O P E R A T I N G M A N U A L

HAPSITE®

Headspace Sampling System

IPN 074-521-P1A

INFICON

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Headspace Sampling System

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A Technical Documentation File is also available for review by competent authorities and will be maintained for a period of ten years after the date on which the equipment was last manufactured. In additional to this file, technical, installation, maintenance and application information concerning this equipment can also be found in the Operating Manual(s) for this product or product family.

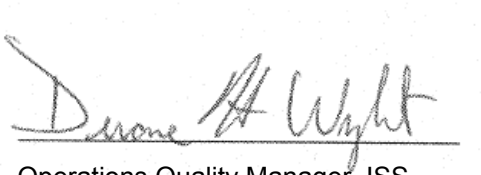
Equipment Description:	Headspace Sampling System (when used with the HAPSITE Smart Portable GC/MS System)
Applicable Directives:	2006/95/EC (LVD) 2004/108/EC (General EMC) 2002/95/EC (RoHS)

Applicable Standards:

Safety:		EN 61010-1:2001
	Emissions:	EN 61326-1:1997/A1: 1998/A2: 2001 (Radiated & Conducted Emissions) Class A: Emissions per Table 3 (EMC – Measurement, Control & Laboratory Equipment)
	Immunity:	EN 61326-1:1997/A1: 1998/A2: 2001 (General EMC) Class A: Immunity per Table A.1 (EMC – Measurement, Control & Laboratory Equipment)
	RoHS:	Due to the classification of this product it is currently exempt from the RoHS directive.

CE Implementation Date: October 2004

Authorized Representative: Duane H. Wright



Operations Quality Manager, ISS
INFICON Inc.

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Revised 11/04/08 (Rev B)

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NOTE: These instructions do not provide for every contingency that may arise in connection with the installation, operation or maintenance of this equipment. Should you require further assistance, please contact INFICON.

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Chapter 1
Introduction

1.1 Introduction

The Headspace Sampling System (HSS) is an accessory for the HAPSITE® Chemical Identification System. Using the HSS, the HAPSITE's sampling capability is extended to include volatile organic compounds in soil and water. See Figure 1-1.

Figure 1-1 Headspace Sampling System

When operating the HSS, the sample can be qualitatively identified using the National Institute of Standards and Technology (NIST) mass spectral library or the sample can be quantified when using a quantitative HSS method, which contains a calibration library.

1.2 Performance Specifications

Operating Conditions	10°C to 45°C, up to 95% Relative Humidity (non-condensing)
Dimensions (L x W x H)	36 cm x 39.5 cm x 19 cm
Weight (including battery)	12 kg
Power Consumption	30 W at 24 V
Oven Temperature Range	Ambient to 80°C
Equilibrium Stabilization Time	20 minutes
Practical Quantitation Limit (toluene)	5 µg/liter
Physical Orientation for Operation	Gray base side down, ≤15 ° tilt

1.3 Using this Manual

Please take a moment to read the following.

NOTE: Notes provide additional information about the current topic.

HINT: Hints provide insight into product usage.

CAUTION

This caution paragraph cautions against actions which may bring about a malfunction or the loss of data.

WARNING

This warning paragraph warns of actions that may result in physical injury.

WARNING - Risk Of Electric Shock

This warning paragraph warns of potentially lethal voltages.

1.4 How To Contact Customer Support

Please read this Operating Manual before contacting Customer Support. To contact support, please request:

- Technical Support for information and questions regarding general operation of the HSS and/or software assistance
- Applications support for information and questions regarding the ability of the HSS to detect various compounds and for assistance creating calibration libraries
- Sales for pricing requests and purchasing
- Service and Repair for troubleshooting advice and for information on repairing the HSS

If the instrument is experiencing a problem, please have the following information readily available:

- Serial number for the instrument, which is located inside the front panel door
- A description of the problem
- A summary of any corrective action that has been attempted
- The exact wording of any error messages

For current customer support phone numbers, please refer to **Support** at www.inficon.com.

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1.4.1 Returning the Instrument to INFICON

Do not return any component of the instrument to INFICON without first speaking with a Customer Support Representative.

Prior returning the instrument, a Declaration Of Contamination (DOC) form will need to be completed. The Customer Support Representative will provide the DOC form. All chemicals that have been analyzed by the HSS should be reported on the DOC form in order for INFICON's service personnel to take the proper safety precautions when performing the repair. In certain cases, INFICON may require that the instrument be sent to a designated decontamination facility instead of the factory.

Once the DOC has been received, the Customer Support Representative will provide shipping instructions and a Return Authorization Number (RMA), which signifies that INFICON has authorized the return.

1.5 HSS Components

1.5.1 Headspace Sampling System — Components Received

Headspace Sampling System (HSS) — The main module includes the following:

- Headspace sampling needle assembly
- Heater block with four sample wells
- Compartment for loading an INFICON nitrogen carrier gas canister
- Compartment for loading an INFICON rechargeable battery
- Swagelok® connection for use with an external supply of pressurized nitrogen
- Power supply connection
- Transfer line connection

NOTE: See Chapter 7, Part Numbers for the component's part numbers.

Transfer Line — A directional heated line which connects the HSS to the HAPSITE. The line transfers the sample from the HSS to HAPSITE and provides communication between the two instruments. For the Smart Plus, each end of the transfer line is labeled to ensure proper orientation.

Transfer Line Insulation — This foam sleeve insulates the transfer line. The insulation extends battery life by reducing the energy required to heat the line. Once the transfer line is heated, the insulation helps to maintain the temperature.

NOTE: The transfer line heats to 60°C for sample collection and requires the transfer line insulation in order to maintain the temperature.

Replacement Needle Kit — This kit contains a new HSS needle. The original needle will need to be replaced if it becomes worn, plugged, or broken.

HSS Carrying Shoulder Strap — A strap which connects to the mounts on the sides of the HSS. It facilitates carrying the instrument between the lab and the field.

Y-Cable — A power cable to split the power from the AC to DC power converter to both the HAPSITE and the HSS.

1.6 Consumables

1.6.1 Compressed Nitrogen

A source of pressurized, ultra high purity nitrogen is required for sample purging and analysis. Nitrogen may be delivered by the on-board canister. Alternately, an external nitrogen source, regulated to 60-100 psi (approx. 420-700 kPa), may be connected through the 3/16" Swagelok quick-connect fitting located at the back of the instrument.

External ultra high purity nitrogen cylinders must meet the following requirements:

- less than 50 ppb VOCs
- less than 40 ppm argon

For mobile, in-the-field sampling, a 110 L bulk tank of nitrogen is available. Larger bulk cylinders of ultra high purity nitrogen, e.g., 300 ft^3, can be used in fixed locations.

The HAPSITE Analytical module will also require an on-board nitrogen canister or an external nitrogen source, such as the 110 L bulk tank or bulk cylinder described above, to analyze HSS samples.

Nitrogen canisters and the 110 L bulk tank are available from INFICON. See Chapter 6, Part Numbers for ordering information.

1.6.2 HSS Internal Standards

The HSS uses a liquid internal standard in order to correlate with sample matrix.

The liquid internal standard must be injected with a syringe into each sample prior to placing the sample into the HSS.

The HSS internal standard is a four component mix, which contains:

- Fluorobenzene at a concentration of 250 µg/mL
- Chlorobenzene-d5 at a concentration of 250 µg/mL
- 1,4 dichlorobenzene-d4 at a concentration of 250 µg/mL
- Bromopentafluorobenzene (BPFB) at a concentration of 500 µg/mL

The HSS internal standard is available from INFICON. See Chapter 6, Part Numbers for ordering information.

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1.6.3 Internal Standard Gas Canister

An internal standard canister must be inserted into the HAPSITE Analytical Module for tuning the mass spectrometer. Refer to the Tune chapter of the HAPSITE ER or Smart Plus manual.

Canisters are available from INFICON. See Chapter 6, Part Numbers for ordering information.

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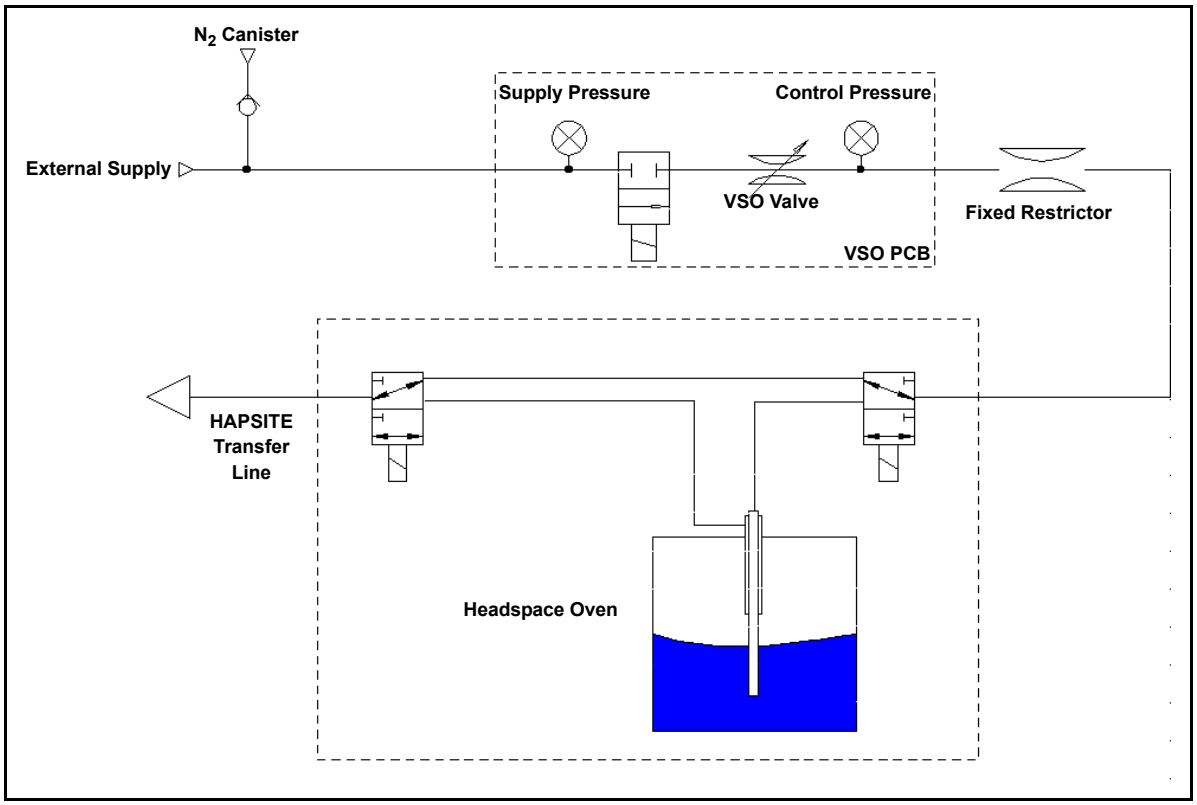
Chapter 2
Theory of Operation

2.1 How the HSS Operates

The HSS heats the sample to allow the compounds to volatize. Once the compounds are volatile, the gas will be transferred to the HAPSITE for analysis. To begin the process of volatilization, the sample must be collected into a 40 mL sample vial and placed into a sample well of the heater block inside of the HSS. After placing the sampling needle into the vial, the liquid or soil sample is heated in the closed sample container to the temperature set by the method. Heat forces the volatile components to partition between the sample and the headspace (gas space) above the sample. After allowing sufficient time for sample equilibration, nitrogen is bubbled through the bottom of the needle. A portion of the headspace, which now contains volatile compounds from the sample, is drawn through the top of the needle and introduced to the HAPSITE as a gas sample.

Figure 2-1 is a schematic of the gas flow system. The flow begins with the nitrogen supply, at the upper left. The nitrogen pressure and flow are controlled by two pressure gauges, a shut-off valve (the variable orifice valve) and a fixed restrictor. All of the valves in this system are operated under software control.

Figure 2-1 HSS Operation Flow Diagram



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Two three-way valves direct the flow to either bypass the vial (in the position shown) or purge through the vial. When the headspace sample is being transferred to the HAPSITE, the nitrogen flow is directed through the bottom of the long needle, below the surface of the sample. This allows nitrogen to bubble through the sample. The nitrogen flow into the vial is balanced by the HAPSITE's sample pump draw of the headspace sample out of the vial. The headspace sample is transferred to the HAPSITE while maintaining neutral pressure in the vial.

At the end of the analysis, if a **Purge** cycle is programmed, the operator is prompted to insert the needle into a clean vial and press **Continue**. **Purge** provides a flow of VOC free nitrogen through the needle, heated line and the sample path in the HAPSITE. This flow of nitrogen removes residual organics and moisture from the previous run. During the **Purge** cycle, the three-way valves change state, assuring that the bypass line is also purged. The sample pump continues to run during **Purge**.

The heater block contains the sample wells with the sample vials, the three-way valves, and the entire length of the sample line which connects with the HAPSITE heated transfer line. This design precludes the condensation of volatiles at cold spots.

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Chapter 3
System Setup

3.1 Connecting System Components

The following components are required for assembling the HSS.

- HAPSITE
- The HSS module
- The transfer line
- Nitrogen canister or alternate nitrogen source
- Power source

For portable use, two batteries are necessary. One battery for the HAPSITE and another battery for the HSS. For stationary use, a power supply and a y-cable are necessary.

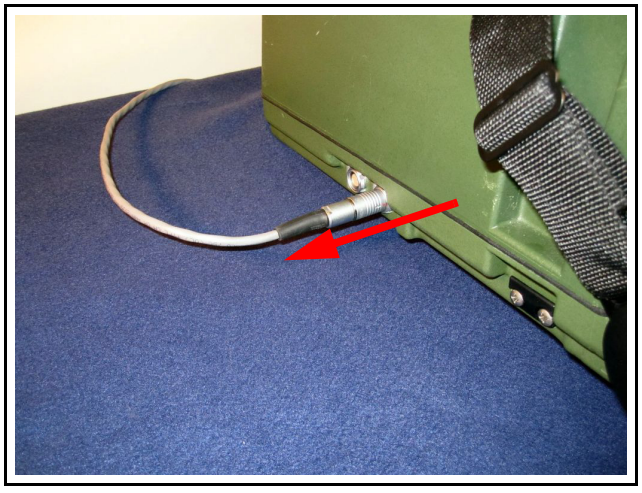
The transfer line provides communication and allows the sample to be transferred from the HSS to the HAPSITE. When using the transfer line, care must be taken to avoid sharp bends of the transfer line (greater than 90°). This may lead to flow restriction or possible breakage.

3.2 HSS Assembly

Prior to assembly, determine a suitable location, on a level surface, where the HAPSITE and the HSS are close enough together to connect via the transfer line.

1. Insert a charged battery into the HAPSITE. Installation instructions are located inside the HAPSITE front panel.
2. Disconnect the power supply cord. See Figure 3-1.

Figure 3-1 Power Supply Cord



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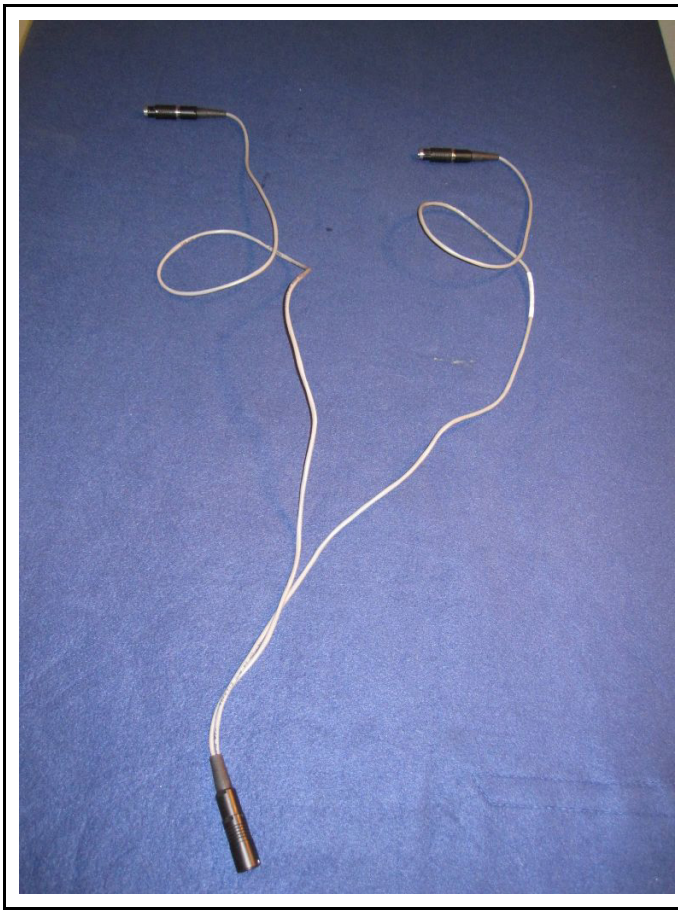
3 If the HAPSITE is being used in a stationary location, follow steps 3a-3c.

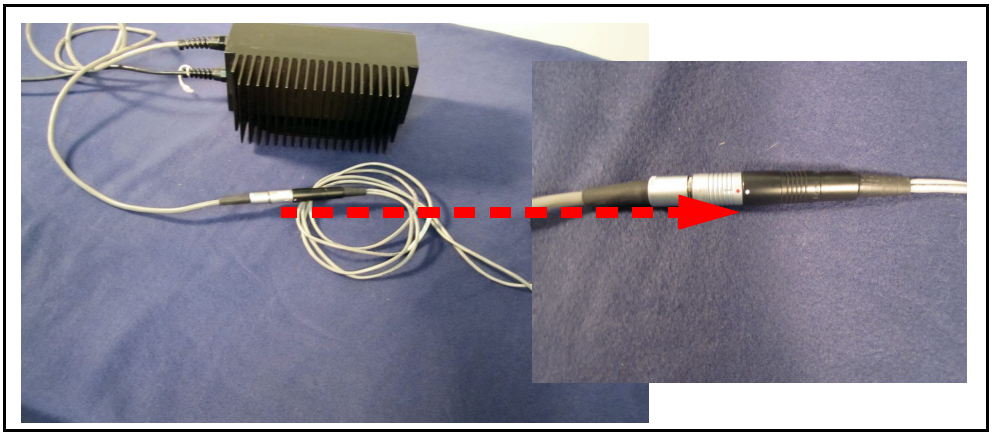
3a The y-cable will be connected to split the power between the HSS and the HAPSITE Analytical Module. The y-cable has a joined end and two split ends. See Figure 3-2.

Figure 3-2 Y-Cable



3b Align the dot on the joined end of the y-cable with the dot on the power supply connection. Insert the cable into the power supply connection. See Figure 3-3.

Figure 3-3 Inserting the Y-cable into the Power Supply Connection



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3c Align the dots on the split end of the y-cable with the connection on the HSS. Insert the split end of the y-cable into the HSS. See Figure 3-4.

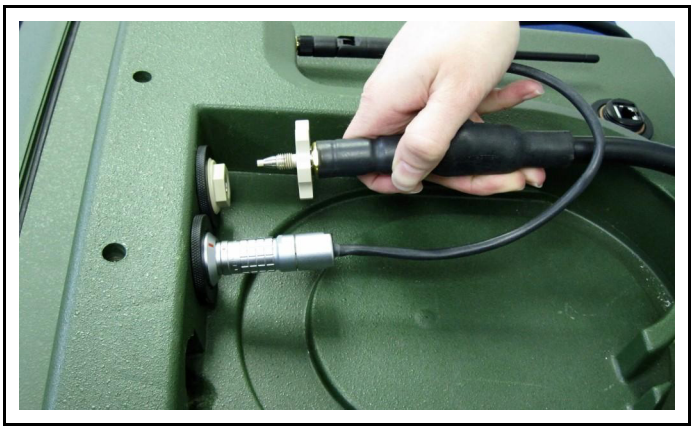
Figure 3-4 Connection to the Back of the HSS

3d Align the dots on the split end of the y-cable with the power supply port on the HAPSITE. Insert the split end of the y-cable into the HAPSITE. See Figure 3-5.

Figure 3-5 Power Supply

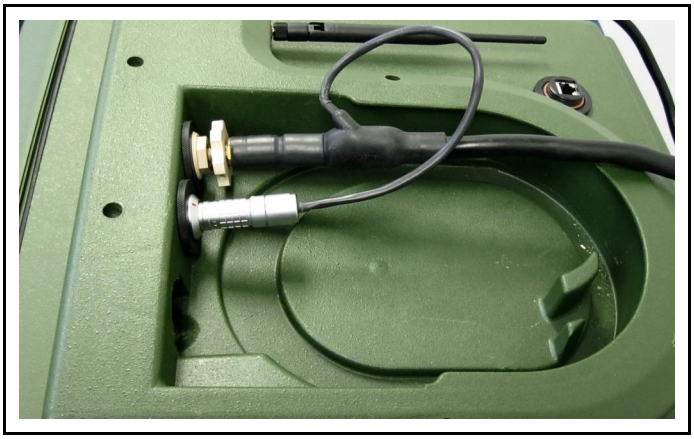
4 For the ER, remove the air probe from the HAPSITE Analytical Module by unscrewing the bulkhead connector and pulling outwards on the LEMO connection. See Figure 3-6.

Figure 3-6 Removing the Air Probe



5 To attach the transfer line to the HAPSITE ER, screw the Universal Bulkhead connection into place. Align the red dots on the LEMO connection with the red dots on the HAPSITE. Insert the LEMO connection. See Figure 3-7.

Figure 3-7 ER Transfer Line



6 To attach the transfer line to the HAPSITE Smart Plus/Smart, align the red dots on the LEMO connection with the red dots on the HAPSITE. Insert the LEMO connection. See Figure 3-8.

NOTE: The transfer line is directional for the Smart Plus. Each end of the transfer line is labeled to ensure proper orientation.

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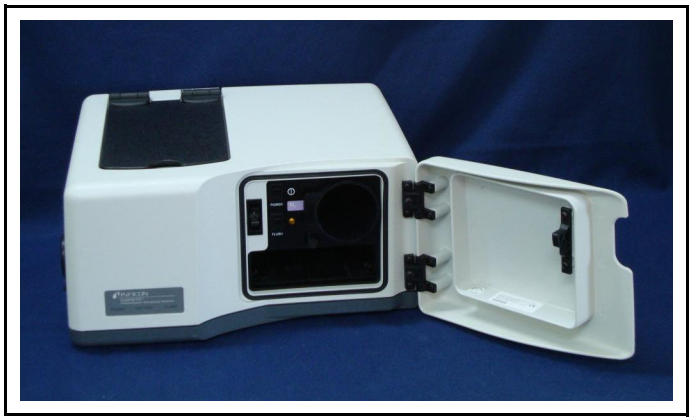
Figure 3-8 Smart Plus Transfer Line

7 Insert the transfer line into the back of the HSS. See Figure 3-9.

Figure 3-9 Inserting Transfer Line

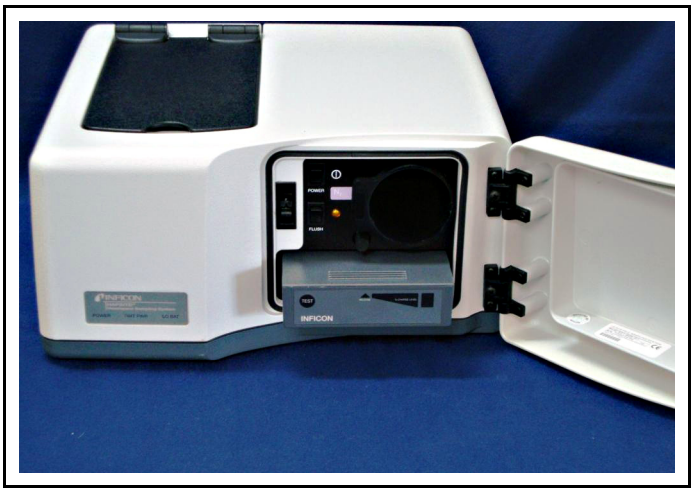
8 Open the front door of the HSS. See Figure 3-10.

Figure 3-10 HSS Front Door



9 Insert the battery into the slot. The arrow on the battery will be facing the battery release button and the INFICON label will be in the lower left hand corner. See Figure 3-11.

Figure 3-11 Battery Insertion



10 Push battery into the slot until a "click" is heard.

11 Verify that battery is securely fastened by gently pulling outwards on it.

12 Insert the nitrogen canister into the HSS. See Figure 3-12.

Figure 3-12 Inserting Nitrogen Canister

13 Verify that battery is securely fastened by gently pulling outwards on it.

14 Turn on the HSS by pressing down on the power switch. See Figure 3-13.

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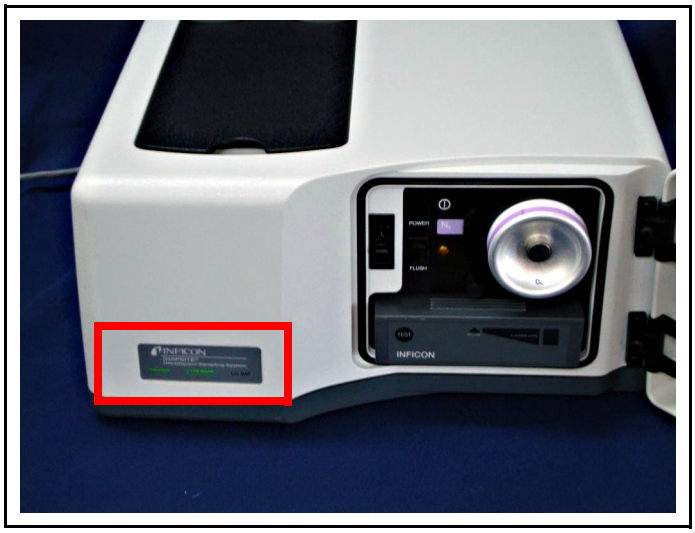
Figure 3-13 Turning on the HSS

NOTE: The power switch is a toggle switch. Once pressed, it will return to its original position.

15 The word **POWER** will illuminate. See Figure 3-14.

Figure 3-14 Power Button



NOTE: If the HSS is powered by the power supply, **RMT POWER** will also illuminate.

16 Close the front door.

3.3 Loading the Vials with a Liquid Sample

WARNING

Wear appropriate Personal Protection Equipment (PPE) as advised by the MSDS of the compound(s) being used.

The following materials are necessary for loading sample vials:

- Volatile organic compound free (VOC-free) water
- Clean vessel (beaker or similar)
- 25 or 50 mL Luer-Lok® tip sample syringe
- 10 µL syringe with fixed needle
- HSS internal standard
- Sample
- Methanol
- Clean, 40 mL sample vial

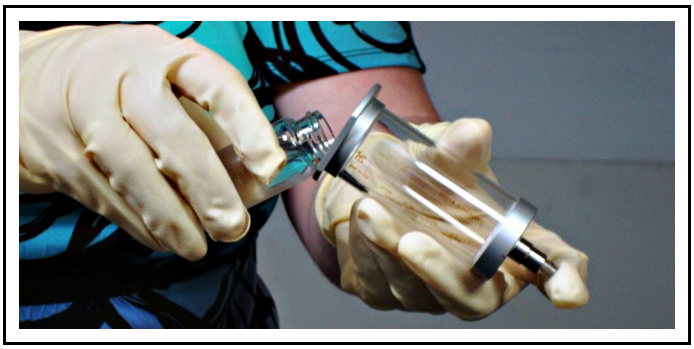
The integrity of the sample should be preserved when loading the sample vials. Heat and aeration will remove volatiles from a sample, thus, reducing the integrity of the sample. Follow the procedure below to load a water sample into the vial.

1. Rinse a small, clean vessel with VOC-free water. Discard the water.
2. Pour VOC-free water into the rinsed vessel.
3. Using the water in the rinsed vessel, rinse the sample syringe with VOC-free water by drawing the water up into the syringe through the tip. Push the syringe plunger to discard the water into a separate container. Repeat three times.

   NOTE: Use VOC- free water to rinse a syringe. (Either a 25 or 50 mL Luer-Lok tip syringe is suggested.) No needle is required for this syringe.

4. Remove the plunger from the sample syringe. Hold the sample syringe at an angle with the large open end up, and the small end, the area where the needle would be located, stopped against a gloved finger. See Figure 3-15. Carefully transfer the sample into the sample syringe.

Figure 3-15 Transferring the Sample into a Sample Syringe



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5 Adjust the amount of sample in the sample syringe to 20 mL and clear the air bubble. See Figure 3-16.

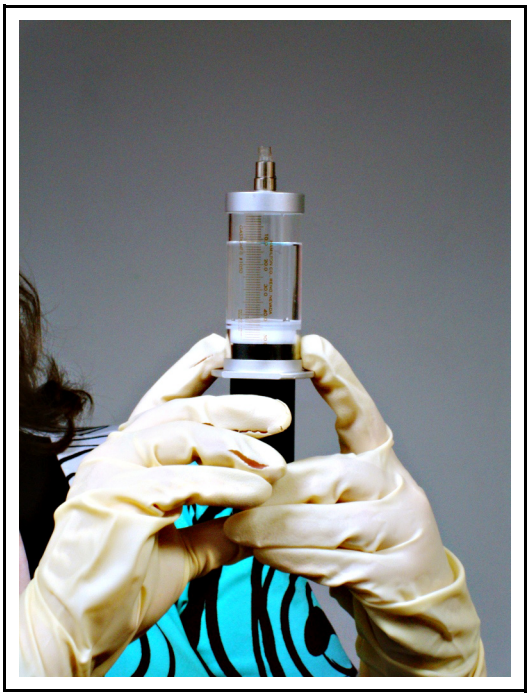
WARNING

Do not insert a vial, which is completely full of liquid sample, into a Headspace sample well. An adequate airspace above the sample is required to allow for sample expansion during heating. Failure to leave an airspace in the vial may cause the vial to break and personal injury. Do not fill the vial with more than 20 mL of liquid.

CAUTION

Overfilling the vial will cause liquid to be drawn into the HSS and HAPSITE which will damage both instruments.

Figure 3-16 Clearing the Air Bubble from the Sample Syringe



6 Add internal standard and surrogates (if desired) into the sample.

NOTE: The internal standards are a set of compounds which are injected at a consistent known concentration with each calibration standard, continuing calibration check, blank, quality control sample, as well as with each sample. The internal standards are used to correct for method inconsistencies. Internal standards are chosen so that interference with compounds from the sample is not encountered.

NOTE: Surrogates are used to indicate consistency within the analysis as compared to internal standards. These compounds are also injected into the sample at a consistent known concentration similar to the internal standard. Surrogates are also chosen to avoid interference with compounds in the sample. Surrogates are reported as recovery values in percent (%) compared to expected response value.

7 Rinse the 10 µL syringe, with the fixed needle (pictured in Figure 3-17), which is used for the injection of the internal standard/surrogate mixture, with high purity methanol three times. Discard the methanol appropriately after each rinse into a separate container.

WARNING

Be careful to avoid injury when using the sharp needle.

8 Rinse the 10 µL syringe once with the internal standard/surrogate mixture, and discard the internal standard/surrogate mix from the 10 µL syringe.

9 Inject the desired amount of internal standard/surrogate mixture into the sample through the small end of the sample syringe. For the INFICON default PPB methods, 10 µL of internal standard is recommended. For the INFICON default PPT methods, 1 µL of internal standard is recommended. See Figure 3-17.

Figure 3-17 Injecting the Mix into the Sample Syringe

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10 If creating a quantitative method, a calibration standard will need to be prepared. Rinse a separate 10 µL syringe with methanol three times. Discard the methanol from each rinse appropriately.

NOTE: For complete calibration and method writing instructions using the IQ software, please refer to the ER or Smart Plus manual.

11 Rinse the syringe once with the calibration mixture. Discard this rinse as well.

12 Load the syringe with the desired amount of calibration standard. Inject the standard through the small end of the sample syringe to finish preparing the calibration standard.

NOTE: The following table has calculated the amount of calibration that must be added to 20 mL of water to achieve the stated concentrations when using standards at concentrations of 200 and 2000 µg/mL. See Table 3-1.

Table 3-1 Example Calibration Concentration Table at 200 µg/mL

Concentration Desired	Amount at 200 µg/mL to be injected
20 ppb	2 µL
50 ppb	5 µL
100 ppb	10 µL

Table 3-2 Example Calibration Concentration Table at 2000 µg/mL

Concentration Desired	Amount at 2000 µg/mL to be injected
400 ppb	4 µL
1000 ppb	10 µL

The formula used to calculate the amount needed for injection (as above) is as follows (1 PPB = 1 ng/mL):

$X = C_F / C_C \times 1000\ \mu L/mL \times 1\ \mu g/1000\ ng \times 20\ mL$ [1]

where:

- X = µL to be Injected
- C_F = Final Desired Concentration in ng/mL (ppb)
- C_C = Calibration Mix Concentration in µg/mL (ppm)

13 Uncap a clean, 40 mL sample vial, tilt the vial, and transfer the sample from the sample syringe. When transferring, avoid aerating (bubbling) the sample. See Figure 3-18.

Figure 3-18 Transferring the Sample to a 40 mL Vial

14 Cap the sample vial tightly.

15 Label the vial with the appropriate information.

3.4 Loading the Vials with a Soil Sample

WARNING

Wear appropriate Personal Protection Equipment (PPE) as advised by the MSDS of the compound(s) being used.

The following materials are necessary for loading sample vials:

- 10 µL syringe with fixed needle
- HSS internal standard
- Sample
- Methanol
- Clean vessel (beaker or similar)
- Clean, 40 mL sample vial

The integrity of the sample should be preserved when loading the sample vials. Heat and aeration will remove volatiles from a sample, thus, reducing the integrity of the sample. Follow the procedure below to load a soil sample into the vial.

1 Carefully weigh out 10 g of soil into the clean vessel.

2 Transfer the 10 g of soil into the clean, 40 mL sample vial.

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3 Rinse the 10 µL syringe, with the fixed needle (pictured in Figure 3-17), which is used for the injection of the internal standard/surrogate mixture, with high purity methanol three times. Discard the methanol appropriately after each rinse into a separate container.

WARNING

Be careful to avoid injury when using the sharp needle.

4 Rinse the 10 µL syringe once with the internal standard/surrogate mixture, and discard the internal standard/surrogate mix from the 10 µL syringe into a separate container.

5 Inject the desired amount of internal standard/surrogate mixture into the soil sample. For the INFICON default PPB methods, 10 µL of internal standard is recommended. For the INFICON default PPT methods, 1 µL of internal standard is recommended.

NOTE: The internal standards are a set of compounds which are injected at a consistent known concentration with each calibration standard, continuing calibration check, blank, quality control sample, as well as with each sample. The internal standards are used to correct for method inconsistencies. Internal standards are chosen so that interference with compounds from the sample is not encountered.

NOTE: Surrogates are used to indicate consistency within the analysis as compared to internal standards. These compounds are also injected into the sample at a consistent known concentration similar to the internal standard. Surrogates are also chosen to avoid interference with compounds in the sample. Surrogates are reported as recovery values in percent (%) compared to expected response value.

6 Cap the sample vial tightly.

7 Label the sample vial with the appropriate information.

CAUTION

The HSS needle may clog or break when using densely packed soil samples (i.e., clay)

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3.4.1 Loading the Sample Wells

This section describes the procedure for loading a sample vial into the sample well of the HSS.

1 Open the top, black cover of the HSS to expose the sample needle assembly and metal heater block with four sample wells.

WARNING

Be careful to avoid injury when handling hot sample vials.

WARNING

Be careful to avoid injury when loading/unloading samples as the HSS metal sampling needle is sharp.

WARNING

Be careful to avoid injury from any broken glass.

WARNING

Do not insert a vial which is completely full of liquid sample. An adequate airspace above the sample is required to allow for sample expansion during heating. Failure to leave an airspace in the vial may cause the vial to break and result in personal injury. Do not fill the vial with more then 20 mL of liquid.

CAUTION

Overfilling the vial will cause liquid to be drawn into the HSS and HAPSITE which will damage both instruments.

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CAUTION

When opening the top panel, do not allow contamination or water to enter into the HSS as this may damage the instrument.

2 Insert the prepared vial, plastic cap facing upwards, into an empty sample well.

3 Place a clean empty vial into another empty sample well. This vial will be the purge vial.

4 Grasp the needle assembly between the thumb and forefingers. Pull up on the assembly until the needle can freely rotate.

5 Swivel the needle assembly left or right so that the needle is above the clean, empty purge vial.

CAUTION

Needle assembly has a limited axis of rotation. Do not force.

6 Gently lower the needle into the purge vial to allow the needle to pierce through the cap septum. See Figure 3-19.

NOTE: Do not puncture the sample septum until the sample has had adequate time to equilibrate.

Figure 3-19 Inserting the Needle into a Vial

7 Continue to lower the needle until the needle is fully inserted into the vial.

8 Close the black cover to prevent heat loss and promote thorough heating of the needle assembly.

9 Record the time when each sample was inserted into the well in order to monitor the equilibration time. Most samples take approximately 20 minutes to equilibrate.

NOTE: The 40 mL sample vials are intended for one time use only. The vial and sample should be properly discarded when finished.

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Chapter 4
Operation

4.1 HSS Operation

To operate the HSS from the front panel, follow the instructions below.

NOTE: The HSS does not have Survey methods.

1. Verify that the desired sampling configuration is installed (i.e., concentrator).
2. Verify that the HSS transfer line is installed. See Chapter 3, System Setup.
3. Place a 40 mL vial with either blank or sample into a sample well.

   NOTE: Do not fill the sampling vial with more than 20 mL of liquid or 10 g of solid sample. See section 3.4.1, Loading the Sample Wells, on page 3-14 for detailed instructions and information on loading the sample vials into the wells.
4. Place a blank vial into a sample well.

WARNING

The HSS needle is very sharp and the assembly may be hot.

Figure 4-1 HSS Needle

5 When powered on or taken out of Extended Standby, the HAPSITE will automatically start preparing the default HSS method. For information on method selection, see section 4.4 on page 4-20. If the HSS method that the HAPSITE begins preparing is not the desired one, see section 4.1.1, Selecting a Different Method Using the SELECT METHOD Icon, on page 4-6.

6 If running a HSS concentrator method, the HAPSITE will run a concentrator cleanout. The progress of the concentrator cleanout will be shown by a bar graph. If the concentrator cleanout is unsuccessful, refer to the ER/Smart Plus manual.

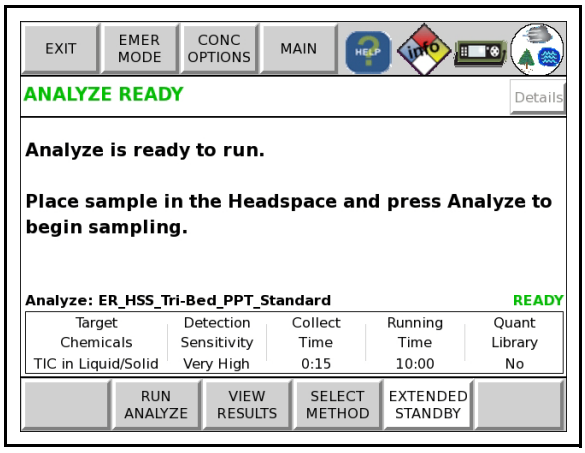
7 When the HAPSITE has finished preparing, a **SYSTEM IS READY** message will appear with a message to press Analyze to begin sampling.

NOTE: A blank run is recommended before running a sample.

8 Gently insert push the HSS needle into the 40 mL vial containing the blank/sample.

9 Using the touch screen, touch **RUN ANALYZE** to start the method. See Figure 4-2**.** If using the push buttons, push **ANALYZE RUN**.

Figure 4-2 HSS Analyze



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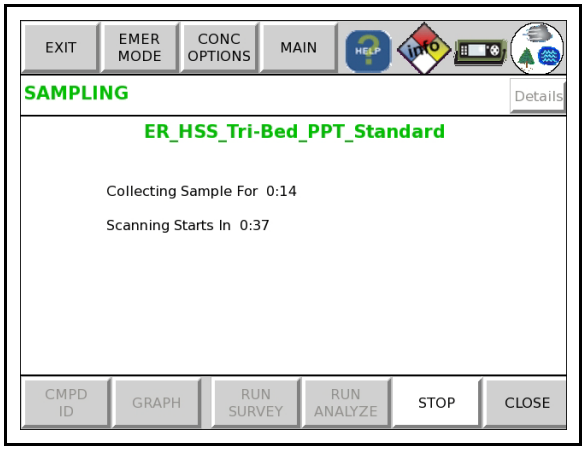
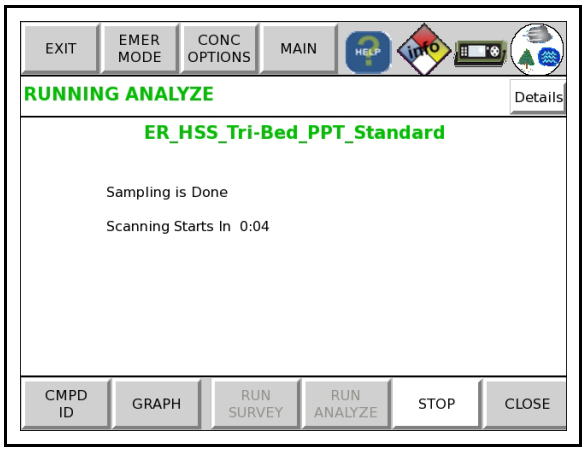
10 The screen will prompt **Collecting Sample For**. See Figure 4-3. The HSS is automatically collecting a sample. No action is required by the user.

Figure 4-3 Collecting Sample



11 The next screen will prompt **Sampling Done**. Again, no action is required by the user. See Figure 4-4.

Figure 4-4 Sampling Done HSS

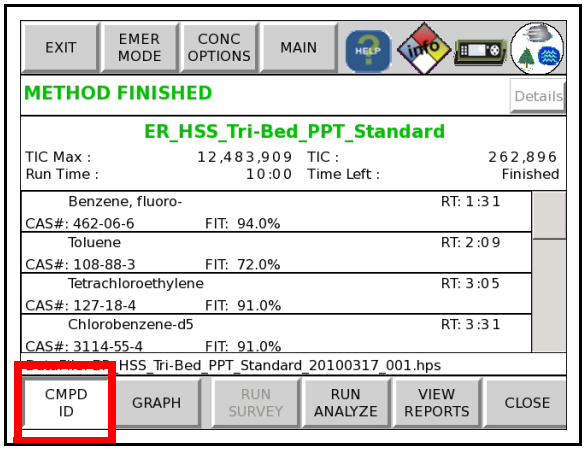


12 Touch **CMPD ID**, to view a list of identified compounds. The CAS number, the fit and the retention time for each compound will also be displayed. This screen will also display the TIC (Total Ion Count) Max, the current TIC and the run of the time and the time remaining until the method finishes.

NOTE: Touching a compound on the list will display its NIOSH database information if available.

12a The **CMPD ID** screen can also be accessed by using the **arrow keys** to highlight **CMPD ID** and pushing **OK SEL**. See Figure 4-5.

Figure 4-5 Sample Compound ID View for HSS

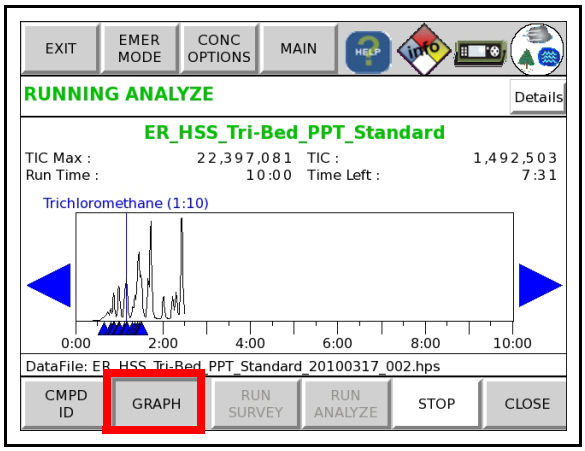


13 To view the chromatogram while the method is running, touch **GRAPH**. See Figure 4-6. Alternately, use the **arrow keys** to highlight **GRAPH**. Push **OK SEL**.

NOTE: This screen will also state the TIC Max, the current TIC Count and the time remaining.

NOTE: Touching the blue compound identification above the chromatogram will display its NIOSH database information if available.

Figure 4-6 Sample Chromatogram View for HSS



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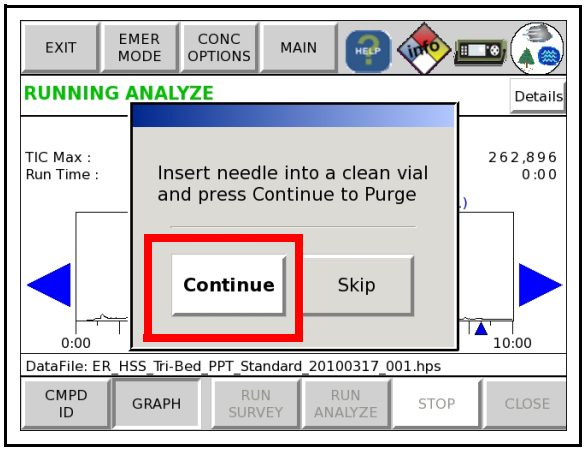
14 At the end of the HSS run, a prompt will appear. When prompted **Insert needle into a clean vial and press Continue to Purge**, place the HSS needle into the clean, empty vial. When inserted, touch the **Continue** button or using the **arrow keys**, highlight **Continue**. Push **OK SEL**.

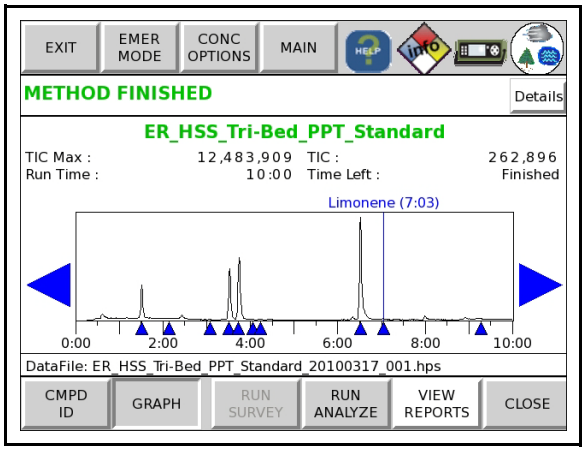
NOTE: If purge is skipped, a full HSS run must be completed to flush the system. Once purge has been skipped, it is not possible to re-access it.

Figure 4-7 Purging HSS



15 The **METHOD FINISHED** message will appear when the purge method has ended. See Figure 4-8.

Figure 4-8 Sample Method Finished for HSS



NOTE: Upon completion of a method, another Analyze (GC/MS) method can be immediately started. Depending on the temperature profile, the column may need to cool before another run will begin. Remember to move the needle into the desired sample vial before starting a new run.

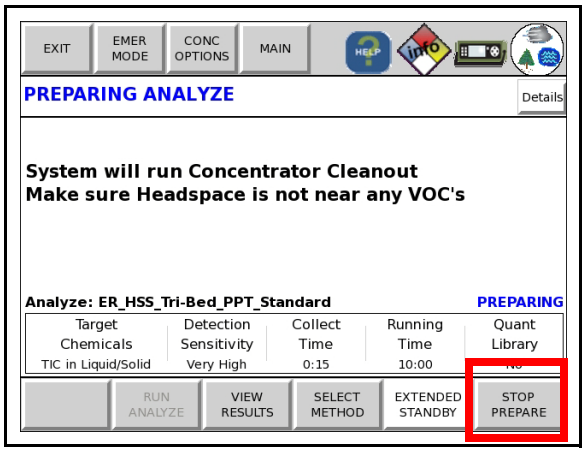
NOTE: Refer to the ER/Smart Plus manual for more information on reviewing the data.

4.1.1 Selecting a Different Method Using the SELECT METHOD Icon

If the default method is not the desired method, the method can be changed. Changing the method can occur when the system is preparing or when another method has finished preparing.

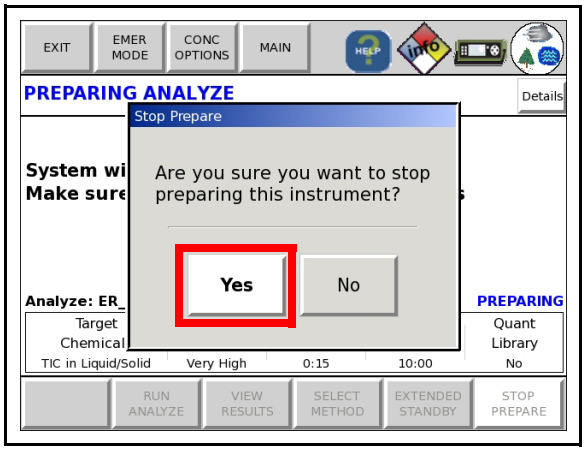
1 When the **PREPARING SYSTEM** screen is displayed, touch **STOP PREPARE**. Alternately, use the **arrow keys** to highlight **STOP PREPARE** and push **OK SEL**. See Figure 4-9.

Figure 4-9 Stopping Prepare



2 The screen will prompt, **Are you sure you want to stop preparing this instrument?** Touch **Yes** or using the **arrow keys**, highlight **Yes** and push **OK SEL**. See Figure 4-10.

Figure 4-10 Stopping Preparation



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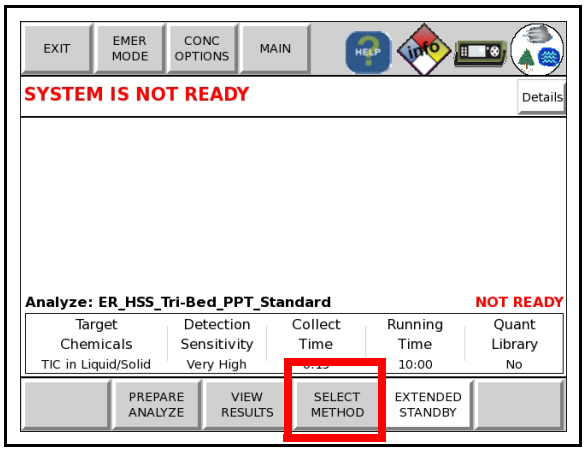
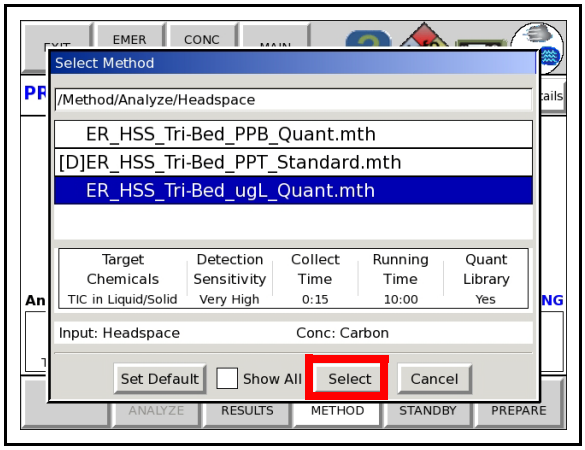
3 The **SYSTEM IS NOT READY** screen will appear. To select a new method, touch **SELECT METHOD** or using the **arrow keys**, highlight **SELECT METHOD** and push **OK SEL**. See Figure 4-11.

Figure 4-11 Selecting a Method Screen



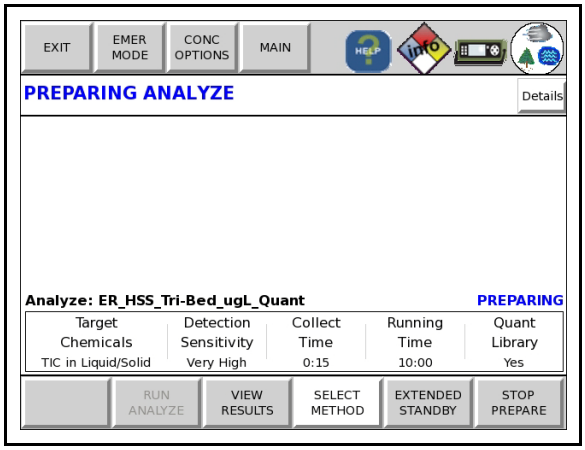
4 Scroll up or down using the scroll bar or with the **arrow keys**. When the desired method is highlighted, touch **Select** or push **OK SEL**. See Figure 4-12.

Figure 4-12 Method Selection



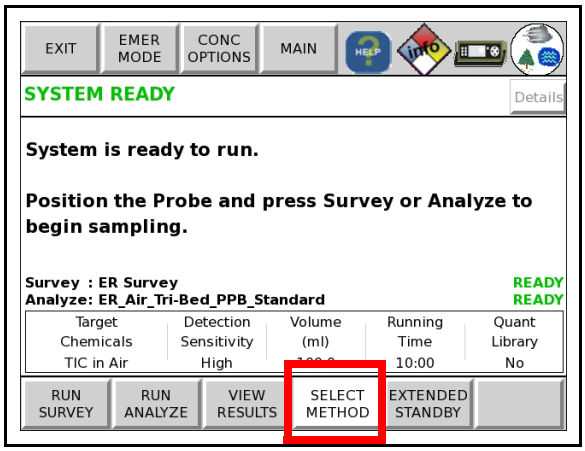
5 The **PREPARING ANALYZE** message will again be displayed. See Figure 4-13.

Figure 4-13 Preparing System



6 If the **SYSTEM READY** message is already displayed and the prepared method is not the desired one, touch **SELECT METHOD**. See Figure 4-14.

Figure 4-14 Selecting New Method



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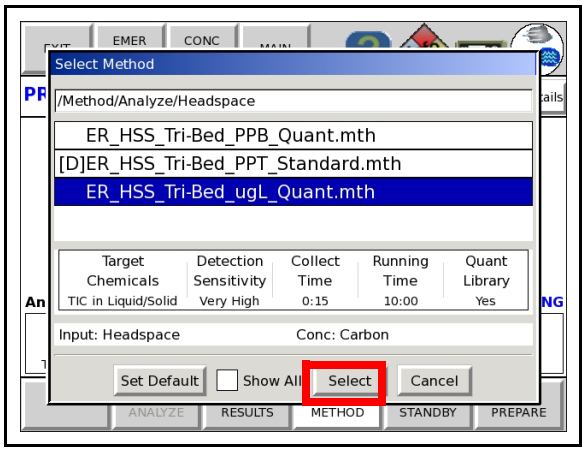
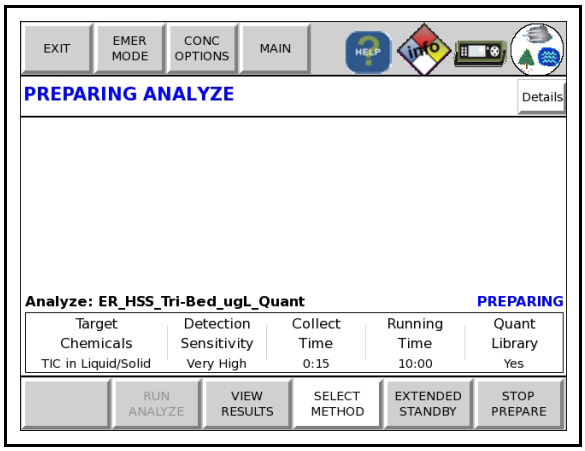
7 Scroll up and down with the scroll bar or use the **arrow keys** to highlight the desired method. Touch **Select** or highlight **Select** using the **arrow keys** and push **OK SEL**. See Figure 4-15.

Figure 4-15 Selecting Method



8 The HAPSITE will begin preparing the new method. See Figure 4-16.

Figure 4-16 Preparing New Method



4.1.2 Quick Reference SOP — GC/MS Mode with HSS in Portable Mode

1. Verify that the desired sampling configuration is installed.
2. Insert the transfer line.
3. If the system is shutdown or in Extended Standby, either power on the HAPSITE or take the system out of Extended Standby. If a concentrator is installed, the HAPSITE will begin preparing a concentrator method.

3a. If the **SYSTEM IS NOT READY** message is displayed, touch **PREPARE ANALYZE**. Alternately, use the **arrow keys** to highlight **PREPARE ANALYZE** and push **OK SEL**.

4. Insert the sample/blank vial into a sample well and an empty vial into another sample well. Place the needle into sample/blank vial.
5. Touch **RUN ANALYZE** or push **ANALYZE RUN** when the **SYSTEM IS READY** screen is displayed.
6. When the screen prompts, **Collecting Sample For** and **Sampling Is Done**, no action is required from the user.
7. When prompted to purge, insert the needle into the empty vial and press **OK**.
8. When the run is complete, a **METHOD FINISHED** prompt will be displayed.

WARNING

The HSS needle is very sharp and the assembly may be hot.

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4.2 Operating the HSS from the Laptop using ER/Smart Plus

1. Verify that the desired sampling configuration is installed (i.e., concentrator).
2. Verify that the HSS transfer line is installed. See Chapter 3, System Setup.
3. Place a 40 mL vial with either blank or sample into a sample well.

   NOTE: Do not fill 40 mL vial more than 20 mL full. See section 3.4.1, Loading the Sample Wells, on page 3-14 for detailed instructions and information on loading the sample vials into the sample wells.

4. Insert the sample/blank vial into a sample well and an empty vial into another sample well. Place the needle into sample/blank vial.

WARNING

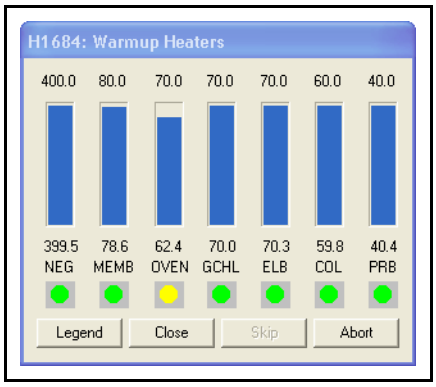
The HSS needle is very sharp and the assembly may be hot.

5. When the HAPSITE ER/Smart Plus is powered on (refer to section Chapter 3 on page 3-1) or taken out of Extended Standby (refer to section 3.8.1 on page 3-59), it will automatically start preparing a concentrator method. If the HAPSITE begins to prepare a method that is not desired, refer to section 4.3, Selecting a New Method from the Laptop, on page 4-17.
6. Power on the laptop by pushing the **POWER** button. Open IQ Software by double-clicking on the **IQ Icon**. See Figure 4-17.

Figure 4-17 IQ Software Icon

7. The HAPSITE will begin preparing to run the default HSS method. This includes heating all necessary components, checking pressures and running an AutoTune if necessary. A bar graph of the heater's progress will be displayed on the laptop screen. See Figure 4-18.

Figure 4-18 Heater Progress



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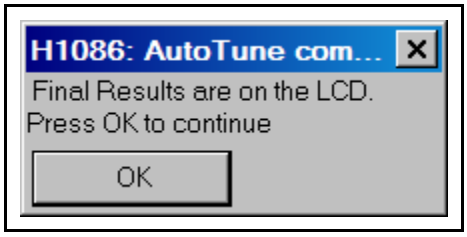
8 When the AutoTune is finished, the following message will be displayed. Click **OK**. See Figure 4-19.

Figure 4-19 AutoTune Complete



NOTE: If AutoTune fails, refer to the HAPSITE ER/Smart Plus manual.

9 A concentrator cleanout will automatically run as part of the HAPSITE's preparation. If the cleanout is successful, a **SYSTEM READY** message will be displayed.

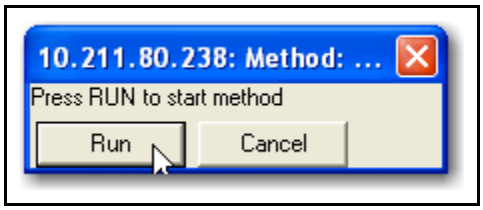
NOTE: If the cleanout is unsuccessful, refer to the ER/Smart Plus manual.

NOTE: If this method is not the desired method, refer to section 3.2, Selecting a Different Method Using the SELECT METHOD Icon, on page 3-11.

10 Once all temperature zones have reached their setpoint, a prompt to **Press RUN to start method** will be displayed.

11 Click **RUN** button on the pop-up window or from the Control Panel on the screen. See Figure 4-20.

Figure 4-20 Run Button



12 When the HAPSITE screen prompts **Collecting Sample For**, no action is required from the user. The sample will be automatically collected from the vial. See Figure 4-21.

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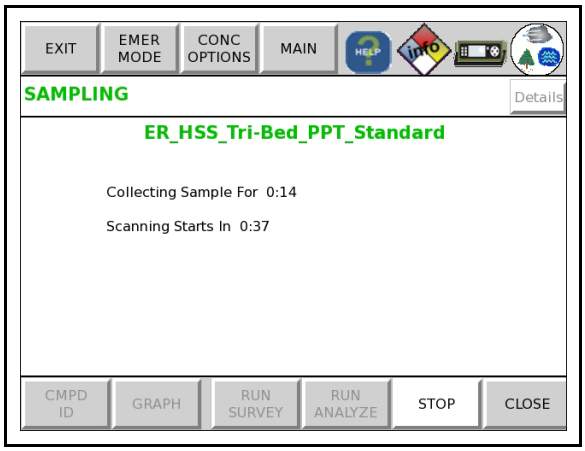
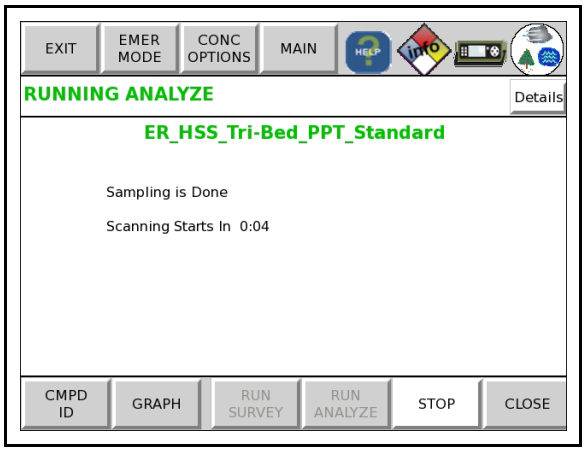
Figure 4-21 Collecting Sample



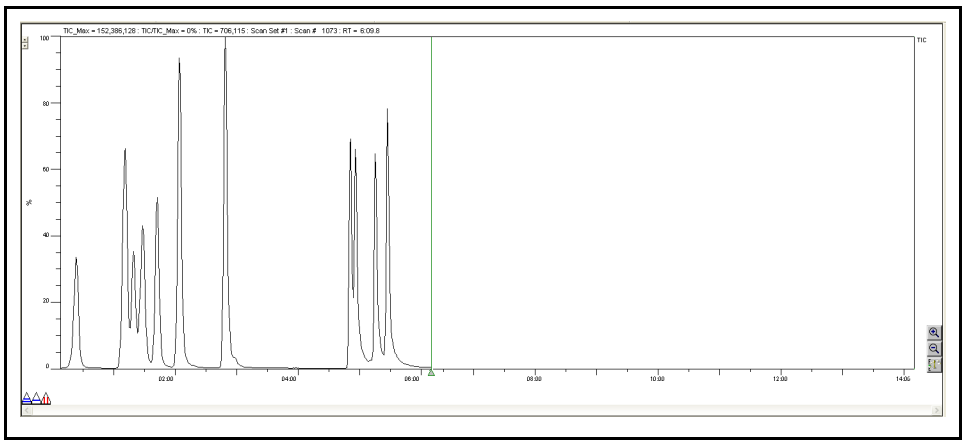
13 The **Sampling is Done** message will appear when the HAPSITE is finished sampling. Again, no action is required by the user. See Figure 4-22.

Figure 4-22 Sampling is Done



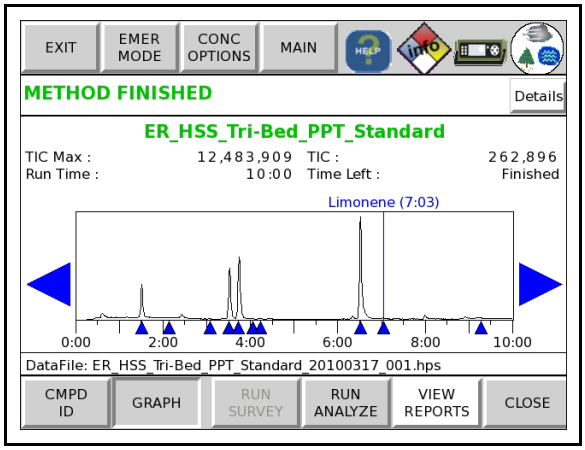
14 As the method runs, the chromatogram will begin to appear on the Laptop screen. See Figure 4-23.

Figure 4-23 Method in Progress on Laptop



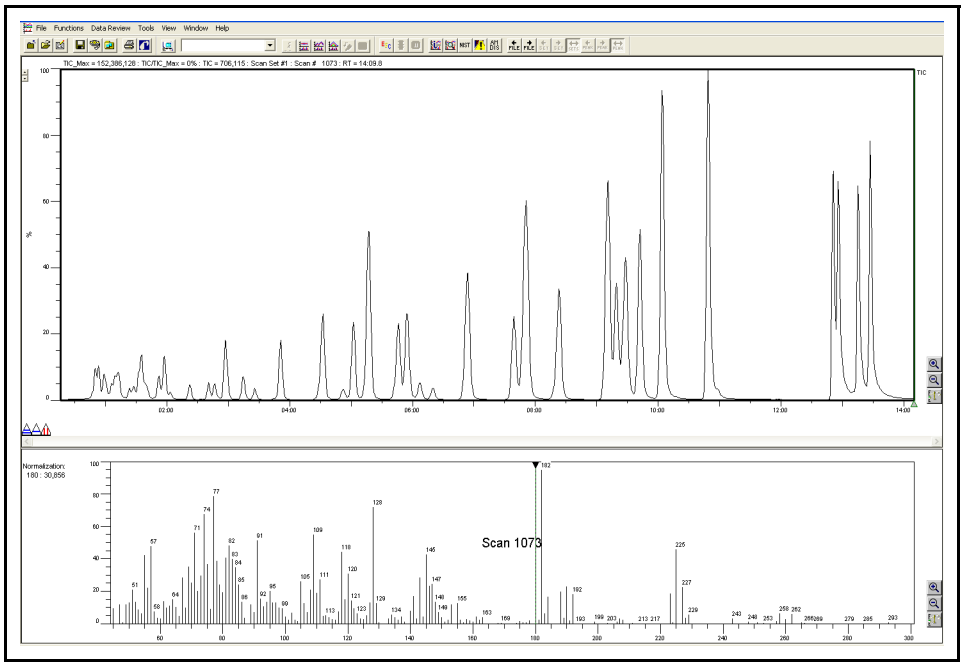
15 The message **METHOD FINISHED** will be displayed on the HAPSITE screen when the run is complete. See Figure 4-24.

Figure 4-24 Method Finished for HSS



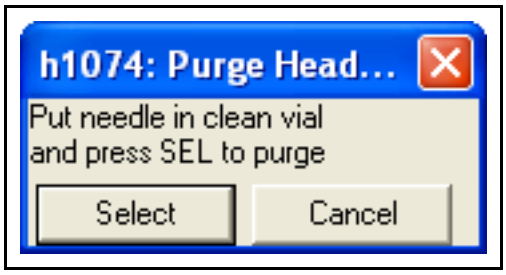
16 The completed chromatogram will be displayed on the screen. See Figure 4-25.

Figure 4-25 Completed Chromatogram



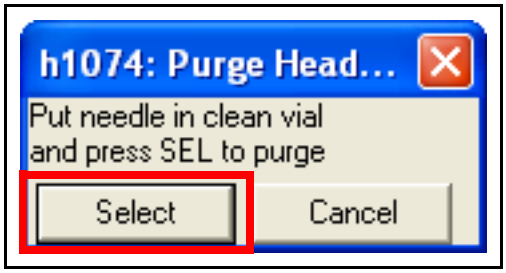
17 When the method is finished, a purge message will be displayed on the screen. Running a purge is recommended to avoid carryover contamination in successive runs. See Figure 4-26.

Figure 4-26 Purge Message



18 Place the needle in a clean, empty vial. Then click **Select**. See Figure 4-27.

Figure 4-27 HSS Purge



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4.2.1 Quick Reference SOP — Operating the HSS from the Laptop

1. Verify that the desired sample configuration is installed (i.e., concentrator).
2. Insert the transfer line.
3. If the system is Shutdown, power on the HAPSITE. The HAPSITE will automatically begin preparing the default HSS method.
4. If the system is in Extended Standby, exit Extended Standby mode. The HAPSITE will automatically begin preparing the default HSS method.
5. Insert the sample/blank vial into a sample well and an empty vial into another sample well. Place the needle into sample/blank vial.
6. When the HAPSITE has finished preparing, a prompt to press **Run** will be displayed on the laptop screen. Click the **Run** button to start the method.
7. When the screen prompts, **Collecting Sample For**, no action is required from the user.
8. When sampling is complete the message **Sampling Is Done** will be displayed. Again, no action is required from the user.
9. When the run is complete, a **Method Finished** message will be displayed.
10. When prompted to purge, insert the needle into the empty vial and press **Continue**.
11. When the run is complete, a **METHOD FINISHED** prompt will be displayed.

WARNING

The HSS needle is very sharp and the assembly may be hot.

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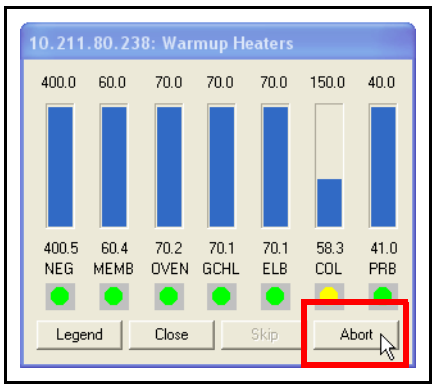
4.3 Selecting a New Method from the Laptop

1 Click the **Abort** button. See Figure 4-28.

Figure 4-28 Aborting Method

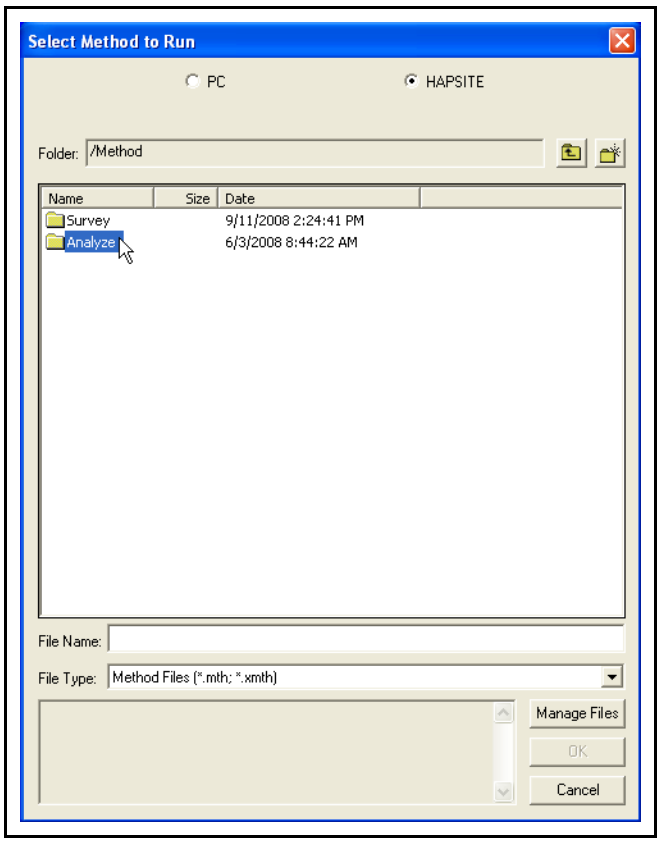


2 Double-click on the **Run Method** icon.

3 Double-click the **Analyze** folder. See Figure 4-29.

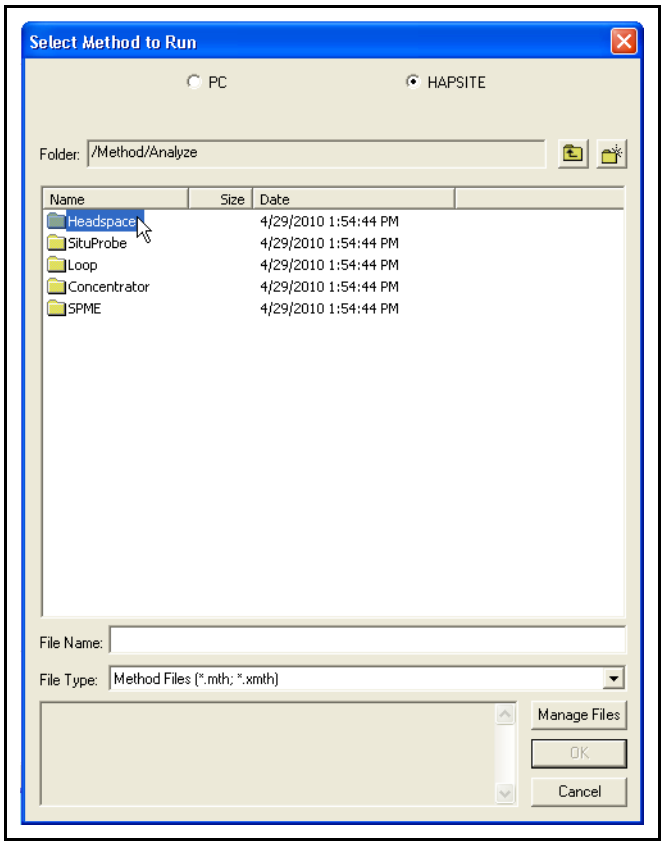
NOTE: Use the buttons at the top of the dialog window to choose a file pathway on the HAPSITE or the Laptop.

Figure 4-29 Choosing the Mode of Operation



4 Double-click the **Headspace** folder. See Figure 4-30.

Figure 4-30 Selecting the Physical Configuration



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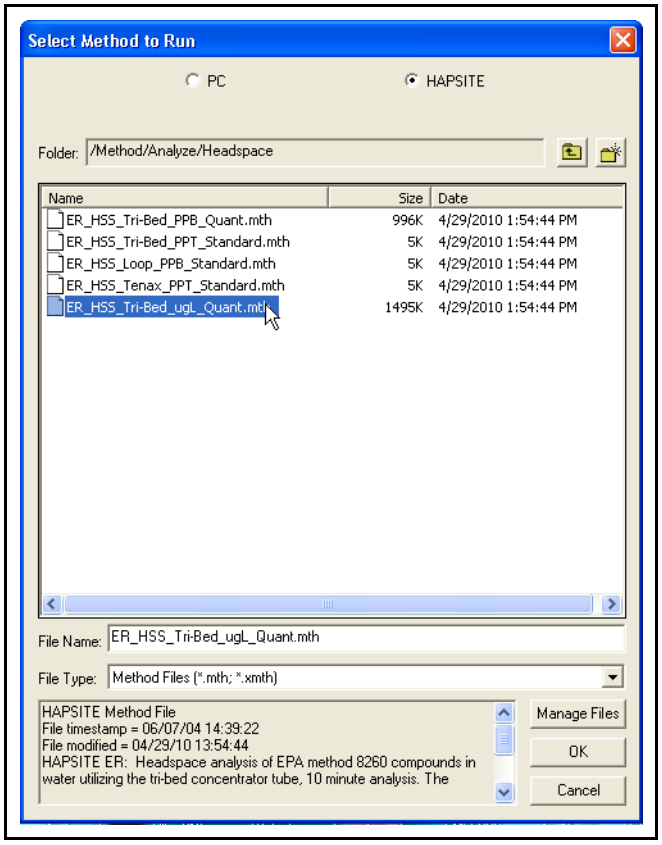
5 Click the desired method and then, click **OK**. This example shows the **ER_HSS_Tri-Bed_ugL_Standard** method. See Figure 4-31.

Figure 4-31 Selecting the Method



6 The software will check the pressure in the gas canisters, heat all necessary components and run an AutoTune (if required). A concentrator cleanout will also be run if needed.

7 When it is finished heating, a prompt will appear to indicate the HAPSITE ER is ready to run a sample. Click **RUN**.

4.4 Method Selection

4.4.1 ER Default Methods

ER_HSS_Tri-Bed_PPT_Standard . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the Tri-Bed concentrator (10 minute analysis time)

ER_Tri-Bed_PPB_Quant . . . . . A calibrated, quantitative method for VOCs using a US EPA 8260 calibration mix (10 minute analysis time)

ER_Tri-Bed_ugL_Quant. . . . . A calibrated, quantitative method for VOCs using a US EPA 8260 calibration mix (10 minutes analysis time)

ER_HSS_Loop_PPB_Standard . . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the sample loop (10 minute analysis time)

ER_HSS_Tenax_PPT_Standard . . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the Tenax concentrator (10 minute analysis time)

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4.4.2 Smart Plus Default Methods

HSS_Tri-Bed_PPT_Standard . . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the Tri-Bed concentrator (15 minute analysis time)

HSS_Tri-Bed_PPT_Extended . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the Tri-Bed concentrator. Extra method run time allows for elution of high boiling point compounds (25 minute analysis time)

HSS_Tri-Bed_PPB_Quant . . . . . A calibrated, quantitative method for VOCs using a US EPA 8260 calibration mix with the Tri-Bed concentrator (22 minutes analysis time)

HSS_Loop_PPB_Standard . . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the sample loop (15 minutes analysis time)

HSS_Loop_PPB_Extended . . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the sample loop. Extra method run time allows for elution of high boiling point compounds (25 minute analysis time)

HSS_Tenax_PPT_Standard . . . . . VOC and Chemical Warfare Agent Headspace solid/liquid qualitative analysis using the Tenax concentrator (15 minute analysis time)

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Chapter 5
Troubleshooting and Maintenance

5.1 Troubleshooting Carryover Contamination

When samples with high concentrations are analyzed using the HSS, the system may retain analytes which are detectable in the next sample run. These detectable compounds are referred to as a carryover contamination. Carryover contamination can be reduced to acceptable levels by using the **Purge** function at the end of every run. In the case of severe carryover, use the **Flush** function.

5.1.1 Persistent Contamination

For persistent carryover contamination, run an air blank while the HSS needle is inside of a clean, empty, 40 mL sample vial. In some cases, the blank may need to be run more than once.

NOTE: A blank is the same method run without introducing a sample.

5.1.2 Reducing a High Background

High background is usually encountered when analytes are retained in the HSS valves, transfer line or within the HAPSITE.

To test whether the contaminant is in the HSS or the HAPSITE, disconnect the transfer line from the HAPSITE and reconnect the air sampling probe. Run an air probe method with a clean air sample. If the contamination is no longer present, the contamination is in the HSS or transfer line.

Test the transfer line by reconnecting it to the HAPSITE and allowing for a HSS method to prepare. Once the HSS method has prepared, disconnect the transfer line from the HSS. Run a HSS method with a clean air sample. If the contamination is no longer present, the contamination is in the HSS.

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5.1.2.1 Flush Procedure

Persistent contamination can be cleared from the HSS by using the **FLUSH** option. To **FLUSH** the HSS, connect the transfer line to the HSS, but do not connect the transfer line to the HAPSITE. Verify that the HSS needle is inserted into a clean, new, empty sample vial during flushing. Press the **FLUSH** switch, which is located inside the front panel of the HSS (see Figure 5-1). While **FLUSH** is running, nitrogen will flow through the HSS. During the **FLUSH** process, the sample wells and vial will be heated to 80°C. Run **FLUSH** for two hours. If contamination is still present, repeat the **FLUSH** procedure.

NOTE: The **FLUSH** function will continue to operate until the **FLUSH** toggle switch is pressed again to turn off **FLUSH**.

CAUTION

Failure to remove the transfer line from the HAPSITE Analytical Module during *FLUSH* will cause the HAPSITE Analytical Module to become contaminated.

Figure 5-1 Flush Switch Inside The HSS

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5.2 Maintenance of the HSS

5.2.1 Cleaning the Sample Wells

The heating block is constructed of aluminum and routine cleaning is normally not necessary. However, the four wells may be cleaned, as necessary, using a damp paper towel or cloth. Cleaning should be performed after turning off the equipment. Allow the heating block to cool to ambient temperature to avoid injury.

WARNING

Be careful to avoid burns if the surfaces are hot. Surfaces may still be hot, even if the HSS has been turned off.

WARNING

Be careful to avoid injury from the sharp sampling needle.

To remove liquids, relocate the needle assembly to an empty well. Roll a paper towel or cloth into a tube shape for insertion into the well. Insert the cloth or towel, twist and remove.

Loose debris may be removed by turning the HSS upside down with the top door open. (Remove the battery first to reduce the weight.) Verify that the sample vials have been removed before performing this cleaning procedure.

Water, detergents or solvents may be used to remove hardened debris. However, certain detergents or solvents may cause contamination and should only be used as a last resort.

CAUTION

Do not completely fill the sample wells with liquids. Damage to the instrument may result.

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5.2.2 Decontaminating the HSS

NOTE: The HSS is designed to be water resistant, but not waterproof, and can withstand short periods of light rainfall. When closed, the front door seals to prevent water from entering into the instrument. The area where the HSS cover is joined with the base plate of the HSS is also sealed.

WARNING - Risk Of Electric Shock

Be careful to avoid shock. Disconnect the HSS from its power source before continuing.

WARNING

Be careful to avoid burns if the surfaces are still hot.

WARNING

The needle tip is sharp.

1. Disconnect the HSS from the external power supply.
2. Remove the battery.
3. Remove all vials from the HSS sample wells.
4. Disconnect the transfer line at the back of the HSS.
5. Verify that the front and top doors are closed.
6. Install the red plastic and metal plugs included in the original packaging on all inlets and outlets on the outside of the HSS.
7. Decontaminate the instrument using a soft cloth and a 10% bleach solution. For decontamination of the wells, refer to section 5.2.1, Cleaning the Sample Wells, on page 5-3.

   NOTE: Solvents, abrasives, and strong soaps should not be used.
8. Use a soft cloth to wipe the HSS with clean water.
9. Allow the HSS to dry thoroughly before reconnecting any power supply.

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5.3 Replacing the HSS Needle

The HSS needle will need to be replaced if:

- It becomes deformed
- It is broken
- The point becomes blunted
- It is plugged with debris

Tools Required

- A No. 2 Phillips screwdriver.
- 1/4" open-end wrench or equivalent.

WARNING

The needle tips are sharp. Be careful to avoid injury.

WARNING

Be careful to avoid burns if the surfaces are still hot.

Procedure

1. Ensure that the HSS is powered off and cooled.
2. Open the top black cover of the HSS to expose the needle assembly.
3. Using the Phillips screwdriver, loosen and remove the two screws on top of the needle assembly.
4. Remove the top cover of the needle assembly to expose the needle and the 1/4" connection fittings.
5. Using the 1/4" open-end wrench, completely loosen both 1/4" connection fittings. Note the position of the N and S labels, which refer to nitrogen and sample. See Figure 5-2.

CAUTION

The orientation of the nitrogen and sample connection fittings is important. Improper orientation of the connection fittings will pull liquid or soil into the HAPSITE and cause severe damage to the instrument.

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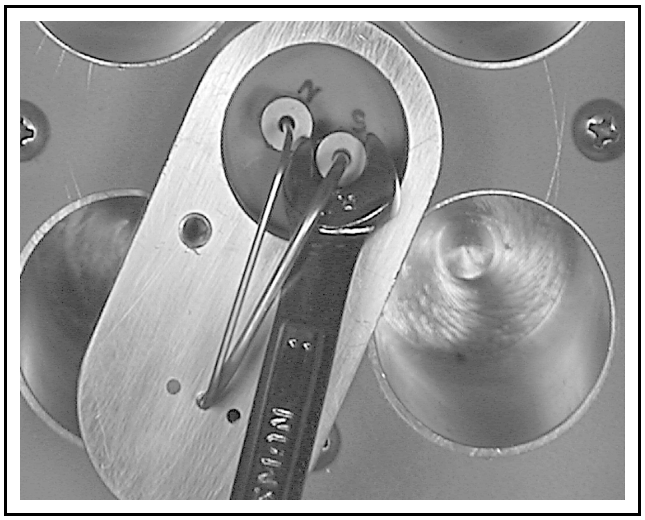
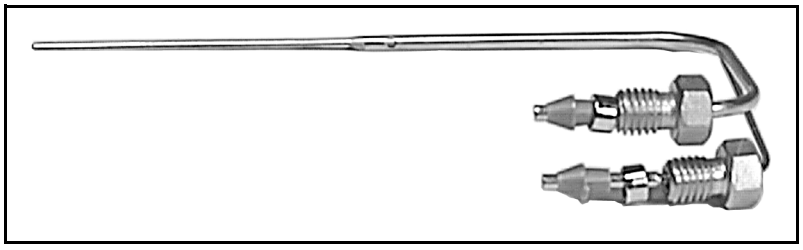
Figure 5-2 Removing the Connection Fittings



6 While holding the needle assembly in place, pull straight up on the needle to remove the needle and connection fittings (the nuts and ferrules shown in Figure 5-3) from the needle assembly. Set aside the used needle with the connection fittings.

7 Insert the new connection fittings onto the new needle using Figure 5-3 as a guide for proper placement.

Figure 5-3 Needle Assembly with Connection Fittings



8 Insert the replacement needle into the needle opening and the connection fittings into the proper nitrogen and sample openings.

9 While firmly holding down the needle to properly seat the ferrules, snugly tighten both connection fittings using a 1/4" wrench. See Figure 5-4.

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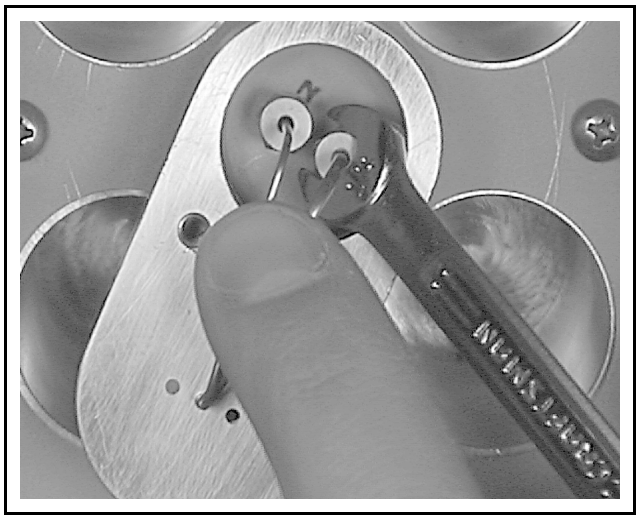
Figure 5-4 Holding Down the Needle while Tightening the Connection Fittings



10 When the needle is securely in place, replace the top cover and two screws. Tighten both screws using the Phillips screwdriver.

11 Run an air blank with the needle inserted into a clean, empty vial to verify that the needle is clean.

12 The HSS is now ready to operate.

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Chapter 6
Part Numbers

6.1 Gas Supplies

Nitrogen Carrier Gas

IPN 930-432-P6 . . . . . Pack of 6 canisters

IPN 930-432-P12 . . . . . Pack of 12 canisters

IPN 930-432-P24 . . . . . Pack of 24 canisters

IPN 930-730-G1 . . . . . Extended life carrier gas deployment kit (110 L)

IPN 930-4611-P1 . . . . . Extended life nitrogen carrier gas (110 L)

Internal Standard Gas

IPN 930-433-P6 . . . . . Pack of 6 canisters

IPN 930-433-P12 . . . . . Pack of 12 canisters

IPN 930-433-P24 . . . . . Pack of 24 canisters

6.2 HSS Module

IPN 931-205-G1 . . . . . Full accessory for the Smart Plus/Smart including the strap, transfer line, sample needle, needle guides and y-cable

IPN 931-205-G2 . . . . . Full accessory for the ER including the strap, transfer line, sample needle, needle guides and y-cable

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6.3 Accessories

IPN 931-401-P2 . . . . . Standard 4’ transfer line for the HAPSITE Smart Plus and Smart

IPN 931-409-P1 . . . . . Standard 6’ transfer line for the HAPSITE Smart Plus and Smart

IPN 931-210-G1 . . . . . Standard 4’ transfer line for the HAPSITE ER

IPN 931-211-G1 . . . . . Standard 6’ transfer line for the HAPSITE ER

IPN 931-405-P1 . . . . . HAPSITE Smart/Smart Plus Transfer Line Insulation, Thin-49"

IPN 931-405-P3	HAPSITE Smart/Smart Plus Transfer Line Insulation, Thin-72"
IPN 931-408-P1	HAPSITE Smart/Smart Plus Transfer Line Insulation, Thick-49"
IPN 931-408-P3	HAPSITE Smart/Smart Plus Transfer Line Insulation, Thick-72"
IPN 070-1545	HAPSITE ER Transfer Line Insulation
IPN 600-1131-P30	"Y" Cable Assembly
IPN 931-402-P1	Sample Needle, Headspace Sampling System
IPN 070-1204	40 mL Headspace Vials
IPN 931-702-G10	Vial Needle Guide, 10 each
IPN 071-748	Performance/Internal Standard, Headspace Sampling System
IPN 930-4151-P1	VX Conversion Pads for HSS, 10 packs of 5 each
IPN 431-406-P1	Shipping case
IPN 930-4061-G1	Battery

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