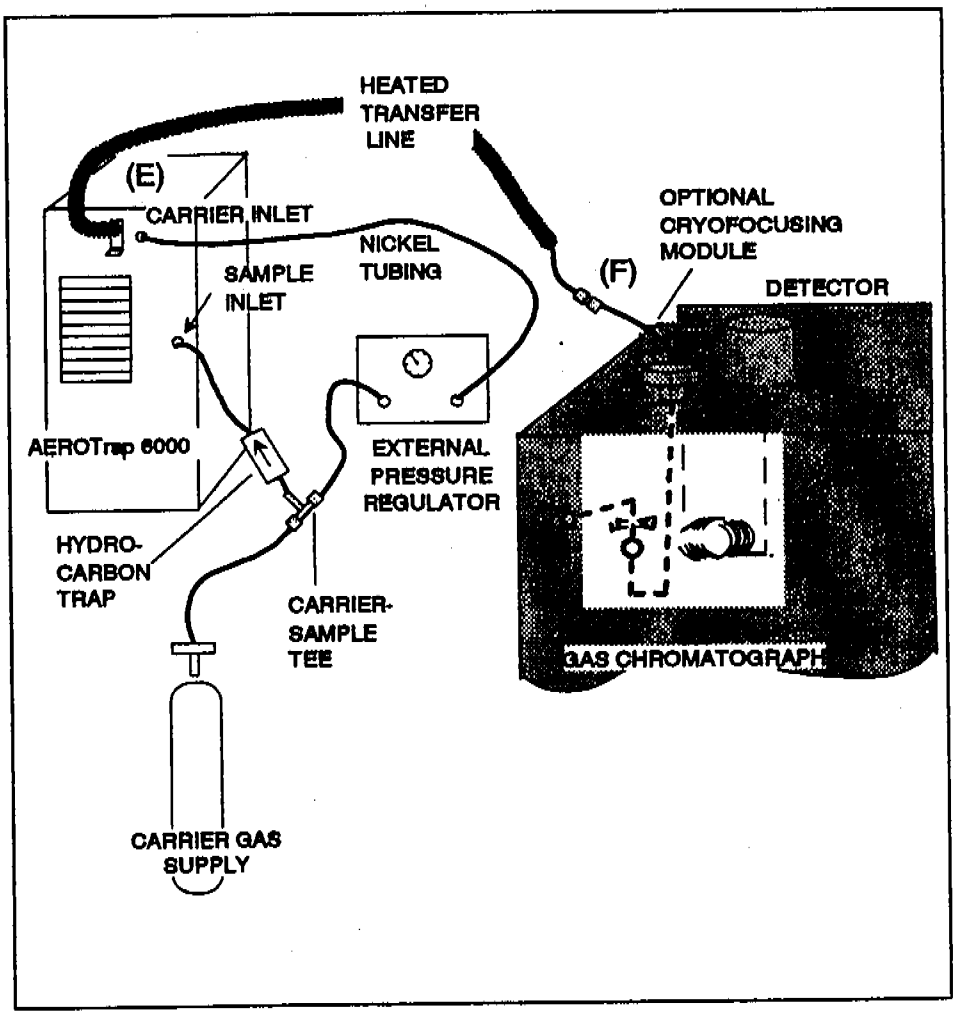


Figure 3-5. Direct-Column Connections to the GC

3.2.3.1 Making a Direct-Column Connection, cont.

To make a direct-column connection:

1. Make sure the GC is not hot; allow it to cool down to room temperature.
2. Since this configuration removes carrier gas flow from the GC pneumatic control, you must install an external pressure regulator (Tekmar P/N 14-3938-000, or equal) between the gas supply source and the carrier gas inlet to the 6000.
   - Disconnect the carrier gas line from the GC and run it to the inlet of the external pressure regulator.
   - Connect the outlet of the regulator to the carrier gas inlet on the 6000 rear panel (at point E).
4. Select an injection port. Remove the nut, septum, and liner. Run the column up through the injection port.
5. Using a zero dead volume union, connect the column to the transfer line from the 6000 (at point F).

Notes:

1) If you use the AEROTrap 6000 with a Cryofocusing Module, connect the transfer line to the Cryofocusing Module, not directly to the GC. Please refer to the Cryofocusing Module User Guide for installation instructions.

2) Be sure that the line heater assembly on the transfer line is as close to the injection port as possible to minimize cold spots. As an alternative, the transfer line can pass through the injection port with the union in the GC oven.

3.2.3.2 Using GC-Regulated Carrier Gas

When you make the connections illustrated in Figure 3-6, the GC supplies and controls carrier gas flow to the 6000. Using this configuration keeps the GC injection port free for direct sample injections. You cannot use a Cryofocusing Module with the connection configuration shown in Figure 3-6.

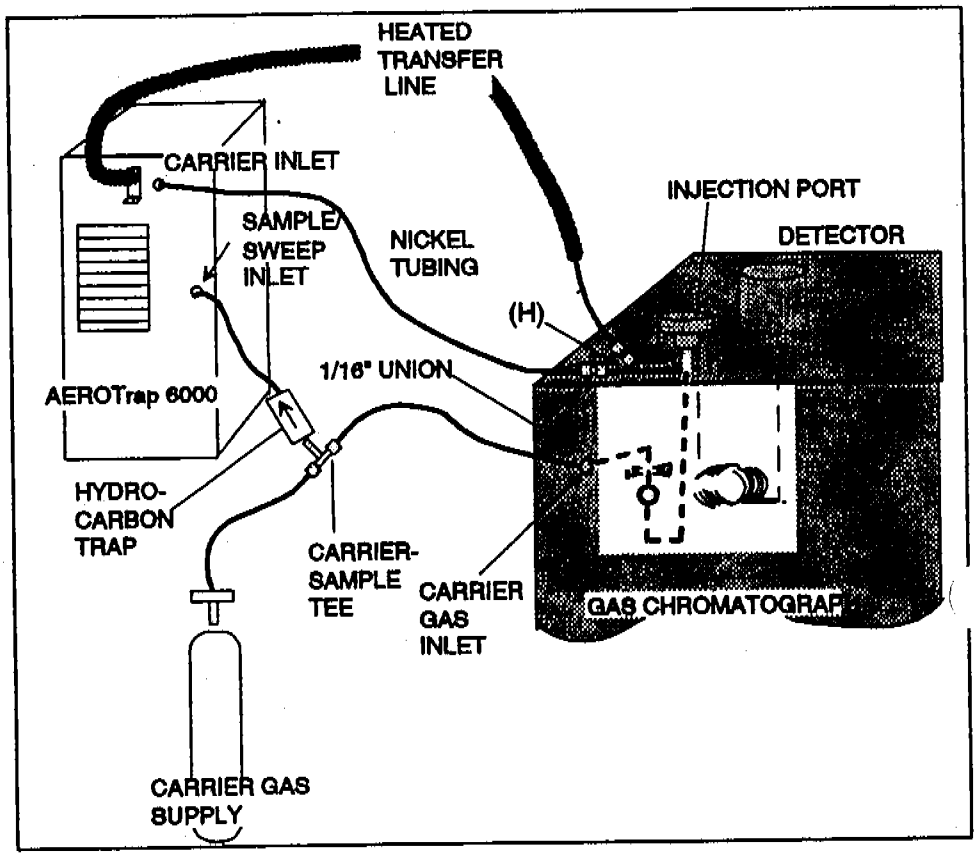


Figure 3-6. **GC-Regulated Carrier Gas Connections**

To make the connections:

1. Make sure the GC is not hot; allow it to cool down to room temperature.
2. Select an injection port. You may have to remove the covers around the port to expose the stainless steel line which supplies carrier gas to the port.
3. Open the line at a point one or two inches from the injector housing (point H in Figure 3-6). (If a union connects tubing from the carrier gas supply to the stainless steel injector port inlet, disconnect the union. If there is no union, cut the line.
4. Connect the line coming from the GC control pneumatics to a 1/16" union.

3.2.3.2 Using GC-supplied Carrier Gas, cont.

5. Connect a piece of 1/16" nickel tubing to the union; connect the other end to the union labeled CARRIER on the back of the 6000.
6. Cut about two inches from the end of the fused-silica transfer tubing.
7. Using the graphitized vespel ferrules and a stainless steel union from the accessory kit, connect the injection port inlet to the transfer line from the 6000 (at point F). With the .32 mm I.D. transfer line, use the 0.5-mm. graphitized vespel ferrule. If you have replaced the .32 mm I.D. transfer line with a 0.53 mm. line (for use with a megabore column), use a 0.8 mm. ferrule.

Notes:

1) If the injection port used to connect to the 6000 has a septum purge function, the septum purge must be turned off or capped.
2) If the injection port is split/splitless, the split vent and septum purge must be capped.

3.2.4 Connect the Coolant Lines

Liquid nitrogen coolant is provided to the 6000 via a coolant valve (Figure 3-7)

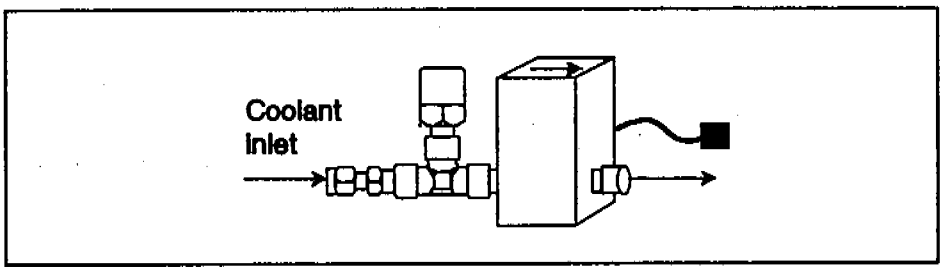


Figure 3-7. **Coolant Valve**

1. Using insulated tubing, connect the coolant supply to the inlet of the coolant valve supplied with the 6000, as shown in Figure 3-7. (The arrow on top of the coolant valve indicates flow direction.)
2. Connect the outlet of the coolant valve to the fitting of the coolant inlet on the 6000.
3. The kit box contains a two-pin interface cable (P/N 14-3105-000) for making an electronic connection between the coolant valve and the 6000. Plug the interface cable into the electrical connector marked COOLANT VALVE on the back of the 6000.

Note:

If space does not allow the coolant valve to be connected directly to the 6000, run a longer insulated line between the two. Although the 6000 can be operated with liquid nitrogen pressures of 20-75 p.s.i.g, we recommend 75 p.s.i.g. for best results. Lower pressures will cause longer cooldown times for the internal trap.

3.3 Installing the Sample Tube

At the factory, before the AEROTrap 6000 is shipped, a glass bead-packed trap is installed in the internal trap area, and the sample bulkhead and heater are mounted on the front panel. A sample tube assembly is included in the kit box. You must install the sample tube assembly before you can use the unit.

To install the assembly:

1. Locate the desorb line and fittings (a length of coiled nickel tubing with fittings at either end) included in the 6000 installation kit box.
2. Loosen the two quarter-turn screws holding the heater guard to the front panel. Then pull the heater guard out to remove it.
3. Attach the desorb line to the union labeled SWEEP (located on the front panel of the 6000, just below the bottom of the sample heater).
4. Locate the sample tube mount fitting and Teflon ferrule set in the kit box. Put the ferrule in the fitting and loosely thread it to the upper sample tube mount.
5. Slide the sample tube up through the heater and into the top nut, making sure the tube passes through the ferrules; then tighten the nut.
6. Make sure the ferrule set is inside the nut on the end of the desorb line; then slide the nut up onto the sample tube and tighten.
7. Replace the heater guard.

⚠ CAUTION

1) ***Make sure the ferrules are in place on the tube. Also inspect the condition of the ferrules every time a tube is replaced to prevent leaks.***

2) ***Be sure to install the blank sample tube supplied in the kit box before you leak-check the unit.***

3.4 Making Electronic Connections

3.4.1 Install Logic Cards

If you are using an accessory like an autosampler or a Cryofocusing Module, it must be connected electronically to the 6000 via cable from a port on the accessory to a logic I/O card in the 6000. The 6000 must also be connected electronically to the GC.

A logic-I/O card for each accessory must be installed in the 6000's logic card slots (Figure 3-8). (The GC logic card comes installed in the 6000.)

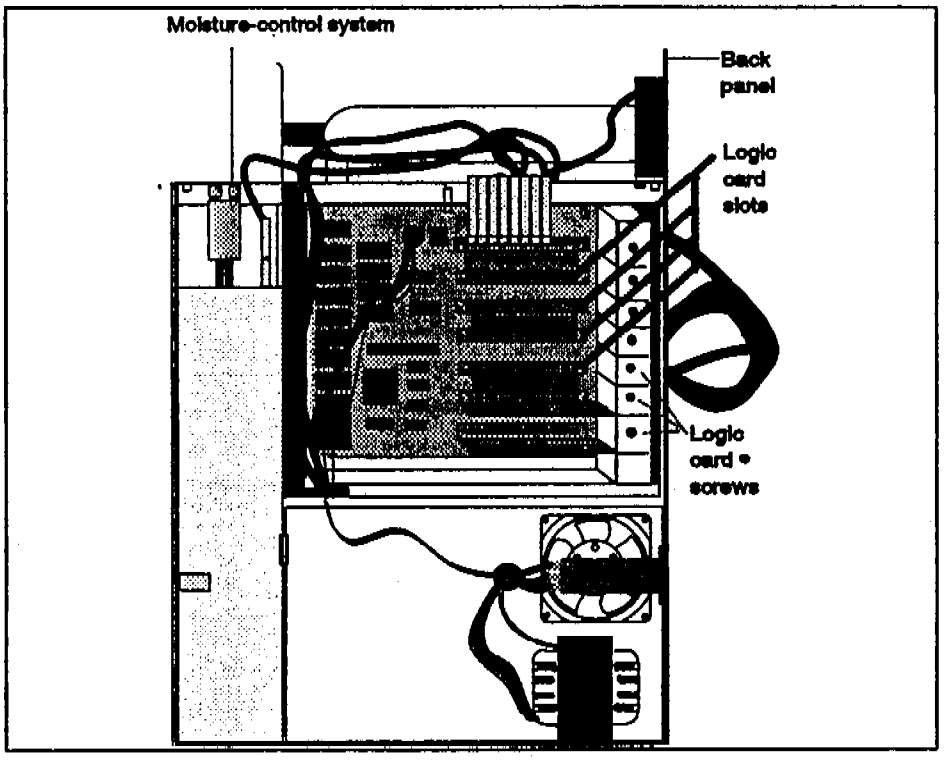


Figure 3-8. **Logic Card Slots**

To access the logic card slots in the 6000:

1. If the right front panel is in place, loosen the two quarter-turn screws on the front of the panel.
2. Slide the panel forward and then to the right to remove it.
3. Loosen the two quarter-turn screws on the sample furnace cover; then pull the cover forward.
4. Slide the top panel forward; then lift it up and off.
5. Remove the screw holding the top of the right side panel and lift the panel; then pull it away from the unit to remove it and expose the logic card slots.

3.4.1 Install Logic Cards, cont.

To install a logic card:

1. Loosen the screw on one of the unused card slot covers. Remove the cover.
2. Insert the logic card into the open card slot. Push it in until the back of the board is flush with the other card slot covers and the card seats in the connector.
3. Tighten the screw on the board to secure it.

3.4.2 Connect to Accessories

With each accessory, you received a logic cable as well as a logic card. To connect an accessory to the 6000:

1. Insert one end of the cable into the port of the appropriate logic card on the 6000.
2. Connect the other end of the cable to the logic board connector in the accessory, following the installation instructions for the accessory.

3.4.3 Connect to the GC

The 6000 comes with a GC interface card installed, as shown in the view of the 6000 rear panel in Figure 3-9.

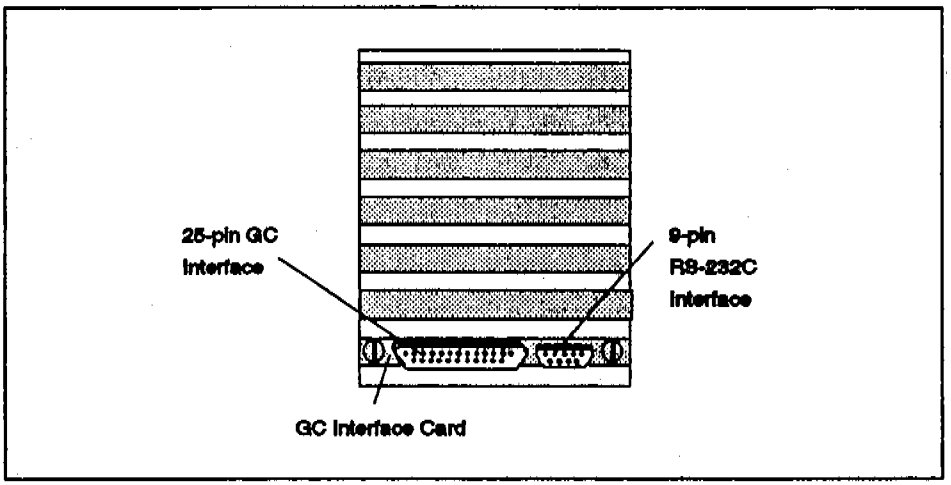


Figure 3-9. **GC Interface Card**

Instructions for connecting a 6000 to a specific model of gas chromatograph accompany the interface cable required for your specific 6000-to-GC setup.

Note: ***If you did not purchase an interface cable, please refer Section 5.5 for specific configuration instructions for your GC.***

3.5 Leak-Checking

3.5.1 General Instructions

To ensure accurate, reproducible results from analytical runs with the AEROTrap 6000, check all fittings for leaks.

Follow these guidelines when you leak-check your AEROTrap 6000 installation:

- Leak-check after you have completely assembled the system and made all pneumatic connections.
- Use an electronic thermal conductivity detector (such as Tekmar Gas Leak Detector, P/N 21-0052-000) to check the fittings. Use helium (not nitrogen) as the pressurizing gas. (Electronic leak detectors do not reliably detect nitrogen.)
- If an electronic leak detector is not available, you may use a 1:1 solution of isopropanol and water. Use the solution sparingly to avoid contamination of the fittings.

⚠ CAUTION

Do not use any type of soap solution (for example, SNOOP or DETECT) to check for leaks. If soap gets in the lines, it will cause increased background and adsorption.

3.5.2 Leak-checking Procedures

Check for leaks in the sample/sweep gas flow lines.

1. Turn the unit on by pressing the power switch on the rear panel. The 6000 performs self tests and goes to Standby (as described in Section 5.4 Getting Started).

1. Remove the top cover (as described on page 3-3) to expose the sweep flow and pressure controllers, as shown in Figure 3-10.
2. Attach a flow meter to the vent fitting on the left-front panel of the 6000 to measure the flow rate of the sample/sweep gas.
3. Use the knob marked SWEEP FLOW to set the sample/sweep gas flow to 40 ml/minute.

3. Using the 1/16" cap nut included in the kit box, cap the vent fitting.
4. Use the knob marked SWEEP PRESSURE to set the gas pressure to 20 p.s.i.g.
5. Using the hand-held terminal (described in Section 5.2), press the STEP key to advance to the Sample Desorb step; then press SHIFT + HOLD.
6. Using an electronic leak detector, check fittings for leaks; tighten as necessary.

3.5.2 Leak-checking Procedures, cont.

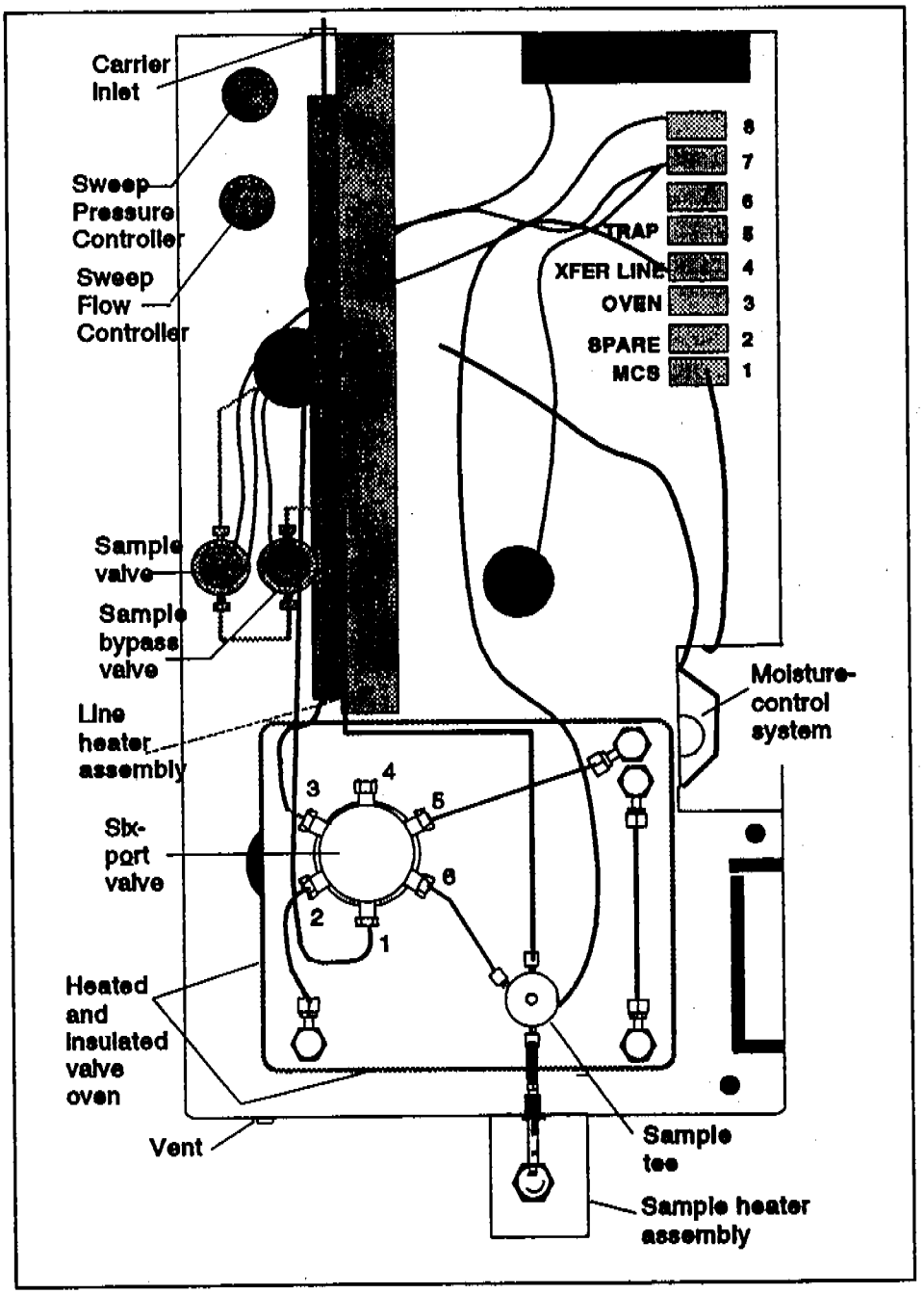


Figure 3-10. **Sweep Flow and Pressure Controllers**

Check for leaks in the carrier gas flow lines. After you have installed the 6000 and made all pneumatic connections, the GC column back pressure gauge should show the same reading as before.

- If the gauge reading is higher than its pre-installation level, check the lines for clogs.
- If the gauge reading is lower than its pre-installation level, there is a leak. Check fittings with a leak detector; tighten as necessary.

4.1 Overview

An analytical run on the AEROTrap 6000 consists of a programmed sequence of steps, called a *method*. At the factory, the AEROTrap 6000 is programmed with 16 methods. Section 6.0 **Programming the 6000** describes the default methods and tells you how to customize methods by changing certain operating parameters to meet your analytical requirements.

This section, **Understanding Operating Steps**, performs the following functions:

- Describes the program steps in the 6000's operating sequence and defines the default values assigned to parameters in each step.
- Tells you which parameters you can program to create customized methods.

4.2 Operating Sequence

The AEROTrap 6000 desorbs analytes from a heated sample, traps and concentrates them in a cryogenically cooled, non-adsorbent trap, and transfers them to a gas chromatograph for analysis.

4.2.1 Steps in an Operating Sequence

When the 6000 is running samples, it goes through the programmed sequence of operating steps listed in Table 4-1.

Step	Purpose
Standby	The main preparatory step for each run; it establishes initial conditions on power-up, re-start, or after a run.
Sample Desorb Ready	Waits for a start signal from the user (via the START key on the keypad) or from an accessory before proceeding to the next step.
GC Synchronize	Adds enough time to the 6000 operating cycle to synchronize it with the GC cycle. When the 6000 is connected to an autosampler and running multiple samples, this step replaces Sample Desorb Ready between samples.
Sample Sweep	Sends gas flow across the sample tube, through the sample pathway to the 6000 internal trap, and out the vent for a specified length of time. If the sample sweep occurs before the internal trap is cooled, the sweeping gas removes water and oxygen from the sample pathway. If the sweep occurs after the trap is cooled, sweeping gas removes oxygen from the sample pathway; any water in the path freezes in the cold trap.
Trap Cooldown	Cools the internal trap to its low-temperature setpoint.
Sample Desorb	Heats the sample and sends sample/sweep gas across the sample tube for a specified length of time at a specified temperature; the gas flow flushes desorbed analytes out of the sample tube and over to the 6000 internal trap.

4.2.1 Steps in an Operating Sequence, cont.

MCS Cooldown	Cools the MCS to its moisture-removal setpoint to prepare it for gas flow from the internal trap to the GC.
Cryofocusing Module Cooldown	Uses the liquid nitrogen valve control on the Cryofocusing Module accessory card to cool the Cryofocusing Module with liquid nitrogen; used only if a Cryofocusing Module is installed.
Trap Desorb Ready	Allows the 6000 to wait for a GC READY signal from the gas chromatograph.
Trap Preheat	Heats the internal trap to a specified preheat temperature before desorbing the analytes.
Trap Desorb/ Sample Bake	Backflushes the internal trap onto the GC; at the same time, the sample tube is heated with the sample and vent valves open, allowing residual contaminants to be baked away from the sample.
Cryo Inject	Transfer the sample from the Cryofocusing Module to the GC. Used only if a Cryofocusing Module is installed.
Trap/MCS Bake	Turns the MCS and internal trap heaters up to bake temperatures, turns on the sample bypass and vent valves, and sends clean gas through the unit to sweep the lines clear of residual moisture and organic contaminants.

Table 4-1. AEROTrap 6000 Operating Steps

4.2.2 Operating Cycle Time

Figure 4-1 illustrates relative operating cycles for the 6000 and the GC. Each unit has a fixed *cycle time*, or number of minutes required to complete an operating sequence.

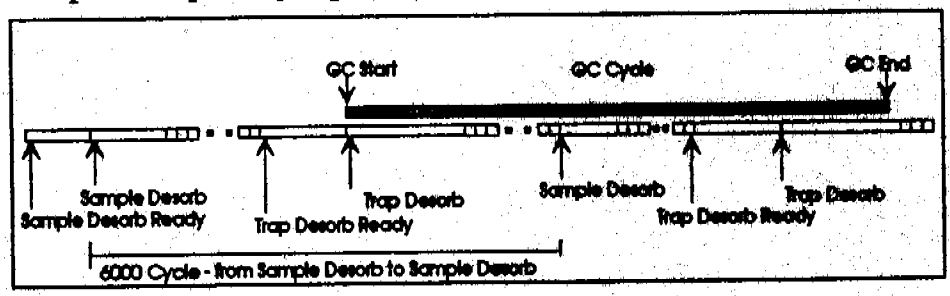


Figure 4-1. GC and 6000 Cycle Times

If the time from GC Start to GC end is longer than the uninterrupted 6000 cycle time from Trap Desorb to Trap Desorb, the 6000 maintains cryogenic conditions on the internal trap and waits in Trap Desorb Ready until it receives a GC READY signal from the gas chromatograph. To minimize the length of time in Trap Desorb Ready (and reduce liquid nitrogen usage), a GC Synchronize step is added between samples for all multiple sample runs, as illustrated in Figure 4-2.

4.2.2 Operating Cycle Time, cont.

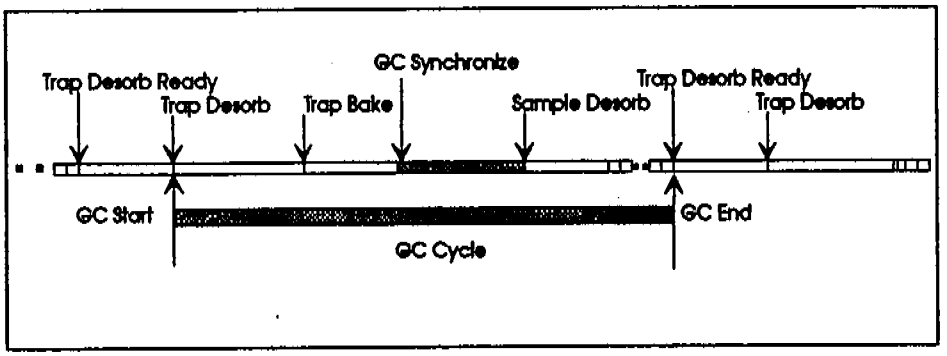


Figure 4-2. **Synchronizing 6000 and GC Cycle Times**

Note: ***GC Synchronize calculations are based on the assumption that liquid nitrogen is being supplied to the 6000 at 75 p.s.i.g. At lower pressures (down to 20 p.s.i.g.), the internal trap takes longer to cool and the GC has to wait for a short time before receiving a start signal from the 6000.***

4.2.3 Operating Step Parameters

Each step is defined by specified valve configurations (which you cannot change) and by time and temperature parameters for heating and cooling. Certain time and temperature parameters are programmable; you can change their values as required for your operation.

4.2.3.1 Valve Configurations

An operating step defines specific flow directions for carrier gas, sample/sweep gas, and coolant by specifying settings for the following valves:

- *Sample/sweep valve*. This valve allows sample/sweep gas flow into the 6000. When it is closed, there is no sample/sweep gas flow.
- *Sample bypass valve*. This valve opens to route sample/sweep gas around (not through) the sample tube. When it is closed, sample/sweep gas flows through the sample tube.
- *Vent valve*. This valve opens to vent the contents of the sample pathway (through the vent on the font of the unit).
- *Six-port valve*. This valve located inside the valve oven has two settings that control the direction of sample/sweep and carrier gas flow through the concentrator.
- *Coolant valve*. This external valve opens to route coolant to the internal trap. When it is closed, there is no coolant flow through the 6000.

Six-Port Valve Settings

The concentrator operates with two separate gas flows:

- Sample/sweep gas enters through the sample/sweep gas inlet at the back of the unit and exits through the front panel vent valve.
- Carrier gas enters through the carrier gas inlet at the back of the unit and proceeds through the transfer line to the gas chromatograph.

4.2.3.1 Valve Configurations, cont.

The six-port valve controls the route traveled by sample/sweep and carrier gas during each step in the operating sequence. Figure 4-3 shows the initial six-port valve setting, called the **Standby** configuration.

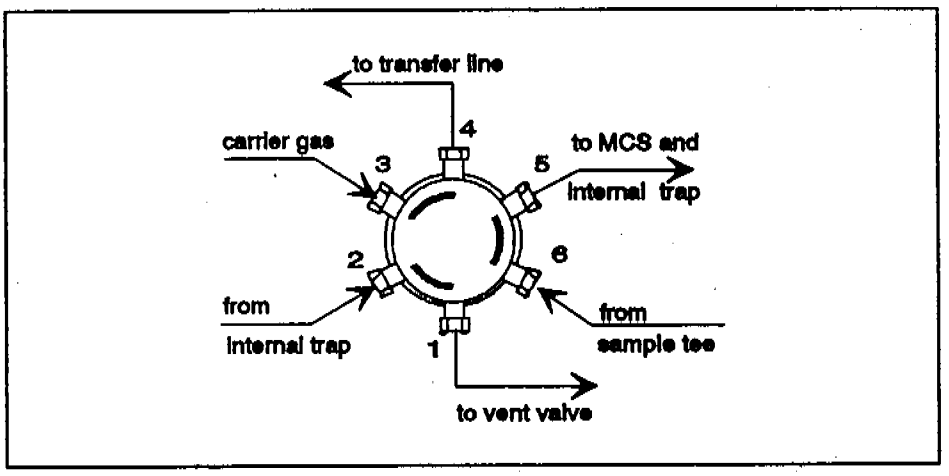


Figure 4-3. **Six-port Valve Standby Setting**

The Standby configuration for the six-port valve is in effect during all operating steps other than **Trap Desorb** and **Sample Bake**.

- Carrier gas enters the six-port valve and exits immediately through the transfer line to the gas chromatograph.
- Sample/sweep gas enters the six-port valve from the sample tee and flows over to the internal trap. From the trap it returns to the six-port valve and exits out the vent valve.

Figure 4-4 shows the six-port valve **Desorb** configuration.

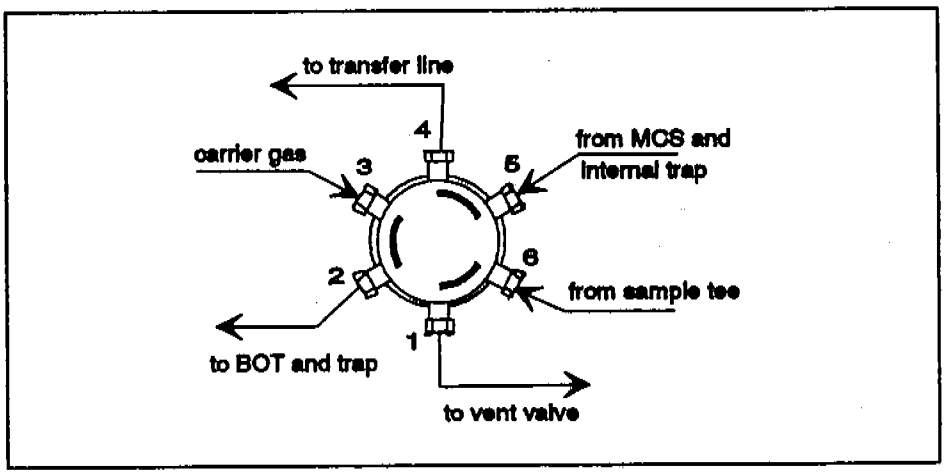


Figure 4-4. **Six-Port Valve Trap Desorb Setting**

The Desorb configuration is in effect during **Trap Desorb** and **Sample Bake**.

4.2.3.1 Valve Configurations, cont.

- Carrier gas enters the six-port valve and flows over to the bottom-of-trap area, up through the trap, back to the six-port valve, and out through the transfer line to the gas chromatograph.
- Sample/sweep gas enters the six-port valve from the sample tee, flows through the six-port valve over to the vent valve, and exits out the vent valve.

4.2.3.2 Time and Temperature Parameters

An operating step also defines the temperature setpoint for heating or cooling and the length of time during which the temperature will be maintained at setpoint. You can program custom methods that specify your required values for the time and temperature of heating and/or cooling the following components:

- *Sample tube heater* on the front panel.
- *Six-port valve and tee* in the valve oven.
- *Transfer line* heater from the 6000 to the GC.
- *Moisture-control system* (MCS) just behind the internal trap.
- *Internal trap.*
- *Bottom-of trap* (line connecting the six-port valve to the bottom of the internal trap).
- *Cryofocusing Module* at the injector port of the GC (if used).
- *Valve and line temperatures* of optional 6016/6032 autosampler(s).

4.3 Understanding Operating Step Parameters

Before beginning a run, the 6000 is in **Standby**. **Standby** is active until the following heated components reach their programmed temperature setpoints:

- Transfer line (*Line Temp*)[1]
- Valve oven (*Valve Temp*)
- Moisture control system (*MCS Line Temp*)
- Internal trap standby temperature (*Trap Standby*)
- Sample tube standby temperature (*Sample Standby*)
- Autosampler valve oven (*60XX Valve*) if an autosampler is present
- Autosampler transfer line (*60XX Line*) if an autosampler is present

Figure 4-5 illustrates carrier and sample/sweep gas flow during **Standby**.

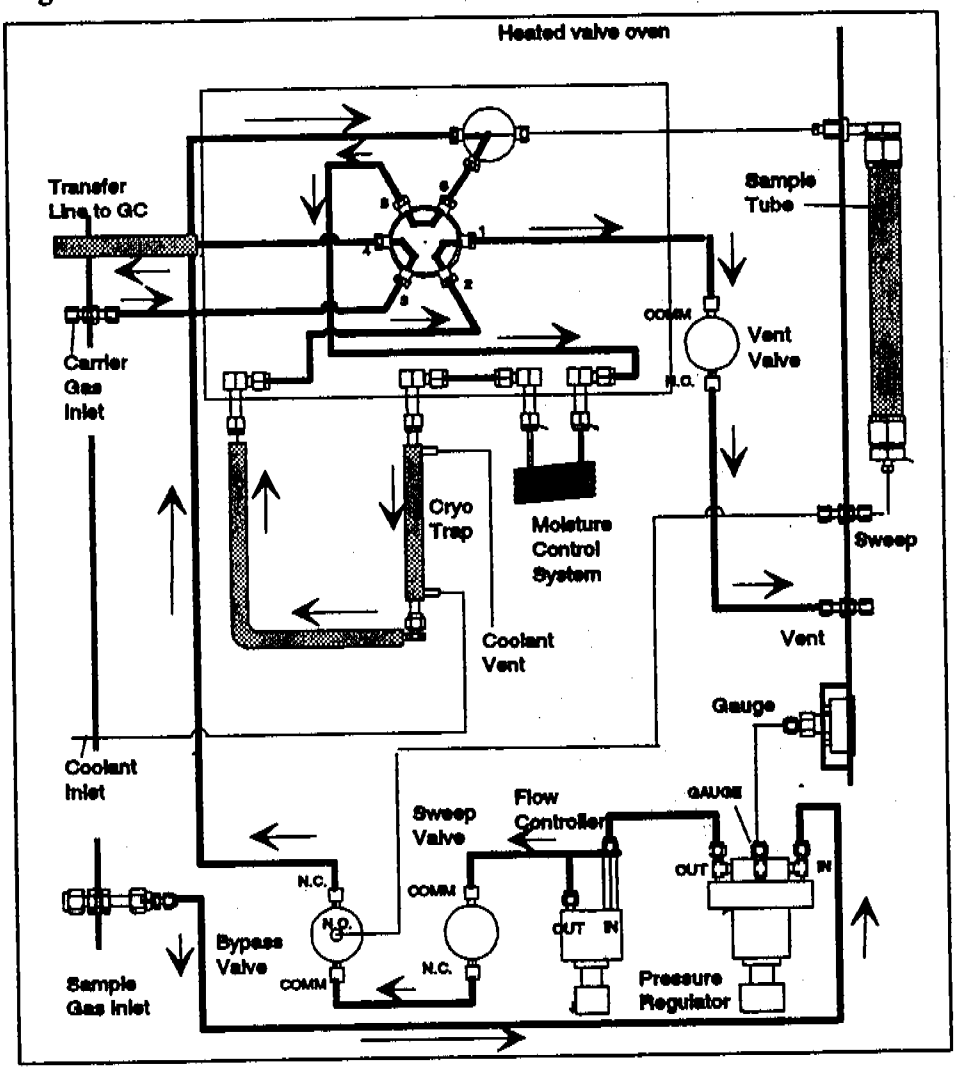


Figure 4-5. **Gas Flow during Standby**

[1]Designations shown in italic type are the parameter names as they appear on the method editing screens.

4.3.1 Sample Desorb Ready

On the first run in a schedule, this step pauses to wait for a START signal from the user or from an accessory. If the 6000 is operating with a multi-position autosampler (like the AEROTrap 6016), the autosampler rotates through sample positions until it reaches the starting position specified in the current operating sequence.

4.3.2 GC Synchronize

Between runs on a multiple sample sequence, **GC Synchronize** replaces **Sample Desorb Ready**. During this step, the 6000 waits before proceeding to the next step. The 6000 calculates the length of the delay (up to 1000 minutes), based on the GC cycle time parameter. Valve settings during this step do not change.

4.3.3 Sample Desorb Flow and Sample Sweep

During **Sample Desorb**, sample/sweep gas flows across the sample tube at a rate of 40 ml./min. ± 5 ml, through the sample pathway to the internal trap, and out the vent for a programmed length of time (*Sample Swp Time*) before the tube is heated. The flow of gas blankets the tube with inert gas. **Sample Sweep** can occur before (*Smpl Sweep Pre-Cool*) or after (*Smpl Sweep Post-Cool*) the internal trap is cooled. A *pre-cool* sample sweep removes water and oxygen from the sample pathway. A *post-cool* sample sweep removes only oxygen from the sample pathway. Because the internal trap is cold during the sweep, any analytes removed by the sweep gas will be trapped again.

4.3.4 Trap Cooldown

Trap Cooldown opens the coolant valve to cool the internal trap to a programmed temperature setpoint (*Trap Cooldown*).

4.3.5 Sample Desorb

During **Sample Desorb**, the sample tube is heated to the programmed setpoint (*Sample Desorb*) while it is flushed with sample/sweep gas for the time specified in the *Sample Des Time* parameter.

Sample/sweep gas enters the sample inlet, flows through the pressure and flow regulators, through the open sample valve to the bypass valve, which sends flow to the sample tube. The heated sample releases volatile analytes, which flow through the sample line and the six-port valve to the internal trap, where they freeze and are held on the cold trap.

4.3.6 MCS Cooldown

This step prepares the MCS for **Trap Desorb** by cooling it to its moisture-removal setpoint (*MCS Des Temp*).

4.3.7 Cryofocusing Module Cooldown

The Cryofocusing Module cools desorbed analytes and focuses them on the head of the column before they are introduced into the GC. Every operating sequence does not use a Cryofocusing Module; this step is not required unless a Cryofocusing Module is installed. Setting the *CryoFocus* parameter to No eliminates the cryofocusing steps from the operating sequence. During **Cryofocusing Module Cooldown**, the cryofocus unit is cooled to its low-temperature setpoint (*CryoFocus Temp*).

4.3.8 Trap Desorb Ready

The 6000 outputs a DESORB READY signal to the GC and waits for a GC READY signal in return. There is no gas flow. Temperature setpoints are maintained, unless the MCS and cryofocuser are cooling to their setpoints (*MCS Des Temp* and *CryoFocus Temp*).

4.3.9 Trap Desorb Preheat

During Trap Desorb Preheat, the internal trap is heated to a specified temperature (*Desorb Preheat*) in preparation for analyte transfer from the trap to the GC. There is no flow through the internal trap during preheat.

4.3.10 Trap Desorb/Sample Bake

During Trap Desorb (Figure 4-6), the six-port valve rotates and the internal trap heats to a temperature setpoint (*Trap Des Temp*) for the time specified in *Trap Des Time*. Gas enters the 6000 at the carrier inlet, flows through the six-port valve over to the internal trap, through the trap and MCS, and back to the six-port valve, where it exits through the transfer line. As the gas backflushes the trap, it carries released analytes over to the GC.

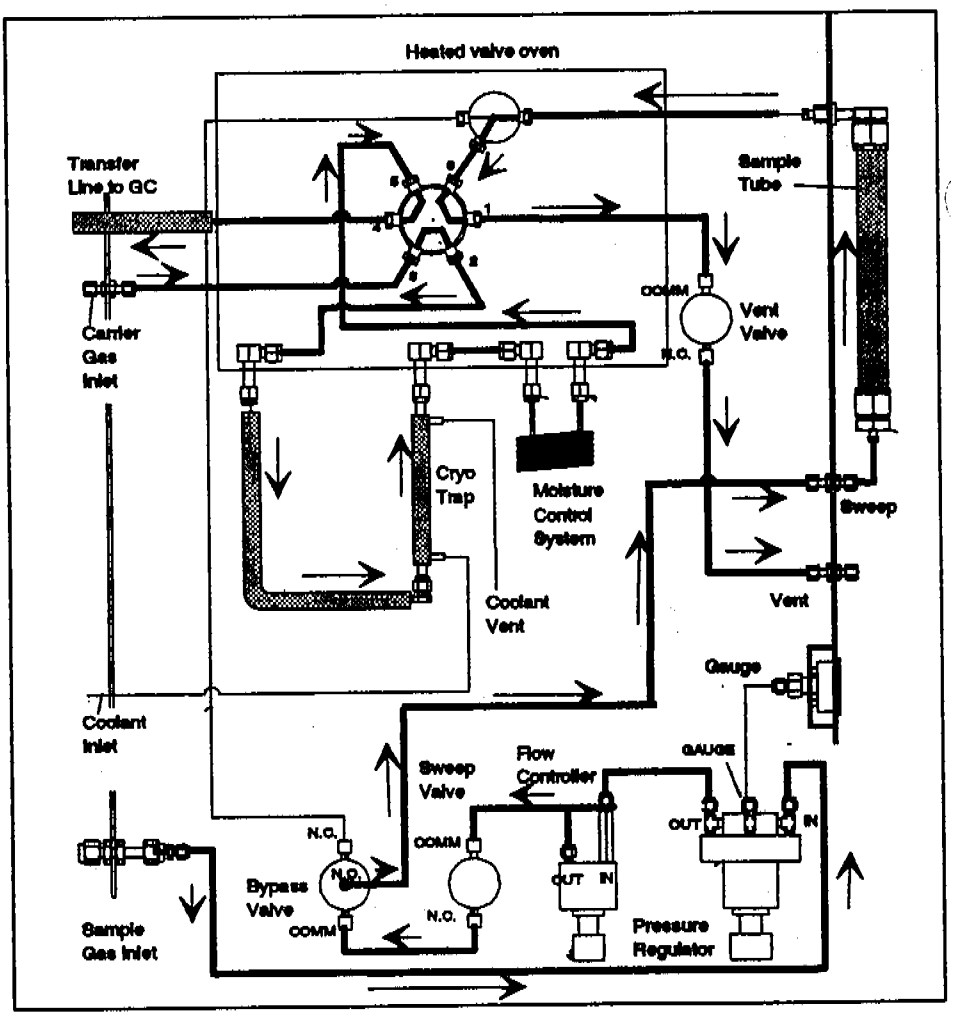


Figure 4-6. Trap Desorb/Sample Bake

4.3.10 Trap Desorb/Sample Bake, cont.

Sample Bake occurs at the same time as **Trap Desorb**. While the internal trap is being backflushed, the sample tube on the front panel is heated to a programmed *Sample Bake* temperature. Sample/sweep gas flows from the sample inlet through the sample valve to the sample bypass valve. The bypass valve directs flow to the sample tube. Gas sweeps through the sample tube to clean it. Leaving the sample tube, the gas goes through the sample tee back into the six-port valve, which directs flow to the open vent valve and out the vent.

Note: ***DO NOT USE THE 6000 SAMPLE BAKE step to condition tubes. This can cause severe contamination of the concentrator unit.***

4.3.11 Cryofocusing Inject

This is a timed step (specified by the *Inject Time* parameter) during which the Cryofocusing Module is heated to a programmed setpoint (*Cryo Inj Temp*). Heating releases the analytes that had been immobilized on the Cryofocusing Module column.

Note: ***Trap Bake (see Section 4.3.12 Trap Bake) and Cryofocusing Inject begin at the same time.***

4.3.12 Trap Bake

Trap Bake cleans out the sample pathway by heating the MCS and the internal trap to their programmed bake-out setpoints (*MCS Bake Temp* and *Trap Bake Temp*) and blowing clean gas through the unit for the length of time specified in the *Bake Time* parameter.

During **Trap Bake**, sample/sweep gas follows the Standby flow path through the unit (see Figure 4-5) to sweep out all moisture and residual analytes. There is no flow through the sample tube during **Trap Bake**.

5.1 Overview

With the 6000's hand-held terminal, you can program and run analytical sequences. This section tells you how to:

- Use the 6000's hand-held terminal.
- Read status screens on the hand-held terminal and the front-panel screens.
- Power-up the 6000 and run self-tests.
- Configure the 6000 to operate with your gas chromatograph (GC).

5.2 Using the Hand-held Terminal

The hand-held terminal consists of a four-line, 20-character wide, LCD display and a 30-key keypad (Figure 5-1).

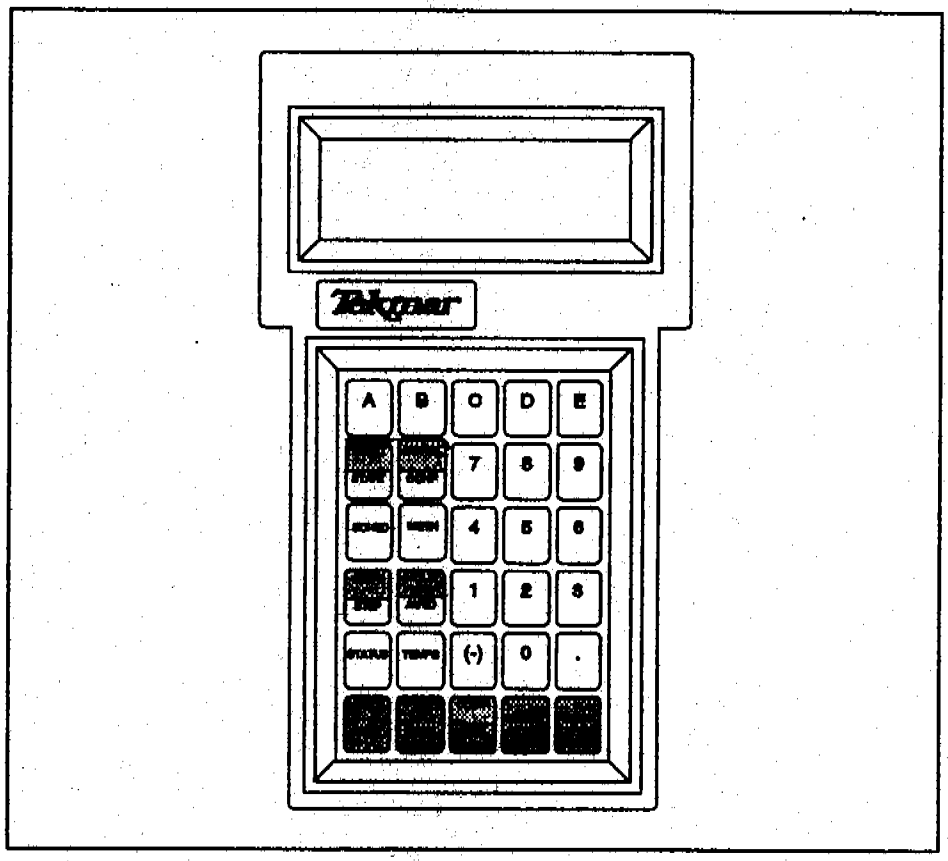


Figure 5-1. **AEROTrap 6000 Hand-held Terminal**

You use the keypad and display screen to communicate with the 6000.

- The four-line *terminal screen* displays data-entry fields for programming, menus for selecting commands, and status information for viewing during operation.
- The *terminal keypad* consists of five variable-function keys, 13 control keys, and 12 numeric keys. You can use the keys to monitor the 6000's operational status and program it to run different operating sequences.

5.2.1 Installing the Hand-Held Terminal

The hand-held terminal comes with an interface cable. To connect the terminal to the 6000, refer to Figure 5-2:

1. Locate the jack on the bottom of the front panel display housing.
2. Plug the end of the cable into the front-panel jack.
3. Plug the other end of the cable into the jack on the bottom of the terminal.

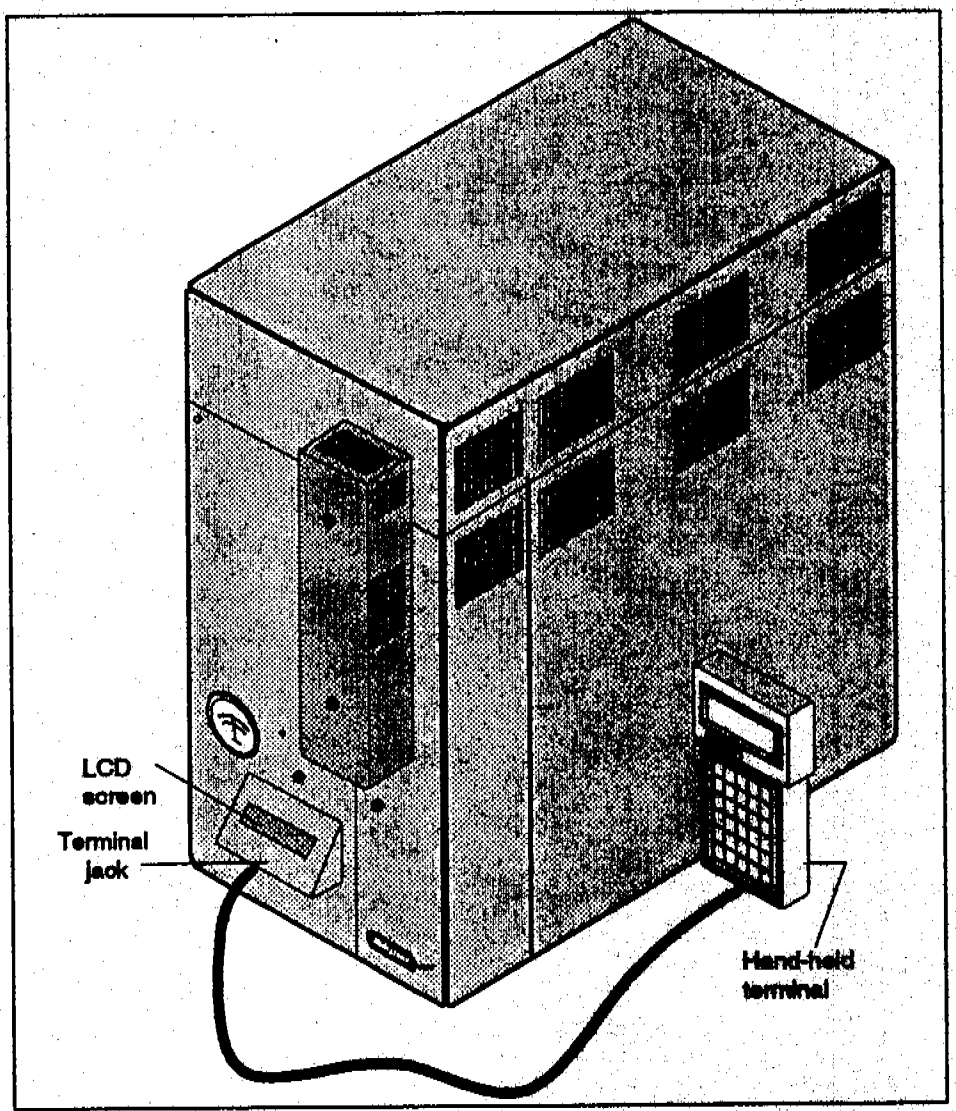


Figure 5-2. Concentrator and Hand-held Terminal

5.2.2 Variable-Function Keys

Keys in the first row (labeled A - E) are used to select options from a screen menu. Their function varies, depending on the options displayed on the current screen. For example:

- From the Setup screen, press A to display system information.
- From the Reset screen, press A to abort a schedule.

5.2.3 Control Keys

The *control keys* consist of:

- Action keys (RESET, START, AUTO, HOLD, STEP, and GO TO). These keys start, control, and stop analytical runs.
- Screen keys (SETUP, CONF, STATUS, SCHED, METH, and TEMPS). These keys display screens that enable you to define operating parameters, set up schedules, and review status and temperature.
- Special keys (NEXT/PREV PAGE, BKSP, CLEAR, and SHIFT). These keys let you scroll through displays or manipulate and save data.

Keys with two-part labels have two functions. To implement the lower-label function, press the control key. To implement the upper-label function, press SHIFT, and HOLD IT DOWN while you press the control key.

5.2.3.1 Action Keys

Table 5-1 defines *action key* functions and refers to the section of the *User Guide* that provides instructions for performing the function.

This key	Performs this function:	Section
RESET	RESET lets you abort a scheduled run, abort the processing of a single sample, rerun a sample, or reset the microprocessor to start-up status. Press and hold SHIFT while you press RESET.	7.5.2
START	START moves the 6000 to the first step in an operating run.	7.3
GO TO	GO TO lets you stop an operating run and immediately go to Standby, Trap Preheat, or Bake. Press and hold SHIFT while you press GO TO.	7.5.1
STEP	STEP moves the 6000 to the next operating step in a program.	7.5.1
HOLD	HOLD prevents it from advancing to the next step. Press and hold SHIFT while you press HOLD.	7.5.1
AUTO	AUTO resumes normal operation after the 6000 has been in HOLD.	7.5.1

Table 5-1. Action Key Functions

5.2.3.2 Screen Keys

Table 5-2 defines *screen key* functions and refers to the section of the *User Guide* that provides instructions for performing the function.

This key	Performs this function:	Section
SETUP	SETUP allows you to access basic system information, set the time and date, and adjust contrast for the status screen. Press and hold SHIFT while you press SETUP.	5.4.4 5.4.5 5.4.6
CONF	CONF displays the Configuration screens that allow you to configure the 6000 to run with your GC model.	5.5
SCHED	SCHED displays the Scheduling screen that allows you to edit and enable *method schedules* (processing timetables that define sample positions and the order in which selected methods will be run) and review the current status of scheduled runs.	7.2.2 7.2.3 7.2.4
METH	METH displays the Select Method screen that allows you to select a method and change its parameters.	6.3
STATUS	STATUS displays a Status screen that shows the current operating step and its controlling parameters.	5.3.2
TEMPS	TEMPS displays the Temperatures screens, which display temperature set points and actual readings for all actively controlled temperature zones.	7.6

Table 5-2. Screen Key Functions

5.2.3.3 Special Keys

Table 5-3 defines *special key* functions.

This key	Performs this function:
NEXT PAGE	For screens that contain more than one screen of data, NEXT PAGE scrolls down to display the next screen full of data.
PREV PAGE	For screens that contain more than one screen of data, PREV PAGE scrolls up to display the previous screen full of data.
CLEAR	CLEAR erases an entry completely. Press and hold SHIFT while you press CLEAR.
BKSP	BKSP deletes the character beneath the cursor.
ENTER	ENTER saves your entry and moves the cursor to the next data-entry field.
SHIFT	SHIFT activates the light-gray labeled functions on two-part control keys. Press SHIFT, hold it down, and press the selected key to execute the *shifted* function.

Table 5-3. Special Key Functions

5.2.4 Numeric Keys

You use the numeric keys 0 through 9, . (decimal point), and - (negative sign) for entering numeric data such as time or temperature parameters.

To enter numeric data:

- Press the desired number keys, including the decimal place and the negative sign, if required.
- Press ENTER.

To clear the last character, press BKSP.

To clear an entry completely, press SHIFT + CLEAR.

5.3 Using Screens

The 6000 uses several types of display:

- A two-line, front-panel status display
- Status screens (on the hand-held terminal).
- Menu screens (on the hand-held terminal
- Action screens (on the hand-held terminal)
- Data-entry screens (on the hand-held terminal).

5.3.1 Front-Panel Status Display

During each operating step of a run, the front panel screen continuously displays two lines of status information.

5.3.1.1 Temperature Parameter Display

When the temperature setpoint is the controlling parameter for the step, the front-panel screen displays the information illustrated in Figure 5-3.

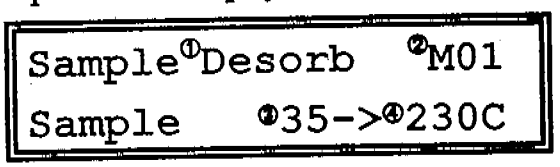


Figure 5-3. Front-Panel Status Screen

① The name of the operating step appears on the first line, at the left margin.

② The number of the currently active method appears on the first line, at the right margin. If the 6000 is running a method schedule, this position shows the currently active method number and currently active sample position. For example, M7P04 indicates that method 7 is running on sample position 4.

③ The name of the heated or cooled component and its current measured temperature appears at the left on the second line. The display updates this value continuously as the temperature changes.

④ The temperature setpoint for the step appears at the right on the second line.

5.3.1.2 Time Parameter Display

When a time setpoint is the controlling parameter for the step, the front-panel screen displays the information illustrated in Figure 5-4.

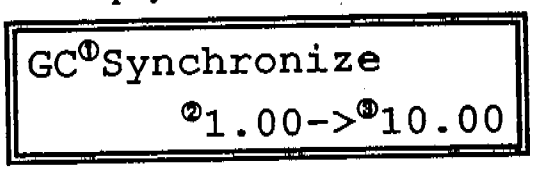


Figure 5-4. Front-Panel Timer Status Screen

① The name of the operating step appears on the first line, at the left margin.

② The elapsed time appears on the second line. The display updates this value continuously.

③ The total time setpoint appears at the right on the second line.

5.3.2 Status Screens

A status screen may display:

- A listing of temperatures for all the actively controlled heated or cooled zones in the 6000. Please refer to Section 7.6 for a full description of the **Temperature Status** screen.
- Information about the current status of a run. Each operating step has a corresponding operating status screen. You can check the progress of the run by reviewing the current operating status screen. This section describes the operating status screens.

5.3.2.1 Displaying Operating Status Screens

To display an operating status screen at any point during operation, press the STATUS key. The 6000 displays a status screen like the one in Figure 5-5.

```
Sample①Desorb    ②M01

        ③0.38->④10.00
 Sample    ⑤35->⑥230C
```

Figure 5-5. **Sample Desorb Status Screen**

5.3.2.2 Reading the Fields

Operating status screens display the following information.

① The name of the operating step appears on the first line, at the left margin.

② The number of the currently active method appears on the first line, at the right margin. If the 6000 is running a method schedule, this position shows the currently active method number and currently active sample position. For example, M7P04 indicates that method 7 is running on sample position 4.

③ For timed steps, the elapsed time appears on the third line. The display updates this value continuously.

④ For timed steps, the total time setpoint appears at the right on the third line.

⑤ For temperature-dependent steps, the name of the heated or cooled component and its current measured temperature appears at the left on the fourth line. The display updates the temperature value continuously.

⑥ For temperature-dependent steps, the temperature setpoint appears at the right on the fourth line.

5.3.3 Menu Screens

Menu screens offer lists of variable-function key options. You press the indicated key to make a selection. Table 5-4 shows the menu screens and the keys which access them.

Press this key	To Display These Menu Screen Choices	Described In
SETUP	A=System Info B=Time/Date C=LCD Contrast	Section 5.4.6 Section 5.4.4 Section 5.4.5
SCHED	A=Sample Status C=Commands E=Edit Schedule	Section 7.5.3 Section 7.2.3 Section 7.2.2
METH	Select Method C=Commands E=Edit	 Section 6.3.1 Section 6.3.4
C (from the Select Method screen)	Commands: Method A=Change Type C=Restore Default E=Copy Method	 Section 6.3.2 Section 6.4 Section 6.3.3

Table 5-4. Menu Screens

5.3.4 Action Screens

An action screen presents a choice of variable function keys. It looks like a menu screen, but there is a difference: pressing a variable-function key from a menu screen displays another screen. Pressing a key from one of the action screens shown in Table 5-5 initiates an action.

Press this key	To Display These Choices	Described In
RESET	A=Abort Schedule B=Abort Sample C=Rerun Sample C=Complete and Abort	Section 7.5.2
STEP (from a Self-Test screen)	A=Continue Testing B=Ignore Self-Test C=Restore Previous	Section 5.4.2
C (from the Scheduling screen)	A=Run Schedule B=Build Schedule C=Clear Schedule	Section 7.2.3 Section 7.2.4 Section 7.2.5
GO TO	A=Standby B=Desorb Preheat C=Bake	Section 7.5.1
Various keys from various screens	A=Abort (cancel action) E=Execute (perform selected action)	N.A.

Table 5-5. Action Screens

5.3.5 Data Entry Screens

A data entry screen can display fields like the ones shown in Figure 5-6.

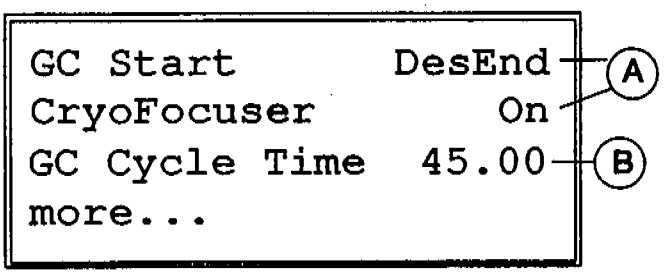


Figure 5-6. **Sample Data Entry Screen**

- A - fields that allow you to select one of several available options.
- B - fields into which you enter numbers.:

5.3.5.1 Option Selection Fields

To review available options and select one:

1. If the cursor is on the option to be changed, press any number key to toggle the status field. Each time you press a number key, the field displays the next available option. When the desired option is displayed, press ENTER to select it. The cursor moves to the next line.
2. If the cursor is not on the option to be changed, press ENTER to move it to the option to be changed, one line at a time. When the cursor reaches the bottom of the screen, pressing ENTER moves it back to the top of the screen.
3. Press any number key to toggle the status field, as described in step 1. When the desired option is displayed, press ENTER to select it.

5.3.5.2 Data Entry Fields

To enter a number into a data entry field:

1. If the cursor is on the desired field, type the appropriate numbers in the field; then press ENTER.
2. If the cursor is not on the desired field, press ENTER to move the cursor, one line at a time. When the cursor reaches the bottom of the screen, pressing ENTER moves it back to the top of the screen.
3. Type the appropriate numbers in the field; then press ENTER.

5.4 Getting Started

To begin 6000 operation:

1. Press the ON switch on the rear panel. The 6000 loads program data into memory, performs initialization tasks, and briefly displays the message **Initialization successful** on the front-panel screens.
2. The front-panel screen (Figure 5-7) shows the date and time of the last power loss.

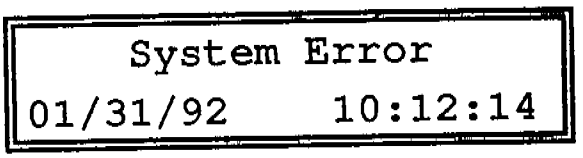


Figure 5-7. Initial Front-Panel Screen

The terminal screen (Figure 5-8) shows the same date and time.

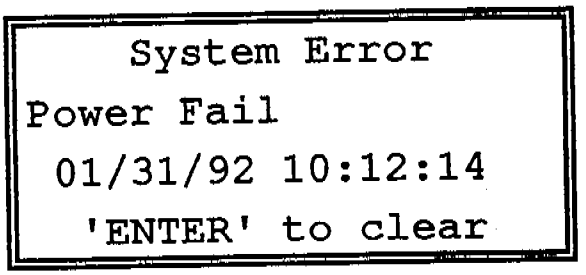


Figure 5-8. Start-Up Screen

3. Press **ENTER**. The screen shown in Figure 5-9 appears briefly.

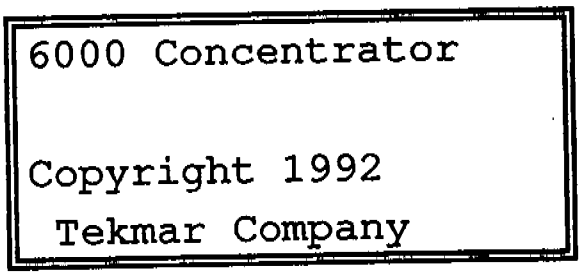


Figure 5-9. Tekmar 6000 Identification Screen

5.4.1 Performing Self Tests

The Identification screen is followed almost immediately by the first Self-Test screen (Figure 5-10).

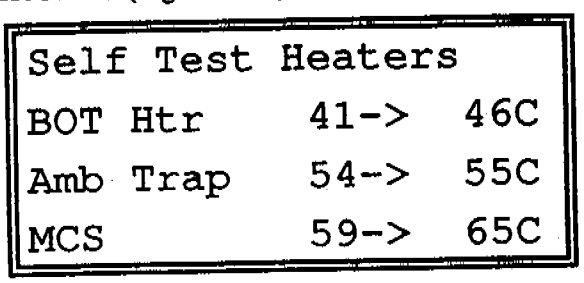


Figure 5-10. Self Test Screen 1

5.4.1 Performing Self Tests, cont.

The screen lists the heaters being tested. To test its heaters:

- The 6000 activates and establishes an incremental setpoint for each heater: 3° C above its current temperature for the valve-oven heater and 5° C above current temperature for the other heaters.
- When a listed heater reaches the test temperature, it disappears from the listing. As heaters drop off the listing, the last line shows elapsed time as it progresses to a two-minute limit.

5.4.2 Exiting the Self Tests

At any point during the self tests, you can suspend self testing. When you press STEP, the 6000 displays the Self-Test Status screen (Figure 5-11).

```
Self-Test Status
<A>=Continue Testing
 B =Ignore Self-Test
 C =Restore Previous
```

Figure 5-11. **Self-Test Status Screen**

The Self-Test Status action screen offers three options for handling pending (uncompleted) self tests. You can:

- Press A to return to the previous screen and complete all pending tests.
- Press B to skip the pending self tests and position the unit to run the first sample of the schedule.
- Press C to restore previous self-test results for the pending tests. This option accepts the results of the self tests that were run the last time the unit was powered up.

5.4.3 Clearing a Self-Test Error

1. If a component fails to reach the setpoint within the time limit, the 6000 displays an error message on both screens. The front-panel screen (Figure 5-12) specifies the region that failed.

Figure 5-12. Front-Panel Error Message Screen

2. The terminal screen (Figure 5-13) lists the region that failed and provides instructions for clearing the error.

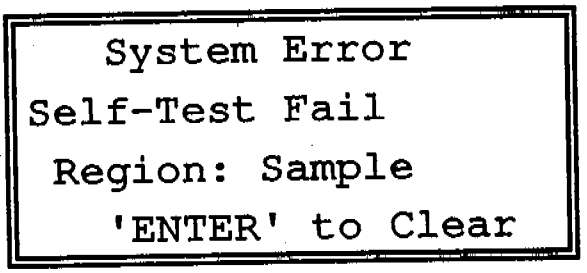


Figure 5-13. Terminal Error Message Screen

3. After you have corrected the problem, press ENTER to clear the error message. The 6000 displays the Reset screen.
4. Press SHIFT + RESET; the Tekmar Identification screen appears briefly, followed by the System Reset screen (Figure 5-14).

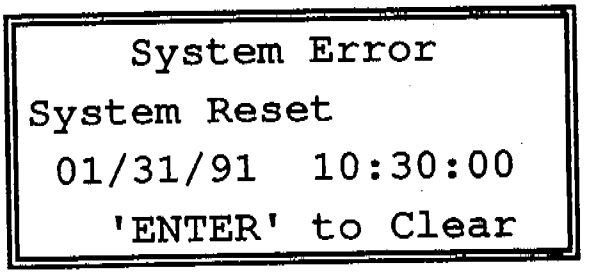


Figure 5-14. System Reset Screen

5. Press ENTER. The 6000 performs the self tests again. If you have not corrected the problem, the same component will fail again. The unit will not run until it passes the self tests.
6. When the self tests are complete, the hand-held terminal displays the Standby status screen for the current method.

5.4.4 Setting the Date and Time

Use the SETUP key to establish or confirm the system clock setting.

1. From any screen, press and hold the SHIFT key; then press SETUP. The 6000 displays the Setup screen (Figure 5-15).

```
<A>=System Info
 B =Time/Date
 C =LCD Contrast
```

Figure 5-15. **Setup Screen**

2. From the Setup screen, press B on the keypad. The Date/Time screen (Figure 5-16) appears.

```
Wed Jul 15 1992
 07/15/92 10:32:53

  Press 'E' to Edit
```

Figure 5-16. **Date/Time Screen**

- The first line shows the day, the month, the date, and the year.
- The second line shows date (MM/DD/YY) and time (HH:MM:SS).

3. Press E on the keypad. The Date/Time Editing screen (Figure 5-17) appears, with the cursor on the last character in the third line.

```
Use '.' as separator

Date:          01/27/92
Time:          10:35:41
```

Figure 5-17. **Date/Time Editing Screen**

4. Type the desired date, using numerals to indicate months, days, and year, and the period (.) to mark each separation between them; press ENTER. The cursor moves to the end of the next line. For example, Enter January 23, 1991 as 01.23.91.
5. Repeat step 4 for the time line, using hours, minutes, and seconds, in military time. For example: Enter 3:13 p.m. as 15.13; then press ENTER. The displays returns to the Setup screen.

5.4.5 Setting the Screen Contrast

Use the SETUP key to adjust the contrast level on the front-panel status screen.

1. From any screen, press and hold the SHIFT key; then press SETUP. The 6000 displays the Setup screen (Figure 5-15).
2. From the Setup screen, press C on the keypad. The Front Panel LCD screen (Figure 5-18) appears.

```
   Front Panel LCD
Next/Page = Darken
Prev/Page = Lighten
LCD Contrast      16
```

Figure 5-18. Front Panel LCD Screen

- The first line shows the name of the screen.
- The second and third lines tell you how to lighten or darken the screen contrast.
- The last line shows the current level of contrast. The LCD Contrast field has a value from 0 (the lightest, or lowest level of contrast) to 32 (the darkest, or highest level of contrast).

3. Press NEXT PAGE to increase the level of contrast; press PREV PAGE to decrease it. The LCD Contrast field increases or decreases in value as you press the specified control keys.
4. Check the front-panel screen as you adjust the contrast level. When you have adjusted the screen satisfactorily, press STATUS to exit the Front Panel LCD screen and display the current operating status screen.

5.4.6 Checking the Unit Type and ROM Version

1. From any screen, press and hold the SHIFT key; then press SETUP. The 6000 displays the Setup screen (Figure 5-15).
2. From the Setup screen, press A on the keypad. The System Information screen (Figure 5-19) appears.

```
Unit Type          6000
ROM Ver:   1.00

UpTime -   0:01:47.15
```

Figure 5-19. System Information Screen

- The first line gives the model number for the unit; should be 6000.
- The second line shows the version of the ROM chip currently installed in the unit; should be 1.00 or later.
- The last line shows the number of minutes since power-up or since the last system reset.

3. After reviewing the system information, press STATUS to exit the System Information screen and display the current status screen.

5.5 Configuring the 6000

You use the **Configuration** screen (Figure 5-20) to give the 6000 information about the type of GC to be used. The GC is interfaced to the 6000 via the 25-pin connector on the GC I/O card (see Figure 3-9 in Section 3.4.3 Connect to the GC.

Press the **CONF** key to display the **Configuration** screen, with the cursor at the end of the first line.

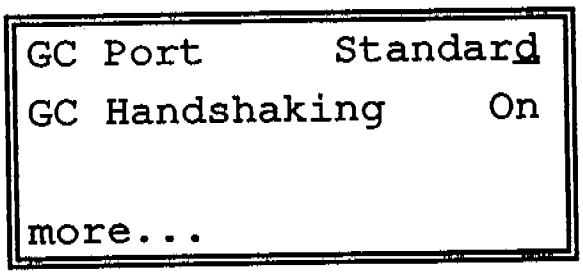


Figure 5-20. **Configuration Screen**

5.5.1 Specify the GC Port Type

The first line on the **Configuration** screen displays **GC Port**, a classification based on the input-output characteristics of the gas chromatograph as it interacts with the 6000. Table 5-6 lists the available options.

Standard	A standard gas chromatograph (all input and output signals from a standard GC are normally open relay closures or TTL active-low signals)
User	The GC supplies or accepts all normally closed relay closures, all TTL active-high signals, a combination of normally open and closed relays, or a combination of TTL active-low and TTL active-high signals

Table 5-6. **Available GC Port Types**

1. If you know that your GC uses normally open relay closures for all its input and output signals, press **ENTER** to select **Standard** as the **GC Port**. The 6000 is now configured to operate with your GC. Skip the next steps and go to Section 5.5.2 **Specify Handshaking**.
2. If you know that your GC supplies and accepts all normally closed relay closures or a combination of open and closed closures (or if you are not sure), press any number key to select **User** as the **GC Port**.

5.5.1 Specify the GC Port Type, cont.

3. Press the NEXT PAGE key to display the Special GC Type screen (Figure 5-21), with the cursor at the last position on the third line.

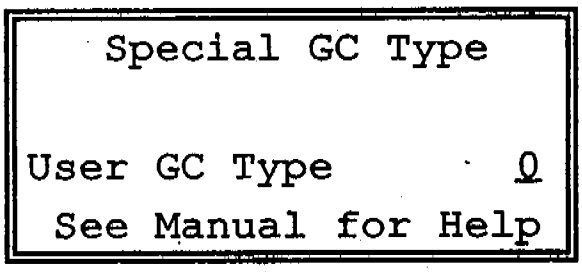


Figure 5-21. **Special GC Type Screen**

4. If you have ordered an interface cable, the User GC Type is provided with the cable. Please refer to the Cable Part Number List that accompanies the cable, and enter the number that matches the part number of your interface cable. The 6000 is now configured to operate with your GC. Skip the next steps and go to Section 5.5.2 **Specify Handshaking.**
5. If you have not ordered a cable, you must know the characteristics of the input and output signals traveling to and from the GC to determine the User GC Type, as described in the following section.

5.5.1.1 Determine I/O Signal Characteristics

During operation, the 6000 sends and receives the following signals:

- A *Begin sample transfer* output signal.
- A *Start GC/MS and Data System* output signal.
- A *Sample Transfer Ready* output signal.
- A *Ready/Continue* input signal.

I/O signal characteristics vary. Some GCs use normally closed contact closures or active-high TTL; others use normally-open contact closures or active-low TTL. You use the User GC Type field to customize the 6000's input and output signals to operate with your GC.

User GC Type is a number from 0 to 63 that defines the electronic control signals used when the 6000 communicates with the GC. The User GC Type number is the decimal representation of a six-digit binary number in which each digit, or bit, indicates the type of closure supplied or accepted by your GC: 1 for normally open or TTL active-low; 0 for normally closed or TTL active-high.

5.5.1.1 Determine I/O Signal Characteristics, cont.

Table 5-7 shows the characteristics that define input and output signals.

Bit #	Pin #	I/O	Signal Function	Contact Closure Type
0	19,20	Output	Begin sample transfer	Specific to your GC
1	21,22 23,24	Output	Start GC/MS and data system	Specific to your GC
2	17,18	Output	Sample transfer ready	Specific to your GC
3	15,16	Output	No function	1[1]
4	2	Input	Start	Specific to your GC
5	4	Input	Ready/continue	Specific to your GC

Table 5-7. **I/O Signal Characteristics for the 6000**

For the columns in Table 5-7:

- Column 1 (Bit #) indicates position in a binary number. Bit 0 is the right-most digit in a binary number; bit 1 is the digit to the left of bit 0; and so on, until bit 5, which is the left-most digit in a binary number. For example, the I/O characteristics shown in this table:

Bit #	5	4	3	2	1	0
Closure Type	1	1	1	0	1	1

  are represented by the binary number 111011. Each position in the binary number has a place value that is used in calculating the decimal number for the User GC Type (see Section 5.5.1.2 Convert the Binary Number to a Decimal User GC Type).
- Column 2 (Pin #) specifies the pin number(s) (on the 25-pin interface cable) through which the signals travel.
- Column 3 (I/O) indicates whether the signal is received by the 6000 (input) or sent by the 6000 (output).
- Column 4 (Signal Function) describes what the signal does.
- Column 5 (Contact Closure Type) indicates the type of signal used by your GC.

To determine the numbers to be entered in Column 5:

1. Refer to your GC manual to see what type of signal (normally closed closure, normally open closure, TTL-high signal, or TTL-low signal) for each of the signaled functions.
2. In the second row of Table 5-8, enter 1 or 0 under each bit number designation: enter 1 if the contact closure is normally open or TTL-low; enter 0 if the contact closure is normally closed or TTL-high.

---

[1]This is a *don't care* bit; the 6000 does not use this signal. In this procedure, assign the number 1 to each *don't care* bit.

5.5.1.1 Determine I/O Signal Characteristics, cont.

Bit No	5	4	3	2	1	0
Signal Function	Ready/ continue	Start	No function	Sample transfer ready	Start GC/MS & data system	Begin sample transfer
Closure Type			1[2]			

Table 5-8. **Blank I/O Signal Characteristics Chart**

For example: for a GC using all normally open contact closures, the completed table will look like the one in Table 5-9:

Bit No	5	4	3	2	1	0
Signal Function	Ready/ continue	Start	No function	Sample transfer ready	Start GC/MS & data system	Begin sample transfer
Closure Type	1	1	1[2]	1	1	1

Table 5-9. **Sample I/O Signal Characteristics Chart**

5.5.1.2 Convert the Binary Number to a Decimal User GC Type

Table 5-10 is a worksheet to help you calculate the User GC Type field. The first row lists the bit number indicating the position of a digit. The second row shows the 1 or 0 designation for closure type. The third row shows the place value for each bit in the binary number.

Bit No	5	4	3	2	1	0
Closure Type			1[2]			
Place Value	32	16	8	4	2	1
(Row 2) x (Row 3)						

Table 5-10. **Blank Calculation Table**

To calculate the number to be entered in the User GC Type field:

1. Enter the closure type designations into the second row of Table 5-10.
2. Multiply each second-row number by the corresponding number in the third row; write each product in the appropriate column in the last row.
3. Add all the numbers in the last row; the total is the User GC Type.

---

[2]This is a *don't care* bit; the 6000 does not use this signal. In this procedure, assign the number 1 to each *don't care* bit.

5.5.1.2 Convert the Binary Number to a Decimal User GC Type, cont.

Examples

- For a GC with the following I/O characteristics:
  Bit 5 = 1, Bit 4 = 1, Bit 3 =1[3], Bit 2 = 1, Bit 1 = 0, Bit 0 = 1
  The calculation table looks like this one (Table 5-11):

Bit No	5	4	3	2	1	0
Closure Type	1	1	1[3]	1	0	1
Place Value	32	16	8	4	2	1
(Row 2) x (Row 3)	32	16	8	4	0	1

Table 5-11. Sample Calculation Table 1

  and the User GC Type (equal to the sum of 32 + 16 + 8 + 4 + 0 + 1) is 63.

- For a GC with the following I/O characteristics:
  Bit 5 = 1, Bit 4 = 1, Bit 3 =1[3], Bit 2 = 0, Bit 1 = 0, Bit 0 = 1.
  The calculation table will look like this one (Table 5-12) :

Bit No	5	4	3	2	1	0
Closure Type	1	1	1[3]	0	0	1
Place Value	32	16	8	4	2	1
(Row 2) x (Row 3)	32	16	8	0	0	1

Table 5-12. Sample Calculation Table 2

  and the User GC Type (equal to the sum of 32 + 16 + 8 + 0 + 0 + 1) is 57.

4. Press the PREV PAGE key to return to the screen.

Note: *If you have a scientific calculator with a binary-to decimal conversion mode, you can use it to convert the binary number. Remember that the bit number indicates position in the binary number, with Bit 0 in the right-most position and bit 5 in the left-most position. The I/O characteristics shown in this table:*

Bit #	0	1	2	3	4	5
Closure Type	1	1	0	1	1	1

are represented by the binary number 111011.

---

[3]This is a *don't care* bit; the 6000 does not use this signal. In this procedure, assign the number 1 to each *don't care* bit.

5.5.2 Specify Handshaking

The second line on the Configuration screen displays the 6000-GC handshaking characteristics — whether or not the 6000 will wait for a signal from the GC (a handshake) before sending a sample. The available options are:

- On — the GC operates its port normally.
- Off — the GC operates with no input or output signals between the 6000 and the GC.

1. Press any number key to toggle the field between On and Off.
2. Press ENTER to accept the currently displayed option.

6.1 Overview

After you have installed the 6000, made the required pneumatic and electronic connections, and made all the required configuration settings, you can create customized methods (operating sequences) for sample processing that meets your analytical requirements.

This section tells you how to:

- Use pre-defined methods with default, factory-installed parameters.
- Define time and temperature parameters for custom methods.
- Restore default parameters

6.2 Using Default Methods

The AEROTrap 6000 can store up to 16 methods, or operating sequences, for running air samples. When you receive your unit, default parameters have been assigned to all methods:

- Method 1 defines parameters for processing a single, front-panel sample according to USEPA TO-1.
- Method 2 defines parameters for processing a sample on an autosampler according to USEPA TO-1.
- Method 3 defines parameters for processing a single, front-panel sample according to USEPA TO-2.
- Method 4 defines parameters for processing a sample on an autosampler according to USEPA TO-2.
- Methods 5 through 15 are identical to Method 1.
- Method 16 defines parameters for baking out the sample pathway and autosampler positions on one or two autosamplers.

At first power-up, the 6000 is scheduled to run Method 1. (Please refer to Section 7.2 Creating a New Schedule for more information about setting up *method schedules*, or processing timetables that define the order in which methods are run.)

- The unit performs self tests and displays the Standby status screen for Method 1.
- When the heaters and coolers have reached the default temperature setpoints for Method 1, the hand-held terminal displays a screen with the prompt Press START to Begin.
- At this point, you can:
  - Press START to run Method 1 with its default parameters.
  - Follow the instructions in Section 7.0 Scheduling and Running Samples to change the method schedule and run any other method with its default parameters.

6.2.1 Default Method 1

Table 6-1 lists the default parameters for Method 1 (USEPA TO-1 running on the front-panel sample position on the 6000 with a Cryofocusing Module installed).

Program Parameter	Default Value
Line Temp	200°C
Valve Temp	200°C
MCS Line Temp	200°C
Trap Standby	35°C
Sample Standby	35°C
Trap Cooldown	-165°C
Sample Sweep	Pre-Cool
Sample Sweep Time	0.00
Sample Desorb Time	10.00 minutes
Sample Desorb	225°C
MCS Desorb Temperature	50°C
GC Start	DeeEnd
Cryo-Focus	Yes
GC Cycle Time	45.00 minutes
Cryo Standby	200°C
CryoFocus Temperature	-150°C
Inject Time	1.00 minutes
Cryo Inject Temperature	225°C
Desorb Preheat	220°C
Trap Desorb Time	4.00 minutes
Trap Desorb Temperature	240°C
Sample Bake	250°C
Trap Bake Time	10.00 minutes
Trap Bake Temperature	250°C
MCS Bake Temperature	340°C

Table 6-1. Method 1 Parameters

6.2.2. Default Method 2

Table 6-2 lists the default parameters for Method 2 (USEPA TO-1 running on specified autosampler positions with a Cryofocusing Module installed).

Program Parameter	Default Value
Line Temp	200°C
Valve Temp	200°C
MCS Line Temp	200°C
Trap Standby	35°C
60XX Valve	200°C
60XX Line	200°C
Trap Cooldown	-165°C
Sample Sweep	Pre-Cool
Sample Sweep Time	0.00
Sample Desorb Time	10.00 minutes
Sample Desorb	225°C
MCS Desorb Temperature	50°C
GC Start	DesEnd
Cryo-Focus	Yes
GC Cycle Time	45.00 minutes
Cryo Standby	200°C
CryoFocus Temperature	-150°C
Inject Time	1.00 minutes
Cryo Inject Temperature	225°C
Desorb Preheat	220°C
Trap Desorb Time	4.00 minutes
Trap Desorb Temperature	240°C
Sample Bake	250°C
Trap Bake Time	10.00 minutes
Trap Bake Temperature	250°C
MCS Bake Temperature	340°C

Table 6-2. **Method 2 Parameters**

6.2.3 Default Method 3

Table 6-3 lists the default parameters for Method 3 (USEPA TO-2 running on the front-panel sample position on the 6000 with a Cryofocusing Module installed).

Program Parameter	Default Value
Line Temp	200°C
Valve Temp	200°C
MCS Line Temp	200°C
Trap Standby	35°C
Sample Standby	35°C
Trap Cooldown	-165°C
Sample Sweep	Pre-Cool
Sample Sweep Time	5.00 minutes
Sample Desorb Time	10.00 minutes
Sample Desorb	360°C
MCS Desorb Temperature	50°C
GC Start	DesEnd
Cryo-Focus	Yes
GC Cycle Time	45.00 minutes
Cryo Standby	200°C
CryoFocus Temperature	-150°C
Inject Time	1.00 minute
Cryo Inject Temperature	225°C
Desorb Preheat	220°C
Trap Desorb Time	4.00 minutes
Trap Desorb Temperature	240°C
Sample Bake	375°C
Trap Bake Time	10.00 minutes
Trap Bake Temperature	250°C
MCS Bake Temperature	340°C

Table 6-3. Method 3 Parameters

6.2.4 Default Method 4

Table 6-4 lists the default parameters for Method 4 (USEPA TO-2 running on specified autosampler positions with a Cryofocusing Module installed).

Program Parameter	Default Value
Line Temp	200°C
Valve Temp	200°C
MCS Line Temp	200°C
Trap Standby	35°C
60XX Valve	200°C
60XX Line	200°C
Trap Cooldown	-165°C
Sample Sweep	Pre-Cool
Sample Sweep Time	5.00 minutes
Sample Desorb Time	10.00 minutes
Sample Desorb	360°C
MCS Desorb Temperature	50°C
GC Start	DesEnd
Cryo-Focus	Yes
GC Cycle Time	45.00 minutes
Cryo Standby	200°C
CryoFocus Temperature	-150°C
Inject Time	1.00 minute
Cryo Inject Temperature	225°C
Desorb Preheat	220°C
Trap Desorb Time	4.00 minutes
Trap Desorb Temperature	240°C
Sample Bake	375°C
Trap Bake Time	10.00 minutes
Trap Bake Temperature	250°C
MCS Bake Temperature	340°C

Table 6-4. Method 4 Parameters

6.2.5 Default Method 16

Table 6-5 lists the default parameters for Method 16 (a bake cycle running on specified autosampler positions).

Program Parameter	Default Value
Line Temp	200°C
Valve Temp	200°C
MCS Line Temp	200°C
Trap Standby	35°C
60XX Valve	200°C
60XX Line	200°C
Trap Cooldown	375°C
Sample Sweep	Pre-Cool
Sample Sweep Time	0.00
Sample Desorb Time	0.00
Sample Desorb	360°C
MCS Desorb Temperature	200°C
GC Start	Disabled
Cryo-Focus	No
GC Cycle Time	0.00
Cryo Standby	200°C
CryoFocus Temperature	200°C
Inject Time	0.00
Cryo Inject Temperature	200°C
Desorb Preheat	180°C
Trap Desorb Time	0.00
Trap Desorb Temperature	200°C
Sample Bake	375°C
Bake Time	10.00 minutes
Trap Bake Temperature	250°C
MCS Bake Temperature	340°C
GC Handshaking	Off

Table 6-5. Method 16 Parameters

6.3 Creating Custom Methods

To create a customized method, follow these steps:

- Specify the method (from 1 - 16) to be changed.
- Indicate whether or not the specified method should include parameters for autosamplers.
- Change parameters to customize the method.

6.3.1 Select a Method

To select a method for editing:

1. Power up the system (as described in Section 5.4). The 6000 displays the **Standby** status screen for Method 1.
2. Press **METH** on the keypad. The 6000 displays the **Method** screen (Figure 6-1), with the cursor at the last position on the second line.

```
   Select Method
Method                1
Type                6000
<C>=Commands E =Edit
```

Figure 6-1. **Method Screen**

   - Line 2 shows the number of the active method (1 through 16).
   - Line 3 indicates whether the currently active method uses an autosampler. If the type shown is 6000, the active method is for a sample run from the front panel of the 6000. If the type shown is 60XX, the active method defines parameters for an autosampler (AEROTrap 6016 and/or 6032).
3. At the cursor, enter the number of the method to be changed; then press **ENTER**.

6.3.2 Specify an Autosampler

To indicate whether the selected method should include parameters for a front-panel sample position on the 6000 or for an autosampler:

1. Press **C** to display the **Method Commands** screen (Figure 6-2).

```
Commands: Method   1
<A>=Change Type
 C =Restore Default
 E =Copy Method
```

Figure 6-2. **Method Commands Screen**

6.3.2 Specify an Autosampler, cont.

2. Press A (or press ENTER when A is highlighted with <> brackets) to display the Change Method Type screen (Figure 6-3), with the cursor on the third line.

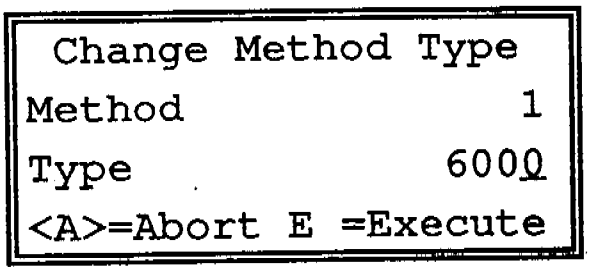


Figure 6-3. Change Method Type Screen

3. Press any number key. The value in the TYPE field toggles each time you press a number key. The available options are 6000 (parameters for the front-panel sample position on the 6000 only) and 60XX (parameters for sample positions on an autosampler).
4. When the screen shows the correct value for the TYPE field, Press E to accept the value and return to the Select Method screen.

Note: *To exit the* Method Commands *screen without making any changes, press* A. *The 6000 ignores any changes you may have entered on the* Method Commands *screen and displays the* Select Method *screen.*

6.3.3 Copy an Existing Method

If the new method will differ from an existing method in only a few parameter values, you can copy the parameters for an existing method into memory and use them as the basis for a new method.

1. On the main Method screen (Figure 6-1), press C to display the Method Commands screen (Figure 6-2).
2. Press E to display the Copying Method screen (Figure 6-4), with the cursor at the end of the second line.

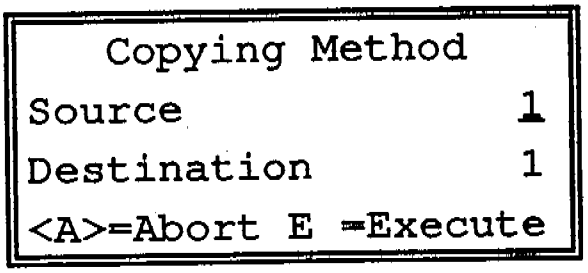


Figure 6-4. Copying Method Screen

- Line 2 shows the number of the method to be copied (Source).
- Line 3 shows the number of the method into which the Source method will be copied (Destination).

6.3.3 Copy an Existing Method, cont.

4. Type the number of the method to be copied; then press ENTER. The cursor moves to the last position on the next line.
5. Type the number of the method to receive the copy; then press ENTER.
6. Press E to execute the copy and return to the Select Method screen.

Note: *To exit the* **Copying Method** *screen without making any changes, press* **A.** *to abort. The 6000 ignores any changes you may have entered on the* **Copying Method** *screen and displays the* **Select Method** *screen.*

6.3.4 Using the Method Editing Screens

The 6000 displays up to nine method editing screens (Figures 6-5 through 6-13). The following paragraphs tell you:

- How to display the method editing screens;
- How each displayed parameter affects a processing run; and
- How to change parameters and save a new method.

To begin editing the selected method, press E from the Method screen. Editing Screen 1 (Figure 6-5) appears, with the cursor on the last character in the first line.

6.3.4.1 Editing Screen 1

Line Temp	200
Valve Temp	200
MCS Line Temp	200
Trap Standby	35

Figure 6-5. **Editing Screen 1**

Editing Screen 1 displays Standby setpoints.

- Line Temp is the temperature setpoint for the bottom-of-trap area on the 6000 and the transfer line from the 6000 to the GC.
- Valve Temp is the temperature setpoint for the 6000 valve oven.
- MCS Line Temp is the initial temperature setpoint for the moisture-control system line.
- Trap Standby is the temperature at which the 6000 maintains the internal trap between runs (in the Standby and/or Sample Desorb Ready/GC Synchronize steps).

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens.

To display the next editing screen, press the NEXT PAGE key.

6.3.4.2 Editing Screen 2

If the method being edited is for a front-panel sample only (Type 6000), the screen in Figure 6-6 does not appear; the 6000 displays the screen shown in Figure 6-7. If the method being edited is for autosampler positions (Type 60XX), the next screen (Figure 6-6) displays the autosampler transfer line and valve oven temperatures.

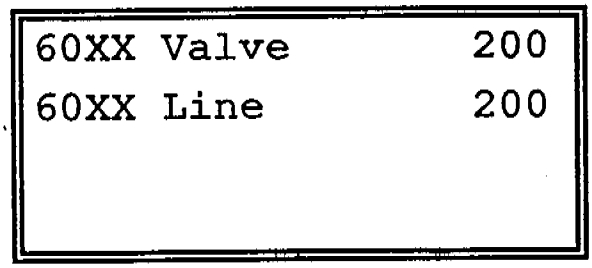


Figure 6-6. Editing Screen 2

- **Line Temp** is the temperature setpoint for the 6016/6032 transfer line.
- **Valve Temp** is the temperature setpoint for the 6016/6032 valve oven.

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. To display the next editing screen, press the **NEXT PAGE** key.

6.3.4.3 Editing Screen 3

If the method being edited is for a front-panel sample only (Type 6000), the screen shown in Figure 6-7 appears. It displays parameters for the **Standby, Trap Cooldown, and Sample Sweep steps.**

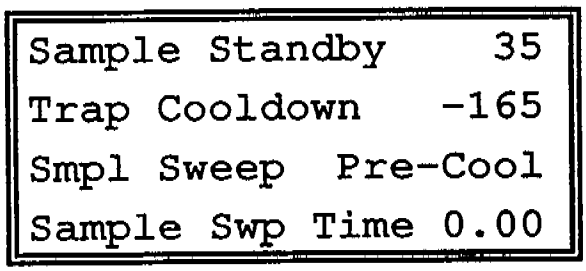


Figure 6-7. Editing Screen 3

If the method being edited is for autosampler positions (Type 60XX), the screen shown in Figure 6-8 appears.

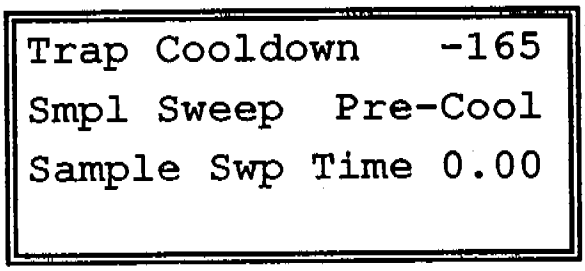


Figure 6-8. Editing Screen 3 (60XX)

6.3.4.4 Editing Screen 3, cont.

- **Sample Standby** is the temperature at which the 6000 maintains the sample tube between runs.
- **Trap Cooldown** is the low-temperature set point for the 6000 internal trap.
- **Smpl Sweep** is the parameter that determines whether the **Sample Sweep** step occurs before or after **Trap Cooldown**. Available options are *Pre-Cool* and *Post-Cool*.
- **Sample Swp Time** is the length of time (in minutes) during which gas flows through the unheated sample tube to remove oxygen and moisture.

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. To display the next editing screen, press the **NEXT PAGE** key.

6.3.4.5 Editing Screen 4

The next screen (Figure 6-9) displays the time and temperature parameters for **Sample Desorb** and **MCS Desorb**.

```
SampleDes Time   5.00
Sample Desorb     225
MCS Des Temp       50
more...
```

Figure 6-9. **Editing Screen 4**

- **Sample Des Time** is the duration (in minutes) of the **Sample Desorb** step (the length of time during which the sample tube is backflushed with gas to desorb analytes and carry them over to the internal trap).
- **Sample Desorb** is the temperature at which the sample tube is maintained while it is being backflushed with gas during the **Sample Desorb** step.
- **MCS Desorb Temp** is the temperature at which the MCS is maintained during internal **Trap Desorb**.

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. To display the next editing screen, press the **NEXT PAGE** key.

6.3.4.6 Editing Screen 5

The next screen (Figure 6-10) allows you to set some parameters for the way the 6000 will operate when this method is running.

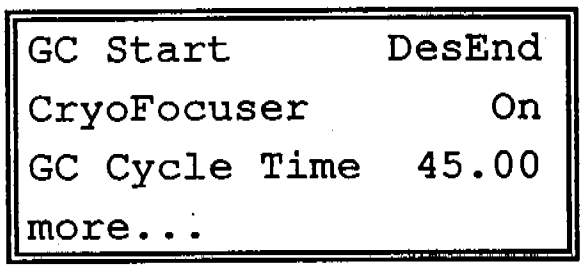


Figure 6-10. Editing Screen 5

- GC Start specifies when the 6000 sends a START signal to the GC; the four available options are:

  DesStart – at the beginning of the Desorb step. Select DesStart if you are not using a Cryofocusing Module.

  DesEnd – at the end of the Desorb step Select DesEnd if you are using a Cryofocusing Module.

  Both – at both the beginning and the end of the Desorb step.

  Disabled – no START signal sent.

- CryoFocuser indicates whether or not a Cryofocusing Module is installed; the available options are On and Off.

Note: ***If you do not intend to cryofocus on a given sample, please refer to Section 6.3.4.7 for instructions about disabling the cryofocusing function; DO NOT set CryoFocuser to OFF. Once a Cryofocusing Module has been installed, it becomes part of the transfer line from the 6000 to the GC; it must always be heated during a run.***

- GC Cycle Time is the number of minutes required for the GC to process a sample. (Please refer to Sections 4.2.2 Operating Cycle Time and 4.3.2 GC Synchronize for a complete description of the relationship between a GC cycle and an operating cycle on the 6000.)

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. To display the next editing screen, press the NEXT PAGE key.

6.3.4.7 Editing Screen 6

The next screen (Figure 6-11) displays the parameters that control Cryofocusing Module operation. These are applicable only if a cryofocuser passed the 6000 self tests at power-up.

Cryo Standby	200
CryoFocus Temp	-150
Inject Time	1.00
Cryo Inj Temp	225

Figure 6-11. Editing Screen 6

- **Cryo Standby** is the temperature at which the cryofocuser is held when it is not in a cryo trapping or injection step.
- **CryoFocus Temp** is the low temperature at which the cryofocuser is held when it is trapping analytes.
- **Inject Time** is the duration (in minutes) of the **Cryo Inject** step, during which the cryofocuser is maintained at its high-temperature setpoint to release analytes onto the GC column.
- **Cryo Inj Temp** is the setpoint for the **Cryo Inject** step (when the cryofocuser is heated to release analytes onto the GC column).

Note:

If you have installed a Cryofocusing Module, but you do not intend to cryofocus on a given sample, disable the cryofocusing function as described below; DO NOT shut the Cryofocusing Module off. When a Cryofocusing Module has been installed, it becomes part of the transfer line from the 6000 to the GC; it must be heated during a run.

To disable the cryofocusing function without shutting off the Cryofocusing Module:

1. Make sure **CryoFocuser** is set to **ON** (see Section 6.3.4.6).
2. Set **Cryo Standby** to 200°C.
3. Set **CryoFocus Temp** and **Cryo Inj Temp** equal to **Cryo Standby**.
4. Set **Inject Time** to 0.00 minutes.

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. To display the next editing screen, press the **NEXT PAGE** key.

6.3.4.8 Editing Screen 7

The next screen (Figure 6-12) displays time and temperature parameters for the **Desorb Preheat** and **Trap Desorb/Sample Bake** steps.

Desorb Preheat	225
Trap Des Time	4.00
Trap Des Temp	240
Sample Bake	250

Figure 6-12. Editing Screen 7

- **Desorb Preheat** is the temperature to which the internal trap is heated before the **Trap Desorb** step. To disable the **Desorb Preheat** step, set the **Desorb Preheat** temperature equal to the **Trap Cooldown** temperature (see Section 6.3.4.3 **Editing Screen 3**).
- **Trap Des Time** is the duration of the **Trap Desorb** step (length of time the internal trap is desorbed to the GC or GC/MS).
- **Trap Desorb Temperature** is the internal trap temperature during **Trap Desorb** (while the analytes are being desorbed off the internal trap and flushed through the transfer line to the GC, GC/MS, or Cryofocusing Module, if installed).
- **Sample Bake** is the temperature to which the sample tube is heated during the **Bake** step. The length of the **Sample Bake** step is equal to the length of the **Trap Desorb** time.

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. To display the next editing screen, press the **NEXT PAGE** key.

6.3.4.9 Editing Screen 8

The next screen (Figure 6-13) displays time and temperature parameters for the internal **Trap Bake** step.

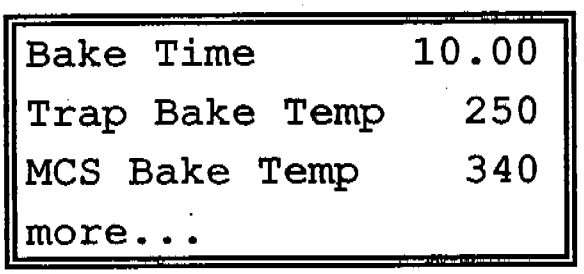


Figure 6-13. **Editing Screen 8**

- **Bake Time** is the duration of the **Trap Bake** step.
- **Trap Bake Temp** is the internal trap temperature during the **Bake** step (while the internal trap is being swept with gas to sweep residual compounds out the vent).
- **MCS Bake Temp** is the temperature to which the MCS is heated during the internal **Trap Bake** step. **MCS Bake Time** is equal to **Bake Time**.

Change the setpoints as required, following the instructions in Section 5.3.5. for using data entry screens. This is the last editing screen; you have set all parameters for this method.

Press the NEXT PAGE key to go back to the first editing screen and the beginning of the method.

Press the STATUS key to save your changes and display the current operating screen.

6.4 Restoring Default Parameters

You can undo changes made to default parameters for any method. With the cursor on line 2 of the Method screen (Figure 6-1):

1. At the cursor, enter the number of the method whose defaults are to be restored; then press ENTER.
2. Press C to display the Method Commands screen (Figure 6-14).

```
Commands:    Method 1
<A>=Change Type
 C =Restore Default
 E =Copy Method
```

Figure 6-14. **Method Commands Screen**

3. Press C to display the Restore Default screen (Figure 6-15).

```
   Restore Default
Method              1

<A>=Abort E =Execute
```

Figure 6-15. **Restore Default Screen**

4. Press E to execute the command. The 6000:
   - Erases any custom parameter values that have been programmed for the current method.
   - Restores the default values.
   - Returns to the Select Method screen display.

Note: ***To exit the* Restore Default *screen without making any changes, press* A *to abort. The 6000 ignores any changes or commands you may have entered on the* Restore Default *screen and displays the* Select Method *screen.***

7.1 Overview

After you create customized methods, you can define a *method schedule* that specifies samples, operating sequences, and the order in which they will run.

This section tells you how to:

- Set up method schedules which define the order in which the 6000 runs methods and specifies the samples on which each method will run.
- Load a sample tube and make an analytical run with the 6000.

7.2 Creating a New Schedule

You can set up a *method schedule*, or processing timetable, for running samples. When you use the 6000 without an autosampler, you can specify the number and sequence of methods to be run on a single sample. When you use the 6000 with one or more autosamplers, a method schedule defines:

- The method(s) to be run.
- Start and stop positions for each method.
- A sequential order for each sample to be run..
- The number of runs per sample.

To create and activate a method schedule, follow these steps:

1. Establish a desired method schedule.
2. Enter the desired schedule parameters.
3. Run the schedule.

7.2.1 Establish a Method Schedule

Before you set up your method schedule, consider:

- The number and type of samples to be run.
- The method required for each sample.
- The preferred sequence in which to run the samples.

7.2.1 Establish a Method Schedule, cont.

Use a worksheet (Table 7-1) to help you define your schedule.

For this set of samples	Use this method	This many times on every sample	Beginning with this sample position	Ending with this sample position
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Table 7-1. **Schedule Worksheet**

Use your worksheet as the basis for entering schedule parameters into the 6000.

7.2.2 Enter Schedule Parameters

1. From any screen, press the SCHED key. The Scheduling screen (Figure 7-1) appears.

```
      Scheduling
<A>=Sample Status
 C =Commands
 E =Edit Schedule
```

Figure 7-1. **Scheduling Screen**

2. Press E to display the Schedule Editing screen (Figure 7-2), with the cursor on the first position in the Start column..

7.2.2.1 Review Default Schedule Parameters

The schedule in Figure 7-2 shows the default schedule parameters for the 6000. The Schedule Editing screen has four columns and up to 12 rows.

Start		Stop	Meth	RPS
1)	0	0	1	1
2)	0	0	0	1
3)	0	0	0	1

Figure 7-2. Schedule Editing Screen

Each row specifies:

- The number of a method to be run (in the **Meth** column). The default method is Method 1.
- The position of the first sample (in the **Start** column) and the last sample (in the **Stop** column) to be run according to the specified method. The default sample start and stop positions are 0, the number assigned to the front-panel sample on the 6000 unit.

Notes:

1) A Type 6000 method has only one position: 0, on the front panel.

2) A Type 60XX method can have from 1 to 32 sample positions: 1 through 16 for an AEROTrap 6016, 17 through 32 for an AEROTrap 6032. The 6000 numbers AEROTrap 6032 autosampler positions as 17 through 32, even though the positions are labeled 1 through 16 on the front-panel display of the 6032.

- The number of times each sample will be run (in the **RPS** - Runs per Sample - column).

7.2.2.2 Changing the Schedule

You can change the schedule in several ways: You can:

- Specify a different Type 6000 method to be run on the 6000 sample position by changing the number in the **Meth** column.
- Specify a Type 60XX method to be run and enter the desired start and stop positions (1 - 32) by changing the numbers in the **Start**, **Stop**, and **Meth** columns.
- Indicate that a sample position should be run more than once by changing the number in the **RPS** column.

To make changes in the method schedule:

1. Type the desired parameters into each field, pressing **ENTER** after each entry. The cursor moves to the next field in the row. When you reach the end of a row, the cursor moves to the first field in the next row.

7.2.2.2 Changing the Schedule, cont.

2. If necessary, press NEXT PAGE to display succeeding screens of Schedule Edit parameters: Rows 4 -6, 7-9, and 10-12.
3. When you have entered the complete schedule, press the SCHED key to return to the Scheduling screen.

7.2.2.3 Sample Schedules

Figure 7-3 shows a sample schedule, for running two Type 60XX methods (2 and 4) on specified sample positions.

	Start	Stop	Meth	RPS
1)	1	8	2	2
2)	9	12	4	1
3)	0	0	0	1

Figure 7-3. **Sample Schedule Editing Screen**

To enter this schedule:

1. On the first row, enter 1, 8, 2, and 2 in their respective columns. These entries specify that:
   - The samples in positions 1 through 8 will be run according to Method 2, with each sample being run twice.
   - Method 2 is a Type 60XX method; if it were a Type 6000 method, the 6000 would display an error message: **Entry Out of Range.**
2. On the second row, enter 9, 12, 4, and 1 in their respective columns. These entries specify that samples 9 through 12 will be run according to Method 4, with each sample being run through the method once.

Figure 7-4 shows a sample schedule for running a Type 6000 Method 3.

	Start	Stop	Meth	RPS
1)	0	0	3	3
2)	0	0	0	1
3)	0	0	0	1

Figure 7-4. **Sample Schedule Editing Screen**

To enter this schedule:

1. On the first row, enter 0, 0, 3, and 3 in their respective columns. These entries specify that Method 3 (a 6000 method) will be run on the 6000's front-panel sample. The sample will be run three times.

Note: ***If you are setting up a schedule to be run on an autosampler, be sure that the method(s) being used are 60XX type methods, NOT 6000.***

7.2.3 Run the Schedule

To run a schedule:

1. From the Scheduling screen (Figure 7-1), press C to display the Schedule Commands screen (Figure 7-5)

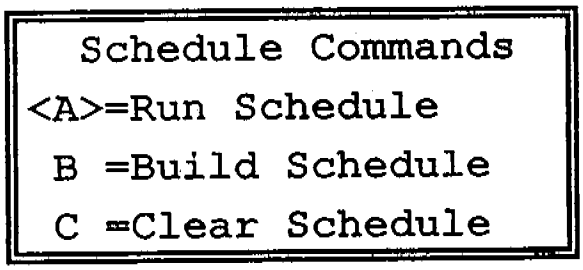


Figure 7-5. **Schedule Commands Screen**

2. Press A (Run Schedule). The 6000 starts the current schedule and displays the Standby status screen (Figure 7-6) for the first sample.

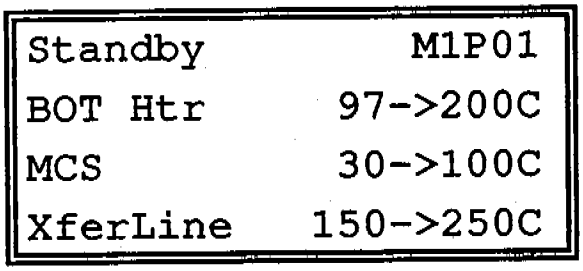


Figure 7-6. **Standby Status Screen**

During Standby, the 6000 establishes initial conditions.

7.2.4 Changing the Schedule During A Run

You can edit a schedule in the middle of a run. From the operating step Status screen press SCHED. Follow the instructions in Sections 7.2.1 and 7.2.2 to make the desired changes. Then:

1. From the Schedule Editing screen, press C to display the Schedule Commands screen (Figure 7-6).
2. Press B to build and enable the new schedule.
   - If your changes affect only those parts of the schedule that have not yet been run, the 6000 combines the new schedule with the old and continues to run.
   - If your changes affect parts of the schedule that have already been run, the 6000 inserts the new schedule and goes back to the beginning of the new schedule.

7.2.5 Restoring the Default Schedule

To restore the default schedule (Method 1 for a front-panel sample on the 6000), press C (Clear Schedule) on the Schedule Commands screen (Figure 7-5).

7.3 Run a Sample

When all Standby set points have been reached, the Sample Desorb Ready status screen (Figure 7-7) appears.

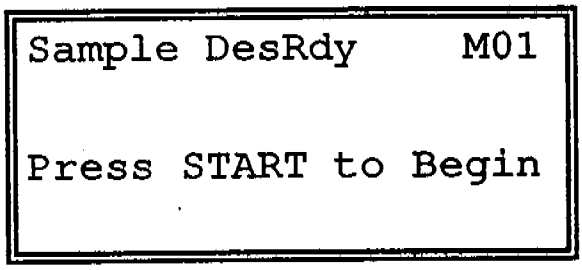


Figure 7-7. **Sample Desorb Ready Screen**

Note: ***If you have not leak-checked the 6000, follow the instructions in Section 3.5 to check for leaks before you start a run***

Sample Desorb Ready waits for a start signal from the user (via the START key on the keypad) or from an accessory before proceeding to the next step.

- To begin a run, press START on the terminal keypad.

The 6000 proceeds to the next step in the scheduled method. As the 6000 goes through a run, it displays a status screen for each step.

Note: ***You can always display a status screen by pressing STATUS on the keypad. For example, if you are editing one method while running another, you can press STATUS and review the current active step in the operating sequence. You can also review current system information on the front panel display of the 6000.***

7.3.1 Sample Sweep

Figure 7-8 shows the Sample Sweep status screen.

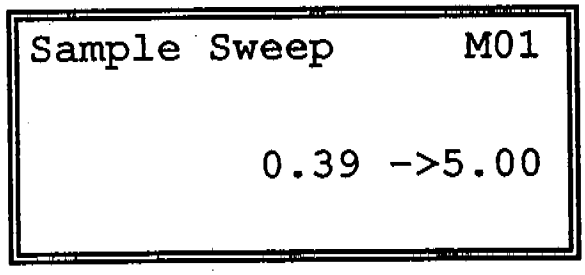


Figure 7-8. **Sample Sweep Screen**

This step sends gas flow across the sample tube, through the sample pathway to the 6000 internal trap, and out the vent for a specified length of time.

- If the sample sweep occurs before the internal trap is cooled, the sweeping gas removes water and oxygen from the sample pathway.
- If the sweep occurs after the internal trap is cooled, sweeping gas removes oxygen from the sample pathway; any water in the path freezes in the cold internal trap.

7.3.2 Trap Cooldown

Trap Cooldown (Figure 7-9) lowers the internal trap to its low-temperature setpoint.

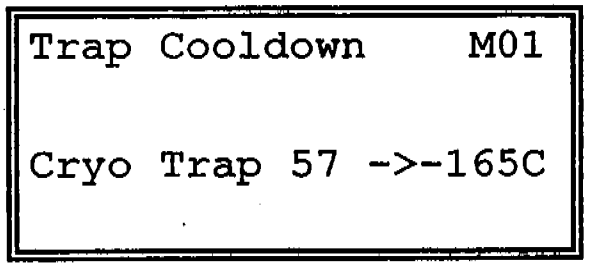


Figure 7-9. **Trap Cooldown Screen**

7.3.3 Sample Desorb

The Sample Desorb step (see Figure 7-10) sends desorb gas across the sample tube for a specified length of time; the gas flow flushes desorbed analytes out of the sample tube and over to the 6000 internal trap.

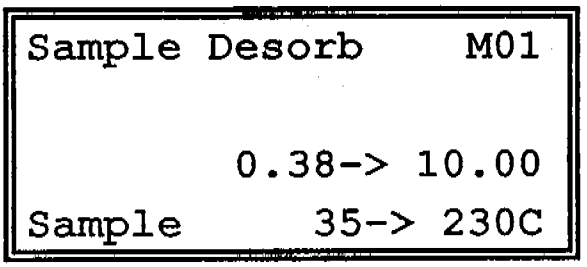


Figure 7-10. **Sample Desorb Screen**

7.3.4 MCS Cooldown

This step (Figure 7-11) cools the MCS to its moisture-removal setpoint to prepare it for gas flow from the internal trap to the GC.

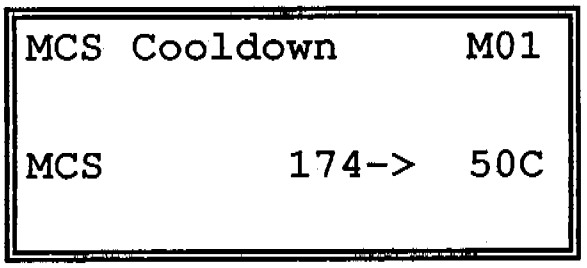


Figure 7-11. **MCS Cooldown Screen**

7.3.5 Cryofocusing Module Cooldown

This step (Figure 7-12) is applicable only if a Cryofocusing Module is installed. It uses the valve control on the Cryofocusing Module accessory card to cool the Cryofocusing Module with liquid nitrogen.

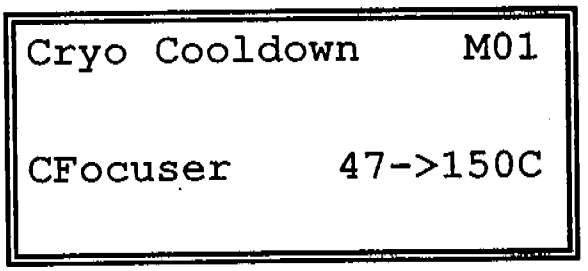


Figure 7-12. **Sample Desorb Screen**

7.3.6 Trap Desorb Ready

This step (Figure 7-13) allows the 6000 to wait for a GC READY signal from the gas chromatograph.

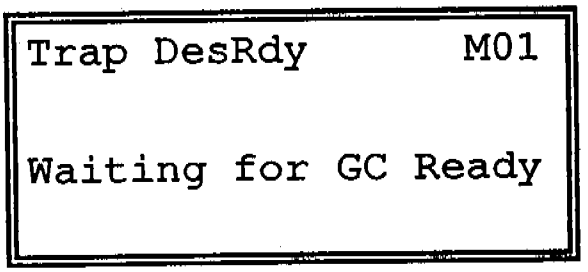


Figure 7-13. **Sample Desorb Screen**

7.3.7 Trap Preheat

This step (Figure 7-14) heats the internal trap to a specified temperature before desorbing analytes.

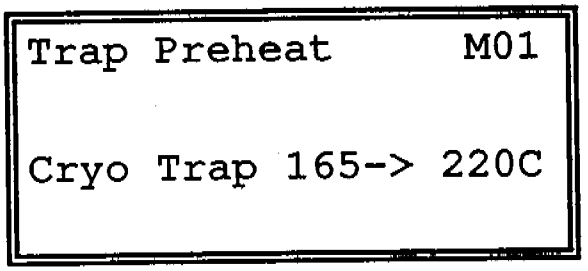


Figure 7-14. **Sample Desorb Screen**

7.3.8 Trap Desorb/ Sample Bake

This step (Figure 7-15) backflushes the internal trap onto the GC or onto the Cryofocusing Module, if installed; at the same time, the sample tube is heated with the sample and vent valves open, allowing residual contaminants to be baked away.

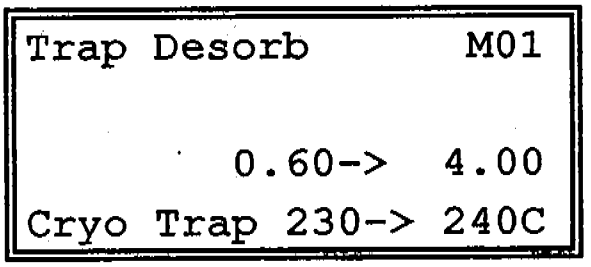


Figure 7-15. **Trap Desorb Screen**

7.3.9 Cryo Inject

This step (Figure 7-16) transfers the sample from the Cryofocusing Module to the GC. It is used only if a Cryofocusing Module is installed.

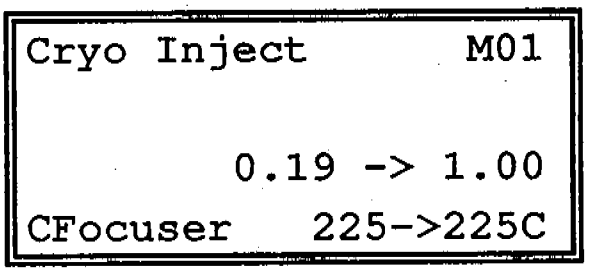


Figure 7-16. **Cryo Inject Screen**

7.3.10 Trap Bake

This step (Figure 7-17) heats the internal trap and MCS and sends clean gas through the unit to sweep them clear of residual moisture and organic contaminants.

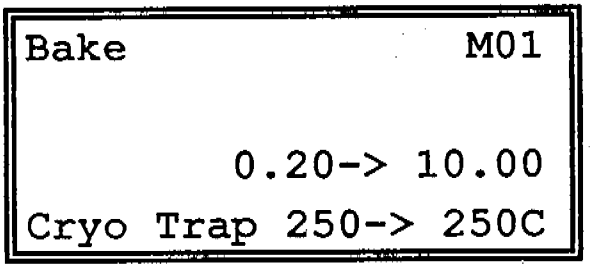


Figure 7-17. **Trap Bake Screen**

7.4 Making Subsequent Runs

If the method schedule calls for another run at the end of internal Trap Bake, the 6000:

- Loads the required method into memory while displaying the screen in Figure 7-18.

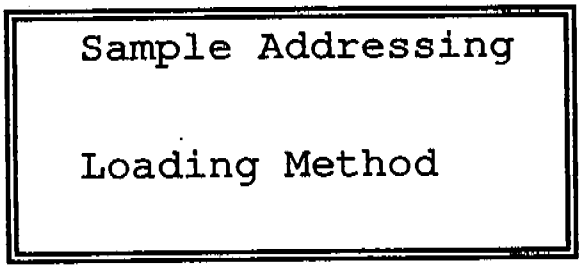


Figure 7-18. Loading Method Screen

- Instructs the autosampler to activate its multiposition valve and switch to the correct sample position while displaying the screen in Figure 7-19.

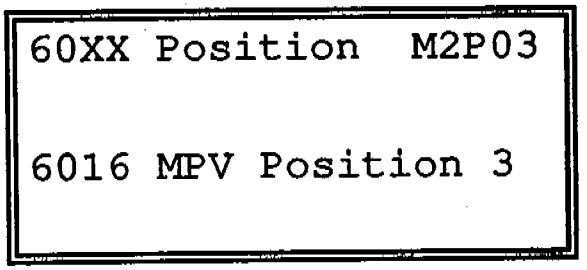


Figure 7-19. MPV Positioning Screen

- Enters a GC Synchronize step (see Figure 7-20) that adds enough time to the 6000 operating cycle to synchronize it with the GC cycle.

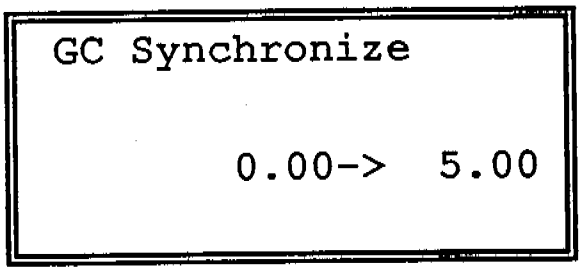


Figure 7-20. GC Synchronize Screen

When the 6000 is running multiple samples or multiple runs on the same sample, GC Synchronize replaces Sample Desorb Ready between runs.

7.5 Interrupting a Run

At any point during a run, you can use control keys on the terminal keypad to:

- Change the normal sequence of operating steps;
- Abort part or all of the scheduled runs; or
- Review the current status of a method schedule.

7.5.1 Change the Normal Step Sequence

To change the normal progression through an operating sequence, you can use one of the following keys:

- Press STEP to step through an operating sequence at will, regardless of the setpoints for the currently active method. STEP ends the current operating step and moves the 6000 to the next step specified in the active method.
- Press SHIFT-GO TO. The 6000 displays the screen shown in Figure 7-21.

```
      Goto Mode
<A>=Standby
 B =Desorb Preheat
 C =Bake
```

Figure 7-21. **Goto Mode Screen**

1 - Press A to interrupt the run and display the Reset screen (Figure 7-22). Follow the instructions in Section 7.5.2 Resetting the Schedule to select one of the Reset options and return to the Standby step.

2 - Press B to go to the Desorb Preheat operating step. This prepares the 6000 to desorb the internal trap.

3 - Press C to go to the Bake operating step. This cleans out the concentrator.

- Press SHIFT-HOLD. The concentrator goes into HOLD mode and does not advance to the next operating step. While the system is in HOLD:

1 - H flashes in the upper right corner of the screen, just in front of the method designation.

2 - Active timers continue to advance, allowing you to monitor the duration of a particular step.

3 - When the timer times out, the concentrator remains in the current operating step.

- Press AUTO to resume normal step progression.

7.5.2 Resetting the Schedule

At any point during the running of a method schedule, you can skip or rerun the current sample, restart the schedule, or completely abort it.

1. From any screen, press and hold the SHIFT key while you press RESET. The Reset screen (Figure 7-22) appears.

```
<A>=Abort Schedule
 B =Abort Sample
 C =Rerun Sample
 D =Complete & Abort
```

Figure 7-22. **Reset Screen**

2. To restart the current method schedule:
   - Press A. The 6000 interrupts the run and returns to the Standby screen for the first sample and first method in the schedule.
3. To skip the rest of a run for the current sample:
   - Press B. The 6000 interrupts its processing on the current sample, moves to process the next scheduled sample, and returns to the Standby screen for the next scheduled sample
4. To rerun the current sample:
   - Press C. The 6000 interrupts the current run, goes back to the beginning of the method to reprocess the current sample, and displays the Standby screen for the current sample.
5. To finish the current sample and abort the rest of the schedule:
   - Press D. The 6000 finishes the current run, goes back to the beginning of the schedule, and displays the Standby screen in Figure 7-23, with the A on Line 1 flashing.

```
Standby              A M01

VlvOven    104-> 200C
```

Figure 7-23. **Standby Screen after an Abort Command**

6. To cancel an attempted abort:
   - Press RESET on the keypad to display the Abort Schedule screen.
   - Press D. The 6000 picks up the once-aborted schedule at the point where it was discontinued.

7.5.3 Reviewing Current Status

You cna review the currently active schedule. When you press A from the Scheduling screen, the Schedule Status screen (Figure 7-24) appears.

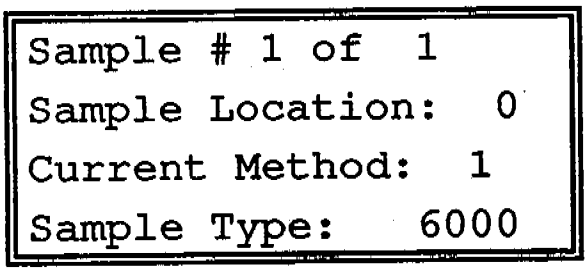


Figure 7-24. **Schedule Status Screen**

The Schedule Status screen is display-only; to change any parameters of the method schedule, press the SCHED key to display the Scheduling screen and refer to Section 7.2.2.2 **Changing the Schedule.**

- Line 1 displays the current sample position and the total number of samples to be run according to the current method.
- Line 2 shows the location of the *currently active* sample. (If the 6000 is running a method, the currently active sample is being processed. If the 6000 is not running a method, the currently active sample is the one that will be processed next.) Sample locations are:

  0 - the single sample location on the front panel of the 6000.

  1 to 16 - the sample positions on an AEROTrap 6016 Autosampler.

  17 to 32 - the sample positions on an AEROTrap 6032 Autosampler.
- Line 3 lists the number of the method is currently being run, or the method that will be run when processing starts. Current Method values range from 1 to 16.
- Line 4 indicates whether or not the current method includes parameters for autosamplers. The available options are:

  6000 - includes parameters for the 6000 front-panel single sample.

  60XX - includes parameters for an autosampler sample.

7.6 Reviewing Temperature

The Temperature screens are a multiple-screen listing of all heated zones, their current temperatures, and their setpoints.

To display the Temperature screens:

- Press TEMP on the keypad. **Temperature Screen 1** (Figure 7-25) appears.

CryoTrap	30C->	30C
Sample	30C->	30C
XferLine	98C->	200C
BOT Htr	98C->	100C

Figure 7-25. **Temperature Screen 1**

To display the next **Temperature** screen, press **NEXT PAGE.**

As you scroll through the screens, to display a previous Temperature screen, press **PREV PAGE.**

8.1 Overview

This section describes routine maintenance procedures for the 6000 and tells you how to:

- Handle and load sample tubes
- Change the sample heater on the front panel from one size to another.
- Install or change the 6000's internal trap.
- Clean and condition the internal trap and the front-panel sample tube.

8.2 Loading a Sample

Before you can leak check the 6000, you must load the sample heater with a blank tube and attach the desorb line, as described in Section 3.3. The blank tube must be removed AFTER you leak check, before you can load a sample.

8.2.1 Removing a Sample Tube

To remove a sample tube from the assembly (Figure 8-1):

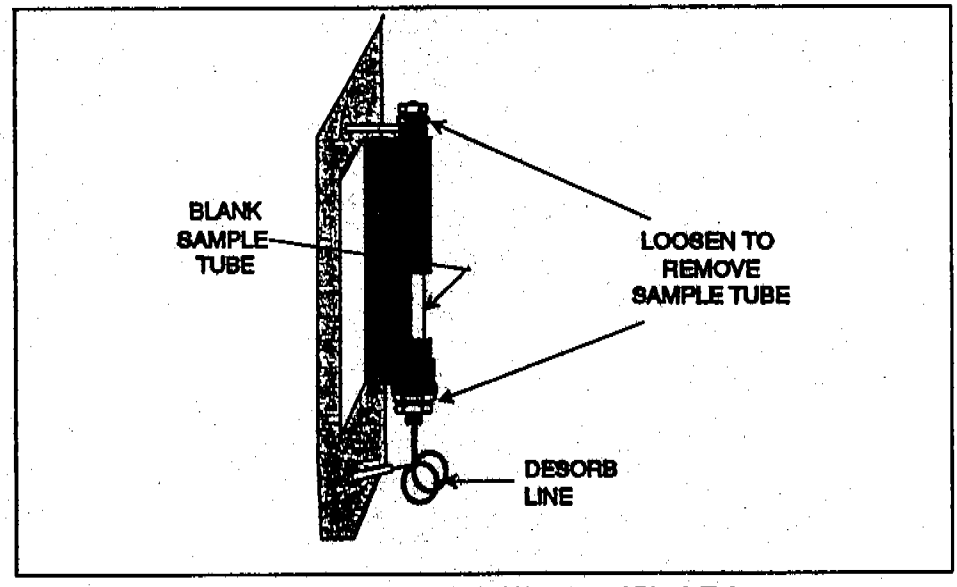


Figure 8-1. Pre-Assembled Heater and Blank Tube

⚠ CAUTION

Make sure both the sample tube and heater assembly are cool before you touch them.

1. Loosen the quarter-turn screws holding the heater cover and pull forward to remove it.
2. Loosen the bottom nut on the tube.
3. Slide the desorb line down off the tube.
4. Hold the bottom end of the tube, below the heater. Loosen the nut at the top of the tube assembly; then slide the tube down and out of the heater.

8.2.2 Handling Samples

When you are ready to load a sample, please review the following handling guidelines before you begin.

- To avoid transferring oil or dirt from your fingers, DO NOT TOUCH the ends of the sample tube.
- Minimize the length of time a loaded sample tube is exposed to the air. DO NOT open a container holding a loaded sample tube until you are ready to install the tube on the 6000.

Figure 8-2 illustrates the front-panel sample position on the 6000, showing the direction of sample gas flow (through the desorb line assembly, up through the heated tube, and out through the sample mount bulkhead back to the outgoing sample line).

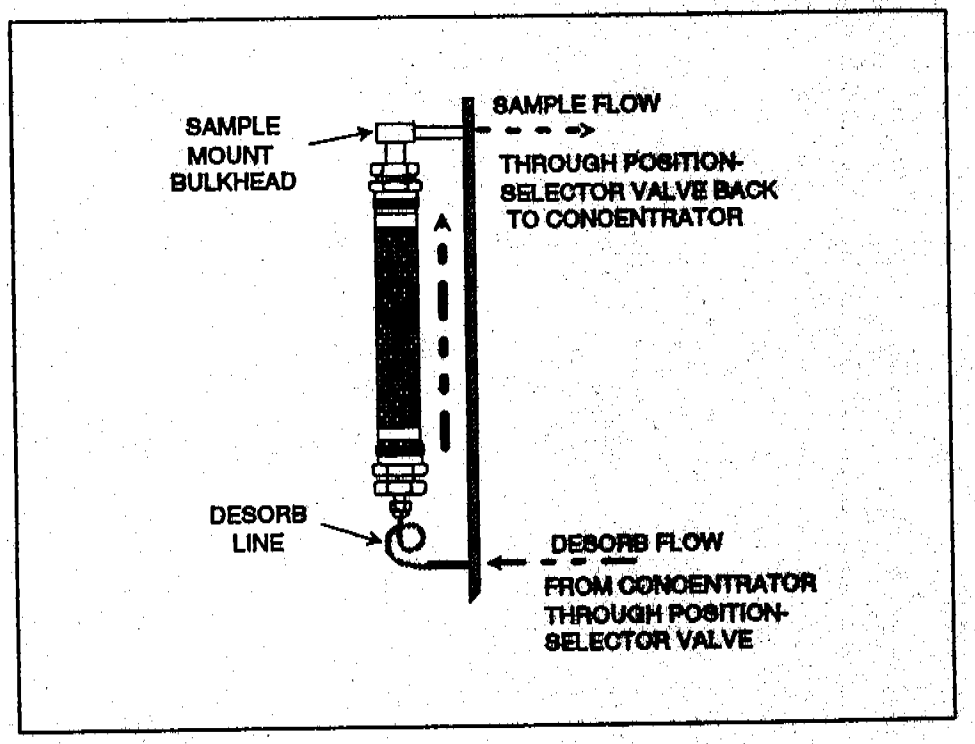


Figure 8-2. Autosampler Sample Position

Note: *The sample tube MUST BE installed so that it is backflushed by the desorb gas. If the sample was collected with the sample flowing in from TOP to BOTTOM of the tube (as shown in Figure 8-3), install the sample tube on the autosampler so that desorb gas flows in from the BOTTOM to the TOP.*

8.2.2 Handling Samples, cont.

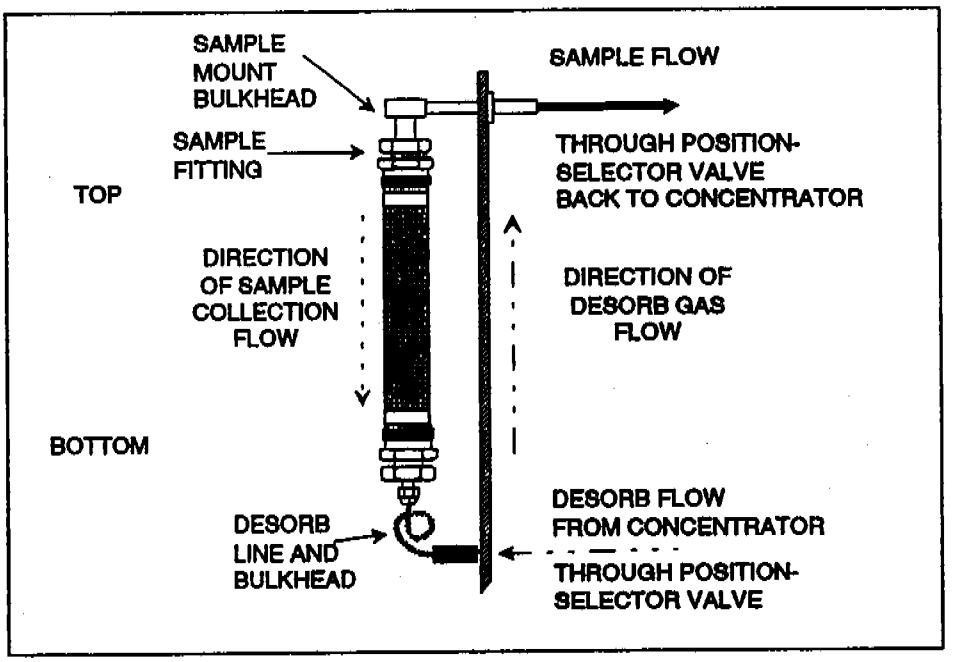


Figure 8-3. **Backflushing the Sample Tube**

Note: ***Make sure that the Teflon ferrules are in place when changing a sample tube. The ferrules should be inspected frequently for wear to prevent leaks.***

1. Beginning at the bottom of the heater, slide the tube up through the heater and into the sample fitting.
2. Slide the tube as far as it will go into the sample fitting; then back it off one or two millimeters.
3. Finger-tighten the sample fitting around the tube. (As the fitting tightens, it draws the tube up and secures it.)
4. Using a wrench, tighten the fitting a ¼-turn past finger-tight.
5. There is a fitting on the end of the desorb line. Slide that fitting up over the bottom of the tube. Finger-tighten; then wrench-tighten the fitting a ¼-turn past finger-tight.

8.3 Changing the Internal Trap

To change the internal trap:

1. Loosen the two quarter-turn screws on the 6000's right-front panel. Then slide the right-front panel forward and then to the right to remove it.

⚠ CAUTION

Make sure the trap is cool before you handle it.

2. Loosen the nut at the top of the trap one full turn, but do not remove it completely.
3. HOLD THE BOTTOM FITTING IN PLACE WITH A 7/16" WRENCH. Use another 7/16" wrench to turn the nut at the bottom of the blank trap counter-clockwise until the fitting is disengaged.

⚠ CAUTION

Failure to hold the bottom fitting with a wrench can damage the fitting.

4. CAREFULLY pull the trap straight down and out of the upper trap fitting.
5. Slide a packed trap into the trap furnace sleeve, being sure that the ferrules are in place.
6. Reconnect the top and bottom fittings. Tighten the top fitting finger-tight. Tighten the brass nut at the bottom 1/8 turn past finger-tight.

8.4 Cleaning the System

A clean system is one of the most important factors in avoiding contamination. The AEROTrap 6000 may become seriously contaminated from a heavily contaminated sample or a bad desorb gas tank; or contaminants may accumulate during the course of normal operation.

Before running your first analysis on the 6000, and twice a week thereafter, routinely clean out the system by following these steps:

1. Install a blank sample tube.
2. Run the system through a **Trap Bake** cycle. Please refer to Section 7.0 **Scheduling and Running Samples** for **Trap Bake** operating instructions.

9.1 Calling for Service

To order parts, ask technical questions, or obtain service for your Tekmar AEROTrap 6000, call one of the following numbers:

- (800) 543-4461 - toll-free in the US and Canada
- (513) 247-7000 - outside the US and Canada

This section lists part numbers and names for AEROTrap 6000 replacement parts. ***Before you call*** for service or parts:

1. Note the model name, model number, and serial number of your instrument.
2. If requesting assistance or service, note the type of problem you are having: write down the conditions under which the problem occurred and the display, activity, or result that indicated the existence of a problem.
3. If ordering parts, write down the part number, part name, and quantity needed.

Thank you.

9.2 6000 Parts List

AEROTrap 6000 spare parts are listed by type: sample handling, fittings, tubing, electronics, heaters and assemblies, valves and pneumatics, and miscellaneous.

9.2.1 Sample Handling

14-1677-002	Trap Tube, SS, Blank, 7" x 1/4" O.D.
14-1677-103	Same as 14-1677-002 but packed with Tenax®
14-1677-203	Same as 14-1677-002 but packed with Tenax®/Carbon Molecular Sieve
14-1677-303	Same as 14-1677-002 but packed with Carbon Molecular Sieve
14-1677-403	Same as 14-1677-002 but packed with Carbotrap™ 300
14-2694-024	Trap Tube, Glass, Blank, 7" x 1/4" O.D.
14-2694-124	Same as 14-2694-024 but packed with Tenax®
14-2694-224	Same as 14-2694-024 but packed with Tenax®/Carbon Molecular Sieve
14-2694-324	Same as 14-2694-024 but packed with Carbon Molecular Sieve
14-2694-424	Same as 14-2694-024 but packed with Carbotrap™ 300
14-5217-003	Trap Tube, SS, Blank, 7" x 1/2" O.D.
14-5217-103	Same as 14-5217-002 but packed with Tenax®
14-5217-202	Same as 14-5217-002 but packed with Tenax®/Carbon Molecular Sieve
14-5217-302	Same as 14-5217-002 but packed with Carbon Molecular Sieve
14-5217-402	Same as 14-5217-002 but packed with Carbotrap™ 300
14-5218-024	Trap Tube, Glass, Blank, 7" x 1/2" O.D.
14-5218-124	Same as 14-5218-024 but packed with Tenax®

9.2.1 Sample Handling, cont.

14-5218-224 Same as 14-5218-024 but packed with Tenax®/Carbon Molecular Sieve
14-5218-324 Same as 14-5218-024 but packed with Carbon Molecular Sieve
14-5218-424 Same as 14-5218-024 but packed with Carbotrap™ 300
14-5570-024 Trap Shipping Container, Glass AEROTrap 1/4" SS traps
14-5570-124 Trap Shipping container, Glass AEROTrap 1/2" SS traps
14-5642-102 Sweep Line Assembly

9.2.2 Fittings

14-5314-016 Fitting, Sample Tube Mount, 1/4"
14-5313-016 Fitting, Sample Tube Mount, 1/2"
14-5494-016 Union, 1/2" to 1/16"
14-5495-016 Union, 1/4" to 1/16"
14-0241-016 Ferrule, 1/16", SS, single piece Valco
14-0158-016 Ferrule, 1/16", SS, Swagelock
12-0041-016 Ferrule, 1/4" Teflon
14-1301-016 Ferrule, 1/2", Teflon
14-0159-016 Nut, 1/16", SS, Swagelock
14-0243-016 Nut, 1/16", short
14-3295-016 Nut, 1/16" SS male Swagelok
14-0264-016 Union, bulkhead 1/16" SS
14-0356-016 Union, bulkhead 1/8" filter assembly
14-0521-016 Ferrule, 0.4 mm 10 graphite vespel
14-0540-016 Ferrule, 0.5 mm 10 graphite vespel
14-2074-016 Ferrule, 0.8 mm 10 graphite vespel
14-2931-016 Ferrule, 1/16" 10 graphite vespel
12-0043-016 Ferrule, set 1/8" Teflon
12-0408-016 Ferrule, set 1/8" SS
14-5304-016 Tee, 60 degree side port
14-5302-016 Elbow, 1/8" - 1/16" bulkhead SS
14-5303-016 Elbow, 1/16"-1/16" bulkhead SS
12-0042-016 Reducer, 1/16"-1/8" tube stub

9.2.3 Tubing

14-0539-002 Tubing, fused silica 0.32 mm ID
14-2072-002 Tubing, fused silica 0.53 mm ID
14-3591-002 Tubing, Aluminum silica 0.53 mm ID
14-3572-002 Tubing, Aluminum silica 0.32 mm ID
14-5229-002 Tubing, 1/16", Nickel, Large Bore
14-5540-002 Tubing, Electroform .04 ID .06 OD

9.2.4 Electronics

14-5233-090 PC Board Assy, Microcontroller
14-5234-090 PC Board Assy, Memory
14-5235-090 PC Board Assy, Comm/Interface
14-5236-090 PC Board Assy, Output
14-5312-090 PC Board Assy, Inter-connect
14-5315-090 PC Board Assy, Thermocouple
14-5297-191 Display Assy, LED with connector
14-5439-080 Cover, Display, Clear
14-5528-086 Modular Jack with cable
14-3027-000 Cable, 6-port valve
14-5260-100 Kit, Hand Held Terminal RS232 with cable
14-5260-000 Hand Held Terminal RS232
14-5558-086 Cable, 6 pin modular, coiled
14-5321-080 Expansion slot cover (thermocouple)
14-4960-034 Fuse, 8 amp 5 x 20 mm
14-5483-034 Fuse, 2.5 amp 5 x 20 mm
14-0298-039 Power cord, 110V
14-5291-038 Transformer Assy, 110V - 24V/8V
14-4957-238 Transformer Assy, 220V - 110V
14-5177-238 Transformer Assy, 100V -110V
14-5634-600 Wiring kit, main, 110V
14-4383-028 Switch, Power, 10 amp filtered
14-5634-000 Power Lead, Trap 10"
14-5634-100 TC Extension, Trap 25"
14-5634-200 TC Extension, BOT 13"
14-5634-300 TC Extension, MCS 8 1/2"
14-5634-400 Power Lead, Cryo 25"
14-5634-500 Cable Display, 21"
14-3105-000 Cryo Power Cord Assy
14-5180-034 Fuse, 10A, 250V 5 x 20 mm
14-4961-034 Fuse, 4 amp 5 x 20 mmTRAPS

9.2.5 Traps

14-5652-003 Trap, Tenax (#1) or Glass Bead 6" #61
14-4164-103 Trap, Blank 6" LG. #60

9.2.6 Heaters and Assemblies

14-5513-000 Heater Assembly, 1/2" x 7"
14-5633-020 Heater Assembly, 1/4" x 7"
14-5299-020 Heater Assembly, bottom of trap
14-5307-020 Heater, Transfer Line 72"
14-5595-020 Cartridge Heater Assembly 1/4" x 3 1/2' (oven) 80 watt
14-5594-020 Cartridge Heater Assembly 1/4" x 4 1/2" (trap) 200 watt
14-5301-079 Plate, machined, valve oven
14-5555-026 Thermocouple type K 16 (oven)
14-5525-019 Blower Assembly 60 cfm 115V
14-4738-028 Switch, Interlock, 125 VAC (sample heater)
14-5524-019 Fan, Assy 3 1/8 sq 21" Leads
14-5524-119 Fan, Assy 3 1/8 sq 17" Leads
14-5654-020 Heater Assy, MCS
14-5293-020 Heater Assy, Cryo Trap
14-5631-079 Heat sink, Assy, MCS

9.2.7 Valves and Pneumatics

14-5298-050 Valve, 6-port, 350°C
14-5529-050 Valve, Assy, sweep 12 VDC
14-5527-050 Valve, Assy, bypass 12 VDC
14-5530-050 Valve, Assy, vent 12 VDC
14-2531-100 Valve, Assy, LN_2 Lt. Grey
14-5026-050 Pressure regulator
14-4570-000 Pressure Gauge Assy, 0-30 p.s.i.g.
14-5522-050 Flow Controller, 0-100 cc/min.
14-0518-050 Valve, Relief 75 p.s.i.g.
14-5653-067 Loop, MCS, 450-500µl Eform

9.2.8 Miscellaneous

14-5562-000 Model 6000 Installation Kit
14-6000-074 Model 6000 Manual
14-5511-000 Model 6000 Kit Box
14-5569-000 Kit Conversion 1/4" to 1/2"
14-5569-100 Kit Conversion, 1/2" to 1/4"
14-1362-000 Hydrocarbon Trap Assembly
14-6000-017 Shipping Carton (set)
14-6000-117 Shipping Foam Enclosures (set)
14-1668-000 Transfer Line Assembly LN_2
14-4814-000 LN_2 Tank Adapter Kit
14-5634-000 Power Lead, Trap 10"
14-5634-100 TC Extension, Trap 25"
14-5634-200 TC Extension, SDT 13"
14-5634-300 TC Extension, MCS 8 1/2"
14-5634-400 Power Lead, Cryo 25"
14-5634-500 Cable Display, 21"
14-3105-000 Cryo Power Cord Assy
14-5180-034 Fuse, 10A, 250V 5 x 20 mm
14-4961-034 Fuse, 4 amp 5 x 20 mm

9.3 Cryofocusing Module Parts List

Spare parts for the Cryofocusing module are listed by type: electronics, heaters, fittings, tubing, and miscellaneous.

9.3.1 Electronics

14-5330-090 Logic Board Assembly
14-4977-090 Logic Board Assembly (from S/N 91046014)
14-3088-000 Output Board Assembly
14-4624-090 Output Board Assembly (from S/N 91046014)
14-2767-000 Cable, Capillary Interface to Tekmar 2000
14-3105-000 Power Cord, Cryogenic Valve
14-3443-034 Fuse, 5 AMP (110V)
14-0717-034 Fuse, 2.5 AGC (220V)

9.3.2 Heaters

14-3353-000 Cartridge Heater Assembly (110V)
14-3353-100 Cartridge Heater Assembly (220V)
14-3636-000 Cryo Heater Assembly (110V)
14-3636-100 Cryo Heater Assembly (220V)
14-2783-026 Thermocouple Probe

9.3.3 Fittings

14-1787-016 Nut, 1/4", Brass, Swagelok
14-0243-016 Nut, Short, 1/16", Stainless Steel, Valco
14-1418-016 Ferrule Set, 1/4", Brass, Swagelok
14-2074-016 Ferrule, GVF, 0.8 mm I.D.
14-0540-016 Ferrule, GVF, 0.5 mm I.D.
14-1668-000 LN_2 Transfer Line Assembly to Capillary Interface
14-1812-000 Cryo-2 Vent Assembly
14-3071-016 Union, 1/16", Gold-Plated, Valco
14-2535-016 Adapture 1/4 Tube to 1/8 NPT, Brass
14-4814-000 LN_2 Adapter Kit

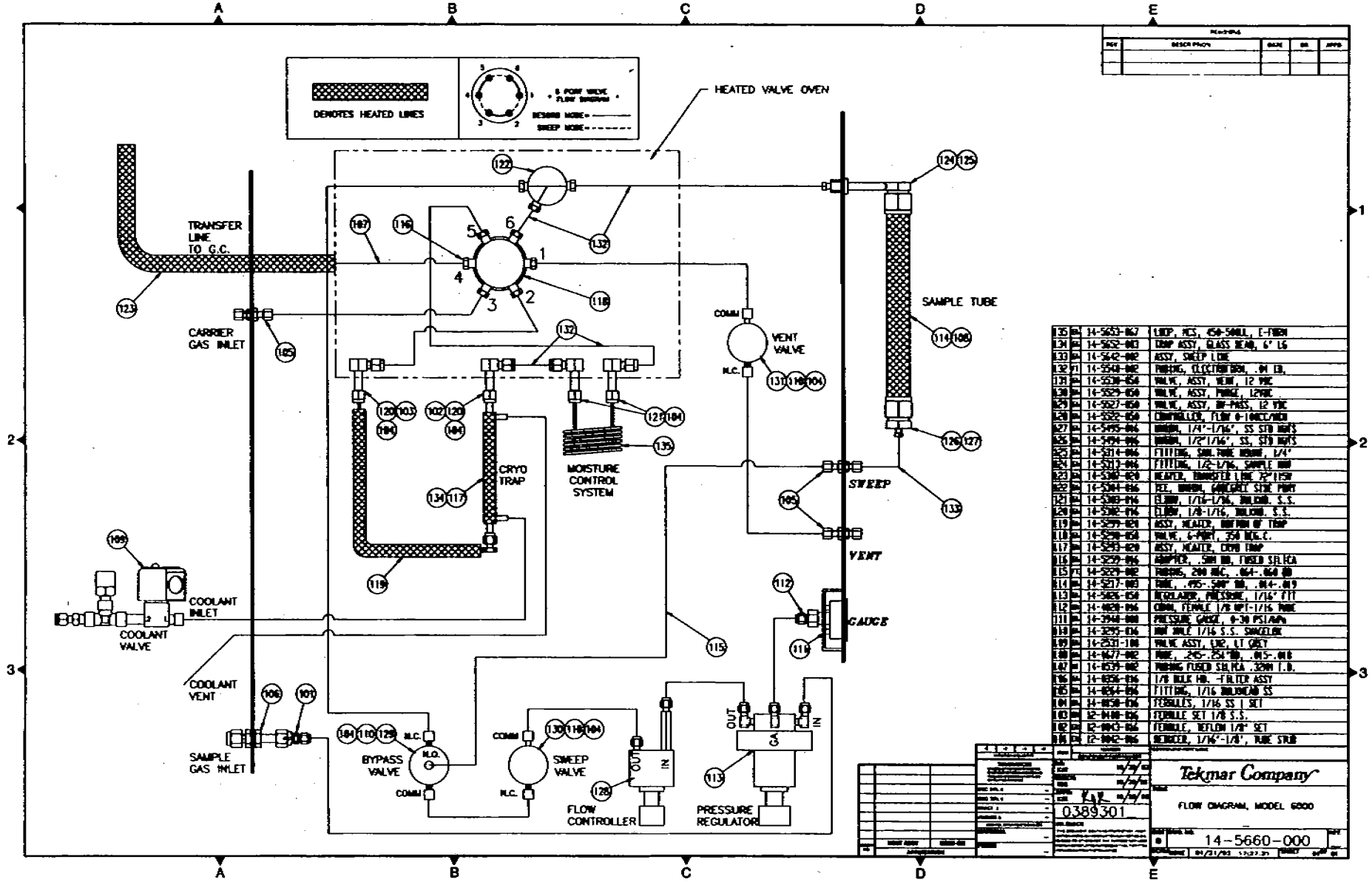
9.3.4 Tubing

14-2072-002 Tubing, Fused Silica, 0.53 mm I.D. (priced per meter)
14-0539-002 Tubing, Fused Silica, 0.32 mm I.D. (priced per meter)
14-5229-002 Tubing, Nickel, 1/16", Large Bore (priced per foot, min. 5 ft.)
14-1313-002 Tubing, Copper, 1/4" (priced per foot, min. order 5 ft.)
14-1652-004 Pipe Insulation (priced per 6 ft. length)
14-3591-002 Tubing, 0.53 mm I.D. Aluminum Silica (priced per meter)
14-3592-002 Tubing, 0.32 mm I.D. Aluminum Silica (priced per meter)

9.3.5 Miscellaneous

14-2755-028 Power Switch
14-1282-034 Fuse Holder
14-3231-000 Power Cord Assembly
14-3228-001 Thumb Screw, 6-32 x 3/8"
12-0323-V01 Screw, 100 Deg. Flat Head (priced each, package of 10)
14-3069-000 Oven Cover Assembly
14-2745-000 Front Panel Wrapper
14-2760-000 Brass Heater Block
14-2754-000 Slider Plate Complete (welded fitting to SS plate)
14-2759-000 Cryo Slider Assembly (110V, heater block, slider plate, union, heaters, and TC probe assembled)
14-2759-100 Cryo Slider Assembly (220V, heater block, slider plate, union, heaters, and TC probe assembled)
14-2531-000 Cryogenic Valve Assembly, 12 VDC
14-2776-050 Cryogenic Valve
14-0518-050 Relief Valve
14-3938-000 External Regulator Assembly
14-3401-000 Instruction Manual

Tekmar



6000 FLOW DIAGRAM

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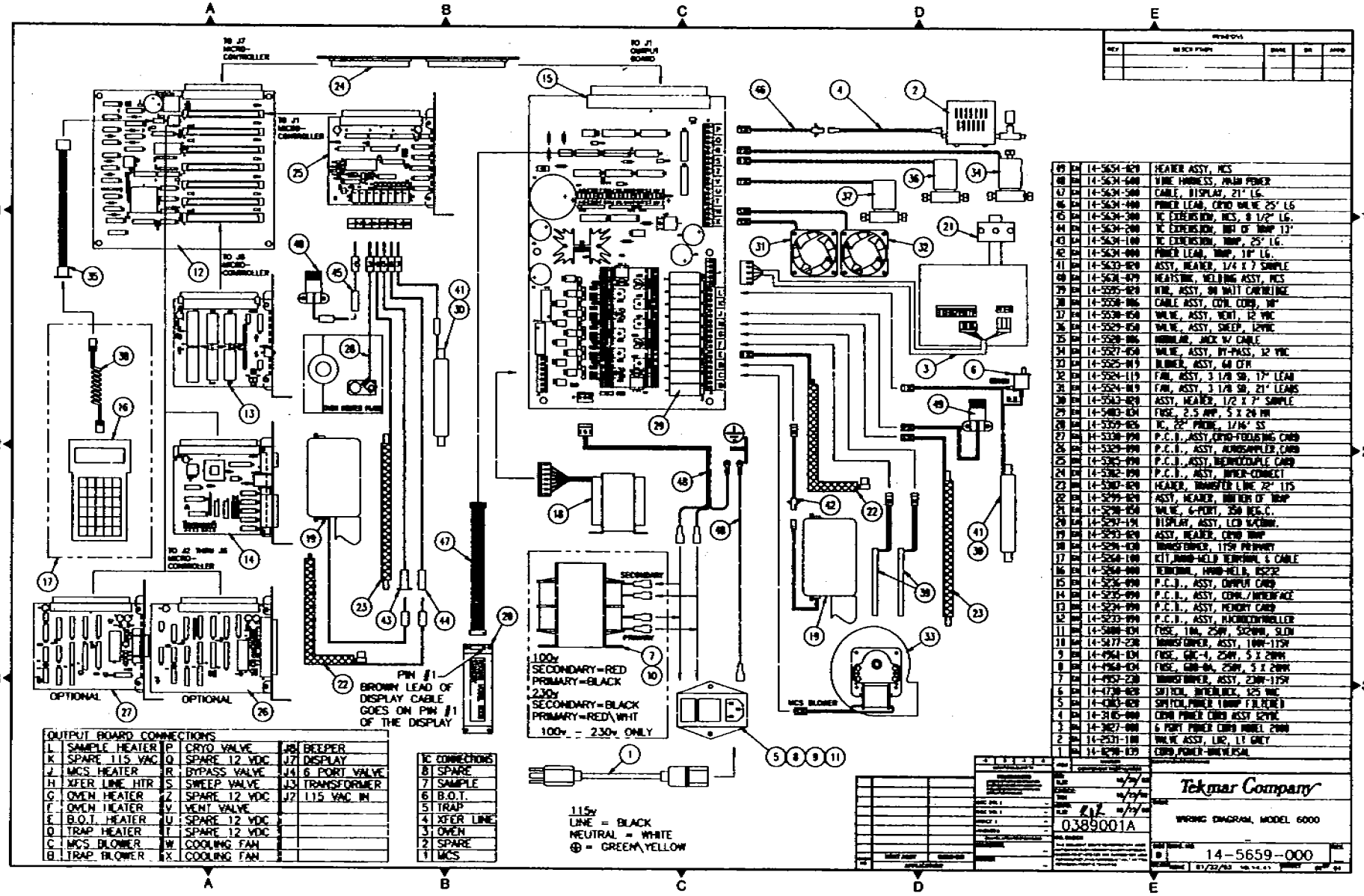
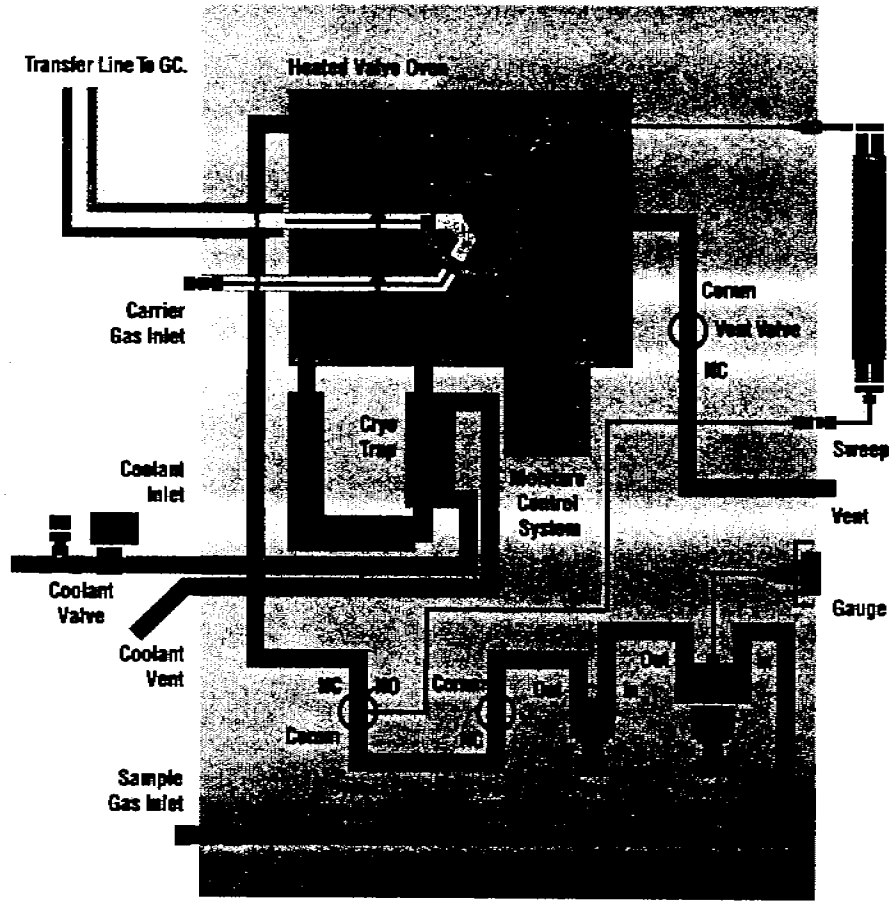


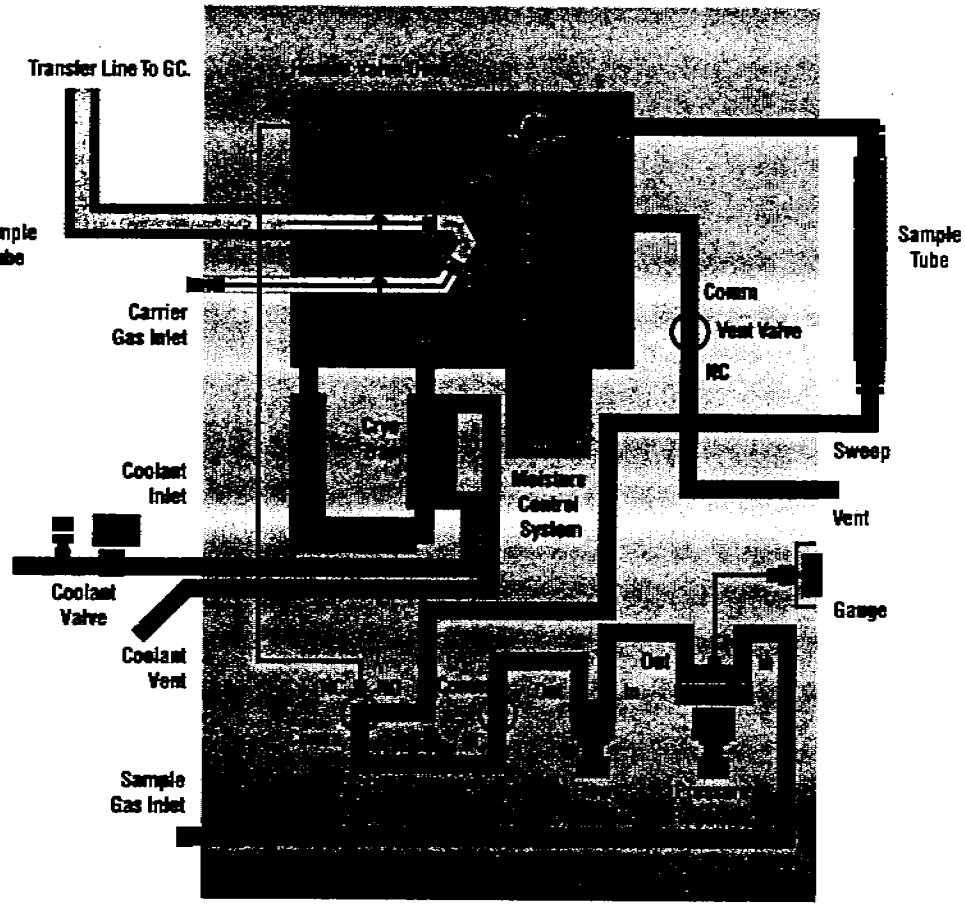
6000 WIRING DIAGRAM

Internal Trap/MCS Bake
Standby With Sweep On

LN_2 Valve May Open to Help Maintain Bake Setpoint



Sample Desorb



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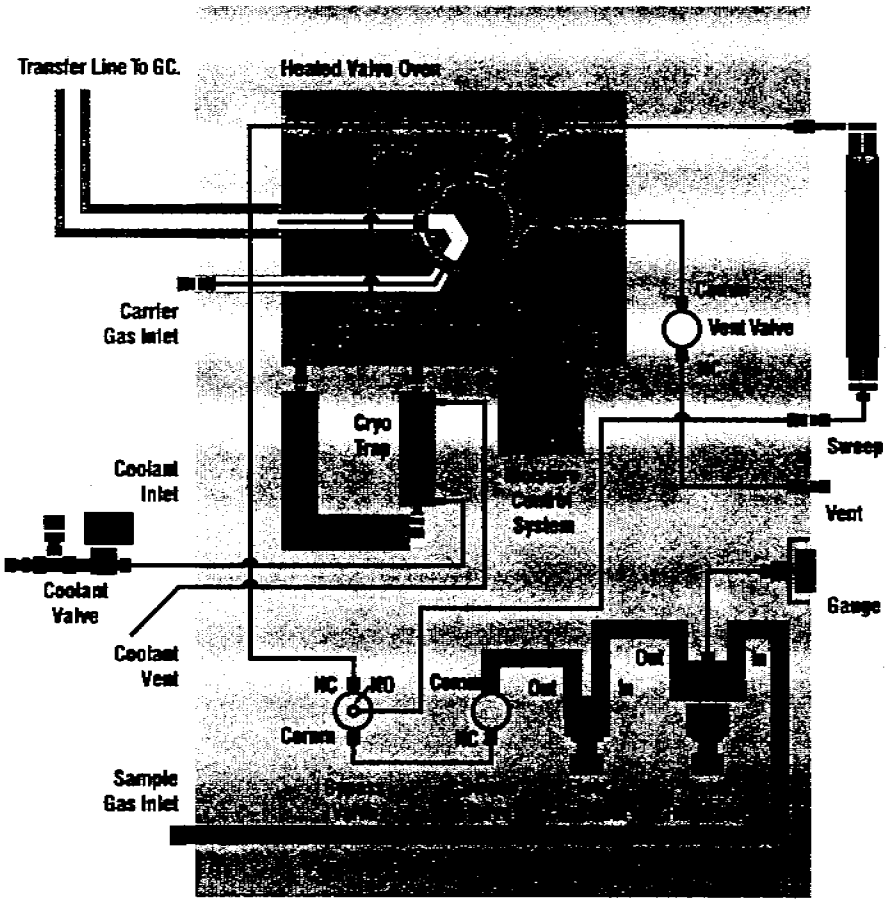
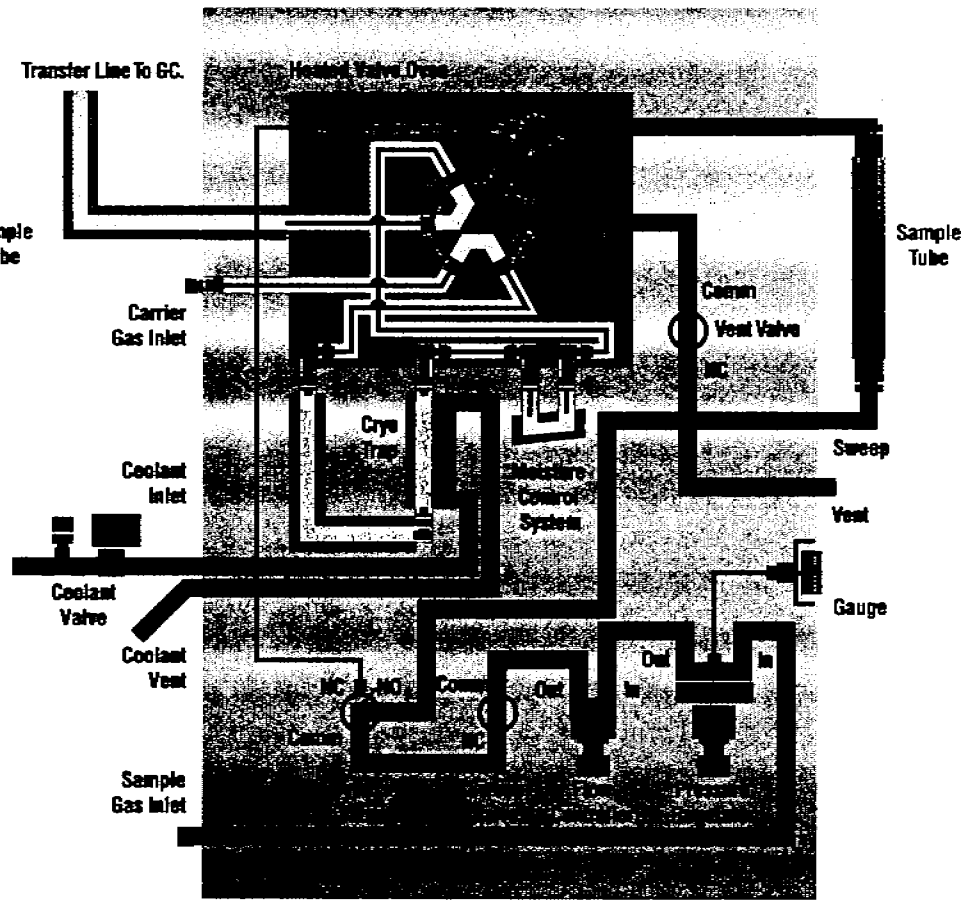
Heated Lines
Sample Gas
Carrier Gas
LN_2 Coolant

Internal Trap Preheat Standby With Sweep Off



Internal Trap Desorb Sample Bake

LN_2 Valve May Open to Help Maintain Desorb Temperature



Tekmar

Heated Lines
Sample Gas
Carrier Gas
LN_2 Coolant

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