Partisol® Model 2300

Speciation Sampler

Operating Manual

42-006439 Revision A April 2005

Thermo
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Thermo Fisher Scientific
Air Quality Instruments
27 Forge Parkway
Franklin, MA 02038
1-508-520-0430
www.thermo.com/aqi

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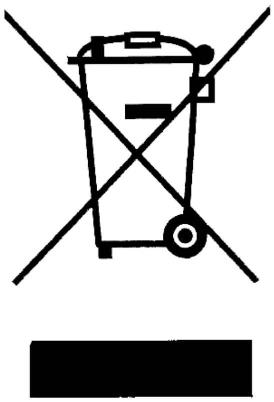

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Repair of instrumentation manufactured by Rupprecht & Patashnick Co., Inc. (R&P) should only be attempted by properly trained service personnel, and should only be conducted in accordance with R&P system documentation. Do not tamper with this hardware. High voltages may be present in all instrument enclosures. Use established safety precautions when working with this instrument. Instrument is supplied with a grounded three-prong plug designed for outdoor use. When operating the instrument outdoors, be sure that it is plugged into a properly rated exterior (outdoor) outlet.

The Partisol stand must be anchored when installed outdoors to prevent tipping of the sampler and/or stand in high winds.

The seller cannot foresee all possible modes of operation in which the user may attempt to utilize this instrumentation. The user assumes all liability associated with the use of this instrumentation. The seller further disclaims any responsibility for consequential damages. Use of this product in any manner not intended by the manufacturer will void the safety protection provided by the equipment, and may damage the equipment and subject the user to injury.

Warranty (U.S.)

Unless otherwise agreed upon in writing by authorized personnel of Rupprecht & Patashnick Co., Inc. (R&P) and the purchaser, the following warranty shall be in force for equipment sold and operated in the United States of America.

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The above warranty is contingent upon the proper use of the equipment (i.e., operation and maintenance in accordance with the procedures set forth in the provided operation manual(s)) and does not cover equipment that has been modified without R&P's approval, or which has been subjected to abuse or unusual physical or electrical stress.

This warranty does not cover any optional personal computer equipment or operating system software supplied with the equipment beyond the warranty period provided by the manufacturer of the computer or software. The customer is responsible for obtaining a local, third-party service agreement for computer service requirements beyond the warranty term of the computer.

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Equipment Rating

The following information can be used to determine the power service requirements of this product:

Line Voltage	
115 V ~ 60 Hz	3.0 Amp
230 V ~ 50 Hz	1.5 Amp

Electrical & Safety Conformity

The product has been tested by Intertek Testing Services, and has been documented to be in compliance with the following U.S. and Canadian safety standards:

UL Standard 3101-1
CAN/CSA C22.2 NO. 1010.1

Rupprecht & Patashnick Co., Inc. certifies that this product operates in compliance with the EC Directive 89/336/EEC in reference to electrical emissions and immunity. Specifically, the equipment meets the requirements of EN61326:1997 (Emissions and Immunity).

In addition, the hardware has been tested for personal or fire safety hazards, and meets the requirements of EN61010-1:1995 (Safety) in fulfillment of EC Directive 73/23/EEC.

Section Revision List

As R&P instrumentation changes, so do our Operating and Service manuals. However, these changes may affect only one aspect of an instrument, while leaving the instrument as a whole unchanged. To explain these individual changes to our customers, R&P will update only those sections of its Operating and Service manuals that are affected by the instrument updates or improvements. As each manual section changes, so does its revision number, which is located at the top right corner of each page of each section.

To help our customers keep track of the changes to the Partisol Model 2300 Speciation Sampler and its operating manual, following is a list of the manual sections with their respective revision numbers:

Section Number and Description	*Revision Number*
Section 1: Introduction	A.000
Section 2: Hardware Installation	A.000
Section 3: Denuder, Filter and Cartridge Preparation	A.000
Section 4: Cartridge Handling and Exchange	A.000
Section 5: Software Overview	A.000
Section 6: Sampler Operation	A.000
Section 7: Software Setup and Operation	A.000
Section 8: Operating Information	A.000
Section 9: Viewing Stored Data	A.000
Section 10: Data Input and Output	A.000
Section 11: Password Protection	A.000
Section 12: Verification Procedures and Routine Maintenance	A.001
Section 13: Resetting the Sampler	A.000
Section 14: Service Menu	A.000

Revision Descriptions

To help our customers keep track of the changes to the Partisol Model 2300 Speciation Sampler and its operating manual, following is a list of the manual sections with their respective revision descriptions. This list contains all the changes made to the manual since the last update.

Section Number	*Revision Description*
Section 12: Verification Procedures and Routine Maintenance	- Updated pump part number (Section 12)

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Section 1: Introduction

The Partisol® Model 2300 Speciation Sampler is a 4- or 12-channel sampling platform for particulate matter-related and gaseous species. The device is based upon the same hardware and software platform as the other members of R&P's Partisol family of samplers. The sampler meets the U.S. Environmental Protection Agency (USEPA) chemical speciation requirements for PM-2.5 sampling.

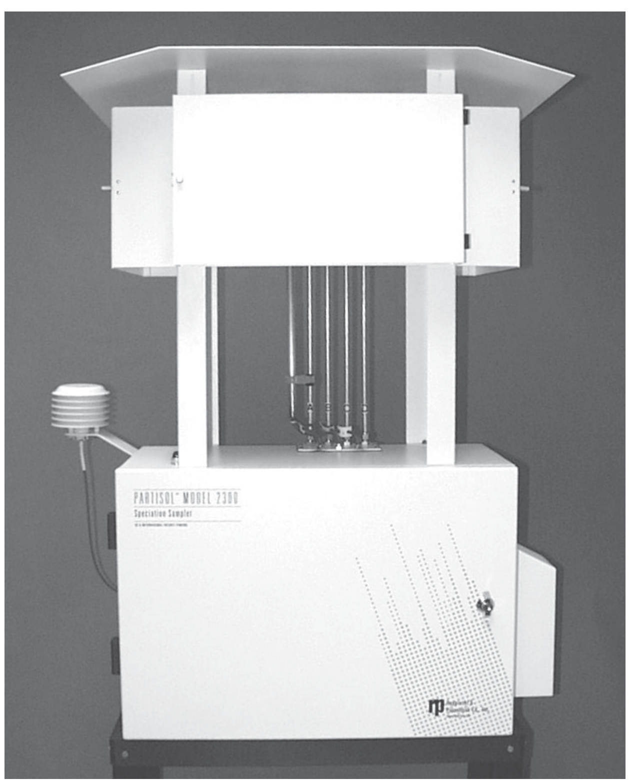
The sampler is available in a basic 4-channel and an advanced 12-channel version to meet the sampling needs of different applications. In these configurations, the unit is designed to house R&P's ChemComb™ Speciation Sampling Cartridges developed by Harvard University. The Partisol Speciation Sampler is also available as a 12-channel Flexible Sampling Platform (FSP) for special project applications.

The programming of the sampler supports the following features:

- Channels can be grouped in the following ways:

    - Three groups of 4 flow channels
    - Three groups of 3 flow channels
    - Six groups of 2 flow channels
    - Twelve groups of 1 flow channels.

Figure 1-1. Partisol Model 2300 Speciation Sampler.



- Four flow channels can be operated simultaneously, each at a flow rate of up to 16.7 l/min (1 m^3/h) to achieve thermodynamic conditions comparable with PM-2.5 FRM samplers. This also allows more material to be collected on each 47 mm filter for analysis than at lower flow rates.

- Flexible definition of sampling programs by time/date or external inputs such as wind speed and/or direction, or analog input from another external source.

1.1. Advanced Features

ChemComb Speciation Sampling Cartridges contain the following features:

- A sharp-cut PM-2.5 impactor that operates at 10 or 16.7 l/min, and achieves a PM-2.5 cut-point similar to that of the U.S. Environmental Protection Agency (EPA) WINS impactor.

- Up to two high-efficiency honeycomb denuders patented, field-tested and characterized by Harvard University.

- A four-stage filter pack for 47 mm diameter filters.

- A straight flow path followed by the sample stream between the PM-2.5 impactor and the four-stage filter pack.

- The hardware components are housed in a sealable module that eliminates the in-field assembly of sampling components.

Other major features include the following:

- Active volumetric flow control maintains a constant volumetric flow rate specified by the user by incorporating four mass flow controllers and ambient temperature and pressure sensors. Sampled volumes are reported in either volumetric or standard terms. Flow rate set points can be defined by channel at a range of 5 to 18 l/min (16.7 l/min default).

- Built-in sensors for ambient temperature, pressure and relative humidity. The sampler contains five 0-5 VDC analog inputs, with two dedicated to recording wind speed and direction.

- Three types of internal data storage, modeled after the Partisol-Plus Model 2025 Sequential Air Sampler:

  - *Interval Data* stored every 5 minutes contain averaged ambient temperature, ambient pressure, and sample flow rates.

  - *Filter Data* contain a set of values related to each speciation cartridge exposed, including sampled volumes (in standard or volumetric terms), averaged meteorological data, error condition flagging and power outage time stamps.

  - *Input Data* are stored at a user-defined interval and include averages of meteorological data and inputs from external sources and operating information. If an optional wind vane/anemometer is connected to the sampler, each input data record contains the average wind speed, and vector-based averages of wind velocity and direction. The default averaging and storage interval is 30 minutes.

- Simplicity of operation, performance audits and retrieval of stored data through an embedded microprocessor and menu-driven software.

- Software support for single- and multiple-point audit/calibration of the sampler's four flow controllers using a volumetric flow meter. Software support for the use of the Streamline FTS Flow Transfer Standard for flow audits and calibrations.

- ChemComb cartridges are sheltered from direct solar radiation and passively ventilated with ambient-temperature air in a protective shield.

- Convenient exchange of sampling modules without opening the instrument enclosure.

- Remote operation through analog input or two-way RS232 serial link.

- Three 0-5 VDC analog inputs are converted to engineering units through user-defined formulas. These values are averaged and stored by the sampler. Two additional 0-5 VDC inputs are dedicated to receiving wind speed and wind direction information. The system performs vector-based averaging of these meteorological inputs to determine average wind velocity and direction.

- Bidirectional RS232 communication allows current operating data, interval data, filter data and input data to be downloaded. Standard equipment includes a 9-to-9 pin cable for linking the sampler to a personal computer (PC), and basic communication software.

- Three user-defined 0-5 VDC analog outputs and two user-defined TTL outputs provide simple access to system information by other devices.

- Automatic analog input/output calibration capability.

- Operates over a wide temperature range from -30° to 50° C.

- Low maintenance requirements through the use of durable components and long-life AC vacuum pump.

- Designed to comply with UL-, CSA- and CE-equivalent electrical and safety approvals.

1.2. Organization of Manual

This manual is divided into fourteen sections, six appendixes and an index which discuss different topics. The first sections explain how to setup the system's hardware and software, while the later sections describe the advanced features of the Partisol Speciation Sampler. The user should read and implement the procedures discussed in the earlier sections before using the advanced functions explained later in the manual. The following list provides an overview of the topics handled in each section of the manual:

Section 1: Introduction
This section introduces the user to the advanced features of the Partisol Speciation Sampler and describes the flow and sampling configurations of the system. It also discusses the flow control scheme used in the unit.

Section 2: Hardware Installation
This section contains the instructions for setting up the sampling hardware and its stand.

Section 3: Denuder, Filter and Cartridge Preparation
This section explains how to prepare the Honeycomb (HC) denuders for use in the ChemComb cartridges, and how to maintain and clean the cartridges. This section also explains how to perform the initial inspection and the equilibrium and weighing (before and after sampling) of the 47 mm filters used in the ChemComb cartridges.

Section 4: Cartridge Handling and Exchange
This section explains how to install and remove the Honeycomb denuders in the ChemComb cartridges, and how to extract sampled gases from the denuders. This section also describes how to install and remove the cartridges from the Partisol Speciation Sampler.

Section 5: Software Overview
This section provides an overview of the hierarchy of the system's software screens, and explains how to navigate around the software and change the values of parameters.

Section 6: Sampler Operation
This section describes the steps involved in verifying the sampler's performance characteristics prior to starting a sampling run, programming a sampling run and retrieving data after a sampling run.

Section 7: Software Setup and Operation
This section describes the operation of the Partisol Speciation Sampler's software, including the definition of its sampling program.

Section 8: Operating Information
The Partisol Speciation Sampler displays a variety of information regarding the state of the system, ranging from status codes to screens that display the current values of operating parameters. This section describes the type of diagnostic information available to the user.

Section 9: Viewing Stored Data
Interval and filter data stored internally may be viewed on the sampler's screen. This section describes the type of operational information stored internally and how to view the data.

Section 10: Data Input and Output
Data may be downloaded through the Partisol Speciation Sampler's RS232 bidirectional port. This section describes how to transmit internally stored operational information to external devices. The unit also can receive and transmit analog voltage information, and output user-defined digital information as logic level outputs. This section describes these input/output capabilities.

Section 11: Password Protection
This section describes the instrument's password protection functions.

Section 12: Verification Procedures and Routine Maintenance
This section explains how to verify the sampler's performance and describes hardware maintenance procedures.

Section 13: Resetting the Sampler
This section describes how to reset the instrument's parameter set points and internal data storage.

Section 14: Service Menu
This Partisol Speciation Sampler contains software support for low-level diagnostics and troubleshooting. This section describes the screens that the user may access for these types of activities. Many of the routines exercised from the service menu are described in Sections 11 and 12, and in the Partisol Model 2300 Service Manual.

Appendix A: Overview of Partisol Model 2300 Software Screens
This appendix contains the software menu tree of the Partisol Model 2300 Speciation Sampler, and all display screens of the software.

Appendix B: Program Register Codes
All important system variables, parameters and current results are stored in "Program Register Codes." These codes, which are listed in this appendix, are important when communicating with the sampler through its RS232 interface.

Appendix C: Two-Way Serial Communication
This appendix describes the two-way serial communication capabilities of the hardware.

Appendix D: Installing New System Software
This appendix explains how to download the unit's operating software into the Partisol Speciation Sampler.

Appendix E: Cartridge/Filter Log
This appendix contains a cartridge/filter log that can be used as a quality assurance tool to track the history of each cartridge and filter used in the sampler.

1.3. Flow Schematic

The system flow schematic provides an overview of the unit's basic flow and electronic connections (Figure 1-2). The schematic shows the air flow entering the ChemComb Speciation Sampling Cartridges where it first encounters a sharp cut PM-2.5 impactor that provides a PM-2.5 sample stream. The air stream then continues through either one or two honeycomb denuders and a four-stage 47 mm filter pack. The user may choose to remove the honeycomb denuders and sample using only the filter packs.

The 12-channel Partisol Speciation Sampler allows up to four sampling trains to be active at once. All four channels may be set to operate concurrently at up to 16.7 l/min (1 m^3/h). Channels can be programmed in groups of 4, 3, 2 or 1 to fulfill specific applications.

The denuders and filters remain inside the ChemComb cartridges during transport for removal in the lab. This simplifies denuder and filter exchange and transport, and minimizes the risk of contamination during these procedures.

The mass flow controllers operate under the control of the sampler's microprocessor, and maintain the sample streams at a constant *volumetric* flow rate through the use of ambient temperature and pressure sensors.

The Partisol Speciation Sampler maintains three constant volumetric flow rates at the set points entered by the user (16.7 l/min, 10 l/min and 10 l/min defaults), and reports sampled volumes (m^3) in volumetric or standard terms. The sampling system determines the ambient temperature and pressure for flow rate calculations through the use of sensors that provide continually updated information to the microprocessor system.

The mass flow controllers in the Partisol Speciation Sampler are calibrated at a temperature of 0° C and pressure of 1 Atmosphere (1013.2 millibars or 760 mm Hg). The instrument uses the measured ambient temperature and pressure to sample at the correct volumetric flow rate. Using this information, the microprocessor calculates the correct mass flow set point (Flow Rate_{STP}) required to achieve the desired volumetric flow setting:

$$\text{Flow Rate}_{STP} = \text{Flow Rate}_{Vol} \times \frac{273.15}{\text{Ave Temp} + 273.15} \times \frac{\text{Ave Pres}}{760}$$

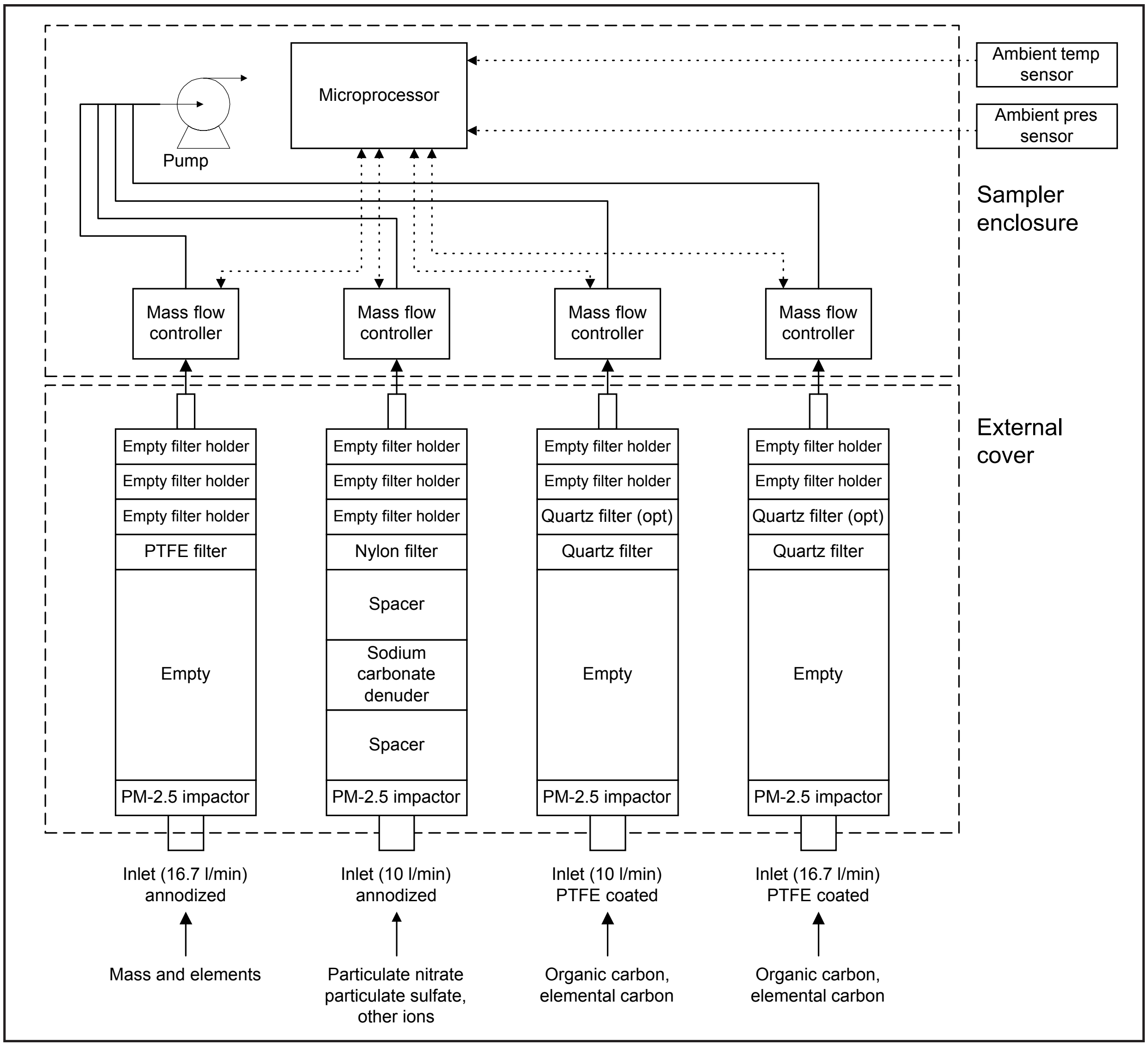


Figure 1-2. Flow schematic for the Partisol Model 2300 Speciation Sampler.

where:

Flow Rate_{STP} = Control set point of the mass flow meter (equivalent flow at 0° C and 1 Atmosphere).

Flow Rate_{Vol} = Volumetric flow rate set point (l/min) as entered by the user in the Cartridge List Setup screen (Section 7.3.8). This value is 16.7 l/min (1 m^3/h) for most applications.

Ave Temp = The current temperature (°C) as measured by the temperature sensor mounted on the down tube of the sampler.

Ave Pres = The current pressure (mm Hg) as measured by the pressure transducer in the sampler's enclosure.

The Partisol Speciation Sampler automatically determines the sampled volume in volumetric or standard m^3 for each filter exposed, and stores this information internally for later viewing or downloading.

To report volumes in standard terms, the user must ensure that the standard temperature and standard pressure parameters in the System Setup screen (Section 7.2.1) are set to their proper values. In many countries, standard volumes are defined in terms of 760 mm Hg pressure and 25° C temperature. Flow volumes referenced internally by the sampler to 0° C are converted to standard conditions using the following computation:

$$\text{Volume}_{EPA} = \text{Volume}_{STP} \times \frac{\text{Std Temp} + 273.15}{273.15} \times \frac{760 \text{ mm Hg}}{760 \text{ mm Hg}}$$

1.4. System Configuration

The Partisol Model 2300 Speciation Sampler has 4 or 12 air flow channels (depending on your unit's configuration) that are first directed through ChemComb cartridges. The air streams pass through either a PTFE or quartz 47 mm filter, or a Sodium Carbonate denuder and a nylon 47 mm filter that are housed in the ChemComb cartridges (Figure 1-2).

The air flows then continue through a bank valve to a series of water traps which prevent water from entering the mass flow controllers (Figure 1-3). The air streams then collect in the accumulator, pass through a check valve and then exit the system through the pump.

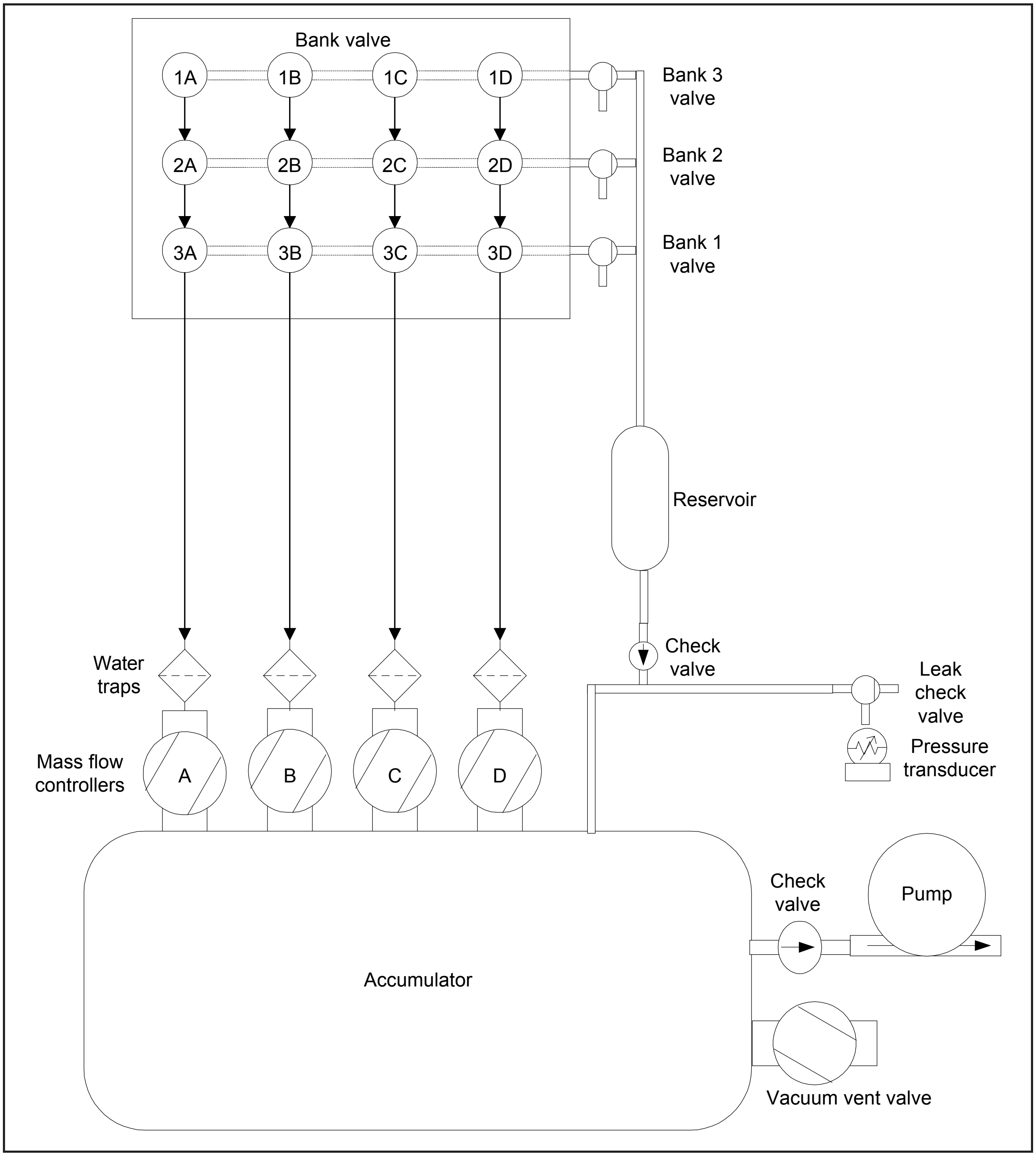


Figure 1-3. Flow configuration for the Partisol Model 2300 Speciation Sampler.

Section 2: Hardware Installation

This section describes the installation of the Partisol Model 2300 Speciation Sampler, along with the setup of its support stand. This section also covers a number of operational considerations.

2.1. Standard Hardware Configuration

The following is a list of the standard components (compilation package) provided with a Partisol Speciation Sampler:

Partisol Speciation enclosure
Shelter assembly (4 or 12 channel)
Hose assembly (4 or 12 channel)
2 Rainhoods and associated hardware
Partisol stand
Ambient temperature sensor and cable
Relative humidity sensor
Fuses
Leak check plugs (4 or 12 channel)
Operating software diskette
9-to-9 pin RS232 computer cable
2 Operating manuals
Service manual

2.2. Setting Up the Sampler

Follow these steps to set up the unit:

1) Cut any tie wraps and remove any transport restraints.

2) Install the relative humidity sensor (Section 2.2.1).

3) Install the large rainhood (Section 2.2.2).

3) Install the small rainhood (Section 2.2.3).

4) Install the ChemComb shelter (Section 2.2.4).

5) Connect the unit to the electric supply. Be sure to fulfill all safety and regulatory requirements for the hardware.

The wires inside the power cord are defined by the following colors, which are different for 115 and 230 VAC configurations:

	115 VAC	*230 VAC*
Line	Black or Brown	Brown
Neutral	White or Blue	Blue
Common Ground	Green or Green/Yellow	Green/Yellow

For *115 VAC configurations* of the Partisol Speciation Sampler, the standard three-pronged U.S. plug is provided at the end of the power cord. The unit is properly grounded and use of a ground fault interrupter is not necessary.

In the case of *230 VAC configurations* of the Partisol Speciation Sampler, no electrical plug is provided at the end of the power cord. This line must be wired in accordance with safety codes.

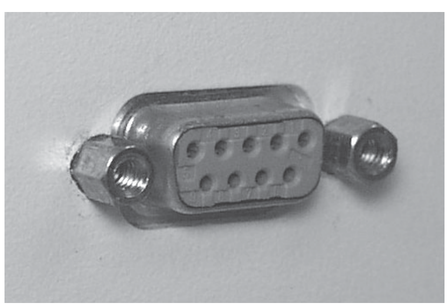
6) Install the ambient temperature sensor (Section 2.2.5).

7) Install the ChemComb cartridges in the manner described in Section 4.

2.2.1. Installing the Relative Humidity Sensor

Follow these steps to install the relative humidity sensor:

1) Plug the relative humidity sensor into the 9-pin connector located on the right side of the enclosure (Figures 2-1 and 2-2).



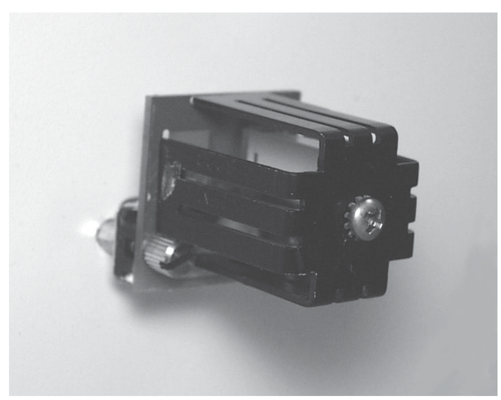


Figure 2-1(left). 9-pin connector for the relative humidity sensor.

Figure 2-2 (right). The relative humidity sensor plugged into its connector.

2) Tighten both screws located on the bottom right and left side of the sensor, securing the sensor to the side of the enclosure (Figures 2-3 and 2-4).

Figure 2-3. Securing the screws on the bottom right and left corners of the relative humidity sensor.

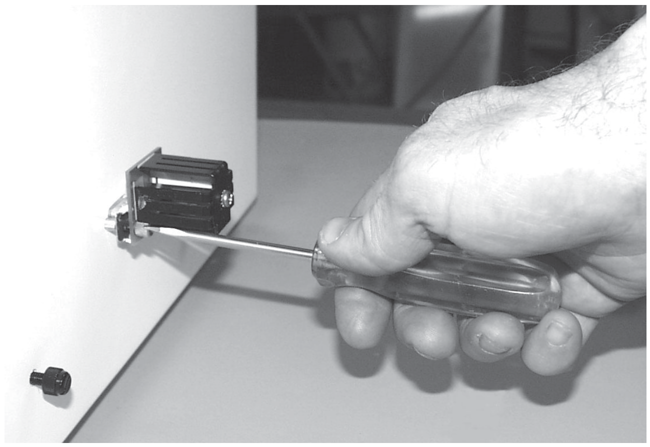


Figure 2-4. Relative humidity sensor installed on right side panel of the unit.

2.2.2. Installing the Large Rainhood

Follow these steps to install the large rainhood:

1) **Peel back the paper facing of the larger gasket and apply it to the larger rainhood.**
2) **Place the large rainhood, with its gasket attached, on the right side of the enclosure (Figure 2-5).**

Figure 2-5. Partisol Speciation Sampler with a large rainhood installed on the right side panel of the unit.

3) **Secure the rainhood to the unit using four (4) #10-32 x 1/2" slot bind head screws.**

2.2.3. Installing the Small Rainhood

Follow these steps to install the small rainhood:

1) **Peel back the paper facing of the small gasket and apply it to the small rainhood.**

2) Place the small rainhood, with its gasket attached, on the back of the enclosure (Figure 2-6).

3) Secure the rainhood to the unit using four (4) #10-32 x 1/2" slot bind head screws.

Figure 2-6. Partisol Speciation Sampler with a small rainhood installed on the back panel of the unit.

2.2.4. Installing the ChemComb Shelter

If you purchased a 4-channel Partisol Speciation Sampler, follow the instructions in Section 2.2.4.1. to install your ChemComb Shelter. If you purchased a 12-channel Partisol Speciation Sampler, follow the instructions in Section 2.2.4.2. to set up your ChemComb Shelter.

2.2.4.1. Installing a 4-Channel ChemComb Shelter

Follow these steps to install the 4-channel ChemComb shelter:

1) Check the ChemComb shelter assembly package for the following parts: 4 shelter legs, 1 hose assembly mounting plate, 1 hose clip plate, 4 side bracket plates, 1 ChemComb shelter box, 1 shelter roof and associated hardware.

2) Slide each leg onto the studs on the top of the sampler (Figures 2-7 and 2-8).

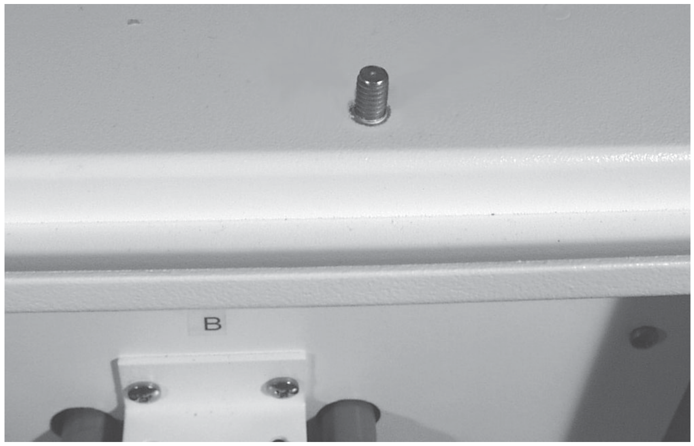


Figure 2-7. Stud on top of unit.

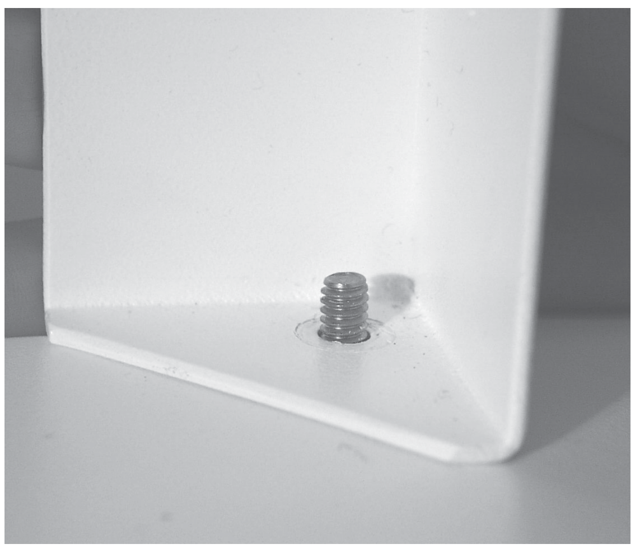


Figure 2-8. Shelter leg on stud.

3) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the shelter legs to the sampler (Figure 2-9).

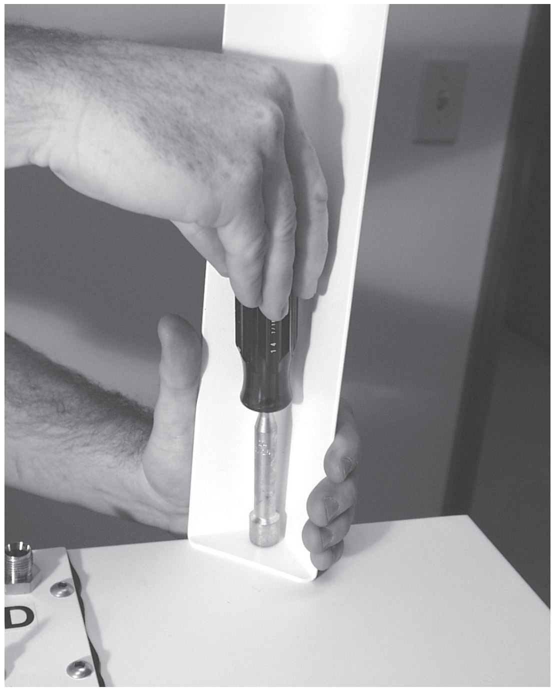


Figure 2-9. Securing the shelter leg to the unit.

4) Attach the hose assembly mounting plate to the two rear legs on the sampler (Figure 2-10) with two [2] #1/4-20 x 1/2" socket screws and two [2] #1/4-20 nuts.

Figure 2-10. Hose assembly mounting plate positioned on the shelter legs.

5) Secure the hose assembly mounting plate to the legs. Be sure to hold each screw with a screwdriver (Figure 2-11) while turning the nuts with a nut driver (Figure 2-12).

Figure 2-11. Securing the hose assembly mounting plate to the shelter legs.

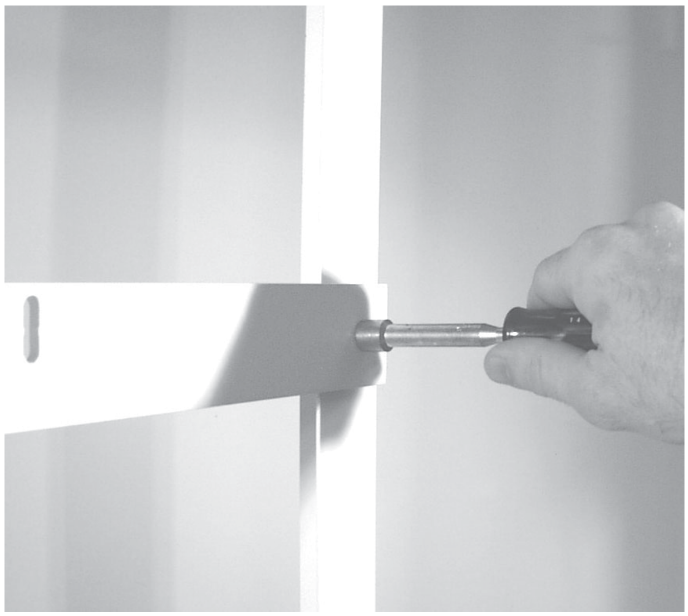
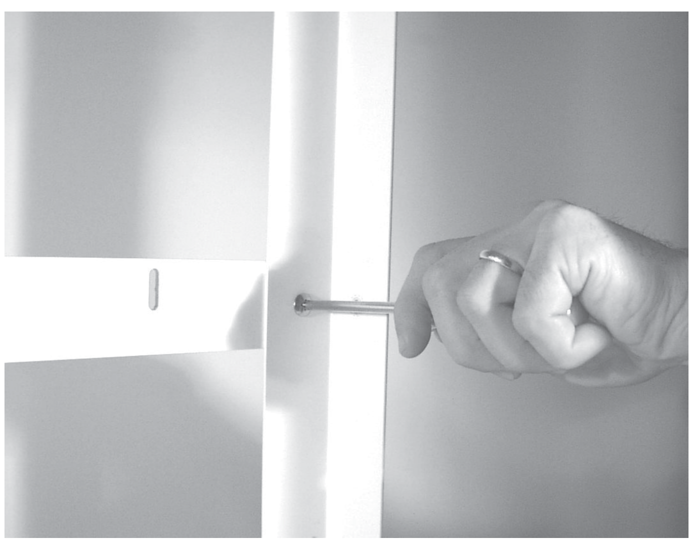


Figure 2-12. Holding the screw with a screwdriver while turning the nut.



6) Slide two side bracket plates onto the top studs on the left side and right side of the sampler (Figure 2-13).

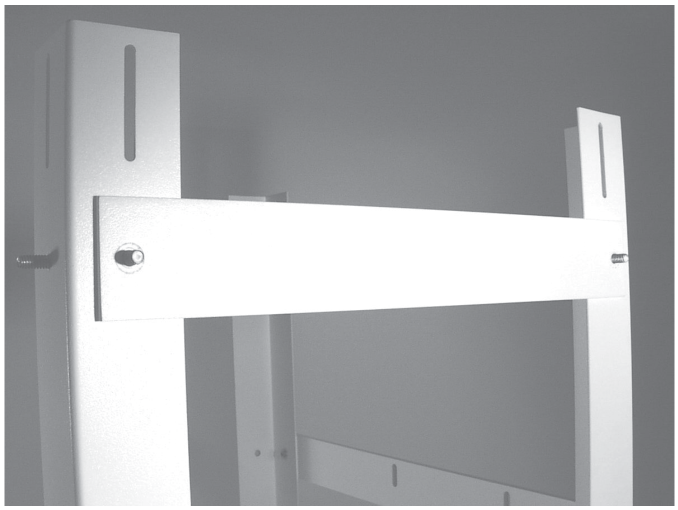


Figure 2-13. Side bracket plate positioned on the top studs of the shelter legs.

7) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the bracket plates to the legs (Figure 2-14).

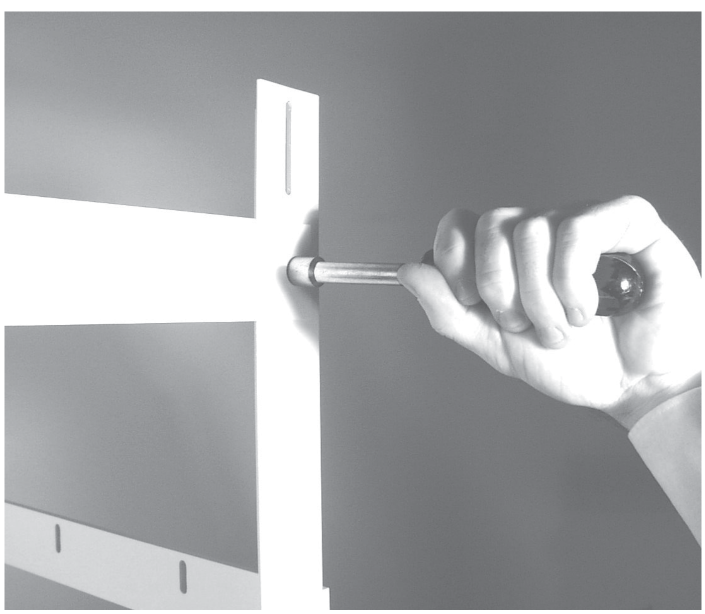
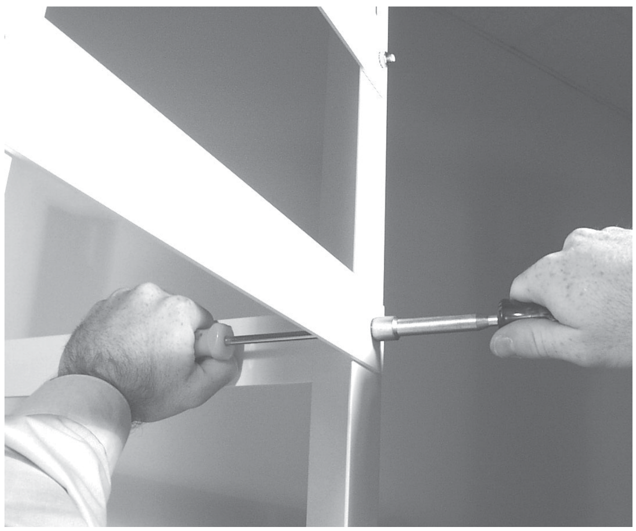


Figure 2-14. Securing a side bracket plate to the top studs of the shelter legs.

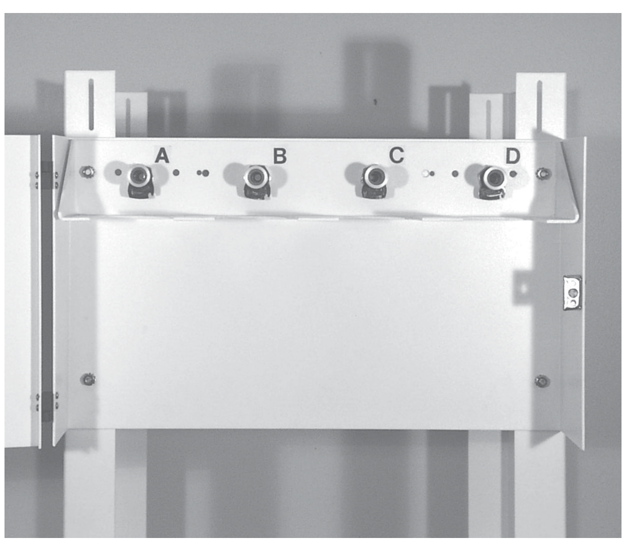
8) Attach two side bracket plates to the left and right legs on the sampler with two [2] #1/4-20 x 1/2" socket screws and two [2] #1/4-20 nuts. Line up the side bracket plates with the screw holes located approximately 8 inches below the top studs. Be sure to hold each screw with a screwdriver, while turning the nuts with a nut driver (Figure 2-15).

Figure 2-15. Securing a bottom side bracket plate to the shelter legs.



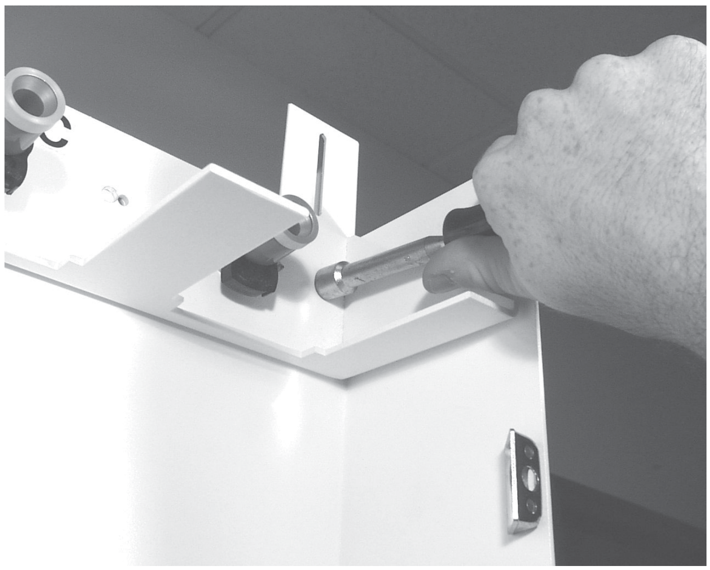
9) Locate the ChemComb shelter box with flow channels A-D. Slide it onto the studs on the two shelter legs on the front of the enclosure (Figure 2-16).

Figure 2-16. Shelter box positioned on leg studs.



10) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the top half of the shelter box onto the legs (Figure 2-17). Make sure that the bottom holes in the box line up with the holes in the shelter legs.

Figure 2-17. Securing the top of the shelter box to the leg studs.



11) Secure the bottom half of the shelter box to the legs with two [2] #1/4-20 x 1/2" socket screws and two [2] #1/4-20 nuts. Insert the screws in the two bottom holes of each side of the shelter box (Figure 2-18).

Figure 2-18. Insert the screws in the bottom holes of the shelter box.

12) Secure the bottom half of the shelter box onto the legs. Be sure to hold each screw with a screwdriver (Figure 2-19), while turning the nuts with a nut driver (Figure 2-20).

Figure 2-19. Securing the bottom of the shelter box.

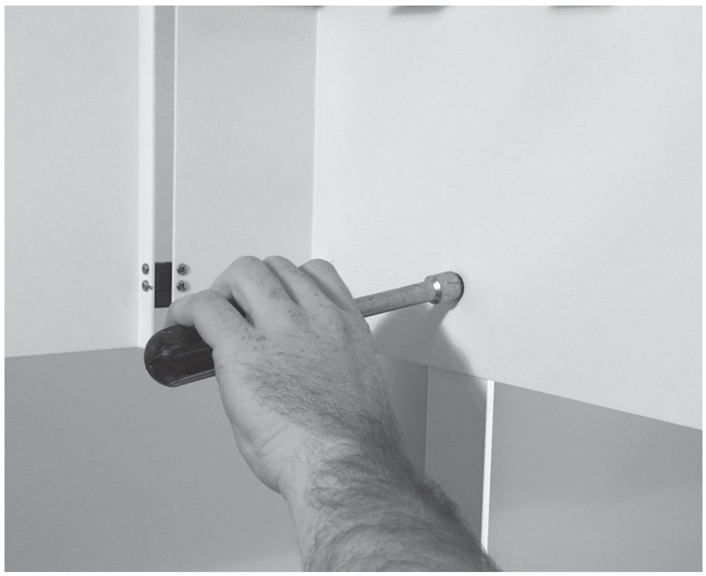
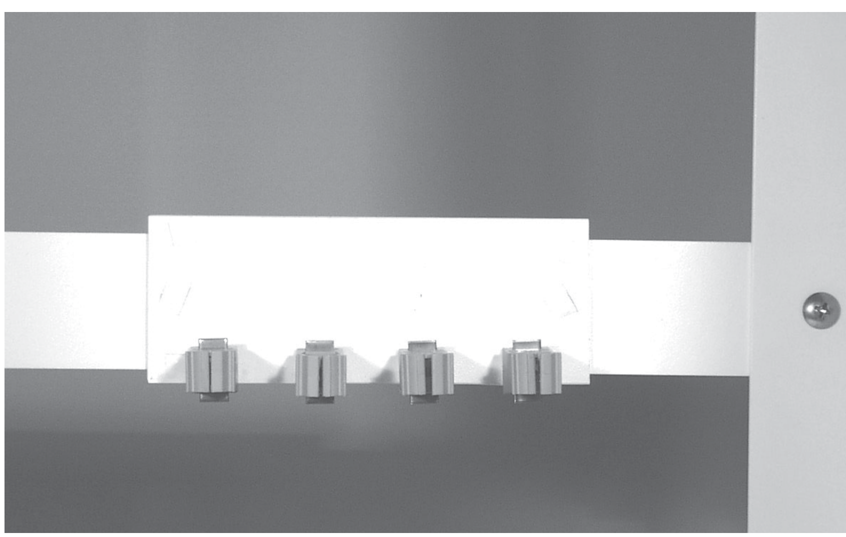


Figure 2-20. Holding the screw with a screwdriver while turning the nut.

13) Locate the hose clip plate. Slide the two studs on the back of the plate into the two holes in the hose assembly mounting plate on the back legs of the sampler (Figure 2-21). Ensure that you mount the plate inside the hose assembly mounting plate, so that the clips are directly above the top of the unit (Figure 2-22).

Figure 2-21. Slide the hose clip plate onto the two rear legs of the unit.

Figure 2-22. Ensure that you mount the hose clip plate inside the hose assembly mounting plate.



14) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the hose clip plate onto the rear legs of the sampler (Figure 2-23) .

Figure 2-23. Secure the hose clip plate to the hose assembly mounting plate.

15) Locate the hose assembly. It should contain 4 single metal pipes (labeled "A," "B," "C" and "D") with attached hoses.

16) Slide pipe "A" into the slot labeled "A" on the top of the unit (Figure 2-24).

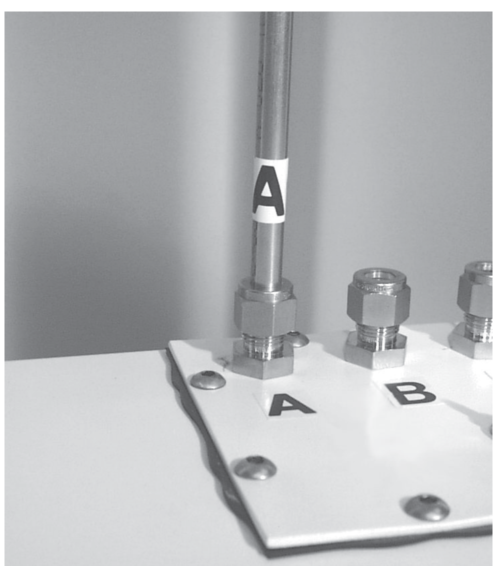


Figure 2-24. Slide pipe "A" into the connector labeled "A" on the top of the unit.

17) There is a nut attached to each pipe. Slide the nut down the pipe and finger-tighten it. Then, using a crescent wrench, tighten the nut 1/4 turn past finger tight (Figure 2-25).

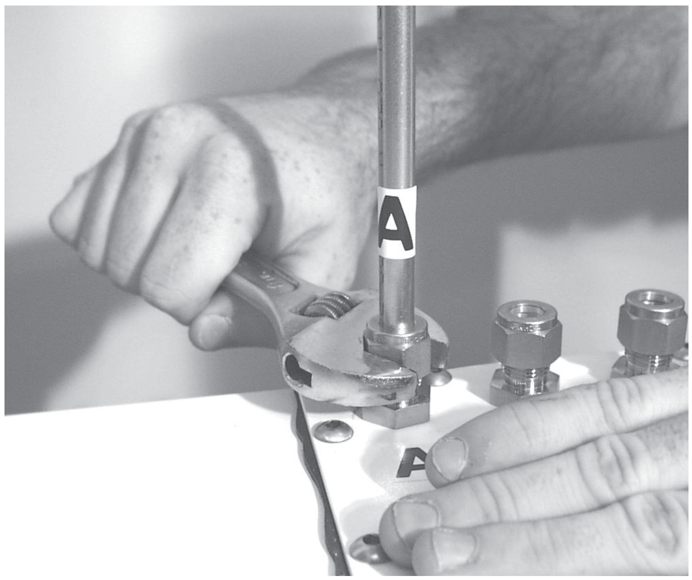


Figure 2-25. Tighten the nut 1/4 turn past finger-tight with a crescent wrench.

18) Push the pipe into the clip on the hose clip plate (Figure 2-26).

Figure 2-26. Push the pipe into the clip on the hose clip plate.

19) Squeeze the clip with your fingers until it snaps together (Figure 2-27).

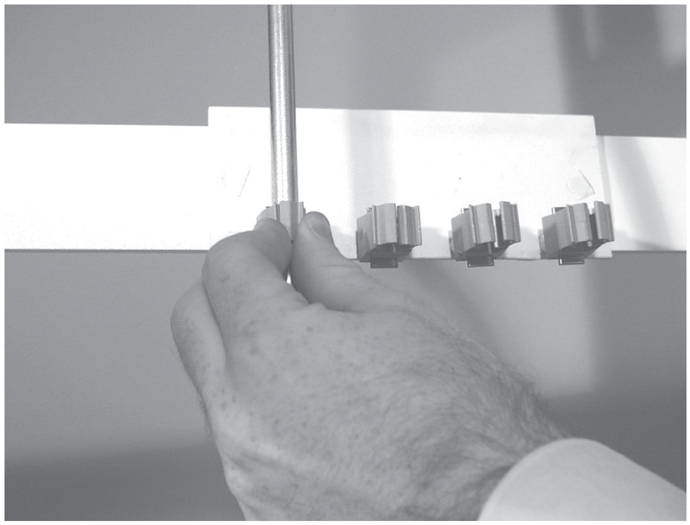


Figure 2-27. Secure the pipe by squeezing the clip until it snaps together.

20) Slide pipe "B" into the slot labeled "B" on the top of the unit. Repeat steps 17-19.

21) Slide pipe "C" into the slot labeled "C" on the top of the unit. Repeat steps 17-19.

22) Slide pipe "D" into the slot labeled "D" on the top of the unit. Repeat steps 17-19.

23) Attach the flow channel hoses to the hose barbs located on the back of the shelter box with flow channels A-D. Inside the shelter box the flow channels are labeled A-D (Figure 2-16). Match the labels on the white hoses to the proper flow channels and slide the hoses over the hose barbs on the back of the shelter box (Figures 2-28 and 2-29).

Figure 2-28. Match the labels on the white tubes with the flow channels inside the shelter boxes.

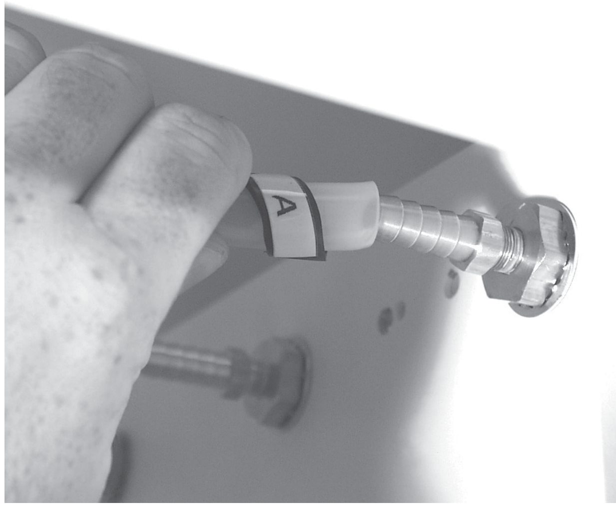
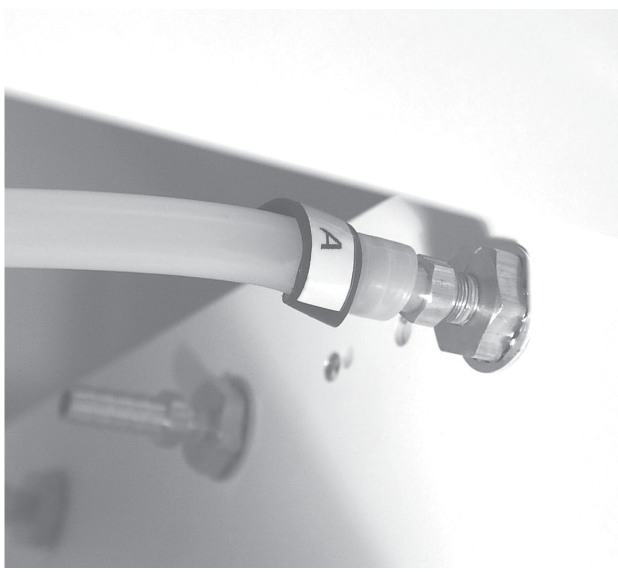


Figure 2-29. Flow channel A attached to the white hose labeled “A.”



27) Slide the roof onto the top of the shelter legs (Figure 2-30). Make sure that the roof supports slide inside the shelter legs, and that the holes on the roof supports line up with the holes on the end of the shelter legs (Figure 2-31).

Figure 2-30. Slide the roof onto the shelter legs.

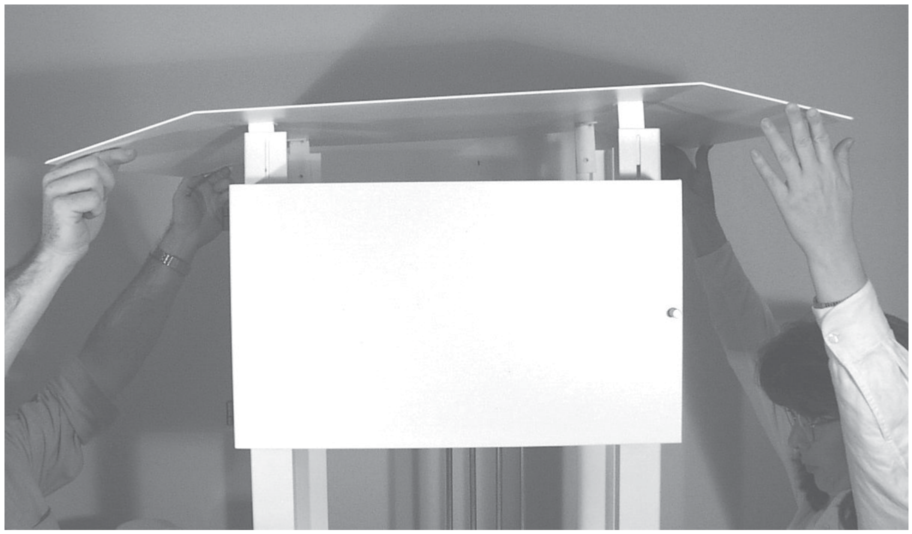
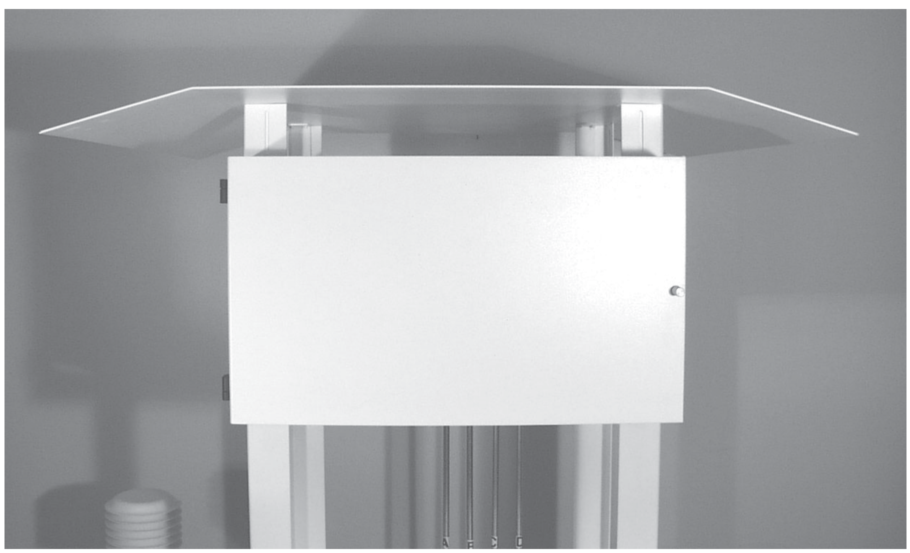


Figure 2-31. Make sure the roof supports slide inside the shelter legs.



28) Secure the roof to the shelter legs with four [4] # 10-32 x 3/8" screws (Figures 2-32 and 2-33). The roof height is adjustable.

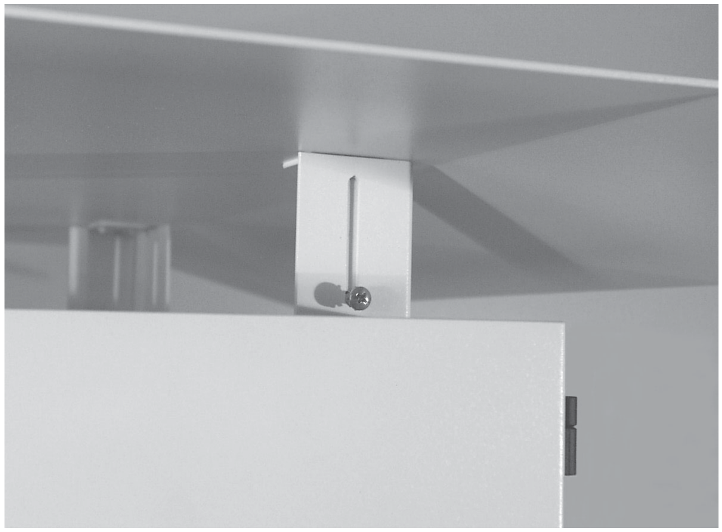


Figure 2-32. Secure the roof to the shelter legs with the appropriate hardware.

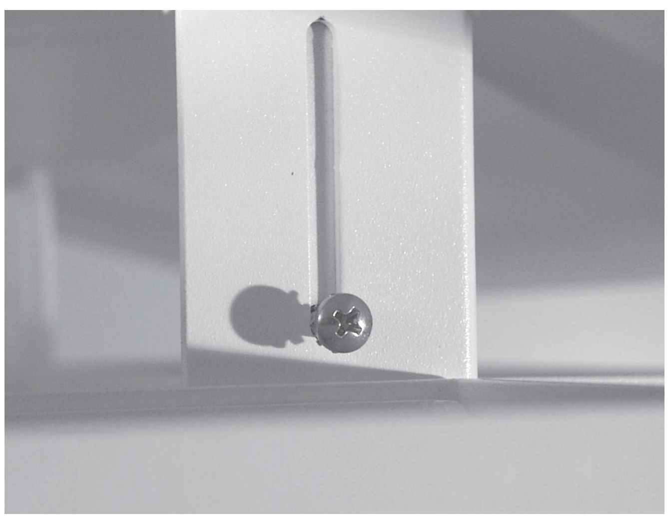


Figure 2-33. Close-up view of roof attachment.

29) Remove the white leak plugs from the hose connections inside the shelter box (Figure 2-34). Be sure to retain these leak plugs to use them during leak check procedures.

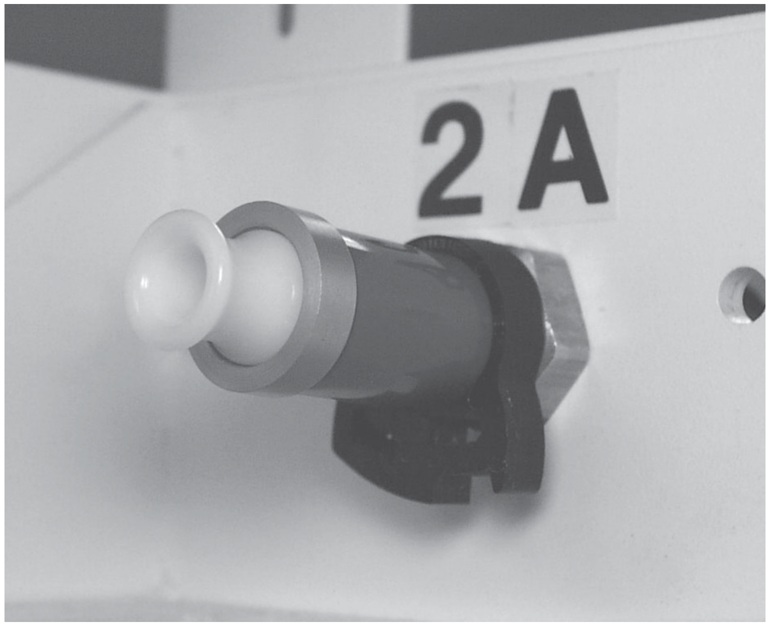


Figure 2-34. Remove the white leak plugs from the hose connections.

2.2.4.2. Installing a 12-Channel ChemComb Shelter

Follow these steps to install the 12-channel ChemComb shelter:

1) **Check the ChemComb shelter assembly package for the following parts: 4 shelter legs, 1 bank valve mounting plate, 3 ChemComb shelter boxes and 1 shelter roof.**
2) **Slide each leg onto the studs on the top of the sampler (Figures 2-35 and 2-36).**

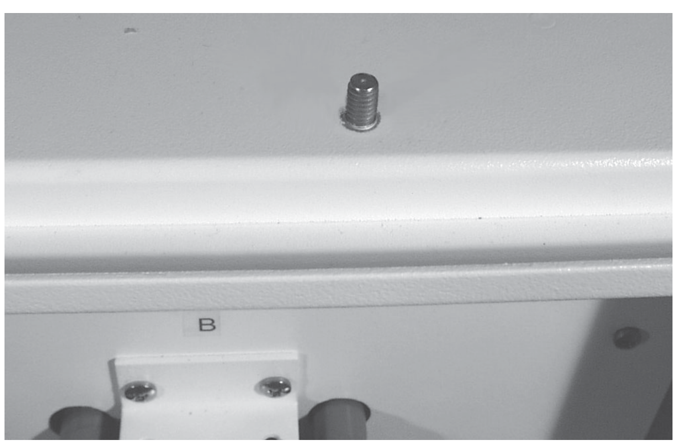


Figure 2-35. Stud on top of unit.

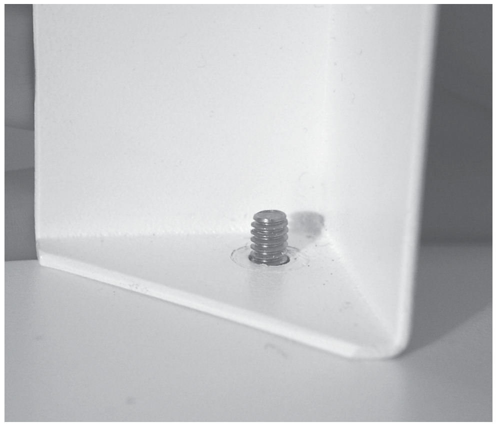


Figure 2-36. Shelter leg on stud.

3) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the shelter legs to the sampler (Figure 2-37).

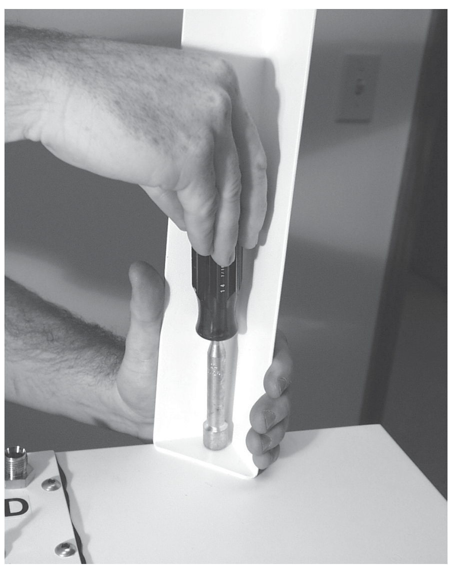


Figure 2-37. Securing the shelter leg to the unit.

4) Slide the bank valve mounting plate onto the studs of the two rear legs on the sampler (Figure 2-38).

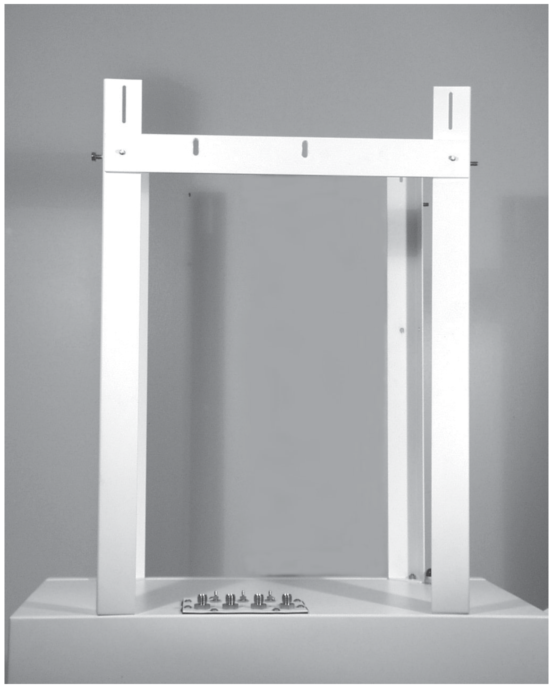


Figure 2-38. Bank valve mounting plate positioned on the shelter legs.

5) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the bank valve mounting plate to the legs (Figure 2-39).

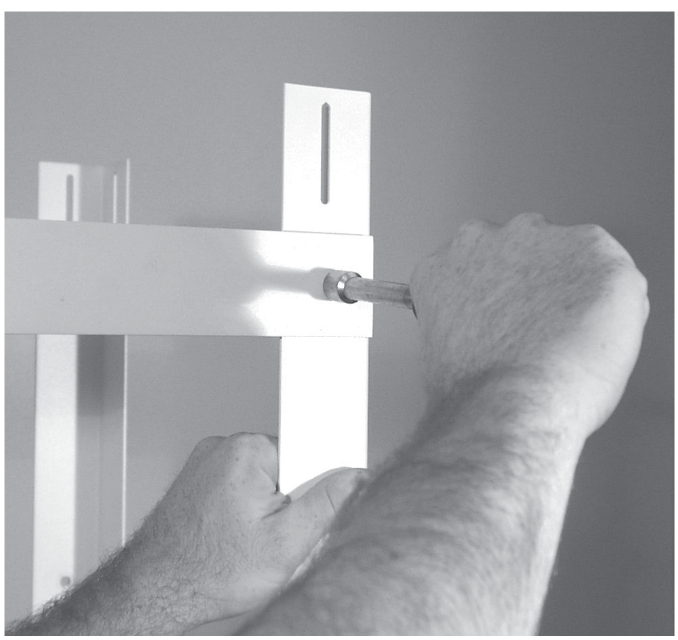


Figure 2-39. Securing the bank valve mounting plate to the shelter legs.

6) Locate the ChemComb shelter box with flow channels 1A-1D. Slide it onto the studs on the two shelter legs on the left side of the enclosure (Figures 2-40 and 2-41).

Figure 2-40. Slide the shelter box with flow channels 1A-1D onto the studs on the left side of the enclosure.

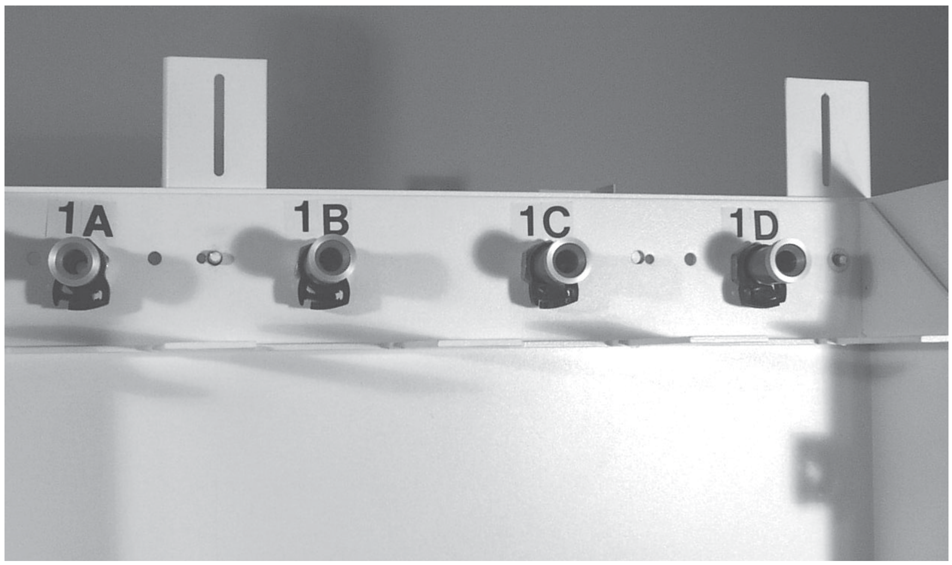
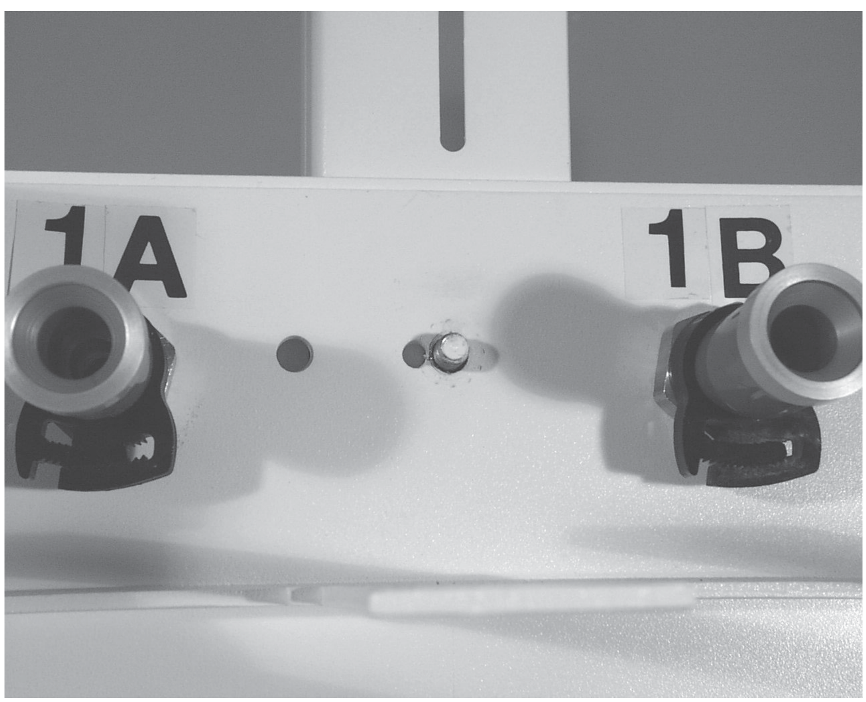
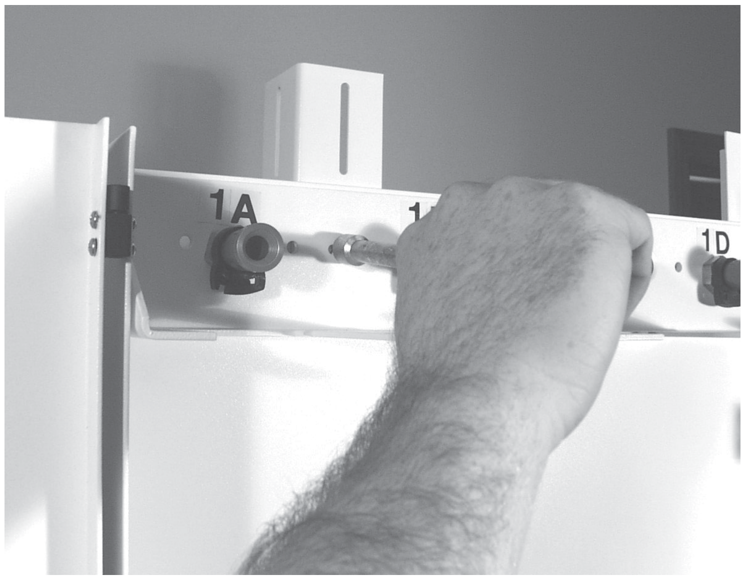


Figure 2-41. Close-up view of the shelter box resting on the studs.



7) Using the hardware provided (one [1] #1/4-20 x 1/2" socket screw for each support post), secure the top half of the shelter box onto the legs (Figure 2-42). Make sure that the bottom holes in the box line up with the holes in the shelter legs.

Figure 2-42. Securing the top of the shelter box to the leg studs.



8) Secure the bottom half of the shelter box to the legs with two [2] #1/4-20 x 1/2" socket screws. Insert the screws in the two bottom holes on each side of the shelter box (Figure 2-43).

Figure 2-43. Insert the screws in the bottom holes of the shelter box.

9) Using the hardware provided (one [1] #1/4-20 nut for each support post), secure the bottom half of the shelter box onto the legs. Be sure to hold each screw with a screwdriver (Figure 2-45), while turning the nuts with a nut driver (Figure 2-44).

Figure 2-44. Securing the bottom of the shelter box.

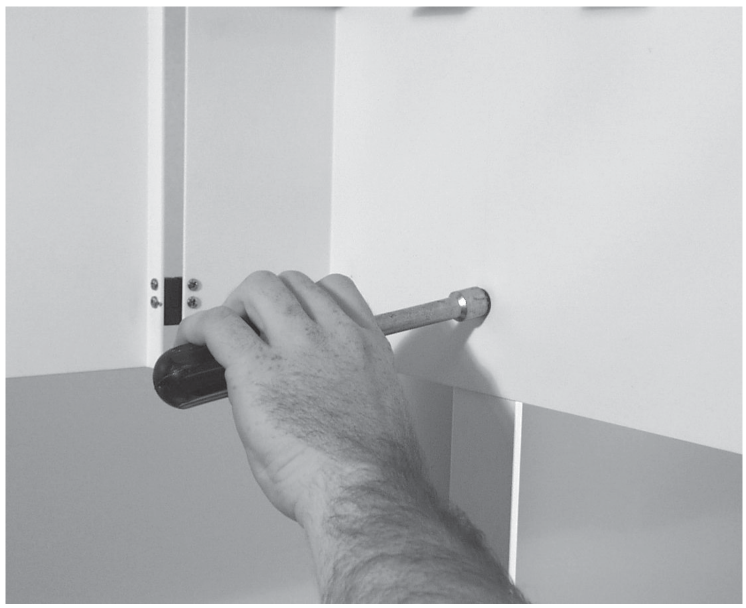
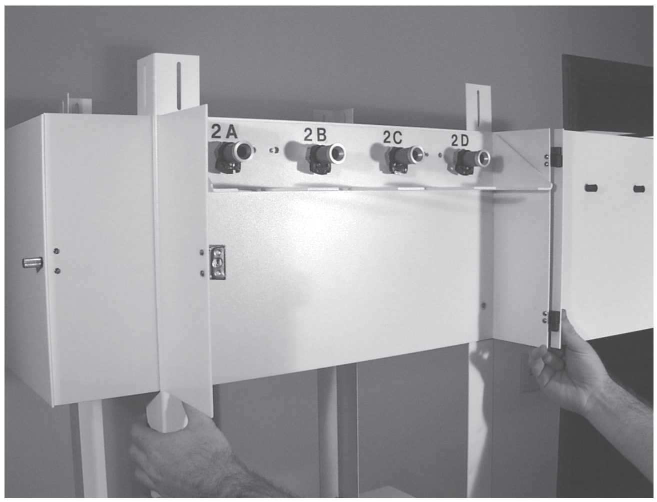


Figure 2-45. Be sure to hold the screw with a screwdriver while turning the nut.

10) Locate the ChemComb shelter box with flow channels 2A-2D. Slide it onto the studs on the shelter legs on the front of the enclosure (Figure 2-46). Repeat steps 8-10 to secure the box to the shelter legs.

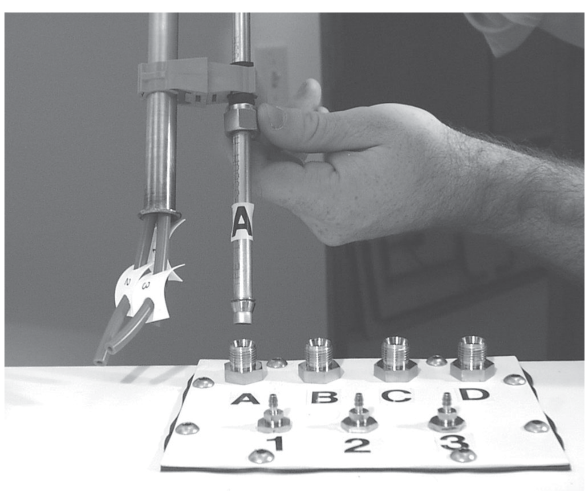
Figure 2-46. Slide the shelter box with flow channels 2A-2D onto the studs on the front side of the enclosure.



11) Locate the bank valve assembly. It should contain 3 single metal pipes (labeled "B," "C" and "D"), 1 metal pipe with an additional pipe clipped to it (labeled "A") and a bank valve with attached hoses.

12) Slide pipe "A" into the slot labeled "A" on the top of the unit (Figure 2-47).

Figure 2-47. Slide pipe "A" into the connector labeled "A" on the top of the unit.



13) There are two [2] nuts attached to each pipe. Slide the bottom nut down the pipe and finger-tighten it (Figure 2-48). Then, using a crescent wrench, tighten the nut 1/4 turn past finger tight (Figure 2-49).

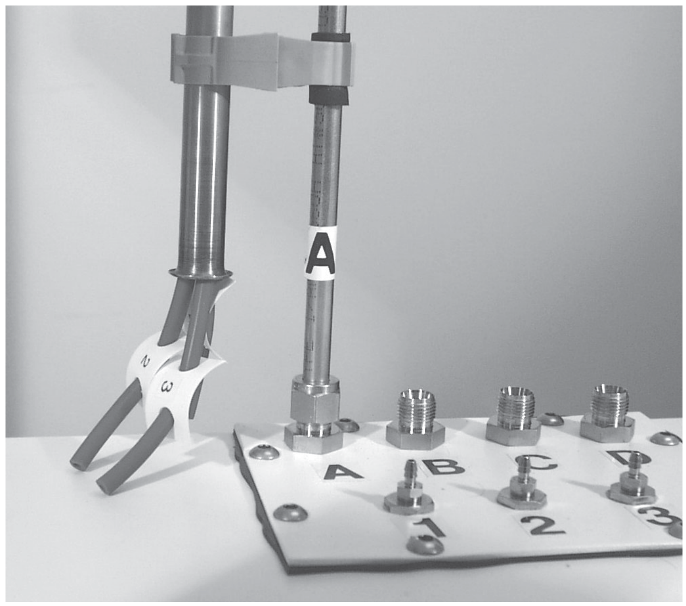


Figure 2-48. Finger-tighten the nut at the bottom of pipe "A."

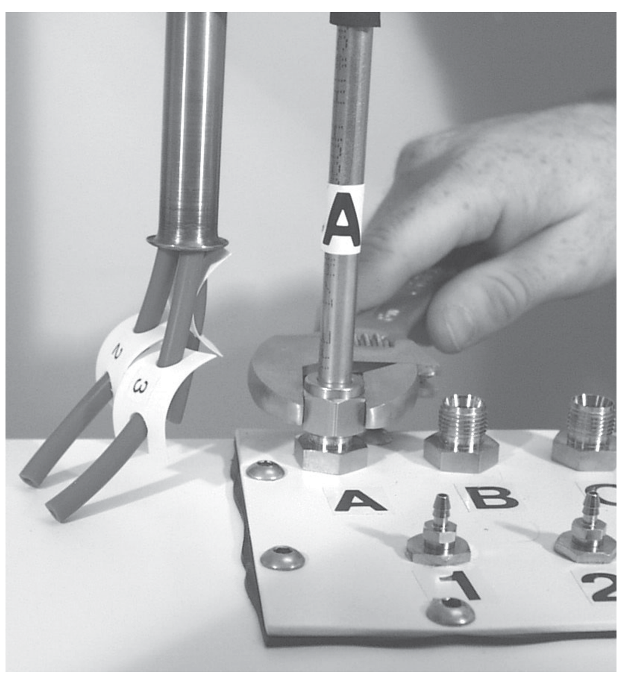
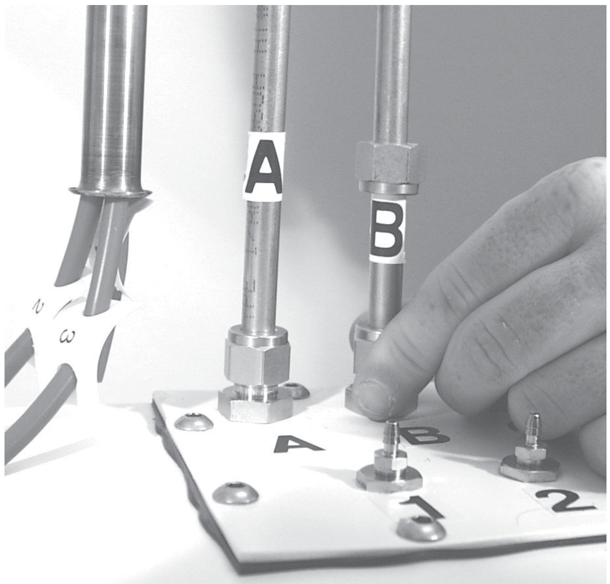


Figure 2-49. Tighten the nut 1/4 turn past finger-tight with a crescent wrench.

14) Slide pipe "B" into the slot labeled "B" on the top of the unit (Figure 2-50). Repeat step 13.

Figure 2-50. Slide pipe "B" into the connector labeled "B" on the top of the unit.

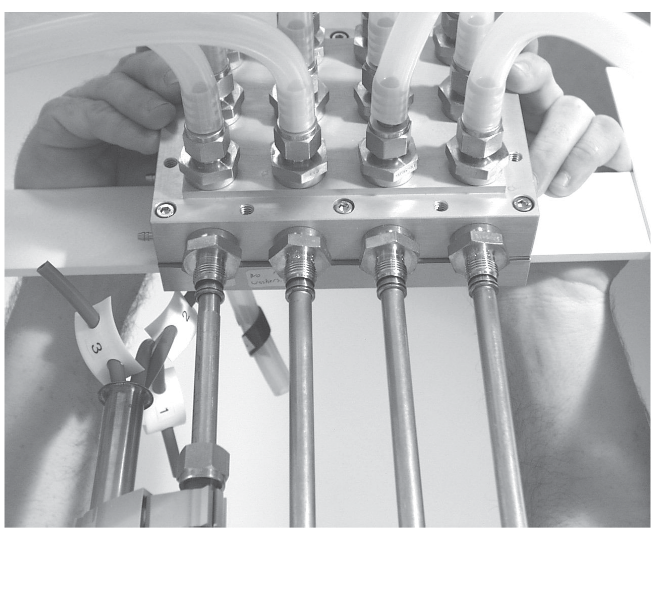


15) Slide pipe "C" into the slot labeled "C" on the top of the unit. Repeat step 13.

16) Slide pipe "D" into the slot labeled "D" on the top of the unit. Repeat step 13.

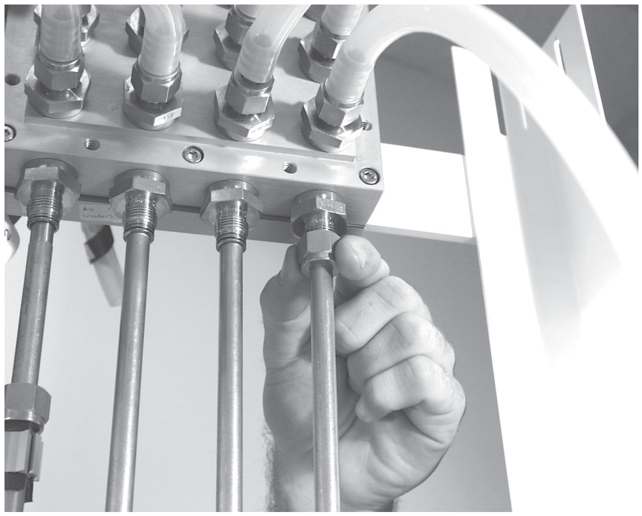
17) Slide the bank valve onto the top of the pipes (Figure 2-51).

Figure 2-51. Slide the bank valve onto the top of the four pipes.



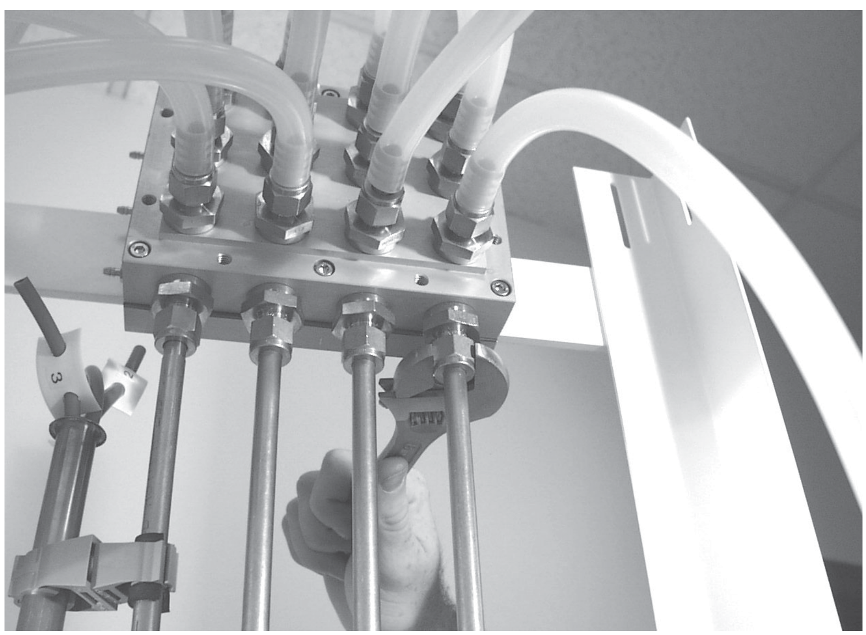
18) Slide the nuts located near the top of each pipe up the pipes and finger-tighten them (Figure 2-52).

Figure 2-52. Finger-tighten the nuts at the top of the pipes.



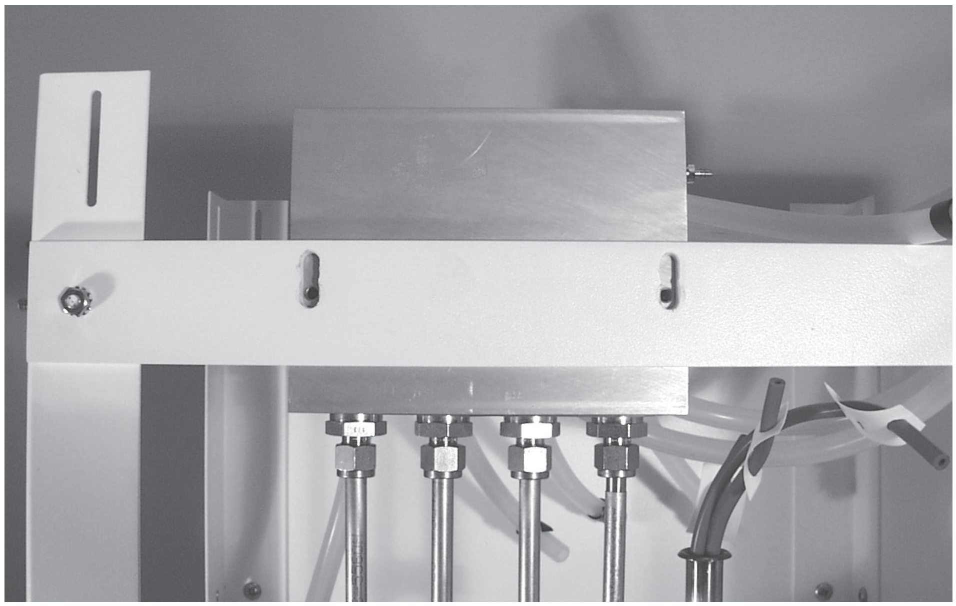
19) Using a crescent wrench, tighten each nut 1/4 turn past finger-tight (Figure 2-53).

Figure 2-53. Tighten each nut 1/4 turn past finger-tight with a crescent wrench.



20) Ensure that the screw holes on the back of the bank valve line up with the holes in the bank valve mounting plate (Figure 2-54).

Figure 2-54. Ensure that the screw holes line up with the holes in the bank valve mounting plate.



21) Using two [2] 1/4"ID x 1/2"OD sealing washers and two [2] #1/4-20 x 1/2" socket screws, secure the bank valve to the bank valve mounting plate (Figures 2-55, 2-56 and 2-57).

Figure 2-55. A [2] #1/4-20 x 1/2" socket screw (left) and a 1/4"ID x 1/2"OD sealing washer (right).

Figure 2-56. Slide the sealing washer onto the screw before using it to secure the bank valve to its mounting plate.

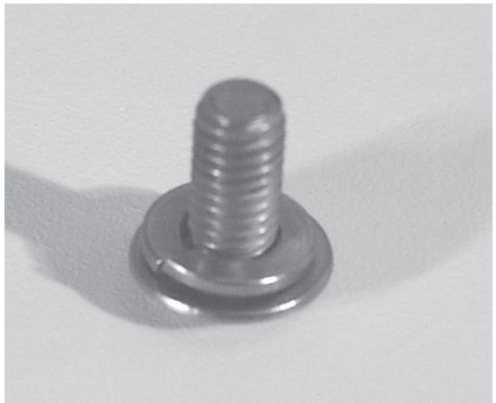
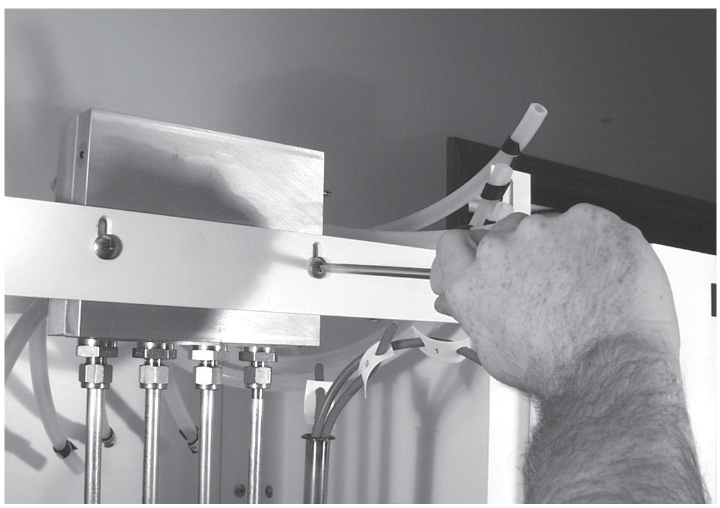


Figure 2-57. Secure the bank valve to the bank valve mounting plate.



22) Inside the additional pipe clipped to pipe "A" there are three small hoses labeled "1," "2" and "3." Each small hose is labeled at the top and the bottom. Match the labels at the bottom of each small hose with the hose barbs located on the top of the unit (labeled "1," "2" and "3") and slide the hose ends over the appropriate hose barbs (Figures 2-58 and 2-59).

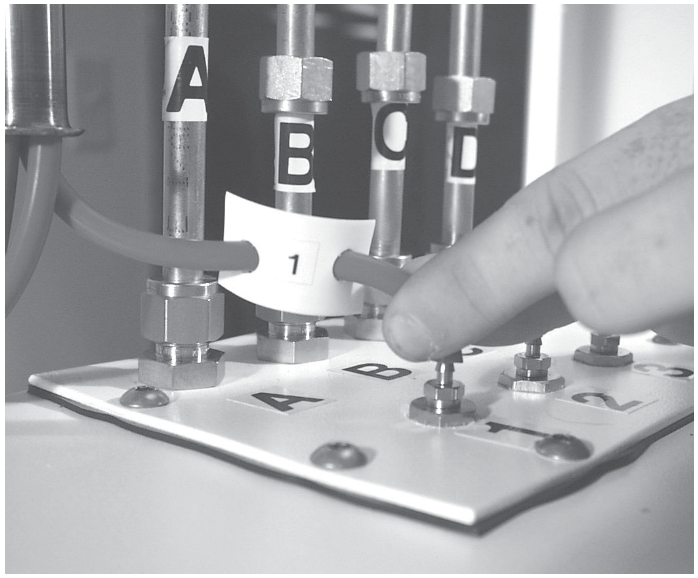


Figure 2-58. Match the labels at the bottom of each small hose with the hose barbs located on the top of the unit.

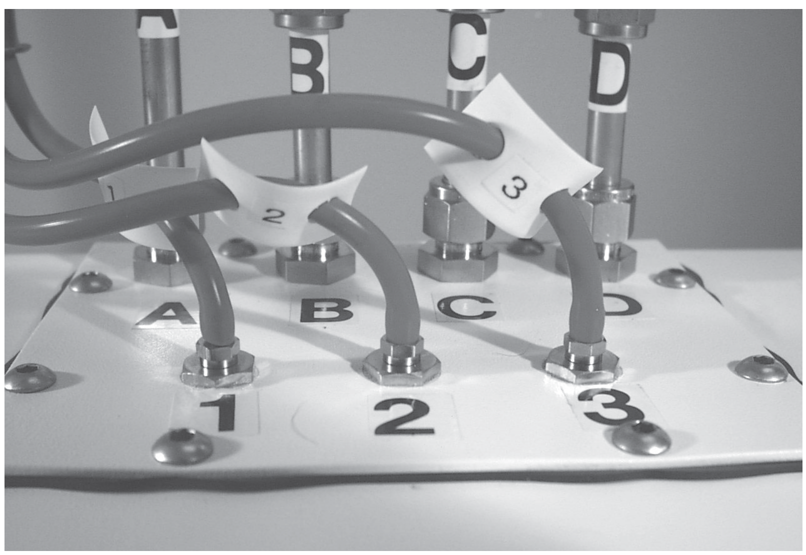
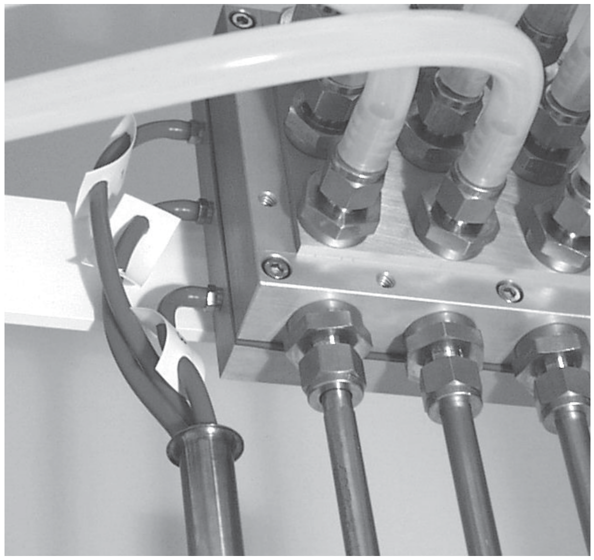


Figure 2-59. Slide the hose ends over the appropriate hose barbs.

23) Attach the top of the small hoses to the bank valve. Slide hose "1" over the top hose barb located on the left side of the bank valve. Slide hose "2" over the middle hose barb and slide hose "3" over the bottom hose barb (Figure 2-60).

Figure 2-60. Attach the top of the small hoses to the bank valve.



24) Attach the flow channel hoses to the hose barbs located on the back of the shelter boxes with flow channels 1A-1D and 2A-2D. Inside each shelter box the flow channels are labeled 1A-1D and 2A-2D (Figure 2-40). Match the labels on the white hoses to the proper flow channels and slide the hoses over the hose barbs on the back of the shelter boxes (Figures 2-61 and 2-62).

Figure 2-61. Match the labels on the white hoses to the proper flow channels.

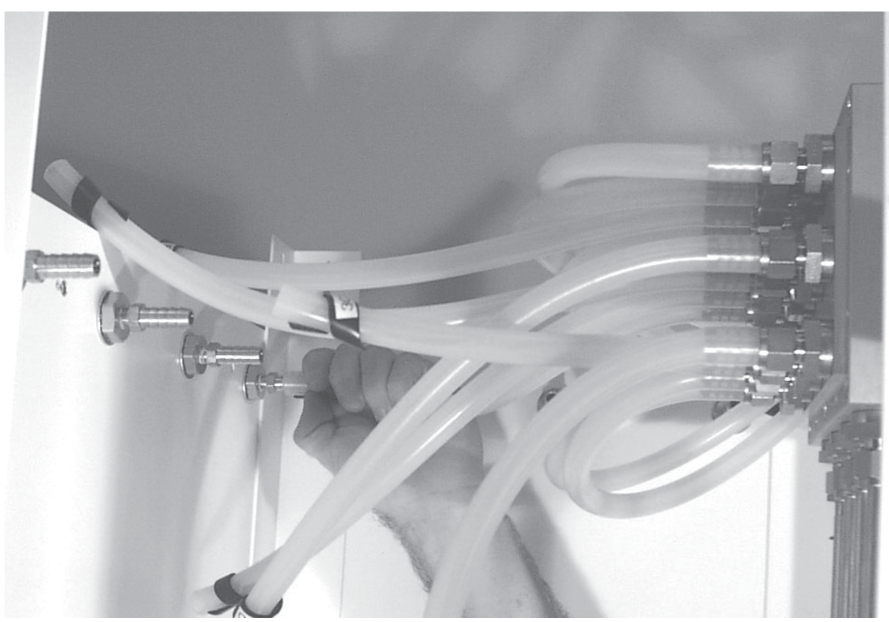
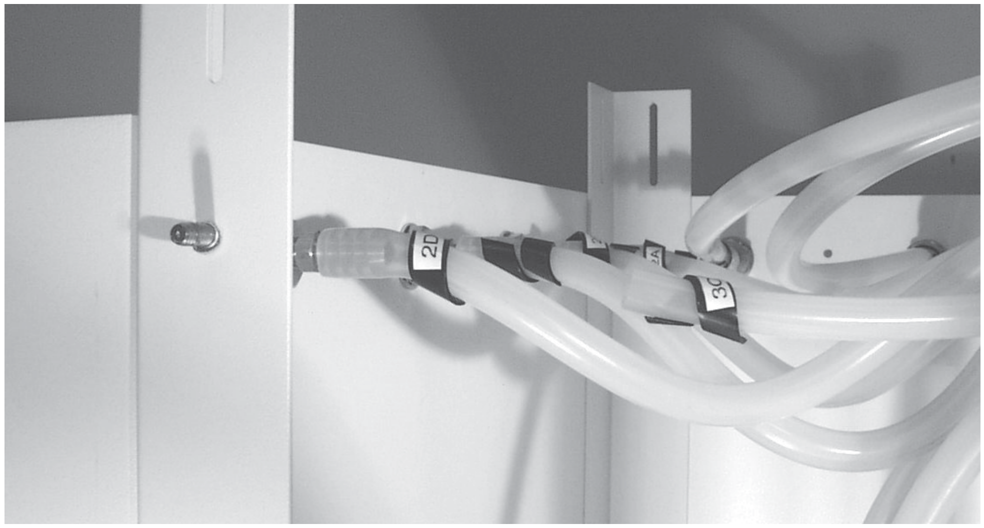


Figure 2-62. Slide the hoses over the hose barbs on the back of the shelter boxes.



25) Locate the ChemComb shelter box with flow channels 3A-3D. Slide it onto the studs on the shelter legs on the right side of the enclosure. Repeat steps 4-5 to secure the box to the shelter legs.

26) Attach the flow channel hoses to the hose barbs located on the back of the shelter box with flow channels 3A-3D. Match the labels on the white hoses to the proper flow channels and slide the hoses over the hose barbs on the back of the shelter box.

27) Slide the roof onto the top of the shelter legs (Figure 2-63). Make sure that the roof supports slide inside the shelter legs, and that the holes on the roof supports line up with the holes on the ends of the shelter legs (Figure 2-64).

Figure 2-63. Slide the roof onto the top of the shelter legs.

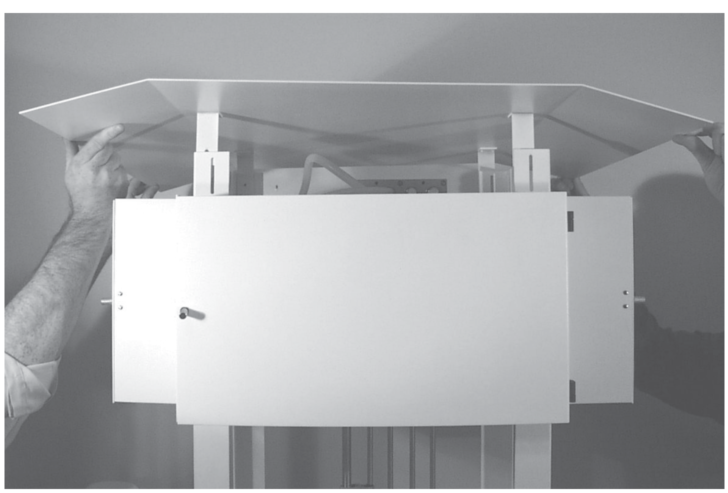
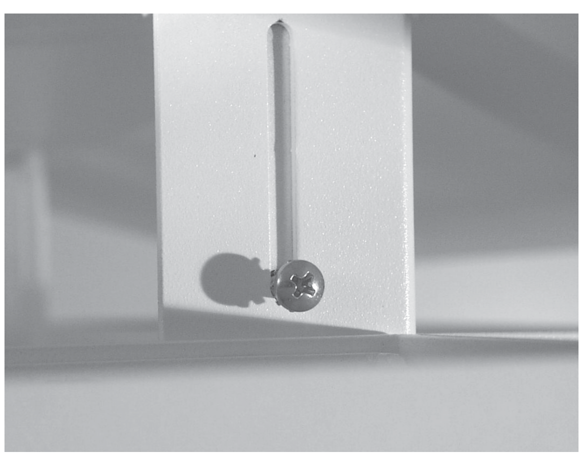


Figure 2-64. Make sure that the roof supports slide inside the shelter legs.

28) Secure the roof to the shelter legs with four [4] # 10-32 x 3/8" screws (Figures 2-65 and 2-66). The roof height is adjustable.

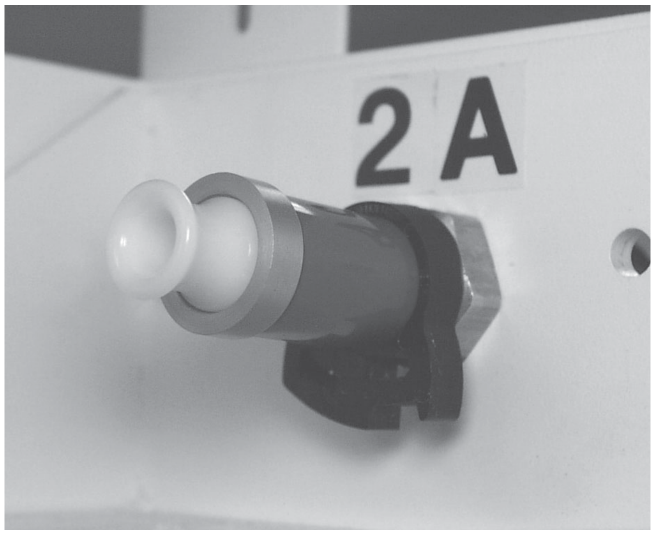
Figure 2-65. Secure the roof to the shelter legs.

Figure 2-66. Close-up view of the roof hardware assembly.



29) Remove the white leak plugs from the hose connections inside the shelter boxes (Figure 2-67). Be sure to retain these leak plugs for use during leak check procedures.

Figure 2-67. Remove the white leak plugs from the hose connections inside the shelter boxes.



2.2.5. Installing the Ambient Temperature Sensor

Follow these steps to install the ambient temperature sensor:

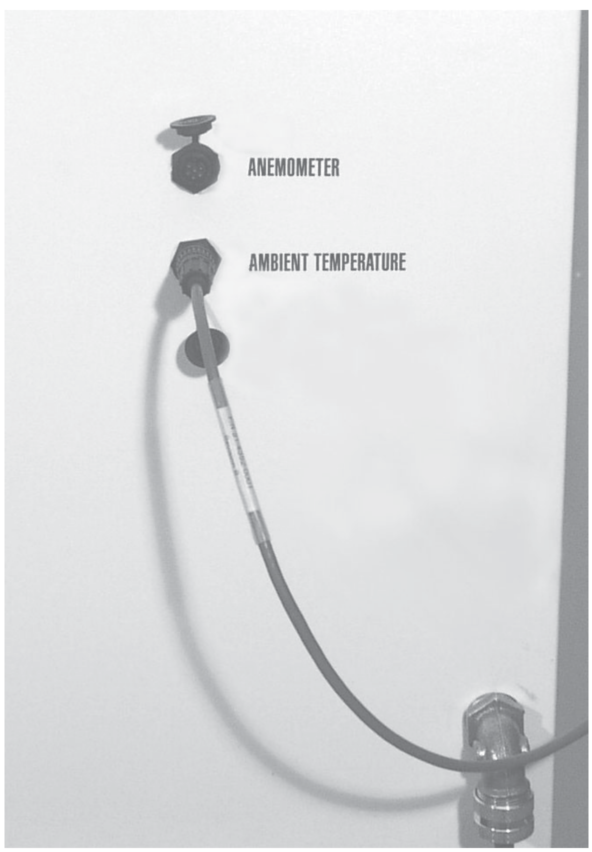
1) **Locate the two screws on the left side of the enclosure.**
2) **Remove the two screws. Be sure to retain the washers. This will expose two holes.**
3) **Locate the ambient temperature probe assembly in the compila- tion package (Section 2.1).**
4) **Secure the temperature probe assembly to the enclosure using the screws and washers previously removed (Figure 2-68).**

   IMPORTANT: Place the washers between the ambient temperature bracket and the enclosure – *not under the head of the screw* – to keep water from leaking into the electronics compartment.

Figure 2-68. Ambient temperature probe assembly mounted on the enclosure.

5) Plug the ambient temperature cable into the connector on the back panel of the sampler labeled “Ambient Temperature” (Figure 2-69).

Figure 2-69. Ambient temperature cable plugged into the “Ambient Temperature” connector.



2.3. Partisol Stand

The Partisol stand (57-004644) keeps the Partisol Speciation Sampler's ChemComb cartridges at the appropriate height.

> **WARNING:** If the Partisol Speciation Sampler is mounted on a stand, it could fall or tip over in high wind conditions if the stand is not properly anchored.

Follow these steps to assemble the Partisol Speciation Sampler's stand:

> NOTE: Figures 2-70 and 2-71 contain a list of parts and assembly information for the stand. Put this hardware together in accordance with the diagram shown in this figure.

> **IMPORTANT:** Always remember to place the split ring washer between the head of the bolt and the washer.

1) **Assemble the bottom of the stand by laying out the front, back and sides.**
2) **Place one leg on each inside corner, fasten with F, G and H hardware.**
3) **Attach the top front and back to the outside of the legs with F, G and H hardware. Do not tighten.**
4) **Fasten the right and left rails to the legs and top front and back rails with F, G and H hardware.**

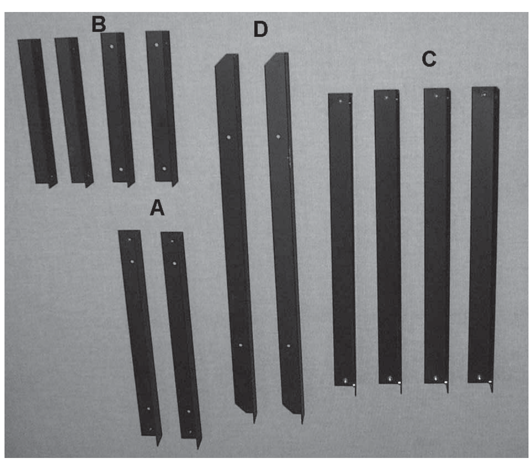


Figure 2-70. Partisol stand components

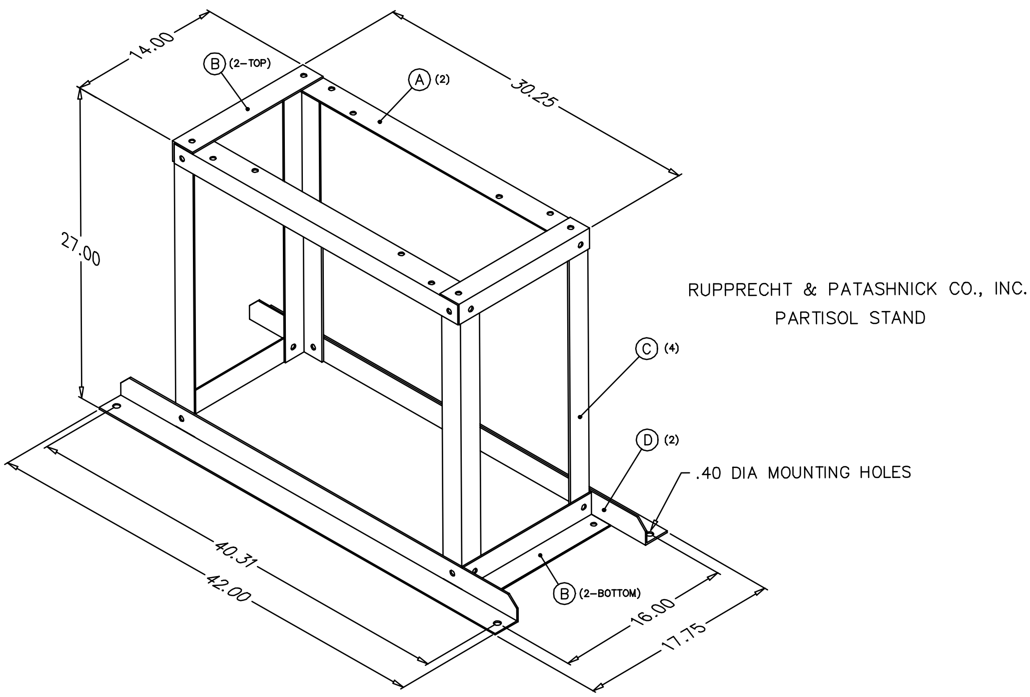


Figure 2-71. Assembly information for the Partisol stand.

A	(2)	Top front and top back	36-005479
B	(4)	Top right and top left	36-005476
C	(4)	Legs	36-005478
D	(2)	Bottom front and bottom back	36-005477
E	(4)	Hex head bolt 1/4-20 x 3/8"	21-001291-0006
F	(20)	Hex head bolt 1/4-20 x 3/4"	21-001291-0012
G	(24)	Flat washer, 1/4"	21-001275
H	(24)	Split ring washer, 1/4"	21-000848

5) Tighten all hardware.

6) Place the Partisol Speciation Sampler onto the stand and secure using E, G, and H hardware.

2.4. Hardware Considerations

A number of internal systems of the Partisol Speciation Sampler are designed to maintain acceptable operating conditions within the hardware.

✔ A fan and heater provide cooling and heating for the sampler.

The sample pump is always running when sampling takes place. If the pump compartment temperature exceeds 15° C, and the sample pump is running, the pump fan in the pump compartment initiates. The pump fan stops running once the temperature falls below 15° C. However, the pump fan will not initiate if the sample pump is not running, regardless of the temperature measured in the pump compartment.

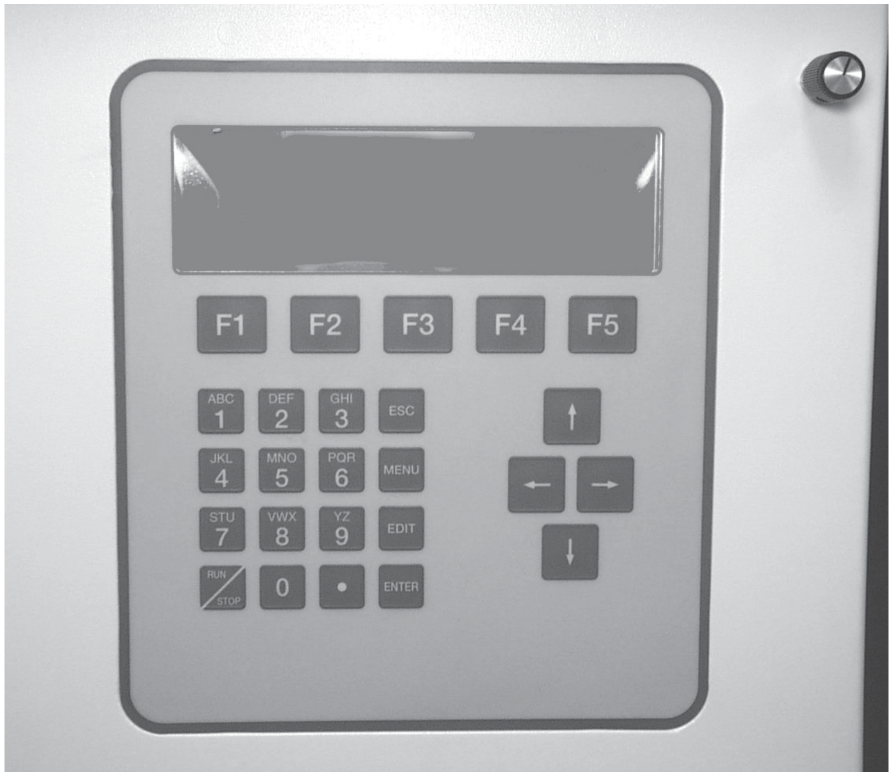
When the device is not sampling, the sample pump initiates only if the ambient temperature falls below 7.5° C for 30 seconds. If the sample pump does initiate due to low temperatures, it stops running when the ambient temperature exceeds 7.5° C. In this case, the flow through the pump enters the system through the vacuum vent valve.

If the temperature measured on the interface board drops below 10° C for 30 seconds, the heater in the electronics compartment initiates and runs until the temperature exceeds 10° C.

2.5. Adjusting the Liquid Crystal Display (LCD)

A knob on the right side of the display/keypad adjusts the contrast of the sampler's liquid crystal display (LCD) (Figure 2-72). This knob may be turned clockwise and counterclockwise.

Figure 2-72. LCD contrast adjustment knob on right side of display/keypad.



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Section 3: Denuder, Filter and Cartridge Preparation

This section explains how to prepare the Honeycomb (HC) denuders for use in the ChemComb cartridges, and how to maintain and clean the cartridges. This section also explains how to perform the initial inspection and the equilibration and weighing (before and after sampling) of the 47 mm filters used in the ChemComb cartridges.

3.1. Lab Equipment and Facilities

The following equipment and materials are required for ChemComb preparation and Honeycomb (HC) denuder cleaning, coating and extraction:

✘ Wear powder-free vinyl (PVC) gloves at all times.

- Ultra-pure water system (18 megohm resistance)
- Acid gas-, ammonia- and particle-free, clean-air source
- Clean-air (acid gas-, ammonia- and particle-free), positive-pressure hood or glove box
- Lab balance (sensitivity: 0.1 mg)
- Calibrated automatic and dispensing pipettes
- Manifold
- Routine lab glassware
- Powder-free vinyl (PVC) gloves
- Coating solution
- Milli-Q water
- Kimwipes
- Silicon vacuum grease
- Laboratory liquid detergent.

R&P recommends that you use the Milli-Q ultra-pure water system manufactured by Millipore Corp., or an equivalent system. To minimize contamination, you should coat, extract and assemble denuders in a clean-air, positive-pressure hood or in a clean-air glove box. R&P strongly recommends that you use a clean-air, positive-pressure hood.

NOTE: It is important to wear the powder-free gloves at all times. Rinse the gloves with Milli-Q water before extraction, and dry the gloves by wiping them with Kimwipes.

3.2. ChemComb Cartridge Preparation

3.2.1. Clean-Air Hood or Glove Box

To minimize contamination, you should coat, extract and assemble denuders in a clean-air, positive-pressure hood or in a clean-air glove box. R&P strongly recommends that you use a clean-air, positive-pressure hood.

Figures 3-1 and 3-2 show the dimensions and major components of the hood and the clean-air drying system. The purpose of each component is described as follows:

- Air blower (Dayton model 4C443A) to supply the clean air into the hood
- Sodium carbonate-coated glass wool to absorb acidic gases, citric acid coated glass wool to remove ammonia, and clean glass wool to remove particles
- Baffle to evenly distribute air flow inside the hood
- Flexible plastic film strips to minimize the amount of room air penetrating into the hood

Figure 3-1. Schematic drawing of a clean-air, positive-pressure hood.

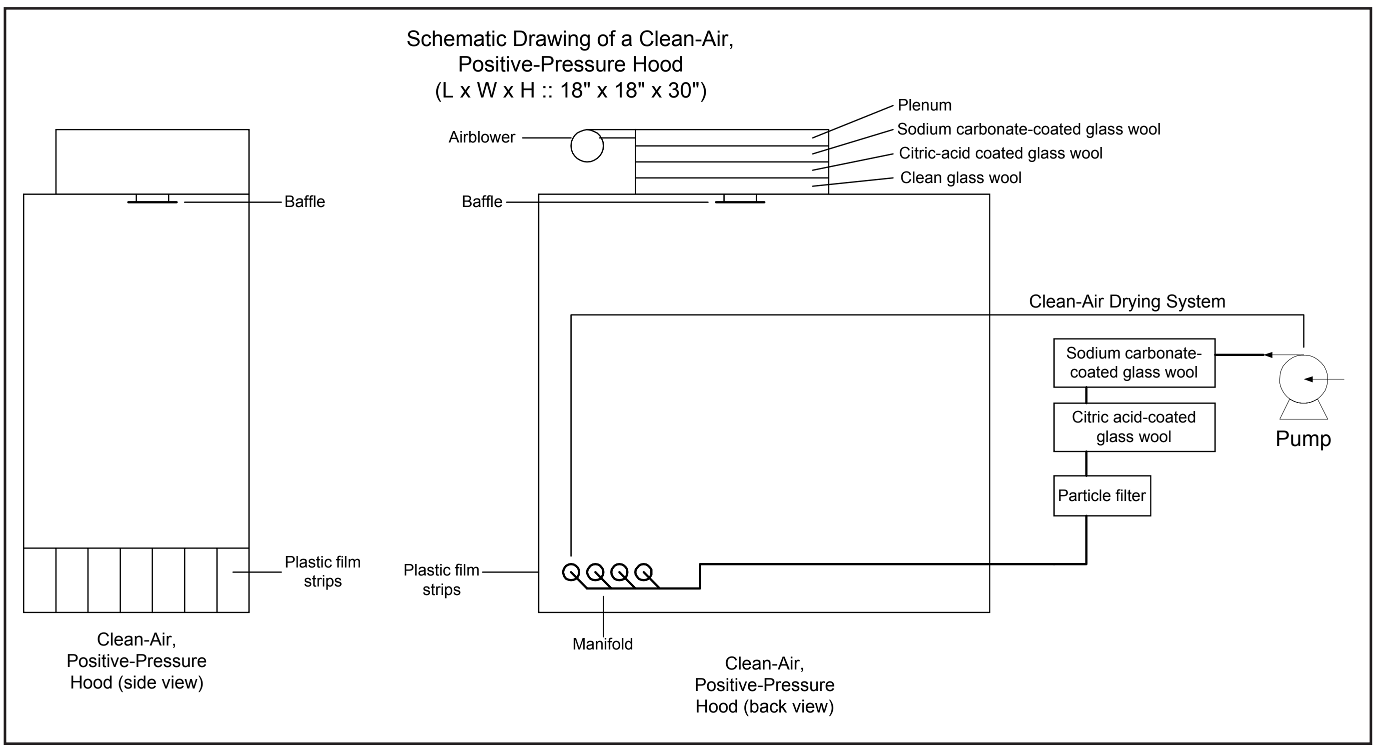


Figure 3-2. Clean-air, positive-pressure hood.

- Top fan to minimize the workers exposure to the methanol in the exhaust air from the hood
- Clean drying air system:
  - Pump to supply clean air
  - Sodium carbonate and citric acid coated glass wool cylinders to absorb gases from the supply air and a filter to remove the particles
  - Manifold for honeycomb drying (Figures 3-3 and 3-4).

Figure 3-3. Schematic drawing of a drying cap for manifold.

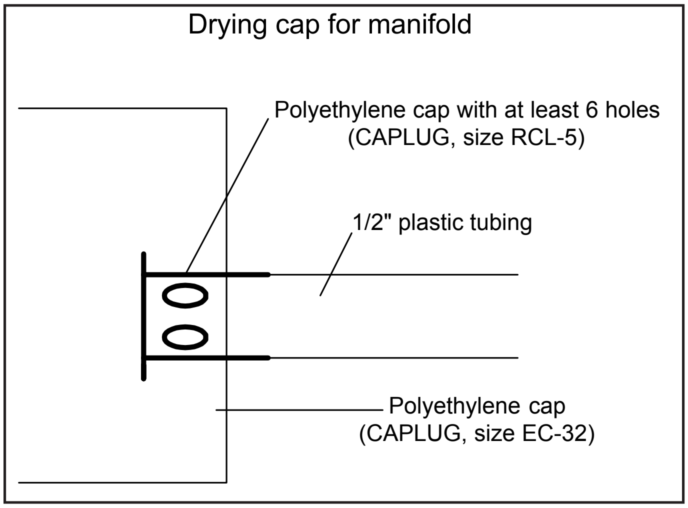
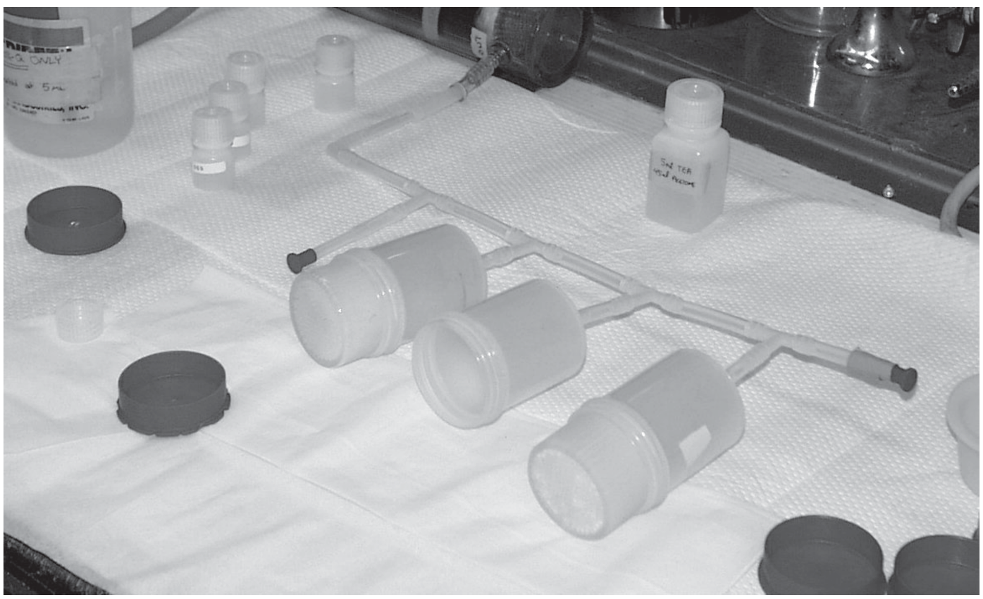


Figure 3-4. Drying caps for the manifold.



If you are using a glove box instead of a clean-air hood, you must place pieces of sodium carbonate- and citric acid-coated, glass-fiber paper inside the box to absorb the target air species in the glove box. Be sure to leave the coated paper inside the glove box for at least 5 minutes before using it for denuder coating, assembly and disassembly of the honeycomb system, or denuder extraction. This will allow the paper to absorb the acid gases and ammonia in the hood.

3.2.2. Coating the Glass Wool

Follow these steps to coat the glass wool used in the clean-air system:

NOTE: Be sure to wear plastic gloves while coating the glass wool.

1) **Dip the clean, soft, Pyrex glass wool (Corning catalog number 3950) in the coating solution. The coating solution is either 2% citric acid monohydrate in alcohol, or 2% sodium carbonate in alcohol.**
2) **Squeeze out the excess solution.**
3) **Partially separate the glass wool fibers and lay them out on clean trays to dry.**
4) **When dry, store the coated glass wool in a clean container.**

3.2.3. ChemComb System Housing

You must wipe the ChemComb System housing (Figure 3-5) with alcohol to clean off any oil residue. Wipe it with MilIi-Q water and dry it in room air.

Figure 3-5. Honeycomb System housing for the ChemComb cartridge.

3.2.4. Teflon-Coated Inlets

You must thoroughly rinse new inlets (Figures 3-6 through 3-10) with Milli-Q water. Allow them to dry, covered with Kimwipes, in room air. Store the clean, dry inlets on Kimwipe-covered trays, with additional Kimwipes placed on top of them.

NOTE: If it is necessary to dry the inlets rapidly, rinse them with methanol and allow them to dry on the Kimwipe-covered tray, or use the clean-air system to dry them more rapidly.

Figure 3-6. Bottom view of a PTFE-coated inlet.

Figure 3-7 (left). Side view of a PTFE-coated 10 l/min inlet.

Figure 3-8 (right). Side view of an annodized 10 l/min inlet.

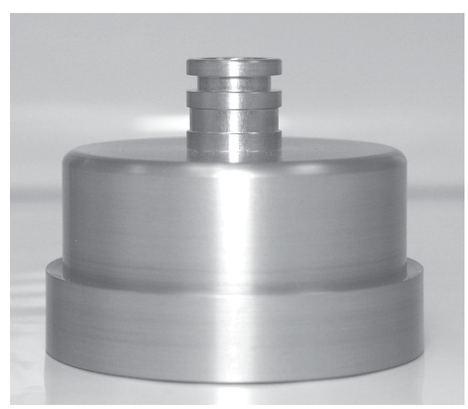


Figure 3-9 (left). Side view of a PTFE-coated 16.7 l/min inlet.

Figure 3-10 (right). Side view of an annodized 16.7 l/min inlet.

3.2.5. O-Ring Preparation

New O-rings on the Honeycomb System Housing and teflon-coated inlets require a thin coating of silicon vacuum grease.

Follow these steps to apply grease to the O-rings:

1) Clean the O-rings with a moist Kimwipe, if necessary.

2) Place a small amount of grease on end of your index finger and rub it onto the O-ring. Use your thumb and index finger to spread the grease until it covers the entire surface of the O-ring.

3) Wipe the excess grease from your fingers, and then use your cleaned fingers to rub any excess grease from the O-rings.

3.2.6. Impactor Plates

3.2.6.1. Cleaning New Impactor Plates Before Use

Follow these steps to clean new impactor plates before use:

1) New impactor plates (Figure 3-11) must be cleaned in an ultra-sonic bath. Use a 1-quart bath, filled with tap distilled water that has a few drops of laboratory liquid detergent in it. Use a specially made rack (Figure 3-12) to support the plates in the bath. The impactor plates must not touch each other because sonication causes the Teflon coating to be deposited on the porous stainless steel plate.

Figure 3-11. Impactor plate that fits inside the inlet of a ChemComb cartridge.

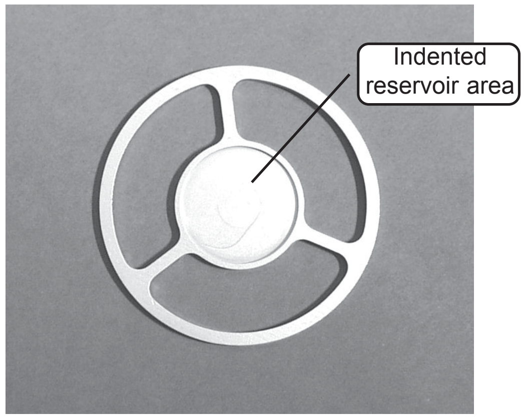
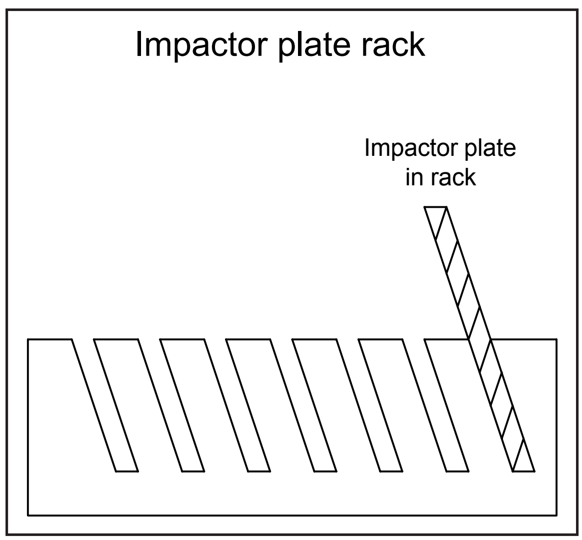


Figure 3-12. Rack for cleaning impactor plates.



2) Sonicate impactor plates for 15 minutes.

3) Rinse the impactor plates thoroughly with distilled water and then sonicate again for 5 minutes with distilled water only.

4) Repeat the rinse and sonicate procedure (with distilled water only) until all the detergent has been removed.

5) Cover the impactor plates with Kimwipes and allow the impactor plates to dry in room air. If you must dry the impactor plates rapidly, rinse them with methanol.

6) Store the clean impactor plates in a clean ziplocked bag.

3.2.6.2. Cleaning Previously Used Impactor Plates

Previously used impactor plates will require more thorough cleaning than new impactor plates.

Follow these steps to clean used impactor plates:

1) **Wipe the collected material and grease from the impactor plates with a clean Kimwipe. You also can use a soapy brush.**
2) **Follow steps 1-4 in Section 3.2.6.1. (Cleaning New Impactor Plates Before Use). During sonication, grease used to catch large particulate matter may detach from the impactor plate. This grease may contain particles that were collected during sampling. This may cause a dark cloudiness in the sonication bath water.**
3) **Following sonication, rinse the impactor plates, and then repeat the sonication treatment with detergent solution as many times as necessary until no more grease detaches from the plates during sonication.**
4) **After the grease has been thoroughly removed from the impactor plates, use repeated rinses and sonication baths with distilled water to completely remove the remaining detergent.**
5) **Cover the impactor plates with Kimwipes and allow the impactor plates to dry in room air. If you must dry the impactor plates rapidly, rinse them with methanol.**
6) **Store the clean impactor plates in a clean ziplocked bag.**

3.2.6.3. Coating the Impactor Plates

Follow these steps to coat the impactor plates with grease:

NOTE: The impactor plates must be completely dry before they are coated with grease.

1) **Place the impactor plates on a clean flat surface with the indented circular reservoir facing upward (Figure 3-11).**
2) **Apply a small amount of Dow Corning high vacuum grease (59-006460) (Figure 3-13) to the indented reservoir area of the impactor plate (Figure 3-11).**

Figure 3-13. Dow Corning high vacuum grease.

3) Using a straight razor, scrape any excess grease off the impactor plate. This should leave enough grease to completely fill the indented reservoir area.

4) Either insert the impactor plate directly into the ChemComb inlet for sampling, or store the plates for future use. If you insert the impactor plate into the inlet, ensure that the greased reservoir area is facing the air flow stream. The greased reservoir area should not be visible when looking into the ChemComb inlet (Figure 3-14). If you are going to store the impactor plates for future use, go to step 5.

Figure 3-14. Impactor plate installed inside the inlet of a ChemComb cartridge.

5) To keep the grease on the plates from contacting the flat bottom sides of the other impactor plates, stack the greased plates in pairs with the greased plates facing each other.

6) Make stacks of 16 plates and tape them together.

7) Store each stack of 16 plates in a clean ziplocked bag until ready for shipment or use.

After every sampling run, scrape out the greased area in the center of the impactor that has visible particulate matter buildup. Replace the scraped out grease with new grease from the tube and repeat steps 3-7. After every 4 weeks of use, completely clean each impactor plate (following the instructions in Section 3.2.6.2) and prepare the impactors for further use by following the instructions in Section 3.2.6.3.

3.2.7. Glass Spacers and HDPE Spacers

You must thoroughly rinse new glass (Figure 3-15) and HDPE spacers (Figure 3-16) with Milli-Q water. Allow them to dry, covered with Kimwipes, in room air. Store the clean, dry glass and HDPE spacers in a clean ziplock bag.

NOTE: If it is necessary to dry the glass and HDPE spacers rapidly, rinse them with methanol and allow them to dry on the Kimwipe-covered tray.

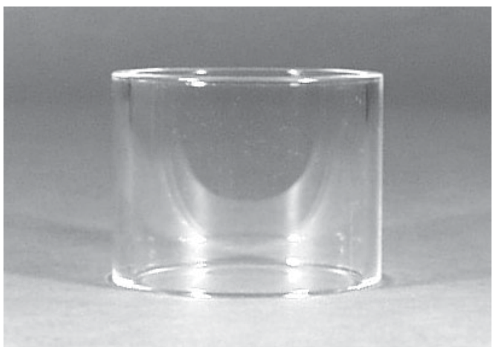


Figure 3-15 (left). Glass spacer for the ChemComb cartridge.

Figure 3-16 (right). HDPE spacer for the ChemComb cartridge.

3.3. Honeycomb Denuder Coating and Extraction Procedures

Honeycomb denuders (HCs) (Figures 3-17 and 3-18) contain a large internal surface area. They are 47 mm in diameter, and 38 mm long. Their internal surface area of 508 cm^2 is made possible by 212 hexagonal flow channels that are 2 mm on a side. The entire ChemComb cartridge is less than 30 cm long.

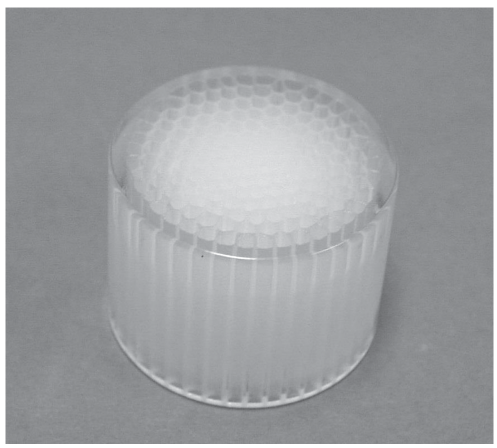


Figure 3-17 (left). Side view of Honeycomb denuder.

Figure 3-18 (right). Top view of Honeycomb denuder.

Honeycomb denuders are made completely of glass to avoid gas losses that can take place due to nitric acid and ammonia adsorption on the epoxy resin sometimes used in annular denuders. The use of the same material throughout the denuder avoids cracking that can otherwise occur due to large temperature changes.

Honeycomb denuders are efficient collectors of inorganic gases such as HONO, HNO_3 and NH_3 through the application of different coatings in the laboratory. A denuder may be coated with a different gas-adsorbing substance each time it is used. Typically, a sodium carbonate/glycerol coating is used for the collection of acidic gases such as SO_2, HONO and HNO_3. A second denuder in series is often coated with a citric acid/glycerol solution for the collection of basic gases such as NH_3. Ion chromatography is often used as the analytical method.

3.3.1. Denuder Pre-Coating Procedure

Follow these steps to wash and dry all new and used Honeycomb denuders before coating them for sampling:

1) All new and used HCs must be thoroughly washed by flushing them with distilled water (DW) for at least 2 minutes (Figure 3-19). Use a high velocity tap to flush the tubes of the denuders.

NOTE: The flushing process is very important to minimize the background value. If you still find high background values after flushing the denuder tubes, you must flush the denuders for a longer period of time before using them for sampling.

Figure 3-19. Flushing the HC with distilled water.

2) After flushing, rinse the HCs with the Milli-Q water at least three times, to make sure that every tube of the HC has been rinsed (Figure 3-20).

Figure 3-20. Rinsing the honeycomb denuders with Milli-Q water.

3) After rinsing, gently tap the HC denuders on the clean Kimwipes to shake all of the water out of the denuder tubes.

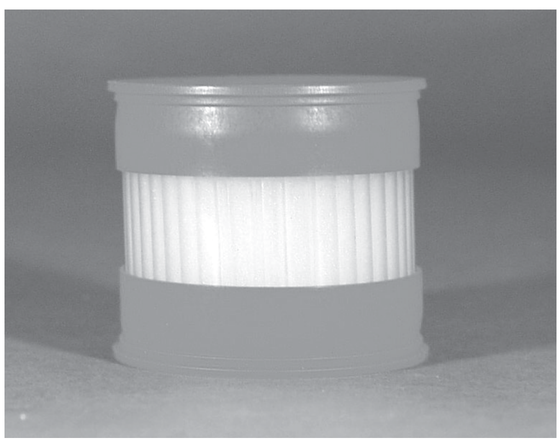
4) Place all of the cleaned denuders on a clean plastic tray that has been covered with Kimwipes. Place additional Kimwipes on the top of the HCs, allowing them to dry in room air.

NOTE: If it is necessary to dry the denuders rapidly, rinse them with methanol and allow them to dry on the Kimwipe-covered tray, or use the clean-air system to dry them more rapidly.

5) After the HCs are dry, cap both ends of each HC with clean red caps (polyethylene caps, size EC-32, CAPLUGS Division, Protective Closures, Inc.) (Figures 3-21 and 3-22) and store them in labeled tubs prior to coating. If you will be using citric-acid coatings, you must soak the denuders in 1 N hydrochloric acid for several hours to reduce background sodium and ammonia ions. Rinse the acid off the denuders using the procedures described above.

Figure 3-21. Placing clean red caps on a Honeycomb denuder.

Figure 3-22. Honeycomb denuder with red caps on either end.



3.3.2. Denuder Coating Procedure

To minimize contamination of the denuders, coat and dry them inside the clean-air hood. Have a supply of clean, dry, red (size EC-32) polyethylene caps ready before coating the denuders (Figure 3-22). To balance the pressure of the denuder, half of the caps must have a hole in them. Use a needle to make the hole in the caps and mark them by cutting a small piece of the caps' edge (Figure 3-23).

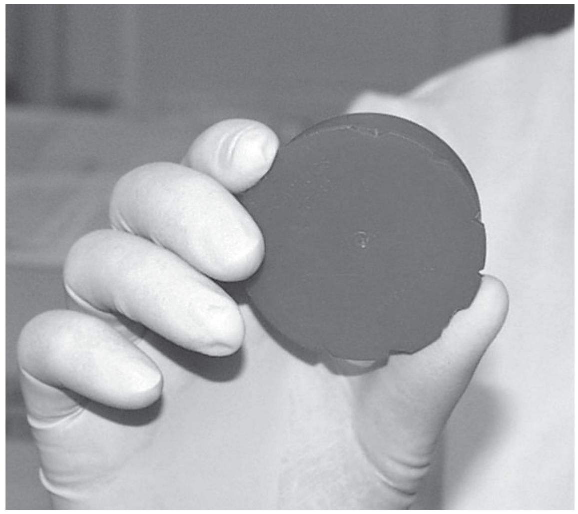


Figure 3-23. Mark the red caps that have holes in them by cutting a small piece of the caps' edge.

Be sure to minimize the exposure of denuders to room air during coating because the acid gases and ammonia in the laboratory air can cause contamination. To decrease drying time and to protect the denuders from contamination, pass clean, dry air through the freshly coated denuders until they are dry (Figures 3-24 and 3-25). The clean air system is shown in Figures 3-2 and 3-4.

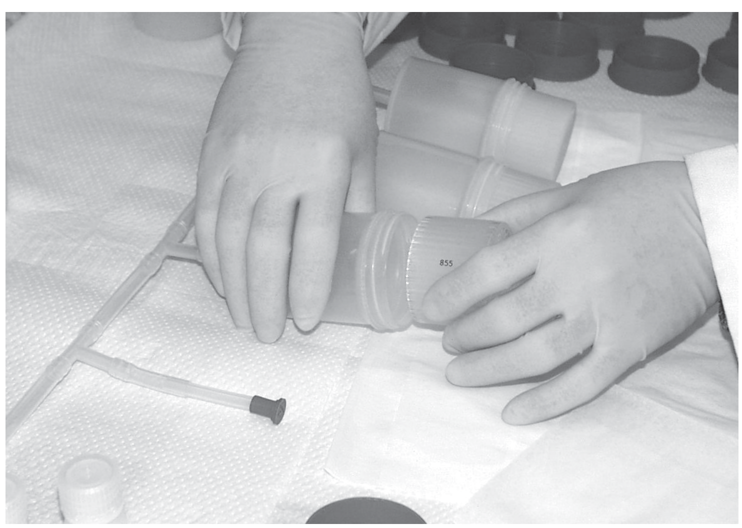


Figure 3-24. Placing a denuder on the manifold of a clean-air system.

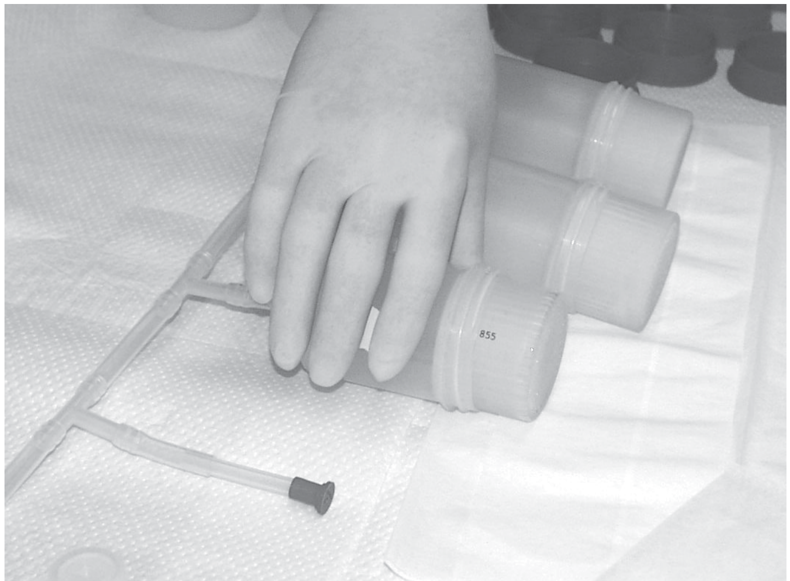


Figure 3-25. Denuder installed on the manifold of a clean-air system.

Make sure that all components of the system are connected properly. Lay out the plastic manifolds on clean paper towels. Wipe the manifold ports with Kimwipes moistened with Milli-Q water (to remove any sodium ion which may have been deposited during previous coating). Connect the manifold inlets to the output tube from the clean air system.

To preserve the capacity of the system, turn on the pumps to start the air flow through the system *only when the denuders are ready to be dried*. Turn the system off as soon as drying is complete.

The following equipment and materials must be readily available during the denuder drying procedure:

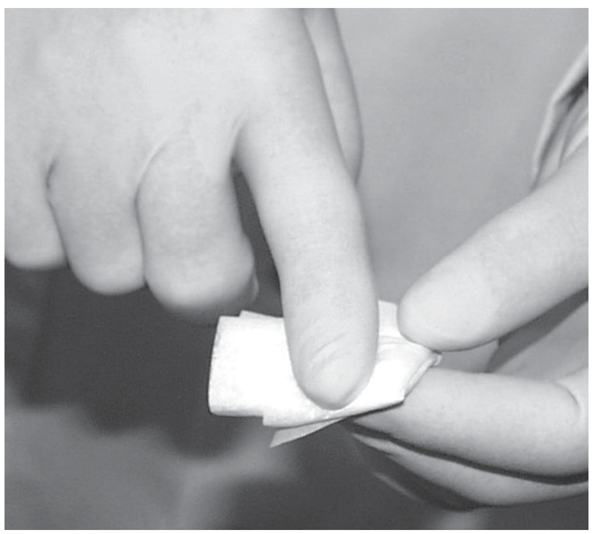
- Container with red polyethylene caps (no hole)
- Container with red polyethylene caps (with hole)
- Container for used red polyethylene caps (with no hole)
- Container for used red polyethylene caps (with hole)
- Container with clean caps for tapping the coated denuders
- Container for used caps
- 10 ml dispensing pipette bottle with fresh coating solution
- Beaker for the used coating solution
- Tray with clean, capped denuders to be coated
- Clean tray for the dried, coated denuders
- Clean tray for the labeled red caps to put back on the denuders when the coating has dried
- Powder-free vinyl gloves.

NOTE: It is important to wear the powder-free gloves at all times. Rinse the gloves with Milli-Q water before coating, and dry the gloves by wiping them with Kimwipes. R&P suggests that two people work together when following these procedures to reduce exposure of the denuders to room air and to preserve the capacity of the clean air system.

Follow these steps to coat and dry the Honeycomb denuders:

1) **Before beginning the coating and drying procedure, place powder-free gloves on your hands. Once you are wearing the gloves, rinse your gloved hands with Milli-Q water and dry the gloves by wiping them with Kimwipes (Figure 3-26).**

Figure 3-26. Rinse your gloved hands with Milli-Q water and dry the gloves by wiping them with Kimwipes.



2) **Remove the labeled red end cap from a clean, dry denuder and place the denuder on a clean tray. Be sure to leave the other red cap on the end of the denuder.**

3) **Use the dispensing pipette bottle and gently add 10 ml of coating solution to the open end of the denuder (Figure 3-27).**

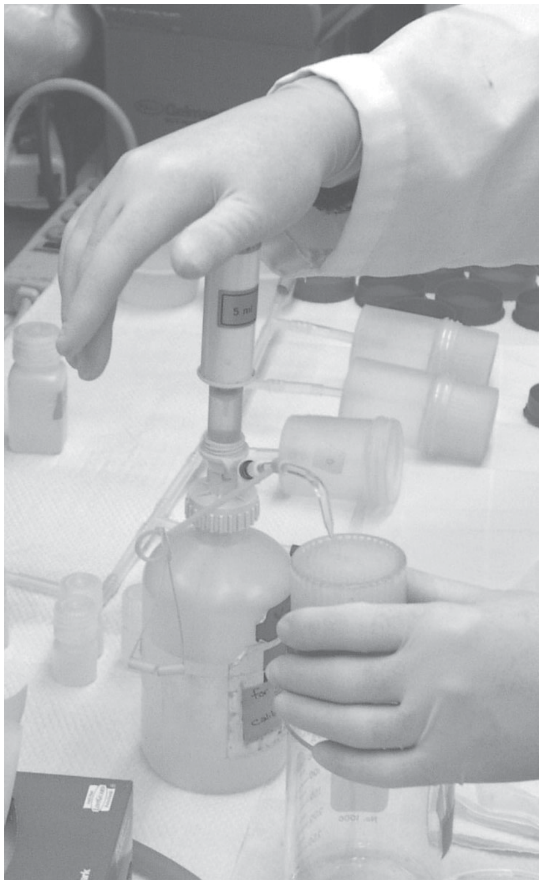


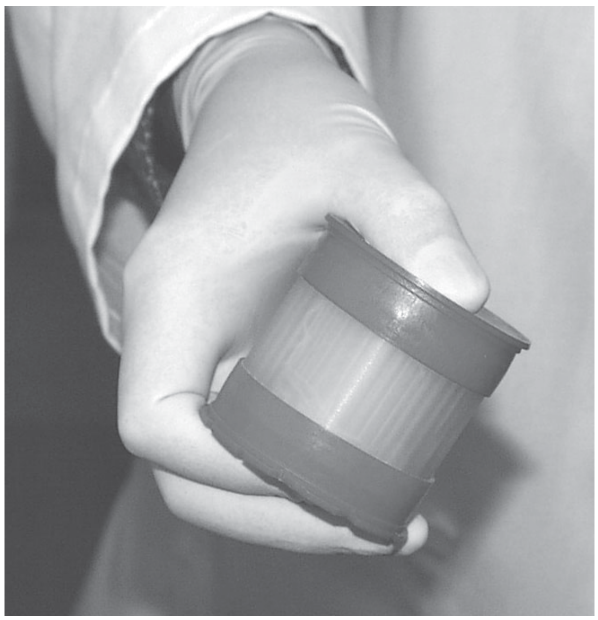
Figure 3-27. Use the dispensing bottle to add coating solution to the open end of the denuder.

4) Cap the open end of the denuder with a clean red cap that has a hole in it (Figure 3-28).

Figure 3-28. Covering the open end of the denuder with a red cap that has a hole in it.

5) Hold the denuder by placing your thumb on the red cap that does not have a hole in it and place your middle finger on the cap that has the hole in it (Figure 3-29). Place your index finger or thumb on the hole of the red cap to avoid any leakage through the hole when turning the denuder.

Figure 3-29. Be sure to place your thumb or finger over the hole in the red cap.



6) Gently invert and reverse the denuder (Figures 3-29 through 3-31) 10 times each way to mix the coating solution. Rotate the denuder about 120 degrees along its axis and repeat the inverting and reversing process. This will ensure that all tubes in the denuder are completely coated. To prevent leakage, do not shake the denuder during coating.

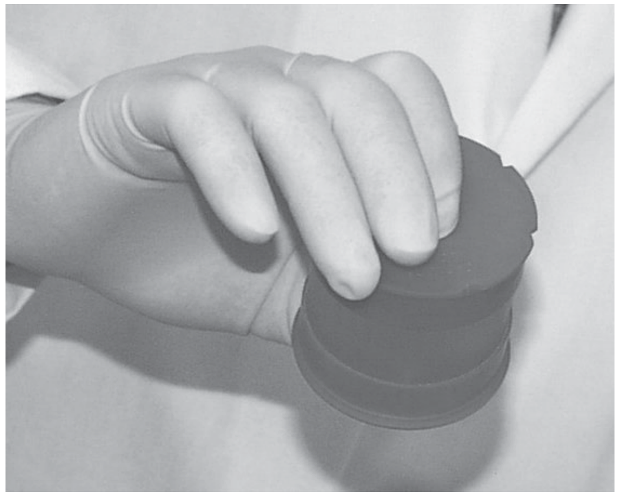


Figure 3-30. Gently invert and reverse the denuder to evenly spread the coating solution on its honeycomb interior.

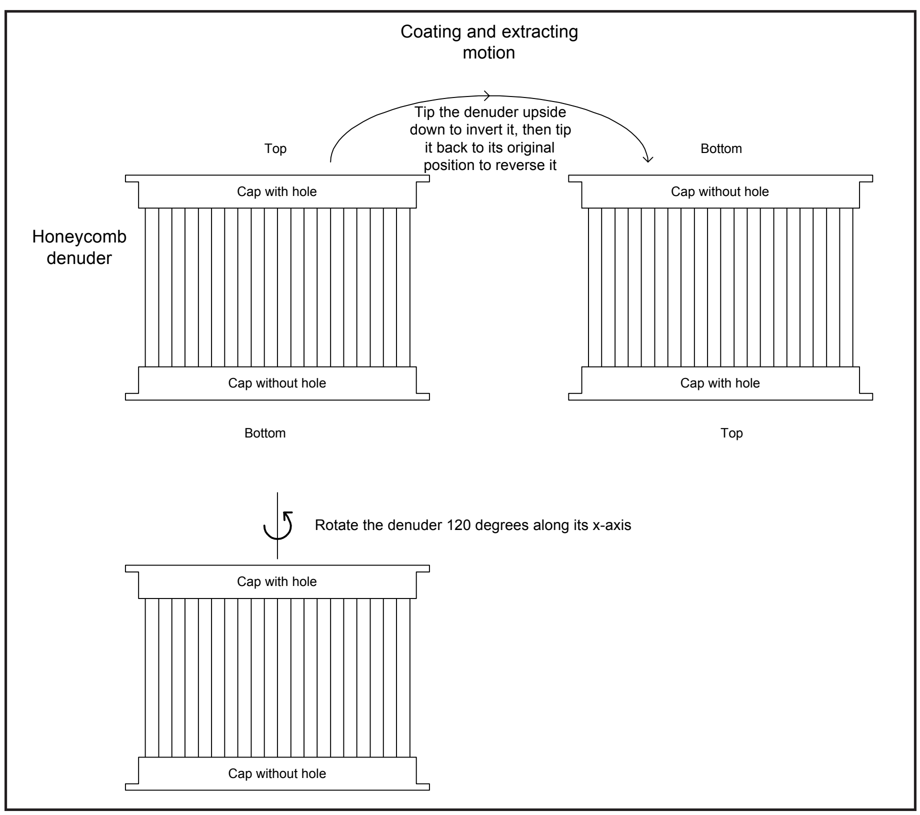


Figure 3-31. Coating and extracting motion for the Honeycomb denuders.

7) **Remove the red cap with the hole on it.**

8) **Pour out the excess coating solution into the waste beaker (Figure 3-32).**

Figure 3-32. Pour out the excess coating solution into a waste beaker.

9) **Gently tap the denuder on a stack of Kimwipes (Figure 3-33). This will ensure that there are no liquid bubbles inside the tubes of the denuder.**

Figure 3-33. Gently tap the open end of the denuder on a stack of clean Kimwipes to remove any liquid bubbles in the denuder tubes.

10) Remove the other red cap, that does not have the hole, from the end of the denuder.

11) Gently tap the denuder into the waste beaker to remove any remaining coating solution from the denuder.

12) Turn on the clean-air drying system (Figure 3-1).

13) Wipe the outer surface of the denuder with Kimwipes moistened with Milli-Q water (Figures 3-34 and 3-35).

Figure 3-34. Moistening a Kimwipe with Milli-Q water.

Figure 3-35. Wiping the outside of the denuder with Kimwipes moistened with Milli-Q water.

14) Attach the denuder to an open manifold port (Figures 3-24 and 3-25) to dry the denuder. While that denuder is drying, coat another denuder by repeating steps 1-13.

15) After you have finished coating the 4th denuder, the first denuder that you coated should be dry. However, if you are coating denuders with sodium carbonate, it will take a longer period of time to dry each denuder.

16) Remove the dry denuder and wipe its outer surface with Kimwipes moistened with Milli-Q water. Attach a clean, dry red cap (without any holes in it) on one end of the denuder and attach a labeled red cap (without any holes in it) on the other end.

17) Place the coated, dry, capped denuder in a clean tub that is covered with Kimwipes on the bottom.

18) Repeat steps 1 to 16 to coat the remaining denuders.

19) Turn off the air pumps after the last denuder has been removed and capped.

20) Label the tray used to store the coated denuders with the batch code.

3.3.3. Denuder Extraction Procedure

To minimize contamination of the denuders, you must perform the extraction prcedure under the clean-air hood and while wearing clean powder-free gloves at all times.

The following equipment and materials are required for the Honeycomb denuder extraction procedure:

- Red polyethylene caps without holes
- Red polyethylene caps each with a hole
- A container to hold the used red polyethylene caps with no holes
- A container to hold the used red polyethylene caps with holes
- A 10 ml calibrated dispensing pipet bottle with fresh Milli-Q water
- A clean tray for the extracted denuders
- Clean, dry sample vials
- A rack to store sample vials
- Powder-free vinyl gloves.

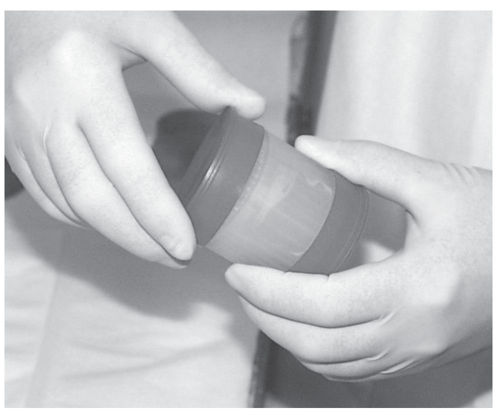
Follow these steps to extract sampled gases from the Honeycomb denuders:

IMPORTANT: Be sure to wear the powder-free vinyl (PVC) gloves while extracting sampled gases from the denuders. Rinse the gloves with Milli-Q water before extraction, and dry the gloves by wiping them with Kimwipes.

1) Place powder-free gloves on your hands. Once you are wearing the gloves, rinse your gloved hands with Milli-Q water and dry the gloves by wiping them with Kimwipes (Figure 3-26).

2) Transfer the label on the top of the red cap to a clean sample vial. Be sure to hold the denuder's outer surface with your thumb and middle finger.

3) Remove the red caps from both ends of the denuder (Figures 3-36 and 3-37). Wipe the outer surface of the denuder with Kimwipes moistened with Milli-Q water (Figures 3-38 and 3-39).



Figures 3-36 (left) and 3-37 (right). Removing the red caps from both ends of a denuder.

Figures 3-38. Wiping the outside of the denuder with Kimwipes moistened with Milli-Q water.

Figures 3-39. Hold the denuder between your thumb and finger. Do not touch the ends of the denuder with your fingers.

4) Place a new, clean, dry red cap that does not have a hole in it on one end of the denuder. Avoid using excessive force when recapping the denuder because the edge of the red cap may distort when you push it onto the end of the denuder. This will cause the extracting solution to leak out of the caps during the extraction process. When the denuder is uncapped, be sure to hold it only by its outer surface. Do not allow your fingers to touch either end of the denuder while it is uncapped.

5) Using the dispensing pipette bottle, add 10 ml of Milli-Q water to the open end of the denuder (Figure 3-27).

6) Immediately cap this end with a clean, dry red cap that does not have a hole in it. Avoid excessive pressure while applying the cap to the end of the denuder.

7) Hold the denuder by placing your thumb on the red cap that does not have a hole in it and place your middle finger on the cap that has the hole in it (Figure 3-29). Place your index finger on the hole of the red cap to avoid any leakage through the hole when turning the denuder.

8) Gently invert and reverse the denuder (Figures 3-29 through 3-31) 10 times each way. Then rotate the denuder about 120 degrees along its axis and repeat the inverting and reversing process 10 times. Rotate the denuder again 120 degrees along its axis and invert and reverse another 10 times. This will ensure that all tubes in the denuder have been rinsed with the extraction solution.

9) Hold the denuder so that the red cap with the hole is on top. Shake the denuder to force the liquid to the bottom, letting the extraction solution remain in the bottom red cap that does not have a hole in it.

10) Remove the red cap with hole from the top of the denuder. Hold the bottom red end cap firmly and carefully remove the denuder from the cap. Most of the extraction solution should remain in the bottom red cap. If the extraction solution does not come out, gently shake the denuder again to get the solution out of the denuder and into the bottom red cap.

11) Pour the extraction solution into the sample vial (Figure 3-40) and cap the vial tightly (Figure 3-41).

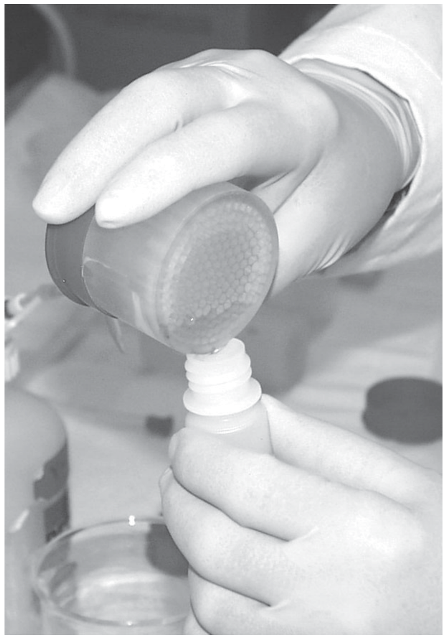


Figure 3-40 (left). Pour the extraction solution into the sample vial.

Figure 3-41 (right). Tightly cap the sample vial.

12) Place the vial in a rack and store the vial at 50° C in a dark area.

13) Place the red caps and the denuder on the tray and clean them as soon as possible.

3.3.4. Coating and Extraction Concerns

If you find a high blank value for ammonia, there may be several reasons for it.

(a) The denuder is not clean enough. Soak it in 1 N HCL longer and flush it with tap distilled water longer.

(b) When you are coating the denuder, keep it away from your body by placing it deep inside the clean-air hood. Exhaled breath contains a lot of ammonia gas which might be absorbed by the denuder.

(c) The coating solution is not fresh or the solution was not created inside a clean-air hood.

If you find a high blank value of sulfate ion, you probably did not clean the new Honeycomb denuder well enough before sampling. The denuders initially were etched during production with an etching solution which contains a high concentration of sulfate ion. You must flush the denuders with tap distilled water for a long period of time before using them for sampling. Repeat the flushing process until you get a low level of sulfate ion. Sulfate ion concentration levels are a good indicator of testing your denuder cleaning skills.

If you feel a headache during or after coating, this means you may have been exposed to a high level of methanol. Use a fan to supply fresh air outside the hood. Do not use a strong fan, because this strong flow might push room air into the clean-air hood and contaminate the denuders.

If your red caps leak during coating, it might be due to:

(a) The end cap is too tight.
(b) You did not use an end cap that has hole in it.
(c) You held the denuder too tightly. This can generate some pressure that will push the solution out of the denuder.

If the red caps leak during coating, just wipe the denuder with Kimwipes moistened with Milli-Q water. Also, replace the Kimwipes covering the bottom of the hood. If some of the sample is lost during extraction, this could result in an error in concentration measurement.

3.4. Filter Handling and Initial Inspection

You may use various types of 47 mm-diameter filters to sample particulate matter that passes through the ChemComb cartridges.

Ensure that your filters are clean and do not touch them with your fingers. Filters should be stored at the laboratory in petri dishes or some other protective housing, and should be transported to and from the sampling site in a capped ChemComb cartridge. Use non-serrated forceps to handle the 47 mm filters.

Inspect each filter visually for integrity before use. Check for the following:

- Pinholes
- Chaff or flashing
- Loose material
- Discoloration
- Non-uniformity.

3.5. Pre-Sampling Filter Equilibration

✘ Do not touch filters with your fingers. Use non-serrated forceps to handle the filters.

Follow these steps to equilibrate the 47 mm filters before use. Use petri dishes to store filters in the laboratory.

1) Place a label on the cover of each petri dish and number each dish.

2) Place the petri dish cover *under* the bottom half of the dish.

3) Place each inspected filter into a separate petri dish.

4) Record the filter number, relative humidity, temperature, date and time at the beginning of equilibration.

5) Equilibrate each filter for *at least* 24 hours under the following conditions:

The equilibration room must be held at a constant relative humidity between 30% and 40%, with a variability of not more than ±5%. The equilibration room must be held at a constant temperature between 20° C and 23° C with a variability of not more than ±2° C.

3.6. Pre-Sampling Filter Weighing

Follow these steps to weigh the 47 mm collection filters (tare weight) before sampling:

1) Ensure that each filter has been equilibrated for at least 24 hours before weighing.

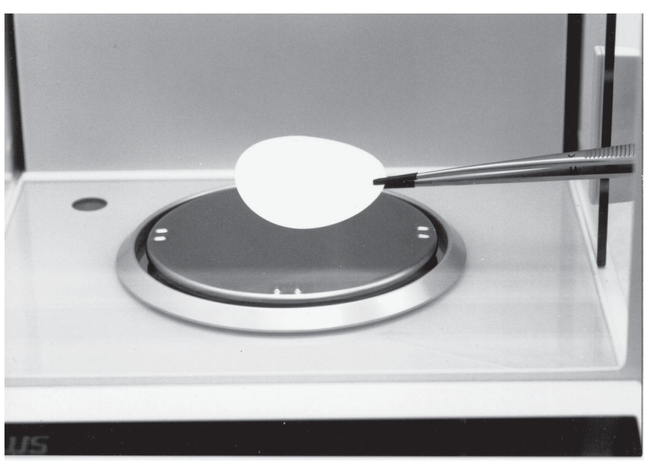
✔ Record the initial filter weight as W_i.

2) Filters must be weighed on a microbalance with a resolution of at least 1 µg (0.001 mg). Be sure to warm up the balance before weighing filters.

✔ The pre-sampling weighing must take place within 30 days of the sampling period.

3) Weigh each filter at least once (three times recommended), recording the mass in grams (Figure 3-42). The average mass reading is the initial filter weight, W_i (g). Use appropriate techniques to neutralize static charges on the filter. This

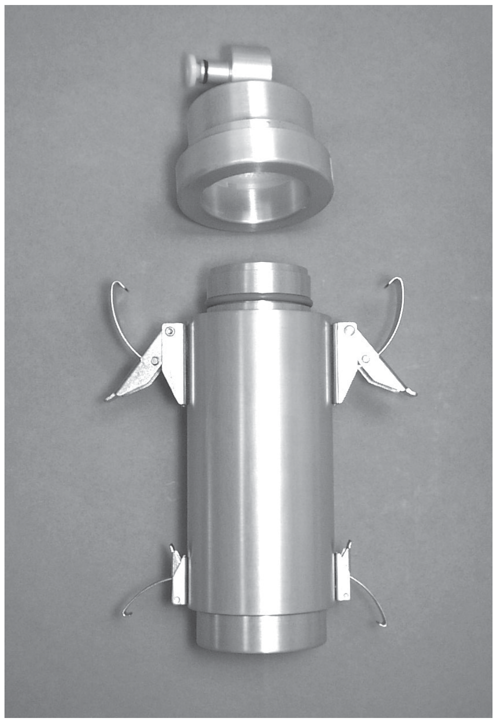
Figure 3-42. Positioning a 47 mm filter on a balance.



pre-sampling weighing must take place within 30 days of the sampling period.

4) Unlatch the top rim of the ChemComb cartridge and separate it from the body housing (Figure 3-43).

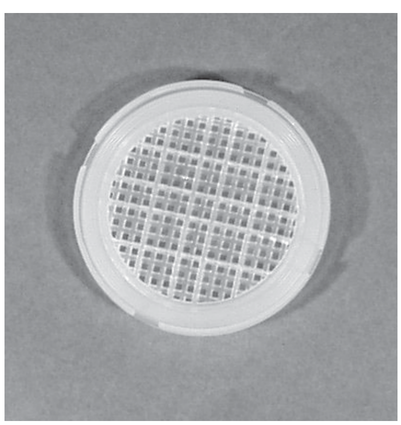
Figure 3-43. Top rim of the ChemComb cartridge separated from the body housing.

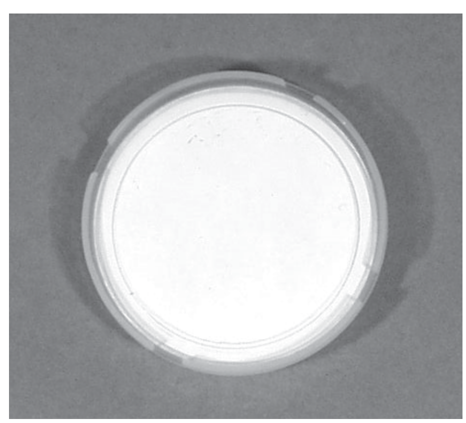


5) Place the filter inside a plastic filter screen (Figures 3-44 and 3-45).

Figure 3-44 (left). Plastic filter screen for 47 mm filters.

Figure 3-45 (right). 47 mm filter installed in a plastic filter screen.





6) Place this filter and plastic filter screen face down on the top rim of the ChemComb housing, between the body housing and the top section of the ChemComb (Figure 3-46). If desired, you may place up to three more plastic filter screens with filters installed on top of this first filter (Figure 3-47).

Figure 3-46. Plastic filter screen installed on the body housing of a ChemComb cartridge.

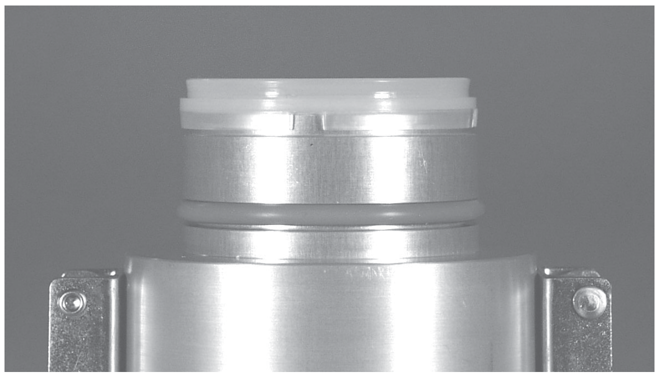
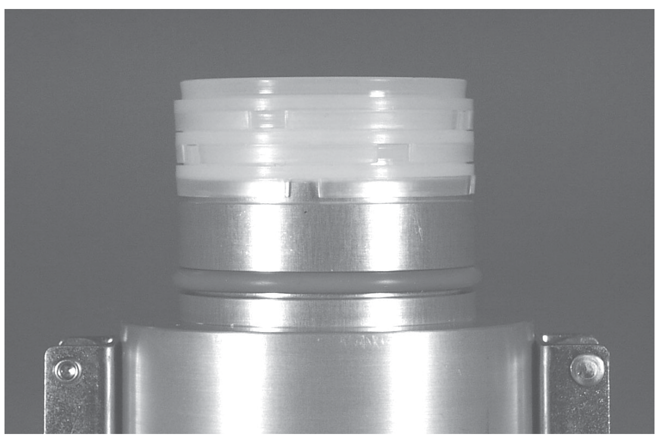


Figure 3-47. Three plastic filter screens installed on the body of a ChemComb cartridge.



7) Slide the top rim of the ChemComb housing down on top of the plastic filter screens. Ensure that the top and middle pieces of the ChemComb cartridge are pushed completely together. Latch both sides tightly.

8) Place a small yellow cap on the hose connection port (Figure 3-48).

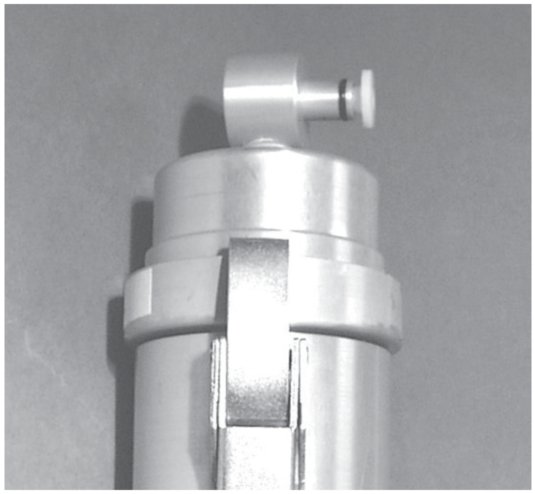


Figure 3-48. Top rim (filter pack outlet port) of a ChemComb cartridge with small yellow protective cap.

9) Document the relative humidity, temperature, date and time of the initial weighing.

10) The "zero" reading of the microbalance should be verified between each filter weighing.

3.7. Post-Collection Filter Equilibration

Follow these steps to equilibrate the 47 mm filters after sampling:

1) Unlatch both sides of the top rim of the ChemComb cartridge and separate the top rim from the main housing of the cartridge (Figure 3-43).

2) Remove the plastic filter screen(s) from the ChemComb cartridge.

3) Remove the 47 mm filter from the plastic filter screen and set it in its petri dish. Examine the filter for defects that may have occurred during sampling.

4) Place the petri dish cover *under* the bottom half of the dish.

5) Place a paper towel over the open petri dish during equilibration.

6) Record the filter number, relative humidity, temperature, date and time at the beginning of this post-collection equilibration.

7) Equilibrate each filter for *at least* 24 hours under the following conditions:

The equilibration room must be held at a constant relative humidity between 30% and 40%, with a variability of not more than ±5% relative humidity.

The equilibration room must be held at a constant temperature between 20° C and 23° C, with a variability of not more than ±2° C.

3.8. Post-Collection Filter Weighing

Follow these steps to weigh the 47 mm collection filters after sampling:

1) Ensure that the filters have been equilibrated for at least 24 hours before weighing.

2) Filters must be weighed on a microbalance with a resolution of at least 1 µg (0.001 mg). Ensure that the balance has been allowed to warm up before weighing the filters.

3) Remove the filter from its petri dish.

4) Weigh each filter at least once (three times recommended), recording the mass in grams (Figure 3-49). The average mass reading is the final filter weight, W_f (g).

Figure 3-49. Placing a used 47 mm filter on a balance.

5) Return the filter to its petri dish, place the petri dish cover over it and store it for archival purposes.

6) Document the relative humidity, temperature, date and time of the post-collection weighing.

7) The “zero” reading of the microbalance should be verified between each filter weighing.

8) Determine the net mass filter loading (DW) using the following formula:

$$DW = W_f - W_i$$

where:

DW = the net mass filter loading

W_f = the final filter weight (calculated in step 4)

W_i = the initial filter weight (calculated in step 3, Section 3.6)

Ensure that the figures used in this computation were obtained from the *same filter and balance*.

3.9. Computation of Mass Concentration

Compute the average mass concentration (MC) of particulate matter during the sampling period using the following formula with the information previously assembled:

$$MC = \frac{DW \times 10^6}{V}$$

where:

DW = the net change in the mass (g) of the 47 mm filter between the initial weighing and the post-collection weighing, as computed in Step 8 of Section 3.8.

10^6 = Conversion factor from grams (g) to micrograms (µg).

V = the volume drawn through the filter during the sampling period, as obtained from the sampler.

The sampler also indicates to the user which, if any, status conditions were encountered during sampling.

Section 4: Cartridge Handling and Exchange

This section explains how to install a hose connector on the filter pack outlet port of the ChemComb cartridges. This section also describes how to install and remove the Honeycomb denuders in the ChemComb cartridges, and how to extract sampled gases from the denuders.

3.1. Filter Pack Outlet Port Assembly

Before loading the denuders and filters into the ChemComb cartridges, you must install a hose connector on the filter pack outlet port of each cartridge.

Follow these steps to install a hose connector:

1) Locate the filter pack outlet port (the top rim of the ChemComb cartridge) (Figure 4-1). Remove it from the Honeycomb system housing (Figure 4-2).

Figure 4-1. ChemComb cartridge with the filter pack outlet port highlighted.

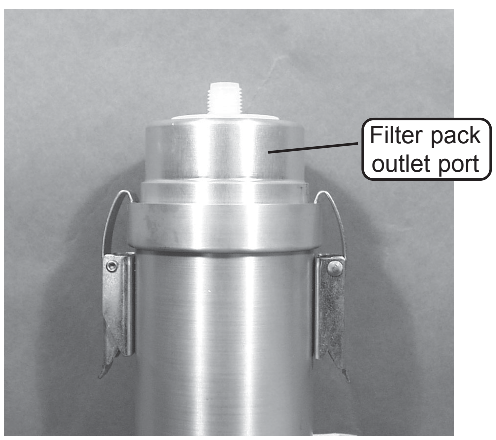
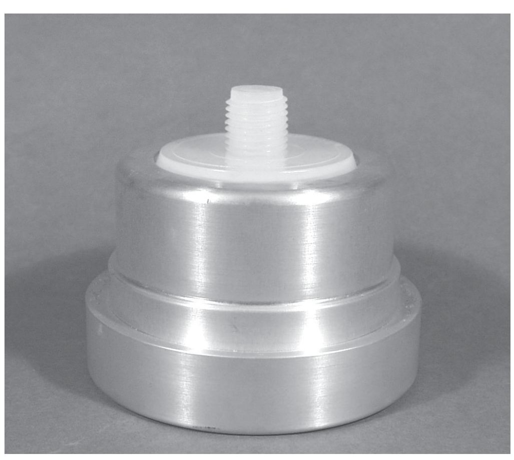


Figure 4-2. Filter pack outlet port removed from a cartridge.



2) Apply a 1-3/4 inch section of Teflon tape to the threads of the plastic hose connection insert (Figures 4-3 and 4-4).

Figure 4-3. Applying Teflon tape to the plastic hose connection insert.

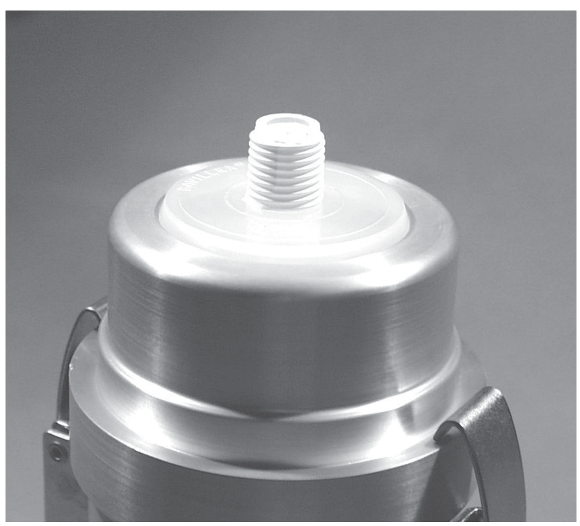
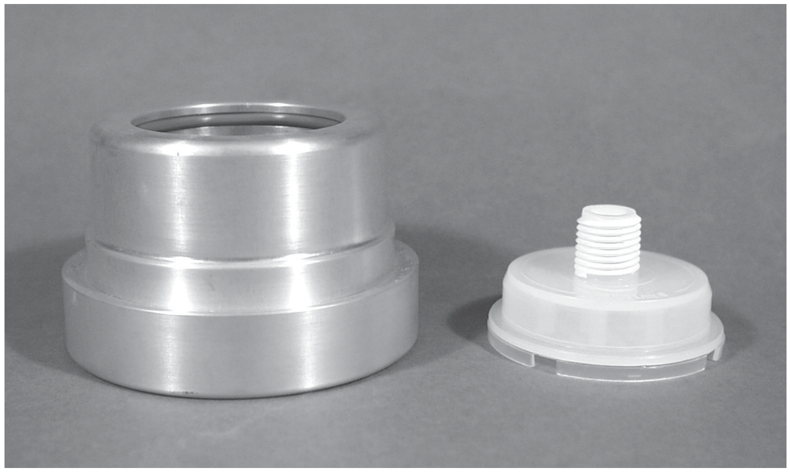


Figure 4-4. Teflon tape applied to the threads of the plastic hose connection insert.

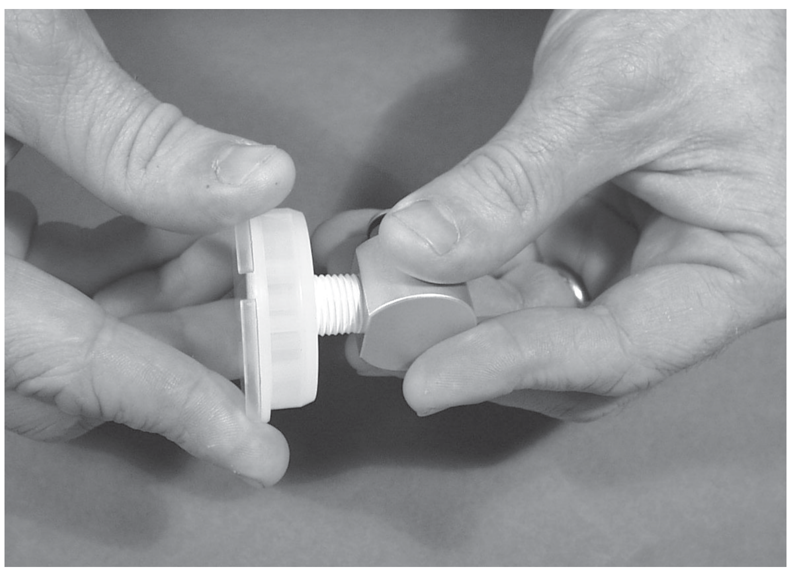
3) Push the plastic hose connection insert out of the metal rim (Figure 4-5).

Figure 4-5. Push the plastic hose connection insert out of the metal rim.



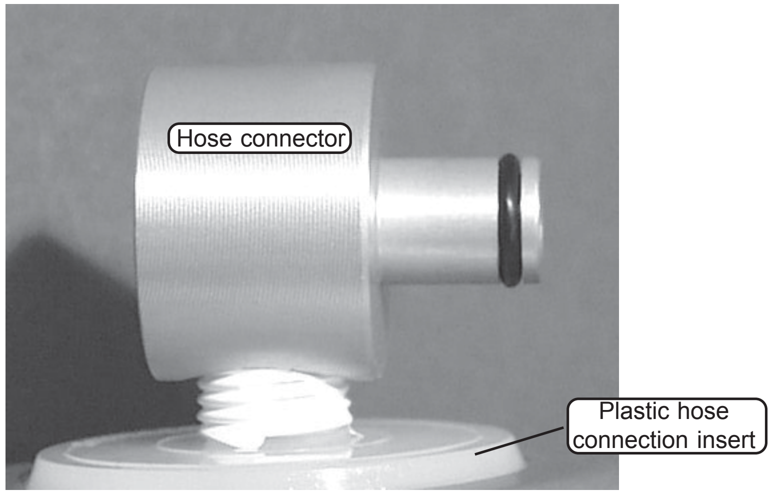
4) Hold the hose connector and screw the plastic hose connection insert into the hose connector (Figure 4-6).

Figure 4-6. Be sure to hold the hose connector while turning the plastic hose connection insert.



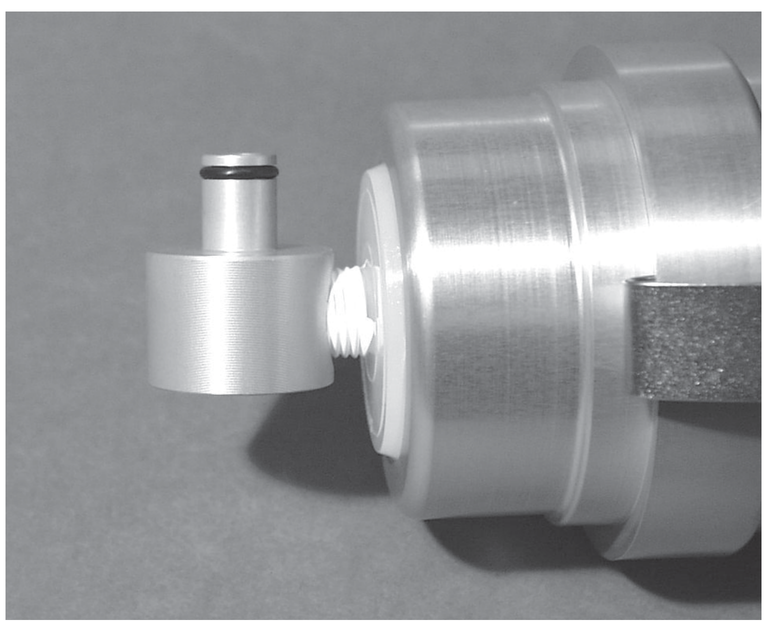
5) Continue turning the plastic hose connection insert into the hose connector until only 5 threads are visible (between the base of the plastic hose connection insert and the hose connector) (Figure 4-7).

Figure 4-7. Ensure that 5 threads are visible between the plastic hose connection insert and the hose connector.



6) Push the plastic hose connection insert into the metal rim of the filter pack outlet port. Reattach the filter pack outlet port to the Honeycomb system housing (Figure 4-8).

Figure 4-8. Reattach the filter pack outlet port to the Honeycomb system.



4.2. Honeycomb System Assembly

Follow these steps to assemble the Honeycomb system:

✘ Wear powder-free vinyl (PVC) gloves while installing and removing the filter packs and Honeycomb denuders.

1) To minimize contamination of the denuders, you must assemble and disassemble Honeycomb systems under a clean-air hood while wearing clean powder-free gloves at all times (Section 2).

2) Place a glass spacer on several clean Kimwipes.

3) Place the filter pack outlet port (the top rim of the ChemComb cartridge) inside the glass spacer (Figure 4-9).

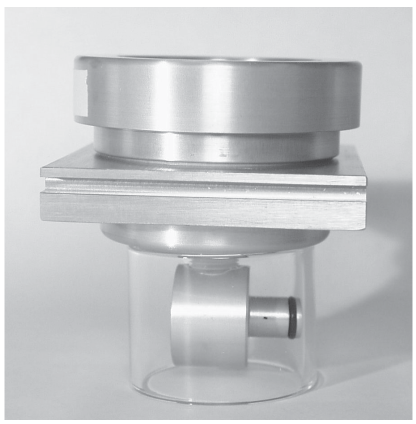


Figure 4-9. Filter pack outlet port (top rim of the ChemComb cartridge) inside a glass spacer.

4) Place inside the filter pack outlet port, in sequence, the following components for the filter pack (Section 3.6):

a. One citric acid-coated glass fiber filter

b. One plastic filter screen

c. One sodium carbonate-coated, glass-fiber filter

d. One plastic filter screen

e. One Teflon filter, “smooth” side up

f. One plastic filter screen

g. Honeycomb system housing.

5) Fasten the housing and the top rim of the ChemComb system together.

6) Hold the ChemComb at a slight angle.

7) Inside the ChemComb body housing, place the following components in sequence (Figure 4-10):

a. One metal spring

b. One HDPE ring spacer

c. One citric acid-coated denuder

d. One HDPE ring spacer

e. One sodium carbonate-coated denuder

f. One HDPE ring spacer

g. One glass spacer

h. One HDPE ring spacer

i. A greased, inlet impactor plate.

NOTE: If you will be using only one coated denuder, place a glass spacer before and after the denuder. For example, you would insert the following equipment into the body housing using this sequence: 1) metal spring; 2) glass spacer; 3) HDPE ring spacer; 4) coated Honeycomb denuder; 5) HDPE ring spacer; 6) glass spacer; 7) HDPE ring spacer; 8) inlet impactor plate.

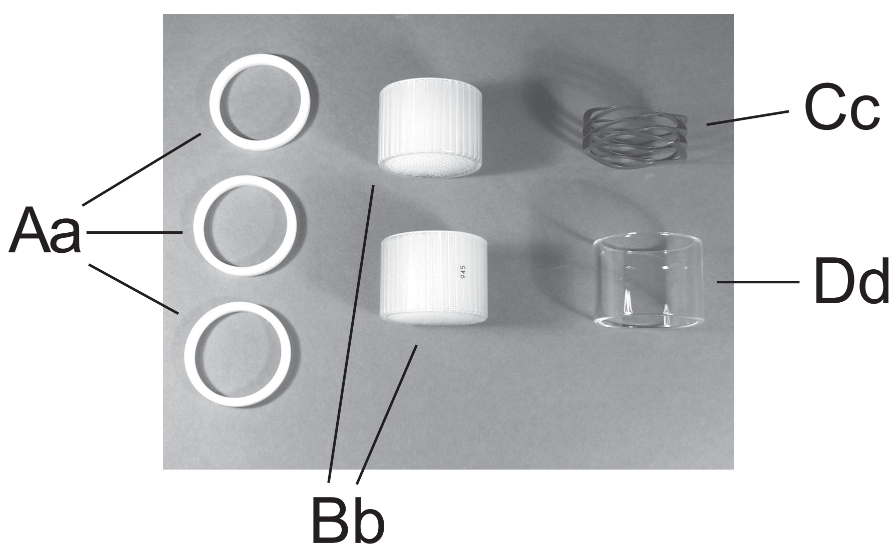
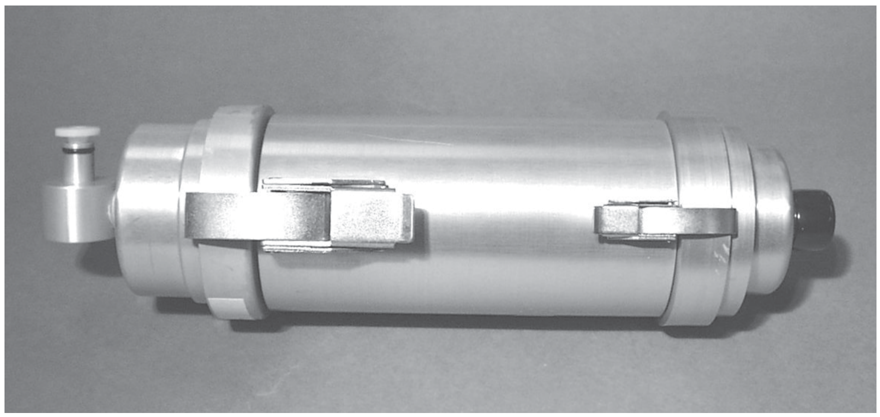


Figure 4-10. Denuder components package: (Aa) HDPE ring spacers; (Bb) Honeycomb denuders; (Cc) metal spring; and (Dd) glass spacer.

8) Slide the inlet onto the housing and secure it with the side clips.

9) Place plastic caps on both ends of the system to exclude ambient air (Figure 4-11).

Figure 4-11. ChemComb cartridge with small caps on both inlet and outlet ports.



10) Place labels on the outside of the ChemComb housing. Include two labels that list the coatings used for the denuders and three labels to list the filter types.

4.3. Honeycomb System Disassembly

The following equipment and materials are required for disassembling the Honeycomb system:

- Clean red caps (size EC-32), two for each denuder
- Clean dry sample vials for filter storage, one for each filter
- Glass petri dish
- Kimwipes
- Plastic squeeze bottle with Milli-Q water
- Filter forceps
- Clean sharp razor blade or small stainless steel scissors
- Tub to hold used parts.

Follow these steps to disassemble the Honeycomb system:

IMPORTANT: Do not disassemble the Honeycomb system in room air.
NOTE: Be sure to wear powder-free vinyl (PVC) gloves at all times.

1) **Unclip the inlet port from the body housing. Remove it and the impactor plate from the body housing.**
2) **Tilt the body housing so that the glass spacer and the HDPE spacer slide out. Place the glass spacer on a tray that is covered with Kimwipes. Place the HDPE spacer in the tub.**
3) **Slide the first denuder (sodium carbonate-coated) out and immediately cap both ends of the denuder with clean red caps (Figure 4-12).**

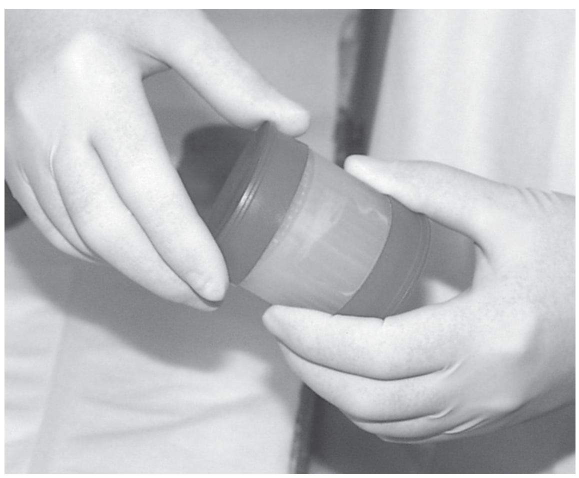


Figure 4-12. Placing clean red caps on both ends of the used denuders.

4) **Transfer the sodium carbonate label from the body housing to the red cap.**
5) **Place the capped denuder on a tray that is covered with Kimwipes.**
6) **Slide the second HDPE spacer out and place it in the tub.**
7) **Slide the second denuder out. Cap both ends with clean red caps.**
8) **Transfer the appropriate label from the body housing to the red cap and then place the denuder on the Kimwipe-covered tray.**
9) **Slide out the third HDPE spacer and the spring.**

10) **Unclip the filter pack outlet port (top rim of the ChemComb) from the body housing. Place the filter pack outlet port, upside down, on the glass spacer (Figure 3-9).**

11) **Remove the first plastic screen.**

12) **With clean filter forceps, remove the Teflon filter and place it on an inverted glass petri dish.**

13) **Using a freshly cleaned razor blade, or clean scissors, make six cuts in the rigid disc at the edge of the Teflon filter. While cutting the filter, you may need to hold the it down with the forceps. Place the cut filter inside the vial and tightly cap the vial.**

14) **Transfer the appropriate label from the body housing to the vial.**

15) **Remove the second plastic screen.**

16) **Wipe the filter forceps and the petri dish clean with damp (not wet) Kimwipes.**

17) **Using clean forceps, remove the sodium carbonate-coated filter and place it on top of the clean petri dish.**

18) **Fold the filter so that it can be placed inside the sample vial. Cap the vial tightly.**

19) **Transfer the appropriate label from the body housing to the vial.**

20) **Remove the third plastic screen.**

21) **Clean the forceps and the petri dish as directed in step 16.**

22) **Using clean forceps, remove the citric acid-coated filter from its plastic screen and place it on top of the clean petri dish.**

23) **Fold the filter, place it inside a clean sample vial and cap the vial tightly.**

24) **Transfer the appropriate label to the vial.**

25) **Clean the forceps and the petri dish as directed in step 16.**

26) **Place the remaining parts of the Honeycomb system in the tub to be cleaned.**

4.3. ChemComb Installation and Removal

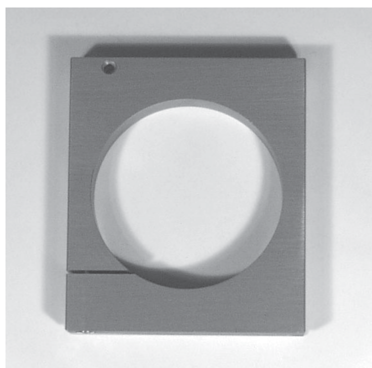
4.3.1. Installing ChemComb Collars

Before you can install a ChemComb cartridge into the Partisol Speciation Sampler, you must insert collars onto the cartridges.

Follow these steps to install collars onto the ChemComb cartridges:

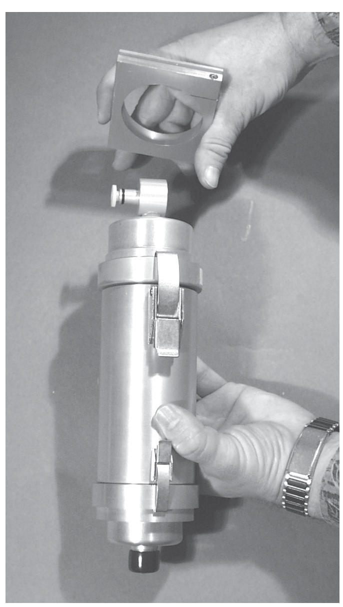
1) Locate a square ChemComb collar (Figure 4-13).

Figure 4-13. Collar for a ChemComb cartridge.



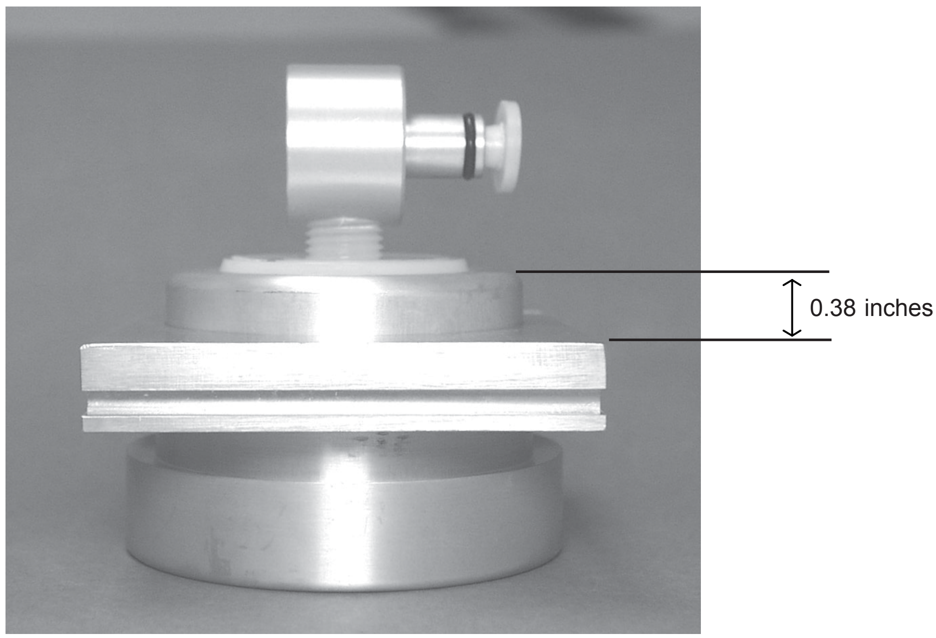
2) Slide a collar onto the filter pack outlet port of a ChemComb cartridge (top rim of the cartridge) (Figures 4-14 and 4-15).

Figures 4-14 (left) and 4-15 (right). Sliding the collar onto the top rim (filter pack outlet port) of a ChemComb cartridge.



3) Make sure that the top edge of the collare is approximately 0.38 inches below the metal edge of the top rim of the filter pack outlet port (Figure 4-16), and that the hose connection is parallel to the grooved track on either side of the collar.

Figure 4-16. Ensure that the collar is properly positioned.



4) Using a 7/64 hex wrench, tighten the screw in the corner of the collar (Figure 4-17).

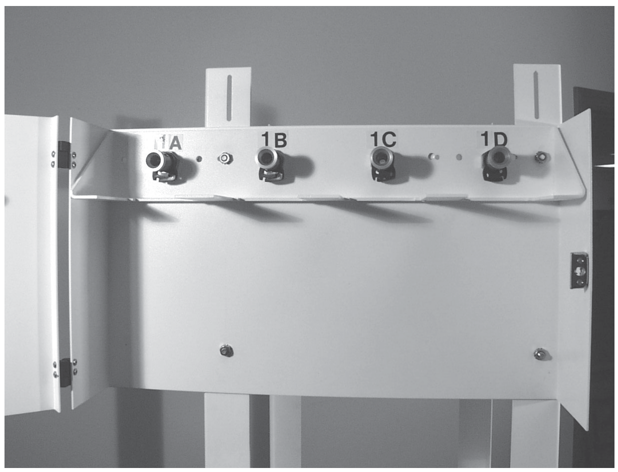
Figure 4-17. Tighten the collar's screw with a 7/64 hex wrench.

4.3.2. Installing ChemComb Cartridges

Follow these steps to install a ChemComb cartridge into the Partisol Speciation Sampler:

1) Open the ChemComb shelter door (Figure 4-18).

Figure 4-18. ChemComb shelter with door open.



2) Line up the groove in the collar on the ChemComb with the edges of the tray inside the shelter box and slide the ChemComb cartridge onto the tray (Figures 4-19 and 4-20).

Figure 4-19. Aligning the groove of the collar on the ChemComb with the edges of the tray inside the shelter box.

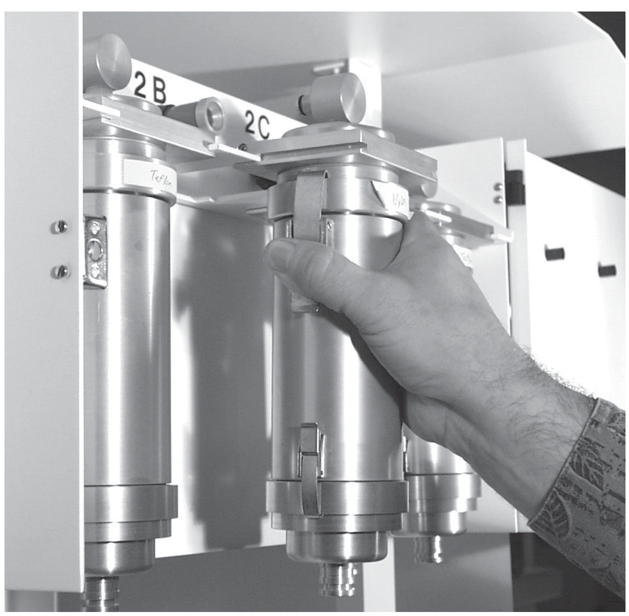


Figure 4-20. Sliding the ChemComb cartridge onto the tray.

3) Ensure that the inlet port on the ChemComb fits securely inside the hose connection (Figures 4-21 and 4-22).

Figure 4-21. The inlet port on the ChemComb should fit securely inside the hose connection.

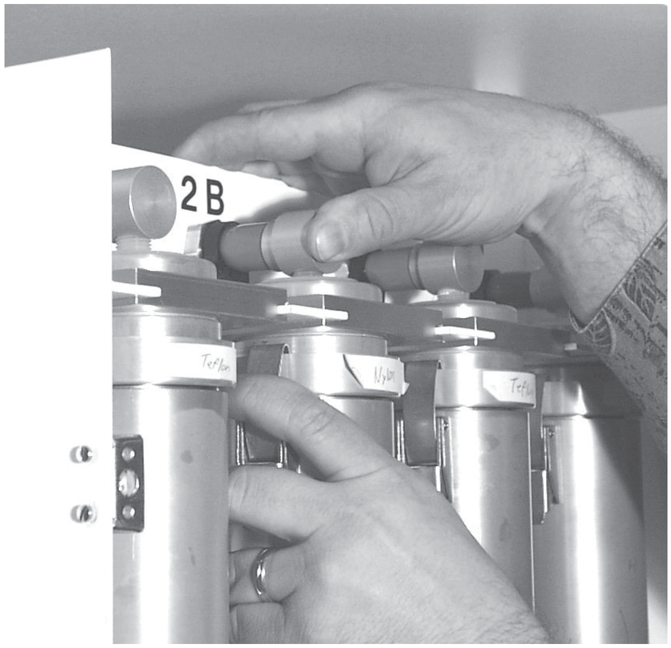


Figure 4-22. Manually securing the hose connection.

NOTE: When you first begin using your ChemComb cartridges, you may need to manually secure the hose connection. After a number of uses, the cartridge outlet port will fit securly into its hose connection when it is slid onto the tray and will not require manual securing.

4) Repeat steps 2-3 to install the desired number of cartridges.

5) Close the shelter door and latch it.

4.3.3. Removing ChemComb Cartridges

Follow these steps to remove a ChemComb cartridge from the Partisol Speciation Sampler:

1) Open the ChemComb shelter door.

2) Slide the ChemComb cartridge out of the tray. The hose connection should disconnect easily.

3) Close the shelter door and latch it.

Section 5: Software Overview

This section describes the steps involved in turning the Partisol Speciation Sampler on and off, navigating through its basic screens and interacting with the unit.

5.1. Turning On the Partisol Speciation Sampler

Follow the procedures outlined in Sections 2, 3 and 4 before attempting to operate the Partisol Speciation Sampler. Once the sampling system has been wired to a main electrical source of the proper voltage in accordance with local standards, power can be applied to the unit.

✔ Ensure that all applicable safety standards are met before applying power to the unit.

Follow these steps to turn on the sampler:

1) Install the ChemComb cartridges in the shelter (Section 4).

2) Press the power switch on the main panel (lower left) to its "on" (1) position to activate the sampler (Figure 5-1).

3) If necessary, turn the adjustment knob, located to the right of the keypad/display, to adjust the contrast of the liquid crystal display (LCD).

Once the power switch is pressed, the electronics and pump compartment heaters will turn on momentarily. This is the default setting of the unit for operating in extremely cold environmental conditions where heat is necessary to warm the equipment.

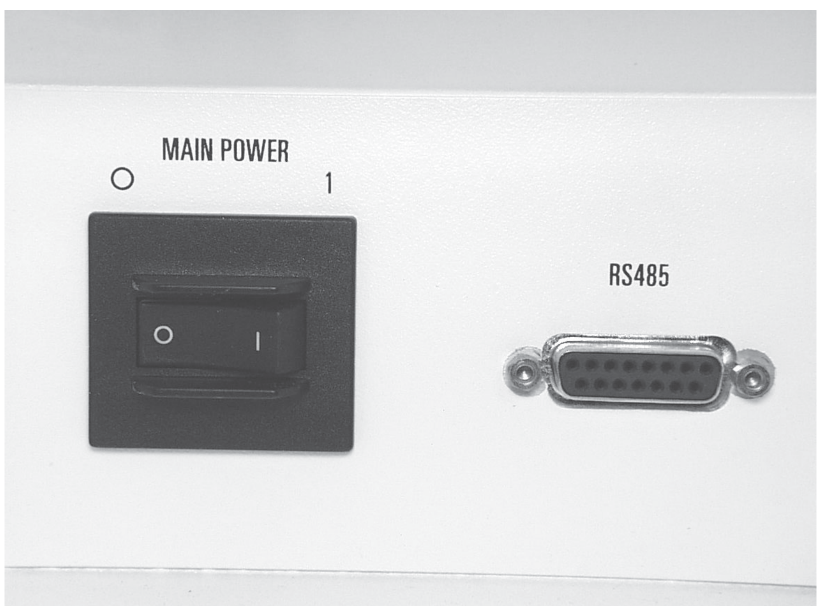


Figure 5-1. Power switch on the sampler.

5.2. Title Screen

The Title screen momentarily appears on the sampler's display to identify the model number of the unit and the revision number of the installed software (Figure 5-2).

Figure 5-2. Title screen.

```
              Partisol 2300
    12 Channel Speciation Air Sampler
   Version:  0.700   Date: Nov  2 1999

             Copyright 1999
     Rupprecht & Patashnick Co., Inc.
```

RDfault	RData			Reset

5.3. Main Screen

After a few seconds, the Title screen is automatically replaced by the Main screen (Figure 5-3). The Main screen contains different information depending on the sampler's operational mode. When the sampler is in the Stop or Wait Operating Modes ("STOP" or "WAIT"), the Main screen will show scheduled operational parameters (Figure 5-3). When the sampler is in the Sampling Operating Mode ("SAMP"), the Main screen will show current operational information (Figure 5-4). Information common to both screens includes summary information regarding the sampling program currently defined by the user, the current operating mode and the existence of any status conditions.

Figure 5-3. Main screen in the STOP operating mode.

```
Stat:OK       Partisol 2300    Mode:STOP
           09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
```

StCode	Stats	System	Sample	Data

When in the “STOP” or “WAIT” mode, the sampler displays the following fields on the Main screen:

Stat	The value of the status code in the upper left-hand corner of the Main screen (to the right of “Stat”) indicates whether the unit is operating properly. A value of “OK” indicates that all functions are proceeding normally.
Mode	The sampler displays the current operating mode in the upper right-hand corner of the Main screen. Press <RUN/STOP> to switch between the Stop and Wait Operating Modes.
Current Time/Date	The local time and date are displayed on the second line of the Main screen. Press <F3: System> from the Main screen to enter the System Setup screen. While in the System Setup screen, input the local time and date before initiating a sampling program. The Partisol Speciation Sampler expresses the current time as “hh:mm:ss” and dates as “yyyy/mm/dd” by default. Users may change these formats in the System Setup screen.
Group	The numbers displayed below “Group” identify the group of cartridges used for sampling. Press <F4: Sample> from the Main screen and then to <F2: Group> to enter the Group Setup screen. With the unit in the Stop Operating Mode, the user can change the group and flow channel options from this screen.
Start	The start times displayed below “Start” indicate the time and date at which the sampler is currently programmed to begin sample collection (hh:mm yy/mm/dd [start time and date] by default) for the group of cartridges listed to the left. Press <F4: Sample> from the Main screen to enter the Sample Setup screen. With the unit in the Stop Operating Mode, the user can change the starting and ending sample times and dates from this screen.

BASIC	This value indicates the sample setup being used. The sample setup options are BASIC, TIME, TIME2, EPISOD (Episodic), ADV (Advanced) and RS232. Press <F4: Sample> from the Main screen to enter the Sample Setup screen. With the unit in the Stop Operating Mode, the user can change the sample setup from this screen (Section 7).
Stop	The stop times displayed below “Stop” indicate the time and date at which the sampler is currently programmed to end sample collection (hh:mm yy/mm/dd [stop time and date] by default) for the group of cartridges listed to the left. Press <F4: Sample> from the Main screen to enter the Sample Setup screen. With the unit in the Stop Operating Mode, the user can change the starting and ending sample times and dates from this screen.

Figure 5-4. Main screen in the Sampling (“SAMP”) Operating Mode.

```
Stat:OK       Partisol 2300    Mode:SAMP
           09:02:36 1999/11/23
Group: 5     BASIC  Stop: 09:41 99/11/23
Channel 3A Flow:  9.9 l/m Vol:    87.8 l
Channel 3B Flow: 10.9 l/m Vol:    88.1 l


 StCode | Stats | System | Sample | Data
```

When in the “SAMP” mode, the sampler displays the following fields on the Main screen:

Stat	The value of the status code in the upper left-hand corner of the Main screen (to the right of “Stat”) indicates whether the unit is operating properly. A value of “OK” indicates that all functions are proceeding normally.
Mode	The sampler displays the current operating mode in the upper right-hand corner of the Main screen. Press <RUN/STOP> to switch between the Stop and Wait Operating Modes.

Current Time/Date	The local time and date are displayed on the second line of the Main screen. Press <F3: System> from the Main screen to enter the System Setup screen. While in the System Setup screen, input the local time and date before initiating a sampling program. The Partisol Speciation Sampler expresses time as “hh:mm” and dates as “yy/mm/dd” by default. Users may change these formats in the System Setup screen.
Group	The number displayed to the right of “Group” identifies the group of cartridges currently used for sampling. Press <F4: Sample> from the Main screen and then to <F2: Group> to enter the Group Setup screen. With the unit in the Stop Operating Mode, the user can change the group and flow channel options from this screen.
BASIC	This value indicates the sample setup being used. The sample setup options are BASIC, TIME, TIME2, EPISOD (Episodic), ADV (Advanced) and RS232. Press <F4: Sample> from the Main screen to enter the Sample Setup screen. With the unit in the Stop Operating Mode, the user can change the sample setup from this screen (Section 7).
Stop	The stop time displayed to the right of “Stop” indicates the time and date at which the sampler is currently programmed to end sample collection (hh:mm yy/mm/dd [stop time and date] by default). Press <F4: Sample> from the Main screen to enter the Sample Setup screen. With the unit in the Stop Operating Mode, the user can change the start and stop sample times and dates from this screen.
Channel	The number and letter displayed to the right of “Channel” identifies the flow channel currently used for sampling. The number of channels displayed varies depending on the number of channels per group. The screen will display only those channels that are part of the current group. Press <F4: Sample> from the Main screen and then <F2: Group> to enter the Group Setup screen. With the unit in the

	Stop Operating Mode, the user can change the group and flow channel options from this screen.
Flow	The value displayed to the right of “Flow” is the current flow rate for this flow channel. Press <F4: Sample> from the Main screen and then <F3: ChanLst> to enter the Cartridge List Setup screen. With the unit in the Stop Operating Mode, the user can change the flow rates for each sampling cartridge from this screen.
Vol	The value displayed to the right of “Vol” is an automatic calculation of the volume of air drawn through this flow channel. The volume calculation depends upon how long the sampler has run.

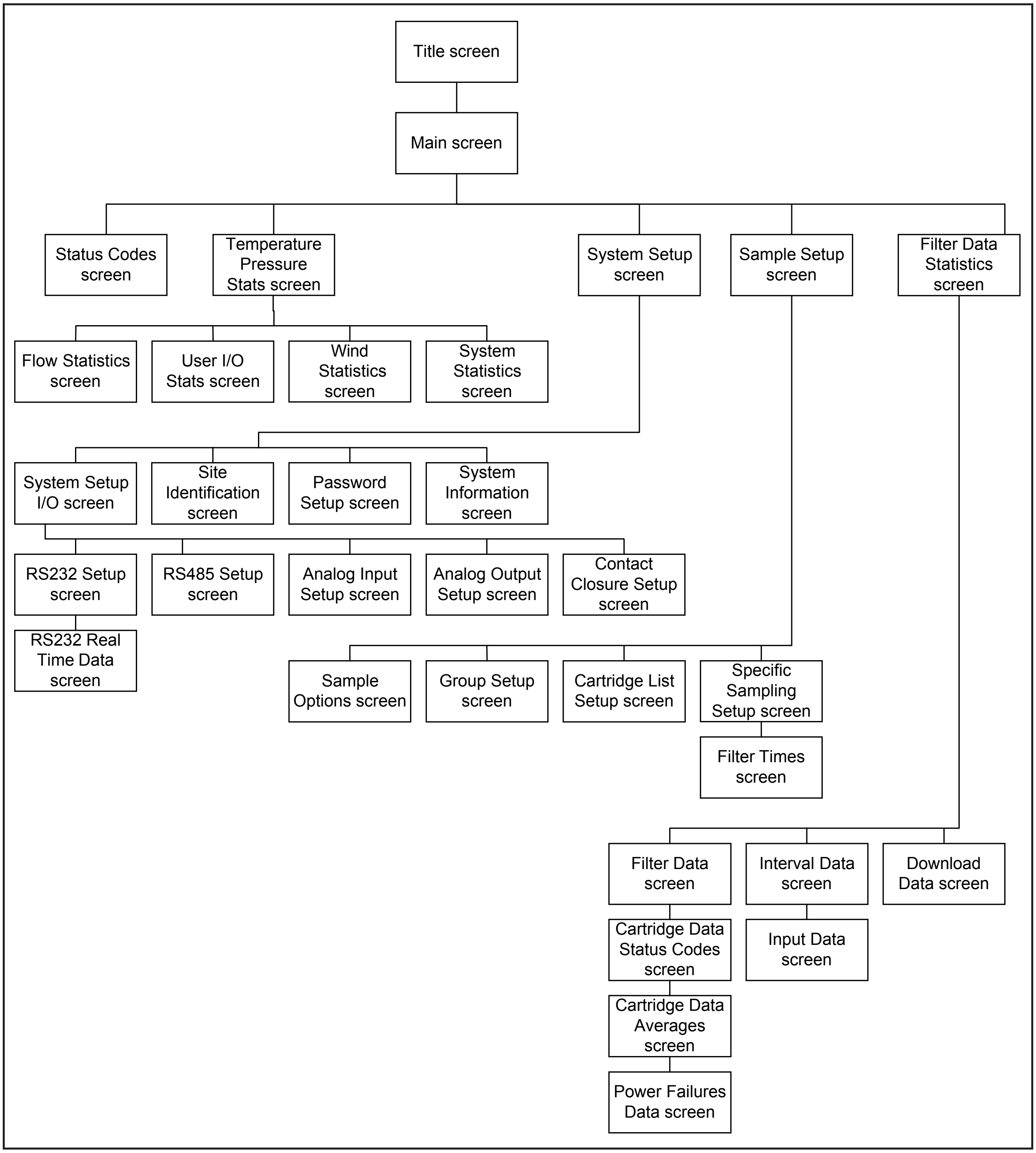
The function keys (soft keys) labeled “F1” to “F5” activate the commands shown on the bottom line of almost every screen in the system. The following parts of this section describe how to navigate among the system’s software screens, and how to switch between the “Browse Mode” and “Edit Mode” to change the system’s parameters.

5.4. Navigating Among Screens

✔ Use the function keys to drop down by one layer in the structure of screens. Pressing <ESC> returns the user to the next highest level.

The system software allows the user to navigate easily through the use of soft function keys (<F1> to <F5>) and the <ESC> key (Figure 5-6). From the Main screen, press <F1: StCode>, <F2: Stats>, <F3: System>, <F4: Sample> or <F5: Data> to drop down one level in the screen structure (Figure 5-5). Pressing the <ESC> key causes the current display to be replaced by the next higher screen in the hierarchy. For example, pressing <ESC> when in the Status Codes screen returns the user to the Main screen. The definitions of the soft function keys changes as different screens appear on the display and different functions are required.

Figure 5-5. Hierarchy of screens.



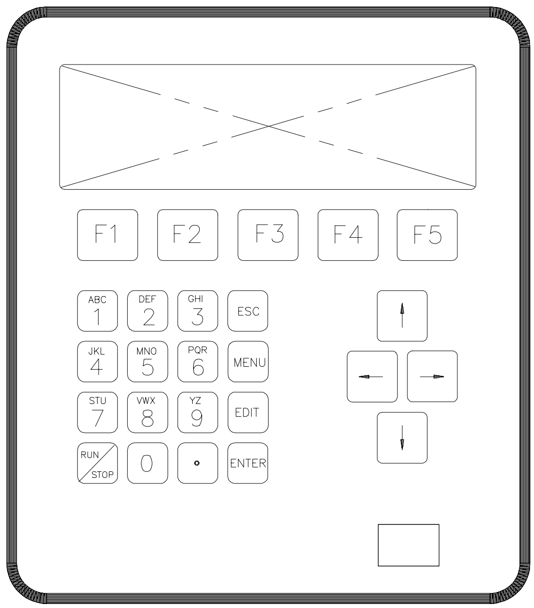


Figure 5-6. The Partisol Speciation Sampler's display/keypad.

Many screens allow the user to change the value of system parameters. The <EDIT> key causes the sampler to leave the Browse Mode and enter the Edit Mode. This interaction with the sampler is described in the following parts of this section. Press <ESC> to exit the Edit Mode while in any screen.

Certain displays such as the Time Sampling Setup screen (Figure 5-7) contain the <F5: *More*> key, which indicates that additional options exist for this screen. Pressing <F5: *More*> causes the additional (extended) menu options to appear on the bottom line of the display shown as a second line of options in Figure 5-7. To distinguish between the selections available from the main and second lines of the menu, the function keys in the first line are designated by <F1> to <F5> in this manual's instructions, while the second line contains the titles <F6> to <F10>. Press <F10: *Back*> when in the second menu line to return to the main menu line.

Figure 5-7. Time Sampling Setup screen.

```
Stat:OK        Group:  01      Mode:STOP
      Current Time: 10:12 99/11/04
      Start Sample: 11:24 99/11/04
       Stop Sample: 11:28 99/11/04
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

5.5. Master Menu

The Master Menu provides another means of gaining access to other screens in the unit's software. It can sometimes provide a more direct route to other program screens than navigating through the hierarchy of screens using regular soft function keys.

Press <MENU> to display the Master Menu screen (Figure 5-8). This screen does not contain any fields that can be changed or edited. Press the arrow keys (<↓> and <↑>) to view the soft function key options available for the categories listed. Press the desired soft function key to make a selection, or <ENTER> in the absence of any soft function key definitions. Refer to Appendix A for the soft function key choices and the screens that you can access from the Master Menu screen.

Figure 5-8. Master Menu screen.

```
              Master Menu
> Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
  Service Mode
```

StCode				

Do *not* select “Service Mode” from the Master Menu unless you need to access this operating mode.

Press <ESC> to return to the Main screen from the Master Menu screen without making a selection.

5.6. Edit Mode

The unit is normally in the Browse Mode, which allows the user to move from screen to screen with ease. In a number of screens, however, the user may want to change the unit’s operating parameters. In such a case, the user must enter the Edit Mode.

Press <EDIT> to enter the Edit Mode from the Browse Mode. If the current screen does not contain any fields that can be changed or edited in the current operating mode, the unit displays a message to inform the user. In such a case, the user must return the sampler to the Stop Operating Mode by pressing <RUN/STOP> before attempting to enter the Edit Mode in the desired screen.

The System Setup screen contains a number of fields that can be changed (Figure 5-9). Press <F3: System> when in the Main screen to enter the System Setup screen. Because the System Setup screen contains fields that can be changed or “edited,” Figure 5-8 displays a second set of soft function key definitions that are active only when the unit is in the Edit Mode.

Figure 5-9. System Setup screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:   99  Standard Temp:   99
 Average Pres:  999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:        :  Auto Run:        NO
Curr Time: 09:16:28
Curr Date: 99/11/04
```

I/O	Site ID	Passwd		SysInfo
Function Keys in Browse Mode				
I/O	Site ID	Passwd		SysInfo
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

✔ The cursor changes shape when the sampler enters the Edit Mode.

After pressing <EDIT> to enter the Edit Mode, the cursor changes shape; it changes from an *underline* when it is in the Browse Mode to a *large square* shape when the monitor is in the Edit Mode.

Press the arrow keys (<↑>, <↓>, <←> and <→>) to select the field to be edited.

In the Edit Mode, many screens, such as the System Setup screen (Figure 5-9), contain soft function keys that will decrease (<-List>) and increase (<+List>) the value of the parameter currently being edited. These keys *repeat* when held down, and also *accelerate* to a faster decrementing or incrementing speed when depressed for a longer period of time.

Users may also enter numeric values directly from the keypad. The <Bksp> (backspace) soft function key erases the previously typed character when in the Edit Mode.

To change the sign of numeric values (to make a positive number, negative, or a negative number, positive), use the "ChSign" key that is available on many screens in the Edit Mode. To use this feature, first enter the required number on the keypad and then press the <ChSign> soft function key.

✔ Use the arrow keys to move from one field to another while remaining in the Edit Mode.

Times are expressed as "hours:minutes:seconds" by default, and can be edited using the <-List> and <+List> keys, or through direct keypad entry. For the purposes of editing, the time variable is split into three separate fields: hours, minutes, and seconds. Use the arrow keys on the keypad (<←> and <→>) to move from one part of the time variable to another.

Dates are expressed as "year/month/day" by default, and are edited as three separate parts using the <-List> and <+List> soft function keys or through direct keypad entry. Use the arrow keys on the keypad (<←> and <→>) to move from one part of the date variable to another.

To edit multiple parameters while remaining in the Edit Mode, press the arrow keys on the keypad after making each change. This moves the cursor to a new field and keeps the Partisol Speciation Sampler in its Edit Mode.

✔ Leave the Edit Mode by pressing <ENTER> to save changes, or <ESC> to disregard changes.

The following two keystrokes cause the software to leave the Edit Mode and return to the Browse Mode:

<ENTER>	Changes made while in the Edit Mode are retained, and the monitor returns to the Browse Mode.
<ESC>	Changes made while in the Edit Mode are *not* retained, and the monitor returns to the Browse Mode.

The cursor reverts to its *underline* shape when the unit returns to the Browse Mode.

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Section 6: Sampler Operation

This section explains how to program a sampling run, retrieve data after a sampling run in the field and verify your sampler's performance characteristics.

6.1. Programming the Sampler

This section describes the procedures for programming the Partisol Speciation Sampler for a sampling run. Refer to Section 5 for more detailed information on navigating through the sampler's software screens.

Follow these steps to program the sampler for a sampling run:

1) **Install the desired number of ChemComb cartridges in the ChemComb shelter (Sections 3 and 4).**
2) **Ensure that your sampler is in the Stop Mode. Do a system check and a leak check, and verify the flow rates for each flow channel on your unit (Section 6.3).**
3) **While in the Main screen (Section 5), press <F1: StCodes> to display the Status Codes screen (Section 8).**
4) **While in the Status Codes screen, ensure that there are no status codes reported and the present status of the unit is "OK." Then press <ESC> to return to the Main screen.**
5) **While in the Main screen, press <F2: Stats> to display the Temperature and Pressure Statistics screen (Section 8).**
6) **While in the Temperature and Pressure Statistics screen, ensure that the current ambient temperature, pressure and relative humidity values are correct. Then press <ESC> to return to the Main screen.**
7) **While in the Main screen, press <F3: Setup> to display the System Setup screen (Section 7).**
8) **While in the System Setup screen, press <EDIT>. Enter the current date and time (Section 7.2.1) and then press <ENTER> to save these changes. Then press <ESC> to return to the Main screen.**
9) **While in the Main screen, press <F4: Sample> to enter the Sample Setup screen (Section 7.2.2). Press <EDIT>, choose your sampling program and enter the start time, sampling duration and sample repeat time for your sampling run(s). Press <ENTER> to save these changes.**

10) While in the Sample Setup screen, press <F1: Options> to enter the Sample Options screen (Section 7.2.3). Press <EDIT> and choose the Flow Error Mode and the Continuous Sampling and System Check options. Press <ENTER> to save these changes and then <ESC> to return to the Sample Setup screen.

11) While in the Sample Setup screen, press <F2: Group> to enter the Group Setup screen (Section 7.2.4). Press <EDIT> and choose the group and channel options for your sampling run. Press <EN-TER> to save these changes and then <ESC> to return to the Sample Setup screen.

12) While in the Sample Setup screen, press <F3: ChanLst> to enter the Cartridge List Setup screen (Section 7.3.8). Check the flow channel, cartridge grouping and flow rates for each cartridge in your sample run in this screen. Then press <EDIT> and enter the cartridge identification numbers (Cartridge ID field). Press <EN-TER> to save these changes and then <ESC> to return to the Sample Setup screen.

13) While in the Sample Setup screen, press <F4: SampSet> to enter the specific sampling setup screen (Section 7) that matches the sampling program you selected in the Sample Setup screen (step 9). Check the values you have set for your sampling run(s). If these values are correct, press <ESC> to return to the Sample Setup screen. If the values are incorrect, check the System Setup screen and the Sample Setup screen to correct these values.

14) Press <RUN/STOP>. The sampler will enter the Wait Mode and then begin the sampling run at the programmed start time.

6.2. Post-Sampling Verification and Data Retrieval

This section explains how to verify the sampling run status and retrieve the sampling run data.

NOTE: Data can be displayed on the screen or downloaded to a personal computer (PC) while in the Stop Mode.

Follow these steps to verify the sampling run status and retrieve the sampling run data:

1) If the sampler has not been previously set up for data transfer to a PC, check the RS232 setup in the RS232 Setup screen (Section

10.2.1). Press <F3: System> from the Main screen to display the System Setup screen (Section 7.2.1). Press <F1: I/O>, then <F1: RS232> to enter the RS232 Setup screen. Make sure that the parameter in the Protocol field is set correctly for the file transfer software installed in the PC (refer to Section 10.2.1 for setting RS232 parameters). Press <ESC> twice to return to the Main screen.

2) Connect the PC to the sampler with the 9-to-9 pin RS232 cable (Section 10). Use any data transfer program such as Pro Comm Plus to transfer data from the sampler to the PC.

3) Check the sampling run status on the Main screen, and note any status code other than “OK.” Press <F5: Data> to enter the Filter Data Statistics screen (Section 9.1.1) and view the filter data from the sampling run. Record data from the Filter Data Statistics screen onto a sampling run log sheet if desired. If there were any status codes other than “OK,” check the Cartridge Data Status Codes screen to verify the validity of the sampling run.

4) While in the Filter Data Statistics screen, press <F1: MoreDat> twice to reach the Cartridge Data Status Codes screen. After checking the validity of the sampling run from this screen, press <ESC> until you return to the Main screen.

5) Press <F3: System> from the Main screen to display the System Setup screen. Press <F1: I/O>, then <F1: RS232> to enter the RS232 Setup screen. Press <EDIT> and set the Protocol field to “Storage.” To save this change, press <ENTER>. Press <ESC> until you return to the Main screen.

6) Press <F5: Data> to display the Filter Data Statistics screen. The record from the last sampling run is displayed in the upper right-hand corner of the Filter Data Statistics screen. Press <F5: DwnLoad> to display the Download Data screen (Section 10.2.3). Scroll to the Last Record field, and use the <F4: Last> key to select the *last data record.* Scroll to the First Record field, and use the <F1: First> to select the *first data record*. Press the <F2: -Ptr> or <F3: +Ptr> key to select the first data record you want to download.

7) Once the PC communications software is ready to receive the records, press <F5: DwnLoad> while in the Download Data screen. The sampler will download all data from the currently displayed record to the last record in the data file. If you need to download output for interval data, status codes or any of the

other screens accessed from the Filter Data screen, display the screen and repeat the download process.

8) If any status code conditions occurred, press <ESC> to return to the Main screen. From the Main screen, press <F1: StCode> to reach the Status Codes screen. Press <F1: Reset> to reset the unit's status condition for the next run to "OK."

6.3. Sampling Verification

R&P recommends that the tests described below be performed before initiating your first sample run. These tests should also be performed *after every four weeks of routine operation.*

Follow these steps to verify sampler performance characteristics prior to starting a sampling run:

1) Ensure that cartridges are installed on the unit. Maintenance tasks and performance verification should be performed while in the Stop Mode. Press <MENU> to enter the Master Menu screen (Section 14).

2) While in the Master Menu screen, press the down arrow (↓) until "Service Mode" is selected. Press <ENTER>. The unit then will display the Service Mode Confirmation screen (Section 14).

3) Press <F3: Yes>. The unit will now display the Service Menu screen (Figure 6-1).

Figure 6-1. Service Menu screen with system maintenance routines options.

```
            Service Menu
> System Maintenance Routines
  Manual Motion Tests
  Calibration
  Low Level System Info
  Download System Log
  Exit Service Mode
```

Audit	SysChck			

4) While in the Service Menu screen, press the down arrow (↓) until ">System Maintenance Routines" is selected (Figure 6-1). Press <F2: SysChck>. The unit then will display the System Check screen (Figure 6-2).

Figure 6-2. System Check screen (Service Mode).

```
Stat:OK       System Check     Mode: SVC
 Pump:OFF| Bank |Flow: A    B    C    D
PumpV:OFF|1:OFF |Set  0.0  0.0  0.0  0.0
VacVt:OFF|2:OFF |Cur 0.10 0.17 0.12 0.10
LkChk:OFF|3:OFF |Pres. Amb: 756 Vac: 000
```

Start				
Function Keys in Browse Mode				
Start				
Function Keys in Edit Mode				
-List	+List	Bksp		

5) While in the System Check screen, press <F1: Start>. The unit will automatically do a system check. When the system check has finished, press <ESC> to return to the Service Menu screen. While in the Service Menu screen, ensure that ">System Maintenance Routines" is selected. Press <F1: Audit>. The unit then will display the Audit screen (Figure 6-3).

Figure 6-3. Audit screen (Service Mode).

```
Stat:OK        Flow Audit      Mode: SVC
Chnl SetPoint  Current  Actual  FTS Pres
 1A     0.0      0.10    0.00     0.000
Amb P: 756 T:  23.7 FTS Const m:  0.0000
Vac P: 000          FTS Const b:  0.0000
```

- Chan	+ Chan		LeakChk	Audit
Function Keys in Browse Mode				
- Chan	+ Chan		LeakChk	Audit
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

6) **While in the Audit screen, verify the sampler's ambient pressure by measuring the current ambient station pressure in mm Hg with an external measurement device. Verify that the value for ambient pressure displayed in the Audit screen is within ±10 mm Hg of the measured barometric pressure. If this is not the case, the sampler requires recalibration. Refer to the Service Manual.**

7) **Perform a leak check. While in the Audit screen, press <F4: LeakChk> to begin the leak check procedure.**

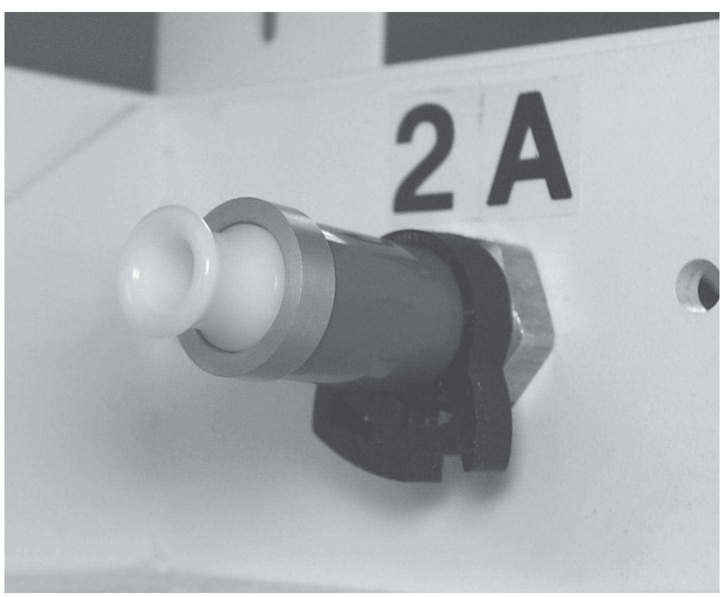
8) **The unit will prompt you to remove the cartridge that is on the flow channel which is being checked, and to install a leak plug on that flow channel (Figure 6-4). The flow channel that is being checked is identified under "Chnl" in the Audit screen. Install a leak plug on the proper channel (Figure 6-5).**

Figure 6-4. Install Leak Plug screen.

```
Stat:OK        Flow Audit      Mode: SVC
    Remove cartridge from Channel 2A
          and seal the inlet.

       Press any key to continue
```

Figure 6-5. Leak plug installed on flow channel 2A.



9) After you have installed a leak plug on the proper flow channel, press any key on the keypad to begin the leak check. The unit will automatically perform a leak check. If a "Pass" message is displayed at the end of the leak check cycle, press <F2: + Chan> to switch the unit to the next flow channel. If a "Fail" message is displayed, refer to the Service Manual.

10) Re-install a cartridge on the flow channel that passed the leak check. Press <F4: LeakChk> to begin the leak check procedure on the next flow channel, and follow the instructions on the unit's screen. Repeat the leak check procedure for all of the flow channels.

11) Verify the sampler's flow. Ensure that the unit is set on the flow channel that you want to verify. Press <F5: Audit> and follow the instructions displayed on the unit's screen. The unit will automatically verify the flow rate.

12) A "Pass" or "Fail" message will display at the end of the flow verification procedure. If a "Fail" message is displayed, refer to the Service Manual. If a "Pass" message is displayed at the end of the flow verification procedure, proceed to step 13.

13) Press <F2: + Chan> to switch the unit to the next flow channel. Press <F5: Audit> and follow the instructions displayed on the unit's screen. Repeat the flow verification procedure for all of the flow channels.

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Section 7: Software Setup and Operation

This section describes the parameter settings in the software screens that affect the sampler's basic operation. It also describes the unit's operational modes. Do not attempt the procedures described in this section until carrying out the steps in Sections 2, 3 and 4. Appendix A contains all of the sampler's screens, and Appendix B provides a listing of the unit's program register codes (PRCs).

7.1. Modes of Operation

The Partisol Speciation Sampler displays its current operating mode in the upper right-hand corner of the Main screen (Figure 7-1), and certain other screens.

Figure 7-1. Main screen with unit in Stop Operating Mode.

```
Stat:OK       Partisol 2300    Mode:STOP
           09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
 StCode | Stats | System | Sample | Data
```

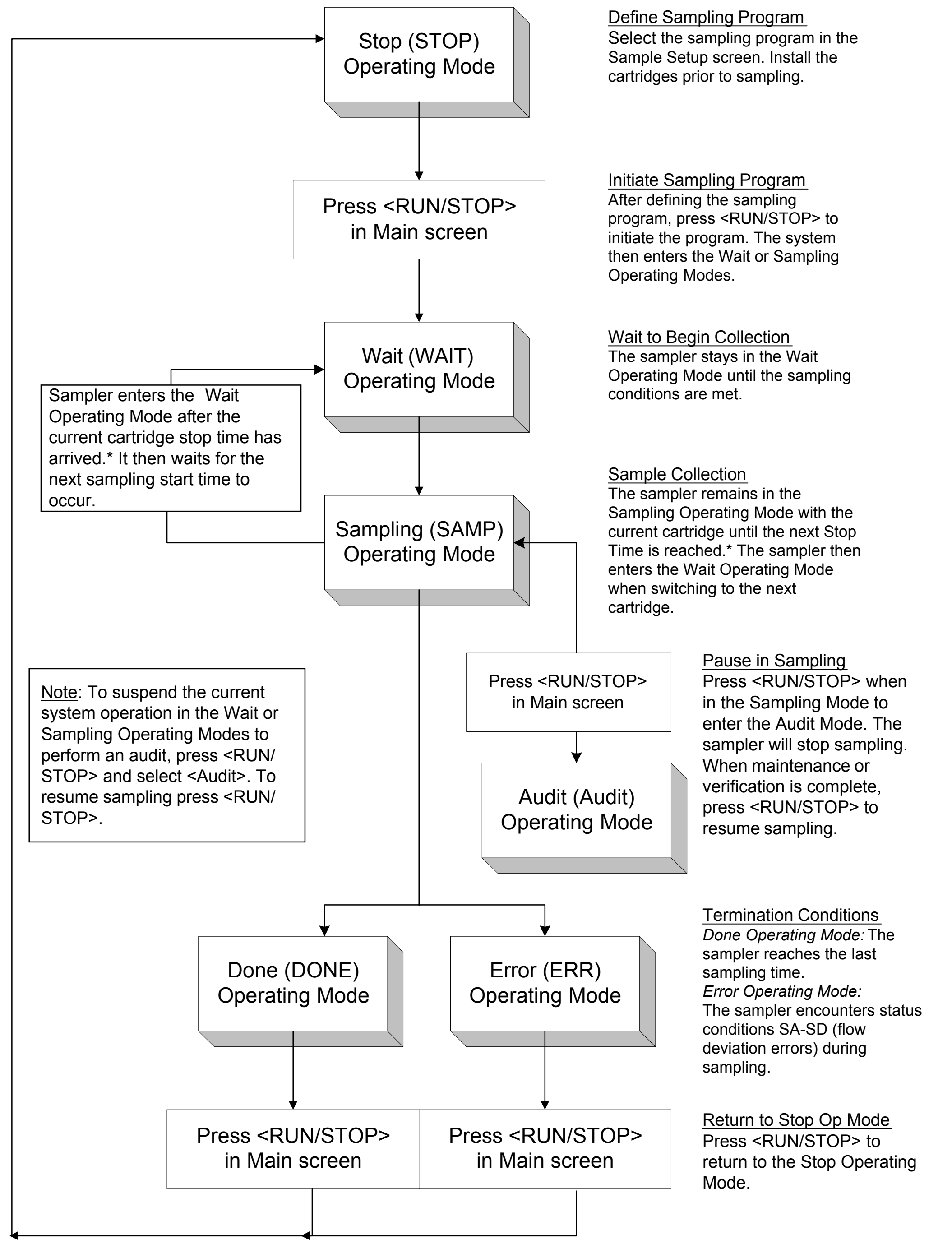
Press <RUN/STOP> to switch between the non-sampling Stop Operating Mode and the sampling program execution modes (Wait, Sampling, Audit and Done). In certain cases, the user must select <STOP> after pressing <RUN/STOP> to re-enter the Stop Operating Mode. The unit's operating modes are defined as follows (Figure 7-2):

Stop Mode — In the Stop Operating Mode (STOP), the user defines the sampling program using the Sampling Setup screen and its sub-screens (Sections 7.3.1-7.3.5). Because this is the only non-operational mode, all user-definable system parameters may be edited with the sampler in this mode.

NOTE: It is *not* necessary to return to the Stop Mode to exchange cartridges. They can be exchanged while the device is sampling.

Pressing <RUN/STOP> with the unit in the Stop Operating Mode causes the sampler to advance to the Wait or Sampling Operating Modes.

Figure 7-2. Overview of operating modes.



*NOTE: If the sampler is in the Advanced, Episodic or RS232 sampling modes, it may stop sampling before the designated sample stop time, enter the WAIT mode and then resume sampling with the same cartridge depending on the user-programmed sampling conditions.

Wait Mode

The Partisol Speciation Sampler resides in the Wait Operating Mode (WAIT) until the user-defined sampling conditions are met for the next sampling run. At that point, the unit automatically enters the Sampling Operating Mode and begins sample collection.

Pressing <RUN/STOP> when in the Wait Operating Mode offers the user the choice of entering the Audit Operating Mode or the Stop Operating Mode.

Sampling Mode

While in the Sampling Operating Mode (SAMP), the sampler is currently in a user-defined sampling interval. Except in the case of Advanced or Episodic sampling with conditions, the unit will draw a continuous air flow through the sample path when the proper sampling conditions are met. The unit controls the sample stream at the volumetric flow rate specified by the user (10 l/min by default). Unless the sample flow rate deviates from its set point by 10% for more than 5 minutes, the sampler remains in this mode until the stop sampling conditions are met.

Pressing <RUN/STOP> when in the Sampling Operating Mode offers the user the choice of entering the Audit Operating Mode or the Stop Operating Mode.

Once the stop sampling conditions are met, the sampler will look for the next set of sampling conditions. If no additional sampling conditions have been set for another cartridge or group of cartridges, then the unit will switch to the Done Operating Mode; otherwise, the hardware returns to the Wait Operating Mode prior to initiating the next sample.

Done Mode

The sampler enters the Done Operating Mode (DONE) when there are no more sampling conditions to be met. In other words, when all sampling times, dates and durations have been completed for all cartridges and groups of cartridges, then the unit will enter the Done Operating Mode. Pressing <RUN/STOP> with the unit in this mode causes the sampler to return to the Stop Operating Mode.

The unit will continue to sample until all sampling conditions are met, except when a critical error condition is encountered (Section 8).

Error Mode — The sampler proceeds to the Error Mode (ERR) when the measured flow deviates from its set point by 10% for 5 minutes, causing the unit to break off sampling and display one of the following status codes: SA, SB, SC or SD (Section 8). These status codes correspond to the flow channel where the measured flow has deviated from its set point.

Pressing <RUN/STOP> with the unit in the Error Operating Mode causes the sampler to return to the Stop Operating Mode.

Audit Mode — The Audit Operating Mode takes the unit off line and allows the user to exchange or clean components in the sampling train. Leak checks and flow verifications (Section 12) can also be done with the sampler in the Audit Mode.

When in the Wait or Sampling Modes, press <RUN/STOP> and select <F1: Audit> to enter the Audit Operating Mode. At this point, the sampler will suspend all regular operations until you complete your audit. After the audit is complete, press <RUN/STOP> to resume regular operations.

To prepare for an audit, press <RUN/STOP> and then select <F1: Audit>. The unit will then display its Main screen. While in the Main screen, press the <MENU> key. This will bring you to the Master Menu screen. From the Master Menu screen, press <F3:Audit>. Once you have completed your leak check or cleaning procedures, press <RUN/STOP> to resume sampling. Press <ESC> to display the Main screen. Section 12 describes the maintenance and verification procedures in detail.

NOTE: Fundamentally, cartridges may be exchanged when the sampler is in any operating mode because the exchange procedure does not affect the sampling train. But if the unit is about to switch to a new cartridge or group of cartridges to begin sampling, or if it is performing advanced or episodic sampling, it is advisable to enter the Audit Operating Mode when exchanging cartridges.

7.2. System Setup

The unit's system setup screens set the global default sampling parameters for the numerous programming options available. The System Setup screen defines whether the sampler uses the default ambient temperature and pressure settings, or standard temperature and pressure settings for maintaining and reporting flow rates in volumetric or standard terms. The System Setup screen also can be used to set the sampler to the current local time and date.

7.2.1. System Setup Screen

The System Setup screen allows the user to define global parameters for the operation of the Partisol Speciation Sampler, such as the current time and date, and default time and date formats, and to set up the sampler for remote RS232 operation. Most of the parameters in this screen can be edited only in the sampler's Stop Operating Mode (Section 7.1).

Press <F3: System> when in the Main screen (Figure 7-1) to enter the System Setup screen (Figure 7-3). All of the fields in the System Setup screen can be edited when the sampler is in the Stop Operating Mode.

The following fields make up the System Setup screen:

Average Temp	The Average Temperature (°C) is used by the sampler to maintain the proper volumetric sample flow rate. The default value of Average Temperature is "99," indicating that the unit should use the reading from the external temperature sensor to maintain a constant volumetric flow rate.
Standard Temp	The Standard Temperature (°C) is used by the sampler to report flow rate results in standard terms. The default setting for Standard Temperature is "99," which may need to be changed to match conventions in different parts of the world. The default setting for Standard Temperature does not have any effect on the volumetric flow rate and actual volume calculations by the unit.
Average Pres	The Average Pressure (mm Hg) is used by the sampler to maintain the proper volumetric sample flow rate. The default value of Average Pressure is "999," indicating that the unit should use the reading from the sampler's ambient pressure sensor to maintain a constant volumetric flow rate.
Standard Pres	The Standard Pressure (mm Hg) is used by the sampler to report the flow rate results in standard terms. The default setting of Standard Pressure is "999." The default setting for

Figure 7-3. System Setup screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:   99  Standard Temp:   99
 Average Pres:  999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:        :  Auto Run:        NO
Curr Time: 09:16:28
Curr Date: 99/11/04
```

I/O	Site ID	Passwd		SysInfo
Function Keys in Browse Mode				
I/O	Site ID	Passwd		SysInfo
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Standard Pressure does not have any effect on the volumetric flow rate and actual volume calculations by the unit.

Date Form

The Date Form determines the form in which the sampler displays dates. The default value is "yy/mm/dd." The Partisol Speciation Sampler makes the following choices available:

yy/mm/dd (default)
mm/dd/yy
dd/mm/yy

Average Time

The Average Time parameter defines the sample averaging and storage interval (min) for the input data records (Section 9). The default value of this parameter is 30 minutes, meaning that input data values are averaged over 30-minute periods and stored every 30 minutes.

Time Form

The Time Form determines the form in which the sampler displays time. The default is "hh:mm:ss." The unit also allows time to be displayed as "hh.mm.ss."

Auto Run

If no keys are pressed for 3 hours and the Auto Run feature is "ON," the unit will automatically enter the Wait or Sampling Mode.

Curr Time

The Curr Time parameter is the current local time (or other standard time selected by the user) expressed by default as "hh:mm:ss." When editing this parameter, treat each part of the time as a separate field.

Curr Date	The Curr Date parameter is the current local date expressed by default as “yy/mm/dd.” When editing this parameter, treat each part of the date as a separate field.

The System Setup screen also provides access to the sampler’s input and output capabilities, site identification information, password protection settings (Section 11), and system information.

7.2.2. Sample Setup Screen

The Sample Setup screen allows the user to define global sampling parameters for the operation of the Partisol Speciation Sampler, such as the sample definition type (default programming method), the default sample start time and duration, and the default repeat time and filter type.

Press <F4: Sample> when in the Main screen (Figure 7-1) to enter the Sample Setup screen (Figure 7-4). All of the fields in the Sample Setup screen can be edited when the sampler is in the Stop Operating Mode.

The following fields make up the Sample Setup screen:

Sample Definition Type	This parameter allows the user to select the type of sampling program: BASIC, TIME, TIME2, ADV (Advanced), EPISOD (Episodic) and RS232. Basic 24-hour continuous sampling (BASIC) is the unit’s default setting. Press <+List> or <-List> in the Edit Mode to access the sampling program selections. Sampling programs are described in Sections 7.3.1-7.3.6.
Default Sample Start Time	The Default Sample Start Time is used to set the default starting time for the selected sampling program in “hh:mm.” “00:00” is the system default for this parameter. When editing this parameter, treat each part of the time as a separate field.
Default Sample Duration	This parameter allows the user to select the sampling duration for the selected sampling program in “hhh:mm.” The default for this parameter is “024:00.” When editing this parameter, treat each part of the time as a separate field.

Figure 7-4. Sample Setup screen.

```
Stat:OK       Sample Setup     Mode:STOP
           09:38:11 1999/11/04
Sample Definition Type:            BASIC
Default Sample Start Time:         11:24
Default Sample Duration:          000:04
Default Sample Repeat Time:       000:04
Default Filter Type:                   P
```

Options	Group	ChanLst	SampSet	
Function Keys in Browse Mode				
Options	Group	ChanLst	SampSet	
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Default Sample Repeat Time

The Default Sample Repeat Time parameter will allow you to pause the unit while it is running in the continuous operation mode, offsetting the sample start time. For example, if you wanted the unit to sample for 24 hours every three days, you would set this field to 72 hours. The unit will then sample 24 hours, wait 48 hours and then sample again for 24 hours. If you don't want to offset the sample start time, you would set this parameter equal to the Default Sample Duration. For example, if you wanted the unit to sample for 24 hours, switch to the next cartridge or group of cartridges and then sample for another 24 hours, you would set the Default Sample Repeat Time and the Default Sample Duration to 024:00.

Default Filter Type

This parameter allows the user to identify the default filter type. The default for this parameter is "P" (EPA filter). The user can select another alphabetic character by pressing <+List> or <-List> while in the Edit Mode to identify another filter type as the default filter.

NOTE: When in the Edit Mode, use the arrow keys (<↑>, <↓>, <←> and <→>) to select the field that you want to edit. After you have finished editing the fields, press <ENTER> to save your changes.

7.2.3. Sample Options Screen

The Sample Options screen (Figure 7-5) allows the user to choose the flow error mode, and continuous sampling and system check options. If no choices are identified in this screen, the unit will default to a flow error mode of “ERR,” and the continuous sampling and system check will default to “OFF.”

While in the Main screen (Figure 7-1), press <F4: Sample> to enter the Sample Setup screen (Figure 7-4). In the Sample Setup screen, press <F1: Options> to display the Sample Options screen.

The Sample Options screen displays the following information:

Flow Error Mode — There are three options to choose from when setting the flow error mode: “ERR,” “WAIT” and “NEXT.” If a flow error occurs when the flow error mode is set to “ERR,” the unit will stop sampling and enter the Error Mode. The user must then press <RUN/STOP> twice (once to enter the Stop Operating Mode and then once more to initiate sampling) before the unit may continue sampling. If a flow error occurs

Figure 7-5. Sample Options screen.

```
Stat:OK        Sample Options   Mode:STOP

        Flow Error Mode:    NEXT
        Continuous Sampling: OFF
        System Check:         ON
```

Function Keys in Browse Mode				
Function Keys in Edit Mode				
-List	+List			

when the flow error mode is set to “WAIT,” the unit will stop sampling on the present group of cartridges and enter the Wait Operating Mode. The unit will then continue sampling on the next group of cartridges at the designated time, using the parameters set for that group. If a flow error occurs when the flow error mode is set to “NEXT,” the unit will stop sampling on the present group of cartridges and enter the Wait Operating Mode. The unit will then continue sampling on the next group of cartridges at the designated time. However, the unit will use the sampling parameters for the previous group of cartridges that had its sampling run interrupted. You can only set the flow error mode to “NEXT” when the unit is programmed to use the “BASIC,” “TIME” or “TIME2” sampling programs (Section 7.3).

NOTE: If you set the flow error mode to “NEXT” and a flow error occurs, then your last scheduled sampling run will not occur. For example, if you have three groups of cartridges (Groups 1-3) scheduled to sample with the flow error mode set to “NEXT” and a flow error occurs, then the Group 3 cartridges will not sample during the times that you have set.

Continuous Sampling

When this feature is turned “on,” the unit will sample until the user presses <RUN/STOP>. When the last user-defined group of cartridges finishes sampling, if there are more cartridges installed on the unit, the unit will add the repeat time to the last group of cartridges’ start time and continue sampling. For example, if the Group 1 cartridges were scheduled to sample from noon to midnight and the continuous sampling feature is turned “on,” then the unit will add the repeat time to the Group 1 start time and continue sampling on the next group (Group 2) with the same parameters set for Group 1.

IMPORTANT: If you turn on the Continuous Sampling feature, you must remove the cartridges after their sampling runs are complete and replace them with new cartridges. If you do not remove the cartridges after sampling and replace them with new cartridges, the sampler will finish its sampling run (sample on all cartridges installed on the unit) and then begin a new sampling run on the same cartridges.

System Check

When this feature is turned “on,” the unit will run a system check of the pumps, valves, flows and other system equipment for the first 5 minutes of the sampling flow on each group of cartridges. During the sampling check, the unit will not consistently pull an air stream through the first cartridge of each group. Therefore, the total volume recorded for the first cartridge will be less than the total volume recorded for each remaining cartridge.

7.2.4. Group Setup Screen

The Group Setup screen (Figure 7-6) allows the user to set up the flow channels by group for each cartridge installed on the Partisol Speciation Sampler. Groups are identified by numbers while flow channels are identified by letters.

Figure 7-6. Group Setup screen.

```
Stat:OK       Group Setup      Mode:STOP
        Channels/Group: 2
         Current Group: 1
              Channels: 12
     /---\
Chan:1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 3C 3D
Grp:  1  1  2  2  3  3  4  4  5  5  6  6
```

- Grp	+ Grp			
Function Keys in Browse Mode				
- Grp	+ Grp			
Function Keys in Edit Mode				
-List	+List	Bksp		

While in the Main screen (Figure 7-1), press <F4: Sample> to enter the Sample Setup screen (Figure 7-4). In the Sample Setup screen, press <F2: Group> to display the Group Setup screen.

The Group Setup screen displays the following information:

Channels/Groups — This parameter defines the number of flow channels per group used for sampling. Depending on the flow configuration of your Partisol Speciation Sampler, you can set this parameter to three groups of 4 flow channels, three groups of 3 flow channels, six groups of 2 flow channels or twelve groups of 1 flow channel. Figure 7-6 shows this screen set up for six groups of 2 flow channels. See Figures 7-7 through 7-10 for detailed cartridge, flow channel and group setup information.

Current Group	This parameter displays the current group selected. You can change the current group by pressing the soft keys <F1: -Grp> and <F2: + Grp>.
Channels	This parameter defines the number of flow channels used for sampling. You may set this field to any multiple of “Channels/Groups” that is less than the unit maximum of “4” or “12,” depending on your system configuration. If you have a sampler that has 12 flow channels and want to sample with more than 4 flow channels, make sure that this field is set to “12.” See Figures 7-7 through 7-10 for detailed cartridge, flow channel and group setup information.
Chan	This list displays the actual cartridge groups and identifies which group is presently selected. These identifiers will change when you edit the “Channels/Groups” and “Channels” fields.
Grp	This list displays the actual group configuration that matches each cartridge installed on the sampler. These identifiers will change when you edit the “Channels/Groups” and “Channels” fields.

When the unit is sampling, this screen will show the parameters for the current group of cartridges that are sampling. Also, during sampling, you can not edit this screen.

Figures 7-7 and 7-9 describe how the group numbers and flow channels combine when using different numbers of groups with a 12-channel and 4-channel unit. Figures 7-8 and 7-10 display these configurations in a visual form. For example, in the first column of Figure 7-7 (labeled “AA” at the bottom of the column), the chart shows the flow channel and group configuration when you set a 12-channel unit to 3 groups of 4 flow channels. In column “AA,” Group 1 consists of flow channels 1A-1D. Figure 7-8 displays the flow channels and grouping configuration of columns AA-DD described in Figure 7-7.

Figure 7-7. Channels per group chart for a 12-channel unit.

	CHANNELS PER GROUP 4	3	2	1	Corresponding flow channels
Group numbers	1	1	1	1	1A
	1	1	1	2	1B
	1	1	2	3	1C
	1	0	2	4	1D
	2	2	3	5	2A
	2	2	3	6	2B
	2	2	4	7	2C
	2	0	4	8	2D
	3	3	5	9	3A
	3	3	5	10	3B
	3	3	6	11	3C
	3	0	6	12	3D
	AA	BB	CC	DD	

Figure 7-8. Top view of cartridges for a 12-channel unit, with flow channels and groups highlighted.

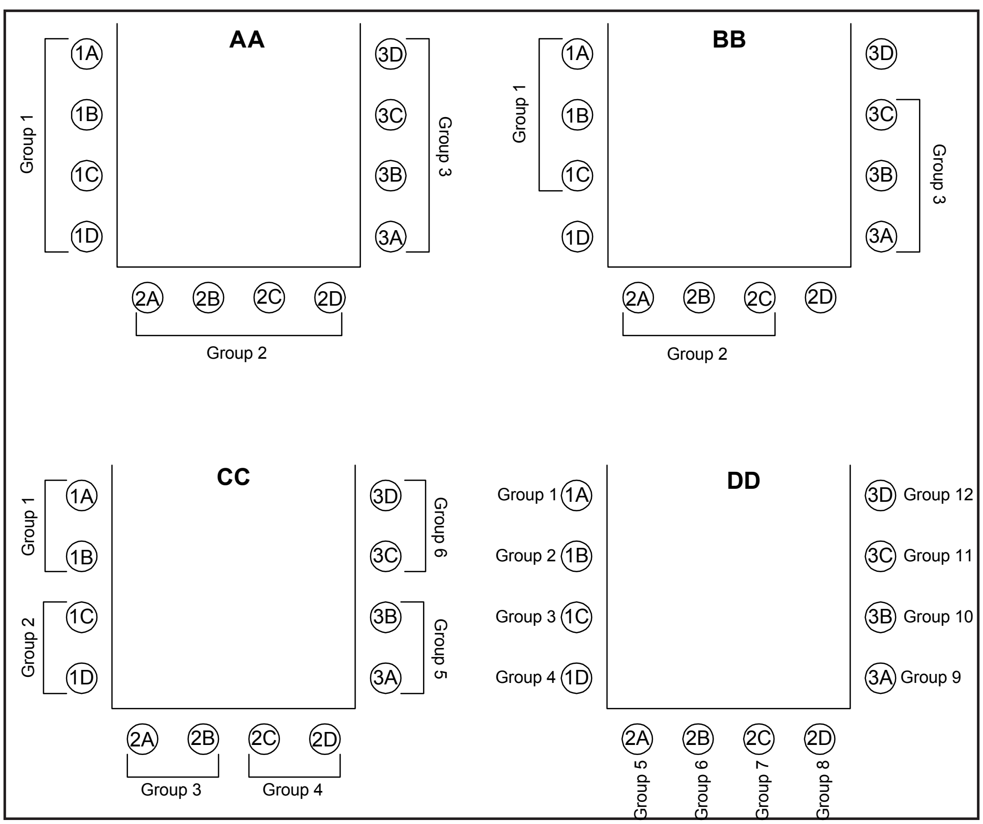
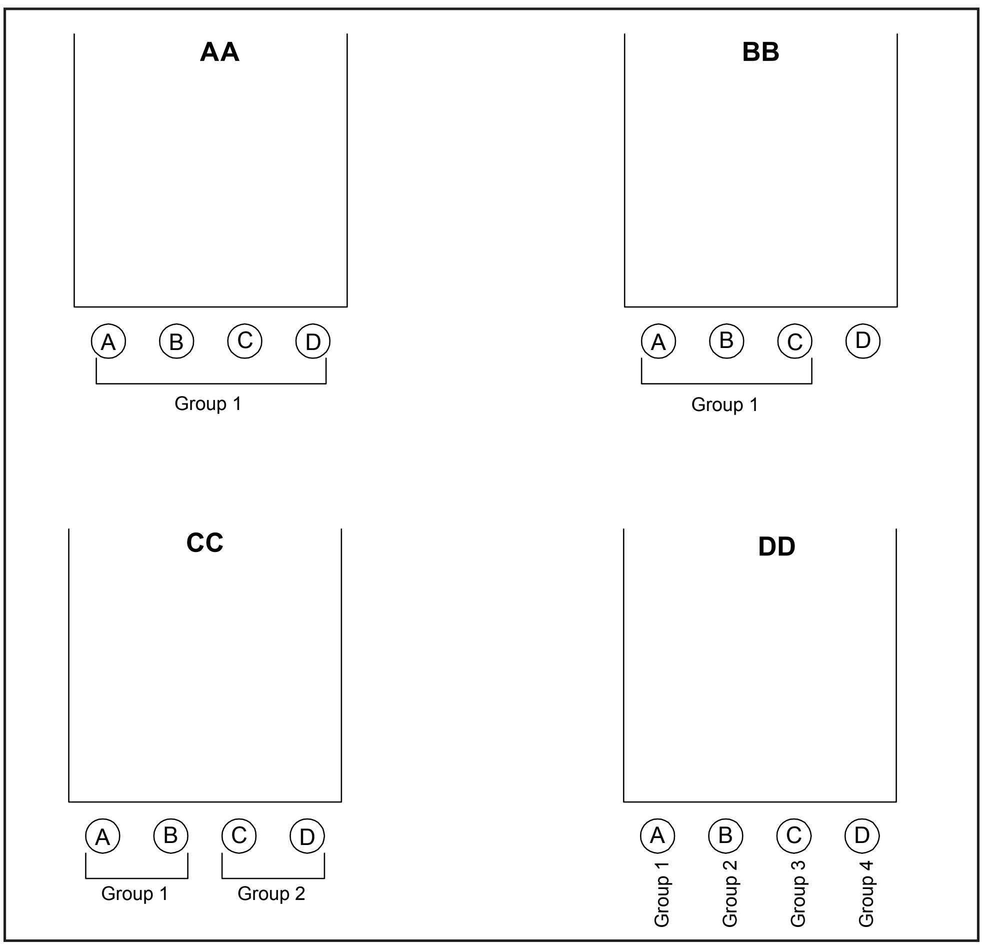


Figure 7-9. Channels per group chart for a 4-channel unit.

	CHANNELS PER GROUP				Corresponding flow channels
	4	3	2	1	
Group numbers	1	1	1	1	A
	1	1	1	2	B
	1	1	2	3	C
	1	0	2	4	D
	AA	BB	CC	DD	

Figure 7-10. Top view of cartridges for a 4-channel unit, with flow channels and groups highlighted.



7.2.6. Site Identification Screen

The Site Identification screen (Figure 7-11) has two 32-character fields. The user can enter site identification numbers or letters using one or both fields. If no entry is made in these fields then the site identification field will appear in the sampler's data output from this screen as a blank field with quotation marks surrounding it (“ ”).

While in the Main screen (Figure 7-1), press <F3: System> which takes you to the System Setup screen (Figure 7-3). In the System Setup screen, press <F2: Site ID> to display the Site Identification screen.

Figure 7-11. Site Identification screen.

```
Stat:OK          Site Identification

Id1: "                                  "
Id2: "                                  "
```

Function Keys in Browse Mode				
Function Keys in Edit Mode				
		Bksp	A <--	A -->

7.2.7. System Information Screen

The only field that can be edited in the System Information screen (Figure 7-12) is the sampler serial number field.

While in the Main screen (Figure 7-1), press <F3: System> to enter the System Setup screen (Figure 7-3). In the System Setup screen, press <F4: SysInfo> to display the System Information screen.

The System Information screen displays the following configuration information:

Software Version — The revision number and date (mmm-dd-yyyy) of the operating software loaded in the sampler.

Unit Serial Number — The serial number of the Partisol Speciation Sampler. The user may edit this field.

Figure 7-12. System Information screen.

```
             System Information
   Software Version: 0.700, Nov  2 1999
 Unit Serial Number:      0
Interface Board Rev: 1
        System Type: 3
MFC A Max: 20 l/min  MFC B Max: 20 l/min
MFC C Max: 20 l/min  MFC D Max: 20 l/min
```

Interface Board Rev — This field contains the revision level of the interface board installed in the Partisol Speciation Sampler. The system's software automatically detects the value of this parameter.

System Type — This field contains the value of the system ID jumpers on the interface board installed in the Partisol Speciation Sampler. The system's software automatically detects the value of this parameter.

MFC (A-D) Max — These fields contain the maximum flow rates of the flow controllers installed in each flow channel (A-D). The value of this parameter is 20 for a 0-20 l/min flow controller.

7.3. Sampling Programs

The Sample Definition Method selected in the Sample Setup screen (Figure 7-4) provides a straightforward means of defining the sampling program. Available programs are Basic, Time, Time2, Advanced, Episodic and RS232. All of these sampling programs except the RS232 sampling program displays a sampling setup screen accessed from the Sample Setup screen, which includes the default parameters set in the Sample Setup screen.

The RS232 sampling program does not have a sampling setup screen. If "RS232" is selected as the sampling method, a Warning/Confirmation screen (Figure 7-13) will display when <F4: SampSet> is pressed from the Sample Setup screen, indicating that no time or conditional setup parameters are required for RS232 sampling. Section 10.2 describes setting up the sampler for remote RS232 operation.

Figure 7-13. Warning/ Confirmation screen.

```
Stat:OK       Sample Setup     Mode:STOP

      No Time or Conditional setup
     is required for RS232 sampling.

      Press any key to continue

Options | Group | ChanLst | SampSet |
```

Press <F4: Sample> when in the Main screen (Figure 7-1) to enter the Sample Setup screen. Only one of the specific sampling setup screens described in Sections 7.3.1-7.3.5 will display depending on the Sample Definition Method selected by the user in the Sample Setup screen (Section 7.2.2). For example, if "BASIC" was selected in the Sample Definition field, then the Basic Samping Setup screen (Figure 7-14) will display when you press <F4: SampSet> from the Sample Setup screen.

The Filter Times screen (Section 7.3.7) is accessible from all of the specific sampling setup screens.

7.3.1. Basic Sampling Setup Screen

The Basic Sampling Setup screen (Figure 7-14) will display if "BASIC" is selected as the Sample Definition Method in the Sample Setup screen (Figure 7-4). The Basic sampling program is the most commonly used sampling program. In this program, the unit samples continuously for the same duration with each cartridge until there are no more cartridges available.

The Basic Sampling Setup screen uses the following fields to define the Basic sampling program of the Partisol Speciation Sampler:

Start Date	The Start Date parameter determines the date (yy/mm/dd by default) on which sampling through the first cartridge sample will begin. When editing this parameter, treat each part of the date as a separate field.
The current time is	The current time and date (hh:mm yy/mm/dd by default) are displayed in this field.

Figure 7-14. Basic Sampling Setup screen.

Stat:OK Basic Setup Mode:STOP Start Date: 99/11/04 The current time is: 09:50 99/11/04 Sample will start at: 11:24 99/11/04 Each sample will collect for 000:04 hrs				
Times	+ Day	NextDay	Next Hr	
Function Keys in Browse Mode				
Times	+ Day	NextDay	Next Hr	
Function Keys in Edit Mode				
-List	+List	Bksp		

Sample will start at — This parameter defines the time of day that the Partisol Speciation Sampler will begin sampling on the cartridges or group of cartridges. This start time by default is the time selected in the Sample Setup screen.

Each sample will collect for — This parameter displays the sampling duration in hours. The sampler will use the default duration from the Sample Setup screen.

Sampling is always continuous in the Basic sampling program unless a Repeat Time offset was selected in the Sample Setup screen. The Partisol Speciation Sampler will automatically begin and end sampling according to the start time and sample collection time displayed in the Basic Sampling Setup screen. During sampling, the screen will show the conditions for the cartridge or group of cartridges that are in sampling position.

In this screen, the <F5: Next Hr> soft key allows the user to quickly start a 24-hour sample at the top of the next hour.

7.3.2. Time Sampling Setup Screen

The Time Sampling Setup screen (Figure 7-15) will display if the Sample Definition Method in the Sample Setup screen was entered as “TIME.” The Time sampling program allows the user to set a time interval for sequential sampling. For example, if the user selected 00:00 for Start Sample and 12:00 as End Sample times as shown in Figure 7-11 for Group #01, the sampler would start sampling at midnight and stop at noon. You must program the Start Sample and End Sample times for each sampling group or the unit will sample according to the default settings that are entered in the Sample Setup screen (Figure 7-4).

The Time Sampling Setup screen contains the following fields to define the Time sampling program of the Partisol Speciation Sampler:

Group — The Group field identifies the group of cartridges that are in sampling position. Pressing <F3:Next> will allow the user to program each group of cartridges with a unique start time and end time.

Current Time — The current time and date are displayed in this field.

Start Sample — The Start Sample parameter defines the time and date that the Partisol Speciation Sampler will begin sampling for the group number displayed in the Group field at the top of the screen. When editing, treat each part of the time and date as a separate field.

Figure 7-15. Time Sampling Setup screen.

```
Stat:OK        Group:  01      Mode:STOP
      Current Time: 10:12 99/11/04
      Start Sample: 11:24 99/11/04
       Stop Sample: 11:28 99/11/04
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

Stop Sample	The Stop Sample parameter defines the time and date that the unit will stop sampling for the group number displayed in the Group field at the top of the screen. When editing, treat each part of the time and date as a separate field.

In the Browse Mode, the soft function keys <F2: Prev> and <F3: Next> are used to move to the previous or next group number. The <F1: Times> key displays the Filter Times screen (Section 7.3.7). Pressing <F5: *More*> will access the <F6> to <F10> function keys. The <F4: Reset> key will reset current settings for all groups to their default settings as defined in the Sample Setup screen. The <F8: +Hour> and <F9: +Day> keys are used to increment the Start Sample or Stop Sample times by one hour or one day, respectively. Pressing <F10: *Back*> will restore the original <F1> to <F5> functions. In the Edit Mode, the soft function keys are <F1: +List>, <F2: -List> and <F3: Bksp>.

> NOTE: If the Partisol Speciation Sampler has been programmed for fewer sampling cycles than available cartridges, the unit will continue to sample using the entered program(s) *and then revert to the default sampling program.* Sampling will continue with any additional cartridges using the default program settings as entered in the Sample Setup screen.

7.3.3. Time 2 Sampling Setup Screen

The Time 2 Sampling Setup screen (Figure 7-16) will display if “TIME2” was selected as the Sample Definition Method in the Sample Setup screen (Figure 7-4). Selecting this program allows the user to sample for two different scheduled intervals on the same sampling group of cartridges. This feature will turn the sampling flow on at the beginning of the sample run, stop sampling for the programmed period of time, and resume sampling on the same group of cartridges for another programmed interval.

The Time 2 Sampling Setup screen contains the following fields to define the sampling program of the Partisol Speciation Sampler:

Group	The Group field identifies the group of cartridges that are in sampling position. Pressing <F3: Next> will allow the user to program each group of cartridges with a unique Time 2 sampling program.
Current Time	The current time and date are displayed in this field.

Figure 7-16. Time 2 Sampling Setup screen.

```
Stat:OK        Group:  01      Mode:STOP
      Current Time: 10:15 99/11/04
        Start Time         Stop Time
  1:  11:24 99/11/04    11:28 99/11/04
  2:  11:28 99/11/04    11:32 99/11/04
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

Start Sample — The Start Sample parameter defines the time and date that the Partisol Speciation Sampler will begin sampling for the group number displayed in the Group field at the top of the screen. When editing, treat each part of the time and date as a separate field.

Stop Sample — The Stop Sample parameter defines the time and date that the unit will stop sampling for the group number displayed in the Group field. The sampler will not switch to the next group of cartridges at the Stop Sample time in row #1, but it will stop sampling until the Start Time in row #2 occurs. When editing, treat each part of the time and date as a separate field.

In the Time 2 sampling program, the Start Time and Stop Time in row #1 must always be less than the Start Time and Stop Time in row #2. The Time 2 Sampling screen has the same <F1> to <F10> function keys as the Time Sampling Setup screen.

7.3.4. Advanced Sampling Setup Screen

The Advanced Sampling Setup screen (Figure 7-17) will display if "ADV" was selected as the Sample Definition Method in the Sample Setup screen (Figure 7-4). The Advanced sampling program provides access to additional sample programming parameters beyond the standard time-based sampling capabilities of the Partisol Speciation Sampler.

Figure 7-17. Advanced Sampling Setup screen.

```
Stat:OK        Group:  01      Mode:STOP
      Current Time: 10:16 99/11/04
      Start Sample: 11:24 99/11/04
       Stop Sample: 11:28 99/11/04
       Cond:   TEMP WNDSPD  ------
        Min:  20.00   5.00   0.00
        Max:  25.00  40.00   0.00
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

The user can select up to three conditions that must be met for sampling to take place. The unit will flow ambient air through the group of cartridges if the conditions are met, and discontinue the flow if the conditions are not met, without switching to the next group of cartridges, during the programmed sampling duration. The sampling times for each condition may overlap.

The Advanced Sampling Setup screen contains the following parameters:

Group	The Group field identifies the group of cartridges that are in sampling position. Pressing <F3:Next> will allow the user to program each group of cartridges with a unique Advanced sampling program.
Current Time	The current time and date are displayed in this field.
Start Sample	The Start Sample parameter defines the time and date that the Partisol Speciation Sampler will begin sampling for the group number displayed in the Group field at the top of the screen. When editing, treat each part of the time and date as a separate field.
Stop Sample	The Stop Sample parameter defines the time and date that the unit will stop sampling for the group number displayed in the Group field at the top of the screen. When editing, treat each part of the time and date as a separate field.

Cond, Min, Max — The Partisol Speciation Sampler allows you to use the values of up to three input variables to control conditional sampling. These three terms (Condition, Minimum and Maximum) are joined together as “and” functions to form the circumstances under which sampling takes place. A value of “------” for the Condition parameter indicates that a particular term is not used.

The permissible values of the Condition parameter are as follows:

------	Condition not used
TEMP	Current ambient temperature (°C)
PRES	Current ambient pressure (mm Hg)
%RH	Current relative humidity (%)
%FLOW	Sample flow rate (l/min)
WNDSPD	Current wind speed (km/h)
WNDDIR	Current wind direction (deg)
AI1	A/I 1 (engineering units)
AI2	A/I 2 (engineering units)
AI3	A/I 3 (engineering units)
AI1AVE	Average A/I 1 (engineering units)
AI2AVE	Average A/I 2 (engineering units)
AI3AVE	Average A/I 3 (engineering units)

The Minimum and Maximum parameters define the range for each condition during which sampling should take place.

No conditional sampling takes place if the value of all three Condition parameters is “------.”

With the values entered in the Advanced Sampling Setup screen as shown in Figure 7-17, sampling on Group 01 will begin any time after 11:24 on November 4, 1999, when the ambient temperature is between 20° and 25° C and the wind speed is between 5 and 40 km/h. The sampler will continue to flow ambient air through the sampling cartridge(s) as long as both conditions are met. The sampler will stop the flow through the cartridge(s) at any time that either condition is not met. The sampler will cycle the ambient air flow through the cartridge(s) on and off for the duration of the sampling run depending upon the ambient conditions. The unit will switch to the next group of cartridges at the programmed Stop Sample time (11:28) regardless of the sampling conditions at that moment. The unit also will switch to the next group of cartridges regardless of the sampling conditions that occurred during the last programmed sampling duration.

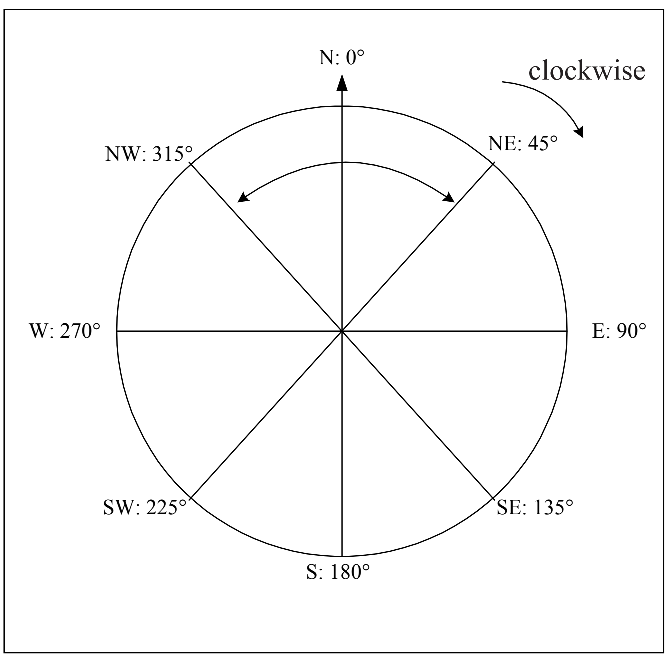
When setting the WNDDIR range, think of the range as a section of a compass (Figure 7-18). This section can be expressed in terms of two values: a minimum and a maximum. The minimum value is defined as the "beginning" of the section when moving around the compass in a clockwise direction. The maximum value is defined as the "end" of this section when moving around the compass in a clockwise direction.

NOTE: The maximum value does not have to be larger than the minimum value.

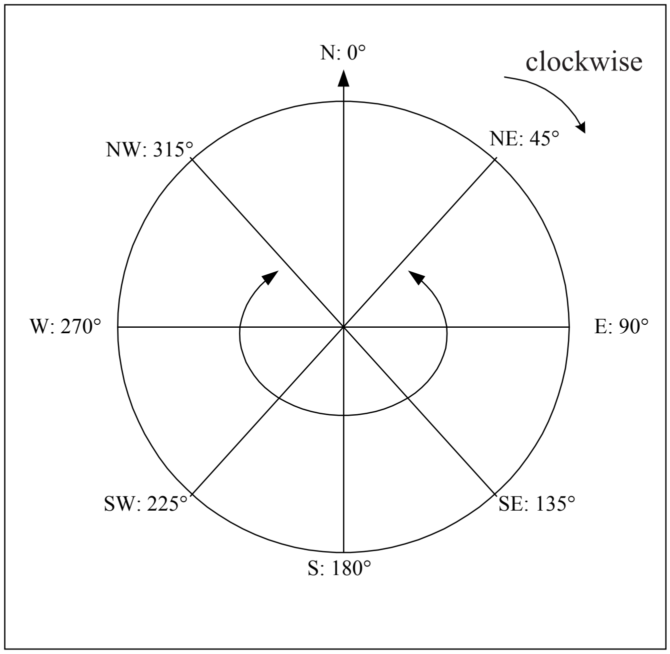
For example, if you want the unit to sample only when the wind direction ranges between 315° and 45° (Figure 7-18), then you would set the minimum to 315° and the maximum to 45°, even though the value 315° is greater than the value 45°. If you were to set the minimum to 45° and the maximum to 315°, the unit would sample only when the wind direction ranged between 45° and 315° (Figure 7-19). Because 315° is the "beginning" of the desired range, and 45° is the "end" of the desired range (when moving around the compass in a clockwise direction) the range is defined by a minimum value of 315° and a maximum value of 45°.

Wind direction is conventionally defined as blowing *from* a specific direction, such as blowing from the South or East. In Figure 7-18, if the wind was blowing from the North, its compass reading would be 0° and if it was blowing from the South, the compass reading would be 180°.

7-18. Setting the wind direction parameter (WNDDIR) in the Advanced Sampling Setup screen to sample only when the wind direction ranges from 315° to 45°.



7-19. Setting the wind direction parameter (WNDDIR) in the Advanced Sampling Setup screen to sample only when the wind direction ranges from 45° to 315°.



It is possible that a group of cartridges will not have ambient air flowing through them at all during their programmed sampling duration. If the sampling conditions are not met during a programmed sampling duration, and the cartridge(s) does not have any ambient air flowing through it, the unit will still switch to the next group of cartridges at the programmed Stop Sample time.

Press <F7: Reset> in the Advanced Sampling Setup screen to reset the conditional sampling parameters to their "off" values ("------" for Condition, and "0" for minimum and maximum values). All other function keys in the Advanced Sampling Setup screen have the same function as those keys in the Time Sampling screen.

7.3.5. Episodic Sampling Setup Screen

The Episodic Sampling Setup screen will display if "EPISOD" is selected as the Sample Definition Method in the Sample Setup screen (Figure 7-4). The Episodic Sampling Setup screen (Figure 7-20) provides access to additional conditional sample programming parameters. The user can select up to three conditions that must be met for sampling to take place. The unit will sample if the conditions are met, and then stop sampling and switch to the next group of cartridges when those conditions are no longer met. Sampling will begin on the new sampling cartridge(s) only when conditions are again met. With Episodic sampling, there is no set sampling cycle for a given group of cartridges, rather the sampler itself is given a duration during which the sampling on an undetermined number of cartridges will take place.

The Episodic Sampling Setup screen contains the following parameters:

Current Time	The current time and date are displayed in this field.
Start Event Capture	The Start Event Capture parameter is the start time for the sampler to determine if conditions met. The air flow through the sampling cartridge(s) will start as soon as the conditions are met.
Stop Event Capture	The unit will stop sampling and enter the Done Mode when the current time equals the Stop Event Capture time.
Cond, Min, Max	The unit allows you to use the values of up to three input variables to control conditional sampling. These three terms (Condition, Minimum and Maximum) are joined together as "and" functions to form the circumstances under which sampling takes place. A value of "------" for the Condition parameter indicates that a particular term is not used.

The permissible values of the Condition parameter are identical to the conditions found in the Advanced Sampling Setup screen (Section 7.3.4). With the values entered in the Episodic Sampling screen shown in Figure 7-20, the sampler will begin sampling at 11:24 on November 4, 1999, if the ambient temperature is between 10° and 40° C and the relative humidity (RH) is between 80% and 95%. The unit will continue to sample on this group of cartridges as long as these conditions are met, until

Figure 7-20. Episodic Sampling Setup screen.

```
Stat:OK       Episodic Setup   Mode:STOP
       Current Time: 10:24 99/11/04
Start Event Capture: 11:24 99/11/04
 Stop Event Capture: 11:28 99/11/04
       Cond:   TEMP   %RH   ------
        Min:  10.00  80.00   0.00
        Max:  40.00  95.00   0.00
```

Times	+ Hour	+ Day	Reset	
Function Keys in Browse Mode				
Times	+ Hour	+ Day	Reset	
Function Keys in Edit Mode				
-List	+List	Bksp		

the Stop Event Capture time (11:28). If either of these conditions are not met during the interval between the Start Event Capture and Stop Event Capture times, the sampler will not pull an air stream through that group of cartridges. Sampling will begin again only if the temperature and relative humidity conditions are within the Min and Max values. This sampling cycle will continue until there are no more cartridges available or until the Stop Event Capture time. The unit will then enter the Done Mode until reprogrammed. Additionally, you can set up different groups of cartridges with various sampling conditions. The unit will sample simultaneously on different cartridges, depending on the programmed sampling conditions.

7.3.6. RS232 Program Mode

If you select “RS232” as the Sample Definition Method in the Sample Setup screen (Figure 7-4), the unit will not display a specific sampling setup screen. When RS232 is selected in the Sample Setup screen, pressing the <F4: Sample> soft function key in the Main screen will display a Warning/Confirmation screen (Figure 7-13) indicating that no time or conditional setup is required for RS232 sampling.

In the RS232 program, the sampler operates according to the present value of Program Register Code 170 (Sampling Serial Control). See Appendix B for a more detailed explanation of Program Register Code 170.

7.3.7. Filter Times Screen

The Filter Times screen (Figure 7-21) is accessible from any of the specific sampling setup screens. Press <F1: Times> while in the any of the specific sampling setup screens to enter the Filter Times screen. This screen is used mainly as a troubleshooting screen to help users know when their unit actually will begin and end sampling on each of the cartridges. However, you may use the screen as a basic reference tool (while your unit is functioning properly) to be sure that your unit is correctly programmed to sample at the times that were set in the Sample Setup screen (Section 7.2.1).

To view all of the starting and ending times for each cartridge in the cartridge list, press the <↓> arrow.

Figure 7-21. Filter Times screen.

Group	Start	Stop
1.	11:24 99/11/04	11:28 99/11/04
2.	11:28 99/11/04	11:32 99/11/04
3.	11:32 99/11/04	11:36 99/11/04
4.	11:36 99/11/04	11:40 99/11/04
5.	11:40 99/11/04	11:44 99/11/04
6.	11:44 99/11/04	11:48 99/11/04
7.	11:48 99/11/04	11:52 99/11/04

The Filter Times screen contains the following parameters:

Group — This column displays the group number for each cartridge in the cartridge list. The unit will display the maximum number of groups in this column, based on the number of groups per channel.

Start — This column displays the beginning sampling times and dates for each cartridge in the cartridge list.

Stop — This column displays the ending sampling times and dates for each cartridge in the cartridge list.

7.3.8. Cartridge List Setup Screen

The Cartridge List Setup screen is accessible from the Sample Setup screen (Figure 7-4) by pressing <F3: ChanLst>. The Cartridge List Setup screen (Figure 7-22) allows the user to enter the type of filters in each cartridge, the serial numbers of the cartridges and the flow rates for each cartridge.

Any flow channel can be disabled (shut off) by setting its flow to “0.” If the flows for all channels in a group are shut off, then the unit will not draw an air stream through those flow channels.

The Cartridge List Setup screen includes the following parameters:

Chan — The numbers and letters (1A-1D, 2A-2D and 3A-3D) in this column identify the flow channels for each cartridge.

Figure 7-22. Cartridge List Setup screen.

Chan	Group	Type	Cartridge ID	Flow
1A:	1	P	0000000	10.0 l/min
1B:	1	P	0000001	10.0 l/min
1C:	2	P	0000002	10.0 l/min
1D:	2	P	0000003	10.0 l/min
2A:	3	P	0000004	10.0 l/min
2B:	3	P	0000005	10.0 l/min
2C:	4	P	0000006	10.0 l/min
2D:	4	P	0000007	10.0 l/min
3A:	5	P	0000008	10.0 l/min
3B:	5	P	0000009	10.0 l/min
3C:	6	P	0000010	10.0 l/min
3D:	6	P	0000011	10.0 l/min

		Copy	Insert	Delete
Function Keys in Browse Mode				
		Copy	Insert	Delete
Function Keys in Edit Mode				
-List	+List	Bksp		

Group — This parameter identifies the flow channel grouping for each cartridge. You can change the flow channel grouping in the Group Setup screen (Section 7.2.4).

Type — This parameter identifies the filter type such as “P” for an EPA supplied filter. You can select another alphabetic character to identify different filter types. The default parameter for this field is “P.”

Cartridge ID — This parameter is used to enter each cartridge’s serial number. Press <EDIT> to edit the Cartridge ID field. Scroll down to the first number in the series to be edited and enter the serial number of the cartridge in the Cartridge ID column, press <ENTER>. Press <F3: Copy> and follow the instructions in the display. This will automatically increment the entered number for the remaining cartridges in the series. Press <F4: Insert> to insert a number in the series, or <F5: Delete> to delete a cartridge serial number. If the ID number is “0,” the sampler will automatically assign a cartridge identifier. Invalid channels (those channels that are not assigned to a group) are hidden with asterisks (*).

NOTE: If you select <F5: Delete> to delete a cartridge, the unit will display a Warning/Confirmation screen that will ask you to confirm the cartridge deletion.

Flow	This parameter identifies the flow rate for each cartridge. Use this field to set the flow rate for each cartridge in the cartridge list.

7.4. Turning Off the Partisol Speciation Sampler

Follow the steps below to turn off the hardware:

- If the device is *not* in the Stop Operating Mode, press <RUN/STOP> to enter the Stop Operating Mode.

- Press the power switch on the front panel of the Partisol Speciation Sampler into its “off” (0) position (Figure 7-23).

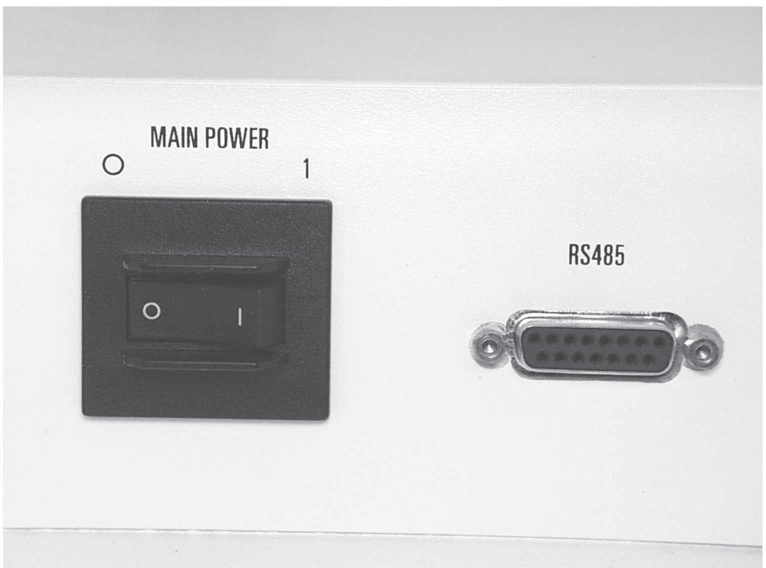


Figure 7-23. Power button on the front panel of the Partisol Speciation Sampler.

7.5. Automatic Switching of Edit Modes and Screens

The Partisol Speciation Sampler takes a number of actions automatically during periods of inactivity:

- Any time more than 15 minutes pass since the last keystroke was entered on the keypad, the backlighting of the LCD (liquid crystal display) dims. When this occurs, press any key to reactivate the screen's backlighting.

- If the sampler is left in the Edit Mode for more than 5 minutes without any user keystrokes, it automatically reverts to the Browse Mode.

- Whenever the sampler remains in a screen other than the Main screen for longer than 15 minutes without any user keystrokes, the unit automatically reverts to the Main screen.

- If no keys are pressed for 3 hours and the Auto Run feature (in the System Setup screen) is "ON," the unit will automatically enter the Wait or Sampling Mode.
- If a "prompt" screen (such as a screen that asks you to choose "Yes" or "No") is displayed for 5 minutes without any action by the user (the user doesn't make a choice or push any buttons), then the unit will either answer the prompt itself and resume operation or wait for the user to take action, depending on the type of prompt screen that appears. If a prompt screen appears that gives the user a message and then asks the user to "Press any key to continue,"and the user doesn't press a key, then the unit will continue normal operation after 5 minutes. If a prompt screen appears that gives the user a choice of "Yes" or "No,"and the user doesn't press a key, then the unit will automatically choose "No" and continue normal operation after 5 minutes. If a prompt screen appears that gives the user a choice of different variables and the user doesn't press a key, then the unit will remain in that prompt screen and wait for the user to press a key.

7.6. Operation After Power Failure

The Partisol Speciation Sampler performs the following actions upon resumption of power if a power failure occurs while the sampler is in its Sampling Operating Mode:

- If the power outage is longer than 60 seconds, the hardware registers a "Z" status condition (Section 8.1) and stores the starting time and date of the power failure in the current record of filter data (Section 9.1).

- If ending sampling conditions are not yet reached for the cartridge that is in sampling position upon resumption of the power supply, the sampler continues its sampling program in the Sampling Operating Mode. The "Z" status condition will be retained in the filter data record. Otherwise, depending upon how much time has passed, the unit will switch to the next group of cartridges scheduled for sampling. It then either begins sampling or enters the Wait Operating Mode to await the start of the next sequential sample. If the unit begins sampling, the "Z" status condition will be retained in the current record of filter data. However, if the unit enters the Wait Operating Mode, the unit will automatically clear the "Z" status condition.

Section 8: Operating Information

This section describes the status codes generated by the Partisol Speciation Sampler, and the operating information contained in the Operating Statistics screens. Refer to Appendix A for a detailed hierarchy of screens.

8.1. Status Codes

✔ The sampler displays the current status code in the upper left-hand corner of the Main screen and several other screens.

The sampler displays operational status codes in the upper left-hand corner of the Main screen (Figure 8-1), and on several other screens. The unit shows a status of "OK" if no current status conditions exist. The sampler resets the status code to "OK" when it switches to the next sampling group.

Figure 8-1. Main screen.

```
Stat:OK       Partisol 2300    Mode:STOP
           09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
 StCode | Stats | System | Sample | Data
```

✔ The current status code is made up of one or more single- or double-letter abbreviations, or "OK."

With the occurrence of any status conditions, the unit will display the single- or double-letter abbreviation for the situation that applies. The sampler also provides secondary indicators of the unit's current status conditions through the use of two status lights. One light is located next to the I/O connectors inside the unit's enclosure. The other light is mounted on the outside enclosure, and located on the top left side of the unit. If the unit's current status code is "OK," the indicator lights do not light up. If the unit reports a noncritical status code, it will turn on the lights. If the unit reports a critical status code, the lights will blink on and off continuously.

The Status Codes screen (Figure 8-2) displays a list and description of the currently active status conditions. When in the Main screen, press <F1: StCode> to enter the Status Codes screen.

Figure 8-2. Status Codes screen.

```
OK              Status Codes             STOP
    OK  No Status Conditions
```

Reset				

The following list details the system's status codes and definitions:

OK *No current status conditions.*

M *Flash Memory*. The sampler detected an error in its flash memory. This is a *critical status condition*, causing the sampler to enter the Error or Wait Operating Mode (Section 5.2.2) and the status lights to blink continuously.

C *Calibration*. A failure occurred in the sampler's automatic analog input calibration routine. This is a *critical status condition*, causing the sampler to enter the Error or Wait Operating Mode (Section 5.2.2) and the status lights to blink continuously.

Y *System Reset*. The system performed an unanticipated reset.

Z *Power Failure*. A power outage occurred during sampling on the current filter. Power outage events of less than 60 seconds are not logged by the sampler.

FA-FD *Flow (A-D) Out of Range*. The measured sample flow rate(s) through the flow channel(s) deviated by ±5% from its set point for more than 5 minutes.

SA-SD *Flow (A-D) Stop*. The measured sample flow rate(s) through the flow channel(s) deviated by ±10% from its set point for more than 1 minute.

TA *Ambient Temperature*. The ambient temperature sensor was not installed correctly or indicated an invalid value. For ambient temperature, this corresponds to a reading of less than -60° C or greater than 70° C.

TP *Pump Temperature*. The pump compartment temperature sensor was not installed correctly or was out of range, i.e., less than -60° C or greater than 70° C.

TE *Electronics Temperature*. The temperature of the unit's electronics compartment was outside of its usual operating range, i.e., less than 0° C or greater than 70° C.

✔ A heater in the sampler's electronics and pump compartment ensures that the control zone stays within limits under cold temperature conditions.

VP *Vacuum Pump Failed*. The sampler encountered a mechanical problem with the vacuum pump. This is a *critical status condition*, causing the sampler to enter the Error Operating Mode (Section 5.1) and the status lights to blink continuously. This status code will register only when the System Check feature is turned on (Section 7.2.3), or during a leak check procedure.

VV *Vacuum Vent Valve Failed*. The sampler encountered a mechanical problem with the vacuum vent valve. This is a *critical status condition*, causing the sampler to enter the Error Operating Mode (Section 5.1) and the status lights to blink continuously. This status code will register only when the System Check feature is turned on (Section 7.2.3), or during a leak check procedure.

VS *Vacuum System Failed*. The sampler encountered a mechanical problem with the vacuum system. This is a *critical status condition*, causing the sampler to enter the Error Operating Mode (Section 5.1) and the status lights to blink continuously. This status code will register only when the System Check feature is turned on (Section 7.2.3), or during a leak check procedure.

OA-OD *Coefficient of Variation (A-D)*. The coefficient of variation of the sample flow rate(s), expressed as a percentage, was greater than 2 (2%) during sampling.

U *User Pressed Stop*. The user pressed the <RUN/STOP> button during sampling.

B1-B3 *Bank (1-3) Failed*. The sampler encountered a mechanical problem with Bank 1-3. This status code will register only when the System Check feature is turned on (Section 7.2.3), or during a leak check procedure.

LA-LD *Leak Check (A-D) Failed*. This error code will appear if the leak check on the indicated flow channel (A-D) failed. A leak check fails if the vacuum created in the sampling system leaks at a rate of 25 mm Hg or greater, which is equal to the maximum leak rate of 80 ml/min that is indicated as acceptable by the U.S. EPA. This status code will register only when the System Check feature is turned on (Section 7.2.3), or during a leak check procedure.

D *Audit Performed.* This status condition indicates to the user that an audit was performed during sampling. It does *not* indicate an error. It is for information purposes only.

In the case of multiple status conditions, the sampler displays the single- or double-letter codes for each status condition in the status field of the Main screen, and other screens that have a status condition field. For example, the sampler would display “ZTP” in the status condition field if a power outage occurred and if its pump compartment temperature was outside of the acceptable range.

The unit stores all status conditions that apply to each cartridge in the filter data storage buffer (Section 10.1).

8.2. Operating Statistics Screens

The Partisol Speciation Sampler contains five screens that display operating statistics: the Temperature and Pressure Statistics screen, Flow Statistics screen, User I/O Statistics screen, Wind Statistics screen and the System Statistics screen. These can be accessed from the Main screen (Figure 8-1) by pressing <F2: Stats> to enter the Temperature and Pressure Statistics screen. From this screen, you can access the Flow Statistics screen by pressing <F2: Flow>, the User I/O Statistics screen by pressing <F3: User IO>, the Wind Statistics screen by pressing <F4: Wind>, and the System Statistics screen by pressing <F5: SysStat>.

8.2.1. Temperature and Pressure Statistics Screen

The Temperature and Pressure Statistics screen (Figure 8-3) displays information on various current and average temperatures, and the current and average pressure and relative humidity. Press <F2: Stats> when in the Main screen, or <F1: TmpPres > when in any of the other statistics screens, to enter the Temperature and Pressure Statistics screen.

Figure 8-3. Temperature and Pressure Statistics screen.

```
Stat:OK       Temp/Pressure    Mode:STOP

                  Current   Average
    Ambient Temp:   21.3      28.6 C
    Ambient Pres:    754       741 mmHg
     Ambient %RH:   28.3      48.3 %

        |  Flow   | User IO |  Wind   | SysStat
```

The Temperature and Pressure Statistics screen contains the following information:

Ambient Temp	This field contains the current and latest averaged values of the ambient temperature (°C), as measured by the external temperature sensor.
Ambient Pres	This field contains the current and latest averaged values of the ambient pressure (mm Hg).
Ambient %RH	This field contains the current and latest averaged values of the ambient relative humidity (%).

Press <ESC> to return to the Main screen from the Temperature and Pressure Statistics screen.

8.2.2. Flow Statistics Screen

The Flow Statistics screen (Figure 8-4) provides information about the flow channel, setpoint, rate, volume and sampling time of the currently installed sampling cartridge in the Partisol Speciation Sampler.

Press <F2: Stats> from the Main screen (Figure 8-1), to reach the Temperature and Pressure Statistics screen (Figure 8-2). From the Temperature and Pressure Statistics screen, press <F2: Flow> to enter the Flow Statistics screen.

Figure 8-4. Flow Statistics screen.

```
Stat:OK         Flow Stats      Mode:STOP

Flow   Setpoint Current   Volume    Time
A       0.0 l/m  0.2 l/m     0.0 l     : 0
B       0.0 l/m  0.1 l/m     0.0 l     : 0
C       0.0 l/m  0.4 l/m     0.0 l     : 0
D       0.0 l/m  0.1 l/m     0.0 l     : 0
 TmpPres |        | User IO |  Wind  | SysStat
```

The Flow Statistics screen contains the following information:

Flow	This field contains the flow channel.
Setpoint	This field contains the flow rate set point (volumetric l/min).
Current	This field contains the current flow rate (volumetric l/min).
Volume	This field contains the sample volume (volumetric m^3) drawn through the cartridge.
Time	This field contains the elapsed sample time in hh:mm of the cartridge.

Press <ESC> to return to the Main screen from the Flow Statistics screen.

8.2.3. User I/O Statistics Screen

The User I/O Statistics screen (Figure 8-5) displays the analog inputs and the digital outputs of the Partisol Speciation Sampler. The averages correspond to the values computed over the latest completed averaging/storage interval, as defined by the Average Time parameter in the System Setup screen (Section 7.2.1).

Press <F3: User IO> from any of the statistics screens to enter the User I/O Statistics screen.

Figure 8-5. User I/O Statistics screen.

```
Stat:OK          User I/O        Mode:STOP
                   Current    Average
 Analog Input 1:      0.00       0.00
 Analog Input 2:      0.00       0.00
 Analog Input 3:      0.00       0.00
 Logic Output 1:       OFF
 Logic Output 2:       OFF
```

TmpPres	Flow		Wind	SysStat

The User I/O Statistics screen contains the following information:

Analog Inputs 1, 2, 3	This field contains the current and latest averaged values of user defined analog inputs 1, 2 and 3 (engineering units). Refer to Section 10 for additional information.
Logic Outputs 1, 2	This field contains the current values of user-defined logic outputs 1 and 2 (VDC). Refer to Section 10.4 for additional information on logical output settings.

Press <ESC> to return to the Main screen from the User I/O Statistics screen.

8.2.4. Wind Statistics Screen

The Wind Statistics screen (Figure 8-6) displays the wind speed, wind velocity and wind direction values. The averages correspond to the values computed over the latest completed averaging/storage interval as defined by the Average Time parameter in the System Setup screen (Section 7.2.1). These values only have meaning if an optional wind vane/anemometer (59-004953) is attached to the sampler.

Figure 8-6. Wind Statistics screen.

```
Stat:OK         Wind Stats       Mode:STOP

                   Current    Average
     Wind Speed:      0.1        0.1 km/h
  Wind Velocity:      N/A        0.0 km/h
 Wind Direction:        0          0 deg
```

TmpPres	Flow	User IO		SysStat

The Wind Statistics screen contains the following information:

Wind Speed — This field contains the current and latest averaged values of the wind speed (km/h. This value only has meaning if an optional wind vane/anemometer is attached to the sampler.

Wind Velocity — This field contains the latest vector-based average of the wind velocity (km/h). This value only has meaning if an optional wind vane/anemometer is attached to the sampler.

Wind Direction — This field contains the current and latest vector-based aver aged values of the wind direction (degrees), as derived from an optional, externally mounted, wind vane/anemometer. This value only has a meaning if an optional wind vane anemometer is attached to the sampler.

Press <ESC> to return to the Main screen from the Wind Statistics screen.

8.2.5. System Statistics Screen

The System Statistics screen (Figure 8-7) provides a general overview of the sampler's operation. Press <F5: SysStat> from any of the other statistics screens to display the System Statistics screen.

Figure 8-7. System Statistics screen.

```
Stat:OK        System Stats    Mode:STOP
  Elec Temp:   25.9 C | Elec Heater: OFF
  Pump Temp:   21.6 C | Pump Heater: OFF
Fan In Temp:   21.4 C |   Pump Fan1: ON
                      |   Pump Fan2: ON
                      |       Pump1: ON
                      |       Pump2: ON
```

TmpPres	Flow	User IO	Wind	

The System Statistics screen contains the following information:

Elec Temp — This field contains the current temperature (°C) of the sampler's electronics compartment.

Elec Heater	This field indicates whether the heater in the electronics compartment is currently switched "on" or "off."
Pump Temp	This field contains the current temperature (°C) of the sampler's pump compartment.
Pump Heater	This field indicates whether the heater in the pump compartment is currently switched "on" or "off."
Fan In Temp	This field contains the current temperature (°C) of the sampler's fan inlet.
Pump Fan1	This field contains the current operational status of sample pump fan #1.
Pump Fan2	This field contains the current operational status of sample pump fan #2.
Pump1	This field contains the current operational status of sample pump #1.
Pump2	This field contains the current operational status of sample pump #2.

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Section 9: Viewing Stored Data

✔ The Partisol Speciation Sampler has a capacity of 240 filter data records, 16 days of interval data records and 32 days of input data records. Data are stored in a circular buffer on a "first in, first out" basis.

The Partisol Speciation Sampler stores three types of data in its internal data logger: filter data, interval data and input data. This information is stored in three separate circular buffers whose contents can be viewed on the screen of the sampler and/or downloaded through the RS232 port. Once these buffers are filled, the oldest data points are replaced with the most recent information ("first in, first out"). The following describes the three types of data stored internally in the hardware:

Filter Data — Each record in this buffer contains information for a different collection filter exposed to the sample stream. The sampler displays records from this buffer in the Filter Data Statistics screen and its subscreens (Figures 9-2 to 9-6). These screens contain information about the operation and status of the sampler while it sampled through each cartridge, calculated averages of cartridge data recorded by the sampler and a list of the unit's recorded power failures during sampling. The Partisol Speciation Sampler has a capacity of 240 records of filter data.

✔ The unit stores one record of filter data for each cartridge.

Interval Data — The sampler writes a new record of interval data every 5 minutes. Each record contains the latest 5-minute average of the ambient temperature, ambient pressure and average flow rate(s). The unit displays records from this buffer in the Interval Data screen (Figure 9-7). The Partisol Speciation Sampler has a capacity of 16 days of interval data.

Input Data — The sampler stores calculated averages of meteorological data and other information received through its analog input channels at the rate specified by the user in the Average Time field of the System Setup screen (Section 7.2.1). The unit displays these stored values in the Input Data screen (Figure 9-8). The sampler has a data storage interval of 30 minutes and a 32-day capacity of input data.

✔ The Partisol Speciation Sampler stores one record of interval data every 5 minutes whenever the unit is turned on.

9.1. Cartridge Data

✔ Press <F1: -Rec> and <F2: +Rec> to move among stored records of information. Hold down these keys to repeat and *accelerate* the movement.

Data for each cartridge in the Partisol Speciation Sampler are stored as a separate record of filter data. For readability, the sampler splits the display of filter data records among five screens: the Filter Data Statistics screen (Figure 9-2), Filter Data screen (Figure 9-3), Cartridge Data Status Codes screen (Figure 9-4), Cartridge Data Averages screen (Figure 9-5) and the Power Failures screen (Figure 9-6).

Press <F5: Data> when in the Main screen (Figure 9-1) to access the Filter Data Statistics screen (Figure 9-2). From this screen, press <F3: MoreDat> repeatedly to view its subsidiary screens in the following order:

Filter Data screen
Cartridge Data Status Codes screen
Cartridge Data Averages screen
Power Failures screen.

Figure 9-1. Main screen.

```
Stat:OK       Partisol 2300    Mode:STOP
           09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
 StCode   Stats   System   Sample   Data
```

To switch among filter data, interval data and input data, press <F4> repeatedly from the Filter Data Statistics screen. With the exception of the subsidiary filter data screens, the sampler displays the last database record when the user enters these screens. The fields in these screens can not be edited.

To navigate among records of stored information, press <F1: -Rec> to move backward and <F2: +Rec> to move forward when in any of the filter data screens, the Interval Data screen and the Input Data screen. Holding down these keys repeats and *accelerates* these actions. The current record number is in the upper right-hand corner.

9.1.1. Filter Data Statistics Screen

Press <F5: Data> when in the Main screen (Figure 9-1) to enter the Filter Data Statistics screen (Figure 9-2). The sampler displays the following filter data fields in this screen:

Stat — The Stat field in the upper left-hand corner of the screen shows the status conditions encountered during sampling. A value of "OK" indicates that the sampler did not encounter any status conditions. Press <F3: MoreDat> twice to view the Cartridge Data Status Codes screen (Figure 9-3) for an explanation of the status codes recorded. Section 8.1 contains a complete listing of the single- and double-letter status codes that may be displayed in this field.

Rec — This field contains the number of the current record, which is displayed in the upper right-hand corner of the screen.

Set Sample Start — The Set Sample Start field is the time and date (hh:mm yyyy/mm/dd by default) set by the user as the start time in the Filter Setup screen (Section 5.2).

Set Sample Stop — The Set Sample Stop field is the time and date (hh:mm yyyy/mm/dd by default) set by the user as the sample ending time in the Filter Setup screen.

Actual Sample Start — This field shows the *actual* starting time/date (hh:mm yyyy/mm/dd by default) at which the unit began sampling.

Figure 9-2. Filter Data Statistics screen.

```
Stat:OK       Filter Times    Rec:199
    Set Sample Start:  17:52 1999/11/02
     Set Sample Stop:  17:56 1999/11/02
 Actual Sample Start:  17:52 1999/11/02
  Actual Sample Stop:  17:52 1999/11/02
  Valid Elapsed Time: 000:00
  Total Elapsed Time: 000:00
  -Rec  |  +Rec  | MoreDat | IntvDat | DwnLoad
```

Actual Sample Stop	This field indicates the *actual* ending time/date (hh:mm yyyy/mm/dd by default) at which the system stopped sampling.
Valid Elapsed Time	The Valid Elapsed Time field shows the elapsed sampling time (hhh:mm by default) during which the sampler operated normally, i.e., without any status conditions.
Total Elapsed Time	The Total Elapsed Time field shows the total sampling time (hhh:mm by default) during which the sampler drew a sample stream through its filter. Power outages will cause this figure to be smaller than the programmed sample duration time.

Press <F3: MoreDat> to display the Filter Data screen. Press <ESC> to return to the Main screen.

9.1.2. Filter Data Screen

The Filter Data screen (Figure 9-3) provides information on the flow channel, Cartridge ID and Site ID numbers to identify the filter(s) and the cartridge used for the displayed record number and to identify the site where the sampler is located. Other data included on this screen are the flow volume and the percent coefficient of variation.

The sampler displays the following filter and cartridge data fields in this screen:

Stat	The Stat field in the upper left-hand corner of the screen shows the status conditions encountered during sampling.

Figure 9-3. Filter Data screen.

```
Stat:OK        Filter Data    Rec:199
         Channel: 1B
    Cartridge ID: 0000001 Type: P
          Volume:     0.0 l
             %CV:  0.0
ID1: "                                "
ID2: "                                "
```

-Rec	+Rec	MoreDat	IntvDat	DwnLoad

Rec	The Rec field in the upper right-hand corner of the screen contains the number of the current record.
Channel	This field displays the flow channel for the record number that is displayed in the upper right- hand corner of the screen.
Cartridge ID	This field displays the Cartridge ID number for the record number that is displayed in the upper right-hand corner of the screen.
Volume	The Volume field indicates the total sample volume (volumetric m^3) that has passed through the filter.
%CV	The coefficient of variation is equal to the standard deviation of the 5-minute flow rate averages divided by the average flow rate (10 l/min by default). This value is then multiplied by 100 to yield the percent (%) CV value. If the figure is greater than 2 (2%), the sampler displays a status code (Section 8.1).
ID1, ID2	The ID1 and ID2 fields are the site identification numbers as entered in the Site Identification screen (Section 5.1).

Press <F3: MoreDat> to display the Cartridge Data Status Codes screen. Press <ESC> to return to the Main screen.

9.1.3. Cartridge Data Status Codes Screen

Press <F3: MoreDat> when in the Filter Data screen to enter the Cartridge Data Status Codes screen (Figure 9-4). The sampler remains in the same record of filter data when switching among filter data-related screens.

The Cartridge Data Status Codes screen displays descriptions of all status codes recorded in the present record of cartridge/filter data.

Figure 9-4. Cartridge Data Status Codes screen.

```
              Status Codes      Rec:199
   OK  No Status Conditions



   -Rec      +Rec     MoreDat  IntvDat
```

9.1.4. Cartridge Data Averages Screen

Press <F3: MoreDat> when in the Cartridge Data Status Codes screen to enter the Cartridge Data Averages screen (Figure 9-5). The sampler remains in the same record of filter data when switching among filter data-related screens.

The Cartridge Data Averages screen displays the following information:

Stat	The Stat field in the upper left-hand corner of the screen shows the status conditions encountered during sampling.
Rec	The Rec field in the upper right-hand corner of the screen contains the number of the current record.
Flow	This field contains the minimum, average and maximum flow rate (l/min).
WSpd	This field contains the average wind speed (km/h) recorded during the cartridge sampling period. This

Figure 9-5. Cartridge Data Averages screen.

```
                Averages        Rec:199
       Min   Ave   Max|  Average
Flow:   9.7  10.1  10.4| WSpd:    0.0
AmbT:  23.5  23.6  23.6| WVel:    0.0
Pres:   761   762   762| WDir:      0
 %RH:  85.8  87.5  87.5| AI1:    0.00
                       | AI2:    0.00
                       | AI3:    0.00
   -Rec      +Rec     MoreDat  IntvDat
```

	value has meaning only if an optional wind vane/ anemometer is attached to the Partisol Speciation Sampler.
AmbT	This field contains the minimum, average and maximum ambient temperature (°C) recorded during the sampling period.
WVel	This field contains the vector-based average of the wind velocity (km/h) recorded during the filter exposure period. This value has meaning only if an optional wind vane/anemometer is attached to the Partisol Speciation Sampler.
Pres	This field contains the minimum, average and maximum ambient pressure (mm Hg) recorded during the sampling period.
WDir	This field contains the vector-based average of the wind direction (degrees) recorded during the sampling period. This value has meaning only if an optional wind vane/anemometer is attached to the Partisol Speciation Sampler.
%RH	This field contains the minimum, average and maximum relative humidity (%) recorded during the sampling period.
AI1	This field contains the average of analog input 1 (engineering units) recorded during the sampling period.
AI2	This field contains the average of analog input 2 (engineering units) recorded during the sampling period.
AI3	This field contains the average of analog input 3 (engineering units) recorded during the sampling period.

9.1.5. Power Failures Screen

Press <F3: MoreDat> when in the Cartridge Data Averages screen to enter the Power Failures screen (Figure 9-6). The sampler remains in the same record of filter data when switching among filter data-related screens.

The Power Failures screen displays the starting time/date (hh:mm yyyy/mm/dd by default) of up to 10 power outages, of durations longer than 60 seconds, that occurred during the sampling period of the current cartridge/filter data record.

Figure 9-6. Power Failures screen.

```
                 Power Failures     Rec:199
         No power failures occurred
```

- Rec	+ Rec	MoreDat	IntvDat	

9.2. Interval Data Screen

The Partisol Speciation Sampler stores 5-minute, averaged ambient temperature, filter temperature, ambient pressure and flow rate measurements as interval data. It writes a new record of interval data every 5 minutes on a continuous basis, and has a capacity of 16 days before it overwrites the oldest records. The unit displays interval data records in the Interval Data screen (Figure 9-7).

You can reach the Interval Data screen in two ways. Press <F4: IntvDat> from one of the filter data screens to reach the Interval Data screen. Also, from the Main screen (Figure 9-1), press <F5: Data> to enter the Filter Data Statistics screen (Figure 9-2). From the Filter Data Statistics screen, press <F4: IntvDat> to enter the Interval Data screen.

The Interval Data screen contains the following information:

Rec	This field contains the number of the current interval record, which is displayed in the upper right-hand corner of the screen.

Figure 9-7. Interval Data screen.

```
               Interval Data      Rec:102
              Time: 10:40 1999/11/04
     Ambient Temp:  22.5 C
     Ambient Pres:   756 mmHg

Flow A:   0.0 l/min Flow B:   0.0 l/min
Flow C:   0.0 l/min Flow D:   0.0 l/min
```

- Rec	+ Rec		InptDat	DwnLoad

Time	This field contains the ending time/date (hh:mm yyyy/mm/dd by default) of the 5-minute interval being displayed.
Ambient Temp	The Ambient Temp field displays the 5-minute average of the ambient temperature (°C).
Ambient Pres	The Ambient Pres field displays the 5-minute average of the ambient pressure (mmHg).
Flow A-D	The Flow A-D field displays the 5-minute averages of the various flow rates (l/min).

9.3. Input Data Screen

The Partisol Speciation Sampler stores averaged meteorological and input data at the interval specified by the user in the Average Time field of the System Setup screen (Section 7.2.1). The default averaging/storage interval is 30 minutes. The sampler has the capacity to retain 32 days of input data before it overwrites the oldest records. The unit displays input data records in the Input Data screen (Figure 9-8).

While in the Interval Data screen (Figure 9-7), press <F4: InptDat> to reach the Input Data screen.

The Input Data screen contains the following information:

Stat	The Stat field in the upper left-hand corner of the screen shows the status conditions encountered during exposure of the sample filter.

Figure 9-8. Input Data screen.

```
Stat:OK        Input Data        Rec: 16
      Record Time: 10:30 1999/11/04
Valid: 000:00       |   AmbT:  22.4 C
Total: 000:00       |   Pres:   755 mmHg
 WSpd:    0.1 km/h  |    %RH:  27.7 %
 WVel:    0.1 km/h  |    AI1:     0.00
 WDir:      0 deg   |    AI2:     0.00
                    |    AI3:     0.00
```

- Rec	+ Rec		FiltDat	DwnLoad

Rec	This field contains the number of the current record, which is displayed in the upper right-hand corner of the screen.
Record Time	This field contains the time/date (hh:mm yyyy/mm/dd by default) at which the sampler stored the current record of input data.
Valid	This field contains the elapsed sampling time within the averaging/storage interval (hh:mm by default) during which the sampler operated normally, i.e., without any status conditions.
AmbT	This field contains the average ambient temperature (°C) recorded during the averaging/storage interval.
Total	This field contains the total sampling time within the averaging/storage interval (hhh:mm by default) during which the sampler drew a sample stream through its cartridge(s). Power outages result in this figure being smaller than anticipated.
Pres	This field contains the average ambient pressure (mm Hg) recorded during the averaging/storage interval.
WSpd	This field contains the average wind speed (km/h) recorded during the averaging/storage interval. This value has meaning only if an optional wind vane/anemometer is attached to the Partisol Speciation Sampler.

%RH	This field contains the average relative humidity (%) recorded during the averaging/storage interval.
WVel	This field contains the vector-based average wind velocity (km/h) recorded during the averaging/storage interval. This value has meaning only if an optional wind vane/anemometer is attached to the Partisol Speciation Sampler.
AI1	This field contains the average of analog input 1 (engineering units) recorded during the sampling period.
WDir	This field contains the vector-based average wind direction (degrees) recorded during the averaging/storage interval. This value has meaning only if an optional wind vane/anemometer is attached to the Partisol Speciation Sampler.
AI2	This field contains the average of analog input 2 (engineering units) recorded during the sampling period.
AI3	This field contains the average of analog input 3 (engineering units) recorded during the sampling period.

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Section 10: Data Input and Output

The Partisol Speciation Sampler provides various capabilities for transmitting data to other devices in digital and analog form. It can also receive information in the form of analog voltages from other hardware, allowing the user to convert these inputs to engineering units. This section describes how to access these features.

Data input and output is accessed from the System Setup screen (Figure 10-1). The contents of the System Setup screen are reviewed in Section 7.2.1. This section describes how to access and use the <F1: I/O> function from the System Setup screen.

Figure 10-1. System Setup screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:   99  Standard Temp:   99
 Average Pres:  999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:        :  Auto Run:        NO
Curr Time: 09:16:28
Curr Date: 99/11/04
```

I/O	Site ID	Passwd		SysInfo
Function Keys in Browse Mode				
I/O	Site ID	Passwd		SysInfo
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

10.1. System Setup I/O Screen

While in the Main screen, press <F3: System> to reach the System Setup screen (Figure 10-1). From the System Setup screen, press <F1: I/O> to display the System Setup I/O screen (Figure 10-2).

The function keys available at the bottom of the System Setup I/O screen provide access to specialized screens for RS232 (<F1: RS232>) and RS485 (<F2: RS485>) output capabilities, analog input (<F3: A/I>), analog output (<F4: A/O>) and Contact Closure (<F5: Contact>) output capabilities. By selecting these function keys, the user can move from one type of I/O screen to another without having to backtrack to the System Setup screen.

Figure 10-2. System Setup I/O screen with the I/O menu available on the bottom of the screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:   99  Standard Temp:   99
 Average Pres:  999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:        :  Auto Run:        NO
Curr Time: 09:16:37
Curr Date: 99/11/04
```

RS232	RS485	A/I	A/O	Contact
Function Keys in Browse Mode				
RS232	RS485	A/I	A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

10.2. Downloading Stored Data

R&P supplies the Partisol Speciation Sampler with AKComm software a 9-to-9 pin computer cable (07-000587) to enable the creation of data files containing stored information on a personal computer (PC). Alternately, other commercially available software may be used to receive and store transferred information on a PC.

10.2.1. RS232 Setup Screen

Set up the sampler for downloading data in the System Setup screen (Figure 10-1). Press <F3: System> from the Main screen to display the System Setup screen. Press <F1: I/O> to display the System Setup I/O screen (Figure 10-2), then <F1: RS232> to enter the RS232 Setup screen (Figure 10-3). Ensure that the parameters displayed in the RS232 Setup screen match the settings of your PC's RS232 port settings. Edit these if necessary.

Figure 10-3. RS232 Setup screen.

```
Stat:OK          RS232 Setup       Mode:STOP
Protocol:           AK  RS-Para1:         52
Baud Rate:        9600  RS-Para2:      75048
Data Bits:           8  RS-Para3:      13010
Parity:           None  RS-Para4:          0
Stop Bits:           1  RS-Para5:          0
Flow Ctrl:        None  RS-Para6:          0
```

SetPRC	RS485	A/I	A/O	Contact
Function Keys in Browse Mode				
SetPRC	RS485	A/I	A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp		

The RS232 Setup screen defines the configuration of the RS232 port on the front panel of the Partisol Speciation Sampler (Figure 10-4).

Figure 10-4. Connector panel on front panel of Partisol Speciation Sampler.

1: RS485 connector.
2: RS232 connector.
3: User I/O connector.

Depending upon the definition of the parameters in this screen, the RS232 port can be used either for advanced two-way serial communication (AK Protocol or German Ambient Network Protocol) or one-way transmission from the instrument to another device. The following parameters define the operation of the RS232 port:

NOTE: For the fields described below, press <F1: -List> or <F2: +List> when in the Edit Mode to scroll through the list of choices.

Baud Rate — This field contains the data transmission rate (baud), which may be set to 1200, 2400, 4800, 9600, 19200 or 38400 baud (9600 is the default).

Data Bits — This field contains the word length (bits), which may be either 5, 6, 7, or 8 bits (8 is the default).

Parity — This field contains the parity of data transmission, which can be defined as “None,” “Even” or “Odd” (None is the default).

Stop Bits — This field contains the number of stop bits for each character transmitted, ranging from 1 to 2 (1 is the default).

Flow Ctrl — This field contains the type of communication flow control, which may be either “None” or “Xon/Xoff” (None is the default).

Protocol — This field contains the manner in which the RS232 port is used, according to the following categories:

None. The serial port is not currently defined for any communication. The unit must reside in this mode to download a new version of the system operating software into its Flash memory (Appendix D).

AK. With the unit in this protocol, the RS232 serial port is configured for two-way serial communication using the AK communication protocol (Appendix C). This selection makes use of RS232 parameters 1 to 3 listed in the RS232 Setup screen (Figure 10-3).

Storage. With the unit in this protocol, the user can download information from the sampler’s data storage buffers.

This protocol allows only one-way transmission from the unit to another device. To retrieve data from the unit in this protocol, you must have a software program, such as Hyper Terminal or Pro Comm Plus, already installed on your PC that will capture the data.

RealTime. When in this protocol, the unit downloads user-defined, comma-delimited records of information defined by time intervals. The user defines the program register codes (PRCs, see Appendix B) of the variables to be downloaded in the RS232 RealTime Data screen (Figure 10-5) in the "Data 1" to "Data 12" fields. To reach this screen, press <F1: SetPRC> when in the RS232 Setup screen. To input your required data time interval, you would change the value of the "Intv" field in the RS232 RealTime Data screen. This field will accept values ranging from "0" (no data transmission) to "3,600" seconds. Each transmitted record is date and time stamped. For example, if you entered "10" in the Intv field, during sampling the unit will output one line of data (the actual data values are defined by the user in the Data 1 to Data 12 fields) every 10 seconds. This protocol allows only one-way transmission from the unit to another device, such as a PC. To retrieve data from the unit in this protocol, you must have a software program, such as Hyper Terminal or Pro Comm Plus, already installed on your PC that will capture the data.

Figure 10-5. RS232 Real Time Data screen.

```
   RS232 RealTime Data      Intv:    8
 Data 1:     None   Data 7:     None
 Data 2:     None   Data 8:     None
 Data 3:     None   Data 9:     None
 Data 4:     None   Data 10:    None
 Data 5:     None   Data 11:    None
 Data 6:     None   Data 12:    None
```

Function Keys in Browse Mode				
Function Keys in Edit Mode				
-List	+List	Bksp		

German. The serial port is set up for basic communication functions using the German Ambient Network Protocol (Appendix C).

The correct setting for the Protocol field is dependent upon the user's transfer software.

10.2.2. Downloading Data from the Sampler

Follow these steps to download data from the unit using commercially available data capture software:

✔ Pressing <F5: DwnLoad> while in the Filter Data, Interval Data or Input Data screen is a convenient way to download stored information.

1) **Go to the RS232 Setup screen (Figure 10-3) and set the Protocol field to "Storage" or "RealTime," depending on how you want your data formatted. To change the value of this field, press <EDIT> and then press <F2: +List> until the correct protocol appears in the field. To save this change, press <ENTER>.**
2) **Attach the ends of the 9-to-9 pin computer cable to the RS232 port of the Partisol Speciation Sampler and the RS232 connector of your PC to link the two devices (Figure 10-4).**
3) **Initiate your commercially available data capture software program such as Hyper Terminal or Pro Comm Plus.**
4) **Ensure that your data capture software program is set for the same communications parameters as the Partisol-Plus Sampler. The default settings of the unit is 9600 baud, 8 bit word length, 1 stop bit and no parity. Refer to Appendix C, if you suspect that the unit's parameters have been changed.**
5) **Set the communications software into the appropriate mode, such as the "Data Capture" mode or another similar downloading command.**
6) **On the sampler, define your data output parameters, depending on which protocol that you are using, as follows:**

   a) *Storage protocol.* Go to the screen that identifies the storage buffer that you want to download. You can select the Filter Data screen, Interval Data screen or the Input Data screen (Figure). Each screen has the <F5: DwnLoad> button. If you want to download data from all three storage buffers, you must perform the data download from each screen. For example, if you want to download from the Filter Data screen, press <F5: DwnLoad> while in that screen. In the Download Data screen (Figure 10-6), the Storage field will indicate that the storage buffer being downloaded is the "Filter" storage buffer. Choose the record at which you would like the unit to begin downloading. To select the beginning record, press <F2: -Ptr> or <F3: +Ptr>. This will change the Current Pointer field. Once the correct beginning record is indicated in the Current Pointer field, press <F5: Start>. The unit will download all the data in filter storage buffer beginning at the record number indicated in the Current Pointer field.

b) *RealTime protocol.* From the RS232 Setup screen, press <F3: SetPRC> to go to the RS232 RealTime Data screen (Figure 10-5). In this screen, select the time interval at which you want the data to download during sampling. For example, if you want the unit to download data every 10 seconds, you would input “10” in the Intv field. This field will accept values ranging from “0” (no data transmission) to “3,600” seconds. Then select the program register codes (PRCs) (Appendix B) of the variables that you want to download and input them in the Data 1 through Data 12 fields. To change the PRCs, press <EDIT> and then <F1: -List> and <F2: +List>. When you are finished entering the correct PRCs, press <ENTER> to save your changes. At this point, the unit should automatically begin downloading to your PC.

For two-way communication via modems, an optional 9-to-25 pin modem cable (51-002814) is required to attach the sampler’s 9-pin RS232 port to a modem’s 25-pin connector. Refer to the Service Manual for a listing of the pin assignments on the RS232 connector. For further instructions on connecting the unit to a modem, go to Appendix J.

10.2.3. Download Data Screen

The Filter Data Statistics screen, Filter Data screen, Interval Data screen and the Input Data screen (Section 9), contain the <F5: DwnLoad> key to download stored data through the sampler’s RS232 port to another serial device. Press <F5:DwnLoad> from the Filter Data Statistics screen, Filter Data screen, Interval Data screen or the Input Data screen to display the Download Data screen (Figure 10-6).

The <F5: DwnLoad> keystroke allows the user to download records from the *current* position, or current record being displayed, to the last record recorded by the unit. Pressing <F5> again prior to completing the download cancels the data transfer.

The Download Data screen provides information on the current position, or current record being displayed, and other available records.

Figure 10-6. Download Data screen.

```
              Download Data
            Storage:   Filter      Rec #
   First Record: 11:09 1999/11/02     0
Current Pointer: 11:09 1999/11/02     0
    Last Record: 17:52 1999/11/02   199
```

First	- Ptr	+ Ptr	Last	DwnLoad
Function Keys in Browse Mode				
First	- Ptr	+ Ptr	Last	DwnLoad
Function Keys in Edit Mode				
-List	+List	Bksp		

The Data Download screen contains the following information:

Storage — This field contains the data type being downloaded: Filter Data, Interval Data or Input Data.

First Record — This field contains the time and date of the first record of stored data.

Current Pointer — This field shows the time and date of the record at the position of the current pointer. Data will be downloaded *starting at this record number*. Pressing <F2: +Ptr> or <F3: -Ptr> will increment or decrement the current pointer record number. Pressing <F1: First> will move the pointer to the first record number.

Last Record — This field indicates the time and date of the last record of stored data. An uninterrupted data download will transfer all data records from the position of the current pointer to the last stored record.

Pressing <F5: DwnLoad> from this screen will download the selected data type (Filter, Interval or Input data) from the position of the current pointer to the last record of stored data.

10.3. Format of Filter Data Records

Each record of filter data contains the comma-delimited data fields shown below. Records are separated from each other by the “carriage return” (ASCII 013) and “line feed” (ASCII 010) characters.

Each filter data record contains:

Channel Number (2 character string)
Cartridge ID (7 character string)
Cartridge Type (1 character string)
Status Codes (hexadecimal summation)
Set Start Date (yyyy/mm/dd)
Set Start Time (hh:mm)
Actual Start Date (“yyyy/mm/dd”)
Actual Start Time (hh:mm)
Set Stop Date (“yyyy/mm/dd”)
Set Stop Time (hh:mm)
Actual Stop Date (“yyyy/mm/dd”)
Set Stop Time (hh:mm)
Total Sampling Time (hhh:mm)
Valid Sampling Time (hhh:mm)
Minimum Flow (volumetric l/min)
Average Flow (volumetric l/min)
Maximum Flow (volumetric l/min)
Flow Coef of Variation (%)
Sampled Volume (m^3)
Minimum Ambient Temperature (°C)
Average Ambient Temperature (°C)
Maximum Ambient Temperature (°C)
Minimum Ambient Pressure (mm Hg)
Average Ambient Pressure (mm Hg)
Maximum Ambient Pressure (mm Hg)
Minimum Ambient RH (%)
Average Ambient RH (%)
Maximum Ambient RH (%)
Average Wind Speed (km/h)
Average Wind Velocity (km/h)
Average Wind Direction (degrees)
Average Analog Input 1 (engineering units)
Average Analog Input 2 (engineering units)
Average Analog Input 3 (engineering units)
Site ID1 (32 character string)

✔ The sampler includes these power interruption fields only for the number of events that occurred (up to 10).

Site ID2 (32 character string)
Power Failure Date (“yyyy/mm/dd”)
Power Failure Time (hh:mm)

The number of fields in each record of filter data varies, depending upon the number of power interruptions recorded. If the sampler did not experience any power interruptions during sampling, the unit omits all of the power interruptions fields shown above. Otherwise, filter data records contain fields for only the number of power interruptions encountered.

10.4. Format of Interval Data Records

Each record of interval data contains the comma-delimited data fields shown below. Records are separated from each other by the “carriage return” (ASCII 013) and “line feed” (ASCII 010) characters.

Each interval data record contains:

Date at End of 5-Minute Period (“yyyy/mm/dd”)
Time at End of 5-Minute Period (hh:mm)
5-Minute Average Ambient Temperature (°C)
5-Minute Average Ambient Pressure (mm Hg)
5-Minute Average Flow A (volumetric l/min)
5-Minute Average Flow B (volumetric l/min)
5-Minute Average Flow C (volumetric l/min)
5-Minute Average Flow D (volumetric l/min)

10.5. Format of Input Data Records

Each record of input data contains the comma-delimited data fields shown below. Records are separated from each other by the “carriage return” (ASCII 013) and “line feed” (ASCII 010) characters.

Each input data record contains:

Storage Date of Input Data Record (“yyyy/mm/dd”)
Storage Time of Input Data Record (hh:mm)
Status Codes (hexadecimal summation)
Valid Sampling Time (hhh:mm)
Total Sampling Time (hhh.mm or hhh:mm)

Average Ambient Temperature (°C)
Average Ambient Pressure (°C)
Average Ambient RH (%)
Average Wind Speed (km/h)
Average Wind Velocity (km/h)
Average Wind Direction (degrees)
Average Analog Input 1 (engineering units)
Average Analog Input 2 (engineering units)
Average Analog Input 3 (engineering units)

10.6. Analog Input Conversions

The User I/O connector on the front panel of the Partisol Speciation Sampler (Figure 10-4) allows the unit to receive three 0-5 VDC analog inputs from external sources.

The pin assignments of these inputs are as follows:

Input Channel 1	Positive Pin 14	Ground Pin 1
Input Channel 2	Positive Pin 3	Ground Pin 15
Input Channel 3	Positive Pin 17	Ground Pin 4

Refer to the Service Manual for a complete listing of pin assignments in the external connectors of the Partisol Speciation Sampler.

The Analog Input Setup screen (Figure 10-7) allows the user to convert the input voltage levels into engineering units for display, averaging and storage. From the Main screen, press <F3: System>, <F1: I/O> and then <F3: A/I> to display the Analog Input Setup screen.

The sampler uses the following formulas to convert voltage level inputs (0-5 VDC) to engineering units, where “x” is the voltage being received:

$$\text{Calculated Value} = A + Bx + Cx^2$$

The Analog Input Setup screen allows the user to enter unique values for constants A, B and C for each channel of analog input. The calculated values shown at the bottom of the screen are the current results computed by the sampler using the A, B and C constants entered by the user.

For example, the user would assign a value of 0 to constant A, 200 to constant B, and 0 to constant C to convert a 0-5 VDC analog input voltage corresponding to an ozone concentration of 0-1,000 ppb (analog input 1 in Figure 10-7). The sampler shows results from implementing these constants on the bottom line of the Analog Input Setup screen, 19.63 ppb in this example.

The logic level outputs of 0 or 5 VDC are transmitted through the User I/O connector on the front panel of the Partisol Speciation Sampler (Figure 10-4). The two channels have the following pin assignments (consult the Service Manual for a complete listing of connector definitions):

Channel 1	Logic Output Pin 11	Ground Pin 13
Channel 2	Logic Output Pin 25	Ground Pin 24

Figure 10-7. Analog Input Setup screen.

```
Stat:OK         A/I Setup      Mode:STOP
       Const A    Const B    Const C
 1:     0.0000   200.0000     0.0000
 2:     0.0000   200.0000     0.0000
 3:     0.0000   100.0000     0.0000
Calculated Values     A/I Mode: SING
 1: 19.6294 2:  8.7125  3:  1.1384
```

RS232	RS485		A/O	Contact
Function Keys in Browse Mode				
RS232	RS485		A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

10.7. Analog Voltage Output

The User I/O connector on the front panel of the Partisol Speciation Sampler (Figure 10-4) provides the hardware connections to analog voltage output (described below), analog voltage input and to user-defined logic level outputs described in Sections 10.3 and 10.6.

While in the Main screen, press <F3: System> to reach the System Setup screen (Figure 10-1). From the System Setup screen, press <F1: I/O> to display the System Setup I/O screen (Figure 10-2). From the System Setup screen, press <F4: A/O> to reach the Analog Output screen (Figure 10-8).

Figure 10-8. Analog Output Setup screen.

```
Stat:OK         A/O Setup      Mode:STOP
  Variable   MinVal   MaxVal    Format
1      None     0.00     0.00   0-5 VDC
2      None     0.00     0.00   0-5 VDC
3      None     0.00     0.00   0-5 VDC
```

RS232	RS485	A/I		Contact
Function Keys in Browse Mode				
RS232	RS485	A/I		Contact
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

The Analog Output Setup screen (Figure 10-8) allows the user to define the output of three voltage signals through the User I/O port. For each channel of output, the user specifies the following parameters in the Edit Mode:

Variable — This field contains the program register code (PRC) (Appendix B) of the variable whose current value is to be transmitted. To enter the desired variable, the user may press either the <F1: -List> and <F2: +List> soft function keys while in the Edit Mode, or may enter the numeric PRC itself. Pressing <F3: Bksp> allows the user to “backspace” over previously typed characters.

MinVal — This field contains the value of the PRC variable that corresponds to the minimum analog voltage output (0% of full scale output).

MaxVal — This field contains the value of the variable that corresponds to the maximum analog voltage output (100% of full scale output).

Format — This field contains the type of analog or current output selected. The range of choices includes 0-1, 0-2, or 0-5 VDC. Press <F1: -List> and <F2: +List> when in the Edit Mode to choose the desired output format. The default setting for output format is 0-5 VDC.

For voltage output, the minimum input impedance is 10 KΩ.

The pin assignments on the User I/O connector for analog output are as follows (see the Service Manual for complete listing of pin-out definitions):

Output Channel 1	Positive Pin 9	Ground Pin 21
Output Channel 2	Positive Pin 20	Ground Pin 7
Output Channel 3	Positive Pin 6	Ground Pin 18

Pressing <F1: RS232>, <F2: RS485>, <F3: A/I> or <F5: Contact> allows the user direct access to the other output-related screens without having to return to the Setup screen.

10.8. RS485 Input/Output

An RS485 port on the front panel of the Partisol Speciation Sampler (Figure 10-4) provides future connection options with other R&P instrumentation. While in the Main screen, press <F3: System> to reach the System Setup screen (Figure 10-1). From the System Setup screen, press <F1: I/O> to display the System Setup I/O screen (Figure 10-2). From the System Setup I/O screen, press <F2: RS485> to display the RS485 Setup screen (Figure 10-9).

The RS485 Setup screen contains one user-definable field, defined as follows:

Station — This field contains the address of the ChemSpec sampler for the purpose of RS485 communication.

Figure 10-9. RS485 Setup screen.

```
Stat:OK        RS485 Setup      Mode:STOP

 Station: 11
```

RS232		A/I	A/O	Contact
Function Keys in Browse Mode				
RS232		A/I	A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp		

10.9. Logic Level Output

The Partisol Speciation Sampler provides two user-definable, logic level outputs on the User I/O connector on the front panel of the sampler (Figure 10-4) with a voltage level of either 0 or 5 VDC. The user defines the conditions in the Contact Closure Setup screen (Figure 10-10) under which each of these channels reads 0 or 5 VDC. This programmability provides the user with the ability to tailor the outputs to a variety of alarm conditions that may vary from site to site.

While in the Main screen, press <F3: System> to reach the System Setup screen (Figure 10-1). From the System Setup screen, press <F1: I/O> to display the System Setup I/O screen (Figure 10-2). From the System Setup I/O screen, press <F5: Contact> to display the Contact Closure Setup screen.

For each output channel defined in the Contact Closure Setup screen, the unit performs an evaluation of a program register code's (PRC) current value. This test can include a bit-wise operator ("AND" or "OR") for integer variables such as the current status condition, a comparison operator (<, <=, =, >=, > and <>), and a constant with which the unit compares the resulting value of the left-hand operations. *If the result of the comparison for an output channel is "true" the unit transmits 5 VDC; otherwise, the voltage transmitted by an output channel is 0 VDC.*

Figure 10-10. Contact Closure Setup screen.

```
Stat:OK       Contact Closure Setup

  Variable BitOp   BitVal  Comp CompVal
1     None  AND         0   <     0.00
2     None  AND         0   <     0.00
```

RS232	RS485	A/I	A/O	
Function Keys in Browse Mode				
RS232	RS485	A/I	A/O	
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

The screen contains the following user-definable fields for each channel of logic level output:

NOTE: When in the Edit Mode, press <F1: -List> and <F2: +List> to select from a list of predefined settings for Variable, BitOp and Comp.

Variable This is the PRC (Appendix B) of the variable whose current value is to be tested by the unit.

BitOp If the variable selected is an integer, the user can apply a bit-wise "AND" or "OR" mask to its value. For example, if the user would like to test for a filter temperature range 1 or 2 error (H800 and H1000, PRC 5), the values of the contact closure parameters would be:

Variable	5	Program register code for "StatCode" (Appendix B).
BitOp	AND	Use the bit-wise "AND" operator to mask the variable.
BitVal	6144	The sum of status codes 2048 and 4096 (R1 and R2).
Comp	=	Equal to
CompVal	0	The value of the left-hand side is equal to "0" if neither status code 2048 (H800) nor 4096 (H1000) is currently active.

In this case, the TTL output level is 5 VDC if neither status condition is currently active, and 0 VDC if either status code occurs. Refer to the Service Manual for a definition of the pins in the User I/O connector.

✔ Select "OR" as the BitOp and "0" as the BitVal if no masking is desired. Masking is only performed with integer program register codes (PRCs).

BitVal The value that is masked against the variable using the "AND" or "OR" operator. Select "OR" as the BitOp and "0" as the BitVal if no masking is desired.

Comp — The type of comparison performed between the result of the left-hand operations and the constant entered at the right. The comparison operator is defined as one of the following:

< Less than
<= Less than or equal to
= Equal to
>= Greater than or equal to
> Greater than
<> Not equal to.

CompVal — The constant against which the result of the left-hand operations are compared to determine a value of true (0 VDC) or false (5 VDC). In Figure 9-9, the value of the left-hand side is equal to 0 if neither status code 2048 (H800) nor 4096 (H1000) is currently active. In this case, the TTL output is 5 VDC; otherwise, it is 0 VDC.

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Section 11: Password Protection

Access to program features of the Partisol Speciation Sampler can be restricted through the use of passwords. This section describes how to access this feature.

Password protection is accessed from the System Setup screen. The contents of this screen are reviewed in Section 7.2.1, while this section describes how to use the <F5: Passwd> function.

While in the System Setup screen (Figure 11-1), press the <F3: Passwd> key to display the Password Setup screenThe user may redefine the low and high level passwords while in this screen.

Figure 11-1. System Setup screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:   99  Standard Temp:   99
 Average Pres:  999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:        :  Auto Run:        NO
Curr Time: 09:16:28
Curr Date: 99/11/04
```

I/O	Site ID	Passwd		SysInfo
Function Keys in Browse Mode				
I/O	Site ID	Passwd		SysInfo
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

11.1. Password Protection

The Password Setup screen (Figure 11-2) is displayed by pressing <F4: Passwd> while in the System Setup screen. The Partisol Speciation Sampler offers two levels of password protection to guard against unauthorized use of the unit. Under normal conditions, the unit operates with password protection turned off.

Figure 11-2. Password Setup screen.

```
Stat:OK       Password Setup    Mode:STOP

Cur Lo Psw: ******   Cur Hi Psw: ******
New Lo Psw: ******   New Hi Psw: ******
Confirm Lo: ******   Confirm Hi: ******
```

Function Keys in Browse Mode				
Function Keys in Edit Mode				
		Bksp		

The two levels of password protection are defined as follows:

Low — When in the low protection state, the sampler prevents the user from entering the Edit Mode. Execute the following keystrokes while in the Browse Mode to initiate or disable the low protection state:

<ENTER>, <ENTER>, LoPassword, <ENTER>

If the password protection is successfully invoked or revoked, the unit will beep twice. An “L” in the field farthest to the right of the soft function key line (Figure 11-3) in the Main screen indicates that the unit is in the low protection state.

Figure 11-3. Main screen with low password protection turned on.

```
Stat:OK       Partisol 2300    Mode:STOP
           09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
```

StCode	Stats	System	Sample	Data	L

High

When in the high protection state, the sampler prevents the user from editing values and changing screens. Execute the following keystrokes while in the Browse Mode to initiate or disable the high protection state:

<ENTER>, <ENTER>, <ENTER>, HiPassword, <ENTER>

If the password protection is successfully invoked or revoked, the unit will beep three times. An "H" in the farthest field to the right of the soft function key line (Figure 11-4) indicates that the unit is in the high protection state.

Figure 11-4. Main screen with high password protection turned on.

```
Stat:OK      Partisol 2300    Mode:STOP
         09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
StCode | Stats | System | Sample | Data | H
```

The initial passwords for both low and high protection is "100000." The user may move from low to high protection using the keystrokes above for the high protection state. When the user turns off high protection, the unit always reverts to its unprotected state.

The user may change the low and high passwords in the Password Setup screen (Figure 11-2). To reach this screen from the Main screen, press <F3: System> and then <F3: Passwd>. After entering this screen, the user can move the cursor only to the fields labeled "Cur Lo Psw" and "Cur Hi Psw."

To change the low password, enter the value of the current low password in the Cur Lo Psw field while in the Edit Mode. The unit then provides access to the New Lo Psw and Confirm Lo fields, in which the user must now enter the *new* low password twice. Press <ENTER> to leave the Edit Mode and to save your new low password. The sampler should beep twice to indicate that the password has been successfully changed.

If you do not enter a new low password correctly, the unit will not beep when you press <ENTER> and the cursor will move back to the line labeled “New Lo Psw.” Press <ESC> to leave the Password Setup screen in case of difficulties.

To change the high password, enter the value of the current high password in the Cur Hi Psw field while in the Edit Mode. The unit then provides access to the New Hi Psw and Confirm Hi fields, in which the user must now enter the *new* high password twice. Press <ENTER> to leave the Edit Mode and to save your new high password. The sampler should beep three times to indicate that the password has been successfully changed.

If you do not enter a new high password correctly, the unit will not beep when you press <ENTER> and the cursor will move back to the line labeled “New Hi Psw.” Press <ESC> to leave the Password Setup screen in case of difficulties.

> NOTE: Password protection can be turned on or off from any screen.

11.2. Resetting Low and High Passwords

If you misplace or forget the low and high passwords, you can reset both high and low passwords to “100000” by pressing <F4> when the unit displays the Title screen (Figure 11-5). Note that <F4> is not labeled with any text – this is a precaution taken to guard against unwanted use of this feature. Resetting the low and high passwords does not affect the current protection state of the unit , and does *not* change any of the sampler’s other parameters.

Figure 11-5. Title screen.

```
              Partisol 2300
   12 Channel Speciation Air Sampler
  Version:  0.700   Date: Nov  2 1999

             Copyright 1999
    Rupprecht & Patashnick Co., Inc.
RDfault | RData |       |       | Reset
```

Section 12: Verification Procedures and Routine Maintenance

This section explains how to enter the Service Mode and calibrate your Partisol Speciation Sampler's ambient air temperature and pressure and flow channels.

12.1. Verification Procedures

The following verification procedures use the sampler's Audit screen which is accessed through the Service Mode while the unit is in the Stop Mode. However, you may perform an audit and leak check while the unit is in the Wait or Sampling modes by pressing <RUN/STOP>.

12.1.1. Entering the Service Mode — Stop Mode

Follow these steps to enter the Service Mode while in the Stop Mode:

1) **When the unit is in Stop Mode, press <MENU> to enter the Master Menu screen (Figure 12-1).**

Figure 12-1. Master Menu screen.

```
              Master Menu
> Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
  Service Mode
 StCode |        |        |        |
```

2) **While in the Master Menu screen, press the down arrow (↓) until "Service Mode" is selected. Press <ENTER>. The unit will then display the Service Mode Confirmation screen (Figure 12-2).**

Figure 12-2. Service Mode Confirmation screen.

```
              Master Menu
  Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
> Service Mode
      Are you sure?      |  Yes  |  No
```

3) Press <F3: Yes>. The unit will now display the Service Menu screen (Figure 12-3).

Figure 12-3. Service Menu screen.

```
              Service Menu
> System Maintenance Routines
  Manual Motion Tests
  Calibration
  Low Level System Info
  Download System Log
  Exit Service Mode
```

Audit	SysChck			

4) To enter the Audit screen while in the Service Menu screen, press the down arrow (↓) until “>System Maintenance Routines” is selected. Press <F1: Audit> to enter the Audit screen (Figure 12-4).

Figure 12-4. Audit screen.

```
Stat:OK        Flow Audit      Mode: SVC
Chnl SetPoint  Current  Actual  FTS Pres
 1A     0.0      0.10     0.00     0.000
Amb P: 756 T:  23.7 FTS Const m:  0.0000
Vac P: 000          FTS Const b:  0.0000
```

- Chan	+ Chan		LeakChk	Audit
Function Keys in Browse Mode				
- Chan	+ Chan		LeakChk	Audit
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

12.1.2. Entering the Service Mode — Wait or Sampling Modes

Follow these steps to enter the Service Mode while in the Wait or Sampling modes:

1) **When the unit is in Wait or Sampling modes, press <RUN/STOP> to perform an audit. The unit will display the Audit Confirmation screen (Figure 12-5).**

Figure 12-5. Audit Confirmation screen.

```
Stat:OK      Partisol 2300     Mode:WAIT


      Do you want to AUDIT or STOP?

             Please choose:
```

Audit	Stop			Resume

2) **While in the Audit Confirmation screen, press <F1: Audit>. The unit will display the Audit Directions screen (Figure 12-6).**

Figure 12-6. Audit Directions screen.

```
Stat:OK      Partisol 2300     Mode:AUDT

Press MENU key to go to the audit screen
      or to perform a leak check.

        Press any key to continue
```


3) **While in the Audit Directions screen, press any key to continue. This will display the Audit Menu screen (Figure 12-7).**

Figure 12-7. Audit Menu screen.

```
              System Maintenance
>Audit
 System Check
```


4) While in the Audit Menu screen, press the down arrow (↓) until “>Audit” is selected. Press <ENTER>. The unit will then display the Audit screen (Figure 12-4).

5) When you have completed your audit procedures, press <RUN/STOP> to resume sampling.

12.1.3. Verifying the Ambient Air Temperature

Follow these steps to verify the ambient air temperature:

1) Ensure that the Audit screen (Figure 12-4) is displayed on the sampler’s keypad.

2) Determine the current temperature (°C) at the ambient temperature sensor using an external thermometer, [°C = 5/9 x (°F - 32)].

3) Verify that the value of Amb Temp displayed in the Audit screen is within ± 2° C of the measured temperature. If this is not the case, perform the ambient temperature calibration procedure described in the Service Manual.

12.1.4. Verifying the Ambient Pressure

Follow these steps to verify the ambient pressure:

1) Ensure that the Audit screen (Figure 12-4) is displayed on the sampler’s keypad.

2) Determine the current ambient station pressure in mm Hg (absolute pressure, not corrected to sea level). Verify the sampler’s ambient pressure by measuring the current ambient station

pressure in mm Hg with an external measurement device.

- To convert from Atmospheres @ 0° C to mm Hg, multiply by 760.
- To convert from millibars to mm Hg, multiply by 0.75012.
- To convert from inches Hg @ 32° F to mm Hg, multiply by 25.4.

3) Verify that the value for Amb Pres in the Audit screen is within ±10 mm Hg of the measured ambient pressure. If this is not the case, perform the ambient pressure calibration procedure described in the Service Manual.

12.1.5. Leak Check

Follow these steps to perform a leak check:

1) While in the Audit screen (Figure 12-4), press <F4: LeakChk> to begin the leak check procedure.

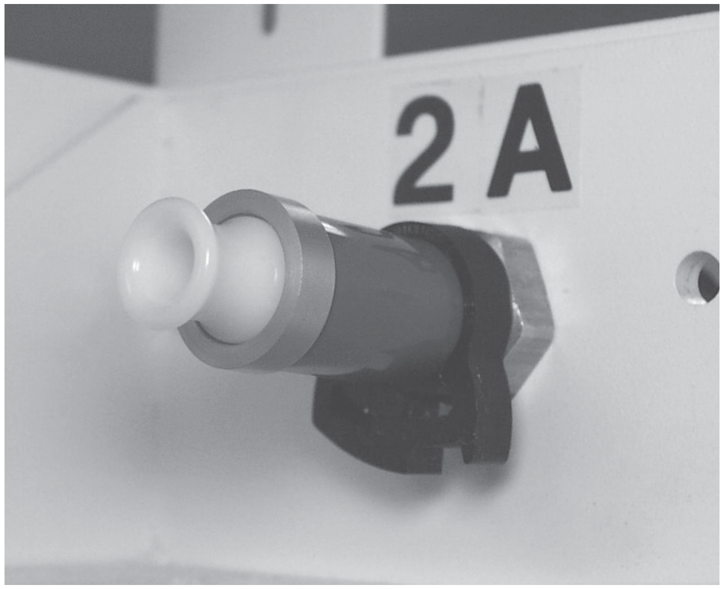
2) The unit will prompt you to remove the cartridge that is on the flow channel which is being checked, and to install a leak plug on that flow channel (Figure 12-8). The flow channel that is being checked is identified under “Chnl” in the Audit screen. Install a leak plug on the proper channel (Figure 12-9).

Figure 12-8. Leak Check Prompt screen.

```
Stat:OK         Flow Audit       Mode: SVC
        Remove cartridge from Channel 1A
               and seal the inlet.

             Press any key to continue
```

Figure 12-9. Leak plug installed in flow channel.



3) After you have installed a leak plug on the proper flow channel, press any key on the keypad to begin the leak check. The unit will automatically perform a leak check. If a “Pass” message is displayed at the end of the leak check cycle, press <F2: + Chan> to switch the unit to the next flow channel. If a “Fail” message is displayed, refer to the Service Manual.

4) Re-install a cartridge on the flow channel that passed the leak check. Press <F4: LeakChk> to begin the leak check procedure on the next flow channel, and follow the instructions on the unit’s screen. Repeat the leak check procedure for all of the flow channels.

12.1.6. Verifying the Flow Rates

Perform the temperature verification (Section 12.1.3), pressure verification (Section 12.1.4) and leak check (Section 12.1.5) before executing the flow verification procedure.

Follow these steps to verify the flow rate:

1) Ensure that the unit is set on the flow channel that you want to verify. While in the Audit screen (Figure 12-4), press <F5: Start> and follow the instructions displayed on the unit’s screen. The unit will automatically verify the flow rate.

2) A “Pass” or “Fail” message will display at the end of the flow verification procedure.If a “Fail” message is displayed, refer to the Service Manual. If a “Pass” message is displayed at the end of the flow verification procedure, proceed to step 3.

3) Press <F2: + Chan> to switch the unit to the next flow channel. Press <F5: Start> and follow the instructions displayed on the unit’s screen. Repeat the flow verification procedure for all of the flow channels.

12.2. Routine Maintenance Procedures

12.2.1. ChemComb Maintenance

O-Ring Maintenance

New ChemComb O-rings require a thin coating of silicon vacuum grease. Periodically re-grease the O-rings as needed.

Follow these steps to apply grease to the O-rings:

1) Clean the O-rings with a moist Kimwipe, if necessary.

2) Place a small amount of grease on end of your index finger and rub it onto the O-ring. Use your thumb and index finger to spread the grease until it covers the entire surface of the O-ring.

3) Wipe the excess grease from your fingers, and then use your cleaned fingers to rub any excess grease from O-rings.

12.2.2. Other Routine Maintenance

The routine maintenance of the Partisol Speciation Sampler consists of the following procedures performed at the indicated intervals:

Leak check	Perform a leak check after every 4 weeks of use.
Rainhoods	Clean the air screens located under the sampler’s rainhoods every 6 months, or as necessary.

Batteries	Check the voltage level of the batteries on the main computer board in the electronics compartment every 6 months (see Service Manual).
Pump	The pump in the Speciation Sampler has a lifetime of approximately 12-18 months. If the pump's performance deteriorates, it should be rebuilt using the Partisol Pump Rebuild Kit (59-007837) (two kits are required for each rebuild), or replaced with a new pump (R&P part number 54-006528-0120).

Section 13: Resetting the Sampler

The Partisol Speciation Sampler's operating parameters can be easily reset to their default values. This section reviews the different types of reset capabilities available to the user.

The Title screen (Figure 13-1) provides the user access to the unit's reset functions (also see Section 11 for a discussion of the Title screen). With this screen displayed, the user can press one of the soft function keys to implement the desired type of reset. The user should use these capabilities with care, because information can be inadvertently lost if you select the incorrect reset key.

13.1. Resetting Operating Parameters

Pressing <F1: RDfault> while in the Title screen (Figure 13-1) causes the sampler to reset most of its operating parameters to their default settings. Refer to Appendix B for a list of the sampler's parameters and their corresponding program register codes (PRCs) and default values. If you choose this selection, it does *not* clear the sampler's data storage or channel definitions.

Figure 13-1. Title screen.

```
              Partisol 2300
   12 Channel Speciation Air Sampler
  Version:  0.700   Date: Nov  2 1999

             Copyright 1999
    Rupprecht & Patashnick Co., Inc.
```

RDfault	RData			Reset

13.2. Sampler Default Settings

The following list is an example of some of the sampler's default settings. A complete description of all default settings is found in Appendix B.

Standard temperature	99
Standard pressure	999
Average temperature	99
Average pressure	999
Comm baud rate	9600

Comm word length	8
Comm stop bits	1
Comm parity	none
Comm flow control	none
Comm protocol	AK
Current low password	100000
Current high password	100000
Current password protection	none
Flow calibration reading	0 l/min
# points in flow calibration	3
Flow calibration minimum	15 l/min
Flow calibration maximum	18.4 l/min
FTS pressure	0" H_2O
FTS constant m	0
FTS constant b	0
Flow set point	10 l/min
Input data averaging period	30 min
Date format	yy/mm/dd
Time format	hh:mm
Default start time	00:00
Default duration	24:00
Default repeat time	24:00
Default filter type	P
Sampling type	Basic
Sampling start time	00:00
Sampling stop time	00:00
Site ID 1	0
Site ID 2	0
Flow mode	Err

13.3. Resetting Data Storage

Pressing <F2: RData> while in the Title screen (Figure 13-1) causes the sampler to clear the filter data, interval data and input data storage buffers. If you choose this selection, it does *not* clear the sampler's operating parameters or channel definitions.

13.4. Resetting Low and High Passwords

If you misplace the low and high passwords, you can reset both of these to “100000” by pressing <F4> when the unit displays the Title screen (Figure 13-1). Note that <F4> is not labeled with any text – this is a precaution taken to guard against unwanted use of this feature. Resetting the low and high passwords does not affect the current protection state of the unit and does *not* change any other instrument parameters.

13.5. Resetting All Instrument Parameters

> **IMPORTANT:** Extreme care must be used when exercising this command. Pressing <F5: Reset> will erase all of the sampler’s calibration constants. *Record all calibration constants (offset and span) from the samplers calibration screens* (Sensor Calibration, Filter Calibration and Flow Calibration screens) before pressing <F5: Reset>.

Pressing <F5: Reset> while in the Title screen (Figure 13-1) causes the unit to reset *all* of its operating parameters to their default conditions. This also clears the system’s data storage buffers, including the calibration constants.

After resetting the sampler, calibration constants can be re-entered in the appropriate calibration screen by pressing <EDIT>, entering the offset and span (where applicable) and pressing <ENTER>.

The sampler will require re-calibration only if the calibration constants have not been re-entered by the user.

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Section 14: Service Menu

The Service menu provides the user with access to a large number of screens used for operational, verification, calibration, diagnostic and informational purposes.This menu is only available when the unit is in the Service Mode.

14.1. Entering the Service Mode

To enter the Service Mode, press <MENU> on the display/keypad when the sampler is in the Stop Operating Mode (Section 7). This causes the Master Menu screen (Figure 14-1) to be displayed. Then use the arrow keys (↓ and ↑) to move the screen's selection indicator to the line labeled "Service Mode." With the pointer in this position, press <ENTER>. The unit then displays a Warning/Confirmation screen that asks the user to confirm entry into the Service Mode (Figure 14-2).

Figure 14-1. Master Menu screen.

```
              Master Menu
> Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
  Service Mode
```

StCode				

Figure 14-2. Master Menu screen with Service Mode option selected.

```
              Master Menu
  Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
> Service Mode
```


The unit displays “SVC” as the current operating mode in the top right-hand corner of the Main screen (Section 5) when in the Service Mode. Refer to Section 7 for a description of the unit’s operating modes. Press <MENU> to display the Service Menu screen (Figure 14-3), which provides complete access to the unit’s audit/ calibration, diagnostic and service capabilities. Refer to Appendix A for a complete list of screens available through the Service Menu.

Upon entering the Service Mode, the sampler turns off most of its routine control systems. The Partisol Model 2300 Service Manual contains maintenance and calibration routines that can be performed while in the Service Mode.

Figure 14-3. Service Menu screen.

```
              Service Menu
> System Maintenance Routines
  Manual Motion Tests
  Calibration
  Low Level System Info
  Download System Log
  Exit Service Mode
```

Audit	SysChck			

14.2. Leaving the Service Mode

To leave the Service Mode and return to the normal operation of the sampler, press <MENU>. This causes the Service Menu screen to be displayed (Figure 14-3). Then use the arrow keys (↓ and ↑) to move the screen’s selection indicator to the line labeled “Exit Service Mode.” With the pointer in this position, press <ENTER>. The unit then returns to its usual operating configuration, re-establishing the usual control over its functions.

Appendix A: Overview of Partisol Model 2300 Software Screens

This appendix contains all the software screens displayed by the Partisol Speciation Sampler, along with the hierarchy of screens. The later part of this appendix shows the menu structure and screens contained in the unit's Service Mode.

Figure A-1. Hierarchy of screens.

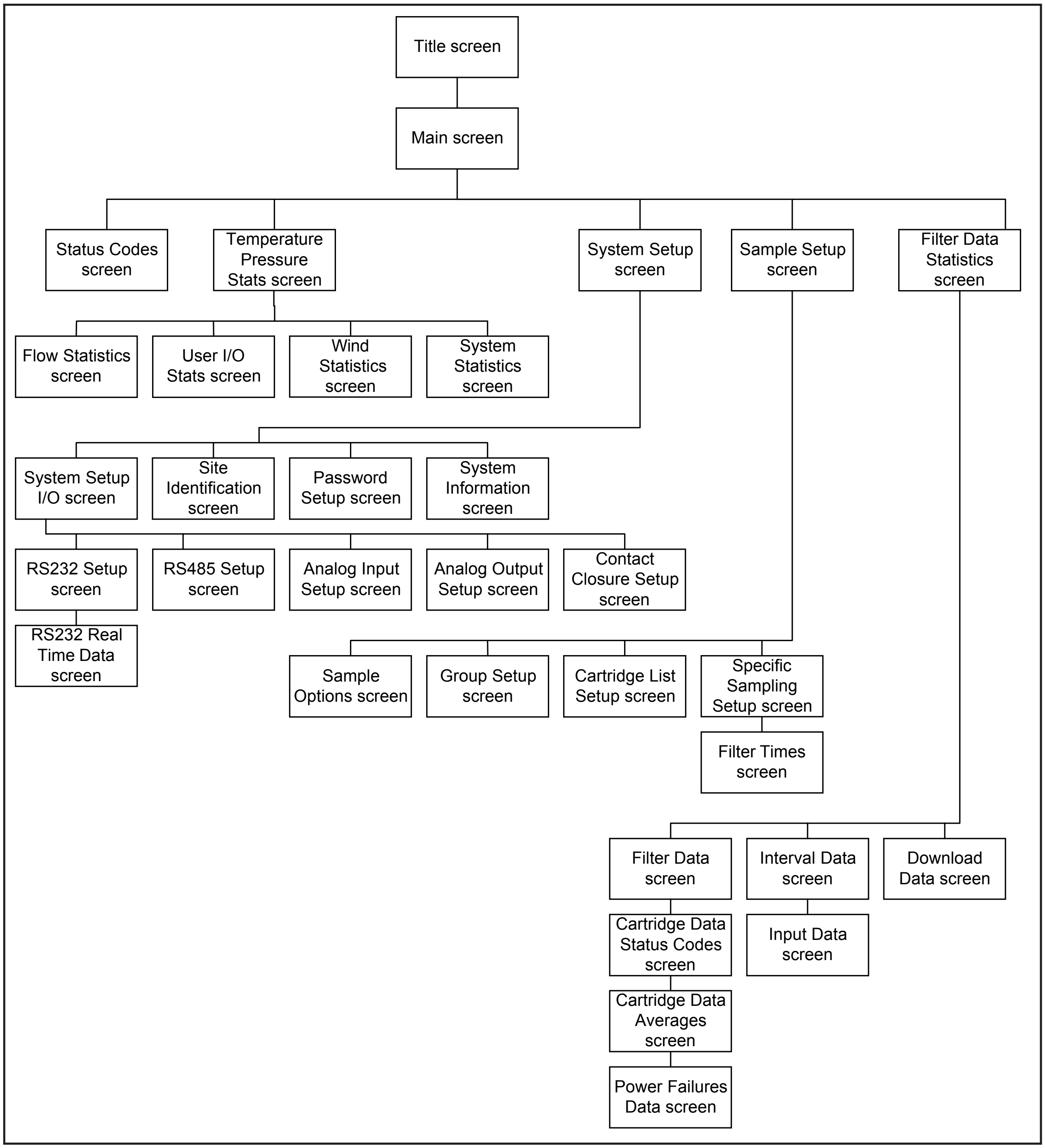

Figure A-2. Title screen.

```
          Partisol 2300
   12 Channel Speciation Air Sampler
  Version:  0.700   Date: Nov  2 1999

          Copyright 1999
    Rupprecht & Patashnick Co., Inc.
RDfault | RData |       |       | Reset
```

Figure A-3. Main screen.

```
Stat:OK       Partisol 2300    Mode:STOP
          09:02:36 1999/11/04
Group      Start    BASIC     Stop
 1    11:24 99/11/04      11:28 99/11/04
 2    11:28 99/11/04      11:32 99/11/04
 3    11:32 99/11/04      11:36 99/11/04
 4    11:36 99/11/04      11:40 99/11/04
StCode | Stats | System | Sample | Data
```

Figure A-4. Status Codes screen.

```
OK            Status Codes          STOP
   OK  No Status Conditions





 Reset  |       |       |       |
```

Figure A-5. Temperature and Pressure Statistics screen.

```
Stat:OK        Temp/Pressure     Mode:STOP

                    Current   Average
   Ambient Temp:    21.3       28.6 C
   Ambient Pres:     754        741 mmHg
    Ambient %RH:    28.3       48.3 %
```

	Flow	User IO	Wind	SysStat

Figure A-6. Flow Statistics screen.

```
Stat:OK         Flow Stats       Mode:STOP

Flow  Setpoint Current   Volume    Time
A       0.0 l/m  0.2 l/m     0.0 l     : 0
B       0.0 l/m  0.1 l/m     0.0 l     : 0
C       0.0 l/m  0.4 l/m     0.0 l     : 0
D       0.0 l/m  0.1 l/m     0.0 l     : 0
```

TmpPres		User IO	Wind	SysStat

Figure A-7. User I/O Statistics screen.

```
Stat:OK          User I/O        Mode:STOP
                    Current   Average
 Analog Input 1:      0.00       0.00
 Analog Input 2:      0.00       0.00
 Analog Input 3:      0.00       0.00
 Logic Output 1:       OFF
 Logic Output 2:       OFF
```

TmpPres	Flow		Wind	SysStat

Figure A-8. Wind Statistics screen.

```
Stat:OK        Wind Stats      Mode:STOP

                  Current   Average
      Wind Speed:      0.1       0.1 km/h
   Wind Velocity:      N/A       0.0 km/h
  Wind Direction:        0         0 deg
```

TmpPres	Flow	User IO		SysStat

Figure A-9. System Statistics screen.

```
Stat:OK        System Stats    Mode:STOP
  Elec Temp:   25.9 C | Elec Heater: OFF
  Pump Temp:   21.6 C | Pump Heater: OFF
Fan In Temp:   21.4 C |   Pump Fan1: ON
                      |   Pump Fan2: ON
                      |       Pump1: ON
                      |       Pump2: ON
```

TmpPres	Flow	User IO	Wind	

Figure A-10. System Setup screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:   99  Standard Temp:   99
 Average Pres:  999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:        :  Auto Run:        NO
Curr Time: 09:16:28
Curr Date: 99/11/04
```

I/O	Site ID	Passwd		SysInfo
Function Keys in Browse Mode				
I/O	Site ID	Passwd		SysInfo
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-11. System Setup I/O screen.

```
Stat:OK       System Setup     Mode:STOP
 Average Temp:    99  Standard Temp:   99
 Average Pres:   999  Standard Pres:  999
Date Form: yy/mm/dd  Average Time:    30
Time Form:         :  Auto Run:        NO
Curr Time: 09:16:37
Curr Date: 99/11/04
```

RS232	RS485	A/I	A/O	Contact
Function Keys in Browse Mode				
RS232	RS485	A/I	A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-12. RS232 Setup screen.

```
Stat:OK        RS232 Setup     Mode:STOP
Protocol:          AK  RS-Para1:       52
Baud Rate:       9600  RS-Para2:    75048
Data Bits:          8  RS-Para3:    13010
Parity:          None  RS-Para4:        0
Stop Bits:          1  RS-Para5:        0
Flow Ctrl:       None  RS-Para6:        0
```

SetPRC	RS485	A/I	A/O	Contact
Function Keys in Browse Mode				
SetPRC	RS485	A/I	A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-13. PRC Settings Warning/Confirmation screen.

```
Stat:OK        RS232 Setup     Mode:STOP

  RS232 protocol needs to be set to
             "RealTime"
    for the PRC settings to work.

      Press any key to continue
```

SetPRC	RS485	A/I	A/O	Contact

Figure A-14. RS232 RealTime Data screen.

RS232 RealTime Data				Intv: 8
Data 1:	None	Data 7:	None	
Data 2:	None	Data 8:	None	
Data 3:	None	Data 9:	None	
Data 4:	None	Data 10:	None	
Data 5:	None	Data 11:	None	
Data 6:	None	Data 12:	None	
Function Keys in Browse Mode				
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-15. RS485 Setup screen.

Stat:OK		RS485 Setup		Mode:STOP
Station: 11				
RS232		A/I	A/O	Contact
Function Keys in Browse Mode				
RS232		A/I	A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-16. Analog Input Setup screen.

```
Stat:OK          A/I Setup       Mode:STOP
       Const A    Const B    Const C
 1:     0.0000     1.0000     0.0000
 2:     0.0000     1.0000     0.0000
 3:     0.0000     1.0000     0.0000
Calculated Values     A/I Mode: XXXX
 1:     0.00  2:      0.00  3:      0.0
```

RS232	RS485		A/O	Contact
Function Keys in Browse Mode				
RS232	RS485		A/O	Contact
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-17. Analog Output Setup screen.

```
Stat:OK          A/O Setup       Mode:STOP
  Variable   MinVal   MaxVal    Format
1      None     0.00      0.00    0-5 VDC
2      None     0.00      0.00    0-5 VDC
3      None     0.00      0.00    0-5 VDC
```

RS232	RS485	A/I		Contact
Function Keys in Browse Mode				
RS232	RS485	A/I		Contact
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-18. Contact Closure Setup screen.

```
Stat:OK       Contact Closure Setup

  Variable BitOp   BitVal  Comp CompVal
1      None  AND         0   <     0.00
2      None  AND         0   <     0.00
```

RS232	RS485	A/I	A/O	
Function Keys in Browse Mode				
RS232	RS485	A/I	A/O	
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-19. Site Identification screen.

```
Stat:OK         Site Identification

Id1: "                                "
Id2: "                                "
```

Function Keys in Browse Mode				
Function Keys in Edit Mode				
		Bksp	A <--	A -->

Figure A-20. Password Setup screen.

Stat:OK	Password Setup			Mode:STOP
Cur Lo Psw: ******		Cur Hi Psw: ******		
New Lo Psw: ******		New Hi Psw: ******		
Confirm Lo: ******		Confirm Hi: ******		
Function Keys in Browse Mode				
Function Keys in Edit Mode				
		Bksp		

Figure A-21. System Information screen.

System Information				
Software Version: 0.700, Nov 2 1999				
Unit Serial Number: 0				
Interface Board Rev: 1				
System Type: 3				
MFC A Max: 20 l/min		MFC B Max: 20 l/min		
MFC C Max: 20 l/min		MFC D Max: 20 l/min		

Figure A-22. Sample Setup screen.

Stat:OK	Sample Setup			Mode:STOP
09:38:11 1999/11/04				
Sample Definition Type:				BASIC
Default Sample Start Time:				11:24
Default Sample Duration:				000:04
Default Sample Repeat Time:				000:04
Default Filter Type:				P
Options	Group	ChanLst	SampSet	
Function Keys in Browse Mode				
Options	Group	ChanLst	SampSet	
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-23. Sample Options screen.

```
Stat:OK        Sample Options    Mode:STOP

        Flow Error Mode:    NEXT
        Continuous Sampling: OFF
        System Check:         ON
```

Function Keys in Browse Mode				
Function Keys in Edit Mode				
-List	+List			

Figure A-24. Group Setup screen.

```
Stat:OK       Group Setup      Mode:STOP
        Channels/Group: 2
         Current Group: 1
              Channels: 12
     /---\
Chan:1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 3C 3D
Grp:  1  1  2  2  3  3  4  4  5  5  6  6
```

- Grp	+ Grp			
Function Keys in Browse Mode				
- Grp	+ Grp			
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-25. Cartridge List Setup screen.

Chan	Group	Type	Cartridge ID	Flow
1A:	1	P	0000000	10.0 l/min
1B:	1	P	0000001	10.0 l/min
1C:	2	P	0000002	10.0 l/min
1D:	2	P	0000003	10.0 l/min
2A:	3	P	0000004	10.0 l/min
2B:	3	P	0000005	10.0 l/min
2C:	4	P	0000006	10.0 l/min
2D:	4	P	0000007	10.0 l/min
3A:	5	P	0000008	10.0 l/min
3B:	5	P	0000009	10.0 l/min
3C:	6	P	0000010	10.0 l/min
3D:	6	P	0000011	10.0 l/min

		Copy	Insert	Delete
Function Keys in Browse Mode				
		Copy	Insert	Delete
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-26. Basic Sampling Setup screen.

```
Stat:OK       Basic Setup      Mode:STOP

         Start Date:   99/11/04

   The current time is: 09:50 99/11/04
  Sample will start at: 11:24 99/11/04
 Each sample will collect for 000:04 hrs
```

Times	+ Day	NextDay	Next Hr	
Function Keys in Browse Mode				
Times	+ Day	NextDay	Next Hr	
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-27. Filter Times screen.

Group	Start		Stop	
1.	11:24	99/11/04	11:28	99/11/04
2.	11:28	99/11/04	11:32	99/11/04
3.	11:32	99/11/04	11:36	99/11/04
4.	11:36	99/11/04	11:40	99/11/04
5.	11:40	99/11/04	11:44	99/11/04
6.	11:44	99/11/04	11:48	99/11/04
7.	11:48	99/11/04	11:52	99/11/04

Figure A-28. Time Sampling Setup screen.

```
Stat:OK         Group:  01       Mode:STOP
      Current Time: 10:12 99/11/04
      Start Sample: 11:24 99/11/04
       Stop Sample: 11:28 99/11/04
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-29. Time 2 Sampling Setup screen.

```
Stat:OK        Group:  01      Mode:STOP
      Current Time: 10:15 99/11/04
        Start Time         Stop Time
  1:  11:24 99/11/04    11:28 99/11/04
  2:  11:28 99/11/04    11:32 99/11/04
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-30. Advanced Sampling Setup screen.

```
Stat:OK        Group:  01      Mode:STOP
      Current Time: 10:16 99/11/04
      Start Sample: 11:24 99/11/04
       Stop Sample: 11:28 99/11/04
       Cond:   TEMP WNDSPD  ------
        Min:  20.00   5.00   0.00
        Max:  25.00  40.00   0.00
```

Times	Prev	Next	Reset	*More*
Function Keys in Browse Mode				
Times	Prev	Next	Reset	*More*
		+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-31. Episodic Sampling Setup screen.

```
Stat:OK       Episodic Setup   Mode:STOP
       Current Time: 10:24 99/11/04
Start Event Capture: 11:24 99/11/04
 Stop Event Capture: 11:28 99/11/04
       Cond:   TEMP   %RH   ------
        Min:  10.00  80.00   0.00
        Max:  40.00  95.00   0.00
```

Times	+ Hour	+ Day	Reset	
Function Keys in Browse Mode				
Times	+ Hour	+ Day	Reset	
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-32. Filter Data Statistics screen.

```
Stat:OK       Filter Times    Rec:199
    Set Sample Start:  17:52 1999/11/02
     Set Sample Stop:  17:56 1999/11/02
 Actual Sample Start:  17:52 1999/11/02
  Actual Sample Stop:  17:52 1999/11/02
  Valid Elapsed Time: 000:00
  Total Elapsed Time: 000:00
```

-Rec	+Rec	MoreDat	IntvDat	DwnLoad

Figure A-33. Filter Data screen.

```
Stat:OK        Filter Data    Rec:199
         Channel: 1B
    Cartridge ID: 0000001 Type: P
          Volume:     0.0 l
             %CV:  0.0
ID1: "                                "
ID2: "                                "
```

-Rec	+Rec	MoreDat	IntvDat	DwnLoad

Figure A-34. Cartridge Data Status Codes screen.

```
            Status Codes       Rec:199
   OK  No Status Conditions
```

-Rec	+Rec	MoreDat	IntvDat	

Figure A-35. Cartridge Data Averages screen.

```
              Averages          Rec:199
        Min   Ave   Max|  Average
Flow:   9.7  10.1  10.4| WSpd:    0.0
AmbT:  23.5  23.6  23.6| WVel:    0.0
Pres:   761   762   762| WDir:      0
 %RH:  85.8  87.5  87.5| AI1:    0.00
                       | AI2:    0.00
                       | AI3:    0.00
```

-Rec	+Rec	MoreDat	IntvDat	

Figure A-36. Power Failures screen.

```
              Power Failures     Rec:199
        No power failures occurred
```

- Rec	+ Rec	MoreDat	IntvDat	

Figure A-37. Interval Data screen.

```
              Interval Data      Rec:102
             Time: 10:40 1999/11/04
     Ambient Temp:  22.5 C
     Ambient Pres:   756 mmHg

Flow A:   0.0 l/min Flow B:   0.0 l/min
Flow C:   0.0 l/min Flow D:   0.0 l/min
```

- Rec	+ Rec		InptDat	DwnLoad

Figure A-38. Input Data screen.

```
Stat:OK        Input Data        Rec: 16
      Record Time: 10:30 1999/11/04
Valid: 000:00       |   AmbT:  22.4 C
Total: 000:00       |   Pres:   755 mmHg
 WSpd:    0.1 km/h  |    %RH:  27.7 %
 WVel:    0.1 km/h  |    AI1:     0.00
 WDir:      0 deg   |    AI2:     0.00
                    |    AI3:     0.00
```

- Rec	+ Rec		FiltDat	DwnLoad

Figure A-39. Download Data screen.

```
              Download Data
           Storage:   Filter      Rec #
   First Record: 11:09 1999/11/02     0
Current Pointer: 11:09 1999/11/02     0
    Last Record: 17:52 1999/11/02   199
```

First	- Ptr	+ Ptr	Last	DwnLoad
Function Keys in Browse Mode				
First	- Ptr	+ Ptr	Last	DwnLoad
Function Keys in Edit Mode				
-List	+List	Bksp		

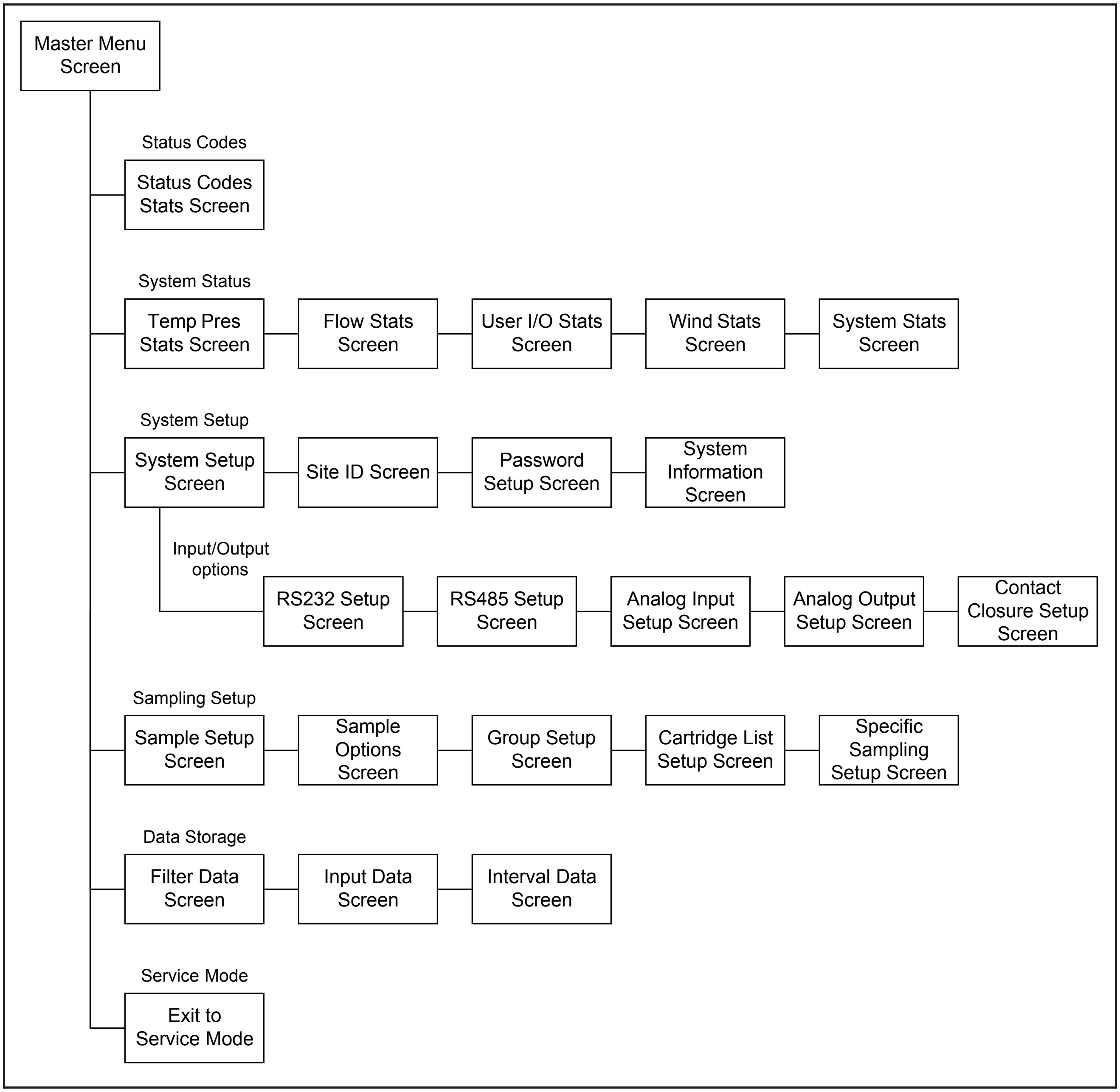

Figure A-40. Hierarchy of screens available through the Master menu. Access the Master menu by pressing <MENU> when in a non-service operating mode.

Figure A-41. Master Menu screen with status codes options.

```
            Master Menu
> Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
  Service Mode
```

StCode				

Figure A-42. Master Menu screen with system status options.

```
            Master Menu
  Status Codes
> System Status
  System Setup
  Sampling Setup
  Data Storage
  Service Mode
```

TmpPres	Flow	User IO	Wind	SysStat

Figure A-43. Master Menu screen with system setup options.

```
            Master Menu
  Status Codes
  System Status
> System Setup
  Sampling Setup
  Data Storage
  Service Mode
```

System	I/O	Site ID	Passwd	SysInfo

Figure A-44. Master Menu screen with sampling setup options.

```
              Master Menu
  Status Codes
  System Status
  System Setup
> Sampling Setup
  Data Storage
  Service Mode
```

Sample	Options	Group	ChanLst	SampSet

Figure A-45. Master Menu screen with data storage options.

```
              Master Menu
  Status Codes
  System Status
  System Setup
  Sampling Setup
> Data Storage
  Service Mode
```

FiltDat	InptDat	IntvDat		

Figure A-46. Master Menu screen with service menu option.

```
              Master Menu
  Status Codes
  System Status
  System Setup
  Sampling Setup
  Data Storage
> Service Mode
```


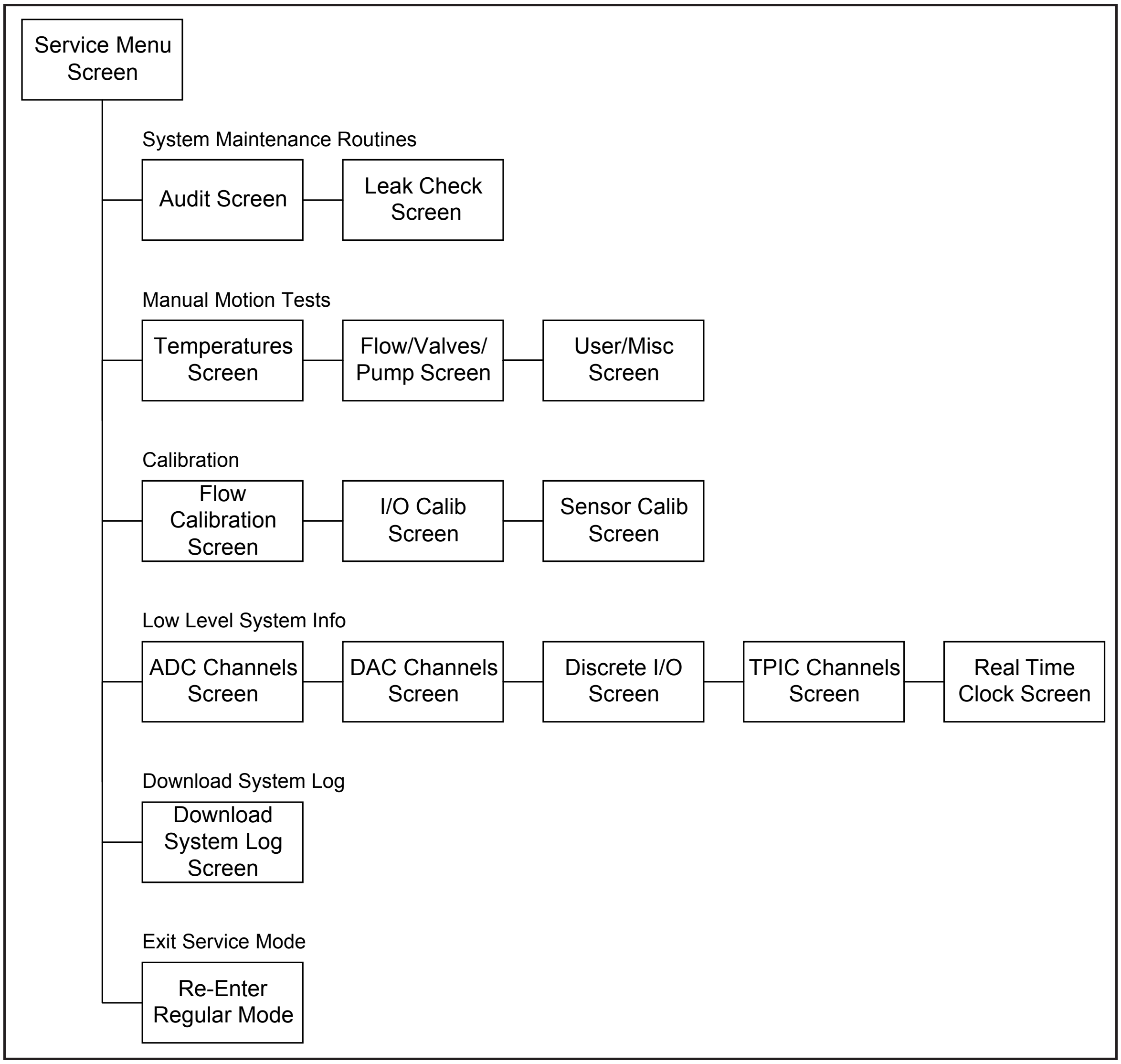

Figure A-47. Hierarchy of screens available through Service menu. Access the Service menu by pressing <MENU> with the sampler in its service operating mode.

Figure A-48. Service Menu screen with system maintenance routines options.

```
            Service Menu
> System Maintenance Routines
  Manual Motion Tests
  Calibration
  Low Level System Info
  Download System Log
  Exit Service Mode
```

Audit	SysChck			

Figure A-49. Service Menu screen with manual motion tests options.

```
            Service Menu
  System Maintenance Routines
> Manual Motion Tests
  Calibration
  Low Level System Info
  Download System Log
  Exit Service Mode
```

Temps	FlowVal	Misc		

Figure A-50. Service Menu screen with calibration options.

```
            Service Menu
  System Maintenance Routines
  Manual Motion Tests
> Calibration
  Low Level System Info
  Download System Log
  Exit Service Mode
```

FlowCal	I/O Cal	SensCal		

Figure A-51. Service Menu screen with low level system information options.

```
            Service Menu
  System Maintenance Routines
  Manual Motion Tests
  Calibration
> Low Level System Info
  Download System Log
  Exit Service Mode
```

A/D	D/A	Discrte	TPIC	RTC

Figure A-52. Service Menu screen with download system log option.

```
            Service Menu
  System Maintenance Routines
  Manual Motion Tests
  Calibration
  Low Level System Info
> Download System Log
  Exit Service Mode
```

Figure A-53. Service Menu screen with exit service mode option.

```
            Service Menu
  System Maintenance Routines
  Manual Motion Tests
  Calibration
  Low Level System Info
  Download System Log
> Exit Service Mode
```

Figure A-54. Audit screen (Service Mode).

```
Stat:OK         Flow Audit       Mode: SVC
Chnl SetPoint  Current  Actual   FTS Pres
 1A     0.0      0.10    0.00      0.000
Amb P: 756 T:  23.7 FTS Const m:  0.0000
Vac P: 000          FTS Const b:  0.0000
```

- Chan	+ Chan		LeakChk	Audit
Function Keys in Browse Mode				
- Chan	+ Chan		LeakChk	Audit
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-55. System Check screen (Service Mode).

```
Stat:OK       System Check       Mode: SVC
 Pump:OFF| Bank |Flow: A    B    C    D
PumpV:OFF|1:OFF |Set  0.0  0.0  0.0  0.0
VacVt:OFF|2:OFF |Cur 0.10 0.17 0.12 0.10
LkChk:OFF|3:OFF |Pres. Amb: 756 Vac: 000
```

Start				
Function Keys in Browse Mode				
Start				
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-56. Temperatures screen in manual motion tests (Service Mode).

```
Stat:OK       Temperatures      Mode: SVC
    Pump      |    Ambient     |    Elec
Temp:  25.1 C| Temp:   25.1C|Temp: 30.7C
FanT:  24.6 C| Pres: 749mmHg|Heater: OFF
Fan1:      ON | %RH:   29.7%
Fan2:      ON | WSpd:   0.1
Heater:  OFF | WDir:     0
```

ON/OFF	FlowVal	Misc		
Function Keys in Browse Mode				
ON/OFF	FlowVal	Misc		
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-57. Flows/Valves/ Pump screen in manual motion tests (Service Mode).

```
Stat:OK          Flows/Valves/Pump
   SetFlow CurFlow  Max   |
A:   0.0     0.00   20.0 | Vacuum:   OFF
B:   0.0     0.10   20.0 | Leak:     OFF
C:   0.0     0.50   20.0 | Pump1:    ON
D:   0.0     0.12   20.0 | Pump2:    ON
Bank 1: OFF Bank 2: OFF Bank 3: OFF
```

Temps	ON/OFF	Misc		*More*
Function Keys in Browse Mode				
Temps	ON/OFF	Misc		*More*
Close	Bank 1	Bank 2	Bank 3	*Back*
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-58. User/Misc screen in manual motion tests (Service Mode).

```
Stat:OK          User/Misc       Mode: SVC
    A/I   A/O |    Misc     |Analog Calib
1:   0.00 0.000| Stat: OFF | InRly:   OFF
2:   0.00 0.000|  LCD: ON  | RefIN: 0.025
3:   0.00 0.000| Spkr: OFF |OutRly:   OFF
   Discrete    |Hardware Id|PoleRly:  ON
1:  ON 2:  ON  |OFF OFF  ON|
```

Temps	FlowVal	ON/OFF		
Function Keys in Browse Mode				
Temps	FlowVal	ON/OFF		
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-59. Flow Calibration screen in calibration (Service Mode).

```
             Flow A Calib
Range: 10.0 - 12.2 |Cur Flow:  0.00 l/mn
(Mass:  9.0 - 11.0)|Set Flow:  0.0  l/mn
Num Points:  3     |Act Flow:  0.00 l/mn
For Streamline FTS:|Pressure: 0.00 inH2O
Const m:  0.0000   |  Offset:-0.574
Const b:  0.0000   |    Span: 1.000
```

- Flow	+ Flow		Start	*More*
Function Keys in Browse Mode				
- Flow	+ Flow		Start	*More*
FlowMin	FlowMax	EPA Cal		*Back*
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-60. I/O Calibration screen in calibration (Service Mode).

```
                I/O Calib      Mode: SVC
       Input     User Analog Outputs
Offset:-0.0013  -0.0120 -0.0139 -0.0150
  Span: 0.9996   0.9953  0.9948  0.9949
   Set: 0.025    0.000   0.000   0.000
 Relay: OFF      A/O Calib Relay OFF ON
Actual: 0.025   -0.00   -0.00   -0.00
```

FlowCal	ON/OFF	SensCal		Start
Function Keys in Browse Mode				
FlowCal	ON/OFF	SensCal		Start
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-61. Sensor Calibration screen in calibration (Service Mode).

```
Stat:OK          Sensor Calibration
               Current  Actual  Offset
Amb Temp  (C) :  25.2     0.0    0.00
Amb Pres(mmHg):   749       0     0.0
  Amb RH  (%):   29.5     0.0    0.00
```

FlowCal	I/O Cal			
Function Keys in Browse Mode				
FlowCal	I/O Cal			
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-62. ADC Channels screen in low level system info (Service Mode).

Stat:OK	ADC Channels			Mode: SVC
MFC 1 0: 1.039		PmpFan T 8: 2.977		
MFC 2 1: 1.018		Humidity 9: 1.447		
MFC 3 2: 1.089		Amb Pres 10: 4.019		
MFC 4 3: 1.021		Cal Ref 11: 0.024		
Pump T 4: 2.983		Elec T 12: 3.043		
Amb T 5: 2.983		User 1 13:-0.00		
Wind Dir 6: 0.002		User 2 14:-0.00		
Wind Spd 7: 0.002		User 3 15:-0.00		
	D/A	Discrte	TPIC	RTC

Figure A-63. DAC Channels screen in low level system info (Service Mode).

Stat:OK	DAC Channels			Mode: SVC
MFC 1 0: 1.115		4: 0.000		
MFC 2 1: 1.000		User 1 5: 0.000		
MFC 3 2: 1.000		User 2 6: 0.000		
MFC 4 3: 1.000		User 3 7: 0.000		
A/D		Discrte	TPIC	RTC
Function Keys in Browse Mode				
A/D		Discrte	TPIC	RTC
Function Keys in Edit Mode				
-List	+List	Bksp		

Figure A-64. Discrete I/O screen in low level system info (Service Mode).

```
Stat:OK       Discrete I/O     Mode: SVC
 MIn1:OFF  MIn2:ON    MFC4:OFF  Sys0:ON
 Sys1:ON    ID3:OFF    ID2:OFF   ID1:ON
   G2:OFF    G1:ON    SRIN:ON   SCLR:ON
  RCK:OFF  SRCK:OFF  Dpb6:OFF  Dpb7:OFF
 Mux1:ON   Mux2:ON   Mux3:ON   Mux4:ON
 Dpc4:OFF  Dpc5:OFF  Dpc6:OFF  Dpc7:OFF
 KbR0:ON   KbR1:ON   KbR2:ON   KbR3:ON
 KbR4:ON   Upa5:OFF  Upa6:OFF  Upa7:OFF
 Spkr:OFF AORly:OFF AIRly:OFF  Pole:ON
 Usr1:OFF  Usr2:OFF  FPGA:OFF Flash:OFF
 KbC0:ON   KbC1:ON   KbC2:ON   KbC3:ON
 KbC4:ON   MFC1:OFF  MFC2:OFF  MFC3:OFF
```

A/D	D/A	MUX	TPIC	ON/OFF

Figure A-65. TPIC Channels screen in low level system info (Service Mode).

```
Stat:OK       TPIC Channels    Mode: SVC
LcdLight:ON     Bank1:OFF     LEAK:OFF
ElecHeat:OFF    Bank2:OFF    DRN17:OFF
   Pump1:ON     Bank3:OFF    DRN18:OFF
   Pump2:ON    Vacuum:OFF    DRN19:OFF
PumpHeat:OFF  Vacuum2:OFF    DRN20:OFF
  Status:OFF    DRN13:OFF    DRN21:OFF
PumpFan2:ON     DRN14:OFF    DRN22:OFF
PumpFan1:ON     DRN15:OFF    DRN23:OFF
```

A/D	D/A	Discrte	ON/OFF	RTC

Figure A-66. Multiplexed Inputs screen in low level system info (Service Mode).

```
Stat:OK          Multiplexed Inputs
   0:  ON    1:  ON    2:  ON    3:  ON
   4:  ON    5:  ON    6:  ON    7:  ON
   8:  ON    9:  ON   10:  ON   11:  ON
  12:  ON   13:  ON   14:  ON   15:  ON
```

A/D	D/A	Discrte	TPIC	ON/OFF

Figure A-67. Real Time Clock screen in low level system info (Service Mode).

```
Stat:OK       Real Time Clock  Mode: SVC
Cur Time: 01:13:33    New Time: 01:13:00
Cur Date: 99/11/04    New Date: 99/11/04
   RTC Adjustment:   4.0 seconds/day
 Set New Time and New Date to a time in
 the future, then press "SetTime" when
 the actual real time equals new time.
```

A/D	D/A	Discrte	TPIC	SetTime
Function Keys in Browse Mode				
A/D	D/A	Discrte	TPIC	SetTime
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

Figure A-68. Download System Log screen (Service Mode).

```
              Service Menu

     About to start data download.


       Press any key to continue
```


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Appendix B: Program Register Codes

This appendix contains a listing of the program register codes (PRCs) used in the operating software of the Partisol Speciation Sampler. These codes come into play when the unit's two-way serial communication capability (Appendix C) is employed to request the current value of variables, to change the value of certain system parameters, and to download data from the system's internal data logger.

Because the sampler uses the hexadecimal number system for some of its status codes, this section also explains how to add and subtract hexadecimal numbers, and how to decipher the sampler's hexadecimal status codes.

B.1. Program Register Codes

Main Program Register Codes					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
002	Serial Number	N/A	N/A	N/A	NotRun
003	Operating Mode (Internal)	Code*	0 - 7	N/A	None
005	Status Code (Internal)	Code*	see code desc	0	None
037	Storage Download Type	Code*	0 - 2	0	Anytime
124	Current Flow 1 (Volumetric)	l/min	N/A	0	None
125	Current Flow 2 (Volumetric)	l/min	N/A	0	None
126	Current Flow 3 (Volumetric)	l/min	N/A	0	None
127	Current Flow 4 (Volumetric)	l/min	N/A	0	None
132	Current Electronics Compartment Temperature	°C	0 - 70	0	None
133	Current Ambient Temperature	°C	-60 - 70	0	None
135	Current Ambient Pressure	mmHg	10 - 950	0	None
137	Current Ambient Relative Humidity	%	0 - 100	0	None
139	Current Pump Compartment Temperature	°C	-60 - 70	0	None
140	Current Fan Inlet Temperature	°C	-60 - 70	0	None
141	Current Wind Direction	deg	N/A	0	None
143	Current Wind Speed	km/h	0 - 180	0	None
170	Sampling Serial Control	Code*	0 - 2	0	Anytime

* Codes are described later in this Appendix.

Program Register Codes (000-024)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
000	Null	N/A	N/A	N/A	N/A
001	Software Version	N/A	N/A	N/A	None
002	Serial Number	N/A	N/A	N/A	NotRun
003	Operating Mode (Internal)	Code*	0 - 6	0	None
004	Status Type (Internal)	Code*	0 - 2	0	None
005	Status Code (Internal)	Code*	see code desc	0	None
006	Current Time/Date (Internal)	sec	N/A	N/A	None
007	New Time/Date	sec	0 - 2.15E9	0	Anytime
008	Standard Temperature	°C	-50 - 50, 99	99	NotRun
009	Standard Pressure	mmHg	500 - 900, 999	999	NotRun
010	Average Temperature	°C	-50 - 50, 99	99	NotRun
011	Average Pressure	mmHg	500 - 900, 999	999	NotRun
012	Comm Baud Rate	Code*	0 - 5	3	Anytime
013	Comm Word Length	Code*	0 - 3	3	Anytime
014	Comm Stop Bits	Code*	0 - 1	0	Anytime
015	Comm Parity	Code*	0 - 2	0	Anytime
016	Comm Flow Control	Code*	0 - 1	0	Anytime
017	Comm Protocol	Code*	0 - 4	1	Anytime
018	Comm Parameter 1	N/A	0 - 1E10	52	Anytime
019	Comm Parameter 2	N/A	0 - 1E10	75048	Anytime
020	Comm Parameter 3	N/A	0 - 1E10	13010	Anytime
021	Comm Parameter 4	N/A	0 - 1E10	0	Anytime
022	Comm Parameter 5	N/A	0 - 1E10	0	Anytime
023	Comm Parameter 6	N/A	0 - 1E10	0	Anytime
024	Comm PRC 1	PRC	PRC	0	Anytime
* Codes are described later in this Appendix.					

Program Register Codes (025-049)

Code	Description	Units	Range	Default	Edit Modes
025	Comm PRC 2	PRC	PRC	0	Anytime
026	Comm PRC 3	PRC	PRC	0	Anytime
027	Comm PRC 4	PRC	PRC	0	Anytime
028	Comm PRC 5	PRC	PRC	0	Anytime
029	Comm PRC 6	PRC	PRC	0	Anytime
030	Comm PRC 7	PRC	PRC	0	Anytime
031	Comm PRC 8	PRC	PRC	0	Anytime
032	Comm PRC 9	PRC	PRC	0	Anytime
033	Comm PRC 10	PRC	PRC	0	Anytime
034	Comm PRC 11	PRC	PRC	0	Anytime
035	Comm PRC 12	PRC	PRC	0	Anytime
036	Comm Interval	sec	0, 1 - 3,600	0	Anytime
037	Storage Download Type	Code*	0 - 2	0	Anytime
038	RS485 Instrument ID	N/A	10 - 99	11	Anytime
039	Analog Input 1, Constant A	N/A	-1E10 - 1E10	0	Anytime
040	Analog Input 2, Constant A	N/A	-1E10 - 1E10	0	Anytime
041	Analog Input 3, Constant A	N/A	-1E10 - 1E10	0	Anytime
042	Analog Input 1, Constant B	N/A	-1E10 - 1E10	0	Anytime
043	Analog Input 2, Constant B	N/A	-1E10 - 1E10	0	Anytime
044	Analog Input 3, Constant B	N/A	-1E10 - 1E10	0	Anytime
045	Analog Input 1, Constant C	N/A	-1E10 - 1E10	0	Anytime
046	Analog Input 2, Constant C	N/A	-1E10 - 1E10	0	Anytime
047	Analog Input 3, Constant C	N/A	-1E10 - 1E10	0	Anytime
048	Current Analog Input 1	N/A	N/A	0	None
049	Current Analog Input 2	N/A	N/A	0	None

* Codes are described later in this Appendix.

Program Register Codes (050-074)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
050	Current Analog Input 3	N/A	N/A	0	None
051	Average Analog Input 1	N/A	N/A	0	None
052	Average Analog Input 2	N/A	N/A	0	None
053	Average Analog Input 3	N/A	N/A	0	None
054	Analog Output PRC 1	PRC	PRC	0	Anytime
055	Analog Output PRC 2	PRC	PRC	0	Anytime
056	Analog Output PRC 3	PRC	PRC	0	Anytime
057	Analog Output Minimum 1	N/A	-1E12 - 1E12	0	Anytime
058	Analog Output Minimum 2	N/A	-1E12 - 1E12	0	Anytime
059	Analog Output Minimum 3	N/A	-1E12 - 1E12	0	Anytime
060	Analog Output Maximum 1	N/A	-1E12 - 1E12	0	Anytime
061	Analog Output Maximum 2	N/A	-1E12 - 1E12	0	Anytime
062	Analog Output Maximum 3	N/A	-1E12 - 1E12	0	Anytime
063	Analog Output Type 1	Code*	0 - 2	2	Anytime
064	Analog Output Type 2	Code*	0 - 2	2	Anytime
065	Analog Output Type 3	Code*	0 - 2	2	Anytime
066	Contact Closure PRC 1	PRC	PRC	0	Anytime
067	Contact Closure PRC 2	PRC	PRC	0	Anytime
068	Contact Closure Logic Type 1	Code*	0 - 1	0	Anytime
069	Contact Closure Logic Type 2	Code*	0 - 1	0	Anytime
070	Contact Closure Mask 1	N/A	0 - 1E10	0	Anytime
071	Contact Closure Mask 2	N/A	0 - 1E10	0	Anytime
072	Contact Closure Comparison 1	Code*	0 - 5	0	Anytime
073	Contact Closure Comparison 2	Code*	0 - 5	0	Anytime
074	Contact Closure Comparison Value 1	N/A	-1E10 - 1E10	0	Anytime

* Codes are described later in this Appendix.

Program Register Codes (075-099)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
075	Contact Closure Comparison Value 2	N/A	-1E10 - 1E10	0	Anytime
076	Current Low Password	N/A	0 - 999999	100000	Anytime
077	New Low Password	N/A	0 - 999999	0	None
078	New Low Password Confirmation	N/A	0 - 999999	0	None
079	Current High Password	N/A	0 - 999999	100000	Anytime
080	New High Password	N/A	0 - 999999	0	None
081	New High Password Confirmation	N/A	0 - 999999	0	None
082	Current Password Protection	Code*	0	0	None
083	Analog Input Offset (Internal)	VDC	-0.2 - 0.2	0	Service
084	Analog Input Span (Internal)	N/A	0.95 - 1.05	1	Service
085	Analog Output Offset 1	VDC	-0.2 - 0.2	0	Service
086	Analog Output Offset 2	VDC	-0.2 - 0.2	0	Service
087	Analog Output Offset 3	VDC	-0.2 - 0.2	0	Service
088	Analog Output Span 1	N/A	0.95 - 1.05	1	Service
089	Analog Output Span 2	N/A	0.95 - 1.05	1	Service
090	Analog Output Span 3	N/A	0.95 - 1.05	1	Service
091	Flow Offset A	l/min	-0.5 - 0.5	0	Service
092	Flow Offset B	l/min	-0.5 - 0.5	0	Service
093	Flow Offset C	l/min	-0.5 - 0.5	0	Service
094	Flow Offset D	l/min	-0.5 - 0.5	0	Service
095	Flow Span A	N/A	0.925 - 1.075	1	Service
096	Flow Span B	N/A	0.925 - 1.075	1	Service
097	Flow Span C	N/A	0.925 - 1.075	1	Service
098	Flow Span D	N/A	0.925 - 1.075	1	Service
099	Flow Calibration Reading	l/min	0 - 20	0	Service

* Codes are described later in this Appendix.

Program Register Codes (100-124)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
100	Number of Points in Flow Calibration	N/A	2 - 5	3	Service
101	Flow Calibration Minimum A	l/min	0 - 20	15	Service
102	Flow Calibration Minimum B	l/min	0 - 20	15	Service
103	Flow Calibration Minimum C	l/min	0 - 20	15	Service
104	Flow Calibration Minimum D	l/min	0 - 20	15	Service
105	Flow Calibration Maximum A	l/min	5 - 20	18.4	Service
106	Flow Calibration Maximum B	l/min	5 - 20	18.4	Service
107	Flow Calibration Maximum C	l/min	5 - 20	18.4	Service
108	Flow Calibration Maximum D	l/min	5 - 20	18.4	Service
109	Volumetric Flow Miniumum	l/min	0 - 25	15	Service
110	Volumetric Flow Maximum	l/min	0 - 25	18.4	Service
111	FTS Pressure	inchH_2O	0 - 20	0	Service/Audit
112	Streamline FTP Constant m	N/A	-1 - 1	0	Service/Audit
113	Streamline FTP Constant b	N/A	-1 - 1	0	Service/Audit
114	Ambient Temperature Calibration Reading	°C	-50 - 80	0	Service
115	Ambient Temperature Offset	°C	-10 - 10	0	Service
116	Ambient Pressure Calibration Reading	mmHg	500 - 900	0	Service
117	Ambient Pressure Offset	mmHg	-15 - 15	0	Service
118	Ambient Rel Humidity Calibration Reading	%RH	0 - 100	0	Service
119	Ambient Rel Humidity Offset	%RH	-15 - 15	0	Service
120	Set Point: Flow A	l/min	0 - 20	0	Service
121	Set Point: Flow B	l/min	0 - 20	0	Service
122	Set Point: Flow C	l/min	0 - 20	0	Service
123	Set Point: Flow D	l/min	0 - 20	0	Service
124	Current Flow A (Volumetric)	l/min	N/A	0	None
* Codes are described later in this Appendix.					

Program Register Codes (125-149)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
125	Current Flow B (Volumetric)	l/min	N/A	0	None
126	Current Flow C (Volumetric)	l/min	N/A	0	None
127	Current Flow D (Volumetric)	l/min	N/A	0	None
128	Current Flow A (Standard)	l/min	N/A	0	None
129	Current Flow B (Standard)	l/min	N/A	0	None
130	Current Flow C (Standard)	l/min	N/A	0	None
131	Current Flow D (Standard)	l/min	N/A	0	None
132	Current Electronics Compartment Temperature	°C	0 - 70	0	None
133	Current Ambient Temperature	°C	-60 - 70	0	None
134	Average Ambient Temperature	°C	N/A	0	None
135	Current Ambient Pressure	mmHg	10 - 950	0	None
136	Average Ambient Pressure	mmHg	N/A	0	None
137	Current Ambient Relative Humidity	%	0 - 100	0	None
138	Average Ambient Relative Humidity	%	N/A	0	None
139	Current Pump Compartment Temperature	°C	-60 - 70	0	None
140	Current Fan Inlet Temperature	°C	-60 - 70	0	None
141	Current Wind Direction	deg	N/A	0	None
142	Average Wind Direction	deg	N/A	0	None
143	Current Wind Speed	km/h	0 - 180	0	None
144	Average Wind Speed	km/h	N/A	0	None
145	Wind Velocity	km/h	0 - 180	0	None
146	Input Data Averaging Period	min	5 - 1440	30	Anytime
147	Date Format	Code*	0 - 2	0	NotRun
148	Time Format	Code*	0 - 1	0	NotRun
149	Default Start Time	sec	0 - 86399	0	NotRun

* Codes are described later in this Appendix.

Program Register Codes (150-174)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
150	Default Duration	sec	60 - 1209600	86400	NotRun
151	Default Repeat Time	sec	60 - 1209600	86400	NotRun
152	Default Filter Type	Code*	1 - 26	16	NotRun
153	Sample Type	Code*	0 - 5	0	NotRun
154	Sample Group Edit	N/A	0 - 12	1	None
155	Site ID1	N/A	0	0	Anytime
156	Site ID2	N/A	0	0	Anytime
157	Instrument Type	N/A	0 - 1	0	NotRun
158	Volume A	N/A	0	0	None
159	Volume B	N/A	0	0	None
160	Volume C	N/A	0	0	None
161	Volume D	N/A	0	0	None
162	Valid Time A	N/A	0	0	None
163	Total Time A	N/A	0	0	None
164	Valid Time B	N/A	0	0	None
165	Total Time B	N/A	0	0	None
166	Valid Time C	N/A	0	0	None
167	Total Time C	N/A	0	0	None
168	Valid Time D	N/A	0	0	None
169	Total Time D	N/A	0	0	None
170	Sampling Serial Control	Code*	0 - 2	0	Anytime
171	AI Mode	N/A	0 - 1	Single	Anytime
172	Flow Mode	N/A	0 - 2	ERR	NotRun
173	Audit Elapsed Time	N/A	0	0	None
174	Real Time Clock Reference Time	N/A	0	N/A	None
* Codes are described later in this Appendix.					

Program Register Codes (175-199)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
175	Real Time Clock Adjustment	sec/day	-60 - 60	4	Service
176	Auto Run	N/A	0 - 1	0	Anytime
177	Cartridge Type 1A	N/A	1 - 26	0	NotRun
178	Cartridge Type 1B	N/A	0 - 26	0	NotRun
179	Cartridge Type 1C	N/A	0 - 26	0	NotRun
180	Cartridge Type 1D	N/A	0 - 26	0	NotRun
181	Cartridge Type 2A	N/A	0 - 26	0	NotRun
182	Cartridge Type 2B	N/A	0 - 26	0	NotRun
183	Cartridge Type 2C	N/A	0 - 26	0	NotRun
184	Cartridge Type 2C	N/A	0 - 26	0	NotRun
185	Cartridge Type 3A	N/A	0 - 26	0	NotRun
186	Cartridge Type 3B	N/A	0 - 26	0	NotRun
187	Cartridge Type 3C	N/A	0 - 26	0	NotRun
188	Cartridge Type 3D	N/A	0 - 26	0	NotRun
189	Cartridge ID 1A	N/A	0 - 9999999	0	NotRun
190	Cartridge ID 1B	N/A	0 - 9999999	0	NotRun
191	Cartridge ID 1C	N/A	0 - 9999999	0	NotRun
192	Cartridge ID 1D	N/A	0 - 9999999	0	NotRun
193	Cartridge ID 2A	N/A	0 - 9999999	0	NotRun
194	Cartridge ID 2B	N/A	0 - 9999999	0	NotRun
195	Cartridge ID 2C	N/A	0 - 9999999	0	NotRun
196	Cartridge ID 2D	N/A	0 - 9999999	0	NotRun
197	Cartridge ID 3A	N/A	0 - 9999999	0	NotRun
198	Cartridge ID 3B	N/A	0 - 9999999	0	NotRun
199	Cartridge ID 3C	N/A	0 - 9999999	0	NotRun
* Codes are described later in this Appendix.					

Program Register Codes (200-224)

Code	Description	Units	Range	Default	Edit Modes
200	Cartridge ID 3D	N/A	0 - 9999999	0	NotRun
201	Flow Channel 1A	N/A	0 - 20	10	Anytime
202	Flow Channel 1B	N/A	0 - 20	10	Anytime
203	Flow Channel 1C	N/A	0 - 20	10	Anytime
204	Flow Channel 1D	N/A	0 - 20	10	Anytime
205	Flow Channel 2A	N/A	0 - 20	10	Anytime
206	Flow Channel 2B	N/A	0 - 20	10	Anytime
207	Flow Channel 2C	N/A	0 - 20	10	Anytime
208	Flow Channel 2D	N/A	0 - 20	10	Anytime
209	Flow Channel 3A	N/A	0 - 20	10	Anytime
210	Flow Channel 3B	N/A	0 - 20	10	Anytime
211	Flow Channel 3C	N/A	0 - 20	10	Anytime
212	Flow Channel 3D	N/A	0 - 20	10	Anytime
213	Channels Per Group	N/A	1 - 4	4	NotRun
214	Sampling Start	sec	0 - 2.14E9	0	NotRun
215	Sampling Mid Stop	sec	0 - 2.14E9	0	NotRun
216	Sampling Restart	sec	0 - 2.14E9	0	NotRun
217	Sampling Stop	sec	0 - 2.14E9	0	NotRun
218	Sampling Condition 1	Code*	0 - 11	0	NotRun
219	Sampling Condition 2	Code*	0 - 11	0	NotRun
220	Sampling Condition 3	Code*	0 - 11	0	NotRun
221	Conditional Sampling Minimum 1	N/A	-1E10 - 1E10	0	NotRun
222	Conditional Sampling Minimum 2	N/A	-1E10 - 1E10	0	NotRun
223	Conditional Sampling Minimum 3	N/A	-1E10 - 1E10	0	NotRun
224	Conditional Sampling Maximum 1	N/A	-1E10 - 1E10	0	NotRun

* Codes are described later in this Appendix.

Program Register Codes (225-249)					
Code	**Description**	**Units**	**Range**	**Default**	**Edit Modes**
225	Conditional Sampling Maximum 2	N/A	-1E10 - 1E10	0	NotRun
226	Conditional Sampling Maximum 3	N/A	-1E10 - 1E10	0	NotRun
227	Current Group	N/A	1 - 12	1	NotRun
228	Channels	N/A	1 - 12	12	NotRun
229	Continue	N/A	0 - 1	0	Anytime
230	System Check	N/A	0 - 1	1	Anytime
231	Number of Pumps	N/A	0 - 2	0	NotRun
232					
233					
234					
235					
236					
237					
238					
239					
240					
241					
242					
243					
244					
245					
246					
247					
248					
249					

* Codes are described later in this Appendix.

B.2. PRC Values Defined by Codes

Some of the Partisol Speciation Sampler's program register codes (PRC) have values that are defined by codes. These codes are defined in this section.

PRC 3: Operating Mode

0	STOP	Stop
1	WAIT	Wait
2	SAMP	Sample
3	3CHCK	System Check
4	DONE	Done
5	ERR	Error
6	SVC	Service
7	PAUS	Pause

PRC 4: Status Type

0	OK	OK
1	WARN	Status Warning
2	CRIT	Critical Warning (see PRC 5 below)

PRC 5: Status Code

0	OK	No Status Conditions
(H)1	M	Flash Memory
(H)2	C	Automatic System Calibration Failed
(H)4	Y	System Reset Occurred
(H)8	Z	Power Failure
(H)10	F1	Flow 1 Out of Range
(H)20	F2	Flow 2 Out of Range
(H)40	F3	Flow 3 Out of Range
(H)80	F4	Flow 4 Out of Range
(H)100	S1	Flow 1 Stopped Due to 10% Dev for 5 minutes*
(H)200	S2	Flow 2 Stopped Due to 10% Dev for 5 minutes*
(H)400	S3	Flow 3 Stopped Due to 10% Dev for 5 minutes*
(H)800	S4	Flow 4 Stopped Due to 10% Dev for 5 minutes*
(H)1000	O1	Coeff of Variation for Flow 1 Too High
(H)2000	O2	Coeff of Variation for Flow 2 Too High
(H)4000	O3	Coeff of Variation for Flow 3 Too High
(H)8000	O4	Coeff of Variation for Flow 4 Too High
(H)10000	TA	Ambient Sensor Out of Range
(H)20000	TP	Pump Compartment Temp Sensor Out of Range

* Critical warning, see PRC 4 above.
NOTE: The current status code is the sum of all conditions that currently apply.

PRC 5: Status Code (continued)

(H)40000	TE	Electronics Temperature Out of Range
(H)80000		Undefined Error
(H)100000	VP	Vacuum Pump Failure
(H)200000	VV	Vacuum Vent Valve Failure
(H)400000	D	Audit Performed in Middle of Sample
(H)800000	VS	Vacuum System Failure
(H)1000000	U	Stop Key Pressed
(H)2000000	B1	Bank 1 Failure
(H)4000000	B2	Bank 2 Failure
(H)8000000	B3	Bank 3 Failure
(H)10000000	LA	Flow A Leak Check Failed
(H)20000000	LB	Flow B Leak Check Failed
(H)40000000	LC	Flow C Leak Check Failed
(H)80000000	LD	Flow D Leak Check Failed

NOTE: The current status code is the sum of all conditions that currently apply.

PRC 12: Comm Baud Rate

0	1200
1	2400
2	4800
3	9600
4	19200
5	38400

PRC 13: Comm Word Length

0	5
1	6
2	7
3	8

PRC 14: Stop Bits

0	1
1	2

PRC 15: Comm Parity

0	None
1	Even
2	Odd

PRC 16: Comm Flow Control

0	None
1	Xon/Xoff

PRC 17: Comm Protocol

0	None
1	AK
2	Storage
3	RealTime
4	German

PRC 37: Storage Download Type

0	Filter Data
1	Interval Data
2	Input Data

PRC 63, 64, 65: Analog Output Type 1, 2, 3

0	0-1 VDC
1	0-2 VDC
2	0-5 VDC

PRC 68, 69: Contact Closure Logic Type 1, 2

0	AND
1	OR

PRC 72, 73: Contact Closure Comparison 1, 2

0	<	Less Than
1	<=	Less Than or Equal
2	=	Equal
3	>=	Greater Than or Equal
4	>	Greater Than
5	<>	Not Equal

PRC 82: Current Password Protection

0	No Protection Enabled – Regular Operation
1	Low Password Protection Enabled
2	High Password Protection Enabled

PRC 147: Date Format

0	yy/mm/dd
1	mm/dd/yy
2	dd/mm/yy

PRC 148: Time Format

0	.	Uses "." as Separator
1	:	Uses ":" as Separator

PRC 152: Default Filter Type

0	Space
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	I
10	J
11	K
12	L
13	M
14	N
15	O
16	P
17	Q
18	R
19	S
20	T
21	U
22	V
23	W
24	X
25	Y
26	Z

PRC 153: Sample Type

0	BASIC	24-hour Based Sampling
1	TIME	Time Base Continuous Sampling
2	TIME2	Time Base Cont. Samp/ two intervals
3	ADV	Conditional Sampling
4	EPISOD	Episodic Conditional Sampling
5	RS232	Sampler Operation to PRC

PRC 170: Sampling Serial Control

0	No Command
1	Sample on Next Group
2	Sample on Previous Group
3	Sample on Current Group
4	Stop Sampling
5	Sampling Completed (DONE Mode)
6	Not Used
7	Not Used
8	Not Used
9	Not Used
10	Not Used
11	Not Used
12	Not Used
13	Not Used
14	Not Used
15	Not Used
16	Sample on Group 1
17	Sample on Group 2
18	Sample on Group 3
19	Sample on Group 4
20	Sample on Group 5
21	Sample on Group 6
22	Sample on Group 7
23	Sample on Group 8
24	Sample on Group 9
25	Sample on Group 10
26	Sample on Group 11
27	Sample on Group 12

PRC 172: Flow Mode

0	Err	Error Mode
1	Wait	Wait Mode
2	Next	Next Mode

PRC 219, 220, 221: Sampling Conditions 1, 2, 3

0	------	None
1	TEMP	Ambient Temperature (°C)
2	PRES	Ambient Pressure (mmHg)
3	%RH	Ambient Relative Humidity (%)
4	WNDSPD	Wind Speed (km/h)
5	WNDDIR	Wind Dir (deg)
6	AI1	Analog Input 1 (Engineering Units)
7	AI2	Analog Input 2 (Engineering Units)
8	AI3	Analog Input 3 (Engineering Units)
9	AI1AVE	Ave Analog Input 1 (Engineering Units)
10	AI2AVE	Ave Analog Input 2 (Engineering Units)
11	AI3AVE	Ave Analog Input 3 (Engineering Units)

B.3. Deciphering Hexadecimal Status Codes

When the Partisol Speciation Sampler's PRC 5: Status Codes are downloaded, they are displayed as hexadecimal numbers. This section describes hexadecimal numbers, shows you how to do simple addition and subtraction with these numbers and explains how they relate to the sampler's status codes.

Generally, in our everyday lives, we use the decimal number system, which is a base-10 number system. It uses 10 symbols (0, 1, 2, 3, 4, 5, 6, 7, 8 and 9) to represent number values. The hexadecimal number system is a base-16 number system that uses 16 symbols (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E and F) (Figure B-1) to represent number values. This can make simple addition and subtraction a bit confusing.

B.3.1. Place Holders

In the hexadecimal number system, when the value of a number exceeds 15 (which is represented by "F"), you must pay attention to the number's "place holder." A "place holder" is the number or symbol that is placed in front of a base number to represent larger numerical values (Example B-1).

Figure B-1. The decimal number system and its hexadecimal equivalent.

Decimal	Hexadecimal
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F
16	10
17	11

In the decimal number system, place holders increase by a value of 10. If we use the decimal number system in Example B-1, the numerical values of the place holders will increase by a value of 10. In the first row of Example B-1, the place holder is “0,” which makes the decimal numerical value of the first number in that row: 0·10+0 = 0. In the second row, the place holder is “1,” so the decimal numerical value of the first number in that row is 1·10+0 = 10. The place holder in the third row is “2,” which makes the decimal numerical value of the first number in that row: 2·10+0 = 20.

Example B-1.

place holders		
↓	↓	↓
00	10	20
01	11	21
02	12	22
03	13	23

However, place holders in the hexadecimal number system increase by a value of 16.This changes the values of the numbers in Example B-1. In the first row of Example B-1, the place holder is “0,” which makes the hexadecimal numerical value of the first number in that row: 0·16+0 = 0. In the second row, the place holder is “1,” so the hexadecimal numerical value of the first number in that row is 1·16+0 = 16. The place holder in the third row is “2,” which makes the hexadecimal numerical value of the first number in that row: 2·16+0 = 32.

B.3.2. Converting Decimal Numbers to Hexadecimal

Converting the decimal numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 to hexadecimal numbers is easy, because they hold the same value in the hexadecimal number system. The decimal numbers 10, 11, 12, 13, 14 and 15, convert to the letters A, B, C, D, E and F (Figure B-1), respectively, in the hexadecimal number system.

B.3.2.1. Converting Large Decimal Numbers to Hexadecimal

To convert large decimal numbers, such as 74 or 2045, to hexadecimal form, you must divide the decimal number by 16 repeatedly until you reach 0, while placing each remainder in a back-to-front sucession until you reach the beginning of the hexadecimal number (Examples B-2 and B-3).

NOTE: In the following examples, hexadecimal numbers will be designated by an (H) in front of the number.

Example B-2.

Convert 74 to hexadecimal form.

74 = (H)_ _ _

First, divide 16 into 74:

74 ÷ 16 = 4 with a remainder of 10

Convert the 10 to hexadecimal form (Figure B-1):

10 = (H)A

and place it at the end of the hexadecimal number:

74 = (H)_ _ A

Now, continue to divide by 16:

4 ÷ 16 = 0 with a remainder of 4

Place these numbers in the following place holders:

74 = (H)0 4 A

Therefore:

74 = (H)4A

Example B-3.

Convert 2045 to hexadecimal form.

2045 = (H)_ _ _ _

First, divide 16 into 2045:

2045 ÷ 16 = 127 with a remainder of 13

Convert the 13 to hexadecimal (Figure B-1):

13 = (H)D

and place it at the end of the hexadecimal number:

2045 = (H)_ _ _ D

Now, continue to divide by 16:

127 ÷ 16 = 7 with a remainder of 15

Convert the 15 to hexadecimal:

15 = (H)F

and place it in the next place holder:

2045 = (H)_ _ F D

Now, continue to divide by 16:

7 ÷ 16 = 0 with a remainder of 7

Place these numbers in the following place holders:

2045 = (H)0 7 F D

Therefore:

2045 = (H)7FD

B.3.3. Converting Small Hexadecimal Numbers to Decimal

To convert small hexadecimal numbers to decimal, multiply each place holder by 16 and then add the sum to the actual number in each place holder (Example B-4).

Example B-4.

Convert (H)5C to decimal form.

First, multiply 5 by 16:

$5 \cdot 16 = 80$

Then, convert (H)C to decimal form:

H(C) = 12

Now add 80 and 12:

$80 + 12 = 92$

Therefore:

(H)5C = 92

B.3.4. Converting Large Hexadecimal Numbers to Decimal

To convert hexadecimal numbers to decimal, you need to understand the concept of "16 to the power of..."which coincides with the number of place holders in the hexadecimal number. As you work your way from the beginning to the end of the hexadecimal number, you must multiply each number in each place holder by the correct power of 16, except in the "one's" place holder (Section B.3.3.1). Then you must add these sums together to find the decimal equivalent of the original hexadecimal number (Examples B-5 and B-6).

B.3.4.1. Understanding the Powers of 16

Each place holder in a hexadecimal number coincides with a "power of 16."

In the "one's" place (the place holder furthest to the right) of a hexadecimal number, the power of 16 is zero. This is represented as 16^0, and its numerical value is "1." For example, in the number (H)742, the number "2" is in the one's place. The numerical value of the number "2" is expressed as $1·2 = 2$.

In the "ten's" place (the place holder directly to the left of the one's place) of a hexadecimal number, the power of 16 is "1." This is represented as 16^1, and its numerical value is $16·1 = 16$. For example, in the number (H)742, the number "4" is in the ten's place. The numerical value of the number "4" is expressed as $16·1·4 = 64$.

In the "100's" place (the place holder directly to the left of the ten's place) of a hexadecimal number, the power of 16 is "2." This is represented as 16^2, and its numerical value is $16·16 = 256$. For example, in the number (H)742, the number "7" is in the 100's place. The numerical value of the number "7" is expressed as $16·16·7 = 1{,}792$.

In the "1,000's" place (the place holder directly to the left of the 100's place) of a hexadecimal number, the power of 16 is "3." This is represented as 16^3, and its numerical value is $16·16·16 = 4{,}096$. For example, in the number (H)32B7, the number "3" is in the 1,000's place. The numerical value of the number "3" is expressed as $16·16·16·3 = 12{,}288$.

Example B-5.

Convert (H)2B4A to decimal form.

First, multiply 2 by 16^3:
(16^3 represents the place holder occupied by the number 2)

$2 \cdot 16^3 = 8{,}192$

Next, convert (H)B to decimal form:

(H)B = 11

Next, multiply 11 by 16^2:
(16^2 represents the place holder occupied by the letter B)

$11 \cdot 16^2 = 2{,}816$

Now add 8,192 and 2,816:

8,192 + 2,816 = 11,008

Next, multiply 4 by 16^1:
(16^1 represents the place holder occupied by the number 4)

$4 \cdot 16^1 = 64$

Now add 11,008 and 64:

11,008 + 64 = 11,072

Next, convert (H)A to decimal form:

(H)A = 10

Add 10 and 16^0:
(16^0 represents the place holder occupied by the letter A)

$10 \cdot 16^0 = 10$

Now add 11,072 and 10:

11,072 + 10 = 11,082

Therefore:

(H)2B4A = 11,082

Example 5 can also be expressed in the following form (Example 6):

Example B-6.

(H)2B4A

$16^0 = 1 \cdot 10 = \underline{10}$ {(H)A = 10}

$16^1 = 16 \cdot 1 \cdot 4 = \underline{64}$

$16^2 = 16 \cdot 16 \cdot 11 = \underline{2{,}816}$ {(H)B = 11}

$16^3 = 16 \cdot 16 \cdot 16 \cdot 2 = \underline{8{,}192}$

$\underline{10} + \underline{64} + \underline{2{,}816} + \underline{8{,}192} = \underline{11{,}082}$

Therefore:

(H)2B4A = 11,082

B.3.5. Adding Small Hexadecimal Numbers

To add small hexadecimal numbers, simply convert them to decimal numbers and add them together. When you find the decimal sum, convert it into a hexadecimal number (Example B-7).

Example B-7.

(H)5	converts to	5
+(H)4		+4
?		9

When you convert the decimal sum, 9, into a hexadecimal number, you have (H)9 (Figure B-1).

(H)5	converts to	5
+(H)4		+4
(H)9		9

To add hexadecimal numbers with sums larger than 9, you will need to pay attention to their place holders. Similar to Example B-7, convert the hexadecimal numbers to decimal numbers and add them together (Example B-8).

Example B-8.

(H)A	converts to	10
+(H)D		+13
?		23

At this point, you should convert 23 into hexadecimal form by dividing it by 16. When you divide 16 into 23, you will find that 16 goes into 23 one time with remainder of 7 . Therefore, the hexadecimal equivalent of 23 is (H)17, where (H)17 = 1·16+7 = 23.

(H)A	converts to	10
+(H)D		+13
(H)17		23

B.3.6. Adding Large Hexadecimal Numbers

To add large hexadecimal numbers, such as numbers that are 3 or more digits in length, you can use simple linear addition (Example B-9).

Example B-9.

$$\begin{array}{rl} & \text{(H)24B} \\ + & \underline{\text{(H)355}} \\ & \text{(H) ?} \end{array}$$

First, convert (H)B to decimal form:

(H)B = 11

Next, add 11 and 5:

11 + 5 = 16

Now convert 16 to hexadecimal form:

16 = (H)10

In the original equation, place the zero under the right-hand column of numbers and carry the 1 over to the middle column:

$$\begin{array}{rl} & \text{1}\;\; \\ & \text{(H)24B} \\ + & \underline{\text{(H)355}} \\ & \text{(H)}\;\;\;\text{0} \end{array}$$

Now, add 1, 4 and 5:

1 + 4 + 5 = 10

Now convert 10 to hexadecimal form:

10 = (H)A

In the original equation, place the A under the middle column:

$$\begin{array}{rl} & \text{(H)24B} \\ + & \underline{\text{(H)355}} \\ & \text{(H)}\;\text{A0} \end{array}$$

Now, add 2 and 3:

2 + 3 = 5

In the original equation, place the 5 under the left-hand column:

$$\begin{array}{rl} & \text{(H)24B} \\ + & \underline{\text{(H)355}} \\ & \text{(H)5A0} \end{array}$$

B.3.7. Deciphering Status Codes

When downloaded, the Partisol Speciation Sampler's PRC 5: Status Codes are displayed in hexadecimal form. The sampler may display more than one code at at time. When the unit does show more than one status code, it adds the codes together and displays them as a hexadecimal sum.

For example, if the unit displays the Flash Memory status code (hexadecimal number "(H)1") (Section B.2) and the System Reset Occurred status code (hexadecimal number "(H)4") at the same time, the two status codes (when downloaded) will be displayed as the hexadecimal number "5."

In Section B.2, the PRC 5: Status Code table has only two status codes that would add up to a value of 5. By looking at this table and breaking down the downloaded status codes, you will be able to decipher which status codes the unit has displayed.

To properly use the PRC 5: Status Code table, you must separate the status codes on the table into place holders: the "one's," "ten's," "100's," "1,000's," "10,000's," and "100,000's" and the "1,000,000's" place. To break down the downloaded status codes, you must match each section of the status code with these place holders. See Examples B-10 and B-11 for assistance with deciphering hexadecimal status codes.

Example B-10.

Decipher the following downloaded status code: 20C30

First, look at the PRC 5: Status Code table in Section B.2, and break down the status code into its different place holders:

1) There are no status codes displayed in the “one’s” place of the original status code.

2) In the “ten’s” place of the original status code, a status code of “30” is displayed. Because there are no status codes in the table that match this number, you will need to break down this number further.

In the “ten’s” place of the table, there are only two status codes that, when added together, will amount to 30: (H)10 “Flow 1 Out of Range” and (H)20 “Flow 2 Out of Range.” These are two of the status codes that the unit is displaying in its original status code.

At this point, you must subtract “30” from the original status code: 20C30 - 30 = 20C00. Now, continue to break down the resulting status code to decipher the rest of the status codes displayed in this number.

3) In the “100’s” place of the new status code (20C00), a status code of “C00 ” is displayed. Because there are no status codes in the table that match this number, you will need to break down this number further.

First, convert C00 to a decimal number. From the table in Figure B-1, you see that “C” is 12, which converts “C00” to “1200.”

Next, look at the PRC 5: Status Code table to decipher the “1200” status code. In the “100’s” place of the table, there are only two status codes that, when added together, will amount to 1200: (H)400 “Flow 3 Stopped Due to 10% Dev for 5 minutes” and (H)800 “Flow 4 Stopped Due to 10% Dev for 5 minutes.” These are two more of the status codes that the unit is displaying in its original status code.

Now, subtract “C00” from “20C00”: 20C00 - C00 = 20,000. Continue to break down this status code to decipher the rest of the status codes displayed in this number.

4) In the “10,000’s” place of the PRC 5: Status Code table, the status code (H)20000 “Pump Compartment Temp Sensor Out of Range” matches the “20,000” status code. This is the last status code that the unit is displaying in its original status code.

Therefore, the downloaded status code, “20C30,” breaks down into the following status codes, according to the PRC 5: Status Code table:

(H)10 “Flow 1 Out of Range”
(H)20 “Flow 2 Out of Range”
(H)400 “Flow 3 Stopped Due to 10% Dev for 5 minutes”
(H)800 “Flow 4 Stopped Due to 10% Dev for 5 minutes”
(H)20000 “Pump Compartment Temp Sensor Out of Range.”

Example B-11.

Decipher the following downloaded status code: 70B002

First, look at the PRC 5: Status Code table in Section B.2, and break down the status code into its different place holders:

1) In the "one's" place of the original status code, a status code of "2" is displayed. In the "one's" place of the PRC 5: Status Code table, the "2" status code matches the (H)2 "Automatic System Calibration Failed" status code. This is one of the status codes that the unit is displaying in its original status code.

Now, subtract "2" from "70B002": 70B002 - 2 = 70B000. Continue to break down this status code to decipher the rest of the status codes displayed in this number.

2) In the "ten's" place of the new status code, there are no status codes displayed.

3) In the "100's" place of the new status code, there are no status codes displayed.

4) In the "1,000's" place of the new status code (70B000), a status code of "B000 " is displayed. Because there are no status codes in the PRC 5: Status Code table that match this number, you will need to break down this number further.

First, convert "B000" to a decimal number. From the table in Figure B-1, you see that "B" is 11, which converts "B000" to "11,000."

Next, look at the PRC 5: Status Code table to decipher the "11,000" status code. In the "1,000's" place of the table, there are three status codes that, when added together, will amount to 11,000: (H)1000 "Coeff of Variation for Flow 1 Too High," (H)2000 "Coeff of Variation for Flow 2 Too High" and (H)8000 "Coeff of Variation for Flow 4 Too High." These are three more of the status codes that the unit is displaying in its original status code.

Now, subtract "B000" from "70B000": 70B000 - B000 = 700000. Continue to break down this status code to decipher the rest of the status codes displayed in this number.

(Example 11 continued on page B-33)

(Example 11 continued from page B-32)

4) In the “10,000’s” place of the new status code, there are no status codes displayed.

5) In the “100,000’s” place of the new status code (700000), a status code of “700000” is displayed. Because there are no status codes in the PRC 5: Status Codes table that match this number, you will need to break down this number further.

In the “100,000’s” place of the PRC 5: Status Code, there are three status codes that, when added together, will amount to “700,000”: (H)100000 “Vacuum Pump Failure,” (H)200000 “Vacuum Vent Valve Failure” and (H)400000 “Audit Performed in Middle of Sample.” These are three more status codes that the unit is displaying in its original status code.

Therefore, the downloaded status code, “70B002,” breaks down into the following status codes, according to the PRC 5: Status Code table:

(H)2 “Automatic System Calibration Failed”
(H)1000 “Coeff of Variation for Flow 1 Too High”
(H)2000 “Coeff of Variation for Flow 2 Too High”
(H)8000 “Coeff of Variation for Flow 4 Too High”
(H)100000 “Vacuum Pump Failure”
(H)200000 “Vacuum Vent Valve Failure”
(H)400000 “Audit Performed in Middle of Sample.”

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Appendix C: Two-Way Serial Communication

The Partisol Speciation Sampler supports two serial communication protocols: the AK Protocol and the German Ambient Network Protocol. These permit a locally or remotely located computer to obtain information digitally from the unit, and are described in this appendix.

C.1. AK Protocol

The AK Protocol is the most powerful RS232 mode in the Partisol Speciation Sampler. It not only allows the user to query the present value of any system variable remotely, but also permits the user to change the values of system variables and download information from the internal data logger. The RPComm software supplied with the unit uses this protocol for two-way communication directly to a computer or through a modem. The following commands of the AK Protocol are presented in detail in the following pages:

AREG — Ask Register Command. This allows the user to query the Partisol Speciation Sampler for the current value of any system variable (Program Register Code, Appendix B).

EREG — Enter Register Command. This allows the user to assign a new value to any system variable. Great care must be exercised in using this command, as the value of variables should be changed only when the monitor is in the appropriate operating mode.

SFxx — Set Function xx Command. This allows the user to send commands such as <RUN/STOP> to the unit. Each command is designated with a two-digit code, xx.

ASTO — Ask Storage Command. This allows the user to download a specified number of records from the internal data logger from the current position of the AK storage pointer. The location of this storage pointer may be defined by the SSTO command. The values on each line of output are delimited by commas.

SSTO — Set Storage Command. This allows the user to change the location of the AK storage pointer in the internal data logger, and is used in conjunction with the ASTO command described above. The AK storage pointer is always located just following the last record transmitted through the RS232 port via the AK Protocol. If the circular buffer overwrites this location or if the ASTO or SSTO commands have not been used, the AK storage pointer resides at the oldest record in the internal data logger.

IMPORTANT NOTE: The Partisol Speciation Sampler contains three internal databases: filter data, interval data and input data (Section 9). When downloading stored information using the ASTO and SSTO commands of the AK Protocol, the user must specify which database is to be accessed by setting the value of Program Register Code 31 (Appendix B) to either 0 for filter data, 1 for interval data, or 2 for input data.

The following pages detail the format of the transmission and response messages of the commands listed above.

AK Protocol

Ask Register Command (AREG)

COM 2-WAY SETTINGS

RS-Para 1	52	ASCII code for the 1-digit Station Number (for example "4": 052). The Station Number is always 1 digit in length.
RS-Para 2	75048	ASCII code representation of the 2-digit Channel Number (for example: "K0": 075, 048). The Channel Number is always 2 digits in length.
RS-Para 3	13010	Optional: Up to 3 ASCII codes can be added to response from instrument. In this case, <CR> and <LF> (ASCII codes 013 and 010) are appended to the response. Enter "0" if nothing is to be appended.
RS-Para 4	0	Not used.
RS-Para 5	0	Not used.
RS-Para 6	0	Not used.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1	<STX>	ASCII code 002.	1	<STX>	<STX>	ASCII code 002.
2	4	1-digit Station Number, RS-Para 1.	2	4	4	1-digit Station Number, RS-Para 1.
3	A	Ask Register command.	3	A	A	4-digit Ask Register command.
4	R		4	R	R	
5	E		5	E	E	
6	G		6	G	G	
7	<space>	Space.	7	<space>	<space>	Space.
8	K	2-digit Channel Number, as defined by RS-Para 2.	8	0	0	Number of current status conditions.
9	0		9	<space>	<space>	Space.
10	<space>	Space.	10	1	S	Program Register Code of the variable whose value is being requested. The PRC may be 1 to 3 characters long, and is not right-filled in the response.
11	1	Program Register Code of the variable whose value is being requested. The PRC may be up to 3 digits long. Do not right-fill if the PRC is less than 3 characters long.	11	2	E	
12	2		12	2	<ETX>	
13	2		13	<space>	<CR>	Space.
14	<ETX>	ASCII code 003.	14	1	<LF>	Current value of the variable referenced by the Ask Register command. NOTE: This value can be of varying length.
15			15	6		
16			16	.		
17			17	6		
18			18	9		
19			19	4		

AK Protocol Ask Register Command (AREG) (continued)						
Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
20			20	<ETX>		ASCII code 003.
21			21	<CR>		Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
22			22	<LF>		
23			23			
24			24			
25			25			
26			26			
27			27			
28			28			
29			29			
30			30			
31			31			
32			32			
33			33			
34			34			
35			35			
36			36			
37			37			
38			38			
39			39			
40			40			
41			41			
42			42			
43			43			
44			44			
45			45			
46			46			

AK Protocol

Enter Register Command (EREG)

COM 2-WAY SETTINGS

RS-Para 1	52	ASCII code for the 1-digit Station Number (for example "4": 052). The Station Number is always 1 digit in length.
RS-Para 2	75048	ASCII code representation of the 2-digit Channel Number (for example: "K0": 075, 048). The Channel Number is always 2 digits in length.
RS-Para 3	13010	Optional: Up to 3 ASCII codes can be added to response from instrument. In this case, <CR> and <LF> (ASCII codes 013 and 010) are appended to the response. Enter "0" if nothing is to be appended.
RS-Para 4	0	Not used.
RS-Para 5	0	Not used.
RS-Para 6	0	Not used.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1	<STX>	ASCII code 002.	1	<STX>	<STX>	ASCII code 002.
2	4	1-digit Station Number, RS-Para 1.	2	4	4	1-digit Station Number, RS-Para 1.
3	E	Enter Register command.	3	E	E	4-digit Enter Register command.
4	R		4	R	R	
5	E		5	E	E	
6	G		6	G	G	
7	<space>	Space.	7	<space>	<space>	Space.
8	K	2-digit Channel Number, as defined by RS-Para 2.	8	0	0	Number of current status conditions.
9	0		9	<space>	<space>	Space.
10	<space>	Space.	10	3	S	Program Register Code of the variable whose value was entered. The PRC may be 1 to 3 characters long, and is not right-filled in the response.
11	3	Program Register Code of the variable whose value is being entered. The PRC may be up to 3 digits long. Do not right-fill if the PRC is less than 3 characters long.	11	1	E	
12	1		12		<ETX>	
13			13	<ETX>	<CR>	ASCII code 003
14	<space>	Space.	14	<CR>	<LF>	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
15	1	New value to be entered for variable referenced by Program Register Code in bytes 11 to 13 above. NOTE: The value entered may be of varying length.	15	<LF>		
16			16			
17			17			
18			18			
19	<ETX>	ASCII code 003.	19			

AK Protocol

Set Function Command (SFxx)

COM 2-WAY SETTINGS		
RS-Para 1	52	ASCII code for the 1-digit Station Number (for example "4": 052). The Station Number is always 1 digit in length.
RS-Para 2	75048	ASCII code representation of the 2-digit Channel Number (for example: "K0": 075, 048). The Channel Number is always 2 digits in length.
RS-Para 3	13010	Optional: Up to 3 ASCII codes can be added to response from instrument. In this case, <CR> and <LF> (ASCII codes 013 and 010) are appended to the response. Enter "0" if nothing is to be appended.
RS-Para 4	0	Not used.
RS-Para 5	0	Not used.
RS-Para 6	0	Not used.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1	<STX>	ASCII code 002.	1	<STX>	<STX>	ASCII code 002.
2	4	1-digit Station Number, RS-Para 1.	2	4	4	1-digit Station Number, RS-Para 1.
3	S	Set Function command, where xx represents a 2-digit code. These codes are defined below.	3	S	S	4-digit Set Function command, with the 2-digit xx code corresponding to the function that was set.
4	F		4	F	F	
5	x		5	x	x	
6	x		6	x	x	
7	<space>	Space.	7	<space>	<space>	Space.
8	K	2-digit Channel Number, as defined by RS-Para 2.	8	0	0	Number of current status conditions.
9	0		9	<ETX>	<space>	Space.
10	<ETX>	ASCII code 003.	10	<CR>	S	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
LISTING OF FUNCTION CODES (xx)			11	<LF>	E	
01 02 10 11 50	Run Stop Set Time Set Date Switch to "None" RS232 Mode		12		<ETX>	
			13		<CR>	
			14		<LF>	
			15			
			16			
			17			
			18			
			19			

AK Protocol

Ask Storage Command (ASTO)

COM 2-WAY SETTINGS		
RS-Para 1	52	ASCII code for the 1-digit Station Number (for example "4": 052). The Station Number is always 1 digit in length.
RS-Para 2	75048	ASCII code representation of the 2-digit Channel Number (for example: "K0": 075, 048). The Channel Number is always 2 digits in length.
RS-Para 3	13010	Optional: Up to 3 ASCII codes can be added to response from instrument. In this case, <CR> and <LF> (ASCII codes 013 and 010) are appended to the response. Enter "0" if nothing is to be appended.
RS-Para 4	0	Not used.
RS-Para 5	0	Not used.
RS-Para 6	0	Not used.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1	<STX>	ASCII code 002.	1	<STX>	<STX>	ASCII code 002.
2	4	1-digit Station Number, RS-Para 1.	2	4	4	1-digit Station Number, RS-Para 1.
3	A	Ask Storage command. Enter the number of records to be downloaded from storage in bytes 11 to 13 below.	3	A	A	4-digit Ask Storage command.
4	S		4	S	S	
5	T		5	T	T	
6	O		6	O	O	
7	<space>	Space.	7	<space>	<space>	Space.
8	K	2-digit Channel Number, as defined by RS-Para 2.	8	0	0	Number of current status conditions.
9	0		9	<space>	<space>	Space.
10	<space>	Space.	10	3	S	Records to be downloaded from storage. This can be smaller than requested number due to end of file. Storage marker moved to after last record transmitted. Not right-filled.
11	5	The number of records to be downloaded from the instrument's storage. Downloading begins at the storage marker, which can be set using the SSTO command.	11	8	E	
12	0		12		<ETX>	
13			13	<ETX>	<CR>	ASCII code 003.
14	<ETX>	ASCII code 003.	14	<CR>	<LF>	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
SET CURRENT DATA STORAGE BUFFER			15	<LF>		
0 in PRC 31 1 in PRC 31 2 in PRC 31		Filter Data Interval Data Input Data	16			
			The instrument then transmits the number of storage records shown in response bytes 10 to 12 above. Each record is followed by <CR><LF>.			

AK Protocol

Set Storage Marker Command (SSTO)

COM 2-WAY SETTINGS

RS-Para 1	52	ASCII code for the 1-digit Station Number (for example "4": 052). The Station Number is always 1 digit in length.
RS-Para 2	75048	ASCII code representation of the 2-digit Channel Number (for example: "K0": 075, 048). The Channel Number is always 2 digits in length.
RS-Para 3	13010	Optional: Up to 3 ASCII codes can be added to response from instrument. In this case, <CR> and <LF> (ASCII codes 013 and 010) are appended to the response. Enter "0" if nothing is to be appended.
RS-Para 4	0	Not used.
RS-Para 5	0	Not used.
RS-Para 6	0	Not used.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1	<STX>	ASCII code 002.	1	<STX>	<STX>	ASCII code 002.
2	4	1-digit Station Number, RS-Para 1.	2	4	4	1-digit Station Number, RS-Para 1.
3	S	4-digit Set Storage Marker command.	3	S	S	4-digit Set Storage Marker command.
4	S		4	S	S	
5	T		5	T	T	
6	O		6	O	O	
7	<space>	Space.	7	<space>	<space>	Space.
8	K	2-digit Channel Number, as defined by RS-Para 2.	8	0	0	Number of current status conditions.
9	0		9	<ETX>	<space>	ASCII code 003.
10	<space>	Space.	10	<CR>	S	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
11	B	New location of the Storage Marker. B: move to beginning of storage buffer, E: move to end of storage buffer. Enter positive numbers such as 250 to move forward by n records, and negative numbers such as -1000 to move backwards by n records. Do not right-fill.	11	<LF>	E	
12			12		<ETX>	
13			13		<CR>	
14			14		<LF>	
15			15			
16	<ETX>	ASCII code 003.	16			
17			17			
18			18			
19			19			

AK Protocol

Response if Command Addressed to Instrument is Unrecognizable

COM 2-WAY SETTINGS		
RS-Para 1	52	ASCII code for the 1-digit Station Number (for example "4": 052). The Station Number is always 1 digit in length.
RS-Para 2	75048	ASCII code representation of the 2-digit Channel Number (for example: "K0": 075, 048). The Channel Number is always 2 digits in length.
RS-Para 3	13010	Optional: Up to 3 ASCII codes can be added to response from instrument. In this case, <CR> and <LF> (ASCII codes 013 and 010) are appended to the response. Enter "0" if nothing is to be appended.
RS-Para 4	0	Not used.
RS-Para 5	0	Not used.
RS-Para 6	0	Not used.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1			1		<STX>	ASCII code 002.
2			2		4	1-digit Station Number, RS-Para 1.
3			3		?	Question marks inserted in place of unrecognized command.
4			4		?	Question marks inserted in place of unrecognized command.
5			5		?	Question marks inserted in place of unrecognized command.
6			6		?	Question marks inserted in place of unrecognized command.
7			7		<space>	Space.
8			8		0	Number of current status conditions.
9			9		<space>	Space.
10			10		S	Syntax error.
11			11		E	Syntax error.
12			12		<ETX>	ASCII code 003.
13			13		<CR>	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
14			14		<LF>	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 3.
15			15			
16			16			
17			17			
18			18			
19			19			

C.2. German Ambient Network Protocol

The German Network Protocol, as implemented in the Partisol Speciation Sampler, provides basic capabilities to obtain the current values of one to three pre-determined program register codes (PRCs). Due to the definition of this protocol, it is not possible to select from a remote location which system variable (Program Register Codes, Appendix A) is to be queried.

The following pages show the manner in which RS-Para 1 through RS-Para 6 are defined in the German Ambient Network Protocol, and display the format of the transmission and response messages.

German Network Protocol

COM 2-WAY SETTINGS		
RS-Para 1	56052053	ASCII codes for 3-digit instrument identifier (for example "845": 056, 052, 053). The instrument identifier must be 3 bytes in length.
RS-Para 2	48048049	ASCII codes for 3-digit location ID (for example "001": 048, 048, 049). The location ID must be 3 bytes in length.
RS-Para 3	122127133	PRC of the variable to be transmitted by the instrument. Up to 3 PRC's may be designated for transmission by the instrument (for example Flow 1, Amb Temp and Filt 1 Temp: 122, 127, 133).
RS-Para 4	13010	Optional: Up to 3 ASCII codes can be added to response from the instrument. In this case <CR> and <LF> (ASCII codes 013 and 010) are appended to the reponse. Enter "0" if nothing is to be appended.
RS-Para 5	0	ASCII codes for 3-digit instrument identifier (for example "845": 056, 052, 053). PRC #2 is "0," this is used only if it is a non-zero value.
RS-Para 6	0	ASCII codes for 3-digit instrument identifier (for example "845": 056, 052, 053). PRC #3 is "0," this is used only if it is a non-zero value.

Transmission to Instrument			Response from Instrument			
Byte	Example	Description	B	No Err	Error	Description
1	<STX>	ASCII code 002.	1	<STX>	<STX>	ASCII code 002.
2	D	The DA command signifies a request for data from the instrument.	2	M	M	Response identifier to the DA command.
3	A		3	D	D	
4	8	3-digit instrument identifier, as defined by RS-Para 1. These three bytes are optional.	4	0	0	Number of variables transmitted by the instrument, as specified by RS-Para 3. May be 01, 02 or 03.
5	4		5	1	1	
6	5		6	<space>	<space>	Space.
7	<ETX>	ASCII code 003.	7	8	8	3-digit instrument identifier, as defined by RS-Para 1. This code increments by one for each variable transmitted. When PRC 2 ≠ 0, then the response from the instrument is RS-Para 5 (if RS-Para 5 holds a value). If RS-Para 5 = 0, then the response is RS-Para 1 + 1. When PRC 3 ≠ 0, then the response from the instrument is RS-Para 6 (if RS-Para 6 holds a value). If RS-Para 6 = 0, then the response is RS-Para 1 + 2.
8	<CRC>	High byte followed by low byte of CRC. The CRC's may be replaced by a single <CR> character.	8	4	4	
9	<CRC>		9	5	5	
			10	<space>	<space>	Space.
DEFINITION OF CRC BYTES			11	+ or -	+	Value of variable being transmitted, in the format +NNNN+EE. For example, a value of 63.7 is represented as +0637-01. If a syntax error exists or the value of the variable is 0, the instrument returns +0000+00.
The CRC bytes above (bytes 8 and 9) are the hexidecimal representation of the "exclusive or" of bytes 1 to 7. The high byte of the CRC is transmitted as byte 8 and the low byte is sent as byte 9.			12	n	0	
			13	n	0	
			14	n	0	
			15	n	0	
			16	+ or -	+	
			17	e	0	
			18	e	0	

German Network Protocol (continued)

Transmission to Instrument

Byte	Example	Description

CURRENT OPERATING MODE (Bytes 20, 21)

The current operating mode is determined as follows:

Byte	Example	Description
0	STOP	Stop
1	WAIT	Wait
2	SAMP	Sample
3	DONE	Done
5	ERR	Error
6	SVC	Service

CURRENT STATUS CONDITION (Bytes 23, 24)

The contents of bytes 23 and 24 indicate the existence of any status conditions in the monitor.

Byte	Example	Description
00	OK	No current status conditions
01	Error	Error Condition Exists
02	Crit Err	Critical Error Exists

DEFINITION OF CRC BYTES

The CRC information in bytes 38 and 39 is the hexidecimal representation of the "exclusive or" of all response bytes. The high byte of the CRC is transmitted as byte 38 and the low byte is sent as byte 39.

Response from Instrument

B	No Err	Error	Description
19	<space>	<space>	Space.
20	1	1	2-digit hexidecimal representation of current instrument operating mode (see description at left).
21	0	0	
22	<space>	<space>	Space.
23	0	0	2-digit hexidecimal representation of current instrument status condition (see description at left).
24	0	0	
25	<space>	<space>	Space.
26	0	0	3-digit Location ID, as defined by RS-Para 2.
27	0	0	
28	1	1	
29	<space>	<space>	Space.
30	1	9	3-digit PRC of the variable being transmitted, zero-filled from the left. These bytes are not defined in the German Protocol, but are included for informational purposes.
31	2	9	
32	2	9	
33	<space>	<space>	These bytes are not defined in the German Protocol, and are reserved for future definition.
34	<space>	<space>	
35	<space>	<space>	
36	<space>	<space>	Space.
37	<ETX>	<ETX>	ASCII code 003.
38	<CRC>	<CRC>	High byte and low byte of CRC. The CRC's are replaced by a single <CR> if transmit byte 8 was <CR>.
39	<CRC>	<CRC>	
40	<CR>	<CR>	Up to 3 digits appended to the end of the response transmission, according to the entry for RS-Para 4.
41	<LF>	<LF>	
42			

NOTE ABOUT MULTIPLE PRC CODES

If more than 1 Program Register Code is specified in RS-Para 3, byte 5 of the reponse transmission is either 2 or 3, and bytes 7 to 36 are repeated for each Program Register Code.

Appendix D: Installing New System Software

This appendix describes the steps involved in loading new system software into the Partisol Speciation Sampler. The Partisol Speciation is equipped with flash memory, which allows its operating program to be downloaded from a PC.

Before updating the software, record the values of calibration constants stored in the I/O Calibration, Sensor Calibration, Ambient Temperature Calibration and Flow Calibration screens in the sampler's Service Mode (Section 14).

Some of the sampler's operational settings also may need to be reentered as a result of the software download.

D.1. Loading Software Into Flash Memory

The software that operates the Partisol Speciation Sampler is stored in flash memory. It is not necessary to make any hardware changes to revise the software. Rather, the operating program is loaded into the sampler's RS232 port from a personal computer (PC).

Follow the procedure below to download new system software into the device:

1) **Record all of your unit's calibration constants (offset and span) from its calibration screens (Sensor Calibration and Flow Calibration screens). Record all required operating parameters.**

   IMPORTANT: After the new system software has been downloaded, you must do a total reset of the unit. This resets all of the unit's parameters to their default conditions and clears the system's data storage buffers, including the calibration constants. Be sure to record your operating parameters and calibration constants before uploading the new software and resetting your unit.

✔ Record system calibration constants before upgrading the software.

2) **Return the sampler to the Stop Operating Mode (Section 5.1).**

   NOTE: This action can be performed remotely if the instrument is in the AK Protocol (Appendix C) by executing the appropriate SFxx command(s).

3) **Using the 9-to-9 pin cable (07-000587) supplied with the sampler, connect the unit's RS232 port to your PC's RS232 port.**

4) **Set the sampler's current RS232 Protocol to "None" in the RS232 Setup screen (Section 10). In the same screen, confirm that the RS232 communication is set up for 8 data bits, 1 stop bit and no parity. The downloading software supports a baud rate of 9600.**

5) Load the following software provided with the system onto a PC (preferably all in the same directory) to perform the software download:

RPLOAD.EXE	Executable program for local or remote downloading.
RPLOAD.CFG	Configuration file containing the download parameters.
2300.BIN	Model 2300 operating program to be downloaded.

6) Using an ASCII text editor such as Windows™ Notepad, review the contents of the self-documenting RPLOAD.CFG file. Change the values of the listed download parameters, if necessary, to match the desired downloading operation:

COM=1	The communication port number. If a non-standard comm-port is being used, specify the correct port and IRQ values in the following lines.
PORT=3F8	This line is only used by the download program if the setting for COM above is 3. In this case, enter the port address (in hexidecimal) of the comm port being used. Otherwise, the download program disregards the value entered for PORT.
IRQ=4	This line is only used by the download program if the setting for COM above is 3. In this case, enter the interrupt request line of the comm port being used. Otherwise, the download program disregards the value entered for IRQ.
BAUD=9600	The baud rate of the program download. This value must match the setting entered in the sampler's RS232 Setup screen (Section 10). Permissible entries are 2400, 4800, 9600, 19200 and 38400 baud.
SETAK=1	Determines whether the sampler's RS232 mode changes to the AK Protocol after the download. A value of "0" causes the instrument to remain in the "None" mode, while a "1" instructs the sampler to enter the AK Protocol after the download.

7) Download the instrument control software according to the parameters in RPLOAD.CFG by issuing the following command from the PC:

RPLOAD 2300.BIN

As the software executes, it indicates and updates the current stage of the software transmission.

8) **Perform a complete reset of your unit. Pressing <F5: Reset> (Figure D-1) while in the Title screen causes the unit to reset *all* of its operating parameters to their default conditions. This also clears the system's data storage buffers, including the calibration constants.**

9) **Re-enter your required operating parameters and the calibration constants that you recorded before loading the new software. Calibration constants can be reentered in the appropriate calibration screens by pressing <EDIT>, entering the offset and span (where applicable) and pressing <ENTER>.**

10) **If performing a direct program download, disconnect the 9-to-9 pin computer cable from the unit to the PC.**

Figure D-1. Title screen.

```
              Partisol 2300
   12 Channel Speciation Air Sampler
  Version:  0.700   Date: Nov  2 1999

             Copyright 1999
    Rupprecht & Patashnick Co., Inc.
```

RDfault	RData			Reset

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Appendix E: Cartridge/Filter Log

This appendix contains a cartridge log to keep track of all important readings associated with each sampling cartridge. R&P encourages users to make photocopies of the form or to use a similar format.

Cartridge/Filter Log

R&P Partisol Model 2300 Speciation Sampler

Cartridge Number	Initial Filter Conditioning	Initial Filter Weighing		Filter Exposure		Post-Collection Filter Conditioning	Post-Collection Filter Weighing		DW	Concentration
	Conditions	Weights	Conditions	Exposure Period	Exposure Stats	Conditions	Weights	Conditions	W(F)-W(I)	DWx10^6/Volume
	RH: Temp: Date: Time:	W1: W2: W3: W(I):	RH: Temp: Date: Time:		Val Time: Tot Time: Volume:	RH: Temp: Date: Time:	W1: W2: W3: W(F):	RH: Temp: Date: Time:		
	RH: Temp: Date: Time:	W1: W2: W3: W(I):	RH: Temp: Date: Time:		Val Time: Tot Time: Volume:	RH: Temp: Date: Time:	W1: W2: W3: W(F):	RH: Temp: Date: Time:		
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