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

HAPSITE® Smart

Chemical Identification System

IPN 074-397-P1G

DETECT TO PROTECT™

INFICON

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Chemical Identification System

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This is to certify that this equipment, designed and manufactured by:

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East Syracuse, NY 13057
USA

meets the essential safety requirements of the European Union and is placed on the market accordingly. It has been constructed in accordance with good engineering practice in safety matters in force in the Community and does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made.

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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: HAPSITE Smart Portable GC/MS with or without wireless communications, including the HAPSITE Service Module, NEG Pump, Battery and AC to DC HAPSITE Adapter.

Applicable Directives:

2006/95/EC (LVD)

1999/5/EC (R&TTE / EMC)
(The required compliance statement concerning this directive can be found in Chapter 4 of this manual.)

2004/108/EC (General EMC)

2002/95/EC (RoHS)

Applicable Standards – Units with wireless communications:

Safety: EN 61010-1:2001

Emissions:

ETSI EN 300 328-2 V1.4.1: 2003 (R&TTE Emissions)
(ERM for equipment operating in the 2.4 GHz ISM band)

ETSI EN 301 489-17 V1.2.1: 2002 (Flicker & Harmonics)
(ERM - Specific conditions for 2.4 GHz)

EN 61326-1:1997/A1: 1998/A2: 2001 (Radiated & Conducted Emissions)
Class A: Emissions per Table 3
(EMC – Measurement, Control & Laboratory Equipment)

Immunity: ETSI EN 301 489-17 V1.2.1: 2002 (General EMI)
(ERM - EMC - Specific conditions for 2.4 GHz)

RoHS: Due to the classification of this product it is currently exempt from the RoHS directive.

Wireless Restrictions:

Countries	Restrictions
France	Outdoor use limited to 10mW e.i.r.p. within the band 2454 to 2483.5 MHz.
Italy	If used outside of own premises, general authorization is required.
Luxembourg	General authorization is required for public service.
Romania	On a secondary basis. Individual license required.
Austria, Denmark, Finland, Germany, Greece, Iceland, Ireland, Liechtenstein, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, The United Kingdom	None

Applicable Standards – Units without wireless communications:

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)

EN 61000-3-2: 2000 (Harmonics)

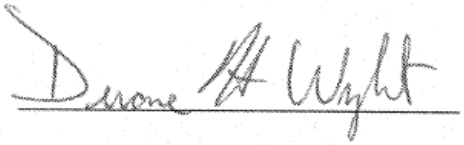
EN 61000-3-3: 1995/A1: 2001 (Flicker)

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: March 31, 2008

Authorized Representative: Duane H. Wright



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Revised 11/04/08 (Rev C)

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Equipment Description: SituProbe
(when used with the HAPSITE Smart Portable GC/MS System)

Applicable Directives: 2006/95/EC (LVD)

2004/108/EC (General EMC)

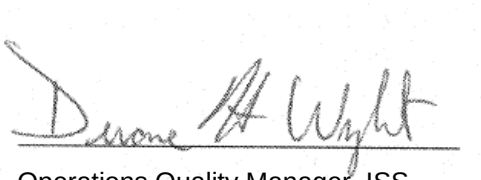
2002/95/EC (RoHS)

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: March 31, 2006

Authorized Representative: Duane H. Wright



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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.

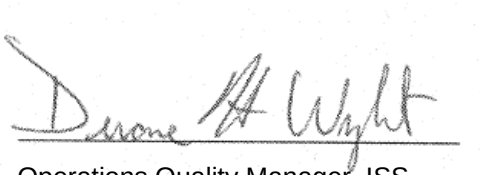
Equipment Description:	Headspace (when used with the HAPSITE Smart Portable GC/MS System)
Applicable Directives:	2006/95/EC (LVD) 2004/108/EC (General EMC) 2002/95/EC (RoHS)

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



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No warranty is made by Seller of any Seller product which has been installed, used or operated contrary to Seller's written instruction manual or which has been subjected to misuse, negligence or accident or has been repaired or altered by anyone other than Seller or which has been used in a manner or for a purpose for which the Seller product was not designed nor against any defects due to plans or instructions supplied to Seller by or for Buyer.

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.

Definition of Note, Hint, Danger, Warning and Caution Paragraphs

NOTE: This is a note paragraph. Notes provide additional information about the current topic.

HINT: This is a hint paragraph. Hints provide insight into product usage

DANGER

This is a Danger paragraph. Failure to heed these messages has a high likelihood of resulting in serious personal injury or even death!

WARNING

This is a Warning paragraph. It warns of actions that may cause physical injury.

WARNING - Risk Of Electric Shock

This Warning paragraph warns of the presence of electrical voltages which may cause physical injury.

CAUTION

This is a Caution paragraph. It cautions against actions which may damage the instrument or lead to the loss of data.

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Operating Manual Style Conventions

The following information describes the conventions used throughout this manual.

When holding down a key and then pressing another key, this is expressed as (for example) Press Ctrl+C

It is assumed that the floppy drive used is drive a. If using another drive, substitute the floppy drive letter being used for "**a:**".

It is assumed that the hard drive used is drive c. If using another drive, substitute the hard drive letter being used for "**c:**".

Left-click means to press and release the left mouse button (LMB) and right-click means to press and release the right mouse button (RMB).

The HAPSITE software operates in the Windows environment using the Windows® Graphical User Interface (GUI). Actions in the HAPSITE software GUI that are common to the Windows GUI are not explained in detail in this manual. Refer to the Windows documentation supplied by Microsoft®.

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Chapter 1
Introduction

1.1 The HAPSITE Smart System

The HAPSITE® Portable Gas Chromatograph and Mass Spectrometer (GC/MS) is designed to measure volatile organic hazardous air pollutants at parts-per-trillion (PPT) levels, using pre-programmed sets of instructions known as "methods". The HAPSITE is specifically designed for portability and field operation. The HAPSITE can collect and analyze samples while operating on battery power using self-contained carrier gas and internal standard gas supplies. The results are displayed and saved on a hard drive and can be downloaded to a floppy disk or through a data connection to a separate personal computer (PC) for analysis.

NOTE: This manual is specifically for the HAPSITE Smart. The terms "HAPSITE" and "HAPSITE Smart" are used throughout this manual to refer to the HAPSITE Smart.

Several hardware modules comprise the HAPSITE System:

HAPSITE . . . . . Often referred to as the Analytical Module (AM). The AM contains the gas chromatograph and mass spectrometer, cylinders of carrier gas and internal standard gas, high-vacuum chemical pump (portable operation), control electronics, battery, keypad, display, and a battery charger.

Probe . . . . . Also known as the Hand Control Unit, this consists of a hand piece and a heated inlet line. The hand piece contains a small display and buttons. The inlet line connects to the HAPSITE and provides a flexible heated sample flow path to the HAPSITE.

Service Module . . . . . Also known as the SM, the Service Module contains the turbo-molecular high-vacuum pump, the roughing pump, the mechanism for operating the interconnecting valve, a battery-charger and a power supply.

Headspace Sampling System . . . . Also known as the HSS, the HSS is an accessory to the HAPSITE that allows testing for volatile compounds in solids and liquids, including soil and water.

SituProbe™ . . . . . The SituProbe accessory is a water purging device that provides continuous testing of water samples in the field.

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1.2 Performance Specifications

The performance specifications for the HAPSITE are shown below:

Mass range	1-300 AMU
Scan Rate	as much as 1000 AMU/sec @ 10 points per AMU
Ionization Mode	70 eV electron impact
Vacuum System	15 l/sec NEG pump; 0.2 l/sec sputter-ion pump
Operating temperature range	0 ^{o}C to 45 ^{o}C (32 to 113 ^{o}F)
Dimensions (LxWxH)	46 x 43 x 18 (cm); 18 x 17x 7 (in)
Weight	16 Kg (35 lb.) without the battery
Internal Power Consumption	30 watts average, 24 V(dc)
Carrier Gas	Nitrogen
Column Temperature Range	60 ^{o}C to 180 ^{o}C
Maximum Sample Moisture Content	8% by weight
pH Range of Sample	2 - 11
Boiling Point of Sample	<250 ^{o}C
Chemical Composition of Sample	1 - 12 Carbon atoms
GC Column	100% methyl silicone phase, 30 m x 0.32 mm ID x 1.0 μ film
SIM Channels	10
External Communications	Ethernet Port
Carrier gas use-rate	1 canister per 8 hours of operation (depending on the details of the method being used).
Internal standards gas use-rate	1 canister per 24 hours of operation (depending on the details of the method being used).
Battery life	Approximately 2 to 3 hours before recharge.

1.3 Serial Number Location

The serial number of the HAPSITE is located on the inside of the front panel under the power switch.

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1.4 Theory of Operation

The HAPSITE combines two analytical techniques, gas chromatography and mass spectrometry, to separate, identify, and measure the organic components in a gas phase sample. Using a flow of inert nitrogen carrier gas, the gas chromatograph (GC) performs a time separation (Retention Time) of the sample compounds. The separation order is primarily based on increasing compound boiling point. The mass spectrometer (MS) detects and identifies the eluting compounds by breaking the molecules apart and detecting the fragments. The resulting mass spectrum is compared to a library of mass spectra to identify the compound.

The gas chromatography technique cannot always separate compound mixtures into individually eluting compounds. Some of the eluting responses or peaks may contain two, three, or more compounds which have taken the same time to progress (elute) through the gas chromatograph. GC identification of compounds is limited to matching the retention time of the unknown compound to that of a known standard. See section 1.6.1, Gas Chromatograph, on page 1-4 for more information on how the GC works. In order to further identify and measure the individual components of such mixtures, the gas stream is directed into the mass spectrometer.

In the mass spectrometer, the gas stream of eluting compounds is bombarded with electrons. The electrons fracture the molecules into a characteristic combination of smaller molecules or mass fragments. The mass spectrometer measures and plots the response of these mass fragments to display a mass spectrum. See section 1.6.2, Mass Spectrometer, on page 1-6 for more information on how the MS works.

The introduction of a mixture of many compounds directly to the MS would produce a very complex and uncharacteristic mass spectrum. However, because the GC has largely separated the gases, the MS can usually differentiate between the few co-eluting compounds and provide very precise identification and measurement of the quantity of each compound. Qualitative identification can be made by comparing the unknown compound spectrum to the NIST mass spectral library (included with the Smart IQ software). See section 9.8, NIST Library Searches, on page 9-23 for more information. Quantitative identifications can be made by analyzing standards of known concentration and creating a target compound library of concentration response curves. See Chapter 12, Target Compound Methods for more information.

In summary, the GC first separates the gaseous compounds in time, then the MS identifies and measures the gases contained in each of the time-separated peaks. This enables the GC-MS system to report the specific identity and concentration of each of the compounds present in the initial pulse of gas analyzed.

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1.5 Instrument Overview

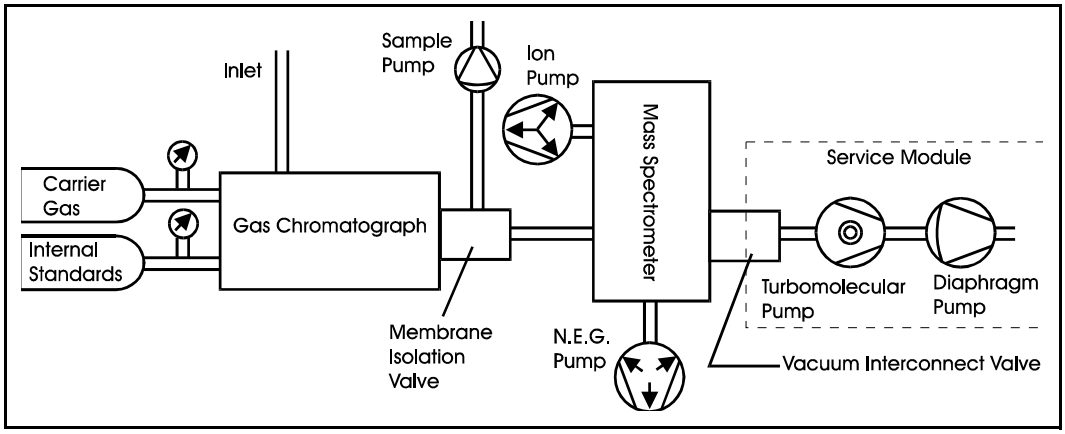
The HAPSITE system is comprised of two modules:

- the HAPSITE, also known as the Analytical Module, and
- the Service Module.

The HAPSITE is comprised of many systems and subsystems. Figure 1-1 shows a diagram of the major subsystems. These subsystems include the several pumps used to provide flow and vacuum.

The Service Module components are identified in Figure 1-1, everything else is housed in the HAPSITE. The Service Module and the HAPSITE module contain a Vacuum Interconnect Valve and electrical connectors through which their vacuum systems join and the modules communicate when the two modules are coupled together.

Figure 1-1 Major HAPSITE Subsystems



1.6 Description Of Subsystems

The HAPSITE is comprised of the following subsystems:

- Gas Chromatograph
- Mass Spectrometer
- Vacuum System
- Electronic Systems
- Software Systems

1.6.1 Gas Chromatograph

The HAPSITE's GC system utilizes nitrogen as the carrier gas to transport analytes through a column, a narrow-bore fused silica tube 30 meters in length, and then on to the detector. The nitrogen is referred to as *the mobile phase.*

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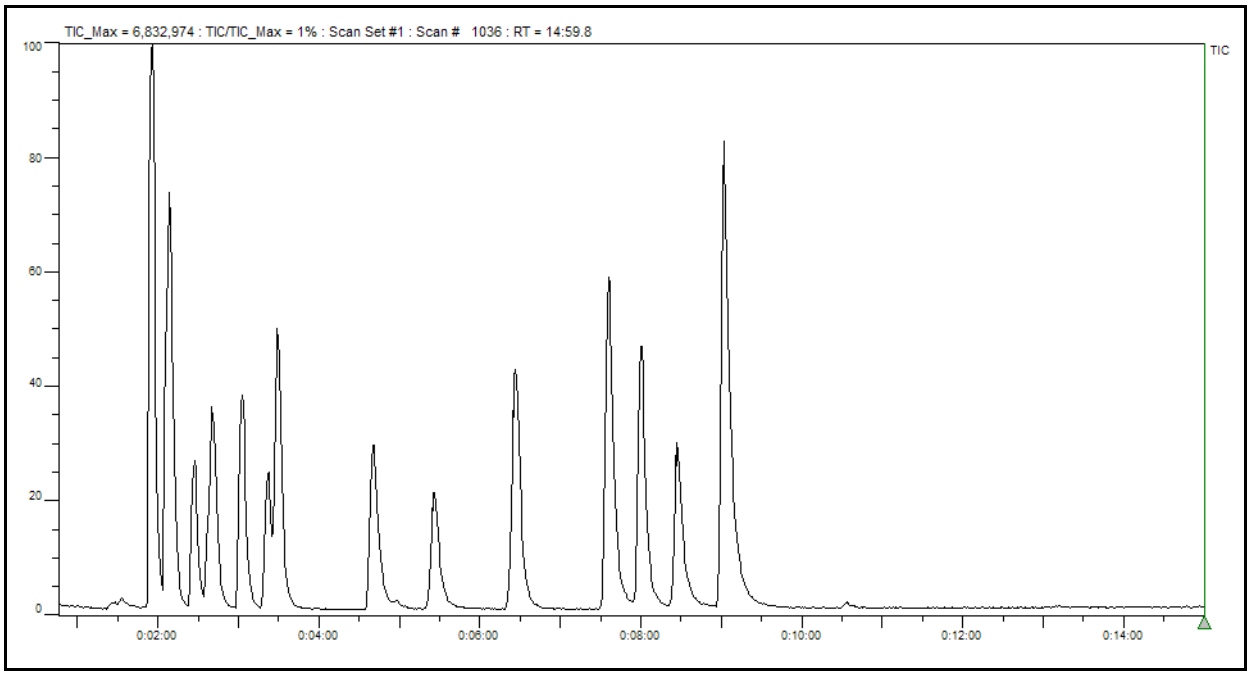
The inside of the column is coated with a thin layer of a material known as the stationary phase. The stationary phase is a chemical which can selectively attract components in a sample mixture. The mixture of sample compounds in the mobile phase interact with the chemicals of the stationary phase. The chemicals which have the fastest interactions will elute (exit) off the column first. The HAPSITE also utilizes a temperature programmable GC. The oven is programmed to increase the temperature gradually (called ramping) to improve compound separation while decreasing analysis time. As the temperature increases, the compounds with the lowest boiling points will elute first with the standard non-polar phase coated column installed. More selective columns may be ordered for specific applications.

The time taken by an individual compound to travel from injection into the system until the compound elutes from the column is referred to as the *retention time* (RT). If the GC conditions remain constant, the same compound will elute from the column at nearly the same retention time for each injection.

An important part of the operation of the HAPSITE is the use of Internal Standards to verify the performance of the gas chromatograph and the tuning and sensitivity of the mass spectrometer. The Internal Standards are two volatile organic gases at low concentrations which are added to the sample inlet flow. The internal standards' retention times and responses are used as references for instrument performance.

Figure 1-2 is a graph of eluting organic gases from the gas chromatograph, plotted as a function of time from the injection of a pulse of mixed compounds. The graph demonstrates the separation of the various compounds from each other by the action of the gas chromatograph, as described above. This plot is called a Total Ion Chromatogram (TIC).

Figure 1-2 Total Ion Chromatogram



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The performance of the column is affected by temperature, therefore, the column is housed in a temperature controlled oven.

The gas chromatograph performs many operational functions, including injecting the sample, analyzing the sample, flushing the system, and tuning the system.

GC/MS measurement begins with the Sample Pump drawing the gas to be analyzed into the Sample Loop, then uses the pressure of the Carrier Gas to flush the sample from the sample loop on to the pre-column and the analytical column. This step is termed *injection*.

When the analytes have passed through the pre-column, the carrier gas is directed to the junction of the two columns where the carrier gas continues to transport the analytes through the analytical column while back-flushing the pre-column to prepare the pre-column for the next analysis sequence. This back-flush continues throughout the next filling of the sample loop.

1.6.1.1 Membrane Isolation Valve

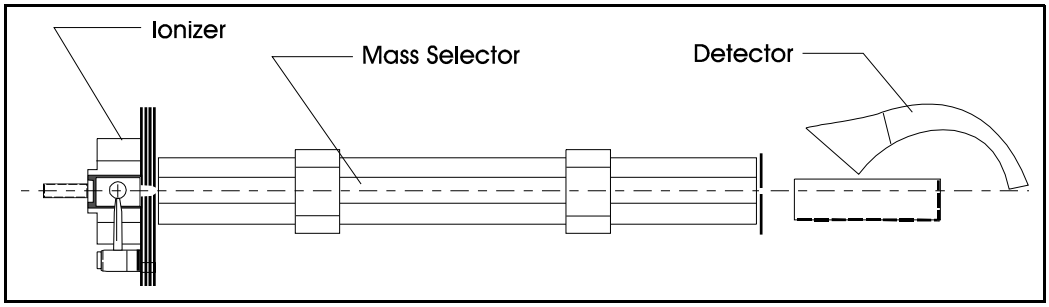
Gas exiting the analytical column crosses the face of a membrane mounted in the membrane isolation valve. This membrane has the special characteristic of transmitting the flow of organic compounds to the mass spectrometer, while effectively blocking the flow of inorganic gases (such as the nitrogen carrier gas). When the membrane isolation valve is opened, the appropriate gases are permitted to enter the Mass Spectrometer for analysis while the Mass Spectrometer remains under vacuum. The membrane's performance is affected by temperature fluctuations and requires housing in a temperature-controlled zone.

In the Survey mode of operation, in which air samples are passed directly to the mass spectrometer, the sample pump draws the air sample directly across the membrane with the isolation valve in the open position.

1.6.2 Mass Spectrometer

The Mass Spectrometer is comprised of three basic physical systems: the *ionizer*, the *mass selector*, and the *ion detector*. These are mounted together in a vacuum manifold which also includes an inlet, two vacuum pumps, and a portion of the vacuum interconnect valve, as shown in Figure 1-1 on page 1-4. Figure 1-3 is a representation of the three sub-systems of the mass spectrometer.

Figure 1-3 Three Subsystems of the Mass Spectrometer



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The inlet flow from the membrane isolation valve is brought directly to the *ionizer*. Within the ionizer, the component introduced from the inlet flow is subjected to a bombardment of electrons which are boiled off the hot *filament*. Collisions with the energetic electrons remove one electron from some of the gas molecules, leaving them with a net positive charge. This process is termed *ionization*. Other gas molecules are fractured into smaller molecules, some of which are also ionized. The remaining stream of gas continues out the far side of the ion volume and is pumped away by the vacuum pump system.

The ionized molecules, or ions, are driven from the ionizer toward the mass selector by the different voltages on the ion volume and the focusing plates which follow. As the ions move through the holes in these plates, the ions are formed into a nearly parallel beam of mixed ions of nearly the same energy.

The mass selector (or mass filter) is a quadrupole analyzer. The quadrupole analyzer is comprised of four parallel rods, mounted with precise alignment and spacing. Opposite rods are electrically connected together. The two pairs of rods are connected to a radio frequency (RF) voltage 180^{o} out of phase with each other. In addition, the two pairs of rods have a direct current (DC) voltage applied to them; positive on one pair, negative on the other.

The ion beam is directed down the center of the array of rods. At any specific combination of RF and DC fields, some ions are light enough to oscillate harmonically with the RF field, picking up energy and increasing speed until the ions impact one of the rods and are neutralized. Much heavier ions, moving more slowly, cannot respond to the RF field. The heavier ions are dragged from the center by the DC field, landing on one of the rods. Once on the rod, the heavier ion is neutralized. At a specific combination of RF and DC fields, ions of a specific mass will be able to transit the rod structure and emerge at the exit end to be detected.

When the ions emerge from the mass selector, the ions are directed to the detector. The active element of the detector is an electron multiplier. The electron multiplier responds to the arrival of each individual ion with a cascade of electrons, each of which generates more electrons. The result is a small burst of electrical current in response to each ion emerging from the mass selector. The signal from the electron multiplier is connected to the electronic amplifier and data-handling system outside the vacuum.

In order to determine the constituents of the gas mixture, the ratio of RF to DC field strengths is varied (swept) to permit progressively heavier ions to transit the mass selector. The sweep, or scan, over the full range of masses (from 1 to 300 AMU) only takes about 100 milliseconds; the sweep is usually repeated many times to statistically improve the quality of the data. This produces the mass spectrum, a plot of the partial pressure (or population or intensity or amplitude) of each mass.

The mass spectrum is compared with a library of mass spectra characteristic of many individual compounds, and the HAPSITE reports the compounds which match the observed spectrum.

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Alternatively, the mass spectrometer can remain tuned to a specific mass or set of masses. The instrument measures the partial pressure of only those masses as a function of time. Operation in this mode, termed selected ion monitoring (SIM), permits very sensitive measurement of the presence of one or a few compounds which have already been identified.

1.6.3 Vacuum System

The mass spectrometer is operated in a vacuum for several reasons.

- The ions must travel nearly a foot from the ionizer through the quadrupole to the electron multiplier without colliding with another molecule (because this would modify their trajectory, and maybe their charge).
- The gas to be analyzed must be free from interference from other unknown gases.
- The hot filament which generates the electrons would be destroyed if operated at atmospheric pressure in the presence of oxygen.

The vacuum is initially provided by the turbo-molecular and diaphragm pumps in the Service Module. When a good vacuum level is achieved and the pumps in the HAPSITE are turned on, the vacuum interconnect valve is closed and the Service Module can be disconnected. The Service Module is not needed again until the NEG pump in the HAPSITE must be changed.

The two vacuum pumps of the HAPSITE continue to provide the pumping necessary for operation. These two pumps are the non-evaporate getter (*NEG*) pump and the smaller sputter-ion pump. The NEG pump incorporates a special zirconium alloy, arranged in sintered disks, which when heated adsorb gas molecules very aggressively.

Over time, the sintered disks gradually become fully saturated with gas molecules and the pumping speed drops. The instrument detects the resultant rise in operating pressure (loss of vacuum) and signals that the pump must be replaced.

The NEG pump is very effective in removing the active gases, but the NEG pump does not remove noble gases. The sputter-ion pump is provided to remove argon, neon, helium, krypton, and xenon which would otherwise accumulate in the mass spectrometer, raising the mass spectrometer pressure and interfering with operation.

The turbo molecular pump in the Service Module is actually a compound pump, incorporating turbo molecular stages for high pumping speeds at low pressure, and molecular drag stages to provide good compression of the gas at higher pressures. Even with the drag stages, this pump is unable to compress the gas enough to exhaust the gas into atmospheric pressure, so an additional diaphragm roughing pump is provided.

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The diaphragm pump consists of four stages, in series. The diaphragm pump draws the gas from the exhaust of the compound pump and compresses the exhaust gas sufficiently to discharge the exhaust into the atmosphere.

1.6.4 Electronic Systems

The electronic systems in the HAPSITE are considered in four groups:

- Mass Spectrometer Control
- Gas Chromatograph Control
- Main Processor
- Interfaces

1.6.4.1 Mass Spectrometer Control

The mass spectrometer control electronics include the programmable DC and RF power supplies for the mass selector, the DC power supplies for the filament, the electron multiplier, the sputter-ion pump, and the A/D converter for the signal from the electron multiplier.

1.6.4.2 Gas Chromatograph Control

The gas chromatograph control circuitry includes the power supplies for the solenoid valves, the ovens, and the heated inlet line, and the control logic for all the valves and heaters of the GC system.

1.6.4.3 Main Processor

The main processor is supported by a hard-disk drive, and is located in the central electronics assembly. The main processor accepts data from many points within the system, and controls all the other electronic sub-assemblies, both in routine operation and in managing the data-taking methods.

1.6.4.4 Interfaces

There are several input/output devices within the HAPSITE. These include the front panel keypad and display, the 3 1/2” floppy-disk drive, the crossover ethernet cable connection, the hand control unit, the power and logic connections to the Service Module, Headspace Sampling System, and the pins which read the details of the gas mixture from the gas canisters.

1.6.5 Software Systems

The HAPSITE operates with two separate software systems. The instrument itself incorporates control and analysis software. This control software accepts inputs from the keypad and other interfaces, and commands the operation and sequencing of all the systems and subsystems. The analysis software analyzes the

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data from the mass spectrometer, accesses the libraries as required, and displays the results of the analyses on the front panel. The control software allows a method to be started with minor modifications from the front panel. Design or substantive modifications of the method require the use of the HAPSITE Application software on an external PC.

The HAPSITE Application software, Smart IQ, is a Windows® XP and Windows® 2000 based system for use in the accessory personal computer. The Smart IQ software is used to design and modify the methods under which the HAPSITE can operate, view the data, analyze the results, and generate and print reports. The PC is linked to the HAPSITE by a crossover ethernet cable, which permits uploading of data from the HAPSITE and downloading new or modified methods to the HAPSITE.

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Chapter 2
HAPSITE Components and Assemblies

2.1 Introduction

This chapter contains the assembly instructions for the HAPSITE and the available accessories.

CAUTION

The HAPSITE instrument should be operated a minimum of every 3 weeks. Recommended storage is in extended standby mode.

2.2 Ship Kit Contents

The following items are provided in a typical HAPSITE Smart Ship Kit. See Figure 2-1.

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Figure 2-1 HAPSITE Ship Kit Box 1

- ❑ . 036-0015 . . . . . Shoulder Strap
- ❑ . 074-290 . . . . . Instruction Sheet (Shoulder Strap)
- ❑ . 059-0329 . . . . . Quick Disconnect Stem
- ❑ . 070-0972 . . . . . Plunger Contact (Bag of 4)
- ❑ . 074-5004-G1 . . Manual CD
- ❑ . 600-1319-P1 . . Crossover Ethernet Cable
- ❑ . 930-021-G1 . . . Gasket Kit
- ❑ . 930-022-G1 . . . Tool Kit
- ❑ . 930-249-G2 . . . Concentrator Cover
- ❑ . 930-251-G1 . . . Concentrator Tube (Tenax®-TA)
- ❑ . 930-716-G1 . . . Concentrator Tube (Tri-Bed)
- ❑ . 930-0221-G1 . . Concentrator Nut and Ferrule
- ❑ . 930-0231-G1 . . Probe Nut and Ferrule
- ❑ . 930-2020-G1 . . Cap Kit
- ❑ . 930-612-P1 . . . USB Flash Drive 512M

Special Cords for International Ship Kits

Extra Cords for SM and Battery Charger (Qty. 2)

Ship Kit	Location . .	Cord
❑ . 930-0241-G1 . .	USA	N/A
❑ . 930-0241-G2 . .	Europe . . .	068-151
❑ . 930-0241-G3 . .	UK.	068-0388
❑ . 930-0241-G4 . .	Australia . .	068-0393

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Figure 2-2 HAPSITE Ship Kit Box 2 Contents

Box 2 Contents

❑ . . . . .930-470-G1 Battery Charger

Figure 2-3 HAPSITE Ship Kit Box 3 Contents

Box 3 Contents

❑ . . . . 24 V Power Supply (see table)

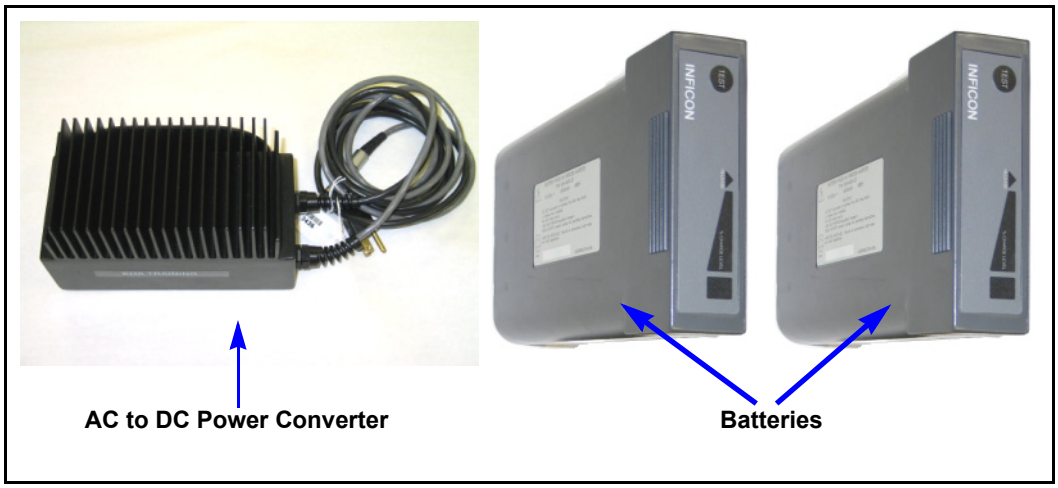
Power Supply	Ship Kit	Usage
930-469-P1	930-0241-G1	110 V USA
930-469-P2	930-0241-G2	230 V European
930-469-G3	930-0241-G3	230 V UK
930-469-G4	930-0241-G4	230 V Australia

Figure 2-4 HAPSITE Ship Kit Box 4 and 5 Contents

Box 4 and 5 Contents

❑. . . . . In two separate boxes,
Battery Pack NiMH (930-4061-G1)

Figure 2-5 USA 24V Power Supply (AC To DC Power Converter) - Box 3 and Battery (2 Shipped) - Boxes 4 and 5



In addition, a laptop computer and accessories are shipped. The ship kits vary depending on the type of laptop ordered. The laptop kits will include the Smart IQ Software CD and NIST Library Install CD.

2.3 Basic Assembly

Figure 2-6 HAPSITE Parts for Basic Assembly

The basic assembly of the HAPSITE can be accomplished in six easy steps.

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2.3.1 Attaching the Probe

To attach the probe line, plug the LEMO® connector into the port on the top of the HAPSITE as illustrated in Figure 2-7.

Figure 2-7 Attaching the LEMO Connector on the Probe Line to the HAPSITE

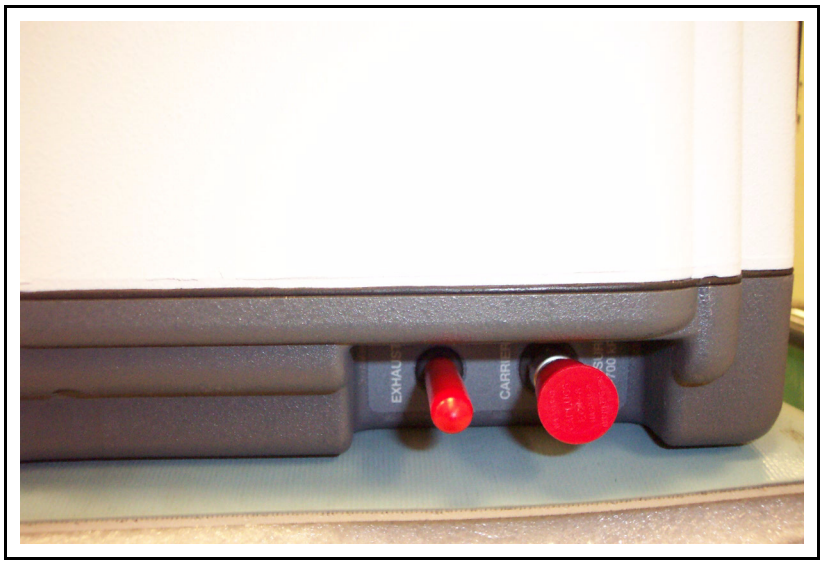
HINT: Save all of the caps to cover ports in the event the instrument needs to be washed or decontaminated. Spare caps are provided in the Ship Kit. See Figure 2-8.

Figure 2-8 Spare Cap Kit

2.3.2 Remove Exhaust (Vent) Cap

The red exhaust (vent) cap is located on the right side of the HAPSITE near the back. This exhaust (vent) cap must be removed for the HAPSITE to function properly. The HAPSITE is shipped with the cap removed. See Figure 2-9.

Figure 2-9 Exhaust Cap



CAUTION

Failure to remove the exhaust cap will cause the HAPSITE to not operate properly.

WARNING

Compounds sampled will vent into the room through the exhaust. When sampling hazardous materials either attach tubing and vent to a hood or attach an activated charcoal filter.

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2.3.3 Installing the Gas Canisters

Insert the gas canisters into the HAPSITE, making sure to place the purple banded canister in the top round opening and the yellow banded canister in the bottom.

To insert the canisters, place them into the opening with the valve facing into the HAPSITE. When the canister is fully inserted, continue to push and then release the "push" lever. Gently pull on the cans to make sure the cans are locked in place. See Figure 2-10.

Figure 2-10 Canister Placement

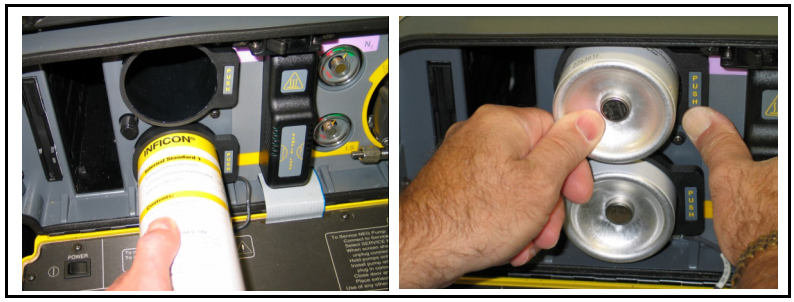
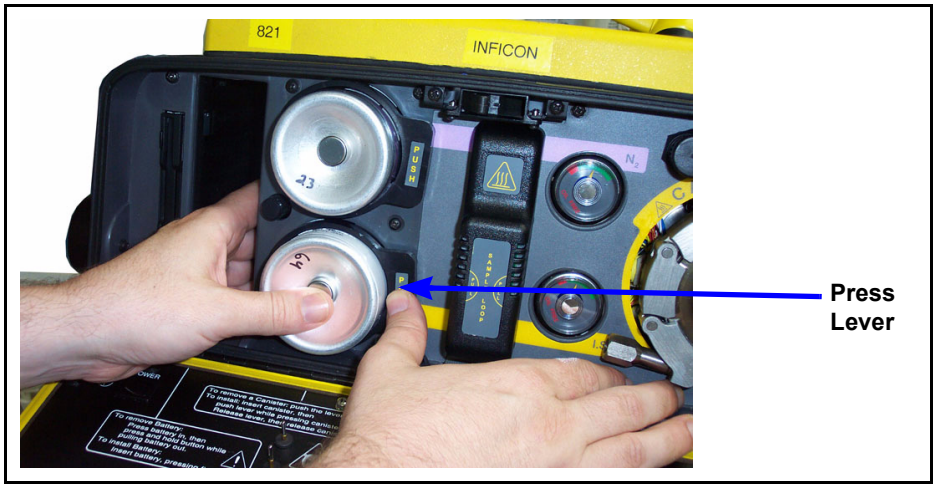


Figure 2-11 Installing A Gas Canister



NOTE: The openings that hold the gas canisters are color-coded to ensure the correct placement of the canisters. The upper opening is color-coded purple, indicating the correct location of the purple-banded Nitrogen Carrier Gas canister. The lower opening is color-coded yellow to indicate the correct location of the yellow-banded Internal Standard canister. The position of the gas canisters should not be interchanged. Do not force the canisters into the wrong location. A teflon ring is positioned around the inner stem on top of the Internal Standard canister. This ring prevents this canister from being placed into the carrier gas canister location which would result in contaminating the HAPSITE with internal standard.

2.3.3.1 How to Change or Remove a Gas Canister

Push the lever located on the right of the canister. The canister will release. Remove the canister. Refer to Figure 2-12 on page 2-8.

HINT: The nitrogen canister will need to be replaced after roughly 8 hours of use. The internal standard canister will need to be replaced after 3 to 4 days of continuous use. These numbers are guidelines and will vary.

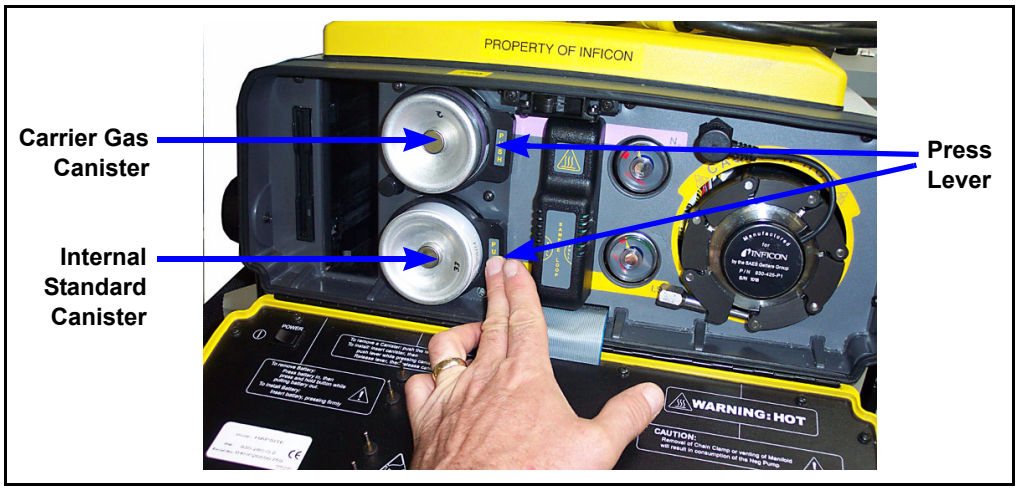
WARNING

Do not re-fill the canisters after use. These canisters are disposable and not designed for re-filling. Canisters may fail upon refilling, causing bodily injury.

CAUTION

Closing the front panel when the canisters are not properly installed may damage the HAPSITE and/or canisters.

Figure 2-12 Canister Removal



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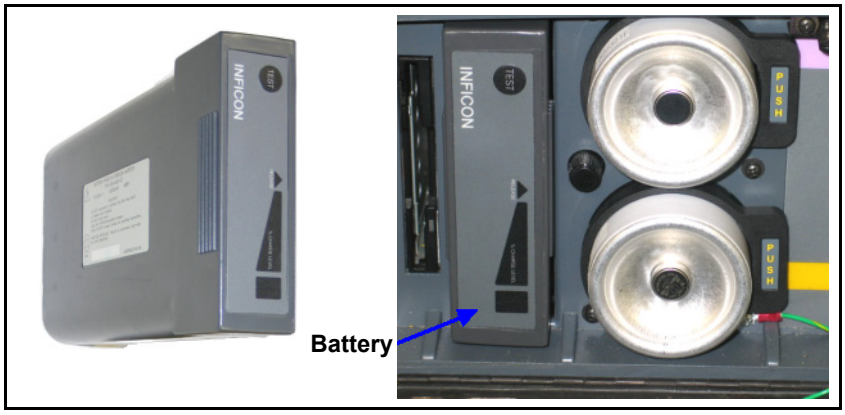
2.3.4 Install Battery

Insert the battery by sliding it into the rectangular opening to the left of the gas canisters. Press and listen for the battery to click into place. Once the battery is installed, gently pull on the battery to make sure the battery is locked in place correctly. See Figure 2-13.

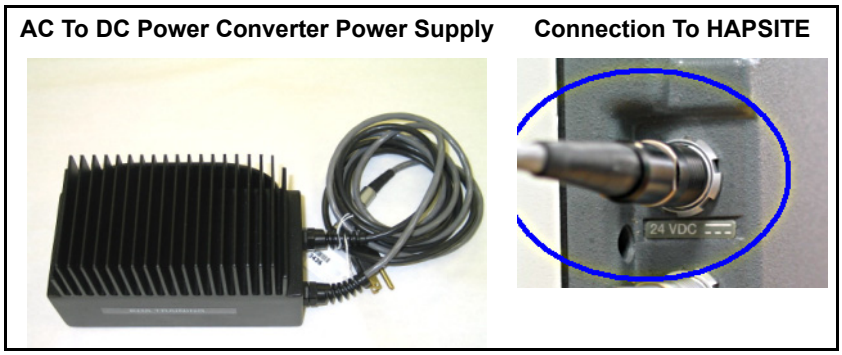
Figure 2-13 Battery Insertion



2.3.5 Connect the AC To DC Power Converter Power Supply

The AC to DC power converter plugs into the four prong plug on the left side of the HAPSITE (when facing the front of the HAPSITE). A red dot on the connector aligns with the corresponding red line on the receptor of the HAPSITE (if the red dot is not visible on the HAPSITE, the red dot on the power supply should be facing forward.) Plug the AC to DC power converter into a 110 V(ac) outlet. See Figure 2-14.

Figure 2-14 The AC To DC Power Converter Power Supply and Correct Connection to the HAPSITE



2.3.6 Connect Laptop (if desired)

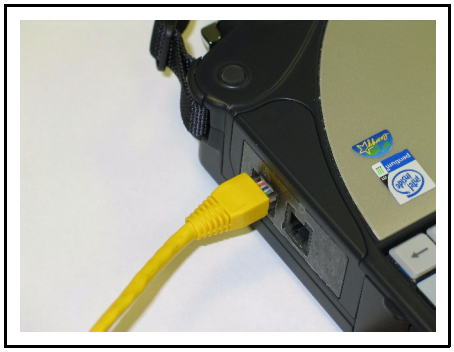
The HAPSITE Smart has two possible configurations for connecting to a laptop computer. The standard connection is via a crossover ethernet cable. All instruments manufactured starting in December 2006 will have a wireless communication connection option. Older instruments may also have the wireless option if a wireless upgrade was installed.

2.3.6.1 Connect Laptop with Yellow Crossover Ethernet Cable

Unscrew the cap on the port next to the probe connection. Plug in the yellow crossover ethernet cable into this port. The opposite end plugs into the COM1 port on the laptop computer. Once connected, the crossover ethernet cable provides the communication connection between the HAPSITE and laptop computer. See Figure 2-15 and Figure 2-16.

Figure 2-15 Ethernet Connection to HAPSITE

Figure 2-16 Ethernet Connection to Laptop



2.3.6.2 Connect laptop with Wireless Connection

Refer to Chapter 4, Wireless and USB for information on enabling the wireless connection.

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2.4 Helpful Guidelines

A set of helpful guidelines to keep the HAPSITE safe and operational.

DON'T…	DO…
◆ Ship with a battery installed. ◆ Start up on battery power, if possible. ◆ Draw liquid into the instrument. ◆ Go into a potentially explosive environment without safety checks (the HAPSITE is not intrinsically safe). ◆ Pressure wash the HAPSITE or immerse in water. ◆ Linearize DACS without the help of an INFICON representative. ◆ Sample strong acids (below pH 2) or strong bases (above pH 11). ◆ Use force when assembling any HAPSITE system components. ◆ Modify default methods without changing their name. ◆ Sample for Sulfur Mustard (HD) with the VX conversion tube installed. ◆ Attempt repairs on the HAPSITE without checking with INFICON first. ◆ Abort a GC/MS method during a sample run. ◆ Over-tighten concentrator tube nuts. ◆ Block the exhaust vent on the HAPSITE. ◆ Use the NEG Pump and Service Module pumps together. ◆ Use expired Internal Standard gas. ◆ Use a LAN or Ethernet cable between laptop and HAPSITE. ◆ Attach a bag sample without first checking the ferrules in the probe nut.	◆ Leave a battery installed when operating even when AC is connected. ◆ Run a background blank once per week or more. ◆ Use Extended Standby instead of cold storage whenever possible. ◆ Place appropriate caps over openings before decontaminating. ◆ Use 5% or 10% bleach solution or soap-and-water to decontaminate according to local SOP. ◆ Only use thumbs to open the front panel. ◆ Attempt to restart, reboot, or power-cycle as a first step to correct operational discrepancies. ◆ Screen potentially high concentration sample with Survey method to reduce the risk of saturation. ◆ Use the VX conversion tube for identification (and quantification) of VX and R-33. ◆ Run a concentrator cleanout method whenever installing/reinstalling a concentrator. ◆ Use crossover cable between laptop and HAPSITE. ◆ Take a training course or refresher training. ◆ Contact INFICON at HAPSITE.Support@INFICON.com, 800.836.2336 or 315.434.1294 for help.

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2.5 HAPSITE Configurations

There are 6 basic configurations for the HAPSITE. The first three can either be in portable mode or connected to AC power. Each configuration can be run with or without the laptop computer connected.

Configuration 1 - HAPSITE with Probe and Sample Loop or concentrator

Configuration 2 - HAPSITE with Headspace Sampling System and Sample Loop or concentrator tube

Configuration 3 - HAPSITE with SituProbe and Sample Loop or concentrator tube

Configuration 4 - HAPSITE mounted on Service Module with Probe and Sample Loop or concentrator tube

Configuration 5 - HAPSITE mounted on Service Module with Headspace Sampling System and Sample Loop or concentrator tube

Configuration 6 - HAPSITE mounted on Service Module with SituProbe and Sample Loop or concentrator tube

2.6 Headspace Sampling System

The Headspace Sampling System is an accessory used to test water and solid samples. Samples are heated to release any VOC's into the sample vial headspace. The sampling needle is inserted into the vial and the headspace is sampled through the needle and transfer line, into the HAPSITE.

For additional information on the Headspace Sampling System refer to Chapter 13, Headspace Sampling System.

2.6.1 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, INFICON part number 930-4061-G1.
- Swagelok® connection for use with an external supply of pressurized Nitrogen.
- power supply connection.
- transfer line connection.

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Transfer Line — A directional heated line which connects the HSS to the HAPSITE, allowing sample transfer to the HAPSITE as well as communication between the two instruments. INFICON part number 931-401-P2. Each end is labeled to ensure proper orientation.

Transfer Line Insulation — This foam sleeve is used as insulation for the transfer line. The insulation reduces the energy required to heat and maintain the temperature of the Transfer Line, extending battery life. INFICON part number 931-405-P1.

Replacement Needle Kit — Replacement when the original needle for a worn, plugged, or broken needle assembly. INFICON part number 931-402-P1.

HSS Carrying Shoulder Strap — A strap which connects to the strap mounts on the sides of the HSS to facilitate carrying the instrument between the office and the field; INFICON part number 036-015.

Y-Cable — A power cable to split the power from the AC to DC power converter to both the HAPSITE and the HSS; INFICON part number 600-1131-P30.

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2.6.2 Installing the Headspace Sampling System

Required Parts

The following items are needed to install the HSS:

- Headspace instrument
- Y-cable power splitter
- Transfer line
- Carrier Gas
- Charged Battery

Procedure

1. Install a fully charged battery into the HAPSITE.
2. Unplug the AC to DC power converter power supply from the HAPSITE. See Figure 2-17.

Figure 2-17 Power Supply to HAPSITE from AC To DC Power Converter

3. Connect the single end of the Y-cable (see Figure 2-18) to the power supply connector removed in step 2.
4. Plug one end of the Y-cable into the HAPSITE 24 V(dc) connector.
5. Plug the other end of the Y-cable into the back of the HSS. See Figure 2-18.

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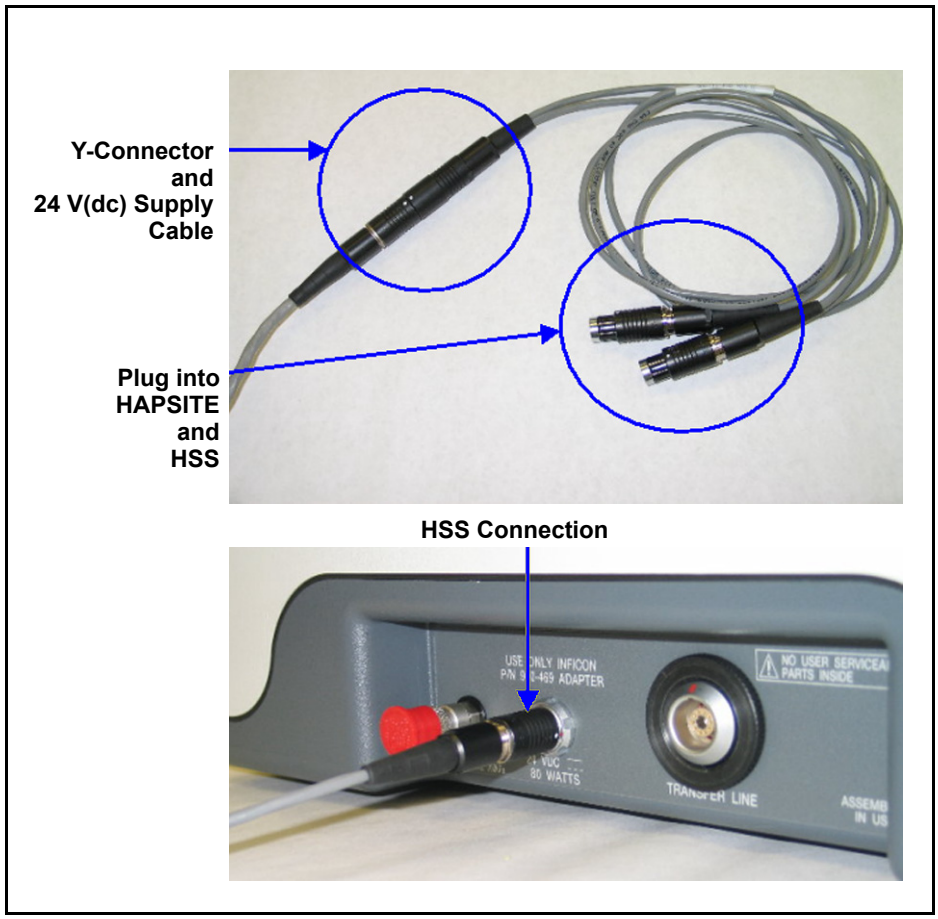
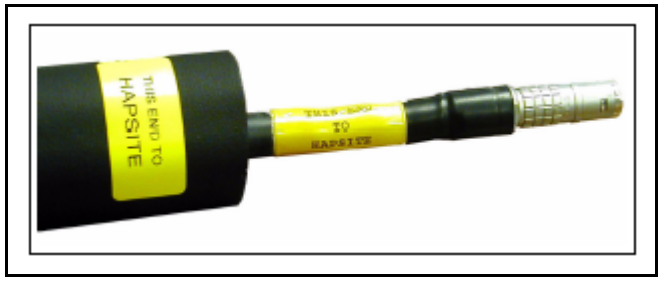
Figure 2-18 Power Supply Y-cable and Back of HSS



6 Properly align the labels on the foam insulation and transfer line and slide into place. The end of the insulation labeled in yellow **THIS END TO HAPSITE** should coincide with the end of the transfer line labeled in yellow **THIS END TO HAPSITE**. See Figure 2-19.

Figure 2-19 HAPSITE End of Transfer Line

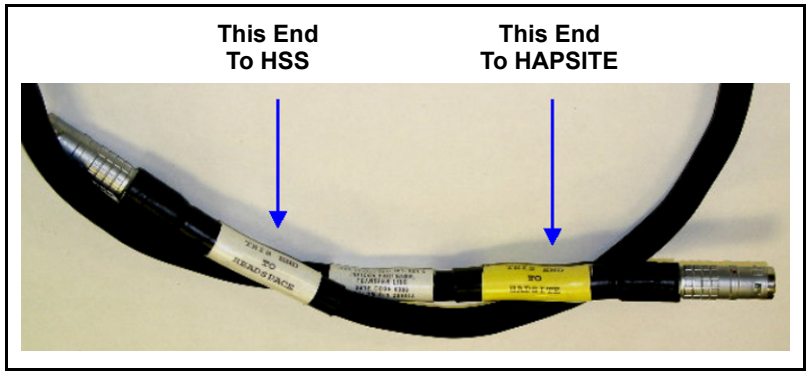


7 The white label **THIS END TO ACCESSORY** on the insulation should coincide with the white label **THIS END TO ACCESSORY** on the transfer line. See Figure 2-20.

Figure 2-20 Accessory End of the Transfer Line

8 Install the transfer line between the HAPSITE and Headspace Sampling System. First, disconnect the probe from the HAPSITE. Install the LEMO connector, labelled **THIS END TO HAPSITE** in the HAPSITE connector. The opposite end labelled **THIS END TO ACCESSORY** will connect to the rear of the Headspace Sampling System. See Figure 2-22. Make sure the red dots on the transfer line connectors align with the marks on the HAPSITE and Headspace Sampling System connectors.

Figure 2-21 Attaching the Transfer Line to the HAPSITE



NOTE: If using a concentrator tube with the HSS, wait to attach the transfer line until after running the appropriate concentrator cleanout method:

From the Front Panel: see section 3.5.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 3-32, section 3.6.1, Quick Reference SOP — Tenax Cleanout, on page 3-35,

From the Laptop: see section 5.4.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 5-24 or section 5.5.1, Quick Reference SOP — Tenax Cleanout, on page 5-31).

The concentrator cleanout methods require the probe to be attached.

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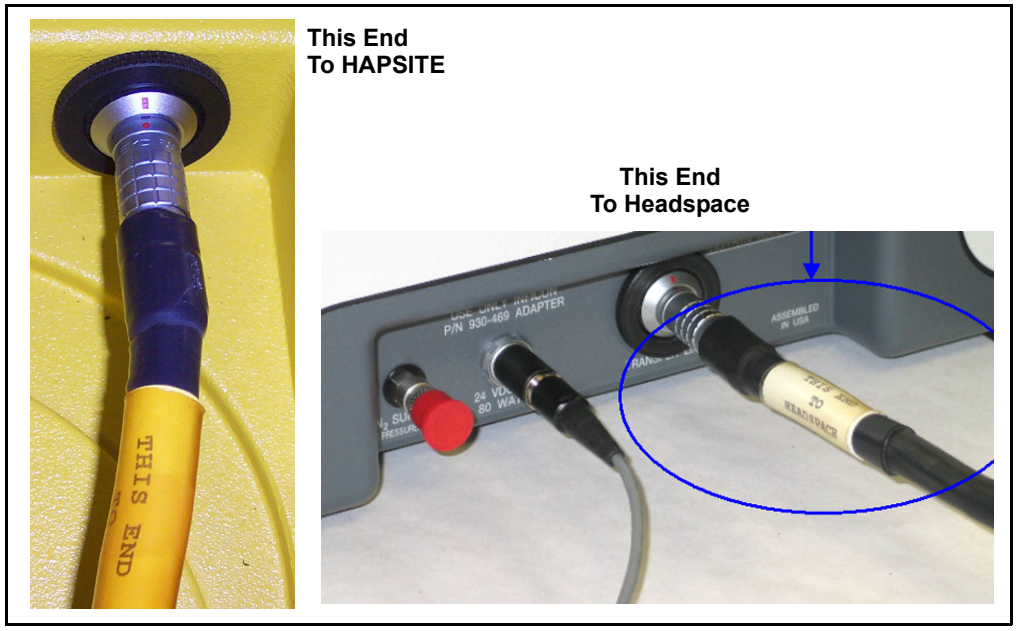
Figure 2-22 Attaching the Transfer Line to the HAPSITE and the Back of the HSS



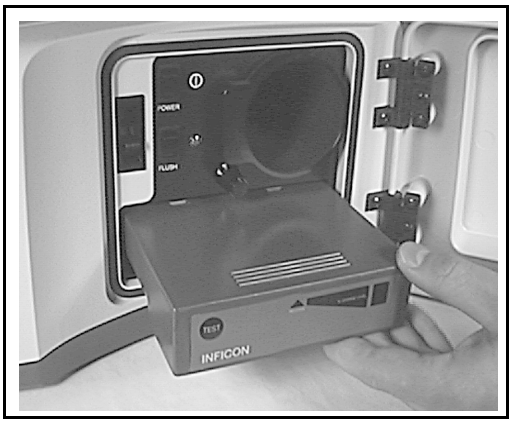
9 Connect a pressurized nitrogen cylinder or install a nitrogen can into the Headspace instrument.

10 If using the HSS in portable mode, disconnect the power supply and place a battery in the HSS. Open the front door of the HSS and insert a charged battery into the rectangular slot below the round carrier gas slot until it is engaged. Make sure when inserting the battery that the lettering is right-side up to insure proper orientation of the battery. When inserted correctly, it will 'click' into place and remain snug. See Figure 2-23.

CAUTION

The HSS is not sealed against moisture, debris, or contamination with the front door open.

Figure 2-23 Inserting the Battery into the HSS



2.7 Service Module

The Service Module is used to create a vacuum in the HAPSITE. It cannot be used in a portable application.

For additional information on the Service Module, refer to Chapter 14, Service Module.

2.7.1 Setting Up the Service Module

Required Components

- RS-232 communication cable.
- Power cord for Service Module.
- PC with Smart IQ software installed.

When stored, the Service Module should have an aluminum plug placed on the top opening. This plug is used to keep the Service Module free of moisture and debris during storage.

NOTE: The aluminum storage plug is supplied with the Service Module. The Service Module is shipped under vacuum from the factory with this plug in place. See Figure 2-24.

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Figure 2-24 Aluminum Storage Plug on Service Module

Covering the aluminum plug is a yellow plastic cover, which aids in protecting the opening from foreign debris. See Figure 2-25. Remove the yellow cover before proceeding, and store it in a safe location.

Figure 2-25 Yellow Plastic Protective Cover on Service Module

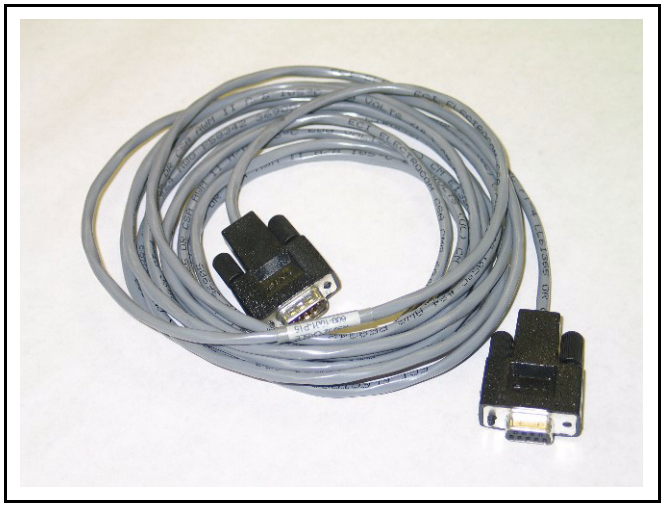
To prepare the Service Module for use with the HAPSITE, the aluminum plug must be removed. If under vacuum, then the vacuum must be released by proceeding as follows:

The Service Module requires a power cable and a RS232 communications cable to allow communication with the laptop computer. Figure 2-26 shows the power cable connected at the left back corner of the Service Module.

Figure 2-26 Power Cable Attached at Back Left of the Service Module

The RS232 communication cable is shown in Figure 2-27.

Figure 2-27 RS232 Communication Cable



Attach the RS232 communications cable to the Service Module, as shown in Figure 2-28.

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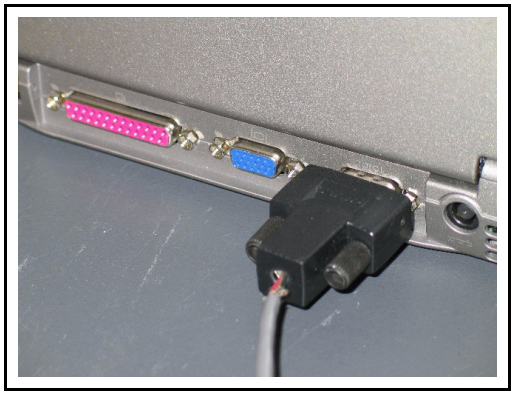
Figure 2-28 RS232 Communication Cable Attached to Back Right Side of Service Module

Now attach the RS232 cable to the laptop computer, as shown in Figure 2-29.

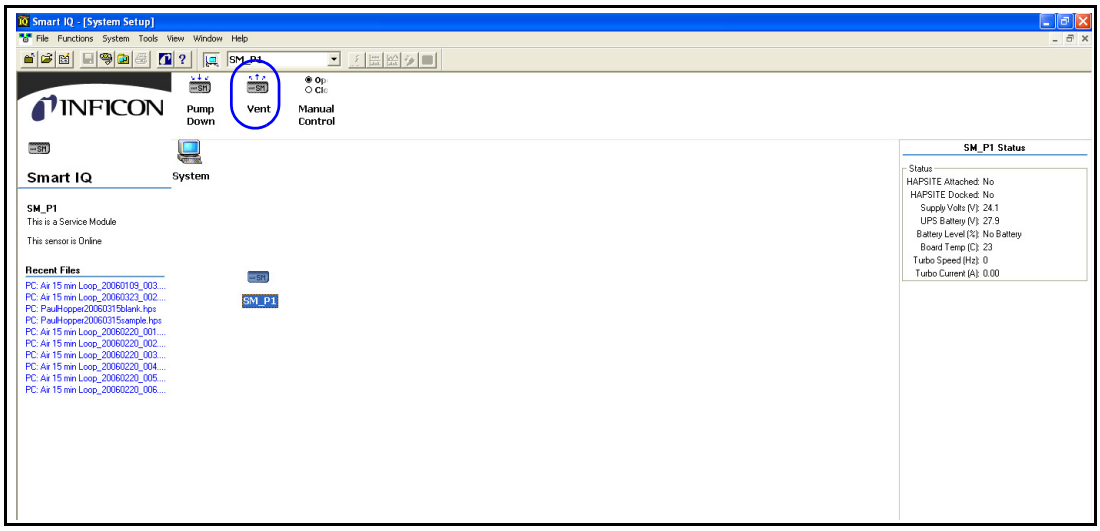
Figure 2-29 RS232 Communication Cable Attached to PC



Turn on the Power switch for the Service Module, located at the back right corner of the Service Module (refer to Figure 2-26).

Open the Smart IQ program.

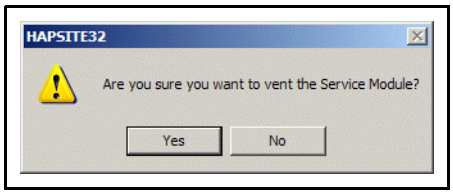
Figure 2-30 System Setup Screen with Service Module



NOTE: If the Service Module icon does not appear, the communications may need to be configured. See section 8.6.3, Establishing Communication with the Service Module, on page 8-26, for information on how to set up a COM port for communicating with the Service Module.

Click on the **Vent** icon. The dialog shown in Figure 2-31 will appear to confirm to Vent the Service Module.

Figure 2-31 Vent Service Module Confirm Window



Select **Yes** to vent the Service Module. A window will appear counting down a fifteen-second delay while the vent procedure completes. Once completed, remove the aluminum plug.

Next, clean any debris or dust from the Viton® o-ring using a lint-free wipe with methanol. Wipe the top of the o-ring, following the contour to clean the entire top exposed section. Avoid pushing dust or debris into the middle opening to the pumps. This will ensure a tight seal to the HAPSITE, allowing the system to maintain vacuum. See Figure 2-32, which shows the o-ring being cleaned.

WARNING

Wear gloves and safety glasses when handling methanol.

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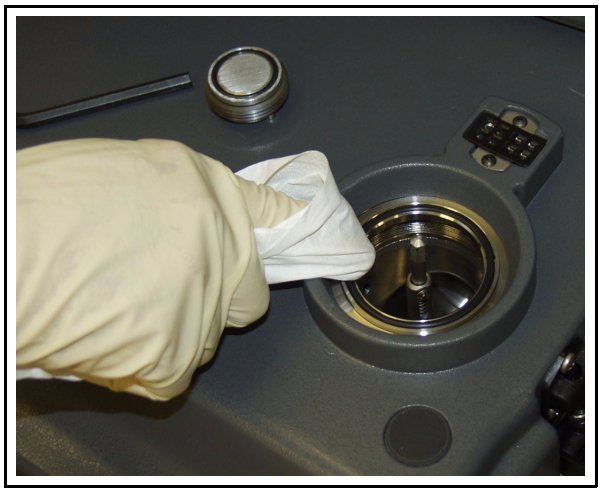
Figure 2-32 Cleaning the Service Module Rubber O-ring using a Lint-free Wipe



After cleaning the rubber o-ring, make sure there are no cuts on it. Also look for any visible cracking of the o-ring. If the o-ring is damaged, the o-ring may need to be replaced. Ensure the o-ring is completely seated in the grove.

2.7.2 Placing the HAPSITE on the Service Module

CAUTION

Never operate the HAPSITE on the Service Module in a moving vehicle.

Remove the yellow plastic protective cover from the bottom of the HAPSITE. The yellow cover is shown in Figure 2-33.

NOTE: Store the yellow cover in a clean dry place, where it will be easily accessible for later use. This protective cover keeps dust and debris out of the HAPSITE manifold connection.

CAUTION

The yellow plastic protective cover must be installed during decontamination of the HAPSITE.

Figure 2-33 Remove the Yellow Plastic Protective Cover on the Bottom of the HAPSITE

Figure 2-34 shows the yellow protective cover removed from the bottom of the HAPSITE.

Figure 2-34 Yellow Plastic Protective Cover Removed from the Bottom of the HAPSITE

Carefully place the HAPSITE on top of the Service Module. The opening at the bottom of the HAPSITE should be placed onto the opening on the Service Module.

Attach the Service Module to the HAPSITE using the black latch at each side of the Service Module. Figure 2-35 shows the right side Service Module latch.

Figure 2-35 Service Module - Showing Latch on Right Side

Figure 2-36 shows the HAPSITE attached to the Service Module using the Service Module latches.

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NOTE: Black latches can be adjusted with the thumb screw to ensure proper tension.

Figure 2-36 HAPSITE Attached to Service Module using Service Module Latches - Left Side View

Continue by following the instructions in section 14.6, Starting Up HAPSITE on the Service Module, on page 14-11.

CAUTION

The Service Module is not sealed against moisture, debris, or contamination with the front door open.

CAUTION

Never attempt to move the Service Module when the Turbo pump is spinning.

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2.7.3 Detaching the HAPSITE from the Service Module

Carefully follow the procedures starting with section 14.8, Detaching the HAPSITE, on page 14-17 to detach the HAPSITE from the Service Module.

CAUTION

Never physically remove the HAPSITE from the Service Module while the Turbo pump is spinning. The Turbo Speed must be at 0 Hz before removing the HAPSITE from the Service Module. Damage can result to both the HAPSITE and Service Module if section 14.8, Detaching the HAPSITE, on page 14-17 is not performed prior to physically removing the HAPSITE from the Service Module.

2.8 SituProbe

For assembly information on the SituProbe, refer to the *SituProbe Purge and Trap System Operating Manual*.

2.9 Sample Collection Modes

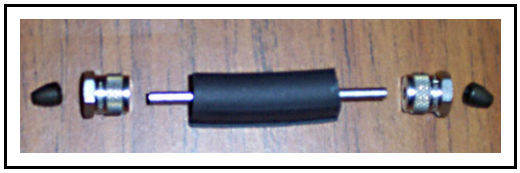
The Sample Loop is used to detect chemicals in the low ppm to high ppb concentration range. Concentrator tubes are used to detect chemicals in the low ppb to high ppt concentration range. The following procedures are used to install and remove the Sample Loop and Concentrator tubes.

2.9.1 Installing the Sample Loop

The Sample Loop is a hollow stainless steel tube. The sample volume is approximately 200 µL. Black insulation covers the center of the Sample Loop and each end has a nut and ferrule assembly. See Figure 2-37.

NOTE: The HAPSITE is originally shipped with the Sample Loop in place.

Figure 2-37 Sample Loop



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Procedure

1. Refer to section 2.9.2, Removing the Sample Loop, on page 2-29 to remove the currently installed sample loop or to 2.9.5, Removing the Concentrator Tube, on page 2-36 to remove the concentrator tube.

NOTE: There is not a specific orientation for the Sample Loop.

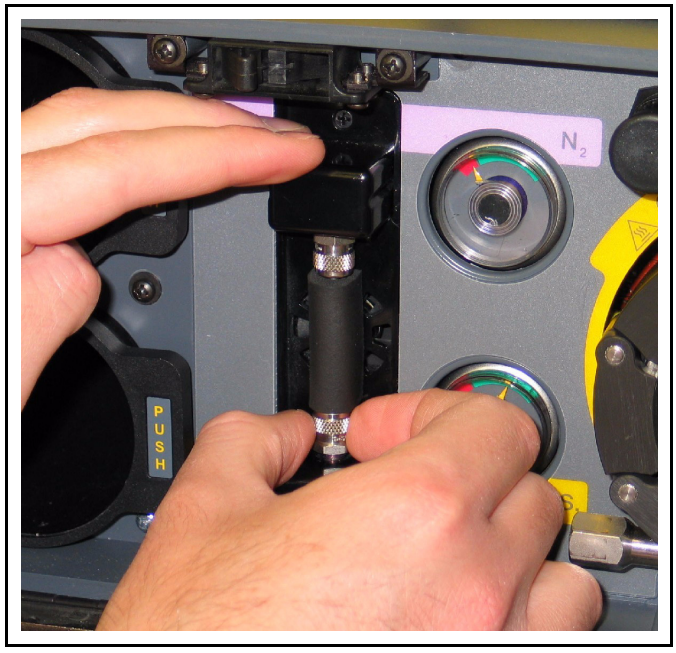
2. Make sure a ferrule is installed in each metal nut with the wide end of the cone toward the center of the sample loop, as shown in Figure 2-37.

WARNING

The elbow fittings and nuts may be hot. If necessary, let the elbow fittings and nuts cool down before continuing.

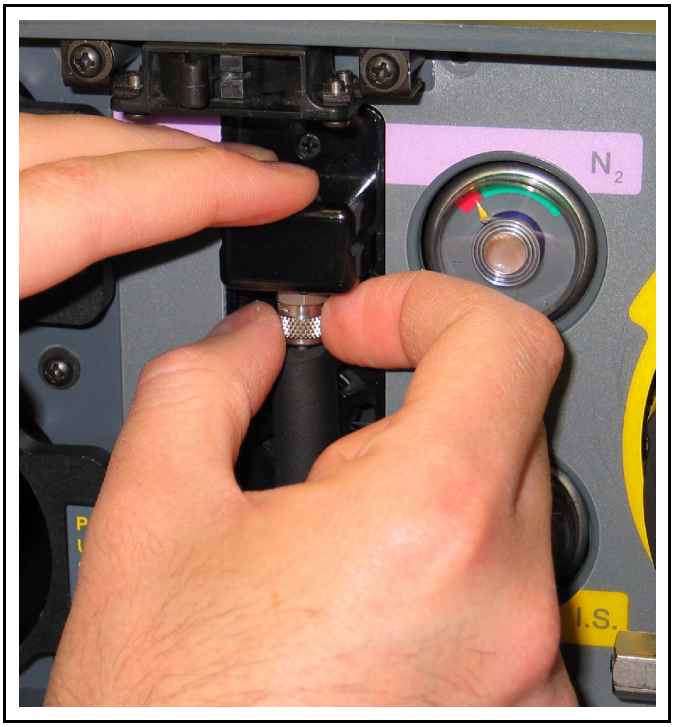
3. While holding the ferrule and nut in place, insert one end of the sample loop into the bottom elbow fitting.
4. Lift the top elbow fitting slightly, so that the top of the sample loop will fit between the two fittings.
5. Press down on the top elbow and with your fingers, tighten the bottom nut until the nut is finger tight. See Figure 2-38.

Figure 2-38 Tightening the Bottom Nut



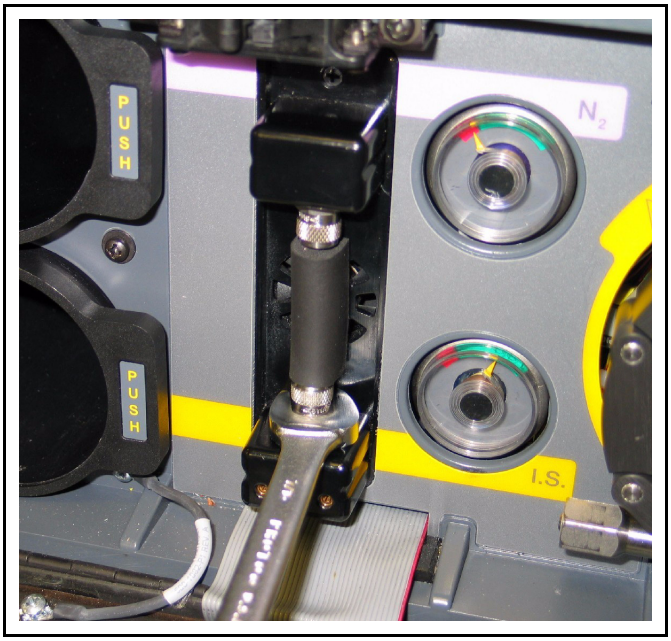
6 Continue pressing on the top elbow, and tighten the top nut finger tight. See Figure 2-39.

Figure 2-39 Tightening the Top Nut



7 Using the 7/16" open end wrench supplied with the HAPSITE, tighten both the top and bottom nut approximately a quarter turn. See Figure 2-40.

Figure 2-40 Wrench tighten



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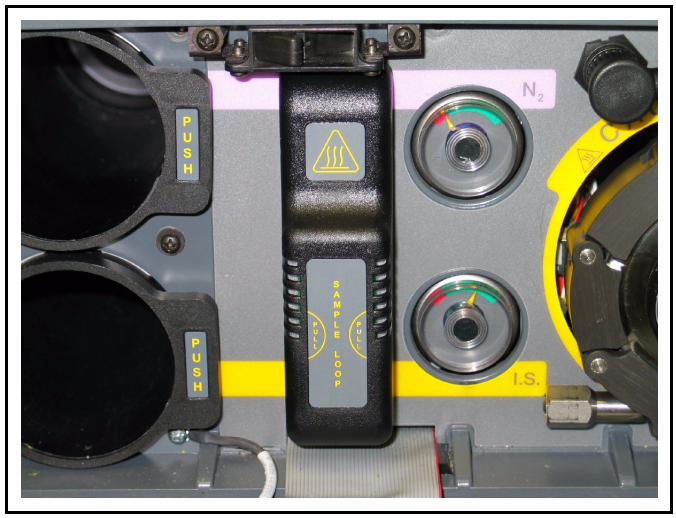
8 Snap on the black cover labeled Sample Loop. See Figure 2-41.

Figure 2-41 Sample Loop Cover Installed



2.9.2 Removing the Sample Loop

1 Open the front panel of the HAPSITE and remove the black cover labeled **Sample Loop**.

WARNING

The elbow fittings and nuts may be hot. If necessary, let the elbow fittings and nuts cool down before continuing.

2 Using the 7/16" open end wrench suppled by INFICON, loosen the nuts on the top and bottom of the sample loop until it becomes free.

3 Remove the Sample Loop, being careful not to lose the ferrules on the top and bottom. Store the Sample Loop in a safe place for future use.

2.9.3 Installing the Tri-Bed Concentrator

1 Refer to section 2.9.2, Removing the Sample Loop, on page 2-29 to remove the sample loop or to section 2.9.5, Removing the Concentrator Tube, on page 2-36 to remove the currently installed concentrator tube.

2 Remove the Tri-Bed Concentrator tube from the storage vial. Orient the plastic nuts and Teflon ferrules onto the glass concentrator tube by placing a nut on each end of the tube with the threaded end facing away from the center of the tube.

3 Place the wide end to the ferrule into the threaded end of each nut.

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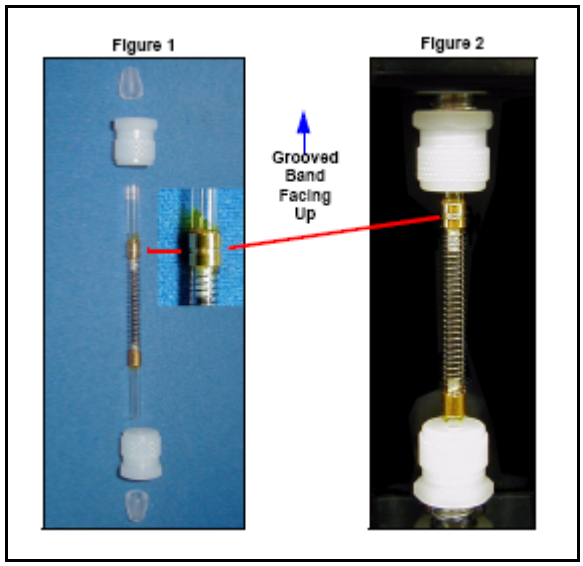
NOTE: The Tri-Bed Concentrator is directional. The Tri-Bed Concentrator must be installed with the smooth metal sleeve pointing down and the grooved metal sleeve pointing up. See Figure 2-42.

Figure 2-42 Proper Tri-Bed Concentrator Orientation



WARNING

The elbow fittings and nuts may be hot. If necessary, let the elbow fittings and nuts cool down before continuing.

4 While holding the nut and ferrule in place, carefully place the smooth metal sleeve end of the Tri-Bed Concentrator tube into the lower elbow fitting.

5 Carefully lift up on the top elbow fitting and insert the end of the tube with the grooved metal sleeve into the fitting.

6 Keep the Concentrator tube aligned between the two elbow fittings while gently pressing down on the top elbow fitting with just enough force to seat the tube.

7 While maintaining steady pressure on the top elbow fitting, first finger-tighten the bottom nut of the concentrator tube, then proceed to finger-tighten the top nut.

8 Continue to hold pressure on the top fitting and gently tighten each of the nuts with 1/8 to a 1/4 turn using a 7/16" open-end wrench.

WARNING

Excessive force and/or tightening can cause the fragile glass to break!

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9 When pressure is released from the top fitting, the elbow should not move. When gentle upward pressure is applied to the top elbow, the elbow should not slip on the concentration tube. If the elbow moves, the tube is not properly seated, loosen the concentrator tube and repeat Step 4 on page 30 through Step 8 on page 30.

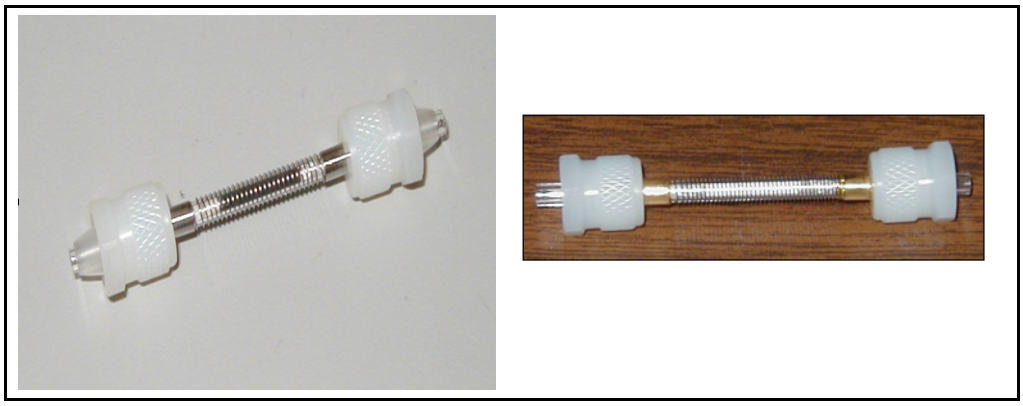
10 Place the black Concentrator Cover over the concentrator tube and elbow assembly. The cover should fit easily, excessive force is not required if the concentrator tube is properly installed.

NOTE: The Concentrator Cover contains two metal contacts, inspect the contacts, prior to assembly, to be sure the contacts are not bent or crimped.

11 Close the front panel.

2.9.4 Installing the Tenax or Carbopack Concentrator

Figure 2-43 The Carbopack and Tenax Concentrator tubes



1 Refer to section 2.9.2, Removing the Sample Loop, on page 2-29 to remove the sample loop or to section 2.9.5, Removing the Concentrator Tube, on page 2-36 to remove the currently installed concentrator tube.

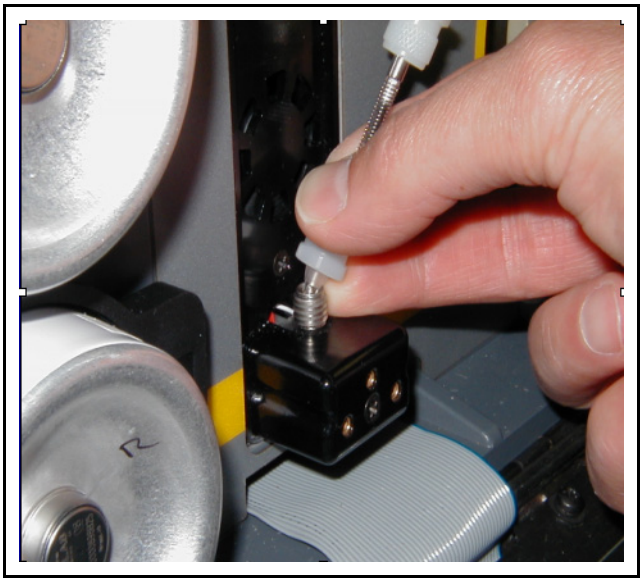
NOTE: The Tenax and Carbopack concentrator tubes do not have a specific orientation.

WARNING

The elbow fittings and nuts may be hot. If necessary, let the elbow fittings and nuts cool down before continuing.

2 While holding the bottom ferrule in place, put the bottom of the concentrator tube into the lower elbow fitting. See Figure 2-44.

Figure 2-44 Placing Concentrator in Bottom Elbow



3 Carefully lift up on the top elbow and insert the top of the concentrator tube. See Figure 2-45.

Figure 2-45 Inserting the Top of the Concentrator

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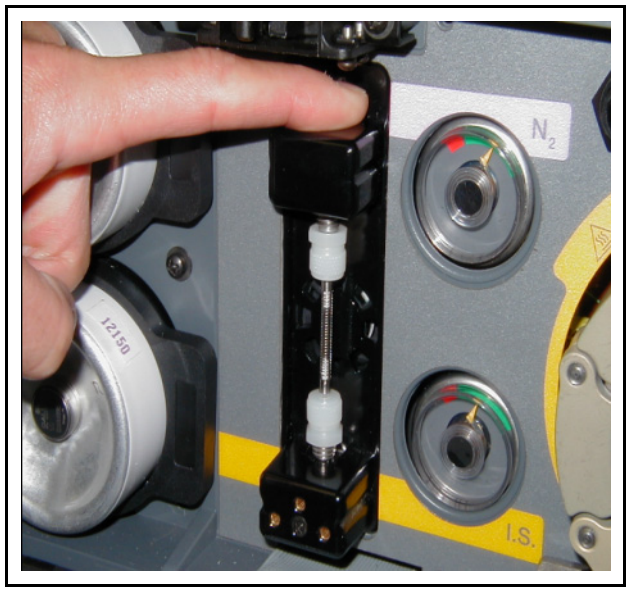
4 With the Concentrator Tube in place, press down on the top of the elbow assembly with just enough force to seat the Concentrator Tube. See Figure 2-46.

Figure 2-46 Pressing Down on Elbow Assembly

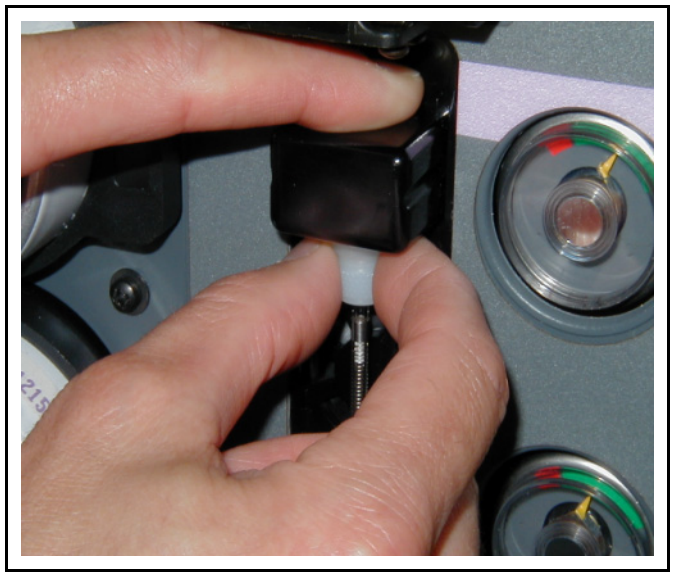


5 Maintain the pressure on the top of the elbow and, tighten the bottom nut only until it begins to contact the ferrule. See Figure 2-47, Tighten Bottom Nut, on page 2-33.

Figure 2-47 Tighten Bottom Nut

6 Fully tighten the top nut using your fingers being careful not to push, pull, shove or tilt the nut and fitting. Once the top nut is tightened, tighten the bottom nut again using your fingers. See Figure 2-48.

Figure 2-48 Tightening the Top and Bottom Nut



7 Once the nuts have been finger-tightened, use a 7/16" inch wrench to finish tightening. Turn the nuts 1/8 to 1/4 of a turn more.

WARNING

Using too much force may cause the fragile glass tube to break.

8 The concentrator cover has two sets of metal arms that are used to make contact with the concentrator tube. If these contacts are too close together the pressure from installing the cover may break the concentrator. If they are spread two far apart, they will not make contact with the concentrator. See Figure 2-49.

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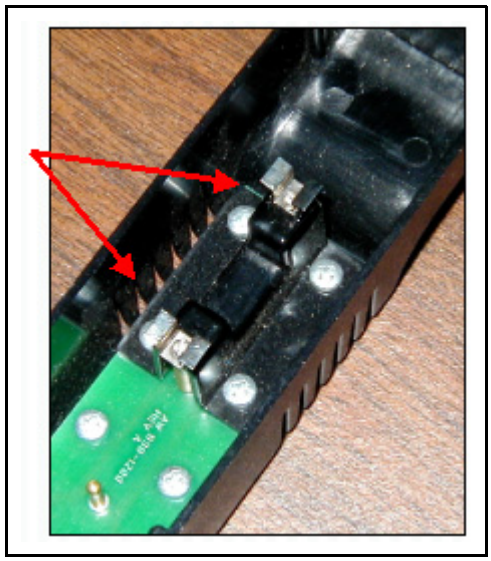
Figure 2-49 Back of Concentrator Cover



9 Install the concentrator cover. See Figure 2-50.

Figure 2-50 Concentrator Cover

2.9.5 Removing the Concentrator Tube

1. Open the front panel of the HAPSITE and remove the black cover labeled **Concentrator**.

WARNING

The elbow fittings and nuts may be hot. If necessary, let the elbow fittings and nuts cool down before continuing.

2. Using the 7/16" open end wrench suppled by INFICON, loosen the nuts on the top and bottom of the concentrator tube until the tube becomes free.
3. Lift the top elbow and gently angle the concentrator tube out of the fixture.
4. Remove the concentrator tube from the bottom elbow, being careful not to lose the ferrules on the top and bottom.
5. Store the concentrator tube in a safe place for future use.

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2.10 Probe Sampling Options and Attachments

To expand the sampling range of the HAPSITE sample collecting bags can be used and special VX Conversion Tubes can be attached.

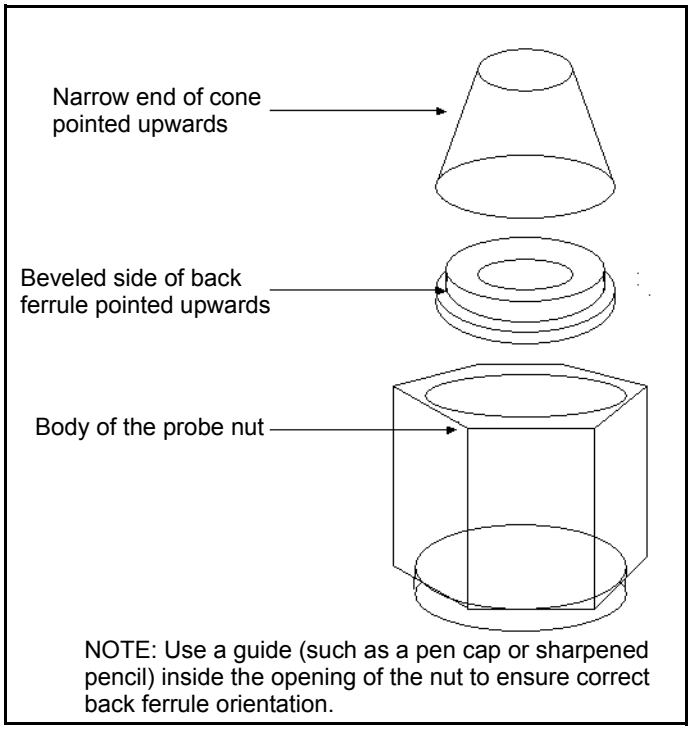
2.10.1 Probe Nut Assembly

The Probe Nut Ferrule orientation is critical for attaching a bag sample or VX Conversion Tube. Using a guide (golf tee, small screwdriver, plastic pen cap with pocket clip extension), place the metal probe nut over the narrow end of the guide with the threads facing up. Place the small, back ferrule over the narrow end of the guide with the beveled side facing up. The cone-shaped ferrule should be placed over the extension with the narrow end facing up. Refer to Figure 2-51. Carefully remove the nut assembly from the narrow end of the guide and gently tap the nut so that the ferrules seat properly into the nut. Thread the nut-ferrule assembly onto the probe. Finger-tightening is sufficient.

WARNING

Ferrule orientation is critical to avoid leaks. If sampling a bag of toxic material, a leak could be harmful to people.

Figure 2-51 Diagram of Proper Ferrule Orientation in the Probe Nut



2.10.2 Attaching a Bag Sample

When situations call for collecting samples to be run later, various sampling bags can be used.

1. Before attaching a Tedlar® Bag to the Probe, refer to section 2.10.1, Probe Nut Assembly, on page 2-37 to ensure proper ferrule orientation in the probe nut.
2. Prepare the Tedlar Bag sample. Avoid filling bag more than 80% full. Be sure the valve is closed on the Tedlar bag.
3. Loosen the nut on the probe by turning the nut counter-clockwise up to two complete revolutions.
4. Guide the cylindrical stem of the bag valve assembly into the opening of the probe nut. Firmly push the stem into the probe nut. Two cylinder "clicks" are usually felt before the bag is properly seated into the probe nut.
5. Finger tighten the probe nut by turning the nut clockwise.
6. Open the Tedlar Bag by turning the valve one complete counter-clockwise revolution.
7. Proceed with the desired method. See Chapter 6, Methods.

2.10.3 VX-G Conversion Tube

This procedure describes the steps required to prepare the HAPSITE to sample for VX or R-33 using the VX-G conversion tube. To detect VX or R-33, you must insert the VX-G conversion tube following the guidelines below.

The process of detecting VX or R-33 on the HAPSITE requires the conversion of VX or R-33 (high boiling point chemicals) to the G analog. The VX or R-33 molecule is broken at the sulfur bond when it comes in contact with a silver fluoride pad. The result is the formation of a volatile chemical ethyl methylphosphonofluoridate in the case of VX, or isobutyl methylphosphonofluoridate in the case of R-33. These compounds are detected by the HAPSITE as VX-G or R-33-G.

NOTE: Theoretically, other G agents can be detected with the VX conversion pad in place. However, if other G agents are suspected, the sample should be also run without the conversion tube in place.

CAUTION

Sulfur Mustard cannot be detected with the conversion tube in place.

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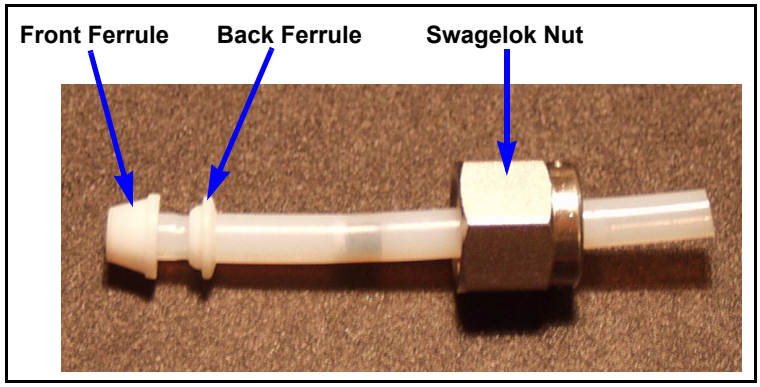
2.10.3.1 VX-G Conversion Tube Installation

1 The HAPSITE probe has a 3/16" Swagelok® nut installed at the end of the probe. Inside this nut is a two piece ferrule set consisting of a front and back ferrule. These must be in place and in the proper orientation to create a leak free seal. The back ferrule goes into the nut first, followed by the front ferrule (cone facing forward). See Figure 2-52.

Figure 2-52 Ferrule Location



NOTE: If the nut on the HAPSITE probe is in place, the nut does not need to be removed. The VX-G conversion tube can be slid inside the nut opening using the following procedure. If the nut is removed to check the ferrules, make sure the ferrules are not dropped. Ferrule placement is critical to insure a leak-free fit around the VX-G conversion tube.

2 Loosen the Swagelok nut on the end of the probe approximately 1/4 to 1/2 turn. See Figure 2-53.

Figure 2-53 Loosening the Swagelok Nut

3 Insert the VX-G Conversion Tube into the Swagelok nut. Make sure the tube is firmly seated into the front ferrule. This positions the nut approximately 1/2 inch from the end of the tube. See Figure 2-54.

Figure 2-54 Inserting the Swagelok Tube

4 Tighten the Swagelok nut finger tight. Pull gently on the conversion tube, it should be held firmly in place. See Figure 2-55.

Figure 2-55 Tightening the Swagelok Nut

2.10.3.2 VX-G Conversion Tube Removal

1 Loosen the Swagelok nut.

2 Gently pull the VX-G Conversion Tube out of the probe.

3 Make sure the ferrules remain properly seated in the Swagelok nut.

4 Finger tighten the Swagelok nut.

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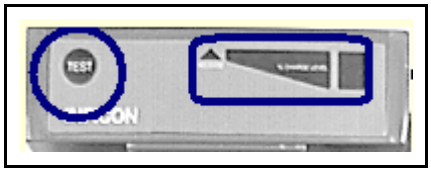
2.11 Batteries

The battery provides power to the HAPSITE to allow portability. Under optimum conditions, the battery has a 2 to 3 hour life.

HINT: To test a battery, push on the **TEST** button on the end of the battery. In the elongated triangle, green lights will appear, the number indicates the percentage of remaining life in the battery in 20% increments. See Figure 2-56.

Figure 2-56 Battery Test Button and Charger Indicator



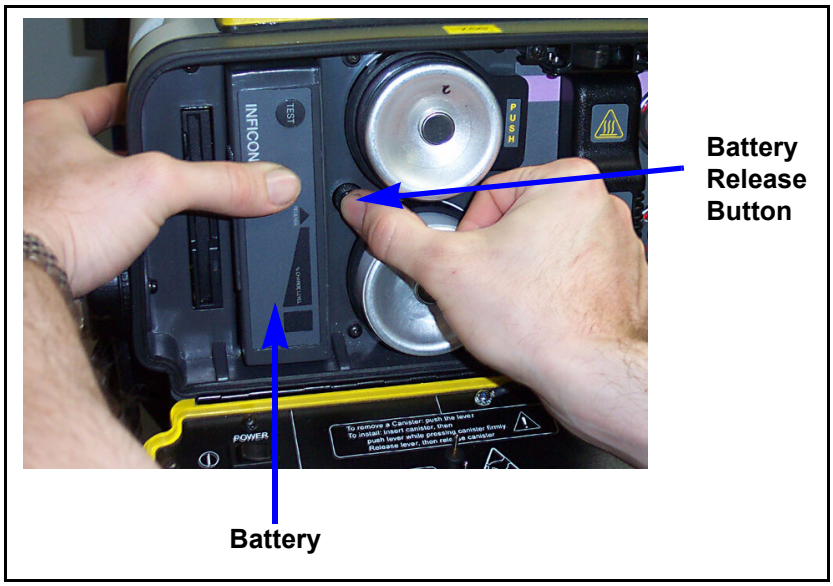
2.11.1 How to Remove a Battery

The black button to the right of the battery is the battery release button. Two clips hold the battery in the battery compartment. See Figure 2-57. Firmly push in on the battery and simultaneously press and hold the battery release button (located to the right of the battery compartment). As the clips release, pull the battery out.

CAUTION

Be sure that no rain or other foreign material gets in the battery compartment.

Figure 2-57 Battery Release Button



2.11.2 Battery Charger

The auxiliary Battery Charger (part number 930-470-G1) is a simple, integrated unit which operates from AC power and charges one, two, or three HAPSITE batteries in 15 hours or less.

CAUTION

The Battery Charger is not sealed against moisture, debris, or contamination.

Figure 2-58 Battery Charger

The Battery Charger operates from a range of nominal AC voltages from 100 to 230 V. It will continue to operate without internal damage at a voltage as low as 90 V and as high as 253 V. The frequency can be from 50 to 60 Hz. The Battery Charger draws 120 W when fully loaded.

The AC power connects to the Battery Charger through a Type IEC 320 male plug, a two-wire grounded connector rated for the full range of voltages. The connector is recessed at the right-hand side of the rear of the Battery Charger and incorporates a pair of fuses.

The Battery Charger is designed for indoor use at ambient temperatures from 5 °C to 35 °C (41 to 95 °F). The Battery Charger is not designed for exposure to contaminants since decontamination is not possible.

2.11.2.1 Battery Charger Components Received

Shipment of the Battery Charger comprises the charger, a power cord, and spare fuses.

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2.11.2.2 Battery Charger Connections and Startup

Plug the power cord into the connector at the right rear of the Battery Charger, then into a grounded outlet. The **ON** light will illuminate. (The Battery Charger does not have a power switch).

As the Battery Charger performs a self-test, all the indicators will turn amber, then all will turn green (except that the indicator for any bay already containing a battery will turn red at this step) then all but the **ON** indicator will extinguish. No further warm-up is required; it is ready to charge batteries.

2.11.2.3 Loading the Battery Charger

The receptacles of the Battery Charger are identical and batteries in any state of charge can be connected. Place each battery to be charged in one of the charging receptacles. The respective light will illuminate green and charging will commence immediately.

CAUTION

Do not use excessive force when placing the battery in the Battery Charger.

CAUTION

Do not charge batteries in a moving vehicle.

2.11.2.4 Understanding the Battery Charger Indicators

Each battery receptacle is associated with an indicator light which can be illuminated in any of three colors. Their interpretation is:

Green . . . . . The battery is being charged. This will continue for 15 hours or less. If a severely discharged battery is inserted, the green light will flash. If it flashes for more that 10 minutes, the battery will not accept a charge and should be replaced. The actual state of the battery charge can be assessed by using the **TEST** button on the battery.

Amber . . . . . The battery is fully charged. The rate of charge has been reduced to a maintenance level. The battery can be left this way indefinitely.

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Red . . . . . The receptacle (or the battery, if one is installed) has a problem. A flashing red light indicates that communication with the battery is unsuccessful.

Off . . . . . The receptacle is ready to charge a battery. If the indicator remains extinguished when a battery is inserted, the battery is severely discharged. In this case, leave the battery in the receptacle and unplug the power cord. Reconnect the power cord and the battery will start to charge.

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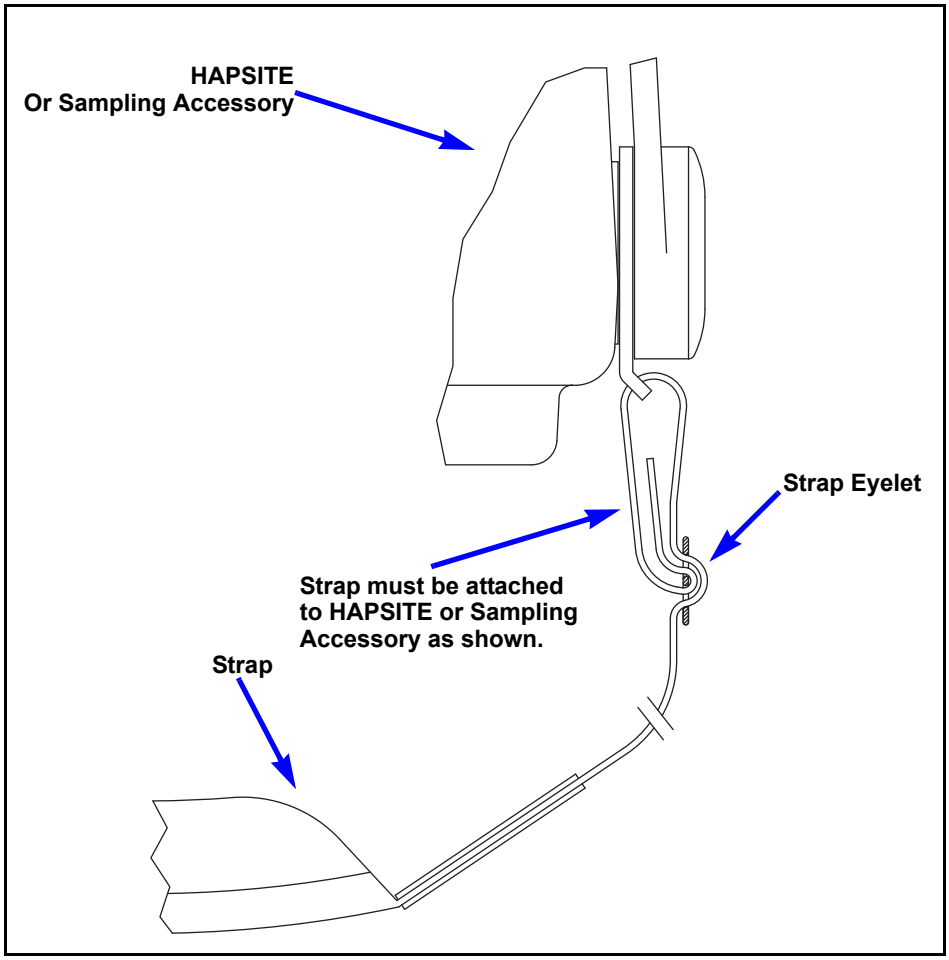
2.12 Portable Accessories

Portability is an important HAPSITE feature. The following accessories facilitate portability.

2.12.1 HAPSITE and Headspace Sampling System Strap

Attach the HAPSITE and Headspace Sampling System straps as illustrated below in Figure 2-59:

Figure 2-59 Attaching the HAPSITE Strap



WARNING

Failure to connect strap as shown increases the risk of strap failure possibly resulting in dropping the HAPSITE and/or bodily injury.

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2.12.2 HAPSITE Backpack

The backpack is a light weight, high quality hiker's backpack, modified to securely mount the HAPSITE.

2.12.2.1 Adjustment of the Backpack

To adjust the backpack, proceed as follows.

1. Put on the empty backpack.
2. Tighten the hip belt.
3. Arrange the backpack so that:
   - the frame's S-curve matches the curve of your back.
   - the hip belt rests on your hip bones.
   - the shoulder straps come from the frame at a slight downward angle over your shoulders.
4. Note the height and shoulder strap adjustments that need to be made to achieve a proper fit.

   HINT: Use a mirror to visually check the fit.
5. Take the backpack off.
6. If a height adjustment is needed, use the grommets and pins to move the hip belt up or down.
7. If the spacing between the shoulder straps needs adjustment, tilt the buckles out of their current slots and insert them in the correct slots.
8. Try on the empty pack again. Repeat as necessary to achieve a proper fit.
9. Release the locks on the two stainless steel buckles.
10. Mount the HAPSITE on the backpack.
11. Correct adjustment of the tension of the buckles permits them to slide slightly on the HAPSITE attachment points.
12. With the HAPSITE securely clipped to the backpack, put on the backpack.
13. Tighten the hip belt and shoulder straps.
14. The weight should be carried by your hips, with the shoulder straps steadying the load.

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2.12.2.2 Care of the Backpack

- Avoid exposing the backpack to solvents and other active chemicals.
- Avoid storing the backpack to direct sunlight.
- Wash the backpack as necessary with water and mild soap.

CAUTION

Do not store the backpack with the fabric in contact with concrete, as the moisture and chemicals in concrete can weaken nylon.

2.13 Hot Swap Cable (IPN 930-246-G1)

The Hot Swap Cable is used to provide an external power source for the HAPSITE®. When connected between an external battery and the 24 V(dc) power port on the HAPSITE, the Hot Swap Cable permits changing the internal battery without the loss of power to the HAPSITE.

2.13.1 Connecting The Hot Swap Cable

WARNING

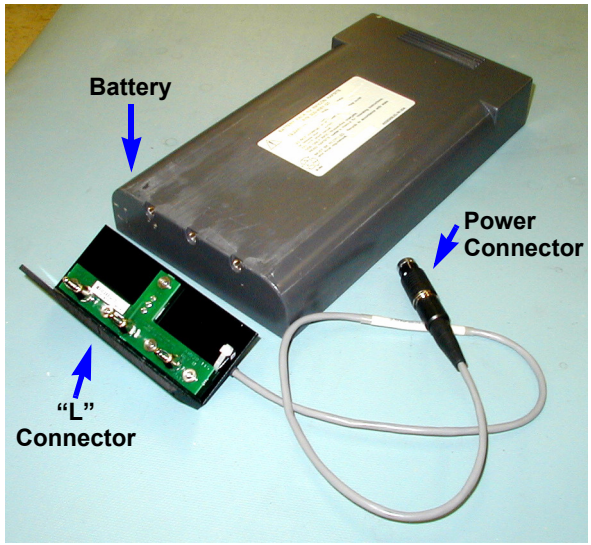
Do not use the Hot Swap Cable in the rain.

1 Plug the "L" connector into the back of a charged battery. See Figure 2-60.

Figure 2-60 Hot Swap Cable Components

WARNING

Do not use if the "L" connector is broken.



WARNING

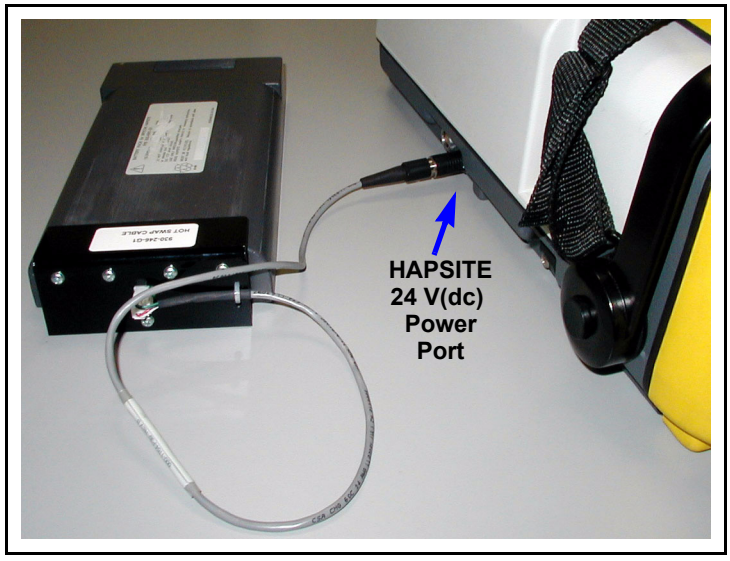
Risk of electrical shock. Be careful when using the Hot Swap Cable. Connect the Hot Swap Cable L connector to the battery first, then plug the power connector into the HAPSITE 24 V (dc) power port.

2 Plug the power connector into the 24 V(dc) power port on the HAPSITE. The discharged internal battery can now be replaced. After replacing the internal battery, disconnect the Hot Swap Cable. See Figure 2-61

CAUTION

Do not open the HAPSITE front panel in a contaminated environment.

Figure 2-61 Power Connector



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2.13.2 Storing The Hot Swap Cable

The Hot Swap Cable and battery have exposed electrical connections. Protect the connections from exposure to moisture or contaminated environments by wrapping the battery and cable connection in a protective plastic bag when not in use. See Figure 2-62.

Figure 2-62 Storing

2.13.3 Use As An Additional Battery Source

When using the Hot Swap Cable and battery to provide an additional battery source, attach the battery to the HAPSITE via the Hot Swap Cable when the front panel shows the level of charge on the internal battery is ≤20%.

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Chapter 3
Operating HAPSITE in Portable Mode

3.1 Starting the HAPSITE in Portable Mode

Starting the HAPSITE in Portable Mode refers to using the HAPSITE without the laptop computer.

Required Materials

- HAPSITE (Analytical Module)
- internal standard gas canister
- carrier gas canister
- charged battery
- AC to DC power converter power supply
- Probe

Procedure

1 Refer to Section 2.3, Basic Assembly, on page 2-4.

CAUTION

Never open the front panel outside while raining.

2 Press the **power button** on the inside of the front panel. The HAPSITE takes 1 to 2 minutes to power on. See Figure 3-1.

NOTE: The power button is a toggle switch and once pressed and released, returns back to the original placement.

HINT: The HAPSITE should be powered on while connected to AC power. The power on sequence will consume over 40% of the battery charge, if not connected to AC power.

HINT: If desired and equipped, the HAPSITE can be used in the portable mode with the laptop computer connected via the wireless connection, see Chapter 4, Wireless and USB for additional information on set-up and usage.

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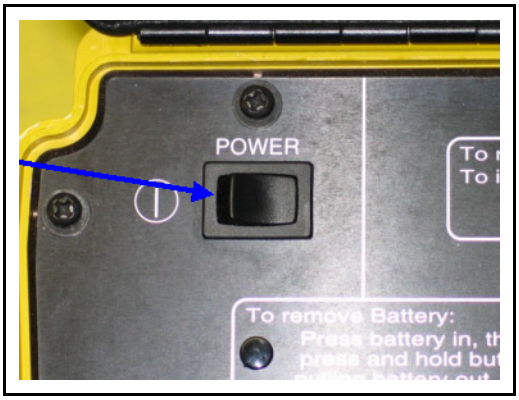
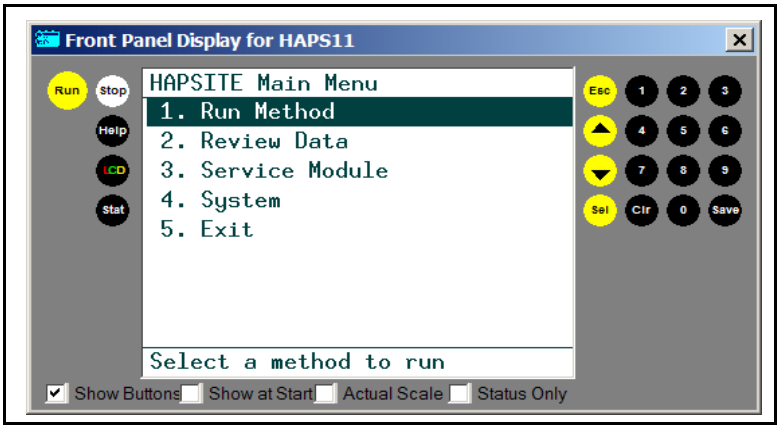
Figure 3-1 The Power Switch



3 To warm up the system and perform a tune check, a method must be chosen to run, unless a startup method has been activated. Press **1**, then **SEL**. See Figure 3-2.

Figure 3-2 Main Menu



HINT: The HAPSITE can be configured to use a startup method. If a startup method is chosen, Step 3 on page 3-2 through Step 5 on page 3-5 will be automatically run. Currently, instruments are shipped with the Survey method selected as the startup method.

4 Select a method to run.

- To select a menu option:
  - use up and down arrows to highlight the desired method, press **SEL**.

  OR

  - press the number of the selection and then press **SEL**.

  HINT: Refer to Section 3.3, Survey Mode, on page 3-18 or Section 3.4, GC/MS Mode with Loop, on page 3-23 for additional instructions.

  HINT: This example will use a GCMS Method with the sample loop installed. See Figure 3-3.

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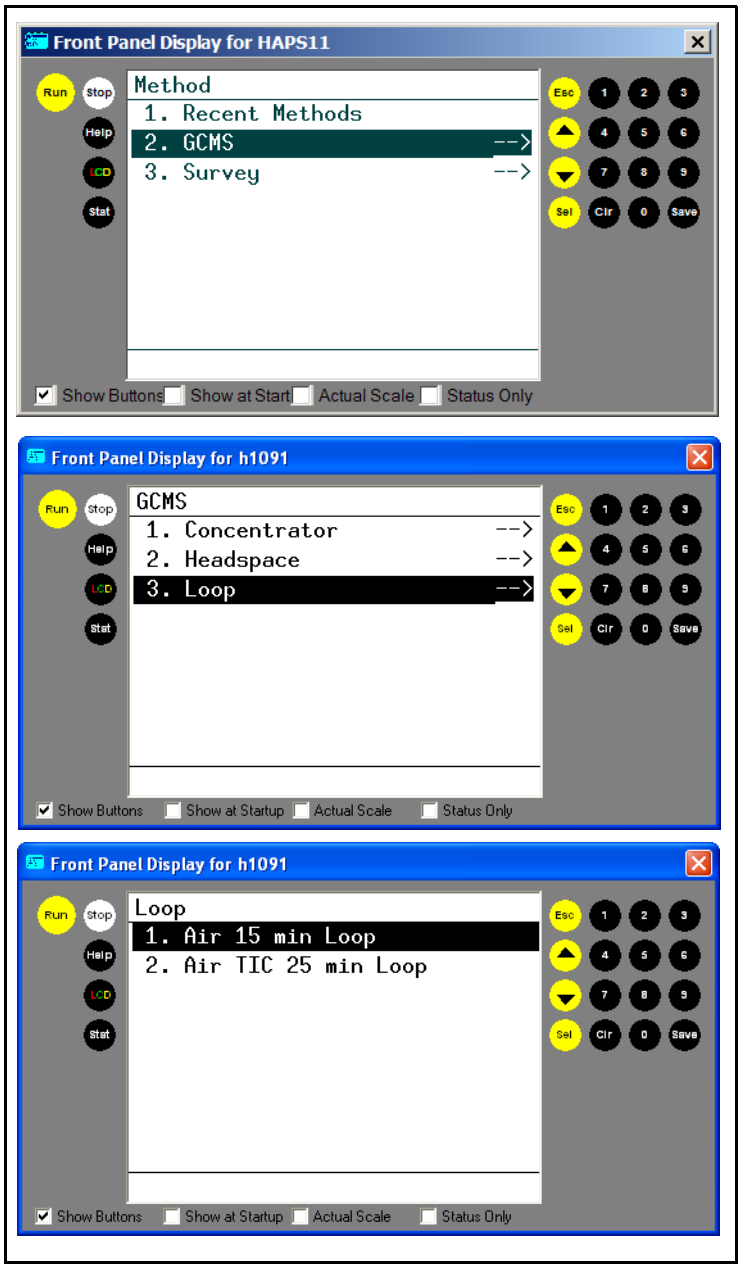
Figure 3-3 Choosing a Method



Once a method is selected, the HAPSITE will automatically check the pressures in the gas canisters, and begin to heat up the system. When the heating sequence is completed the software will check the tune of the instrument and automatically make any necessary adjustments. See Figure 3-4. If autotune fails, refer to Section 7.4, Autotune Failure, on page 7-7.

NOTE: The HAPSITE takes about twenty minutes to complete the warm-up and short autotune. Once completed, the HAPSITE is ready to run samples.

Figure 3-4 Front Panel Display Checking Pressures, Heating and Tuning

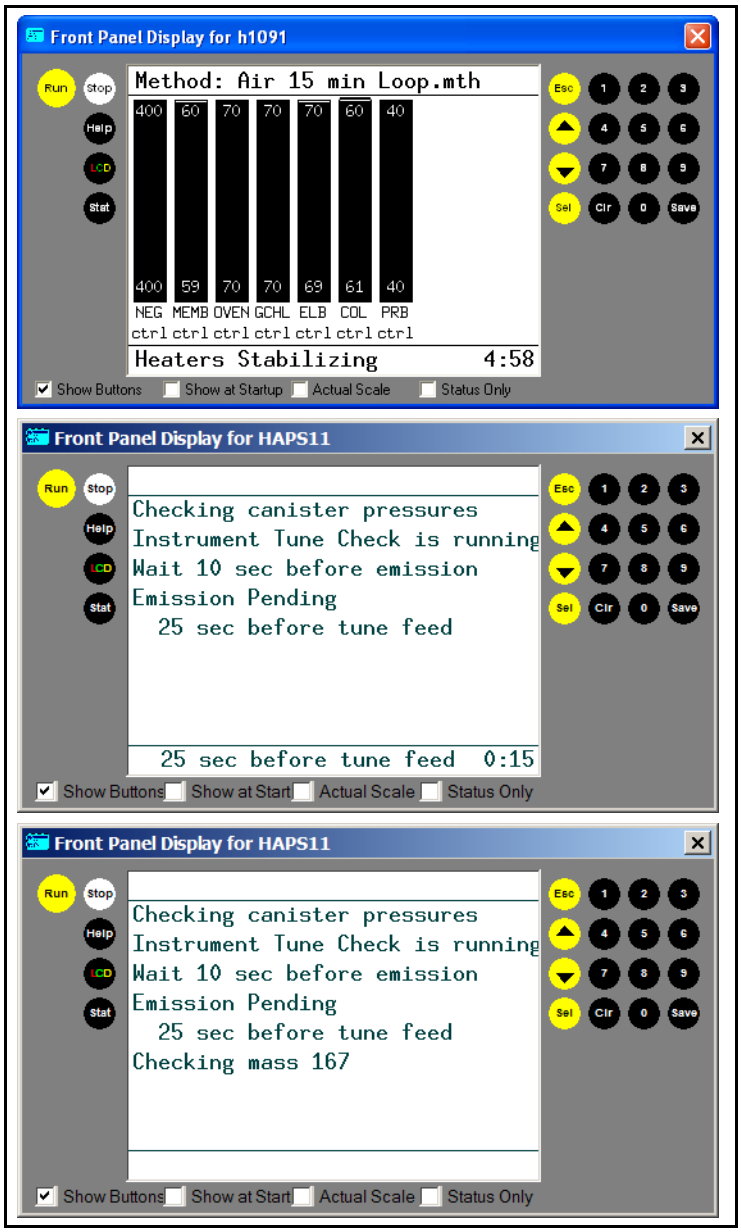


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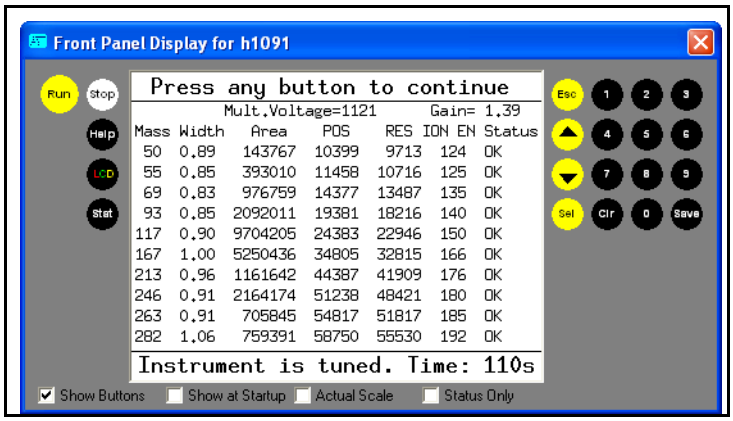
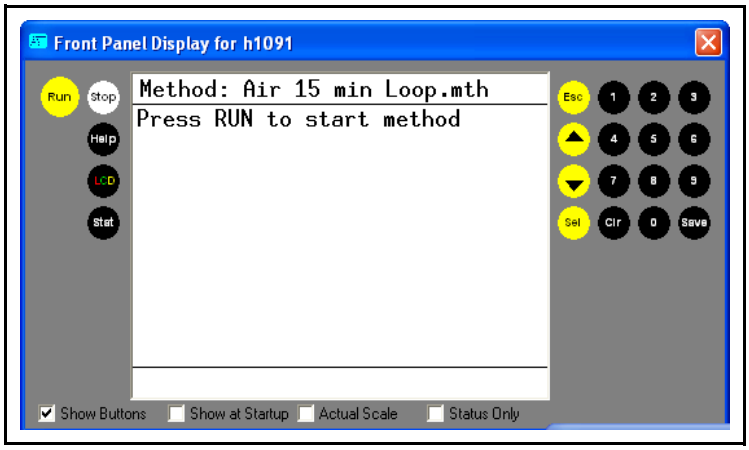
Figure 3-5 Autotune Results



5 When the warm-up is complete the start Method prompt will appear. Press **RUN** when ready to sample. See Figure 3-6.

NOTE: Press **ESC** to not perform the method.

Figure 3-6 Method Ready to Run Screen



3.1.1 Quick Reference SOP - Heat-up and Tune

1. Insert the Internal Standard and Carrier gas canisters.
2. Insert a charged battery
3. Connect the AC to DC power converter power supply.
4. Press the power button on the inside of the front panel.

   NOTE: If a startup method is active, the HAPSITE will automatically perform Step 5 on page 3-6 through Step 7 on page 3-6.

   HINT: If the wireless connection to the laptop computer is to be used, see Chapter 4, Wireless and USB.
5. From the Main Menu highlight **Run Method** and press **SEL.**
6. Highlight either **Survey** or **GCMS** and press **SEL** (depends on what is being run). If choosing the **GCMS**, highlight and select the folder desired.
7. Highlight the desired method (**Air 15 min Loop** or **Survey**)

   NOTE: The HAPSITE will now heat up the all zones and perform a tune check. A run method prompt will appear when the HAPSITE is ready to run a sample. The process for heat-up and tune takes approximately 20 minutes.

3.2 HAPSITE Front Panel Main Menu

The folder tree on the HAPSITE is a menu of operations that can be performed by pressing buttons on the front panel of the HAPSITE.

In all cases, pressing the **SEL** button will select the currently highlighted selection. Pressing the **ESC** button moves back to the previous menu.

Figure 3-7 shows the HAPSITE front panel and LCD Main Menu display.

NOTE: The blue banner at the top of the Front Panel does not exist on the actual Front Panel (this is a computer representation of the front panel which is displayed on the HAPSITE computer software). Also, the LCD button is only on the computer representation.

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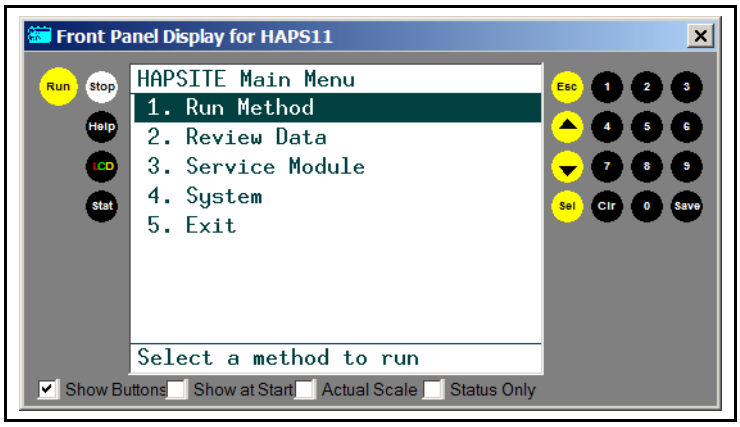
Figure 3-7 HAPSITE Front Panel LCD Main Menu

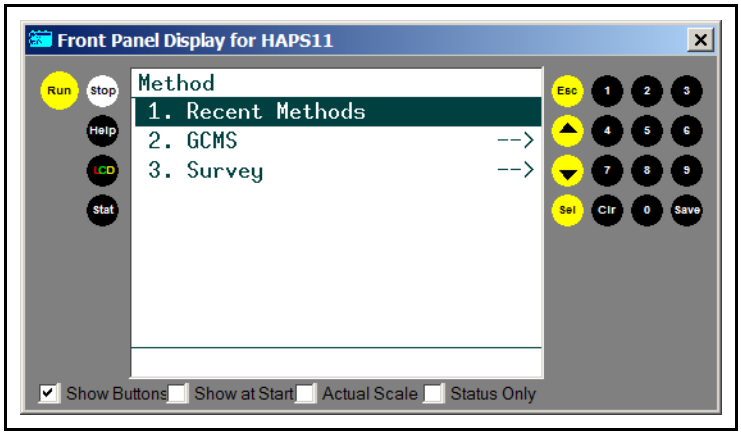


3.2.1 Run Method

The method menu has three options, as shown in Figure 3-8. After selecting **Run Method**, the Method window appears.

NOTE: The Method Menu is user configurable. The standard configuration is shown in this manual.

Figure 3-8 Method Menu



Recent Methods . . . . . Selecting entry 1 will display a list of up to 10 most recently used methods.

GCMS. . . . . Selecting entry 2 will show a of list folders containing the available GCMS methods.

Survey . . . . . Selecting entry 3 will show a list of available Survey methods.

3.2.2 Review Data

The **Review Data** menu provides access to the data files. After selecting Review Data, the Data Review: Method window appears.

Recent Methods . . . . . Provides access to recently collected files. Highlight a file and press **SEL** to review the data.

GCMS . . . . . Provides access to data files collected in GC/MS mode. Highlight a file and press **SEL** to review the data.

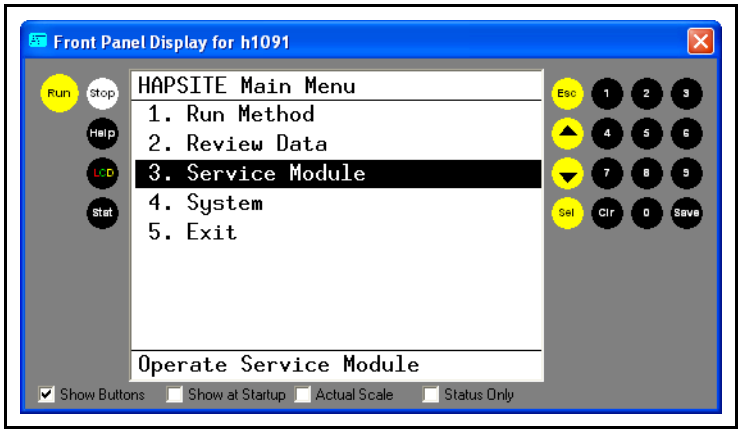
Survey . . . . . Provides access to data files collected in Survey mode. Highlight a file and press **SEL** to review the data.

3.2.3 Service Module

Service Module is the third option on the Main Menu. Refer to Chapter 14, Service Module for more information.

Highlight **Service Module** and press **SEL** to show the screen displayed in Figure 3-9.

Figure 3-9 HAPSITE Main Menu with Service Module Highlighted



Two options are available from this menu. See Figure 3-10. Each option requires the HAPSITE connected to the Service Module (refer to Section 2.7, Service Module, on page 2-18) and the Service Module power on.

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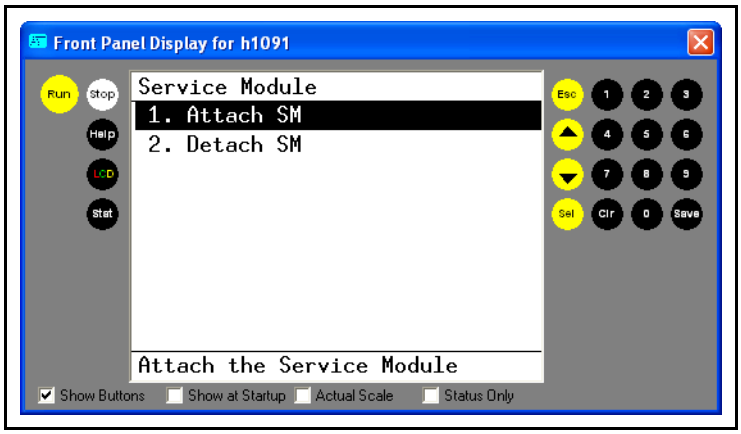
Figure 3-10 Service Module Screen

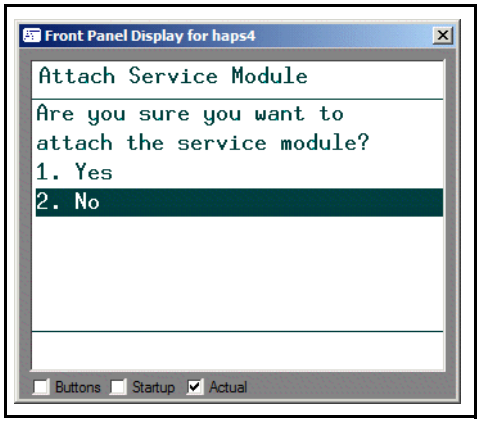


Attach SM . . . . . Service Module menu selection number **1** will Attach HAPSITE, creating a vacuum in the HAPSITE mass spectrometer. Select this option to use the Service Module pumping system. Refer to Section 2.7.2, Placing the HAPSITE on the Service Module, on page 2-23.

Detach SM . . . . . Service Module menu selection number **2** will Detach the HAPSITE by sequentially closing off the vacuum connection between the HAPSITE and Service Module and shutting down the Service Module pumps. Refer to Section 2.7.3, Detaching the HAPSITE from the Service Module, on page 2-26.

Figure 3-11 shows the message which will appear when **Attach Service Module** is selected. Press **1** and **SEL** to confirm this action.

Figure 3-11 Attach Service Module Confirmation Screen

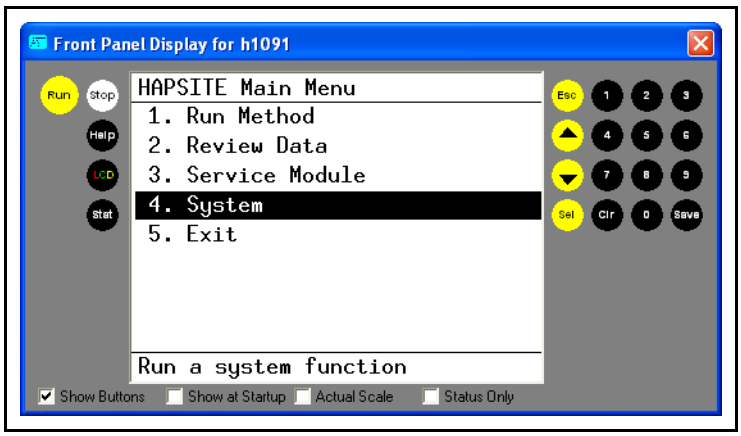


When the attach is finished, press **ESC** to return to the main menu.

3.2.4 System

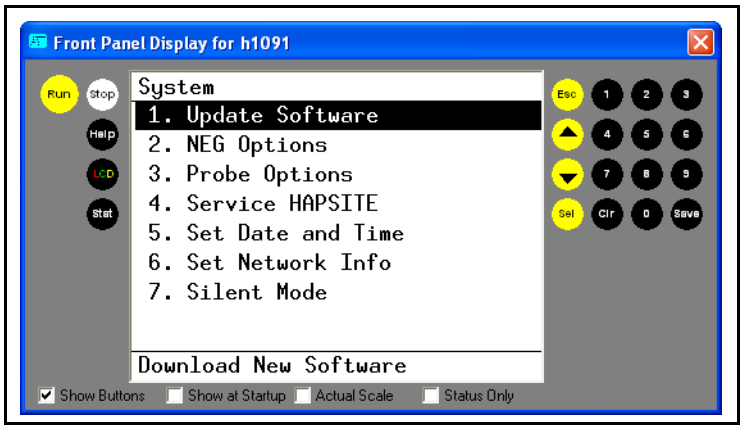
Option **4** is the System Menu which provides access to several HAPSITE features.

Figure 3-12 Main Menu with System Highlighted



Select menu number **4, System**, to advance to the screen shown in Figure 3-13.

Figure 3-13 System Window Selected from Main Menu



System menu selection number **1** is **Update Software**. This selection requires the updated HAPSITE Smart software to have been previously copied to the HAPSITE Root Directory.

NOTE: The **Update Software** function is best accomplished from the Laptop.

System menu selection number **2** is **NEG Options**, as shown in Figure 3-14.

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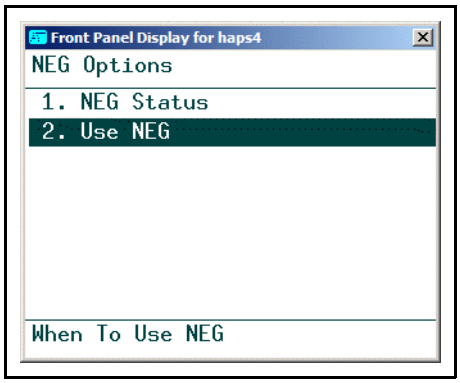
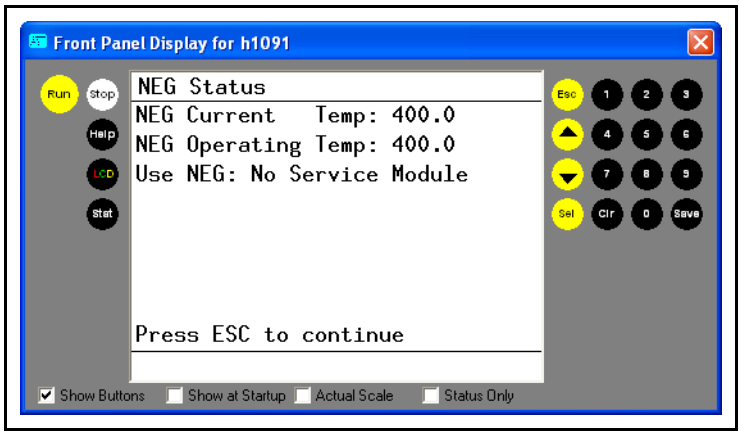
Figure 3-14 NEG Options Screen



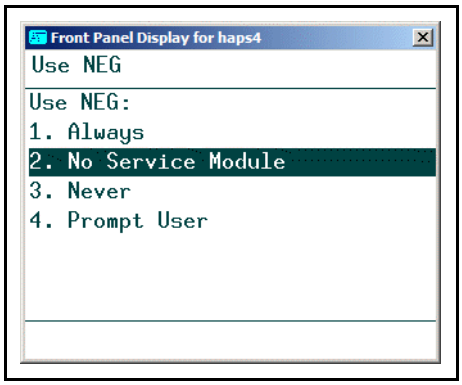
NEG Options menu selection **1, NEG Status,** shows current NEG conditions.

Figure 3-15 NEG Status Screen



NEG Options menu selection **2, Use NEG**, selects when the NEG pump will be used to provide vacuum. Figure 3-16 shows the four options available.

Figure 3-16 Use NEG Options Screen



Always . . . . . Option **1** is selected to always use (heat to operating temperature) the NEG pump when running the HAPSITE.

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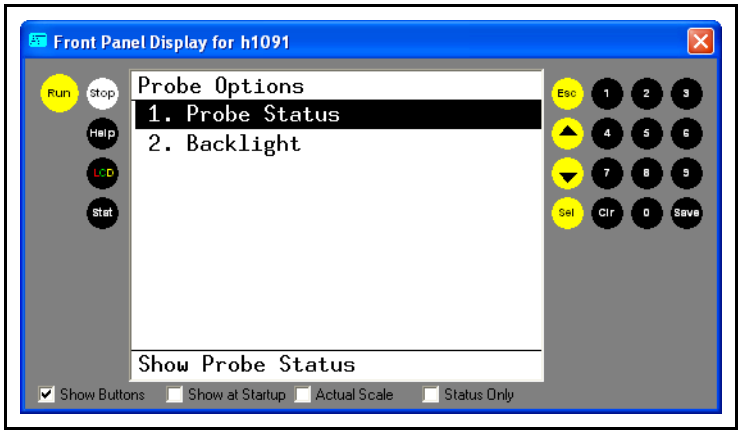
No Service Module . . . . . Option **2** is selected to use the NEG pump only when there is not a Service Module providing the vacuum. This is the preferred selection for a HAPSITE with a NEG installed. This is the Factory default.

Never . . . . . Option **3** is selected to never use the NEG pump. This is the preferred selection when the HAPSITE does not have a NEG pump installed, and will be run using the Service Module.

Prompt User . . . . . Option **4** will prompt the user whether or not to use the NEG pump, each time a method is selected to run.

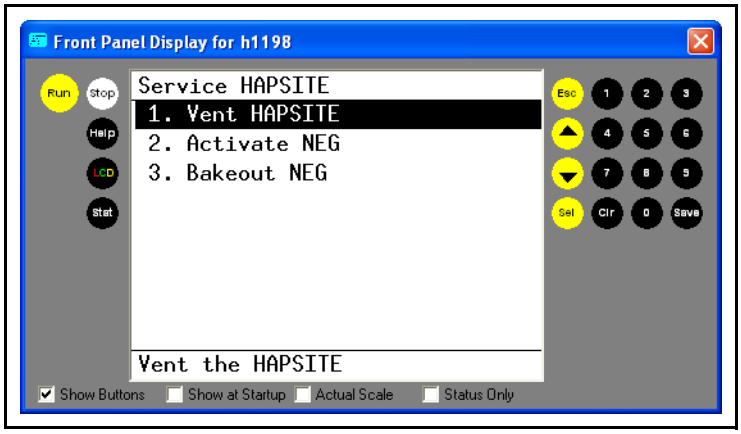
System menu selection number **3** is HAPSITE **Probe Options**, as shown in Figure 3-17.

Figure 3-17 HAPSITE Probe Options Screen



System menu selection number **4** is **Service HAPSITE**.

Figure 3-18 Service HAPSITE Menu



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Vent HAPSITE . . . . . Used to vent the HAPSITE to atmosphere when attached to the Service Module.

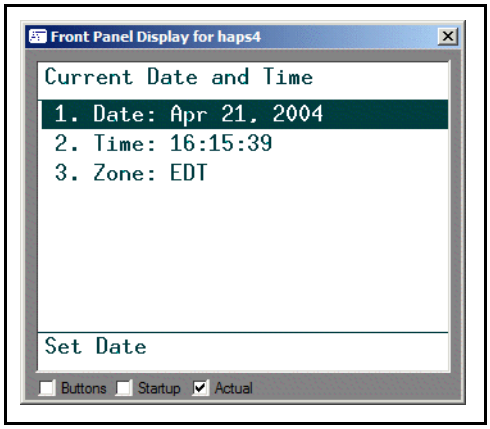
Activate NEG. . . . . Will start the NEG activation or reactivation process. A Service Module is required and the HAPSITE must be attached.

Bakeout NEG . . . . . Is a 1 or 2 hour process that heats the NEG at full power to bake the NEG out and recover usable life. This is best accomplished attached to a Service Module, but can be done without the Service Module.

System menu selection number **5**, **Set Date and Time**, provides the option to set the date and time on the HAPSITE, as shown in Figure 3-19:

NOTE: The Time Zone can only be set from the Laptop.

Figure 3-19 HAPSITE Current Date and Time

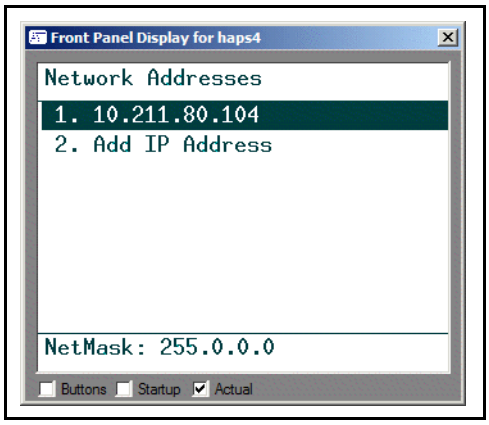


System menu selection number **6**, **Set Network Info**, displays network (computer connection) information. See Figure 3-20.

1. XX.XXX.XX.XXX . . . . . Lists the current IP address. This is how the laptop recognizes the HAPSITE.

2. Add IP Address. . . . . Can be used to add an alternate IP address.

Figure 3-20 Network Addresses Screen

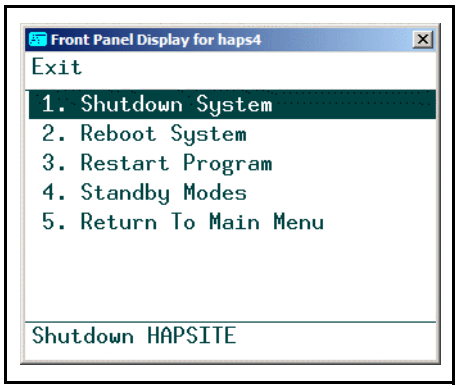


System menu selection number **7**, **Silent Mode** turns off the audible alarms. (This function only works with Probe and Front Panel firmware versions 1.10 and higher.)

3.2.5 Exit

HAPSITE Main Menu selection number **5**, **Exit**, provides the options shown in Figure 3-21. Detailed procedures for the Exit sub-menu can be found in Section 3.10, Exit Options, on page 3-46.

Figure 3-21 Exit Menu Selected



Shutdown System . . . . . Shuts down and powers off the system.

Reboot System . . . . . Reboots the system. Completes power down and restart cycle.

Restart Program . . . . . Restarts the HAPSITE Smart software.

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Standby Modes

Extended . . . . . Used as an alternative to shutting down the HAPSITE. In Extended Standby Mode, the NEG is heated and the ION pump remains on to maintain vacuum in the MS and a higher state of readiness. No gasses are required.

HINT: Extended Standby is the preferred storage mode for the HAPSITE.

Cold . . . . . Sets the system into a Cold Standby state, which shuts down all heaters but leaves the HAPSITE powered on. Used when attached to the Service Module.

Return To Main Menu . . . . . Returns the system back to the HAPSITE Main Menu.

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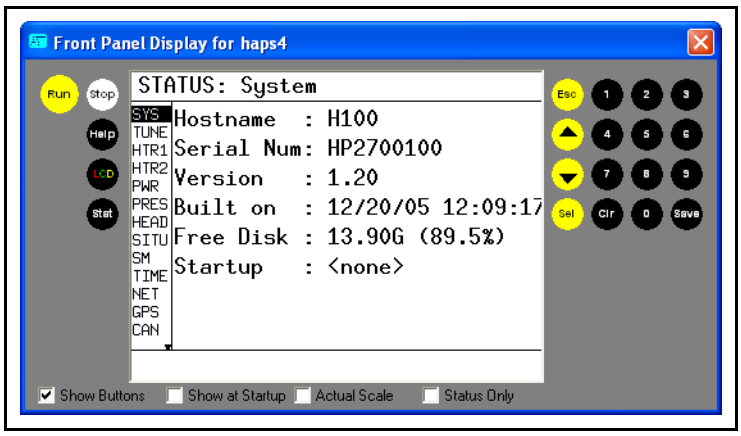
3.2.6 STAT

The **STAT** button on the HAPSITE keypad will display other information about the system. Figure 3-22 will appear when the STAT button is pressed.

Figure 3-22 STATUS Screen with SYS (System) Selected



On the left side of the display, the status of 14 items may be monitored by pressing the Up and Down arrow button then pressing SEL. The current selection will be highlighted in black (**SYS** is selected in Figure 3-22. Alternately, the number keypad can be used.

SYS . . . . . System; Host name; Serial Number; Version Number; Date and Time Built; Free Disk Space; Startup Method Information.

TUNE . . . . . Tune File Name; Time Instrument Tuned; Date Instrument Tuned; Press SEL for Tune Report.

HTR1 . . . . . Heaters Page 1; Current Column, Membrane, Valve Oven, Sample Probe, and NEG Heater Temperatures; Their Setpoint Temperatures; State of Heaters-On, Off, or In-Control.

HTR2 . . . . . Heaters Page 2; Current temperatures of Gas Chromatograph Heater, Elbow, GC Xfer (Transfer Lines) 1 and 2; Setpoint Temperatures; State of Heaters-On, Off, or In-Control.

PWR . . . . . Power; Battery Power Status; Battery Installed; Battery Charge Level.

PRES . . . . . Pressures; Carrier Gas, Internal Standard, Column, Reservoir, Total MS, SituProbe and Headspace Nitrogen Input Pressures.

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HEAD . . . . . Headspace Information: Headspace Supply Pressure; Headspace Temperatures.

SITU . . . . . SituProbe Information: SituProbe temperatures and pressure.

SM . . . . . Service Module Information.

TIME . . . . . Date; Time; Time zone.

NET . . . . . Network Information; IP Address; User; Host.

GPS . . . . . GPS Information: Latitude, Longitude, Number of Satellites Found.

CAN . . . . . Internal Standard Canister Information: Fill Date, Expire Date, Actual PPM concentrations of BPFB and TRIS.

FIRM . . . . . Firmware Versions for: GC (Gas Chromatograph), FP (Front Panel), PR (Probe), MS (Mass Spectrometer), SM (Service Module) and HS (Headspace).

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3.3 Survey Mode

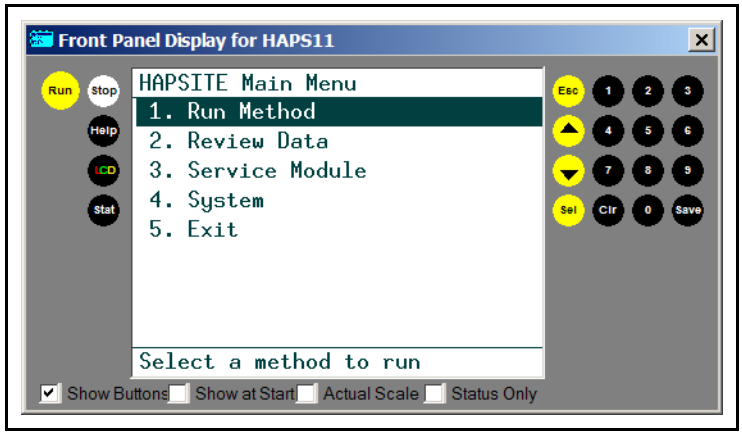
The Survey Mode is used for quick analysis and tentative results. The sampling period is approximately two minutes long. Refer to Chapter 6, Methods, for additional information.

- Sample the air away from the area of concern for one minute to serve as a background of VOC's currently present in the area.
- For the second minute, sample directly over the point of concern to see what additional chemicals are present.

Procedure

1 From the main menu on the front panel select **1. Run Method** by pressing **1**, then **SEL**. See Figure 3-23.

Figure 3-23 HAPSITE Main Menu



2 The Method menu will display. Select the **1. Recent Methods** choice on this menu to display up to the last ten methods run.

3 Arrow down to highlight **Survey** and press select. See Figure 3-24. If the Survey Method has never been run, then **Survey** can be accessed by highlighting **3. Survey** in the Method window and pressing **SEL**. See Figure 3-25.

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Figure 3-24 Selecting Survey Method using Recent Methods Menu

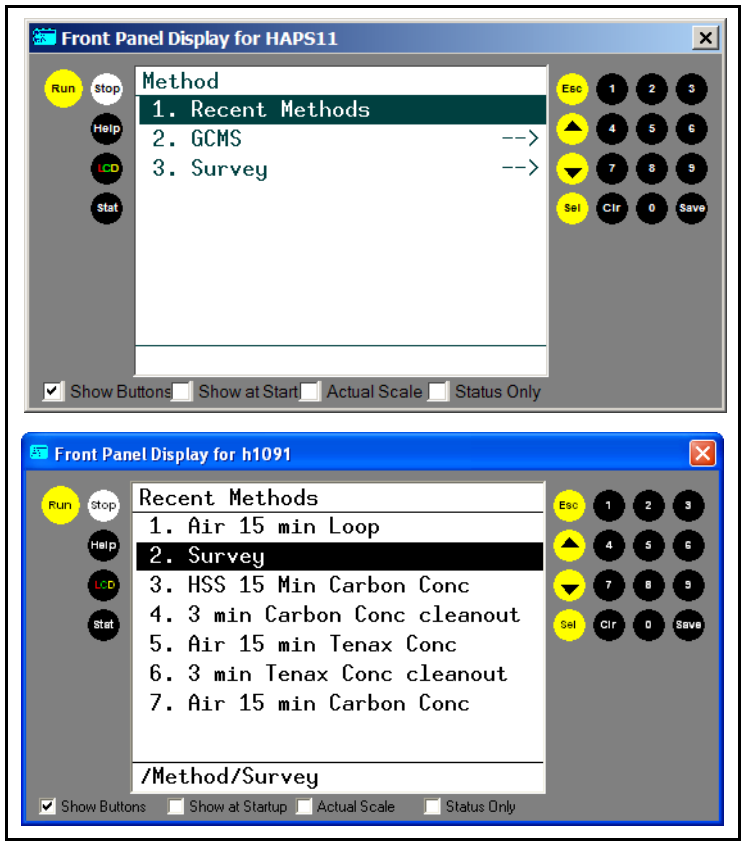
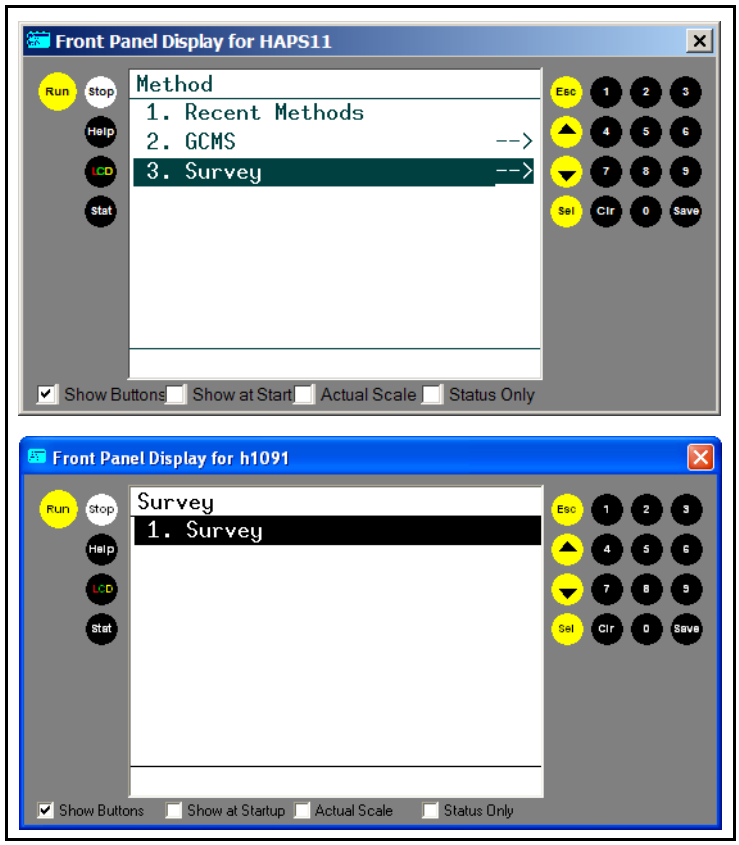


Figure 3-25 Selecting Survey Method using Method Menu



4 After selecting **1. Survey**, the software will make a quick check of the pressures and temperatures.

NOTE: If the HAPSITE was not warmed up, then system will check the pressures, heat up (approximately twenty minutes) and run a Tune check (approximately 2 minutes).

5 Press **RUN** from the Front Panel or from the Probe (both buttons are active). When the sample pump turns on, collect air for one minute (away from the sample), and then place the probe over the sample until the sample is identified, the TIC count is 2 to 3 times the background without exceeding 60 million, or one minute has passed. A plot will appear on the Front Panel. See Figure 3-26.

CAUTION

Do not touch the sample with the probe.
Do not allow any liquid to enter the probe.

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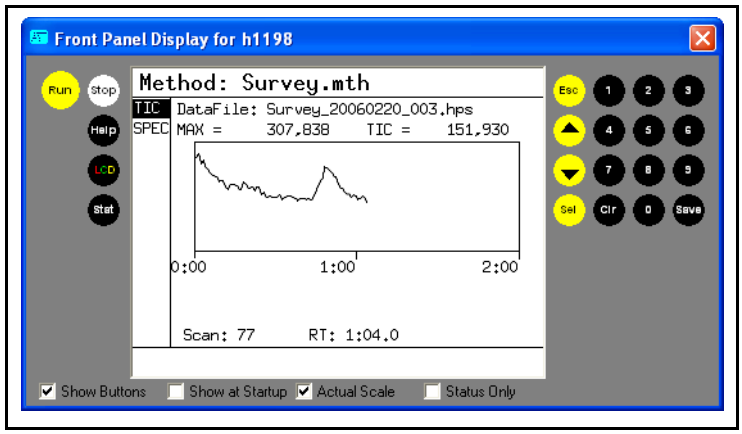
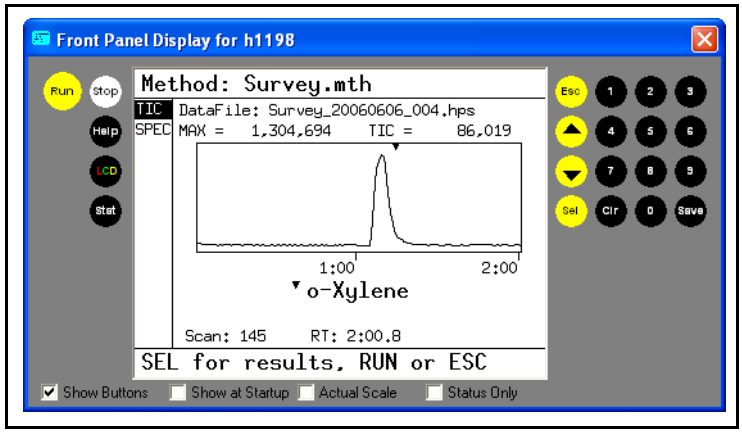
Figure 3-26 Survey Method in Progress



HINT: The top line on the LCD displays the method being run, the second line displays the name of the data file, the third line displays the MAX TIC for the run and the TIC count at the cursor. The bottom line displays the run time.

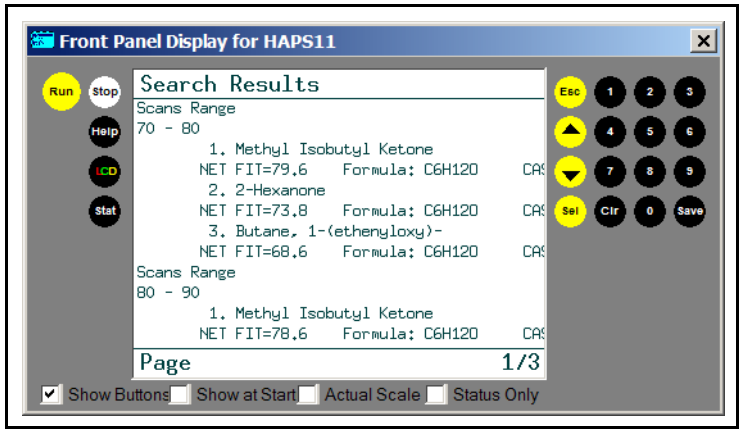
6 Press **RUN** again to stop the sampling. The bottom of the LCD panel will prompt to press **SEL** for the report. Figure 3-27.

Figure 3-27 Survey Run Complete



7 To view the report, press **SEL**. Use the arrow keys to scroll through the pages. See Figure 3-28.

Figure 3-28 Search Results



NOTE: Remember, all results are tentative. Run a GC/MS method for confirmation of the results.

3.3.1 Quick Reference SOP — Survey Method

1 From the main menu on the front panel highlight **1. Run Method** and press **SEL**.

2 Highlight **Survey** and press **SEL**.

3 Highlight **Survey** and press **SEL**

4 Wait for heaters to gain control of set temperatures.

5 Press **RUN** on the front panel or probe, wait one minute before sampling.

6 Hold the probe over the sample for one minute.

7 Press **RUN** to pause the sample and save the data.

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3.4 GC/MS Mode with Loop

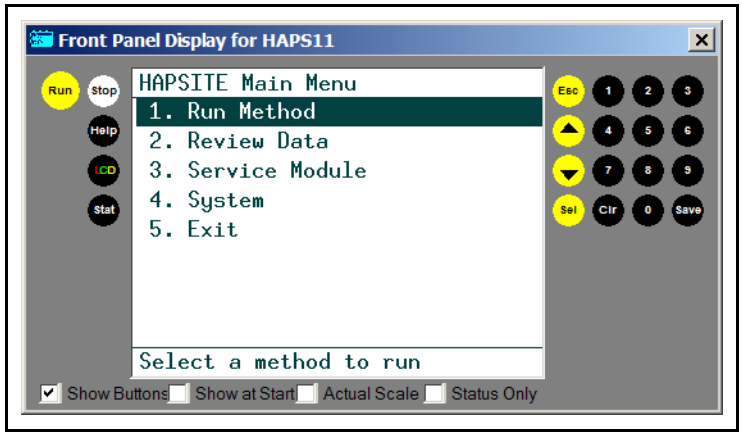
This method is used for analyzing samples with concentration levels in the low part per million (ppm) to high part per billion (ppb) range. This is commonly the second method used when trying to detect unknowns in the environment. Depending on circumstances, the Survey mode may be used to quickly and tentatively identify chemicals prior to the use of this GC/MS method. Refer to Chapter 6, Methods, for additional information on GC/MS methods.

HINT: Remember the Survey method must be followed by a GC/MS method in order to give a positive identification of the unknown.

This section will describe the process required to run a sample with the sample loop installed. Refer to Section 2.3, Basic Assembly, on page 2-4 and Section 2.9.1, Installing the Sample Loop, on page 2-26. Assumptions made are that the HAPSITE is heated up, tuned and ready to go. If the HAPSITE is not warmed-up, follow the instructions in Section 3.1, Starting the HAPSITE in Portable Mode, on page 3-1 before proceeding to this section.

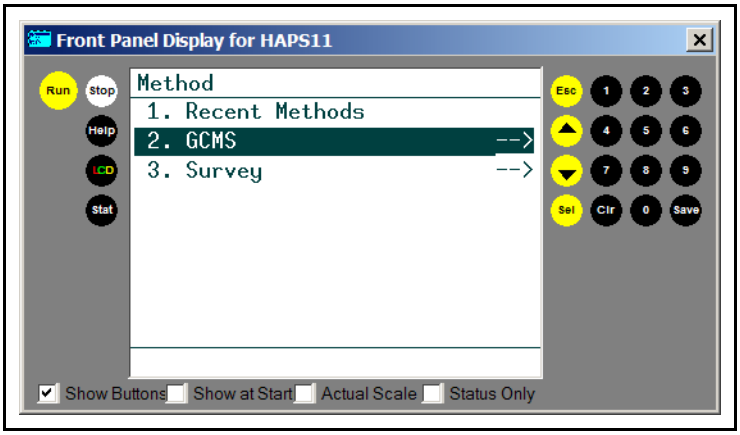
1 Make sure the **Main Menu** is showing on the front panel of the HAPSITE. If it isn't, press the **ESC** button until the **Main Menu** screen appears. See Figure 3-29.

Figure 3-29 HAPSITE Main Menu



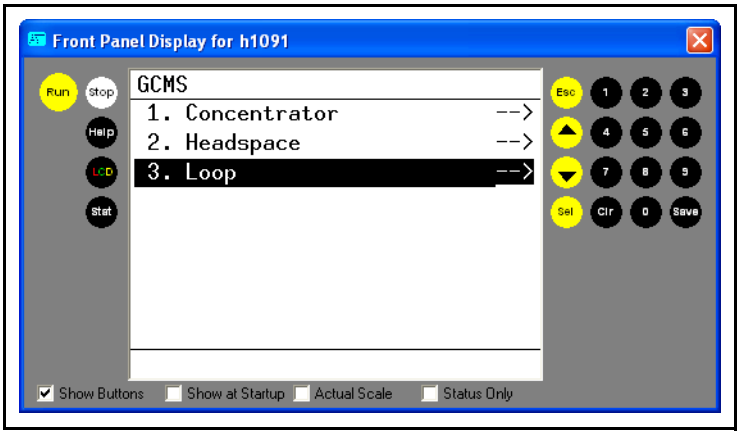
2 From the **Main Menu** select **Run Method** by either pressing **1** then **SEL** or using the up and down arrow to highlight the selection and then press **SEL**. This will access the **Method Menu**. See Figure 3-30.

Figure 3-30 Selecting the Method using Method Menu



3 In the Method menu, arrow down to **GCMS**. To select the item, press **SEL** when the menu item is highlighted, or type the number of the selection and then press **SEL**. After selecting the **GCMS** option the following menu will be shown. See Figure 3-31. Arrow down to **3. Loop** and press **SEL**.

Figure 3-31 Selecting the Physical Configuration



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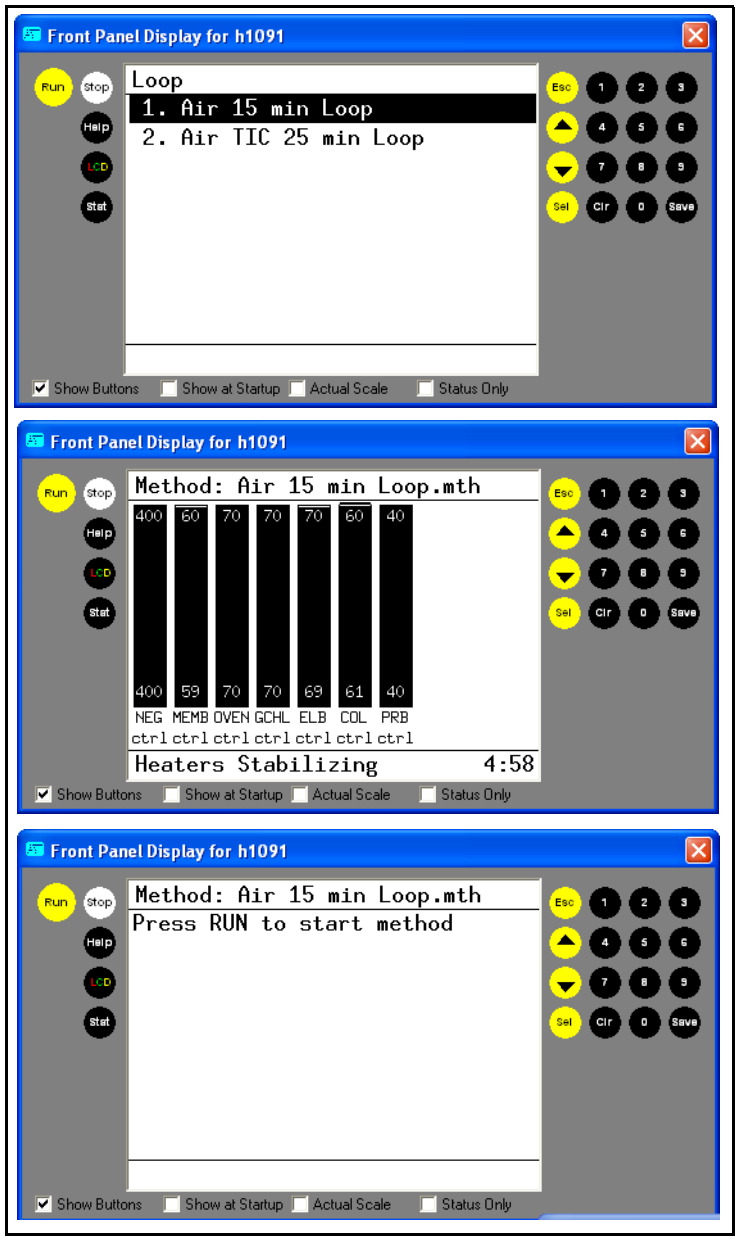
4 Select the method **Air 15 min Loop** by highlighting it and pressing **SEL**. The software will check pressures and temperatures and when ready, the **RUN** prompt will appear. Press the **RUN** button to start the method. See Figure 3-32.

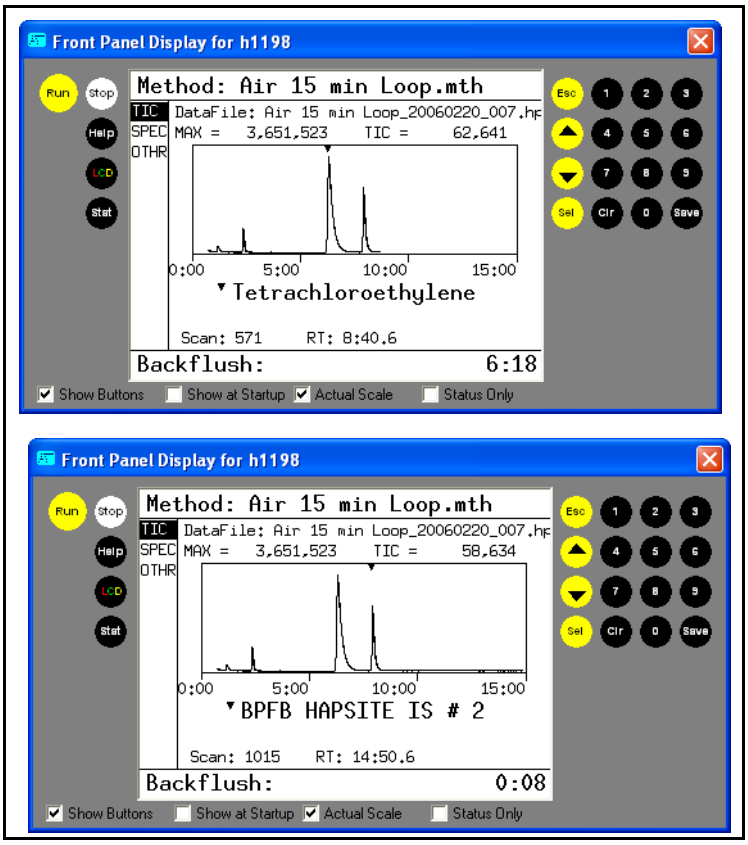
Figure 3-32 Selecting the Loop Method



NOTE: When the **RUN** button is pressed, the sample pump will turn on and the word **Loopfill** will appear in the bottom left corner of the Front Panel display. Hold the probe over the sample for the entire **Loopfill** event (the sample pump will be audible if not in a noisy environment or in PPE).

5 The HAPSITE will now take 15 minutes for the sample to be processed through the HAPSITE. The chromatogram will appear on the Front Panel. See Figure 3-33 to see an example of a run in progress.

Figure 3-33 Progression of a Loop Run



HINT: Another GC/MS method can be started directly after one has completed. Depending on the temperature profile, the column temperature must down before the software will allow another run to begin.

6 Once the Run is complete, a report can be viewed on the Front Panel of the HAPSITE. Press **SEL** for the report and use the arrow keys to navigate through the pages of the report. See Figure 3-34.

HINT: The results page shows option 1. Summary and option 2. Qual. The Summary report gives the basic information from the run in a few pages. The Qual report gives more detail about the identified compounds. Use the numeric keys to access each report.

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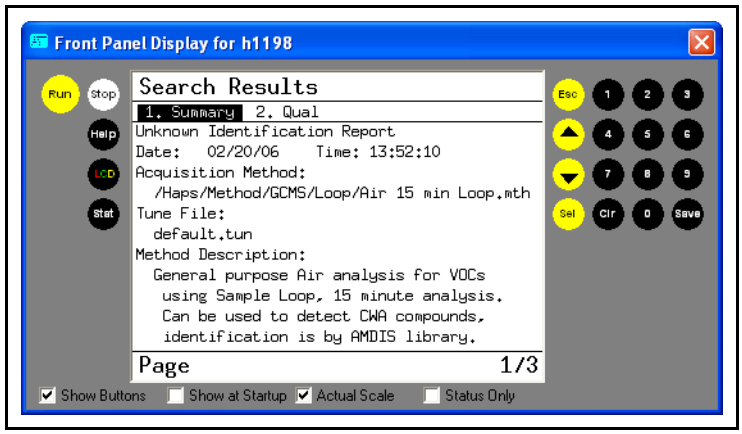
Figure 3-34 Front Panel Report



3.4.1 Quick Reference SOP — Loop Method

1. From the main menu on the front panel highlight **Run Method** and press **SEL**.
2. Highlight **GCMS**, and press **SEL**.
3. Highlight **Loop**, and press **SEL**.
4. Highlight the **Air 15 min Loop** method and press **SEL**.
5. Wait for heaters to gain control of set temperatures.
6. When prompted, press **RUN** from the front panel or Probe.
7. Hold the Probe over sample for the entire Loopfill event (one minute).
8. Review data at the end of run.

3.5 GC/MS Mode with Tri-Bed Concentrator

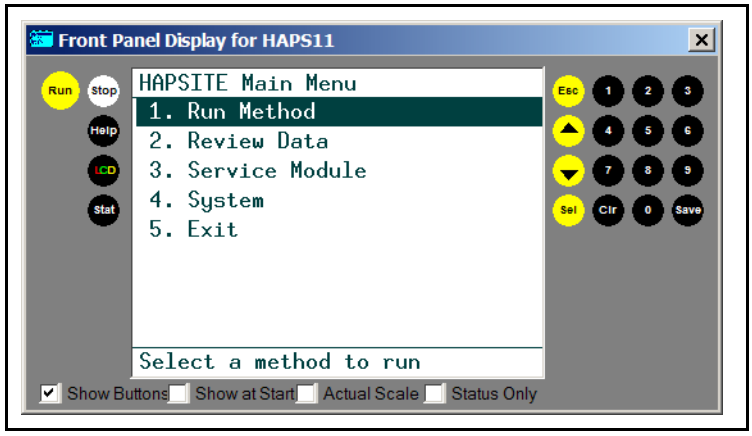
This method is used for analyzing samples with concentration levels in the low part per billion to high part per trillion range. This method is used when the loop method fails to detect a chemical. Refer to Chapter 6, Methods, for additional information on GC/MS methods.

NOTE: Before a GC/MS can be run in this Concentrator mode, the Tri-Bed concentrator must be installed. Refer to Section 2.9.3, Installing the Tri-Bed Concentrator, on page 2-29 for instructions. Once installed, the Tri-Bed concentrator must be cleaned before sampling begins.

NOTE: These methods can also be used for the Carbopack concentrator, which has been discontinued. For instructions on installing the Carbopack concentrator refer to Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31.

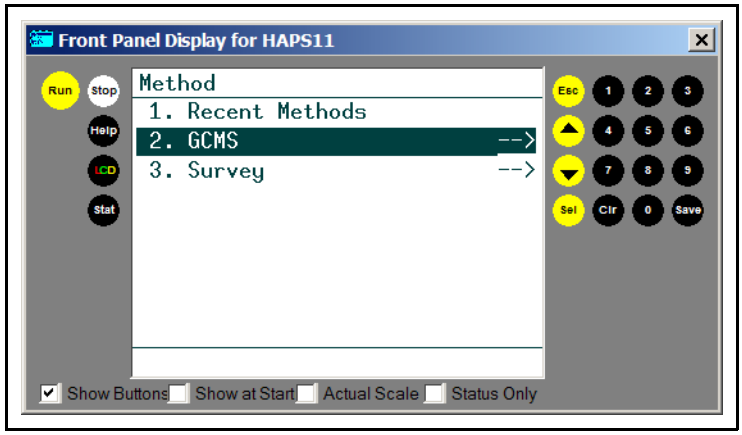
1 From the main menu on the Front Panel display of the HAPSITE select **Run Method** by highlighting the selection and pressing **SEL**. See Figure 3-35.

Figure 3-35 Main Menu on Front Panel



2 Use the up or down arrows to highlight the **GCMS** option on the **Method** menu. Press **SEL**. See Figure 3-36.

Figure 3-36 Selecting GC/MS Folder using the Methods Menu



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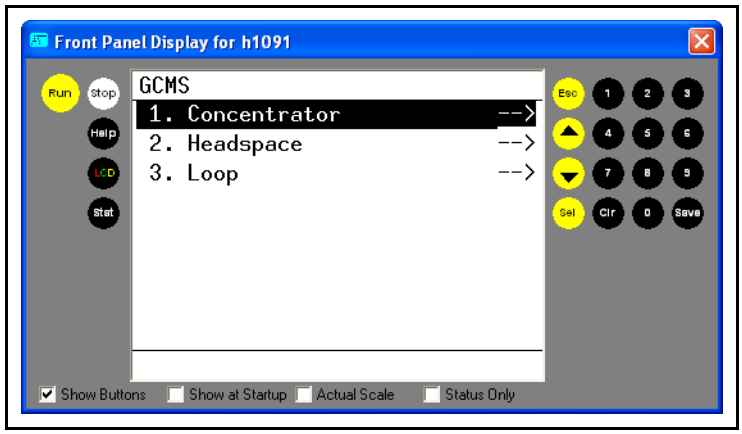
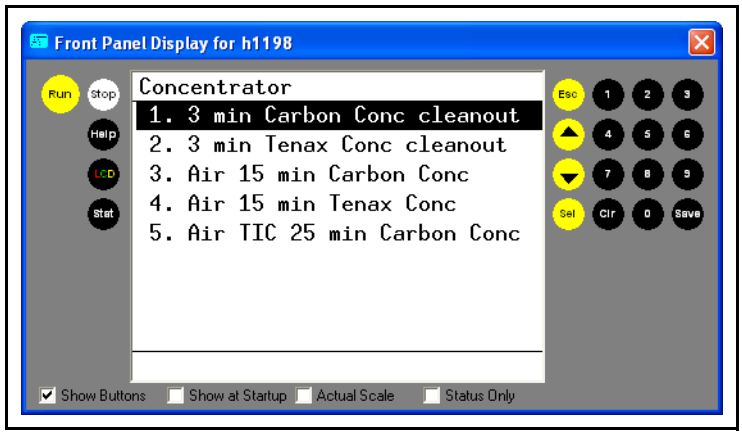
3 Highlight **Concentrator** in the **GCMS** menu and press **SEL**. See Figure 3-37.

Figure 3-37 Selecting the Physical Configuration



4 Select **3 min Carbon Conc Cleanout** and press **SEL**. See Figure 3-38.

Figure 3-38 Selecting the 3 min Carbon Conc Cleanout Method



The system will raise the column temperature to 150 °C, which will take a few minutes. When all the zones are heated the **Run Method** prompt will be displayed on the front panel of the HAPSITE. See Figure 3-39 and Figure 3-40.

Figure 3-39 Heater Warm-up for the 3 min Carbon Conc Cleanout

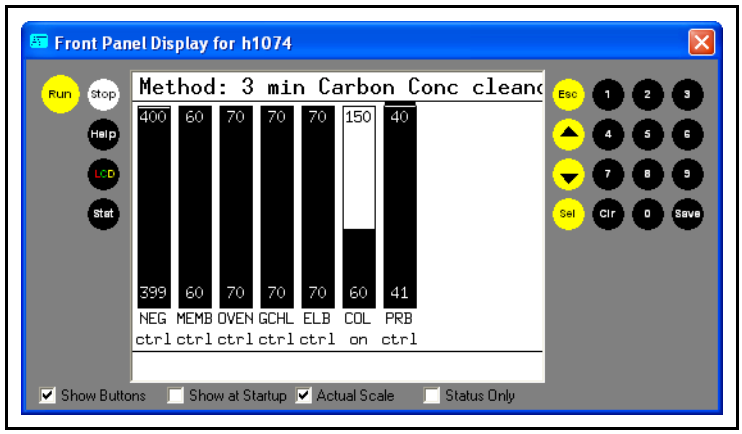


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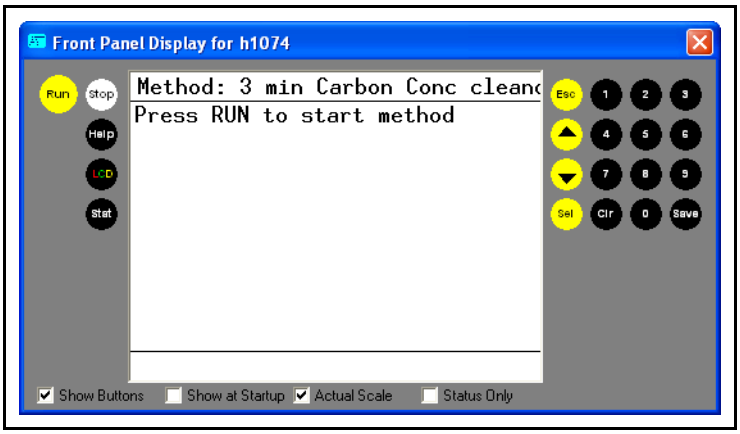
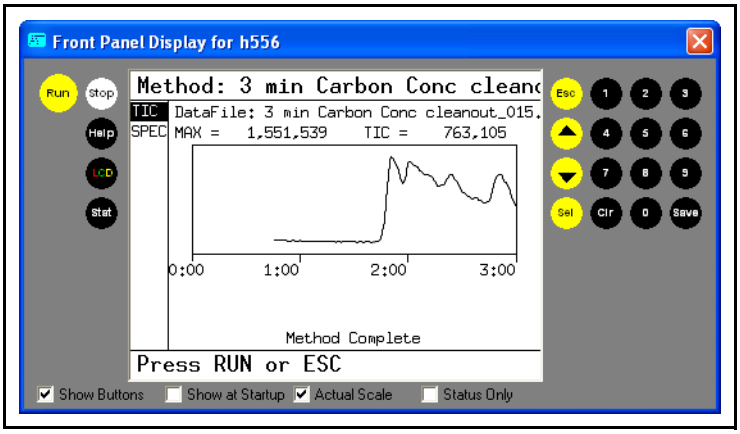
Figure 3-40 Front Panel Run Prompt



5 Press the **RUN** button on the Front Panel or on the Probe. This run will take approximately three minutes to complete. The progress of the run can be seen on the Front Panel. See Figure 3-41.

NOTE: The **MAX_TIC** number on the top left of the LCD must be less than 500,000 for the concentrator tube to be considered clean. If the **MAX TIC** number is greater than 500,000, repeat the 3 min Carbon Conc Cleanout method until the **MAX_TIC** number becomes less than 500,000. Please note, in Figure 3-41 the MAX_TIC is 1,551,539 therefore, the concentrator is NOT clean. The 3 min Carbon Conc Cleanout would need to be run again in this example.

Figure 3-41 Front Panel 3 min Carbon Conc Cleanout Run



6 When the 3 min Carbon Conc Cleanout method is completed and the **MAX_TIC** count is less than 500,000, press **ESC** to exit the method. The system is now clean enough to run the **Air 15 min Carbon Conc** method. See Figure 3-42.

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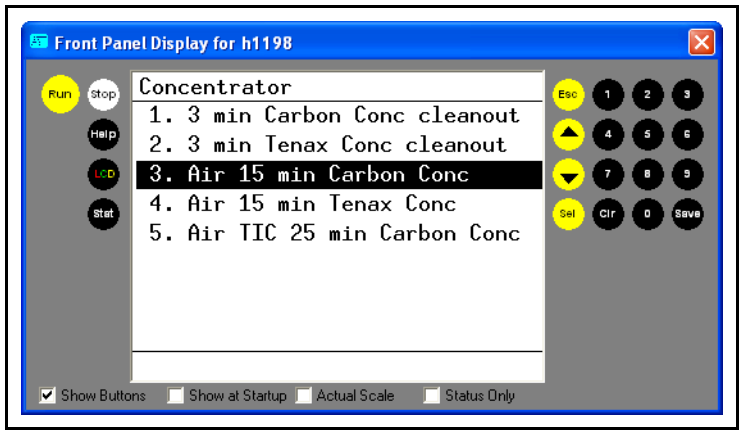
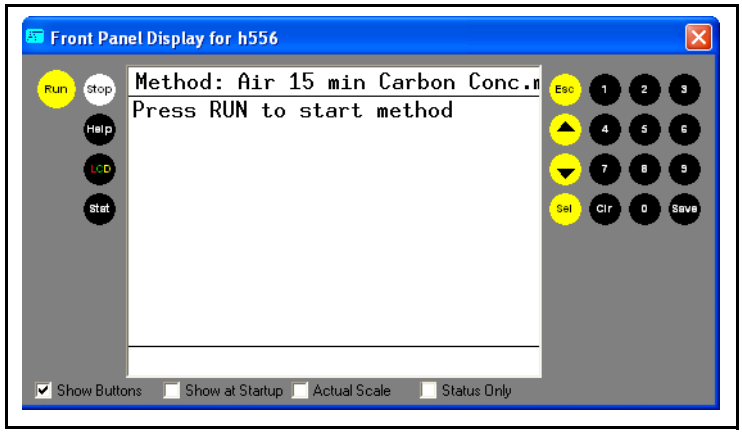
Figure 3-42 Selecting the Air 15 min Carbon Conc method



7 Highlight the **Air 15 min Carbon Conc** menu option by using the up or down arrows in the Concentrator Menu and then press **SEL**.

8 The software will check the pressures and temperatures and prompt when ready to run a sample. See Figure 3-43.

Figure 3-43 Air 15 min Carbon Conc Run Prompt



9 Hold the Probe over the sample and press **RUN** from the Front Panel or the probe.

HINT: The sampling process takes two minutes — one minute to flush the system and one minute to collect the sample. The probe needs to be held over the sample for the entire two minutes while the Sample Pump is running. The bottom left corner will say **LinePurge** and **Concfill** on the Front Panel display during this two minute period.

CAUTION

The concentrator feature is designed to enhance HAPSITE sensitivity when analyzing low concentration samples. The accumulated sample VOCs are transferred from the concentrator adsorbent bed to the HAPSITE as a concentrated sample. Care should be taken to avoid overloading the HAPSITE and causing excessive carryover of VOCs in subsequent runs.

3.5.1 Quick Reference SOP — Tri-Bed Concentrator Cleanout

1. From the main menu on the Front Panel highlight **Run Method** and press **SEL.**
2. Highlight **GCMS** and press **SEL**.
3. Highlight **Concentrator** and press **SEL**.
4. Highlight **3 min Carbon Conc Cleanout** and press **SEL**.
5. Wait for heaters to achieve set temperatures.
6. When prompted press **RUN** from the Front Panel or Probe.

HINT: If the **TIC_Max** count is less than 500,000 at the end of this run, proceed to the **Air 15 min Carbon Conc** method. If the **TIC_Max** count is greater than 500,000, rerun the **3 min Carbon Conc Cleanout** method. Repeat tis until the **TIC_Max** is less than 500,000.

3.5.2 Quick Reference SOP — Tri-Bed Concentrator Method

1. The 3 min Carbon Conc Cleanout method must be run prior this method. Refer to Section 3.5.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 3-32**.**
2. Highlight **GCMS** and press **SEL**.
3. Highlight **Concentrator** and press **SEL.**
4. Highlight **Air 15 min Carbon Conc** method and press **SEL**.
5. Wait for heaters to achieve set temperatures.
6. When prompted press **RUN** from the Front Panel or Probe.
7. Hold the probe over the sample for both the one minute **LinePurge** and the one minute **Concfill** event.
8. Wait for run to complete to view results.

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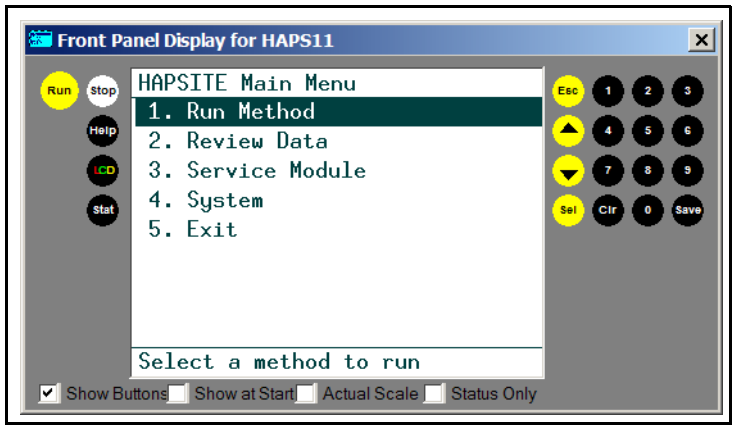
3.6 GC/MS Mode with Tenax Concentrator

This method is used for analyzing samples with concentration levels in the low part per billion to high part per trillion range. This method is used when the loop method fails to detect a chemical and is similar to the Tri-Bed concentrator method. The Tenax concentrator will not effectively concentrate compounds with boiling points below 80 degrees Centigrade. Refer to Chapter 6, Methods, for additional information on GC/MS methods.

NOTE: Before a GC/MS can be run in this Concentrator mode, the Tenax concentrator must be installed. Refer to Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31 for instructions. Once installed, the Tenax concentrator must be cleaned before sampling begins.

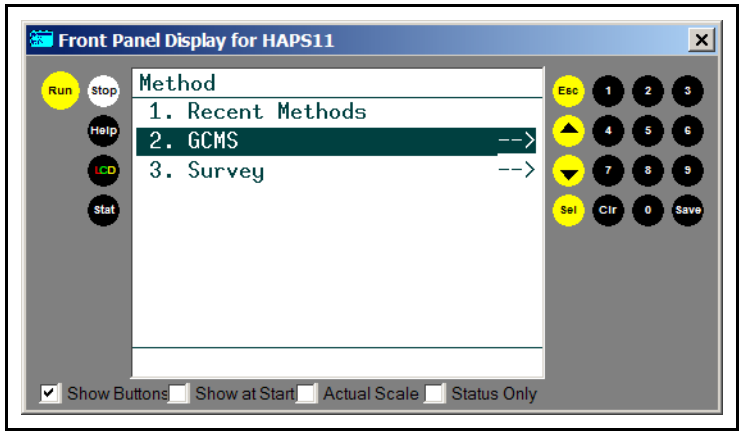
1 From the main menu on the Front Panel display of the HAPSITE select **Run Method** by highlighting the selection and pressing **SEL**. See Figure 3-44.

Figure 3-44 Main Menu on Front Panel



2 Use the up or down arrows to highlight the **GCMS** option on the **Method** menu. Press **SEL**. See Figure 3-45.

Figure 3-45 Selecting GCMS using the Method Menu



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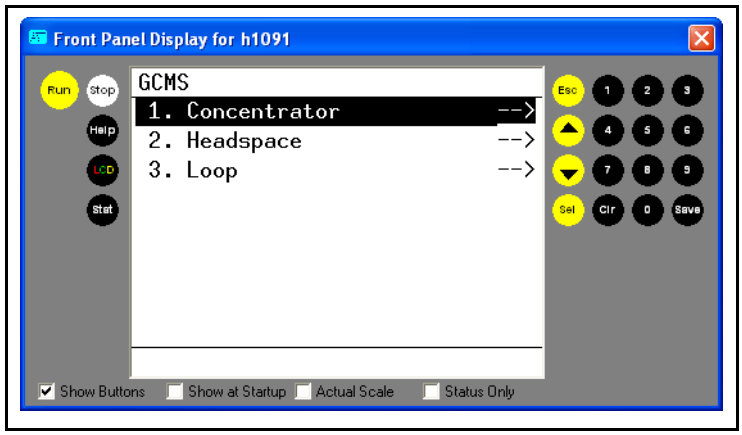
3 Highlight **Concentrator** in the **GCMS** menu and press **SEL**. See Figure 3-46.

Figure 3-46 Selecting the Physical Configuration



4 Select **3 min Tenax Conc Cleanout** and press **SEL**.

5 The system will raise the column temperature to 150 °C, which will take a few minutes. When all the zones are heated the **Run Method** prompt will be displayed on the front panel of the HAPSITE.

6 Press the **RUN** button on the Front Panel or on the Probe. This run will take four minutes to complete. The progress of the run can be seen on the Front Panel.

NOTE: The **MAX_TIC** number on the top left of the LCD must be less than 500,000 for the concentrator tube to be considered clean. If the **MAX_TIC** number is greater than 500,000, repeat the **3 min Tenax Conc Cleanout** method until the **MAX TIC** number is less than 500,000.

7 When the **3 min Carbon Conc Cleanout** method is completed and the **MAX_TIC** count is less than 500,000, press **ESC** to exit the method. The system is now clean enough to run the **Air 15 min Carbon Conc** method.

8 Highlight the **Air 15 min Tenax Conc** menu option by using the up or down arrows in the Concentrator Menu and then press **SEL**.

9 The software will check the pressures and temperatures and prompt when ready to run a sample.

10 Hold the Probe over the sample and press **RUN** from the Front Panel or the probe.

HINT: The sampling process takes two minutes — one minute to flush the system and one minute to collect the sample. The probe needs to be held over the sample for the entire two minutes while the Sample Pump is running. In the bottom left corner, **LinePurge** and **Concfill** appear on the Front Panel display during this two minute period.

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CAUTION

The concentrator feature is designed to enhance HAPSITE sensitivity when analyzing low concentration samples. The accumulated sample VOCs are transferred from the concentrator adsorbent bed to the HAPSITE as a concentrated sample. Care should be taken to avoid overloading the HAPSITE and causing excessive carryover of VOCs in subsequent runs.

3.6.1 Quick Reference SOP — Tenax Cleanout

1. From the main menu on the Front Panel highlight **Run Method** and press **SEL**.
2. Highlight **GCMS** and press **SEL**.
3. Highlight **Concentrator** and press **SEL**.
4. Highlight **3 min Tenax Conc Cleanout** and press **SEL**.
5. Wait for heaters to reach set temperatures.
6. When prompted press **RUN** from the Front Panel or Probe.

NOTE: If the **TIC_Max** count is less than 500,000 at the end of this run, proceed to the **Air 15 min Tenax Conc** method. If the **TIC_Max** count is greater than 500,000, rerun the **3 min Tenax Conc Cleanout** method. Repeat this until the **TIC_Max** is less than 500,000.

3.6.2 Quick Reference SOP — Tenax Concentrator Method

1. The 3 min Tenax Conc Cleanout method must be run prior this method. Refer to Section 3.6.1, Quick Reference SOP — Tenax Cleanout, on page 3-35.
2. From the main menu on the Front Panel highlight **Run Method** and press **SEL**.
3. Highlight **GCMS** and press **SEL**.
4. Highlight **Concentrator** and press **SEL**.
5. Highlight **Air 15 Min Tenax Conc** and press **SEL**.
6. Wait for heaters to gain control of set temperatures.
7. When prompted press **RUN** from the Front Panel or Probe.
8. Hold the probe over the sample for both the one minute **LinePurge** and the one minute **Concfill** event.
9. Wait for run to complete to view results.

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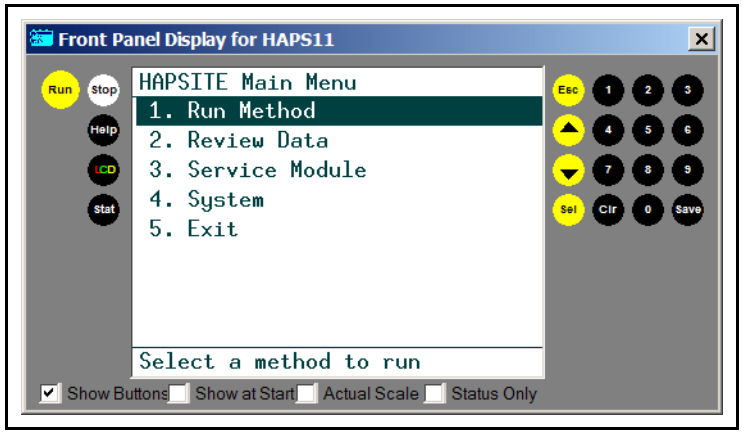
3.7 GC/MS Mode with Headspace Sampling System and Sample Loop in Portable Mode

The Headspace Sampling System is used to test liquid and soil samples. See Chapter 13, Headspace Sampling System for more information on the Headspace System. Refer to Section 2.6, Headspace Sampling System, on page 2-12 for assembly instructions. Refer to Chapter 6, Methods, for additional information on GC/MS methods.

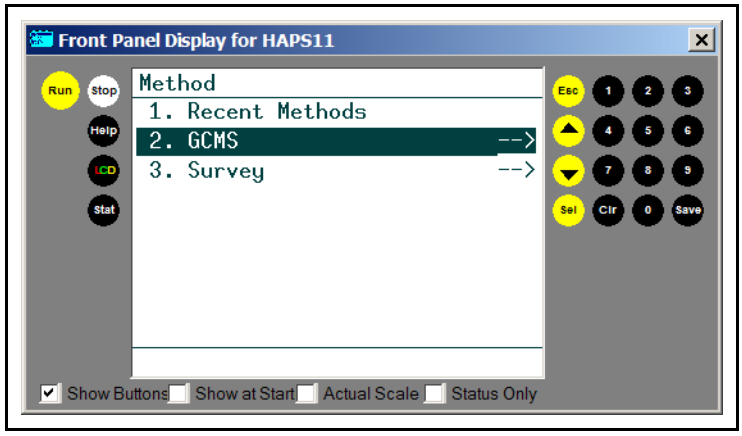
1 Select **1. Run Method** from the main menu on the front panel of the HAPSITE. See Figure 3-47.

Figure 3-47 Run Method From Main Menu



2 Select **GCMS** from the **Method** menu on the front panel of the HAPSITE. See Figure 3-48.

Figure 3-48 Selecting The GC/MS Folder



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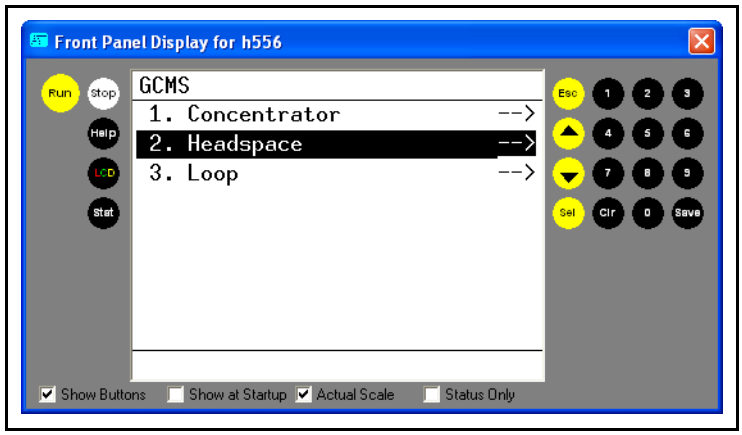
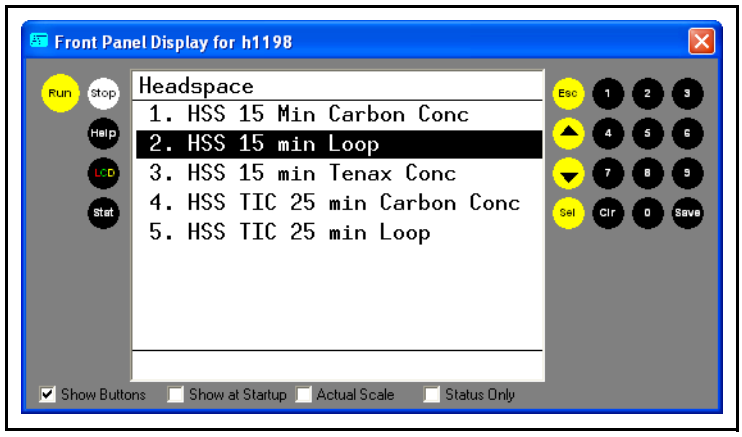
3 Select the **Headspace** folder from the **GCMS** menu. See Figure 3-49.

Figure 3-49 Selecting The Headspace Folder



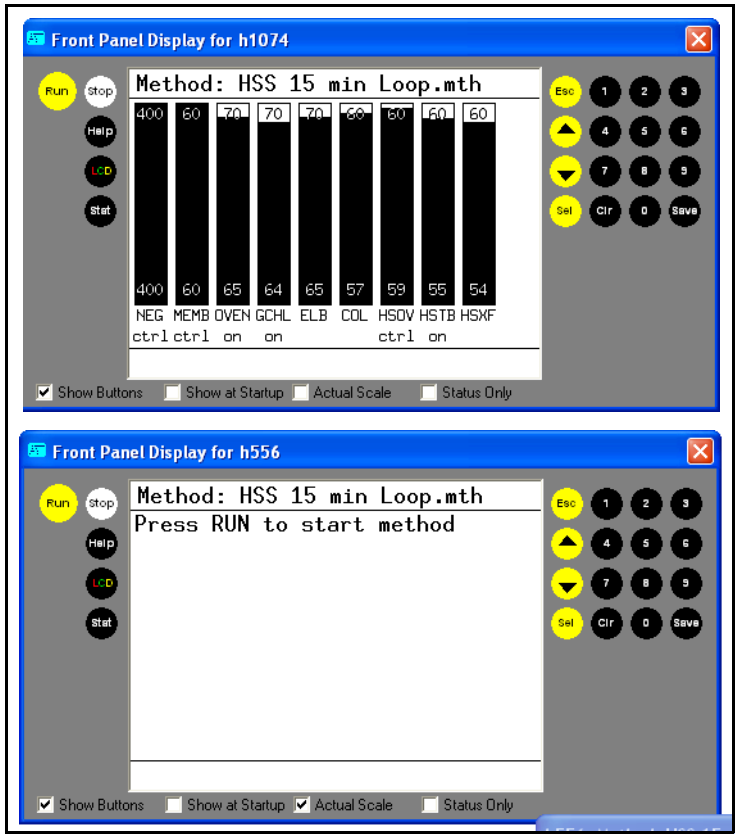
4 Select **HSS 15 Min Loop**. See Figure 3-50.

Figure 3-50 Selecting The Headspace Method



5 Wait for heaters to stabilize and the **Run** prompt window to open. See Figure 3-51.

Figure 3-51 Front Panel Heat-up And Run Prompt



6 Place the headspace needle in the 40 mL vial that contains the sample. Gently depress into sample vial. See Figure 3-52. See Section 13.2.3, Loading the Wells, on page 13-10.

WARNING

The headspace needle assembly may be hot.

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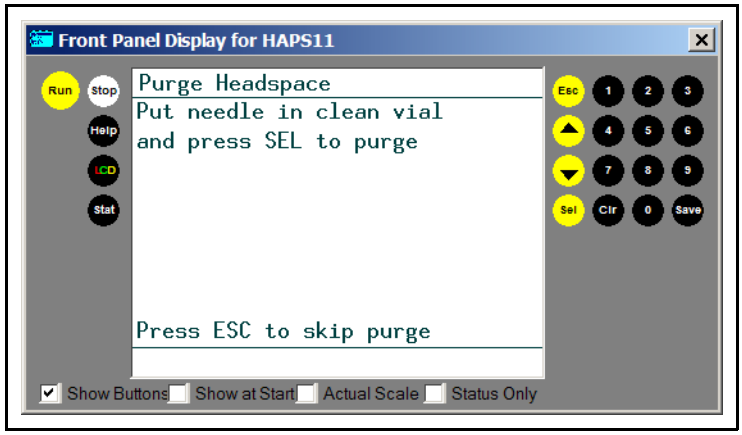
Figure 3-52 Headspace Needle

7 Press the **Run** button on the front panel of the HAPSITE.

8 When prompted (chromatogram completed), place the headspace needle in the purge vial and press **SEL.** See Figure 3-53.

Figure 3-53 Purging the Head Space



9 Review data.

3.7.1 Quick Reference SOP — GC/MS Mode with HSS and Sample Loop in Portable Mode

1. From the Front Panel highlight **Run Method**, then press **SEL**.
2. Highlight **GC/MS**, then press **SEL**.
3. Select the **Headspace** folder from the GC/MS menu.
4. Select **HSS 15 Min Loop** method
5. Place the headspace needle in the 40mL vial that contains the sample.
6. When prompted, press the **Run** button on the front panel of the HAPSITE.
7. When prompted, place the headspace needle in the purge vial and press **SEL**.
8. Review results.

3.8 GC/MS Mode with Headspace Sampling System and Concentrator in Portable Mode

This method is used for analyzing samples with concentration levels in the low part per trillion range. This method is used when the loop method fails to detect a chemical. Refer to Chapter 6, Methods for additional information on GC/MS methods.

CAUTION

The concentrator feature is designed to enhance HAPSITE sensitivity when analyzing low concentration samples. The accumulated sample VOCs are transferred from the concentrator adsorbent bed to the HAPSITE as a concentrated sample. Care should be taken to avoid overloading the HAPSITE and causing excessive carryover of VOCs in subsequent runs.

1. Refer to Chapter 13, Headspace Sampling System for more information on the Headspace System. Refer to 2.6, HAPSITE Components and Assemblies for assembly instructions.
2. Follow the instructions in Section 2.9.3, Installing the Tri-Bed Concentrator, on page 2-29 or Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31 to install the concentrator tube.
3. To cleanout out the concentrator tube, follow the instructions in Section 3.5.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 3-32; or Section 3.6.1, Quick Reference SOP — Tenax Cleanout, on page 3-35;depending on the type of concentrator installed.

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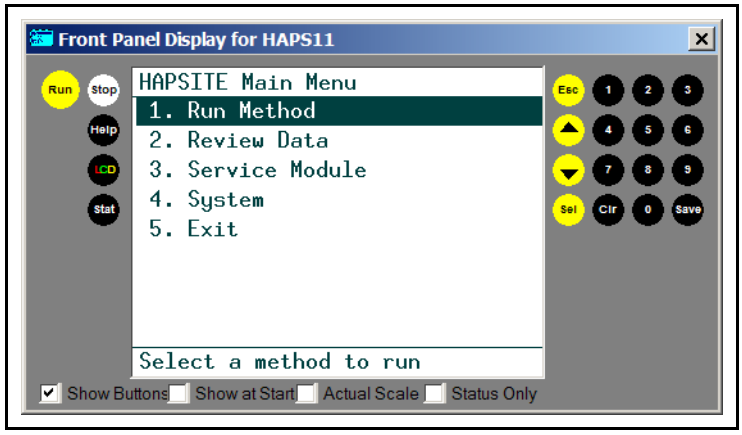
NOTE: Concentrator Cleanout methods require the probe to be attached.

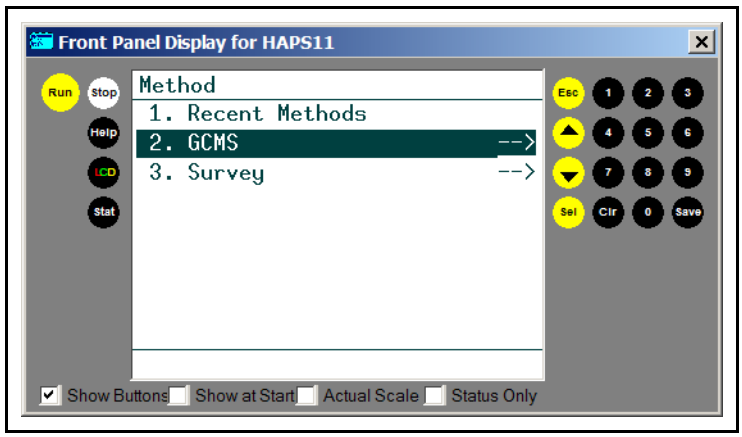
4 Select **Run Method** from the main menu on the front panel of the HAPSITE. See Figure 3-54.

Figure 3-54 Selecting Run Method from the Front Panel



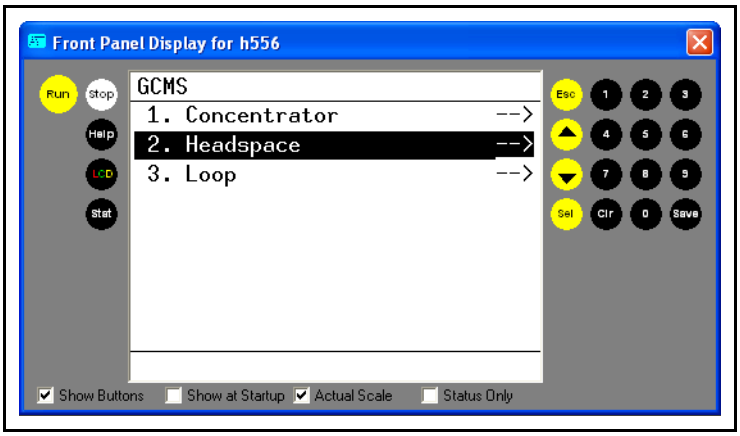
5 Select **GCMS** from the **Method** menu on the front panel of the HAPSITE. See Figure 3-55.

Figure 3-55 Selecting GC/MS from the Method Menu



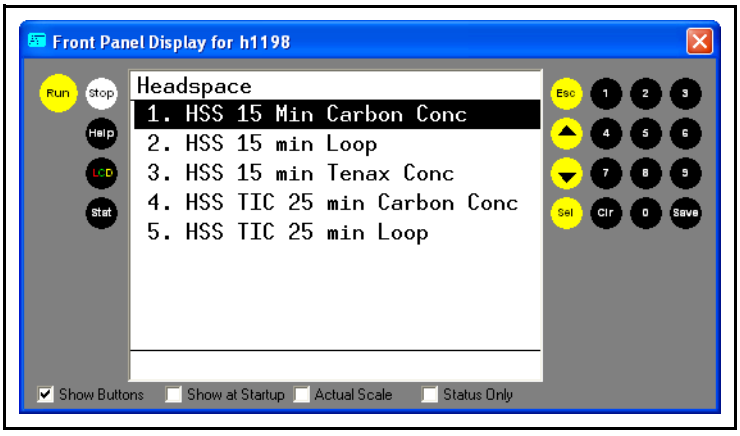
6 Select the **Headspace** folder from the **GCMS** menu. See Figure 3-56.

Figure 3-56 Selecting the Headspace Folder



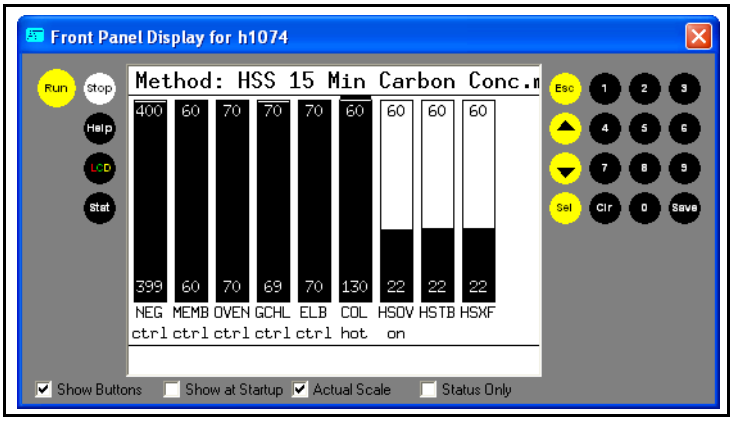
7 Select **HSS 15 Min Carbon Conc** or **HSS 15 min Tenax Conc** method, depending on which concentrator is installed. See Figure 3-57.

Figure 3-57 Selecting the HSS 15 Min Carbon Conc Method



8 Wait for temperatures to stabilize. See Figure 3-58.

Figure 3-58 Front Panel HSS Heater Display



9 Place the headspace needle in the 40 mL vial that contains the sample. Gently depress into sample vial. See Figure 3-59. See Section 13.2.3, Loading the Wells, on page 13-10.

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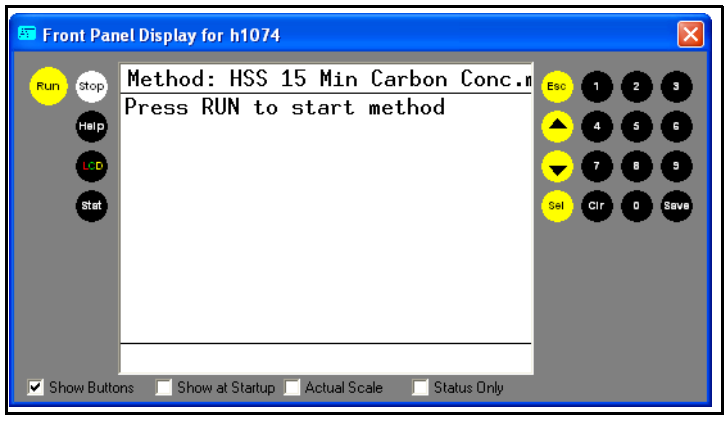
WARNING

The headspace needle assembly may be hot.

Figure 3-59 Loading the Wells

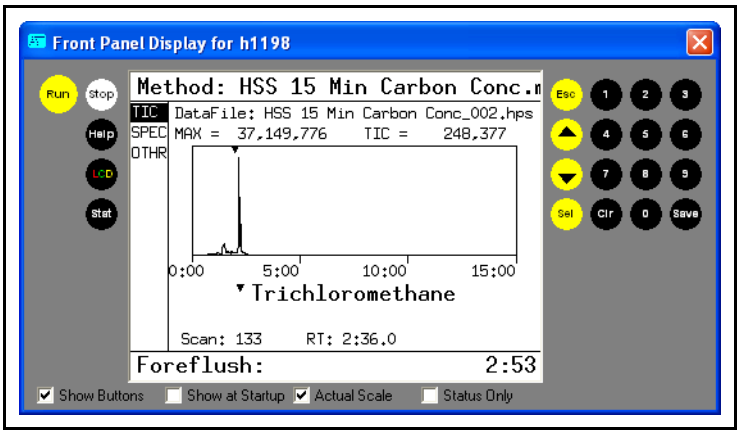
10 Press the **Run** button on the front panel of the HAPSITE. See Figure 3-60.

Figure 3-60 Run Prompt



11 Wait for the method to run to completion. See Figure 3-61.

Figure 3-61 Sample Run in Process



12 When prompted, place the headspace needle in the purge vial and press **SEL**. See Figure 3-62 and Figure 3-63.

Figure 3-62 Purge Needle Request

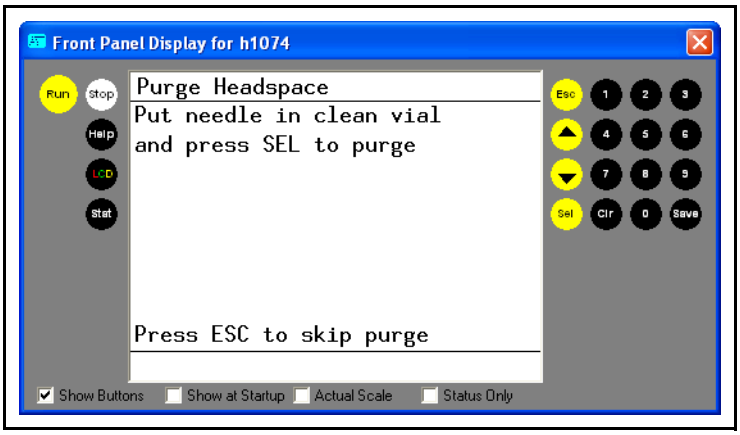
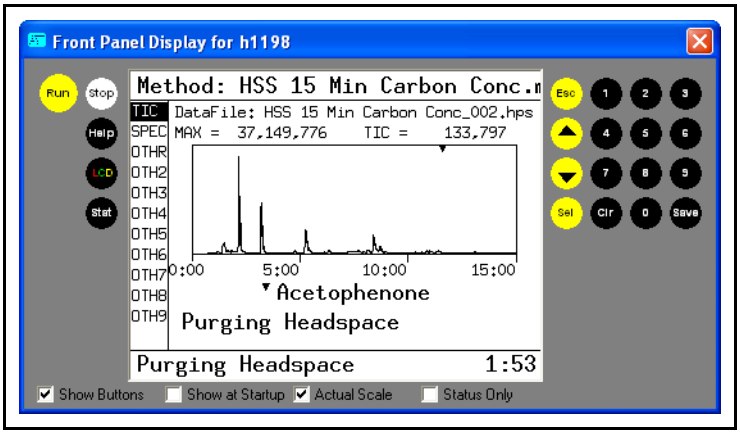


Figure 3-63 HSS Purging



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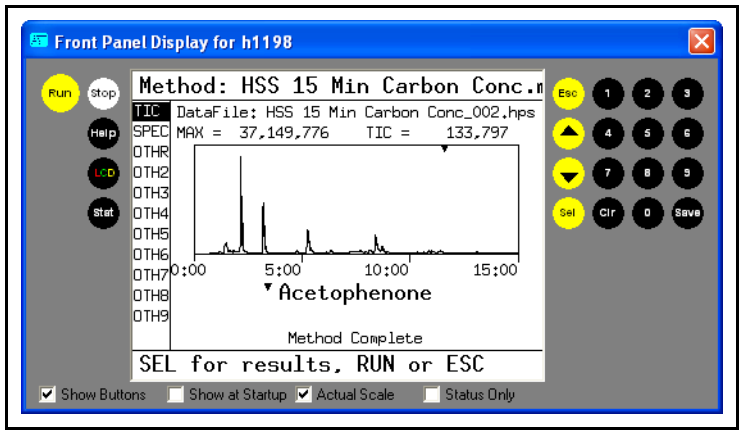
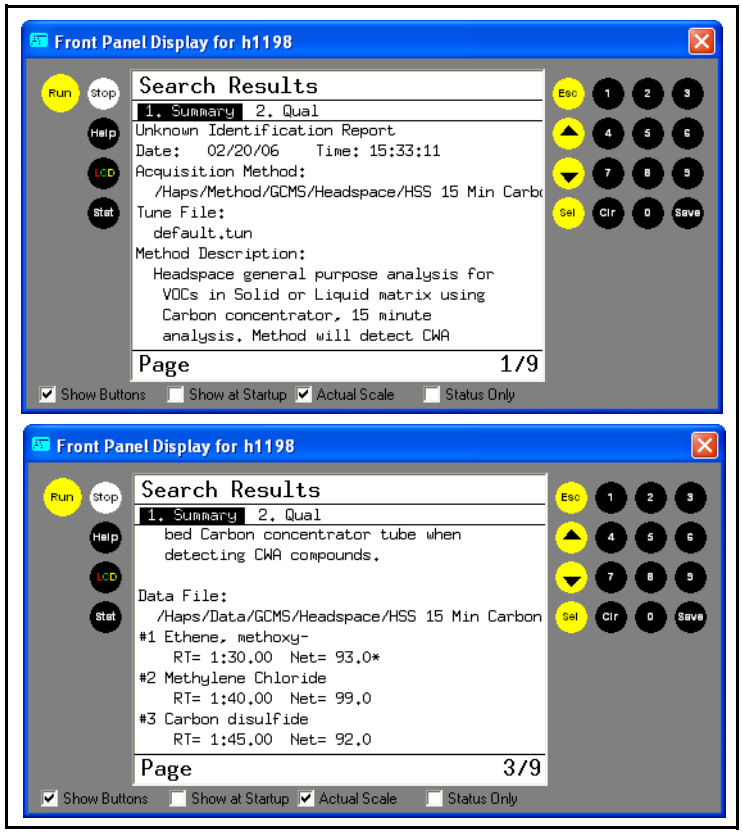
13 Review results at end of run. See Figure 3-64.

Figure 3-64 Completed Run



14 View report. See Figure 3-65.

Figure 3-65 Sample Run Results on Front Panel



3.8.1 Quick Reference SOP — GC/MS with HSS and Concentrator in Portable Mode

1. Follow the instructions in Section 2.9.3, Installing the Tri-Bed Concentrator, on page 2-29 or Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31 to install the concentrator tube.
2. Follow the instructions in Section 3.5.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 3-32; or Section 3.6.1, Quick Reference SOP — Tenax Cleanout, on page 3-35; depending on the type of concentrator installed to cleanout the concentrator tube.
3. Select **Run Method** from the main menu on the front panel of the HAPSITE.
4. Select **GCMS** from the **Method** menu on the front panel of the HAPSITE.
5. Select **HSS 15 Min Carbon Conc or HSS 15 min Tenax Conc** method depending on which concentrator is installed.
6. Place the headspace needle in the 40 mL vial that contains the sample. Gently depress into sample vial.
7. Press the **Run** button on the front panel of the HAPSITE.
8. When prompted, place the headspace needle in the purge vial and press **Sel**.
9. View results.

3.9 SituProbe

For information on running SituProbe methods, refer to *SituProbe Purge and Trap System Operating Manual*.

3.10 Exit Options

Option 5 on the Main Menu is **Exit**. These are the options used to power the HAPSITE down, place it in a standby mode, restart or reboot the system.

3.10.1 Extended Standby

Extended Standby is the preferred mode for the HAPSITE when not running samples. In this state, the MS pumping system is active (Ion pump on. NEG pump at 400 °C). In addition, gases are not being consumed. The expected results are longer NEG pump life and faster startup. All GC heated zones are off. Proceed as follows to place the system in extended standby.

1. Press the **ESC** button on the front panel until reaching the **Main Menu**.
2. Arrow down or press **5** and **SEL** to select the **Exit Menu**. See Figure 3-66.

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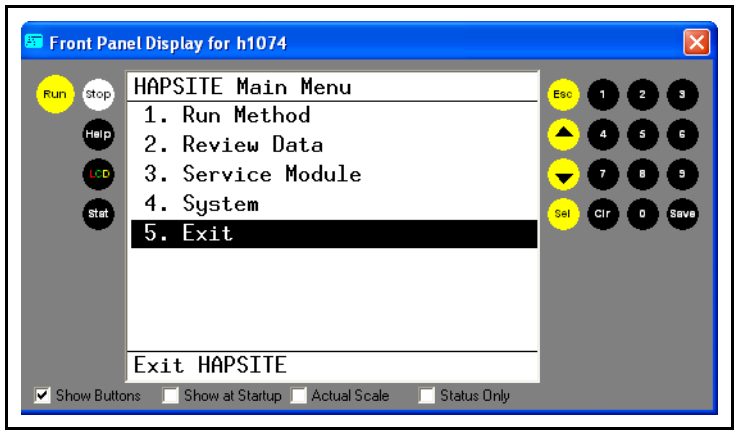
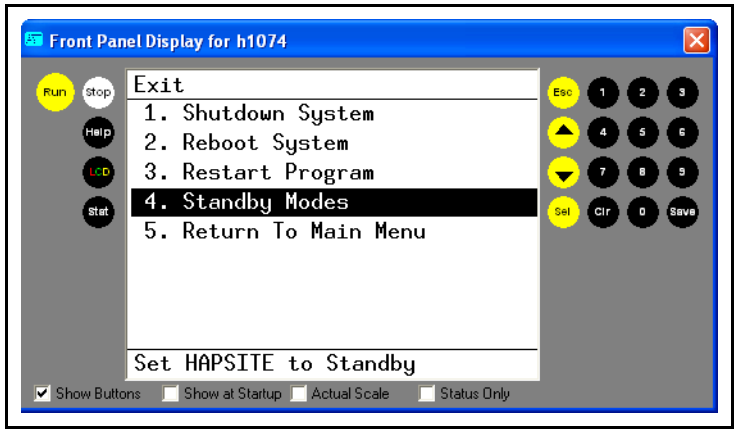
Figure 3-66 Exit Option on Main Menu



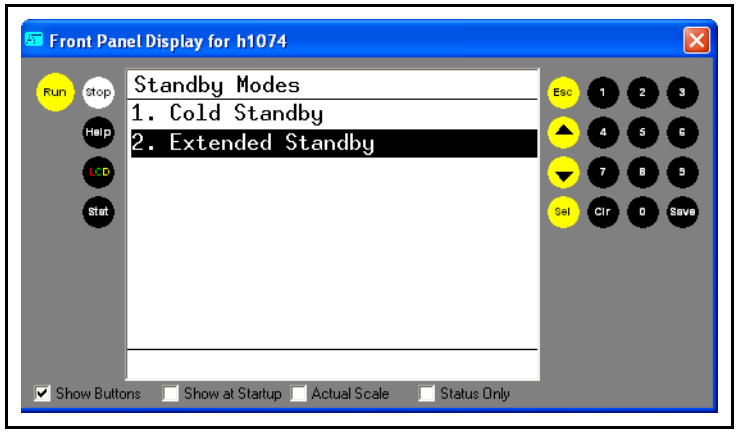
3 Arrow down or press **4** and **SEL** to select **Standby Modes**. See Figure 3-67

Figure 3-67 Selecting Standby Options



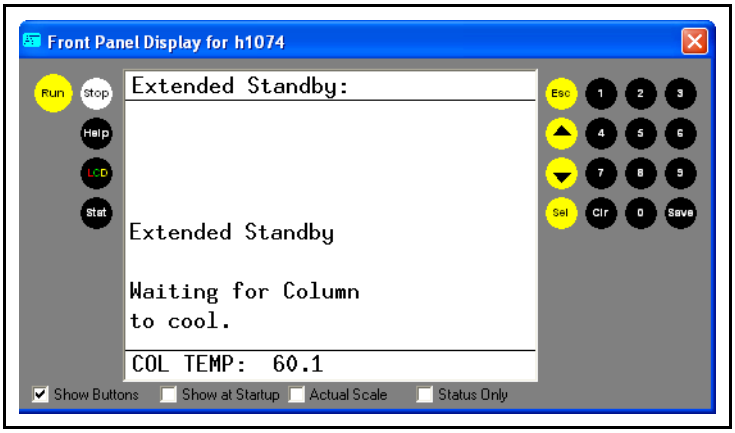
4 Arrow down or press **2** and **SEL** to select **Extended Standby**. See Figure 3-68.

Figure 3-68 Selecting Extended Standby



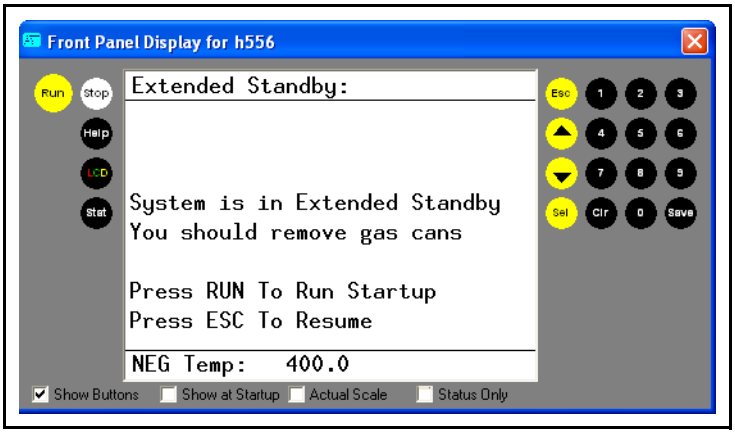
5 Wait for system to cool and enter Extended Standby. See Figure 3-69.

Figure 3-69 Column Cooling Message



6 Remove gas cans when prompted. Refer to Section 2.3.3.1, How to Change or Remove a Gas Canister, on page 2-8 for instructions. See Figure 3-70.

Figure 3-70 System is in Extended Standby



3.10.2 Cold Standby

Cold Standby is used when the HAPSITE is attached to the Service Module. In this state, the Ion pump is on and the NEG pump, if installed, is not powered. All heated zones are off. Refer to Chapter 14, Service Module, for more information on the Service Module and refer to Section 2.7.2, Placing the HAPSITE on the Service Module, on page 2-23 for additional information on attaching the HAPSITE to the Service Module.

1 Press the **ESC** button on the front panel until you reach the **Main Menu**.

2 Arrow down or press **5** and **SEL** to select the **Exit Menu**. See Figure 3-71.

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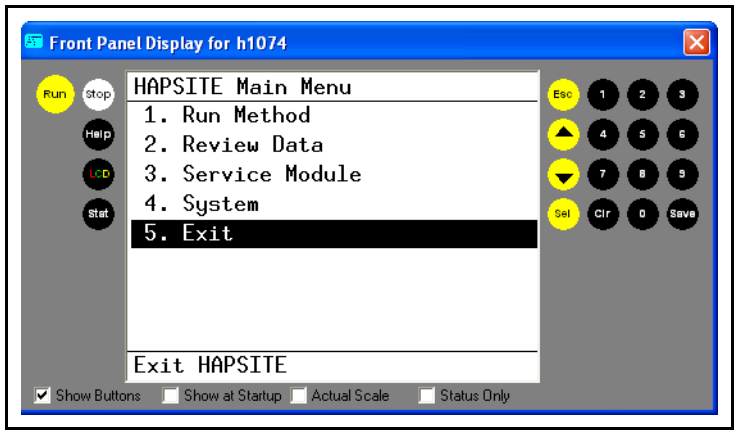
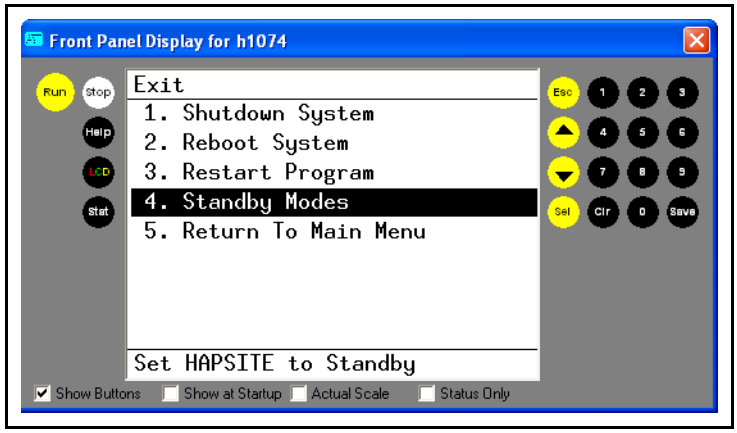
Figure 3-71 Selecting Exit Option from Main Menu



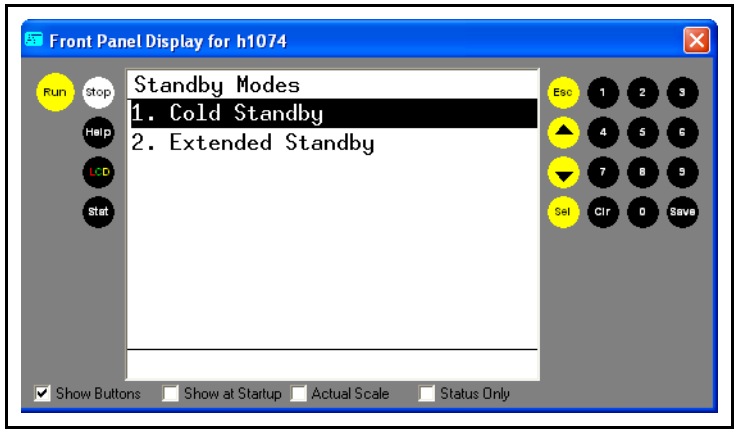
3 Arrow down or press **4** and **SEL** to select **Standby Modes**. See Figure 3-72.

Figure 3-72 Selecting Standby Modes



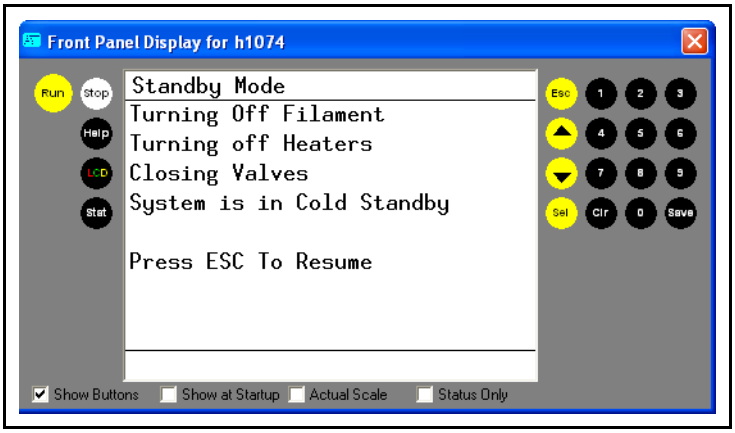
4 Arrow down or press **1** and **SEL** to select **Cold Standby**. See Figure 3-73.

Figure 3-73 Selecting Cold Standby



HAPSITE will turn off filaments, heaters, and valves to enter Cold Standby. See Figure 3-74.

Figure 3-74 HAPSITE in Cold Standby



3.10.3 Shutdown System

Proceed as follows to shutdown the HAPSITE system.

1. Press the **ESC** button on the front panel until reaching the **Main Menu**.
2. Arrow down or press **5** and **SEL** to select the **Exit Menu**.
3. The first choice is **Shutdown System**. Press **1** then **SEL**.
4. When asked to **Halt System?**, press **1,** then **SEL** to shutdown.

The system will automatically shut itself down. Remove the gas canisters and the battery once the shutdown is complete. See Figure 3-75.

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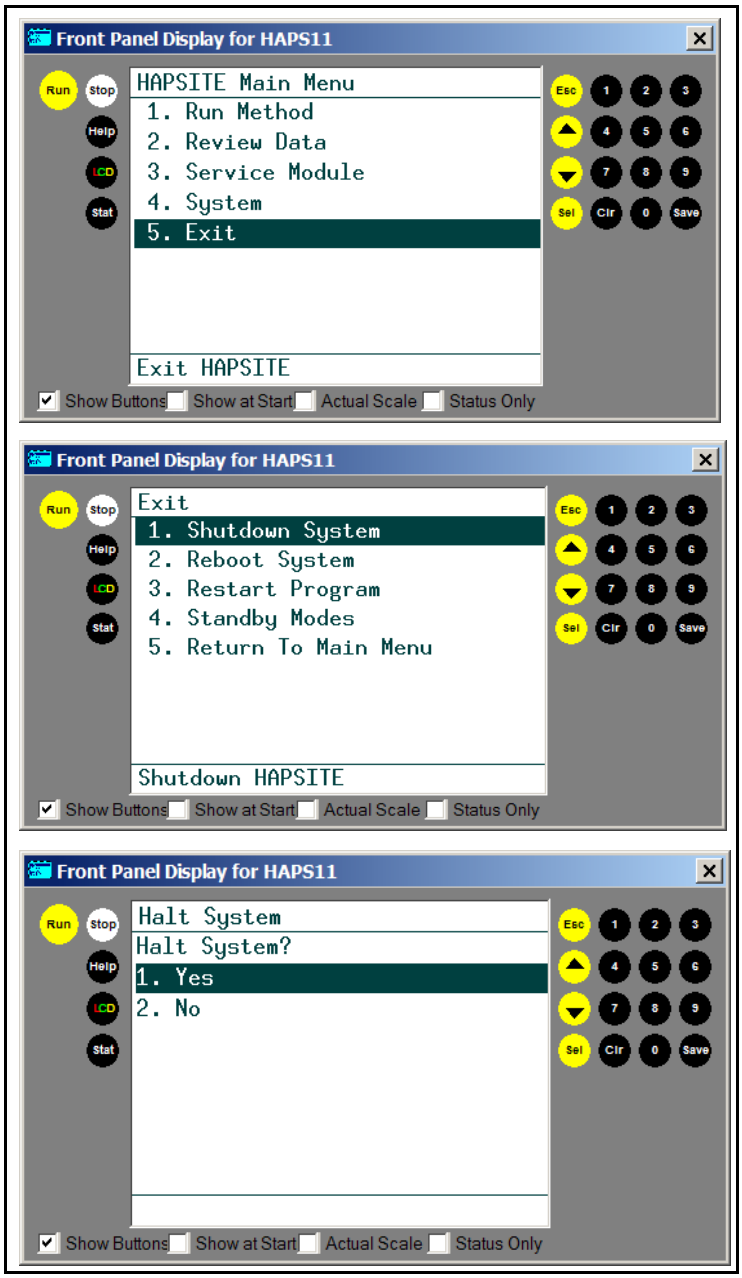
Figure 3-75 Shutting Down the HAPSITE

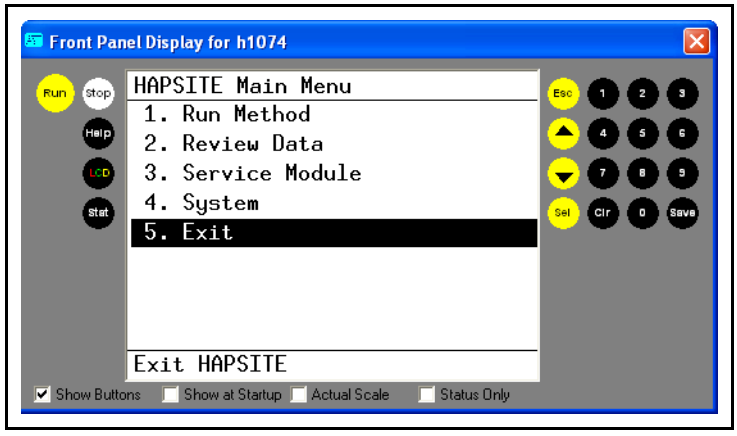


3.10.4 Rebooting the HAPSITE

Rebooting the HAPSITE is the same as powering off and powering on, similar to Ctrl+Alt+DEL on the laptop. This option can be used to force the HAPSITE to autotune or if the HAPSITE has frozen similar to a PC.

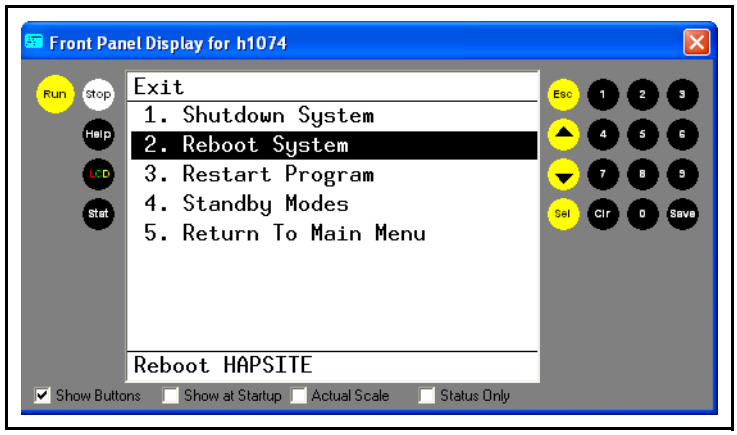
1. Press the **ESC** button on the front panel until reaching the **Main Menu**.
2. Arrow down or press **5** and **SEL** to select the **Exit Menu**. See Figure 3-76.

Figure 3-76 Exit Option on Main Menu



3. Arrow down or press **2** and **SEL** to select **Reboot System**. See Figure 3-77.

Figure 3-77 Reboot Option on Exit Menu



4. Arrow down or press **1** and **SEL** to confirm. See Figure 3-78.

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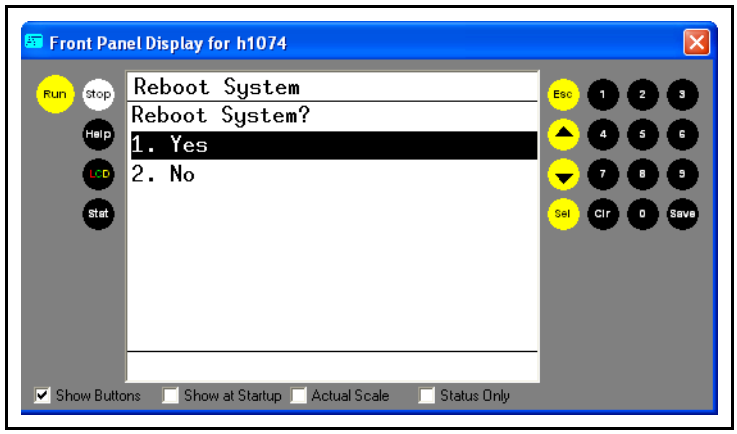
Figure 3-78 Reboot Option Confirm Screen



5 Wait for the HAPSITE to shutdown and restart.

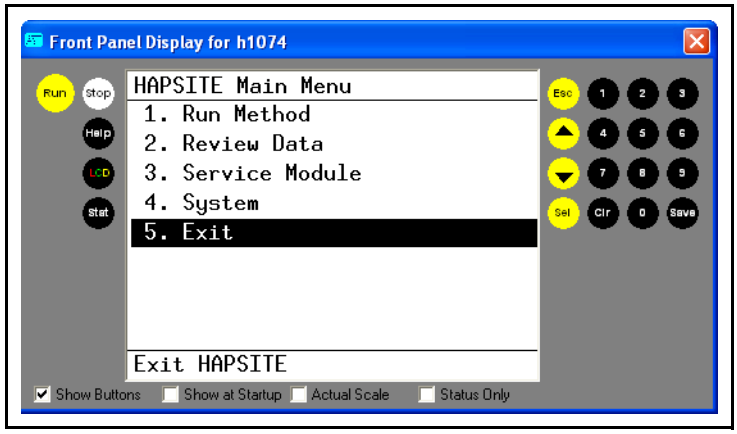
3.10.5 Restart Program

The Restart Program restarts the HAPSITE Smart software. This option is most commonly used after saving a previous tune file to the current default.tun file to.

1 Press the **ESC** button on the front panel until reaching the **Main Menu**.

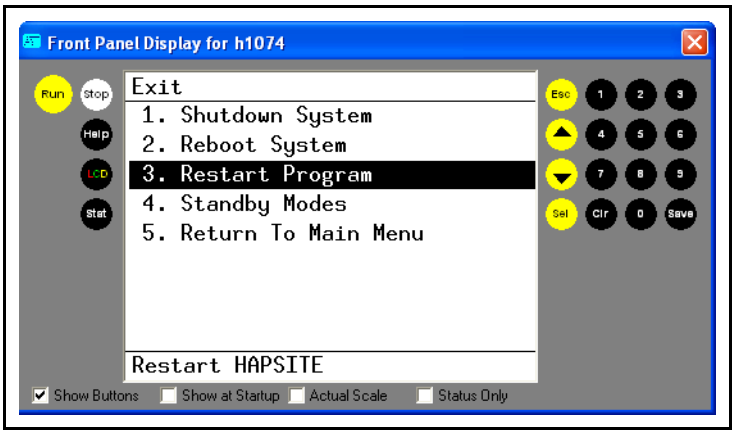
2 Arrow down or press **5** and **SEL** to select the **Exit Menu**. See Figure 3-79.

Figure 3-79 Selecting Exit Option on Main Menu



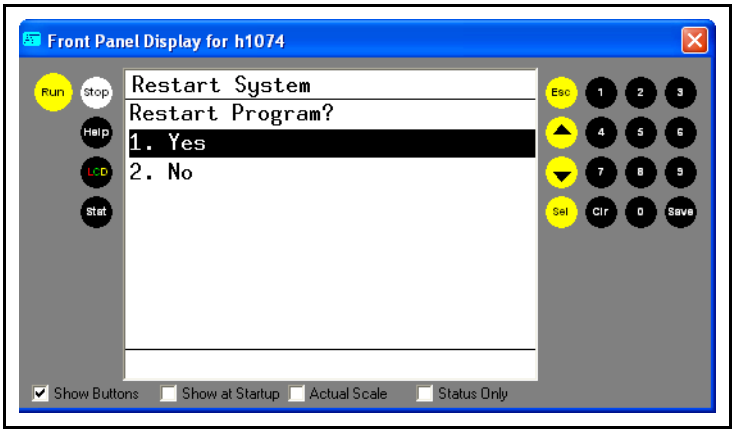
3 Arrow down or press **3** and **SEL** to select the **Restart Program**. See Figure 3-80.

Figure 3-80 Selecting Restart Program Option



4 Arrow down or press **1** and **SEL** to confirm restart. See Figure 3-81.

Figure 3-81 Confirming Restart Program



5 HAPSITE will shutdown the HAPSITE Smart software, then restart the HAPSITE Smart software.

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Chapter 4
Wireless and USB

4.1 Introduction

The HAPSITE Smart has wireless communication along with a USB drive. The wireless option is designed for use with Smart IQ software version 1.30 or greater. Wireless and USB is available as an upgrade for older HAPSITE Smart instruments.

DANGER

The HAPSITE contains a wireless transmitter/receiver that emits electromagnetic radiation (EMR). This radiation in a tactical or operational environment may potentially be used to locate the HAPSITE and its operators. This radiation also has the potential to detonate some types of unexploded ordnance (UXO), or improvised explosive devices (IEDs), or both, if the HAPSITE is transmitting in the safety exclusion area around the device(s). There is a hardware switch to turn off the wireless radio so that the HAPSITE may still be used in areas where these hazards are a concern. Consult applicable regulations and policies when using the HAPSITE with the wireless device active in such environments.

4.2 FCC Compliance Information

This section of the Operating Manual lists FCC and Industry Canada (IC) compliance information for the HAPSITE Smart system that contains the wireless communication option.

NOTE: This equipment contains an OEM Embedded Wireless Bridge (Ethernet to Wireless LAN) Module from DPAC Technologies.

FCC ID: RTTAB-WLNB
IC: 5376A-ABWLNB

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada (IC). Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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CAUTION

To maintain compliance with FCC and Industry Canada (IC) standards and regulations and to ensure the proper operation of the wireless communication system used within the Hapsite instrument, ONLY use the antenna that was originally supplied with the Hapsite instrument. If you damage the original antenna please contact INFICON's service department for a replacement antenna (see Chapter 17 for contact information).

4.2.1 FCC Information — Information for U.S.A. Users

4.2.1.1 FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for assistance.

4.2.2 FCC RF Exposure Statement

WARNING

To satisfy RF exposure requirements, this device and its antenna must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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4.2.3 IC Notice — Information For Canadian Users

This equipment complies with Canadian RSS-210.

This device has been designed to operate with an antenna having a maximum gain of 5.0 dB. An antenna having a higher gain is strictly prohibited per regulations of Industry Canada (IC). The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than required for successful communications.

4.3 Wireless Range

The HAPSITE Smart is equipped with an 802.11b wireless adapter. The typical range for a signal is 300 ft. (100 meters) line of sight with no obstructions. The following may degrade the signal:

- Metal buildings
- Concrete structures
- Electric devices in the area

Other possible obstructions may exist depending on location.

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4.4 Turning the Radio On

If wireless communication is desired, the radio must be turned on. Table 4-1 gives instructions for turning the radio on

NOTE: When the HAPSITE radio is on, even if wireless communication is not being used, a radio signal is being transmitted. The only way to eliminate the radio signal is to turn the radio off.

Table 4-1 Turning the HAPSITE Wireless Radio On

Step	Description
1	Open the front panel of the HAPSITE. 
2	Remove the cover from the power switch (for the wireless radio). It is located on the far left hand side. To remove, unscrew the cover by turning it counter-clockwise. 
	DANGER **The HAPSITE contains a wireless transmitter/receiver that emits electromagnetic radiation (EMR). This radiation in a tactical or operational environment may potentially be used to locate the HAPSITE and its operators. This radiation also has the potential to detonate some types of unexploded ordnance (UXO), or improvised explosive devices (IEDs), or both, if the HAPSITE is transmitting in the safety exclusion area around the device(s). There is a hardware switch to turn off the wireless radio so that the HAPSITE may still be used in areas where these hazards are a concern. Consult applicable regulations and policies when using the HAPSITE with the wireless device active in such environments.**
3	Press the button until a click is heard. The green lights adjacent to “Radio” and “WLAN” should illuminate. When the green lights are illuminated, the power to the wireless radio is on. 
4	Replace the switch cover by placing it over the switch. Turn it clock-wise until finger tight.

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4.5 Establishing Communication

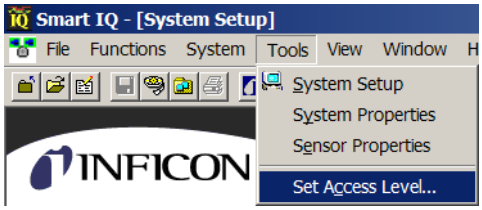
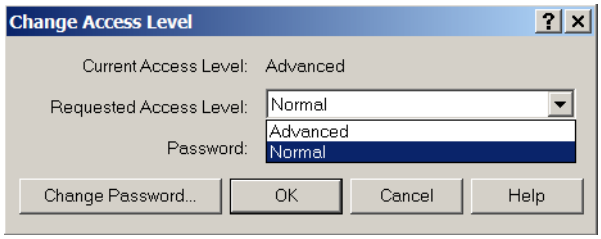
Wireless communication for the HAPSITE Smart is set up at the factory. Table 4-3 and Table 4-4 can be used to verify the set up or correct any communication issues.

HINT: Setting up communications in Smart IQ requires the user to be in Advanced Mode. Table 4-2 gives directions to set up this mode.

4.5.1 Setting the User Access Level

The HAPSITE Smart leaves the factory in Normal operating mode. Setting up communication requires the user to be in Advanced Mode. For information on setting the user level, see Table 4-2.

Table 4-2 Setting User Access Level

Step	Description
1	Open the **Smart IQ** software.
2	From the System Setup page, click on **Tools** >> **Set Access Level**. 
3	The Change Access Level window will appear. Click on the drop down menu. Highlight **Advanced,** then select **OK**. 

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4.5.2 Configuring the HAPSITE for Wireless Communication

To set up wireless communication between the HAPSITE and laptop computer, Smart IQ must be configured to communicate with the HAPSITE by setting up the IP address. See Table 4-3 and Table 4-4 for instruction on how to set up communication.

4.5.2.1 Setting Up Smart IQ for Communication with the HAPSITE

The first step to communication between the HAPSITE and laptop is to set up a Sensor Icon in Smart IQ. This is the HAPSITE Icon seen on the bottom of the System Setup window of Smart IQ. See Table 4-3 for instructions.

Table 4-3 Adding a Sensor Icon in Smart IQ

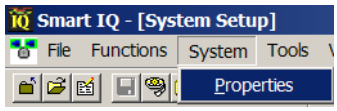
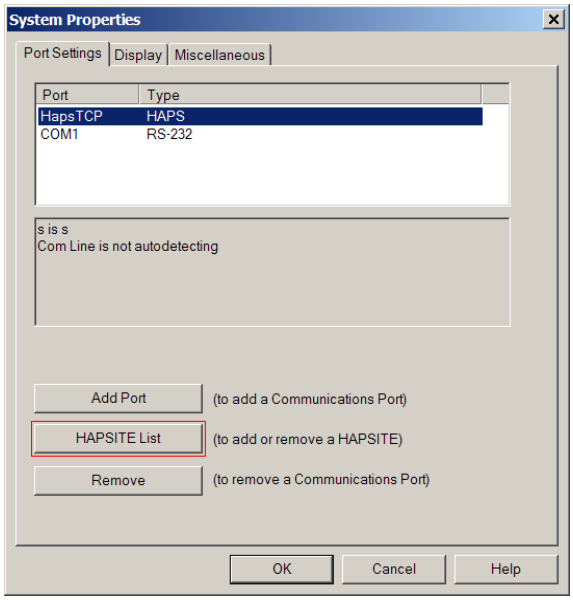
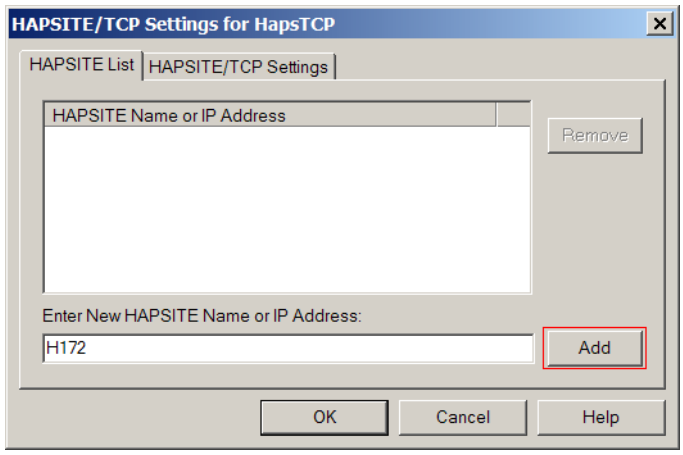
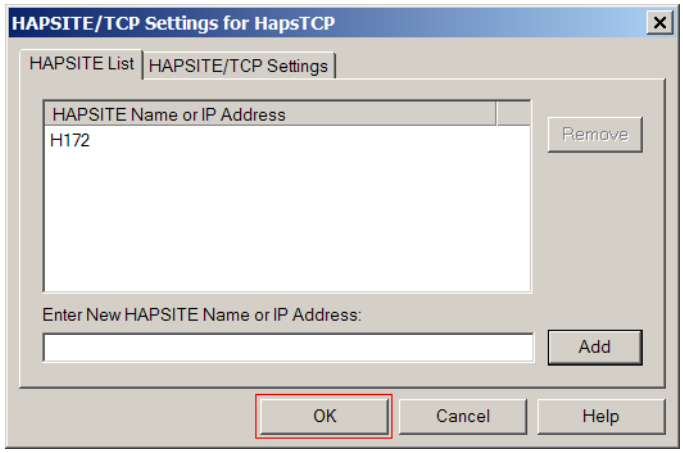
Step	Description
1	Open Smart IQ. From the **System** drop-down menu, select **Properties**. **NOTE:** This is an Advanced User function. See Table 4-2 for instruction on setting Advanced user access level. 
2	With the HapsTCP port highlighted, select **HAPSITE List**. 

Table 4-3 Adding a Sensor Icon in Smart IQ

Step	Description
3	Enter the letter “H”, followed by the last 3 or 4 significant digits of the Serial Number of the HAPSITE that requires communication setup. (The Serial Number is located on the inside of the front cover of the HAPSITE). For example: H172. Select **Add** 
4	The newly added HAPSITE will appear in the HAPSITE List. Select **OK** 
5	Select **OK** in System Properties to close the window.
6	If the HAPSITE Sensor appears as shown in the Smart IQ System Setup window, communication has been established. 
7	If the HAPSITE Sensor appears with a Blue “X” through it, communication has not been fully established. Continue with the instructions in Table 4-4. 

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4.5.2.2 Setting the IP Address

The second step to setting up communications is to set the IP address of the laptop computer for direct communication with the HAPSITE. Instructions for this are found in Table 4-4.

Table 4-4 Setting the IP Address

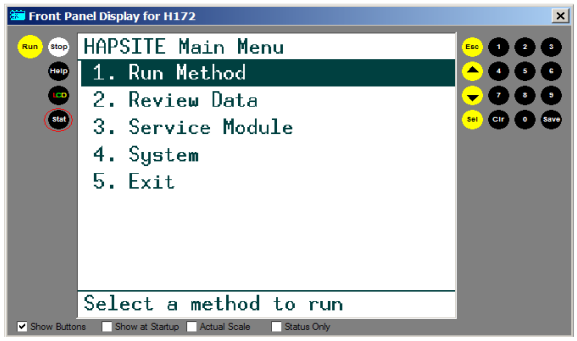
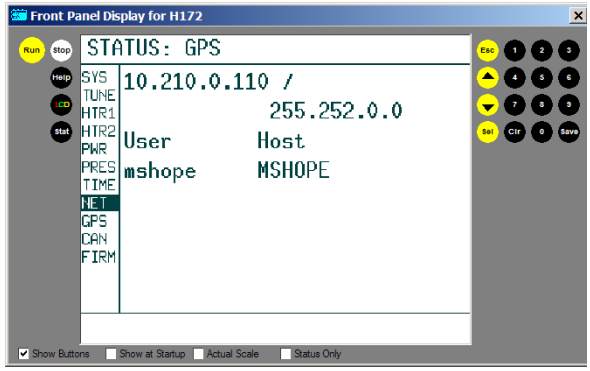
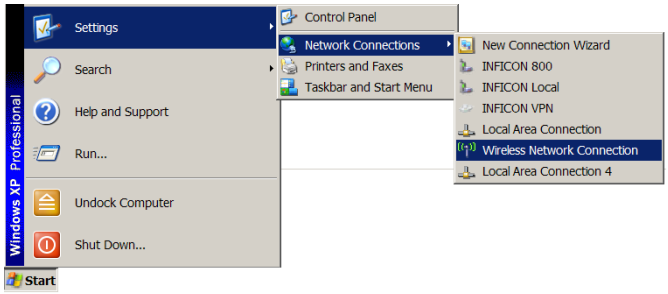
Step	Description
1	If communication between the HAPSITE and the laptop could not be established using Table 4-3 then continue with Step 2. 
2	Press the **STAT** key on the Front Panel of the HAPSITE 
3	Using arrow keys select **NET**. The IP address of the HAPSITE will be displayed. Example: 10.210.0.110 / 255.252.0.0. Each HAPSITE will have a unique IP address. 
4	From Start Menu on the PC, select **Settings >> Network Connections >> Wireless Network Connection** 

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Table 4-4 Setting the IP Address

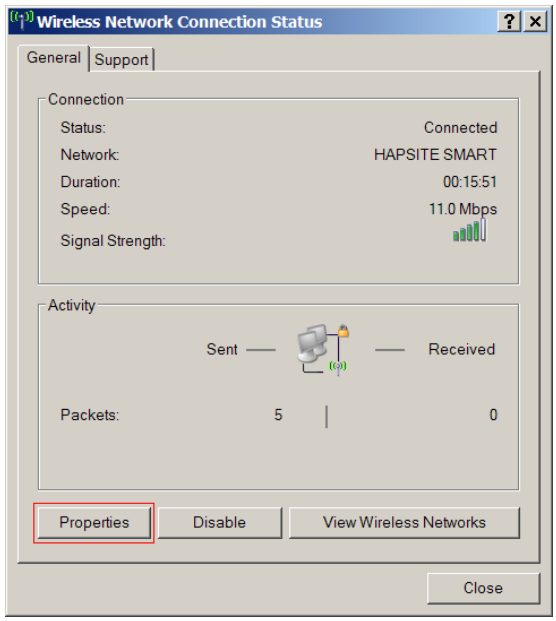
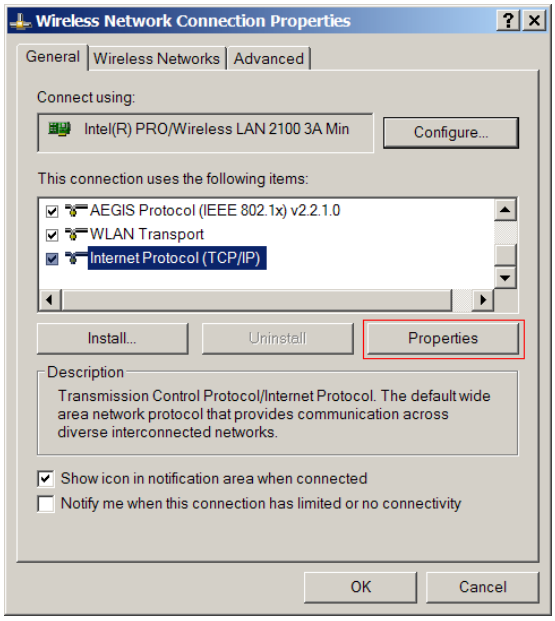
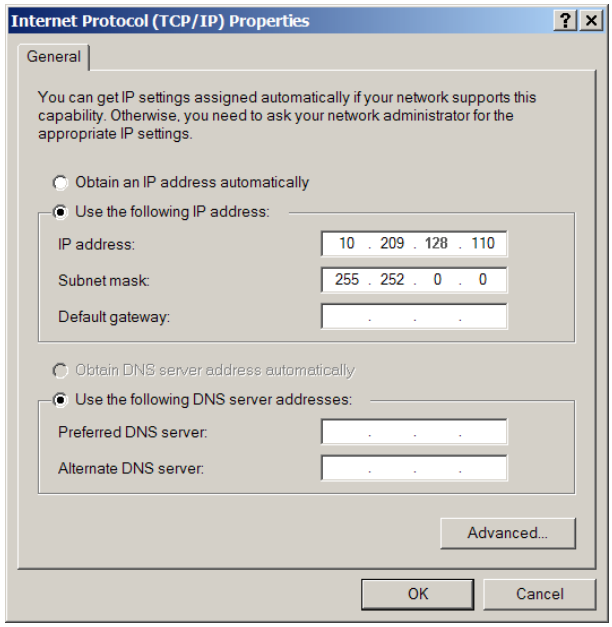
Step	Description
5	From the Wireless Network Connection Status Window, select **Properties**. 
6	In the General tab, highlight **Internet Protocol (TCP/IP)**, select **Properties**. 

Table 4-4 Setting the IP Address

Step	Description
7	Select **Use the following IP address**. Before entering the IP address from the front panel of the HAPSITE there are two important differences to note. ◆ The second set of numbers (210) must be entered as **209** in the IP address line when using wireless. ◆ The third set of numbers must have 128 added to it. In this example the third set of numbers is 0. This would be entered as 128. **NOTE:** This is necessary in order for the system to configure communication properly. Example: 10.210.0.172 becomes 10.209.128.172. Select **OK** 
8	Select **OK** in Wireless Network Connection Properties to close the window.
9	Communication between the HAPSITE and the laptop is now established. Verify by noting that the Sensor Icon, in the System Setup window, has become active. 

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4.5.3 Configuring the Laptop for Wireless Communication

In order for wireless communication between the laptop and HAPSITE Smart to be successful, the radio on the laptop computer must be turned on. The basic steps for configuring the laptop for wireless communication are:

1. Enable the radio on the laptop computer.
2. Scan for available Wireless Networks.
3. Choose HAPSITE Smart.
4. Create a profile for the Wireless Connection.
5. Connect to the HAPSITE Smart wireless network.
6. Verify the connection protocol is 802.11b.
7. If the connection protocol is not 802.11b, modify the profile.

Based on computer model differences between brands and model numbers within a brand, refer to the User's Guide of the laptop for specific instructions on setting up the wireless radio. The Dell™ website has a section on wireless communications called the Wireless Center. This section can be accessed at http://support.dell.com by clicking the Technical Support tab, then selecting Wireless Center. The content applies to many manufacturer's laptop computers, not just Dell laptop computers.

4.6 Wireless Module Indicator Lights

Located on the Wireless Module inside the HAPSITE front cover are four indicator lights.

RADIO . . . . . When illuminated, the radio is enabled.

WLAN. . . . . When illuminated, the wireless connection is linked to the laptop computer. The LED blinks when transmitting or receiving data.

LAN . . . . . When illuminated, the HAPSITE is connected via a crossover cable to the laptop computer. The LED blinks when transmitting or receiving data. The LED will be extinguished if the crossover cable is disconnected.

586 . . . . . When illuminated, the HAPSITE 586 processor is linked to a wired or wireless connection.

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4.7 Turning the Radio Off

If wireless communication is not desired, the radio on the HAPSITE Smart can be turned off. See Table 4-5 for directions.

NOTE: When the HAPSITE radio is on, even if wireless communication is not being used, a radio signal is being transmitted. The only way to eliminate the radio signal is to turn the radio off.

Table 4-5 Turning the HAPSITE Wireless Radio Off

Step	Description
	DANGER **The HAPSITE contains a wireless transmitter/receiver that emits electromagnetic radiation (EMR). This radiation in a tactical or operational environment may potentially be used to locate the HAPSITE and its operators. This radiation also has the potential to detonate some types of unexploded ordnance (UXO), or improvised explosive devices (IEDs), or both, if the HAPSITE is transmitting in the safety exclusion area around the device(s). Discussed below is a hardware switch to turn off the wireless radio so that the HAPSITE may still be used in areas where these hazards are a concern. Consult applicable regulations and policies when using the HAPSITE with the wireless device active in such environments.**
1	Open the front panel of the HAPSITE. 
2	Remove the cover from the power switch (for the wireless radio). It is located on the far left hand side. To remove, unscrew the cover by turning it counter-clockwise. 
3	Press the button until a click is heard. The green lights adjacent to “Radio” and “WLAN” should extinguish. When the green lights are extinguished, the power to the wireless radio is off. 
4	Replace the switch cover by placing it over the switch. Turn it clock-wise until finger tight.

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4.8 Saving Files to the USB

If the HAPSITE is being used in a portable mode, with no laptop, the datafile can be saved to the USB drive and then loaded on the laptop for analysis. Table 4-6 gives instructions for saving files to the USB drive.

HINT: Data is always saved to the hard drive on the HAPSITE Smart and, if connected to the laptop, data will be saved there as well. Saving files to the USB drive is designed for times when the laptop and HAPSITE Smart are not going to be paired for communication (via ethernet or wireless connections). In this instance, data can be placed on the USB drive and later transferred to the laptop for analysis.

Table 4-6 Saving Files to the USB Drive

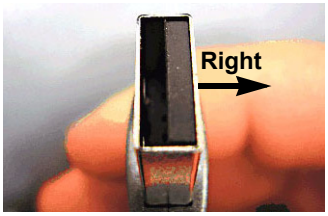
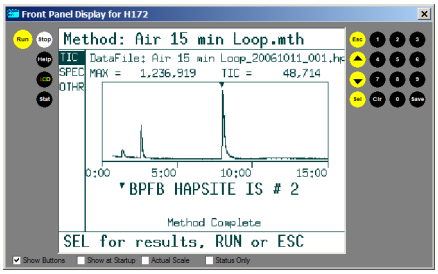
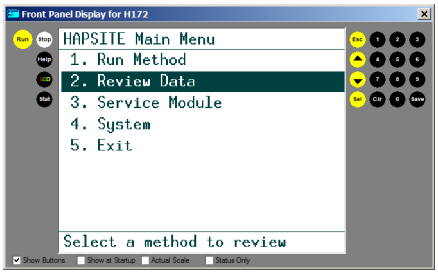
Step	Description
1	Open the front panel of the HAPSITE
2	 **Insert** the **USB drive** into the USB port (located on the top left hand side). Close the front door of the HAPSITE. **NOTE:**When inserting the USB drive, the solid portion should be on the right.
3	To save a file for a method that has just completed, press the **SAVE** button on the front panel of the HAPSITE. **NOTE:** If the file was run previously, proceed to step 4 for further instruction. 
4	To save a previously run file from the Main Menu, highlight choice **2. Review Data** and press **SEL**. 

Table 4-6 Saving Files to the USB Drive (continued)

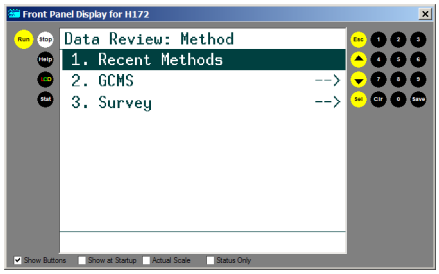
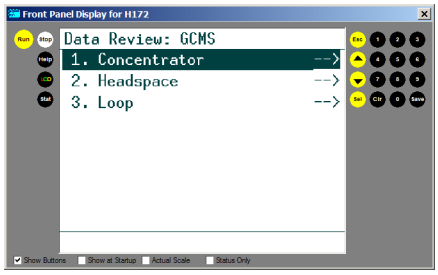
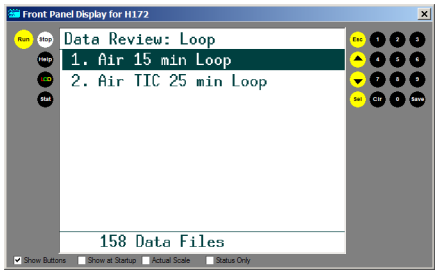
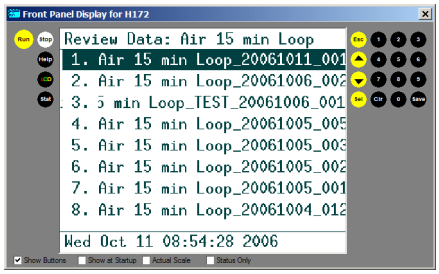
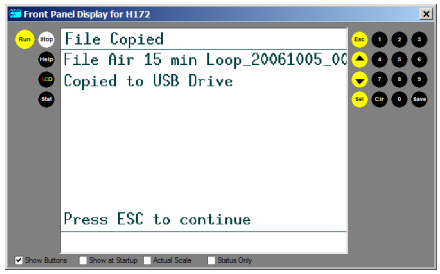
Step	Description
5	Highlight the method type to review. (**Survey** or **GC/MS**) and press **SEL.** 
6	If the method was a GC/MS file, highlight the correct configuration (**Loop**, **Concentrator** or **Headspace**) and press **SEL**. 
7	Highlight the **data file folder** enter and press **SEL**. 
8	Highlight the **data file** to be saved and press **SAVE**.  
9	Repeat as needed.

Table 4-6 Saving Files to the USB Drive (continued)

Step	Description
10	When finished transferring files, open the front panel and **remove** the **USB drive**. See section 4.9 for details on transferring the files from the USB drive to the laptop computer.
NOTE:	Data files are saved to the USB drive with a .hpz file extension.

4.9 Retrieving Files from the USB Drive

Once files are saved to the USB drive, they can be transferred to the laptop for analysis. Table 4-7 gives instructions for transferring these files.

HINT: There are many ways to access data files on the laptop. These instructions can be followed or the files can be accessed in a way more comfortable to the user.

Table 4-7 Retrieving Files from the USB Drive

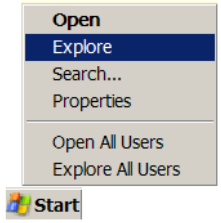
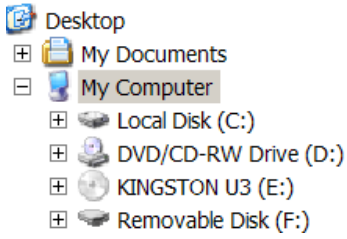
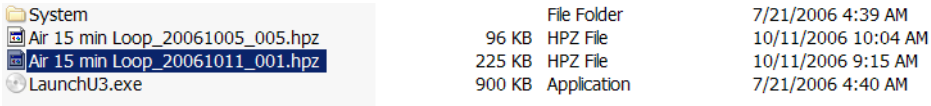
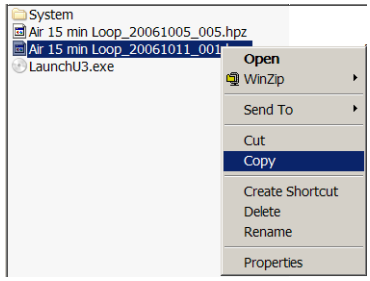
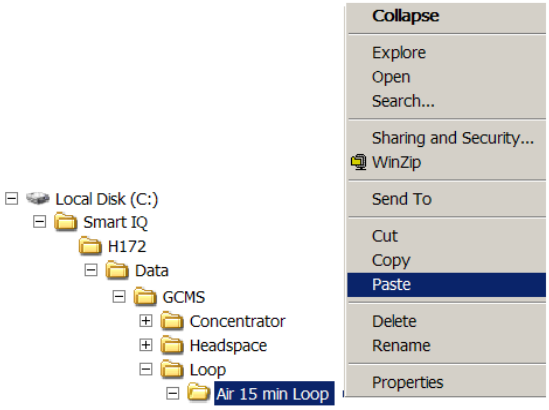
Step	Description
1	**Insert** the **USB drive** into the USB port in the laptop computer.
2	**Right click** on the **START** button. **Left click** on **Explore**. This will open windows explorer. 
3	**Left click** on the appropriate **drive** letter associated for the portable storage device. Example: the F:\ drive. 
4	**Left click** to highlight the **file** to be transferred. 

Table 4-7 Retrieving Files from the USB Drive (continued)

Step	Description
5	**Right click** and select **Copy**. 
6	**Right click** in the destination directory and select **Paste** **NOTE:** The files need to be placed in the correct directory for viewing. For this example the path would be: Smart IQ\H172\Data\Loop\Air 15 min Loop 
7	Now the data files can be accessed using Data Review in Smart IQ. Refer to Table 4-7 for more information.
NOTE:	Use the "Safely Remove Hardware" feature of Windows to unplug the USB drive from the PC. Failure to do so can corrupt the USB drive. This is not necessary when unplugging the USB drive from the HAPSITE Smart.

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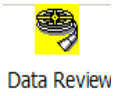
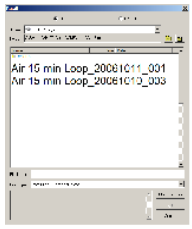
4.10 Reviewing the Data Retrieved from the USB

Files that have been transferred to the laptop can be reviewed in the Smart IQ software. Table 4-8 gives details on how to access the data files.

Table 4-8 Data Review from the Laptop

Step	Description
1	Open **Smart IQ** software. 
2	**Double-click** on the **Data Review** icon. 
3	Designate **PC** in the top portion of the window.  **NOTE:** Any files transferred from the USB drive to the laptop will reside on the **PC.**
4	**Double click** on the appropriate folder. (**GCMS** or **Survey**) 
5	**Double click** on the appropriate configuration (**Loop**, **Headspace**, **Concentrator**) folder. 
6	**Double click** on the method name (**Air 15 min Loop**, **Air TIC 25 min Loop**) folder. 
7	**Double click** on the **data file**. 

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Chapter 5
Operating HAPSITE in Laptop Mode

5.1 Starting the HAPSITE in Laptop Mode

Starting the HAPSITE in Laptop Mode refers to using the HAPSITE in conjunction with the laptop computer. Refer to Chapter 8, Smart IQ Software for additional information on the Smart IQ Software installed on the laptop computer.

Required Materials

- HAPSITE (AM)
- Internal standard gas canister
- Carrier gas canister
- Charged battery
- Probe
- Crossover ethernet cable
- Laptop computer
  - Mouse (optional)
  - Power supply
- AC To DC Power Converter power supply, unless powered by a Service Module.

Procedure

1. Refer to Section 2.3, Basic Assembly, on page 2-4.
2. Press the **power button** on the inside of the front panel to turn on the HAPSITE. The HAPSITE takes 1-2 minutes to power on. See Figure 5-1.

   NOTE: The power button is a toggle switch. Once the power button has been pressed and released, the power button returns back to the original position.

   HINT: If desired and equipped, the HAPSITE can be used with the laptop computer connected via the wireless connection, see Chapter 4, Wireless and USB for additional information on set-up and usage.

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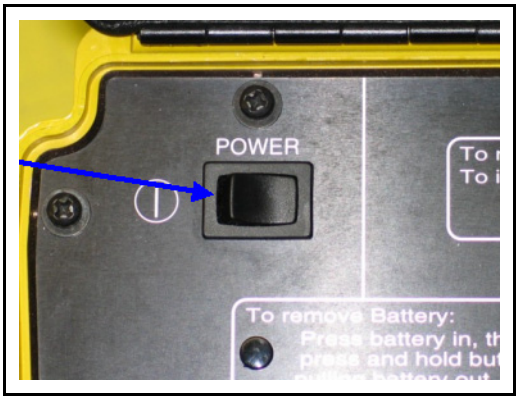
Figure 5-1 Power Switch

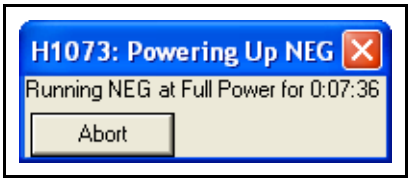


3 The laptop computer needs to be powered up. Locate the power cord and (optional) mouse, plug them into the appropriate places in the back of the computer. Open the laptop and press the **power button**.

4 Double-click the **Smart IQ** icon to open the software. See Figure 5-4.

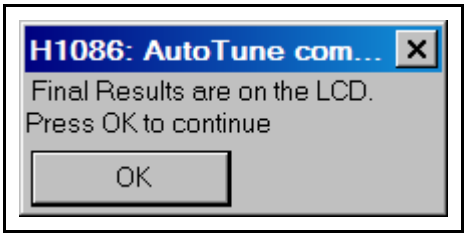
NOTE: The following message will appear during the power on sequence, see Figure 5-2.

Figure 5-2 NEG Full Power



5 If the HAPSITE has a startup method designated, then it will run Autotune when powered up. If no startup method is designated, then the HAPSITE will show the main menu at startup. If Autotune runs and completes, the Autotune OK message will appear. Click **OK**. See Figure 5-3. If Autotune fails, refer to Section 7.4, Autotune Failure, on page 7-7.

Figure 5-3 Autotune Complete



NOTE: If a startup method is enabled, step 6 through step 10 will be automatically run.

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6 Click the **Run Method** icon. See Figure 5-4.

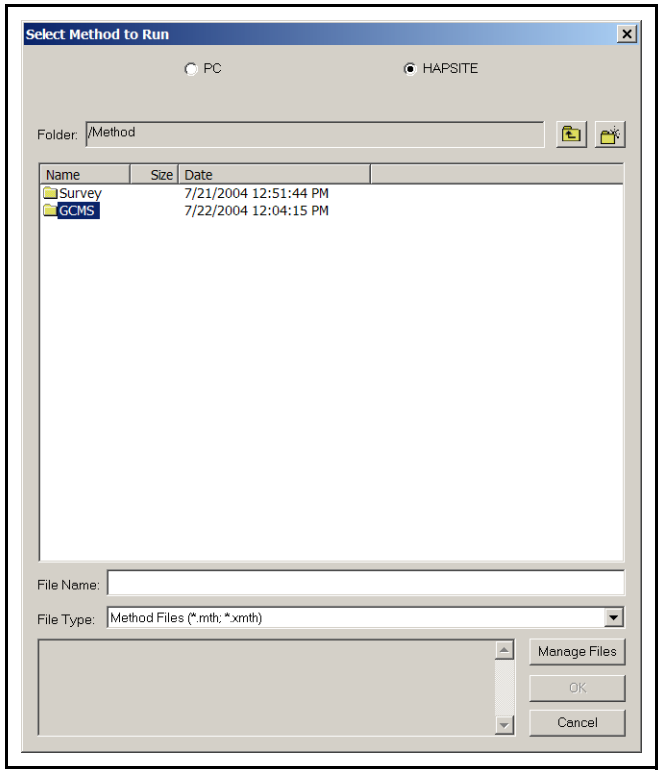
NOTE: In order to heat up the system and run a tune check (which takes 20 minutes total), a method must be selected. Once the method is selected, the HAPSITE will automatically heat up and run Autotune. Figure 5-4 shows the icons needed to access the software and to run a method.

Figure 5-4 Software Icons and Setup Page

7 Double-click on the **Run Method** icon. A dialog is displayed to choose the type of method to run. This example is a GC/MS run, so double-click the **GCMS** folder. See Figure 5-5.

NOTE: Use the buttons at the top of the dialog to choose the methods on the HAPSITE.

Figure 5-5 Choosing the Mode of Operation



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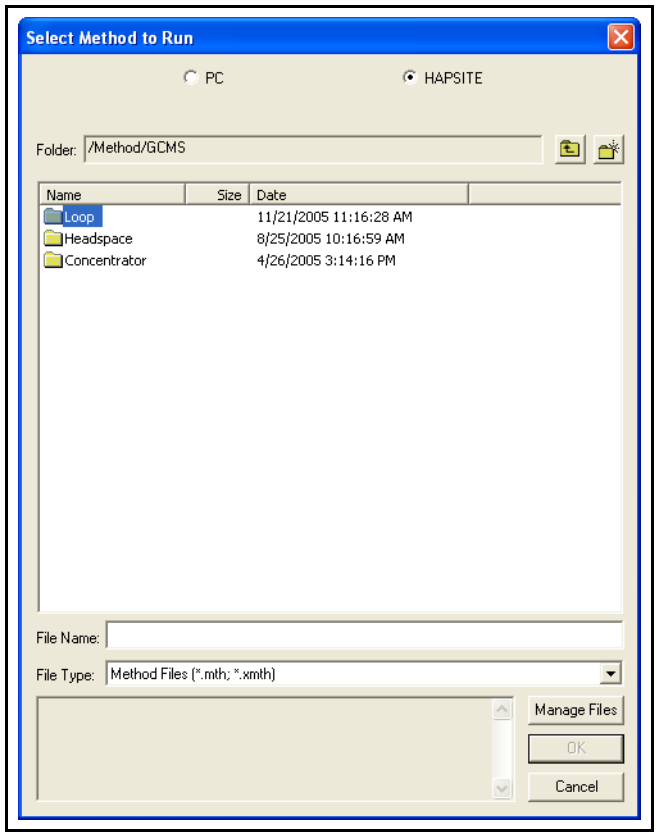
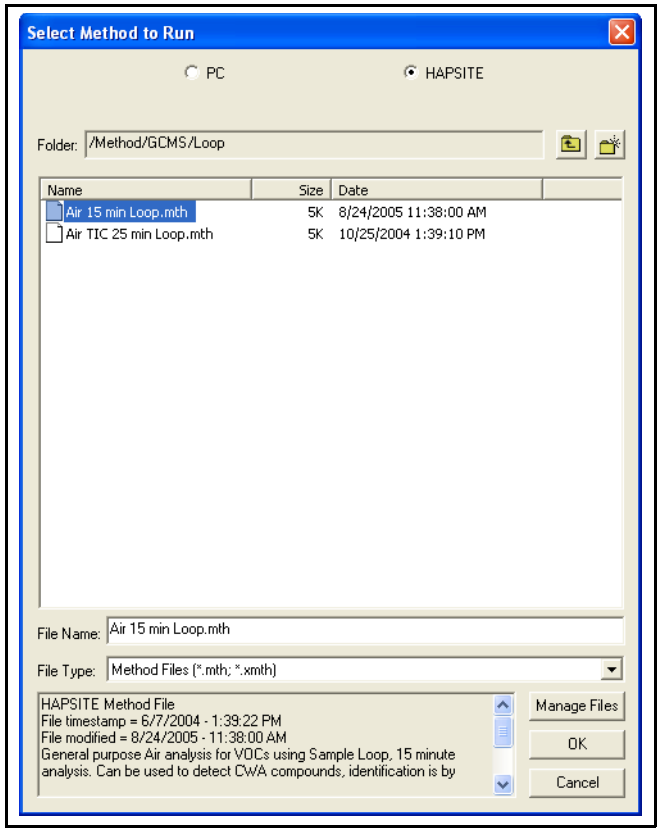
8 Choose a folder that matches the physical configuration of the HAPSITE. In this example the Sample Loop is installed; double-click the **Loop** folder. See Figure 5-6.

Figure 5-6 Selecting the Physical Configuration



9 Choose the desired method. Double-click the **Air 15 min Loop** or select another method and click **OK**. See Figure 5-7.

Figure 5-7 Selecting the Air 15 Min Loop Method



10 The software will check the pressure in the gas canisters, heat up all the zones, run an autotune (if required), and make tune adjustments as necessary. The process may take up to 20 minutes. When it is done heating, a prompt will appear to indicate the HAPSITE is ready to run a sample. Click **RUN**.

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5.1.1 Quick Reference SOP — Starting the HAPSITE

1. Refer to Section 2.3, Basic Assembly, on page 2-4 for assembly instructions.
2. Turn on the HAPSITE.
3. Plug in the power supply for the laptop computer.
4. Connect the laptop to the HAPSITE with the crossover ethernet cable or enable the wireless communication connection, see Chapter 4, Wireless and USB.
5. Plug in the mouse (optional).
6. Turn on the laptop.
7. Double-click the **Smart IQ** software icon.
8. Double-click the **Run Method** icon.

HINT: If a startup method is enabled the HAPSITE will perform step 8 through step 10.

9. Double-click a Method Folder (e.g., **GCMS** or **Survey**).
10. Double-click the desired method. (e.g., **Air 15 min Loop**, **Survey**).
11. The HAPSITE will now go through the heat up process and complete an autotune. This process may take up to 20 minutes. A prompt will appear when the HAPSITE is ready to begin sampling. Click **OK**.

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5.2 Survey Mode

The Survey Mode is used for quick analysis and tentative results. The sampling period is two minutes long.

- Sample the air away from the area of concern for one minute to serve as a background to determine what, if anything, currently exists in the area.
- For the second minute, sample directly over the area of concern to see what additional chemicals are present.

HINT: Refer to Chapter 6, Methods, for additional information on the survey method.

1 Open the **Smart IQ** software by double-clicking on the icon shown in Figure 5-8.

Figure 5-8 Smart IQ Icon

2 Double click the **Run Method** icon. See Figure 5-9.

Figure 5-9 HAPSITE Run Method Icon

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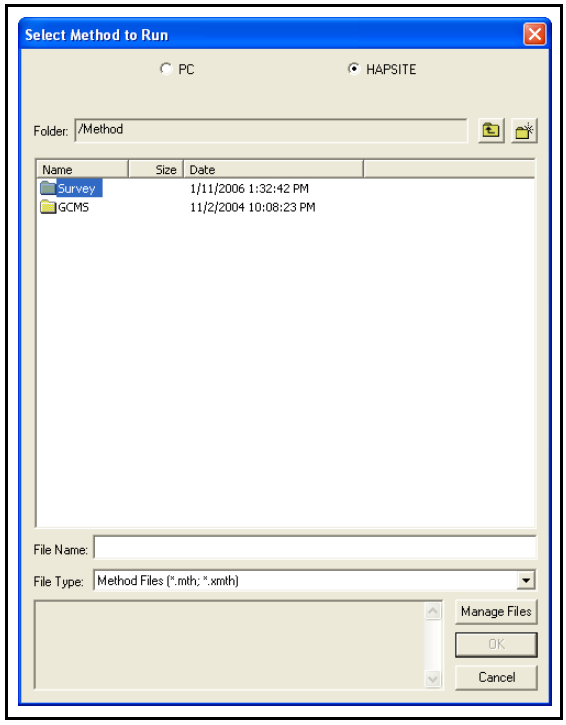
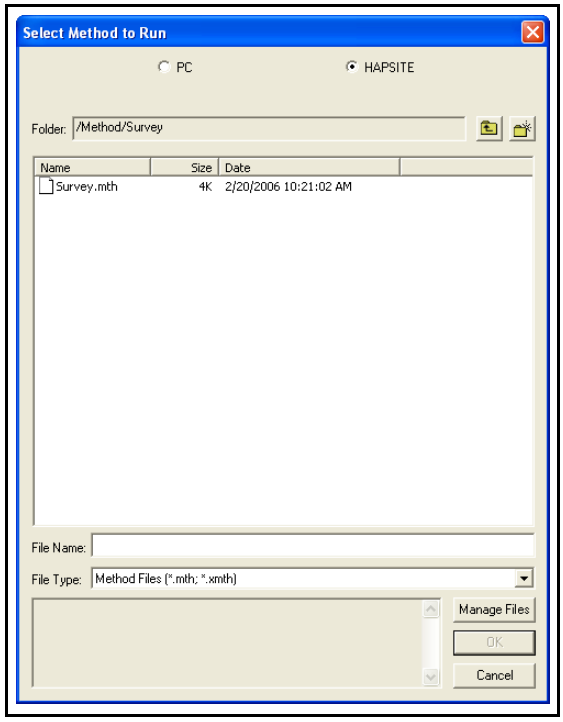
3 Ensure the dialog is showing HAPSITE methods and double-click the **Survey** folder. Alternately, select the **Survey** folder and click OK. See Figure 5-10.

Figure 5-10 Selecting the Survey Folder



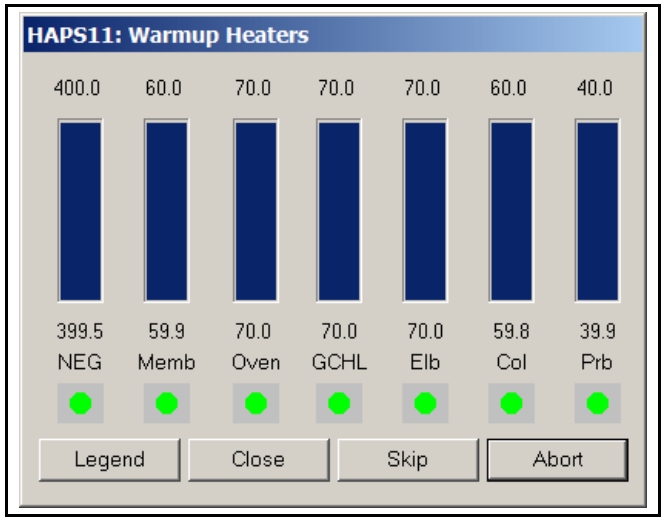
4 Double-click the **Survey.mth** method. Figure 5-11.

Figure 5-11 Selecting Survey Method



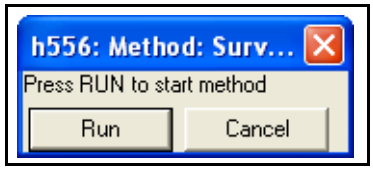
5 The heaters window will pop-up to show the status of the heated zones. See Figure 5-12.

Figure 5-12 Warming Heated Zones



6 Click **Run** from the pop-up window. See Figure 5-13.

Figure 5-13 Run Prompt



7 Allow the sample probe to sample background for 1 minute, then hold the sample probe over the sample until a peak is seen or for one minute.

HINT: Allow the plot to return to baseline while sampling background, before stopping the run.

CAUTION

Do not place the sample probe in liquids while sampling.

8 Click the **Stop** button to end the run. This is located on the right side of the Run Method window, in the Control Panel.

Figure 5-14 Stop Button

9 To view the data, note the data file name and click on the **Data Review** icon in the Setup System window of the Smart IQ software. See Figure 5-15.

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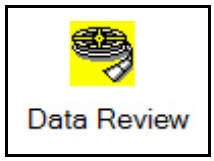
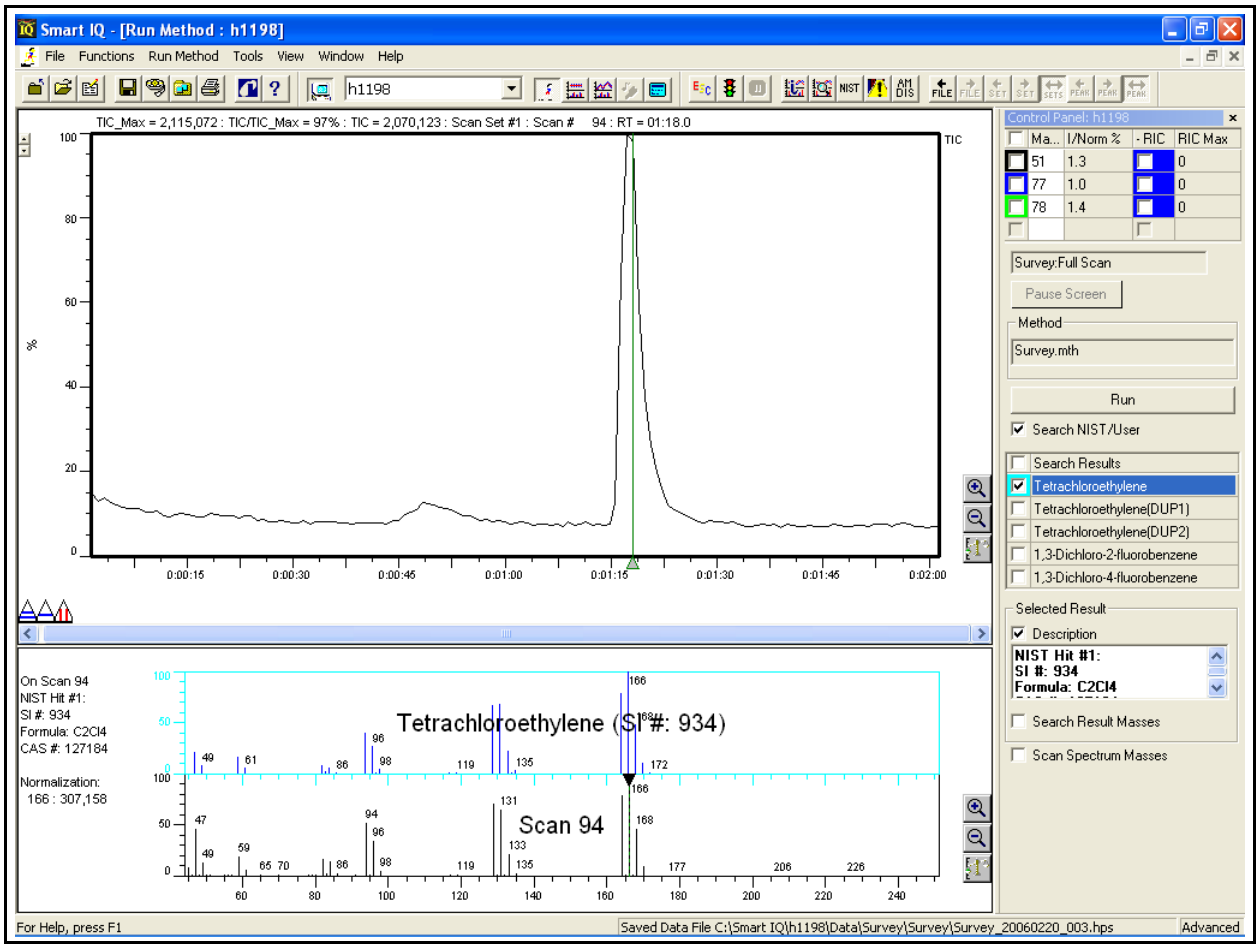
Figure 5-15 Data Review Icon



10 Select the **Survey** folder and then look for the data file that was just run. See Figure 5-16. Full instructions for data review are found in Chapter 9, Data Review.

HINT: Remember that this is a tentative identification. For a more positive identification, run a GC/MS method for confirmation of the results.

Figure 5-16 Survey Run Complete



5.2.1 Quick Reference SOP — Running Survey Mode

1. Double-click the **Smart IQ** software icon.
2. Double-click the **Run Method** icon.
3. Double-click the **Survey** Folder.
4. Double-click the **Survey** method.
5. Wait for heaters to reach the set temperatures.
6. Click the **RUN** button in the pop-up window, sample background for one minute.
7. Hold the Probe over the sample for one minute or until observing a response.
8. Press **RUN** again to stop the sampling and save the data.

HINT: This is a tentative identification. For more positive identification, run a GCMS method.

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5.3 GC/MS Mode with Loop

This method is used for analyzing samples with concentration levels in the low part per million (ppm) to high part per billion (ppb) range. This is commonly the second method used when trying to detect unknowns in the environment. Depending on circumstances, the Survey mode may be used to quickly and tentatively identify chemicals prior to the use of this GC/MS method. Refer to Chapter 6, Methods for additional information on GC/MS methods.

HINT: Remember that the Survey method must be followed by a GC/MS method in order to give a positive identification of the unknown.

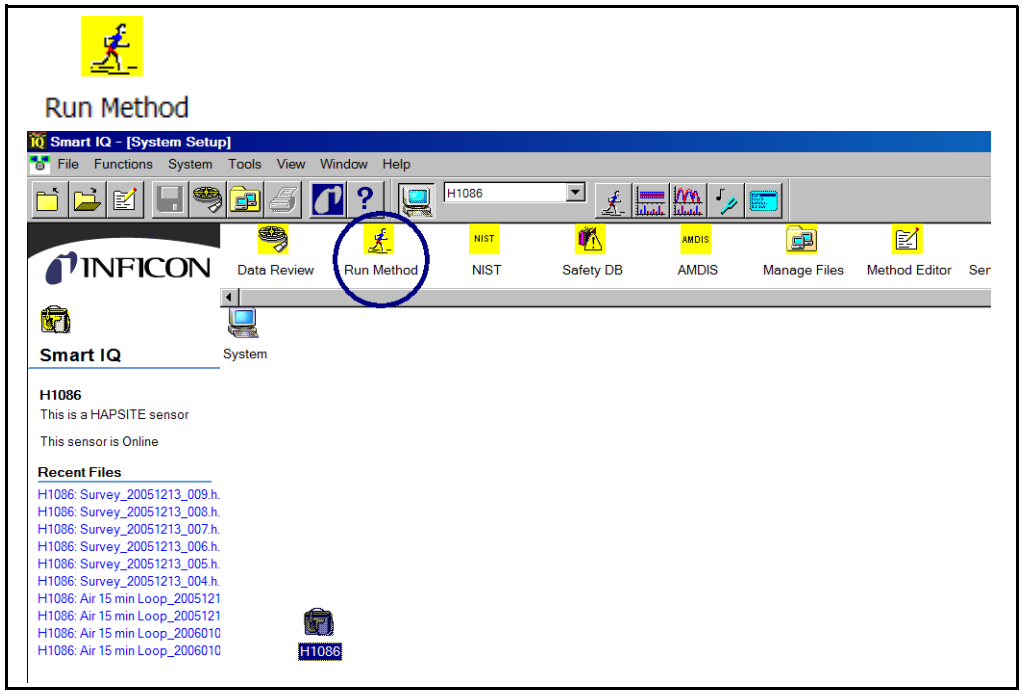
This section will describe the process required to run a sample with the sample loop installed. Refer to Section 2.3, Basic Assembly, on page 2-4 and Section 2.9.1, Installing the Sample Loop, on page 2-26. Assumptions made are that the HAPSITE is heated up, tuned and ready to go. If the HAPSITE is not warmed-up, follow the instructions in Section 5.1, Starting the HAPSITE in Laptop Mode, on page 5-1 before proceeding to this section.

1 Double-click the **Smart IQ** icon to open the software. See Figure 5-18.

Figure 5-17 Smart IQ Icon

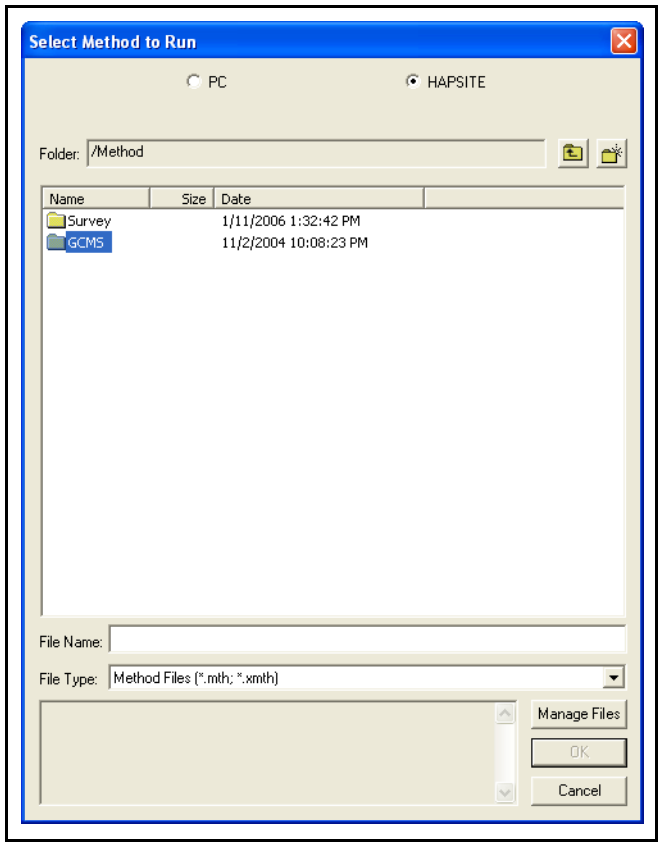
2 Double-click the **Run Method** icon on the System Setup window in the software. See Figure 5-18.

Figure 5-18 Software Icons and Setup Page



3 Double-click the **GCMS** folder on the HAPSITE. See Figure 5-19.

Figure 5-19 Choosing the Mode of Operation



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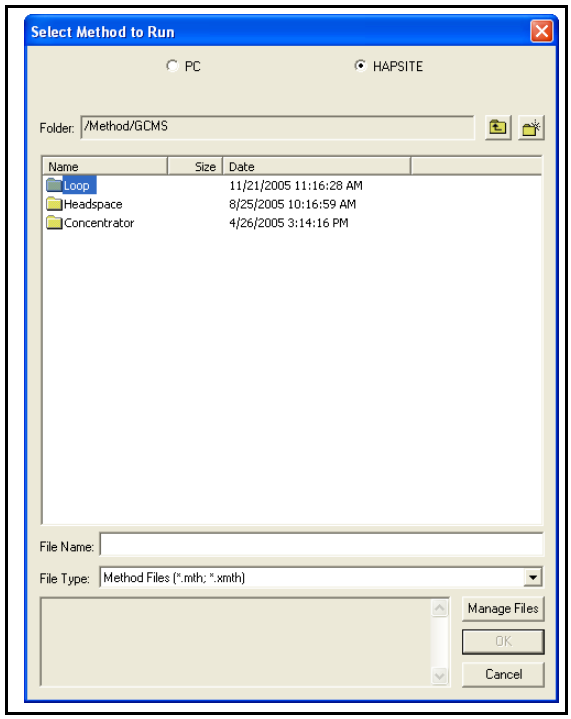
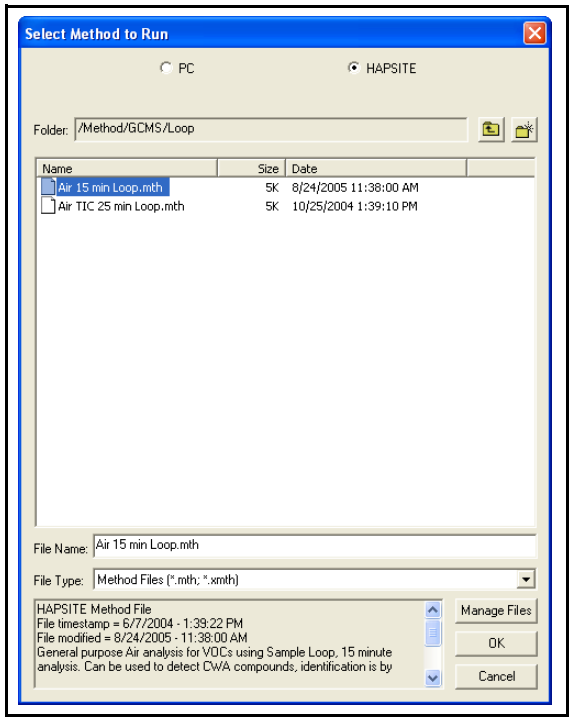
4 Double-click the **Loop** folder. See Figure 5-20.

Figure 5-20 Choosing Loop Folder



5 Double-click the **Air 15 min Loop** method. Or, select the method and click **OK**. See Figure 5-21.

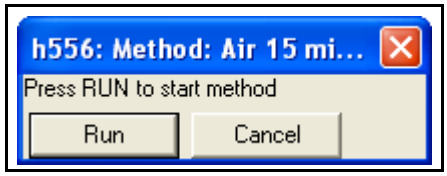
Figure 5-21 Selecting the Method



NOTE: At this point the HAPSITE will check pressures and temperatures. A prompt will appear when the HAPSITE is ready to run the method.

6 Click the **Run** button in the pop-up window of the software. See Figure 5-22.

Figure 5-22 Run Prompt



7 Hold the probe over the sample for the entire loopfill event.

CAUTION

Do not place the sample probe in liquids while sampling.

HINT: An audible sound indicates the sample pump has turned on and the word **Loopfill** will be displayed on the front panel in the bottom left corner. Hold the probe over the sample for this entire 60 second period.

8 Wait for the method to run to completion. the 3 plots shown in Figure 5-23 and Figure 5-24 show examples of data collection.

Figure 5-23 Air 15 min Loop Running

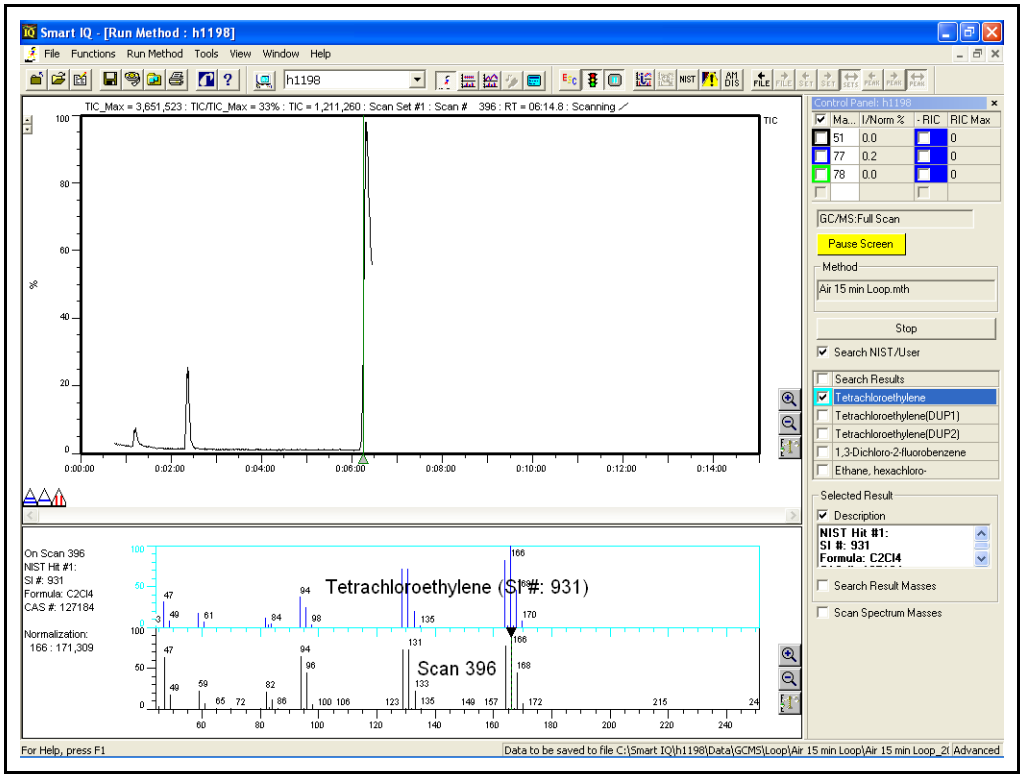
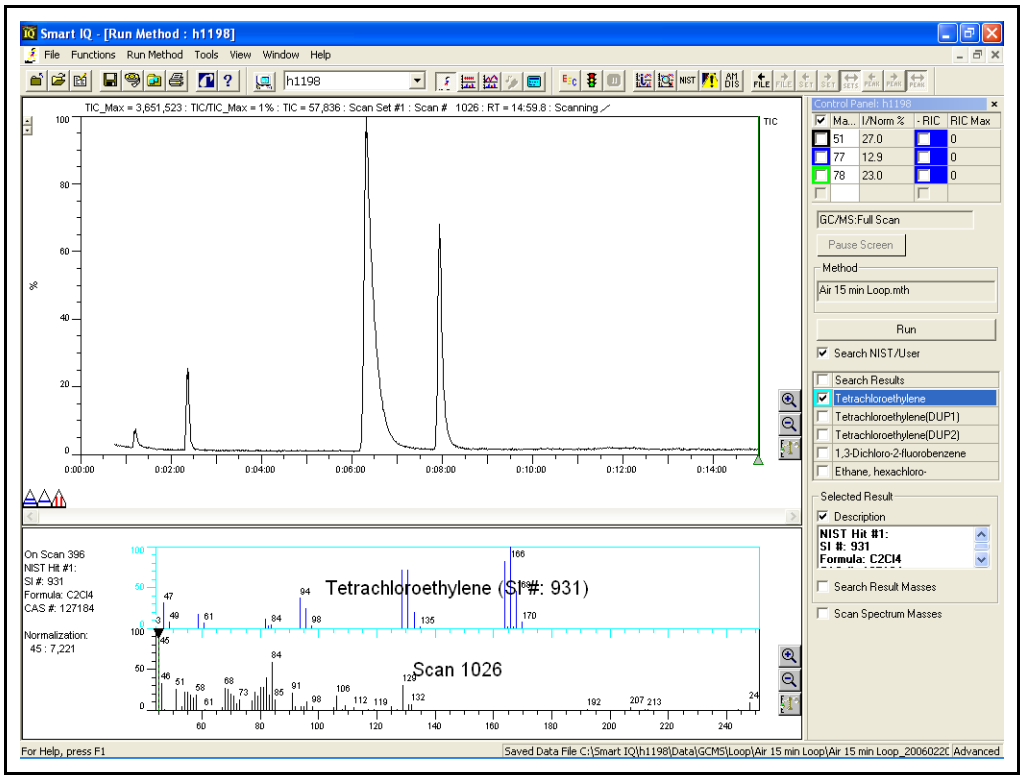


Figure 5-24 Complete Air 15 min Loop



9 Review results at the end of the run.

5.3.1 Quick Reference SOP — Running GCMS Loop Method

1 Double-click the **Smart IQ** icon to open the software.

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

3 Double-click the **GCMS** folder.

4 Double-click the **Loop** folder.

5 Double-click the **Air 15 min Loop** method.

6 Wait for heaters to gain control of set temperatures.

7 Click the **Run** button in the pop-up window of the software

8 Hold the probe over the sample for the entire **Loopfill** event.

9 Review data when run is complete.

5.4 GC/MS Mode with Tri-Bed Concentrator

This method is used for analyzing samples with concentration levels in the low part per billion to high part per trillion range. This method is used when the loop method fails to detect a chemical. Refer to Chapter 6, Methods for additional information on GC/MS methods.

NOTE: The Tri-Bed concentrator must be installed before making a GC/MS run in the Concentrator mode. Refer to Section 2.9.3, Installing the Tri-Bed Concentrator, on page 2-29 for instructions. Once installed, the Tri-Bed concentrator must be cleaned before sampling begins.

NOTE: The discontinued Carbopack Concentrator tube uses the same methods outlined below. To install the Carbopack Concentrator tube refer to Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31.

1 Open Smart IQ Software by double clicking on the **Smart IQ Icon**. See Figure 5-8.

Figure 5-25 Smart IQ Software Icon

2 From the Setup Page on the laptop select the **Run Method** icon by double clicking on the icon. See Figure 5-26.

Figure 5-26 Run Method Icon

3 Double-click the **GCMS** folder. See Figure 5-27.

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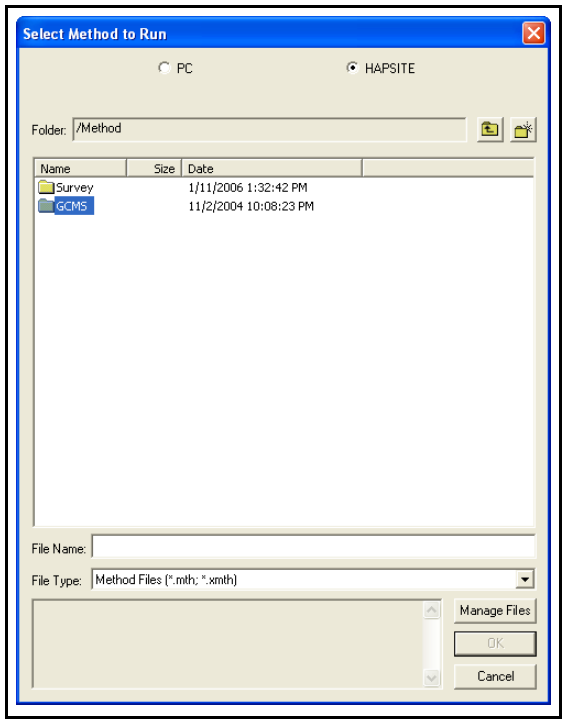
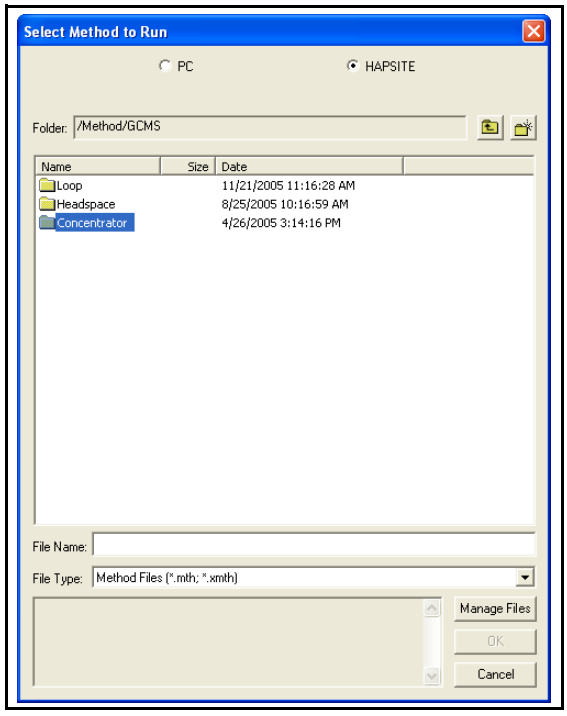
Figure 5-27 Selecting GC/MS Folder using the Methods Menu



4 Double-click the **Concentrator** folder. See Figure 5-28.

Figure 5-28 Selecting the Physical Configuration



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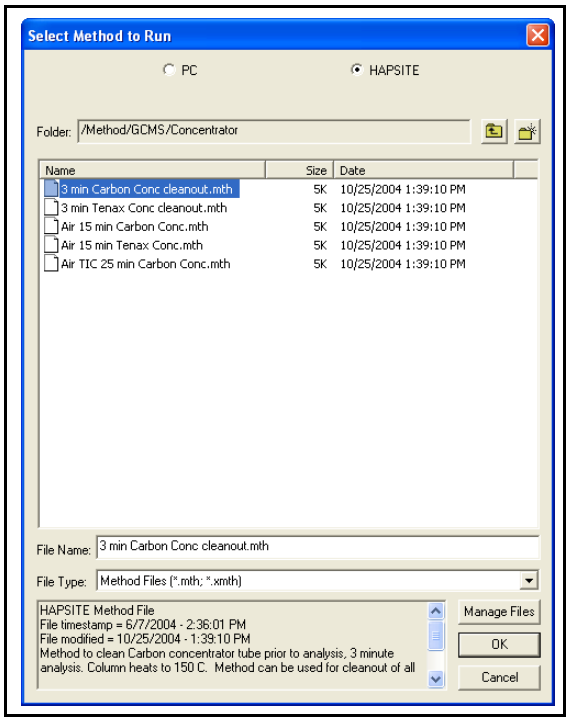
5 Select **3 min Carbon Conc Cleanout** and press **OK**. See Figure 5-29.

Figure 5-29 Selecting the 3 min Carbon Conc Cleanout Method



The system will raise the column temperature to 150 °C, which will take a few minutes. When all the zones are heated the **Run Method** prompt will be displayed. See Figure 5-30 and Figure 5-31.

Figure 5-30 Heater Warm-up for the 3 min Carbon Conc Cleanout

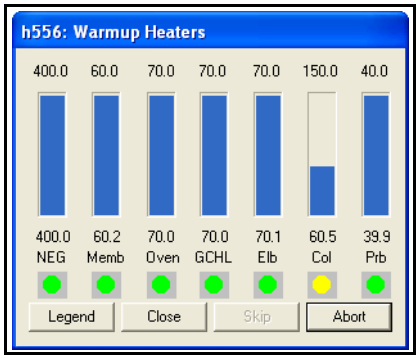
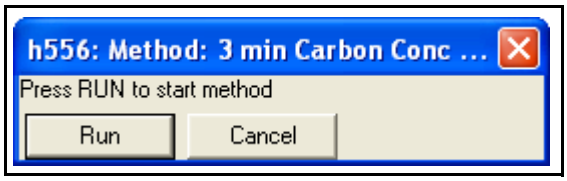


Figure 5-31 Run Prompt



6 Press the **RUN** button. This run will take three minutes to complete. The progress of the run can be seen on the laptop.

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NOTE: The **TIC_Max** number on the top left of the LCD must be less that 500,000 for the concentrator tube to be considered clean. See Figure 5-32. If the **TIC_Max** number is greater than 500,000, repeat the 3 min Carbon Conc Cleanout method until the **TIC_Max** number is less than 500,000. See Figure 5-33.

Figure 5-32 Clean 3 min Carbon Conc Cleanout Run

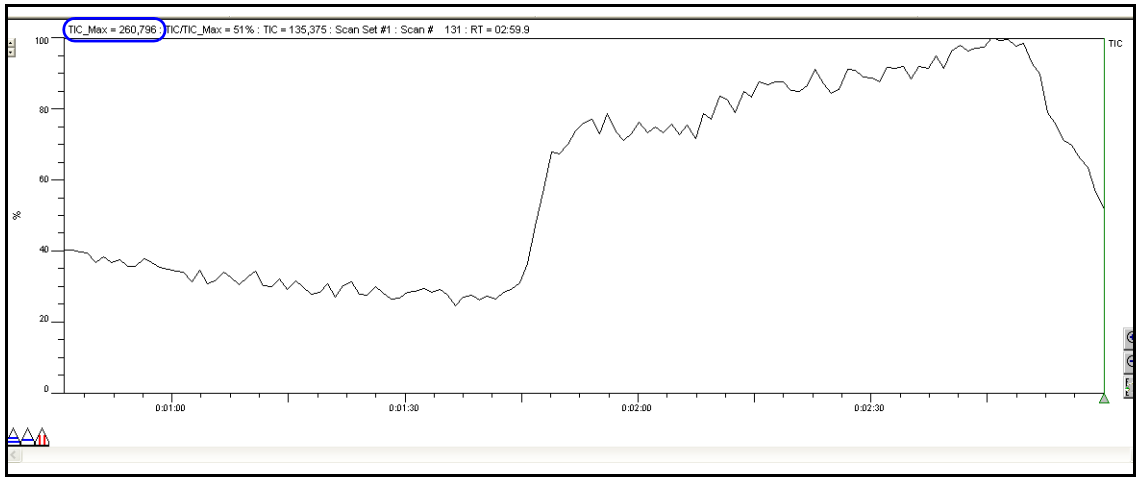
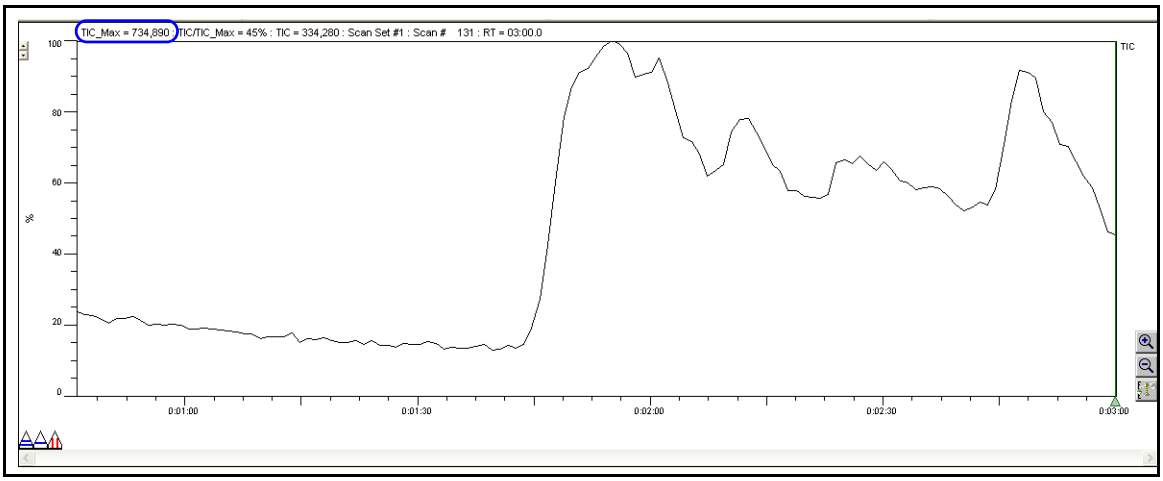


Figure 5-33 3 min Carbon Conc Cleanout Run - Further Cleanup Required



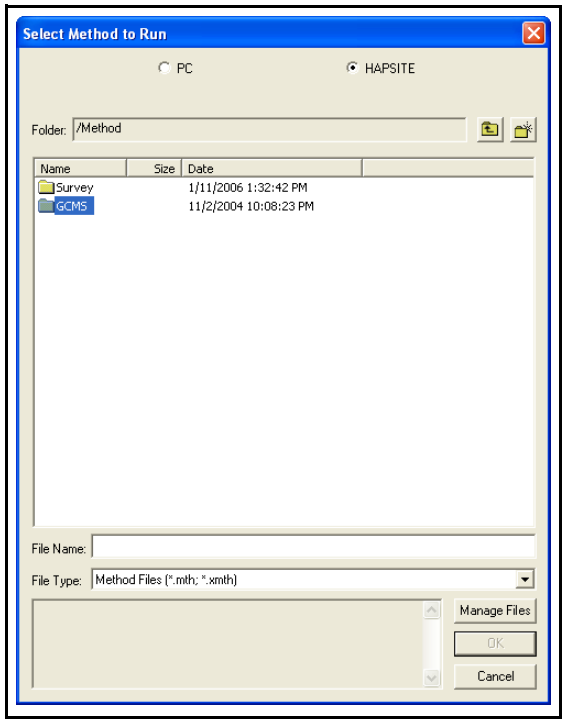
7 When the 3 min Carbon Conc Cleanout method is completed, close the Data Review Window.

8 From the Setup Page on the laptop select the **Run Method** icon by double clicking on the icon. See Figure 5-34.

Figure 5-34 Run Method Icon

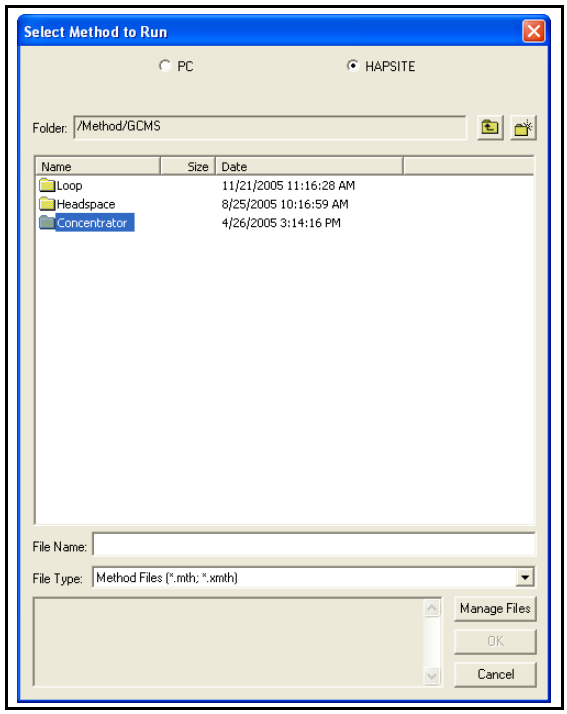
9 Double-click the **GCMS** folder. See Figure 5-35.

Figure 5-35 Selecting GC/MS Folder using the Methods Menu



10 Double-click the **Concentrator** folder. See Figure 5-36.

Figure 5-36 Selecting the Physical Configuration



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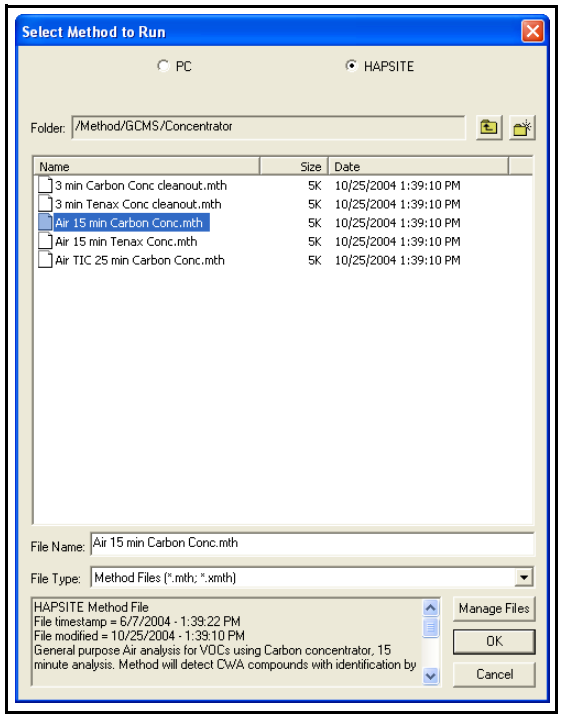
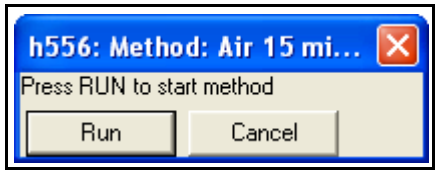
11 Highlight the **Air 15 min Carbon Conc** and then press **OK**. See Figure 5-37.

Figure 5-37 Selecting the Air 15 min Carbon Conc method



12 The software will check the pressures and temperatures and prompt when ready to run a sample. See Figure 5-38.

Figure 5-38 Air 15 min Carbon Conc Run Prompt



13 Hold the Probe over the sample and press **RUN**.

CAUTION

Do not place the sample probe in liquids while sampling.

14 The sampling process takes two minutes — one minute to flush the system and one minute to collect the sample. The probe needs to be held over the sample for the entire two minutes while the Sample Pump is running. The bottom left corner will say **LinePurge,** then **Concfill** on the Front Panel display.

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CAUTION

The concentrator feature is designed to enhance HAPSITE sensitivity when analyzing low concentration samples. The accumulated sample VOCs are transferred from the concentrator adsorbent bed to the HAPSITE as a concentrated sample. Care should be taken to avoid overloading the HAPSITE and causing excessive carryover of VOCs in subsequent runs.

5.4.1 Quick Reference SOP — Tri-Bed Concentrator Cleanout

1. Start Smart IQ and double-click **Run Method.**
2. Double-click the **GCMS** folder.
3. Double-click the **Concentrator** folder.
4. Highlight **3 min Carbon Conc Cleanout** and press **OK**.
5. Wait for heaters to reach set temperatures.
6. When prompted press **RUN**.

HINT: If the **TIC_Max** count is less than 500,000 at the end of this run, proceed to the **Air 15 min Carbon Conc** method. If the **TIC_MAX** count is greater than 500,000, rerun the **3 min Carbon Conc Cleanout** method.

5.4.2 Quick Reference SOP — Tri-Bed Concentrator Method

1. The 3 min Carbon Conc Cleanout method must be run prior to this method. Refer to Section 5.4.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 5-24**.**
2. Start Smart IQ and double-click **Run Method.**
3. Double-click the **GCMS** folder.
4. Double-click the **Concentrator** folder.
5. Highlight **Air 15 min Carbon Conc** method and press **OK**.
6. Wait for heaters to reach set temperatures.
7. When prompted press **RUN**.
8. Hold the probe over the sample for both the one minute **LinePurge** and the one minute **Concfill** event.
9. Wait for run to complete to view results.

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5.5 GC/MS Mode with Tenax Concentrator

This method is used for analyzing samples with concentration levels in the low part per billion to high part per trillion range. This method is used when the loop method fails to detect a chemical. This method is similar to the Tri-Bed concentrator method, but uses a Tenax adsorbent in the concentrator. Refer to Chapter 6, Methods for additional information on GC/MS methods.

NOTE: Before a GC/MS can be run in this Concentrator mode, the Tenax concentrator must be installed. Refer to Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31 for instructions. Once installed, the Tenax concentrator must be cleaned before sampling begins.

1 Double-click the **Smart IQ** software icon. See Figure 5-39

Figure 5-39 Smart IQ Icon

2 Double-click on the **Run Method** icon. See Figure 5-40.

Figure 5-40 Run Method Icon

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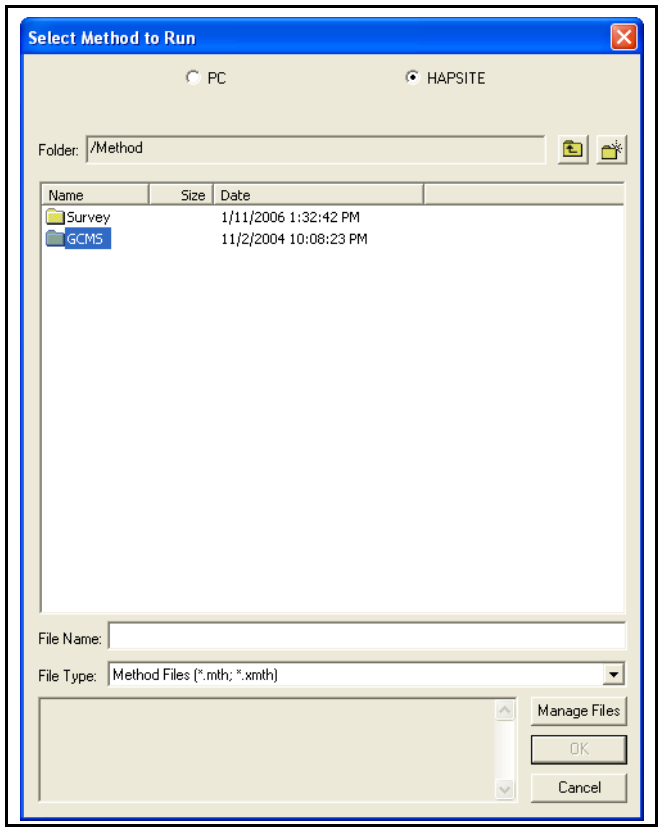
3 Double-click the **GCMS** folder. See Figure 5-41.

Figure 5-41 Choosing the Mode of Operation



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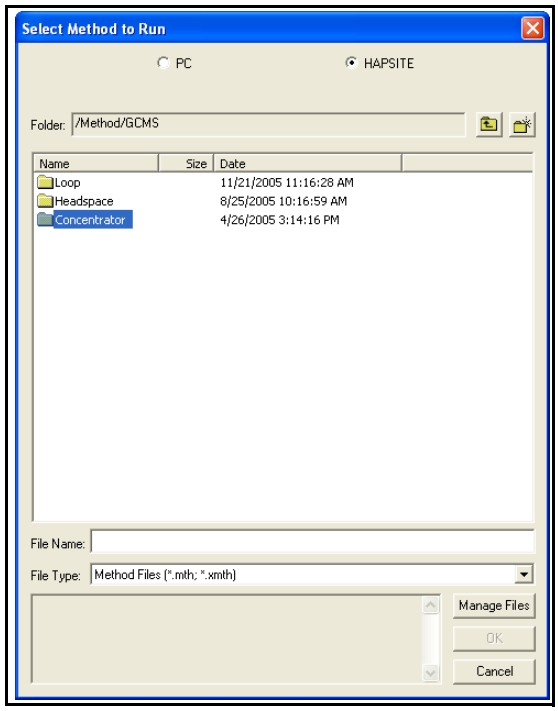
4 Double-click the **Concentrator** folder. See Figure 5-42.

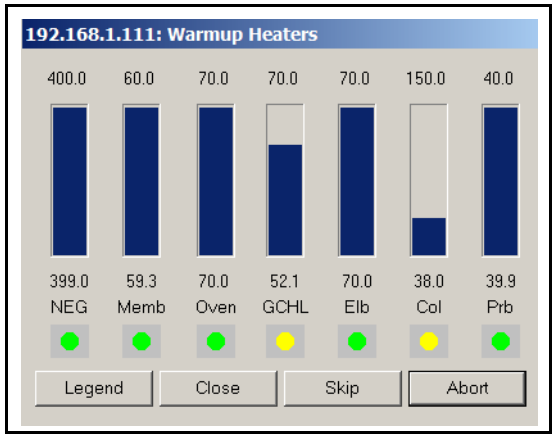
Figure 5-42 Selecting the Physical Configuration



5 Double-click the **3 min Tenax Conc Cleanout.mth** method.

NOTE: The system will raise the column temperature to 150 °C, which will take a few minutes. When all the zones are heated, the **Run Method** prompt will be displayed. See Figure 5-43.

Figure 5-43 3 min Tenax Conc Cleanout Warm-up

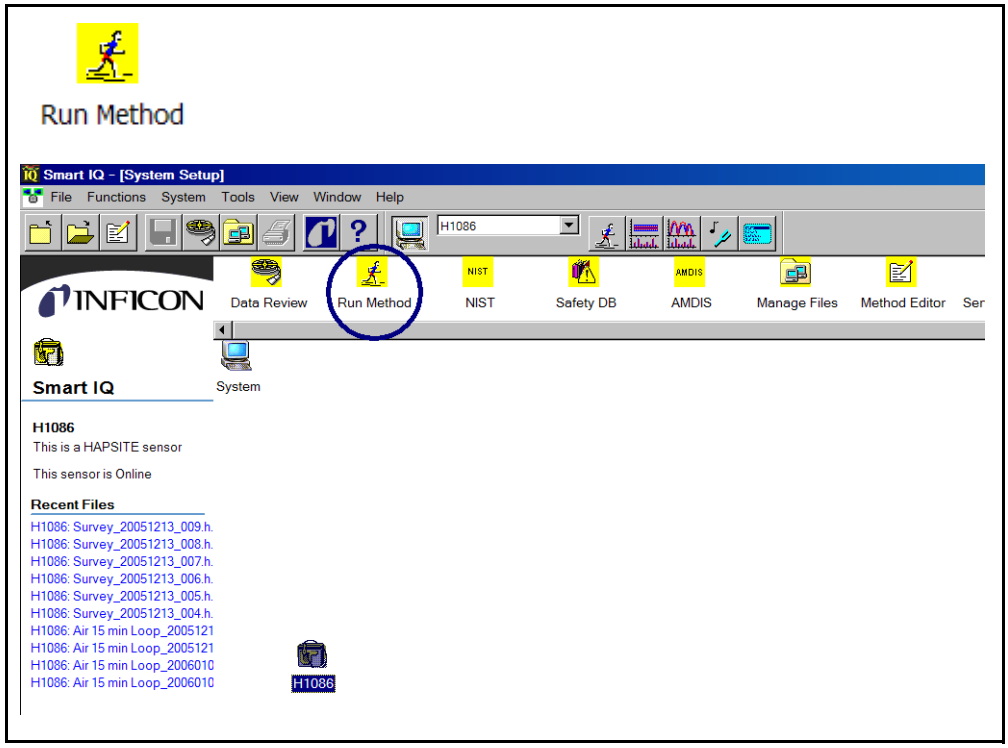


6 Click the **RUN** button displayed in the pop-up window on the laptop. This run will take three minutes to complete.

NOTE: The **TIC_Max** number must be less than 500,000 for the concentrator tube to be considered clean. If the **TIC_Max** number is greater than 500,000, repeat the **3 min Tenax Conc Cleanout.mth** method until the **TIC_Max** number is less than 500,000.

7 Double-click the **Run Method** icon. See Figure 5-44.

Figure 5-44 Software Icons and Setup Page



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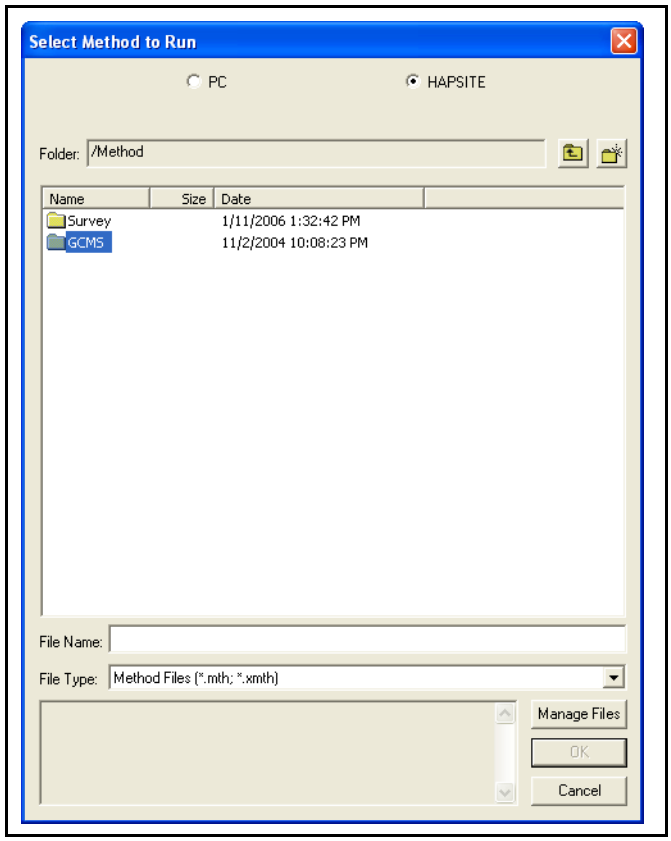
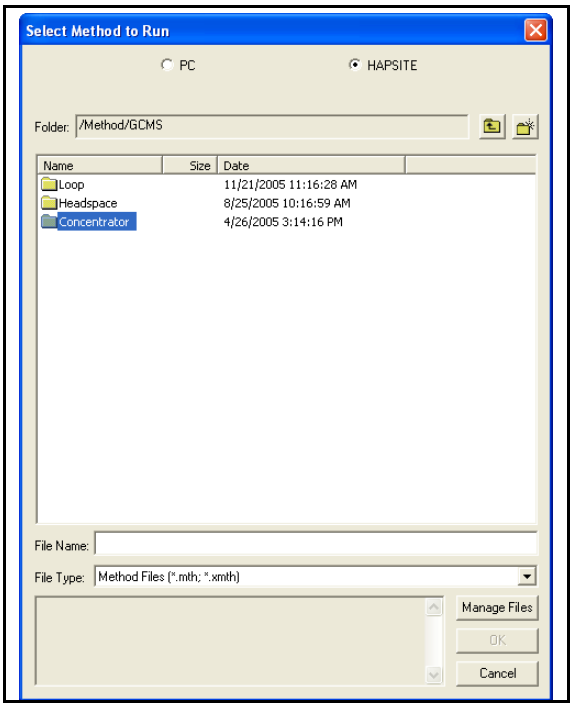
8 Double-click the **GCMS** folder. See Figure 5-45.

Figure 5-45 Choosing the Mode of Operation



9 Double-click the **Concentrator** folder. See Figure 5-46.

Figure 5-46 Selecting the Physical Configuration



10 Select the **Air 15 min Tenax Conc.mth** method and click **OK**.

11 Click **Run** on the pop-up window in the software.

12 Once **Run** is selected, hold the probe over the sample the entire time the sample pump is running from the Linepurge until the Concfill event is completed. This takes two minutes.

NOTE: The software will automatically open up a data review window, as the sample is running, to show the chromatogram. Peaks can be identified as shown during the run. See Chapter 9, Data Review, for details on viewing the results.

CAUTION

Do not place the sample probe in liquids while sampling.

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5.5.1 Quick Reference SOP — Tenax Cleanout

1. Double-click the **Smart IQ** software icon.
2. Double-click on the **Run Method** icon.
3. Double-click the **GCMS** folder.
4. Double-click the **Concentrator** folder.
5. Double-click the **3 min Tenax Conc Cleanout** method.
6. Click the **RUN** button displayed in the pop-up window on the laptop. This run will take three minutes to complete.

NOTE: The **TIC_Max** number must be less than 500,000 for the concentrator tube to be considered clean. If the **TIC_Max** number is greater than 500,000, repeat the **3 min Tenax Conc Cleanout.mth** method until the **TIC_Max** number is less than 500,000.

5.5.2 Quick Reference SOP — Tenax Concentrator Method

NOTE: The 3 min Tenax Conc Cleanout method must be run prior this method. Refer to Section 5.5.1, Quick Reference SOP — Tenax Cleanout, on page 5-31.

1. Double-click the **Smart IQ** software icon.
2. Double-click on the **Run Method** icon.
3. Double-click the **GCMS** folder.
4. Double-click the **Concentrator** folder.
5. Double-click the **Air 15 min Tenax Conc** method.
6. Wait for heaters to gain control of set temperatures.
7. Click **Run** on the pop-up window in the software.
8. Hold the Probe over the sample for the entire **Linepurge** and **Concfill** events. This takes two minutes.
9. Review results when the run is completed.

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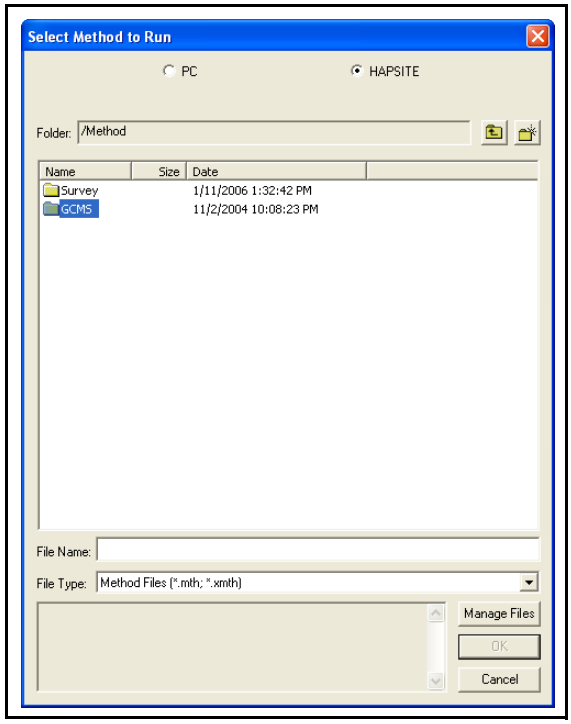
5.6 GC/MS Mode with Headspace Sampling System and Sample Loop Installed

The Headspace Sampling System is used to test liquid and soil samples. Refer to Chapter 13, Headspace Sampling System for more information on the Headspace System. Refer to Section 2.6, Headspace Sampling System, on page 2-12 for assembly instructions. Refer to Chapter 6, Methods for additional information on GC/MS methods.

1. Double-click the **Smart IQ** icon.
2. Double-click on the **Run Method** icon.
3. Double-click the **GCMS** folder. SeeFigure 5-47.

Figure 5-47 Choosing the Mode of Operation



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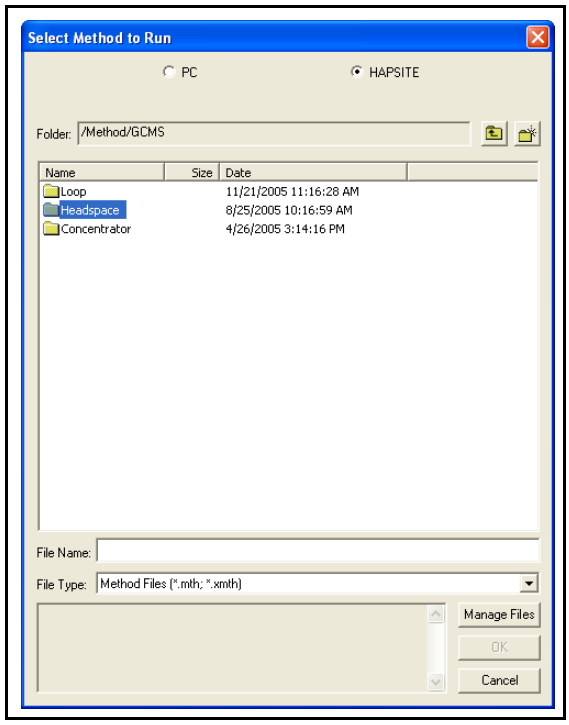
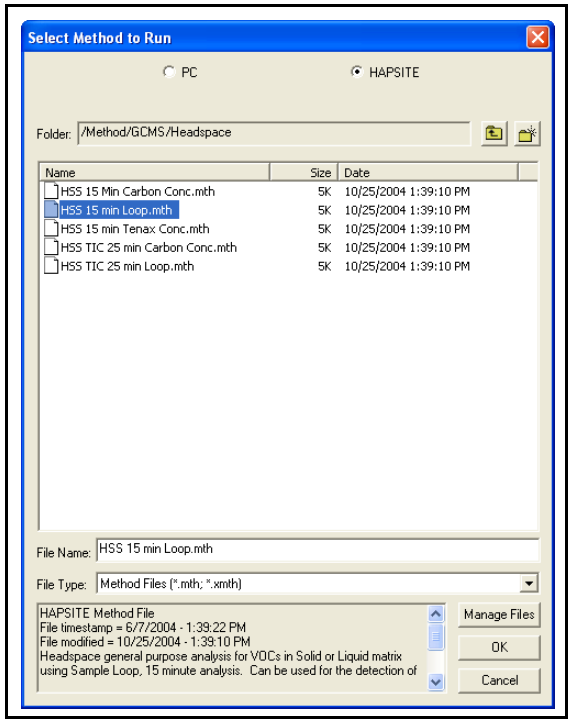
4 Double-click the **Headspace** folder. See Figure 5-48.

Figure 5-48 Selecting the Physical Configuration



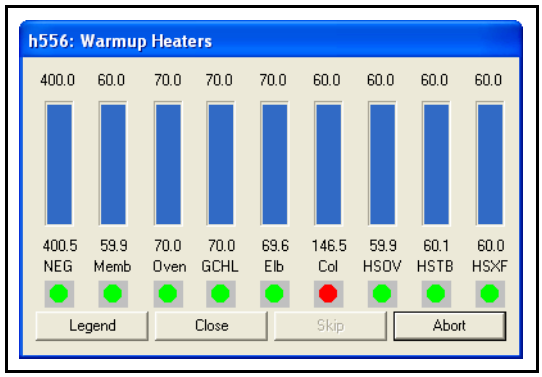
5 Double-click the **HSS 15 min Loop.mth** method. See Figure 5-49.

Figure 5-49 Selecting the Headspace Loop Method



6 Wait for the heaters to reach the set temperatures (see Figure 5-50).

Figure 5-50 Heater Display



7 Refer to Section 13.2.3, Loading the Wells, on page 13-10 for detailed instructions and information on loading the sample vials into the wells.

8 Place the headspace needle in the 40 mL vial that contains the sample. Gently depress into sample vial. See Figure 5-51.

WARNING

The headspace needle is very sharp.

Figure 5-51 Headspace Needle

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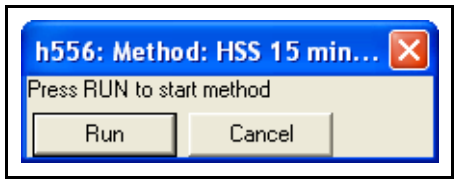
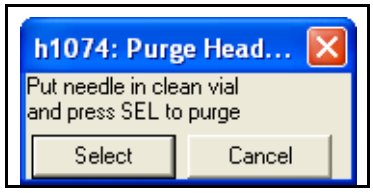
9 Click the **Run** button. See Figure 5-52.

Figure 5-52 Run Button



10 When prompted at the end of the run, place the headspace needle in a clean, empty purge vial and press **Select**. See Figure 5-53.

Figure 5-53 Purge Vial Prompt



11 To analyze the data, see Chapter 9, Data Review.

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5.6.1 Quick Reference SOP — GC/MS Mode with HSS and Sample Loop

1. Double-click the **Smart IQ** software icon.
2. Double-click the **Run Method** icon.
3. Double-click the **GCMS** folder.
4. Double-click the **Headspace** folder.
5. Double-click the **HSS 15 Min Loop** method.
6. Wait for heaters to gain control of set temperatures
7. Following a 20 minute sample temperature equilibration in the HSS oven, gently depress the headspace needle into the 40 mL sample vial.
8. Click the **Run** button in the pop-up window.
9. When prompted, place the headspace needle in the purge vial and press **Sel**.
10. To analyze the data, see Chapter 9, Data Review.

5.7 GC/MS Mode with Headspace Sampling System and Concentrator

This method is used for analyzing samples with concentration levels in the low part per billion to high part per trillion range. This method is used when the Headspace Sampling System with the Sample Loop method fails to detect a chemical. Refer to Chapter 6, Methods for additional information on GC/MS methods.

CAUTION

The concentrator feature is designed to enhance HAPSITE sensitivity when analyzing low concentration samples. The accumulated sample VOCs are transferred from the concentrator adsorbent bed to the HAPSITE as a concentrated sample. Care should be taken to avoid overloading the HAPSITE and causing excessive carryover of VOCs in subsequent runs.

1. Refer to Chapter 13, Headspace Sampling System for more information on the Headspace System. Refer to Section 2.6, Headspace Sampling System, on page 2-12 for assembly instructions.
2. Follow the instructions in Section 2.9.3, Installing the Tri-Bed Concentrator, on page 2-29 or Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31 to install the concentrator tube.

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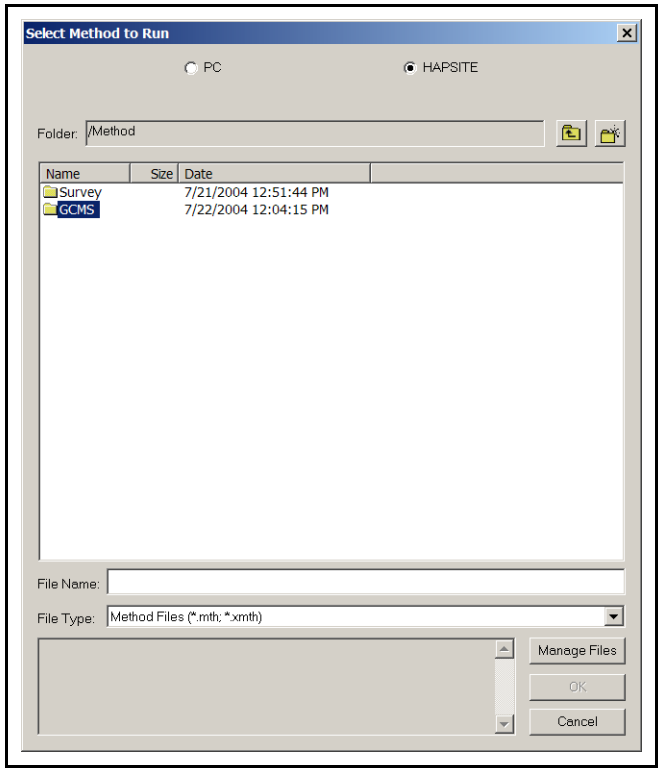
3 Follow the instructions in Section 5.4.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 5-24; or Section 5.5.1, Quick Reference SOP — Tenax Cleanout, on page 5-31; depending on the type of concentrator installed.

NOTE: Concentrator Cleanout methods require the probe to be attached.

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

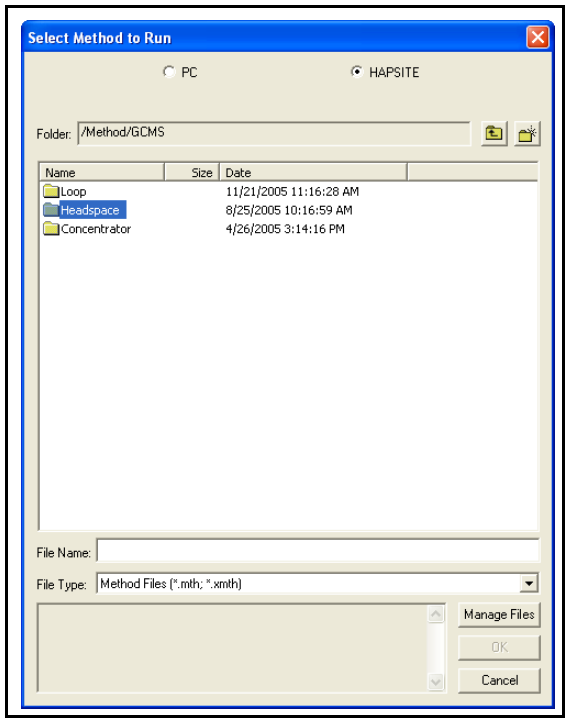
5 Double-click the **GCMS** folder. See Figure 5-47.

Figure 5-54 Choosing the Mode of Operation



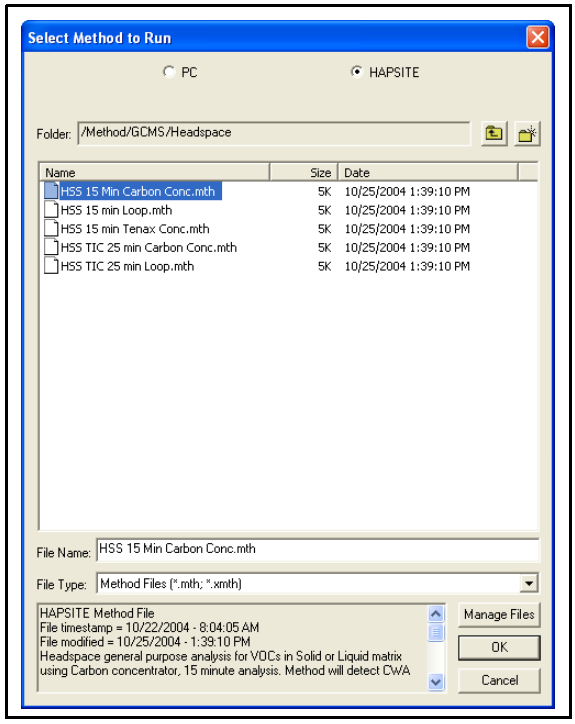
6 Double-click the **Headspace** folder. See Figure 5-48.

Figure 5-55 Selecting the Physical Configuration



7 Select **HSS 15 Min Carbon Conc or HSS 15 min Tenax Conc** method depending on which concentrator is installed. See Figure 5-56.

Figure 5-56 Selecting the HSS 15 Min Carbon Conc Method



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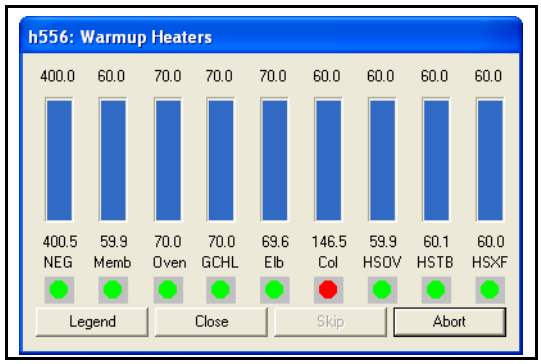
8 Wait for temperatures to stabilize. See Figure 5-57.

Figure 5-57 HSS Heater Display



9 The sample must be heated for 20 minutes prior to sampling.

10 Place the headspace needle in the 40 mL vial that contains the sample. Gently depress into sample vial. See Figure 5-58. Refer to Section 13.2.3, Loading the Wells, on page 13-10.

WARNING

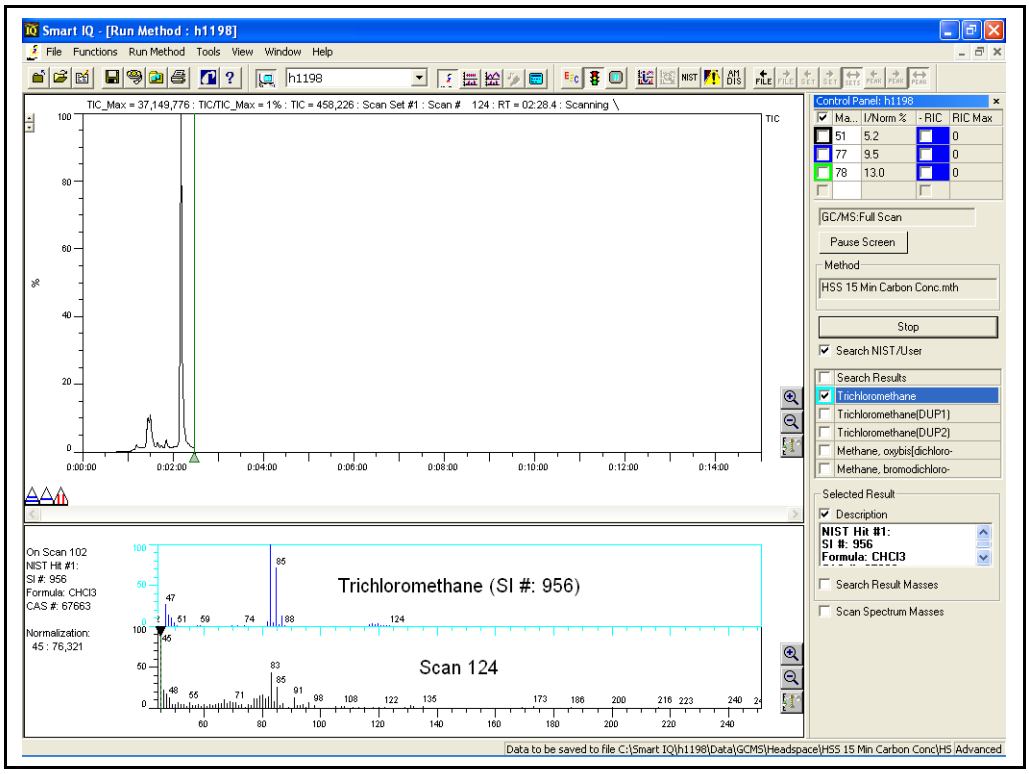
The headspace needle is very sharp.

Figure 5-58 Loading the Wells

11 Press the **Run** button.

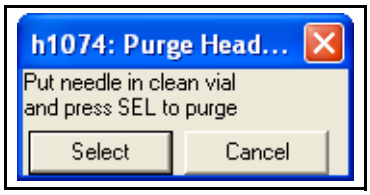
12 Wait for method to run. See Figure 5-59.

Figure 5-59 Sample Run in Process



13 When prompted at end of run, place the headspace needle in a clean, empty purge vial and press **Sel**. See Figure 5-60.

Figure 5-60 Purge Needle Request



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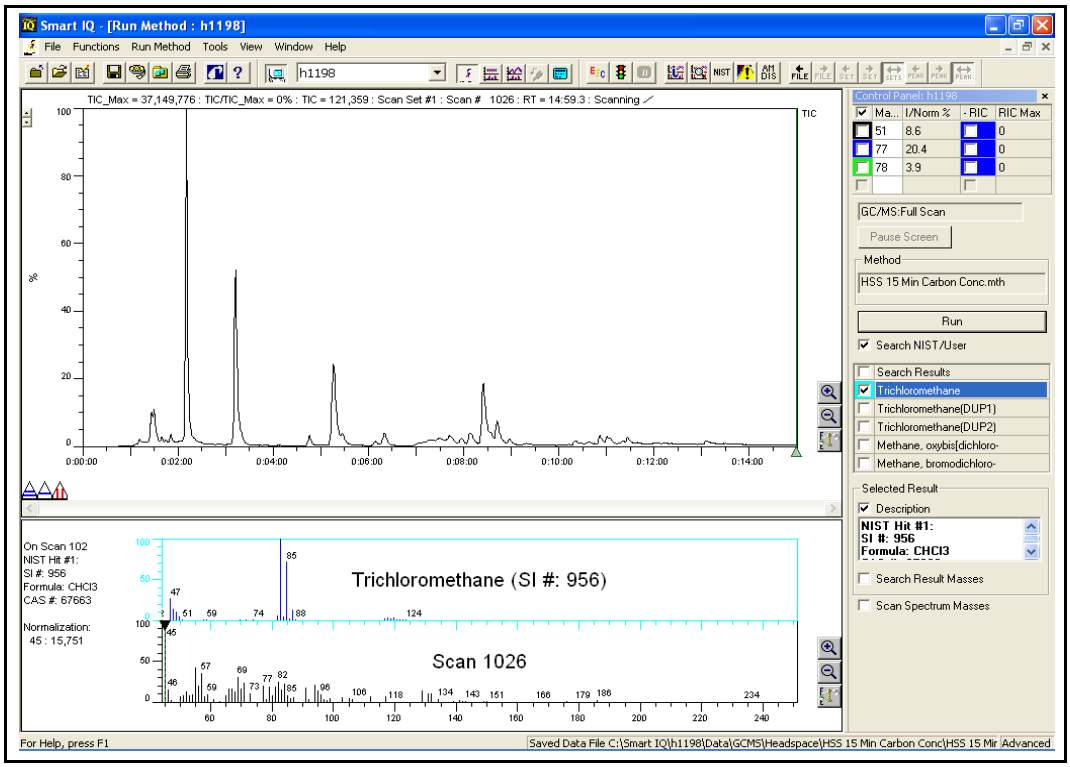
14 Review results at the end of the run. See Figure 5-61.

Figure 5-61 Completed Run



5.7.1 Quick Reference SOP - GC/MS Mode with HSS and Concentrator

1 Refer to Chapter 13, Headspace Sampling System for more information on the Headspace System. Refer to Section 2.6, Headspace Sampling System, on page 2-12 for assembly instructions.

2 Follow the instructions in Section 2.9.3, Installing the Tri-Bed Concentrator, on page 2-29 or Section 2.9.4, Installing the Tenax or Carbopack Concentrator, on page 2-31 to install the concentrator tube.

3 Follow the instructions in Section 5.4.1, Quick Reference SOP — Tri-Bed Concentrator Cleanout, on page 5-24; or Section 5.5.1, Quick Reference SOP — Tenax Cleanout, on page 5-31; depending on the type of concentrator installed.

4 Double-click the **Smart IQ** icon (unless already running).

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

6 Double-click the **GCMS** folder.

7 Double-click the **Headspace** folder.

8 Select **HSS 15 Min Carbon Conc or HSS 15 min Tenax Conc** method depending on which concentrator is installed.

9 Wait for temperatures to stabilize.

10 Following a 20 minute sample temperature equilibration in the HSS oven, gently depress the headspace needle into the 40 mL sample vial.

11 Wait for the method to run.

12 When prompted at end of run, place the headspace needle in the purge vial and press **Sel**.

13 Review results at the end of the run.

5.8 SituProbe Methods

Refer to the *SituProbe Purge and Trap System Operating Manual* for information on running SituProbe methods.

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Chapter 6
Methods

6.1 Introduction to Methods

The versatility of the HAPSITE lies in the variety of methods available. The HAPSITE can be run in GC/MS mode, MS only mode ("Survey"), and uses various sampling accessories to extend its capabilities. The accessories include concentrator tubes, the Headspace Sampling System and the SituProbe. The following chapter describes the various sampling methods.

6.1.1 Sensitivity

The sensitivity of the HAPSITE is based upon the current configuration and sampling mode chosen. The Survey Mode is the least sensitive, requiring levels of greater than 10 ppm (parts per million) for detectability. The sample loop with the probe and GC/MS methods is able to detect levels in the low ppm to high ppb (parts per billion) ranges. With a concentrator tube installed, using the probe and GC/MS methods, the HAPSITE can detect low ppb to high ppt (parts per trillion) levels. The sample loop with the Headspace Sampling System using GC/MS methods can detect down to 5 to 10 ppb and even lower with the concentrator installed.

6.2 Survey Method

Survey is used to quickly screen a location for volatile compounds. The sample is drawn in through the probe and sent directly to the Mass Spectrometer, bypassing the GC, and providing quick response. The survey mode of sample collection is also referred to as MIMS (Membrane Interface Mass Spectrometry). The quick response of a survey method is due to the direct flow of the sample into the mass spectrometer, without separation of the components by the Gas Chromatograph.

Survey Methods can provide tentative identification of compounds by either extracting target mass spectra from the MS response or as a result of searching the total MS response against the AMDIS or NIST library. Survey Methods, when run from the HAPSITE, also provide an indication of the concentrations of VOCs based on the response of the TIC (Total Ion Count). The LCD of the HAPSITE provides a real time plot of response vs. sampling time. Survey Methods can be Selected Ion Monitoring (SIM) or Full Scan methods. The sensitivity of a survey method in full scan will be approximately 10 ppm or greater. A Survey SIM method gives an improved level of sensitivity compared to a Full Scan method. These sensitivity ranges should be viewed as general guidelines, as the sensitivity of individual compounds can vary.

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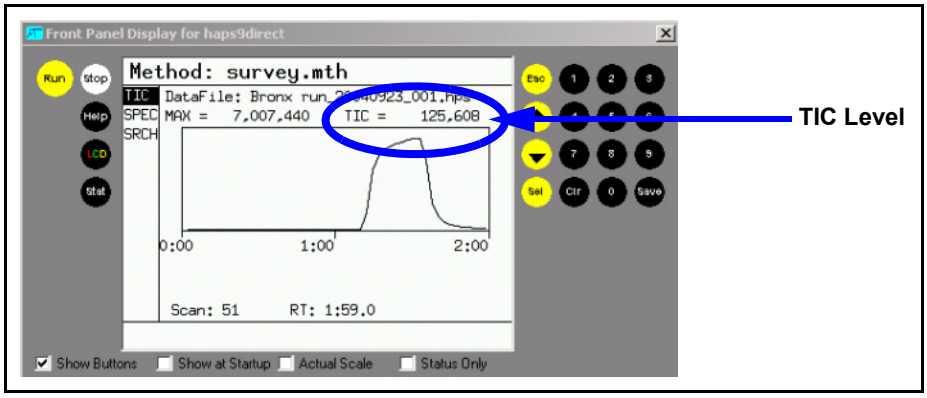
CAUTION

All unknown samples should first be collected with the Survey Method to estimate the total VOC response. The Survey Method allows the tester to gain knowledge of how far away to hold the probe from the sample and if a concentrator needs to be used.

The sampling procedure for a Survey run is to first clear the survey line and obtain a background signal level by sampling for 1 minute away from the suspected VOC source. The source should be sampled for up to 1 minute, depending on the result. If the TIC count remains under 5,000,000 then continue to sample for up to 1 minute. If the TIC count increases above 5,000,000, sample for 15 seconds and then allow the TIC graph to return to the baseline level. If the TIC count increases above 10,000,000 then move back from the source or discontinue sampling. Allow the TIC to return to the background level before stopping the run. See Figure 6-1, Running Survey Method from the Front Panel, on page 6-2.

HINT: Refer to section 3.3, Survey Mode, on page 3-18 and section 5.2, Survey Mode, on page 5-8 for additional information on running methods.

Figure 6-1 Running Survey Method from the Front Panel



MAX . . . . . Is the maximum signal count for the TIC in the window. The TIC is an indication of the level of VOCs present at the source.

TIC . . . . . Is the current TIC level.

RT . . . . . the current elapsed time of the run.

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6.2.1 Building a Survey Method Library File

Survey methods can be designed for data collection in three manners:

- without identification.
- qualitative analysis and identification based on match with the AMDIS library.
- Quantitative/Qualitative analysis, identification and quantification from a target library and unknown identification using the AMDIS library.

The process of building a survey method is best accomplished by preparing and running individual standards for the target compounds at the desired concentration levels. Survey methods can be calibrated at a single level or over a concentration range. The accuracy of a survey method is limited by the manner in which the data is collected and the external calibration technique. Survey method target libraries can be built by running multiple compounds in a single run; however, the user must edit the combined spectrum, selecting the appropriate mass fragments for each compound. Compounds that share mass fragments cannot be run in the same standard.

6.2.1.1 Creating Survey Methods for Target Compounds

Collection of survey data is controlled by the method. Survey methods, like GC/MS methods, are generated or modified using the Method Editor. The Method Editor is covered in detail in Chapter 11, Method Editor.

6.2.1.2 Building a Survey Target Compound Library

The library is built using the Calibrate Function. Calibrate is described in detail in Refer to Chapter 12, Target Compound Methods. The Special features of building a Target compound Method for Survey are detailed in the following example.

Calibration samples must be collected prior to building the library. When collecting the calibration runs enter the concentration of the calibration standard and the units in the Data File Info Header. The Data File Info Header is accessed by selecting the Data File Info button from the toolbar in the Data Review Window. See section 9.3, Data Review Toolbar, on page 9-5. See Figure 6-2.

 . . . . . Access Data File Info icon.

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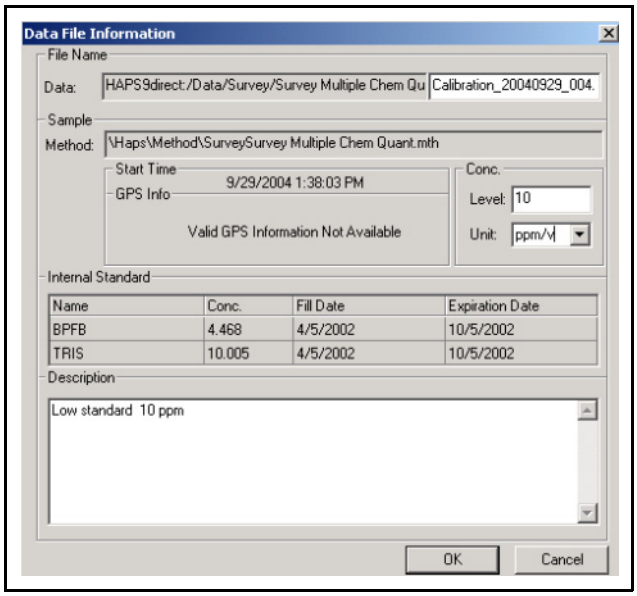
Figure 6-2 Data File Information Page



During the Calibration run, enter the concentration level of the calibration standard and select the corresponding units.

A description can be entered to help identify the sample.

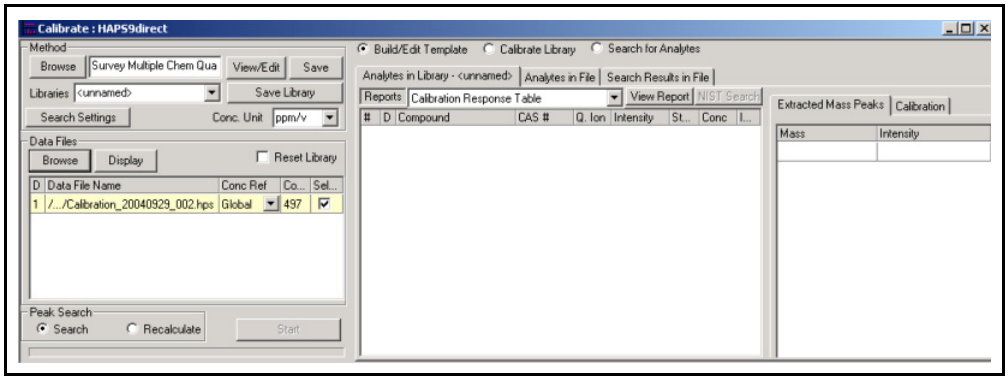
Open the Calibrate Function using the Toolbar Icon or the drop down menu. Select **Survey** as the file type and select **OK**. The File selection dialog box will be displayed. Locate and select the Method that was used to collect the calibration runs.

Use the **Browse** button in the Data Files section to select and open the data file collected during the calibration run. This file will be used to build the target library template. See Figure 6-3.

Highlighting the data file and pressing the **Display** button will display the calibration run.

NOTE: The best way to work with the graphical data is to expand the plot to full screen.

Figure 6-3 Calibration Window



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The spectrum of the analyte must be recorded to the target compound library. The spectrum is recorded by placing the scan cursor on the response curve (e.g., the TIC) at a location that represents the concentration of the calibration standard. See Figure 6-4.

Figure 6-4 Placing Cursor on Response Curve at Location of Calibration Standard

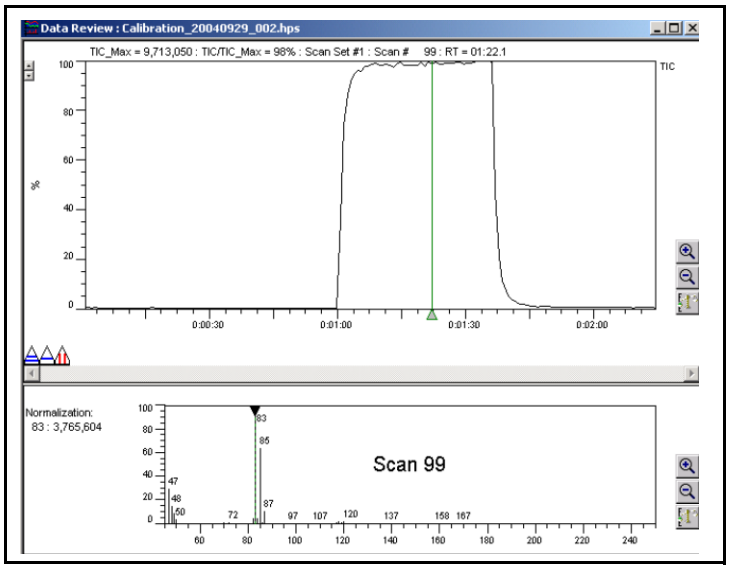
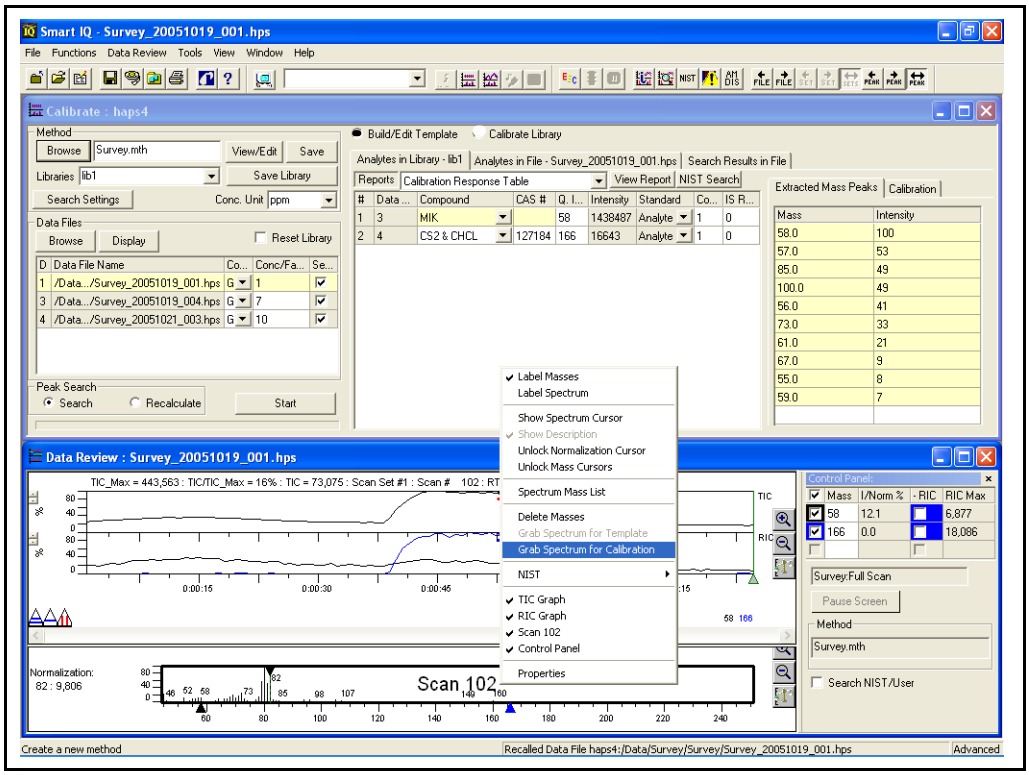


Figure 6-5 Grab Spectrum for Template Window



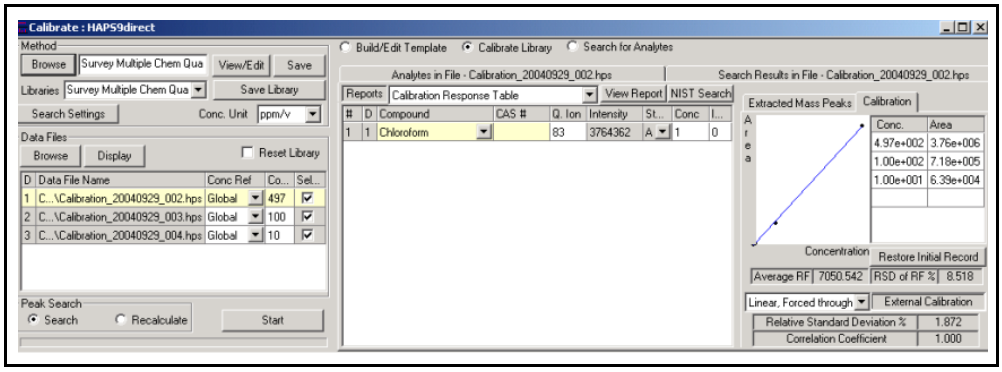
The spectrum must be recorded to the library. Highlight the spectrum window and click the right mouse button to bring up the spectrum menu. Highlight **Grab Spectrum for Template** to record the spectrum. Refer to Figure 6-5.

The compound is displayed in the **Analytes in Library** list and the extracted mass values are displayed. A compound name can be entered and the extracted mass list can be "cleaned up". To edit the extracted mass list, all masses with intensity below 15% should be deleted. To delete a mass, click once on the mass in the **Extracted Mass Peaks** list and press the delete key. After adding all analytes to the template, the library can now be calibrated by checking the **Selection** box for the data file, selecting **Calibrate Library,** and then pressing **Start.**

The library should be saved at this time, the **Save Library** button under Method will display the dialog box to save the library. The library is linked to the method and can be saved using any name.

Additional calibration points can be added to the curve by using the **Browse** button to select additional data files and then processing them as described above, and saving them to the library. See Figure 6-6.

Figure 6-6 Additional Calibration Points



Additional compounds are added by following the same steps.

NOTE: The Reset Library function is used to delete all calibration curves for all compounds and should only be checked when this action is necessary.

6.3 GC/MS Methods

GC/MS is a reliable means of identifying volatile organic compounds. The sample is drawn in through the probe or other sampling accessory and passed through the GC, where the sample is separated by boiling point and sent to the Mass Spectrometer. The GC separates VOC mixtures into individual component for Mass Spectrometer detection. Compounds are positively identified by GC retention time and mass spectra.

GC/MS Methods provide identification of compounds by extracting target mass ions from the MS response or as a result of searching the total MS response against the AMDIS and/or NIST libraries. GC/MS Methods can use Selected Ion

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Monitoring (SIM) or Full Scan MS modes. The sensitivity of a GC/MS Loop method (full scan) will be in the approximate range of high ppb to low ppm. The sensitivity of a GC/MS concentrator method (full scan) will be in the range from high ppt to low ppb. By comparison, a SIM method will always give slightly improved sensitivity over a GC Loop or concentrator method as these methods focus on a limited set of masses for detection. The sensitivity is related to the compound and sampling system; the above are general guidelines.

CAUTION

All unknown samples should first be collected with the Survey Method to avoid saturating the GC. The Survey Method allows the tester to gain knowledge of how far away to hold the probe from the sample and if a concentrator needs to be used.

The sampling procedure for a GC/MS method is dependent on the HAPSITE configuration:

Sample Loop . . . . . Refer to section 3.4, GC/MS Mode with Loop, on page 3-23 and section 5.3, GC/MS Mode with Loop, on page 5-13 for additional information on running methods with the Sample Loop.

Concentrator Tube . . . . . Refer to section 3.5, GC/MS Mode with Tri-Bed Concentrator, on page 3-28 through section 3.6, GC/MS Mode with Tenax Concentrator, on page 3-33 and section 5.4, GC/MS Mode with Tri-Bed Concentrator, on page 5-18 through section 5.5, GC/MS Mode with Tenax Concentrator, on page 5-25 for methods using concentrator tubes.

Headspace Sampling System . . . . Refer to section 3.7, GC/MS Mode with Headspace Sampling System and Sample Loop in Portable Mode, on page 3-36 through section 3.8, GC/MS Mode with Headspace Sampling System and Concentrator in Portable Mode, on page 3-40 and section 5.6, GC/MS Mode with Headspace Sampling System and Sample Loop Installed, on page 5-32 through section 5.7, GC/MS Mode with Headspace Sampling System and Concentrator, on page 5-36 for methods using the HSS.

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SituProbe . . . . . Refer to section 3.9, SituProbe, on page 3-46 and section 5.7.1, Quick Reference SOP - GC/MS Mode with HSS and Concentrator, on page 5-41 for methods using the SituProbe.

6.3.1 Building a GC/MS Method and Target Compound Library File

Collection of GC/MS data is controlled by the method. GC/MS methods are generated or modified using the Method Editor. The Method Editor is covered in detail in Chapter 11, Method Editor. The target compound library is built using the Calibrate Function. The calibrate function is described in detail in Chapter 12, Target Compound Methods.

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Chapter 7
Tune

7.1 Introduction to Autotune and Manual Tune

Ensuring the mass spectrometer (MS) performance requires the MS functionality to be checked at startup and after 8 hours of continuous operation. The process of verifying the function of the Mass Spectrometer is called Tune. Tune can be accomplished by either the Autotune program, where the system sets and adjust all parameters, or by a Manual Tune where the user sets the parameters.

The tune of a MS determines the quality of the mass spectrum produced by the system. A good quality spectrum is one which matches the reference spectrum from the National Institutes of Standards and Technology (NIST) library to give high similarity indexes, or with the Automated Mass Spectral De-convolution and Identification Software (AMDIS) libraries to provide high NET matches. The tune file contains the parameters that control the MS and is linked to a data acquisition method. Multiple Tune files can be created for specific methods/requirements. However, the default Tune is generally all that is required. The default Tune is stored on the HAPSITE as **`default.tun`**.

The parameters set in Tune that affect the quality of the spectrum include:

Base Peak Gain . . . . . Sets the sensitivity level of the MS.

Mass Axis Calibration . . . . . Mass Spectrometers measure Atomic Mass Units (AMU); Tune insures that the Mass Axis is accurately calibrated.

Ratio of Mass Peaks. . . . . The Mass Calibration status measures and records the ratio of mass fragments to preset values. The ratio of the mass peaks controls the quality of the mass spectrum generated by the HAPSITE.

Autotune and Manual Tune are accomplished using a calibration mixture in which the mass fragments (AMU) and the ratios of the mass fragments are known. The HAPSITE uses a mixture of two compounds that together provide mass fragments across the mass range of interest. The compounds are:

- 1,3,5-Tris (trifluoromethylbenzene)
- Bromopentafluorobenzene.

Proper tuning of the MS insures good quality library matches.

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7.2 Autotune

There are two versions of the Autotune program: Short and Long. The Short Autotune program is the daily maintenance tune of the HAPSITE and is pre-configured to run automatically at startup, after the system has been powered OFF and ON and a method selected, or after an eight hour period of operation. Short Autotune can also be invoked from the Manual tune function at anytime. The Short Autotune will check if all parameters are within specification, record the dwell statistics (Baseline/Threshold), create a Tune report and proceed to the Run Method function. If corrections are required, the program will automatically make the correction, measure the dwell statistics, create the report, and then proceed to the Run Method function.

Figure 7-1 through Figure 7-4 show sample screens displayed during a Short Autotune. The status screens will vary depending on the corrections or adjustments required.

Figure 7-1 Autotune Status Screen from Front Panel as System Prepares For Autotune

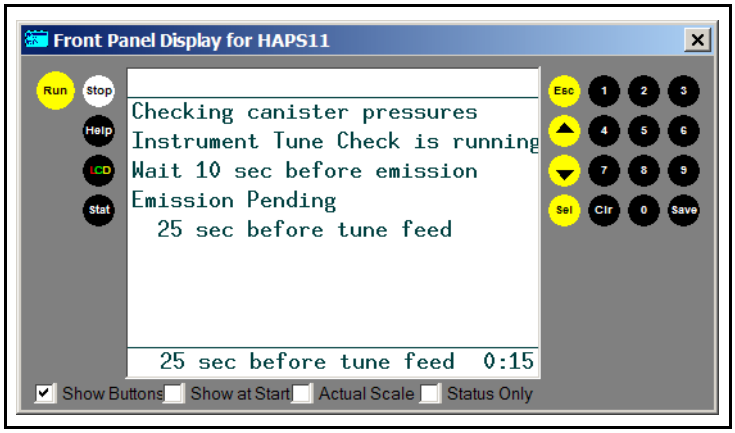

Figure 7-2 Short Autotune Status Screen from Front Panel during Tune Check

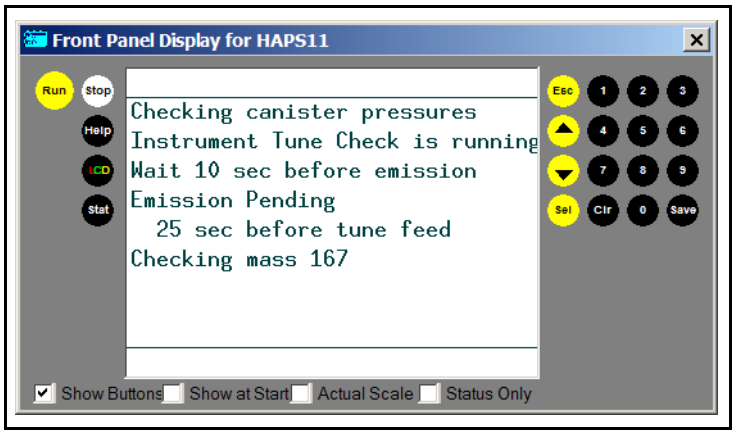

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Figure 7-3 Status Screen from Laptop During Short Autotune

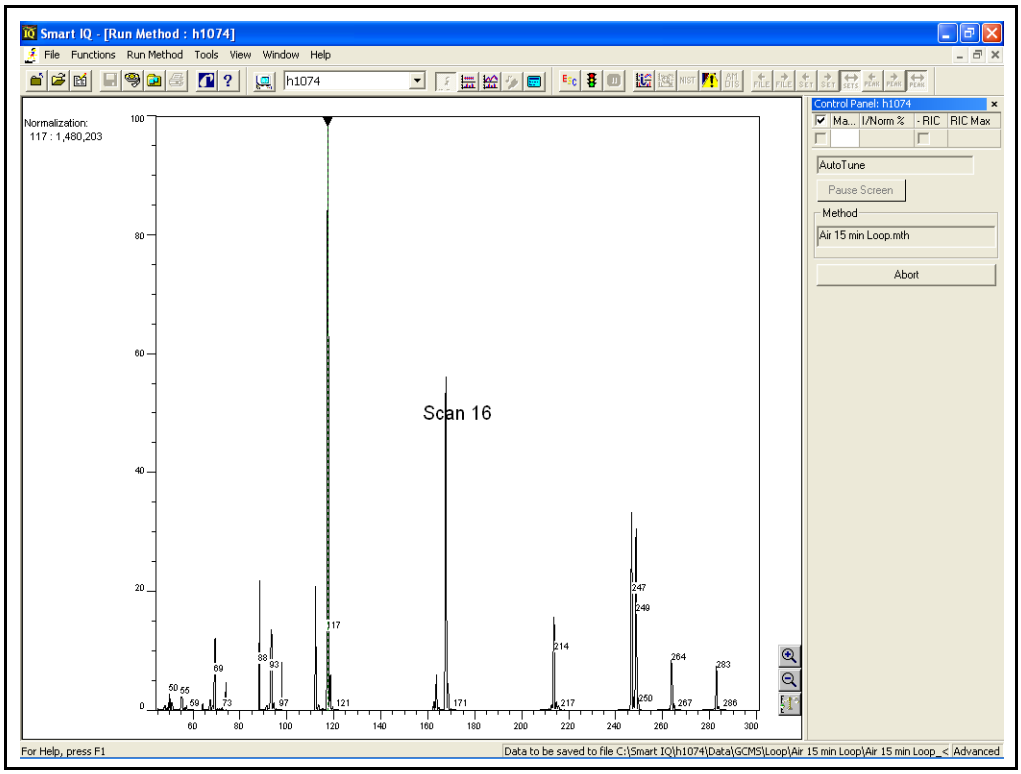
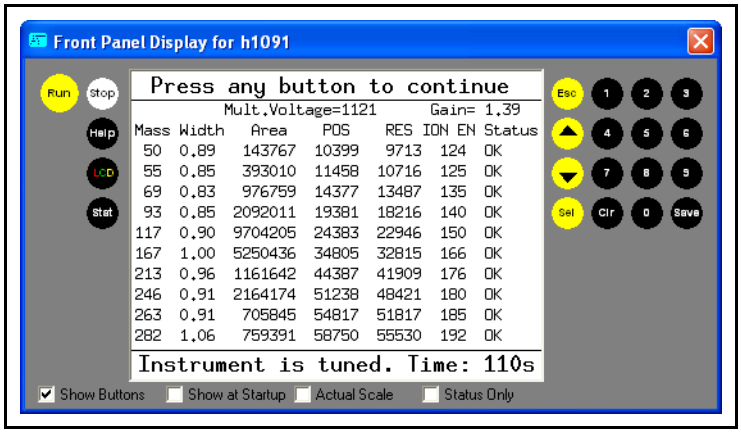


Figure 7-4 Autotune Results



The Long Autotune adjusts several additional parameters in the MS including the emission current and focus and extractor voltages of the ionizer. The Long Autotune is intended to be run when an ionizer has been replaced or the Short Autotune cannot maintain system performance. The Long Autotune must be invoked from the Manual Tune program.

NOTE: INFICON recommends the use of Short Autotune as the primary technique for auto tuning from Manual Tune.

7.2.1 Starting Autotune from the Manual Tune Screen

1 Double-click on the **Smart IQ icon**. See Figure 7-5.

Figure 7-5 Smart IQ Icon

2 Double-click on the **Tune Icon**. See Figure 7-6.

HINT: Only the Advanced Access level can run Manual Tune.

Figure 7-6 Manual Tune Icon

3 Wait until the EM and Emission buttons in the control panel turn green, then click the **Short Tune icon**. See Figure 7-7.

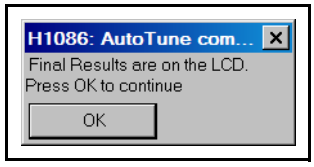
Figure 7-7 Short Tune Icon

CAUTION

Adjusting other parameters without proper training may damage the instrument.

4 Allow the Short Autotune to run to completion and click **OK** and **close** the Manual Tune after receiving the message **Final Results are on the LCD**. See Figure 7-8.

Figure 7-8 Autotune Complete



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7.3 Viewing a Tune Report

The Tune Report can be viewed from the front panel display or from the laptop computer. See Figure 7-9. Tune Reports are stored on the hard drive of the HAPSITE. Therefore, to access Tune Reports from the laptop computer, the HAPSITE must be online.

To view the report from the laptop computer select **File >> View Tune Reports**. Highlight the **`default.tun`** file and press **OK**. The **Tune Files** and **Tune Report**s are displayed. **Tune Reports** can also be accessed by highlighting the HAPSITE icon, pressing the right mouse button and selecting **Tune Reports**. Tune Reports are stored, by default, for the last 30 days. The **Tune Reports** display offers the following functions:

Remove . . . . . Deletes the selected report. Caution: no confirmation is requested.

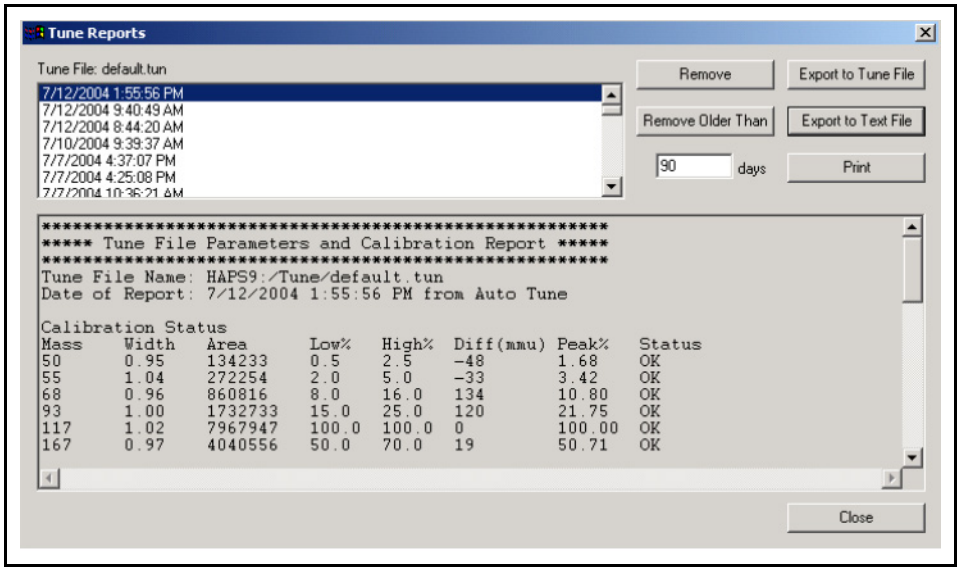
Remove Older Than . . . . . Will delete files older than the number of days specified. Confirmation is requested before the files are deleted.

Export to Tune File . . . . . Converts a Tune Report into a valid Tune file. This feature can be used to recover a good Tune if the current Tune file has been corrupted.

Export to text file . . . . . Creates a text file copy of the Tune Report.

Print . . . . . Prints a copy of the selected Tune Report.

Figure 7-9 Tune Reports Screen from Laptop Computer



To view the Tune Report from the front panel display select the **STAT** button and then **Tune**. See Figure 7-10. Pressing the **SEL** key will then display the last Tune Report. To scroll through the Tune Report, use the up or down arrows on the keypad. See Figure 7-11.

Figure 7-10 Status and Tune Data

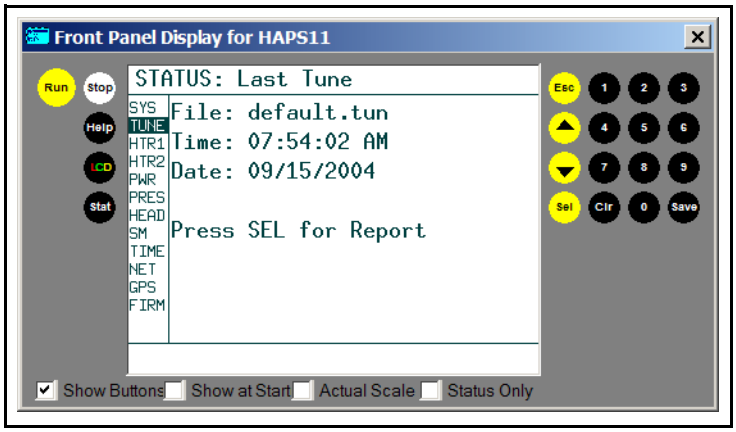
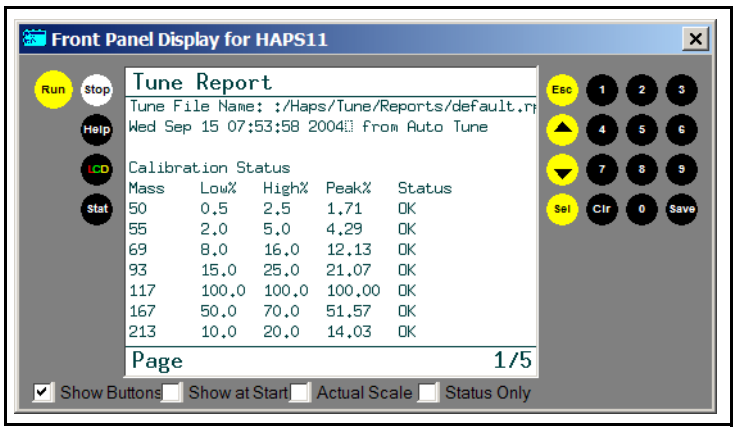


Figure 7-11 Tune Report



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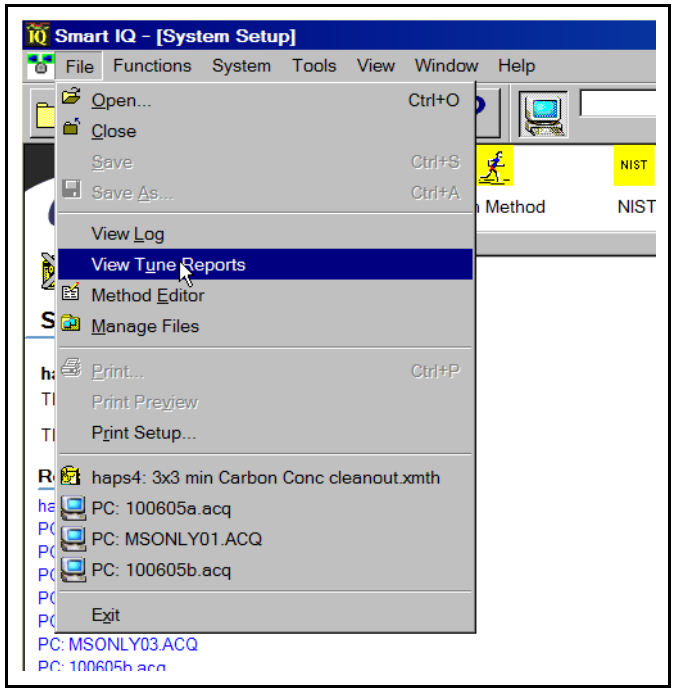
7.4 Autotune Failure

Occasionally Autotune may fail. Follow the procedures outlined below before continuing.

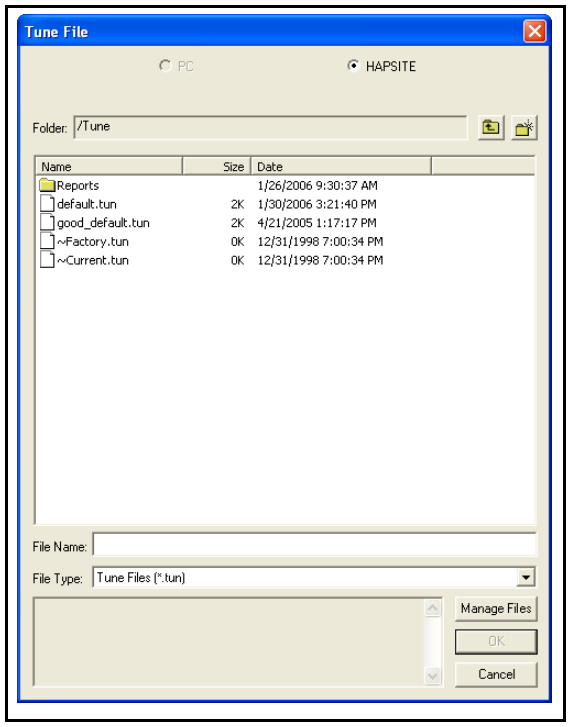
1. When Autotune fails, check IS canister pressure and expiration date. Replace if necessary.
2. Check reservoir pressure to ensure the reservoir pressure is at least 400 kPa. Replenish if necessary by inserting a full can of Nitrogen (>400 kPa).
3. Rerun Autotune by restarting the HAPSITE.
4. If Autotune fails again, select **File** and click on **View Tune Reports**. See Figure 7-12.

Figure 7-12 Selecting View Tune Reports



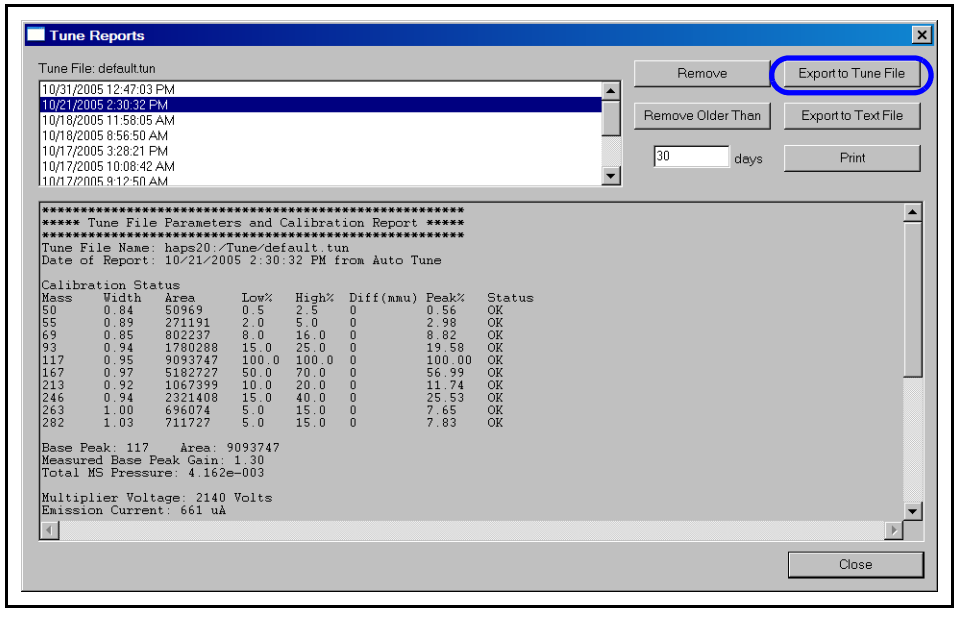
5 Select **default.tun** file and press **OK**. See Figure 7-13.

Figure 7-13 Select "default.tun" File



6 Highlight a "good" tune report. Select **Export to Tune File**. See Figure 7-14.

Figure 7-14 Export Good Tune to Current Tune File



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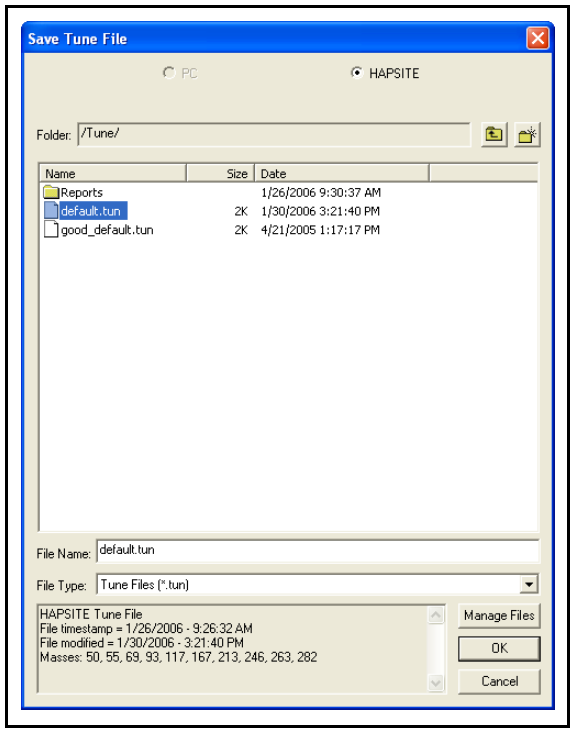
7 Highlight **default.tun**. Click **OK**. See Figure 7-15.

NOTE: This will overwrite the **`default.tun`** file. See section 10.3 on page 10-11 for information on transferring files to the PC if saving a copy of this file is desired prior to overwriting it.

Figure 7-15 Save "default.tun"



8 Replace the existing **`default.tun`** file when prompted.

9 Reboot HAPSITE from the Front Panel Exit menu. Refer to section 3.10.4, Rebooting the HAPSITE, on page 3-52 for more information on how to reboot the HAPSITE.

10 If the HAPSITE fails to tune after steps 1-9 have been performed, see section 7.6, Performing Manual Tune, on page 7-25 for information on performing a manual tune.

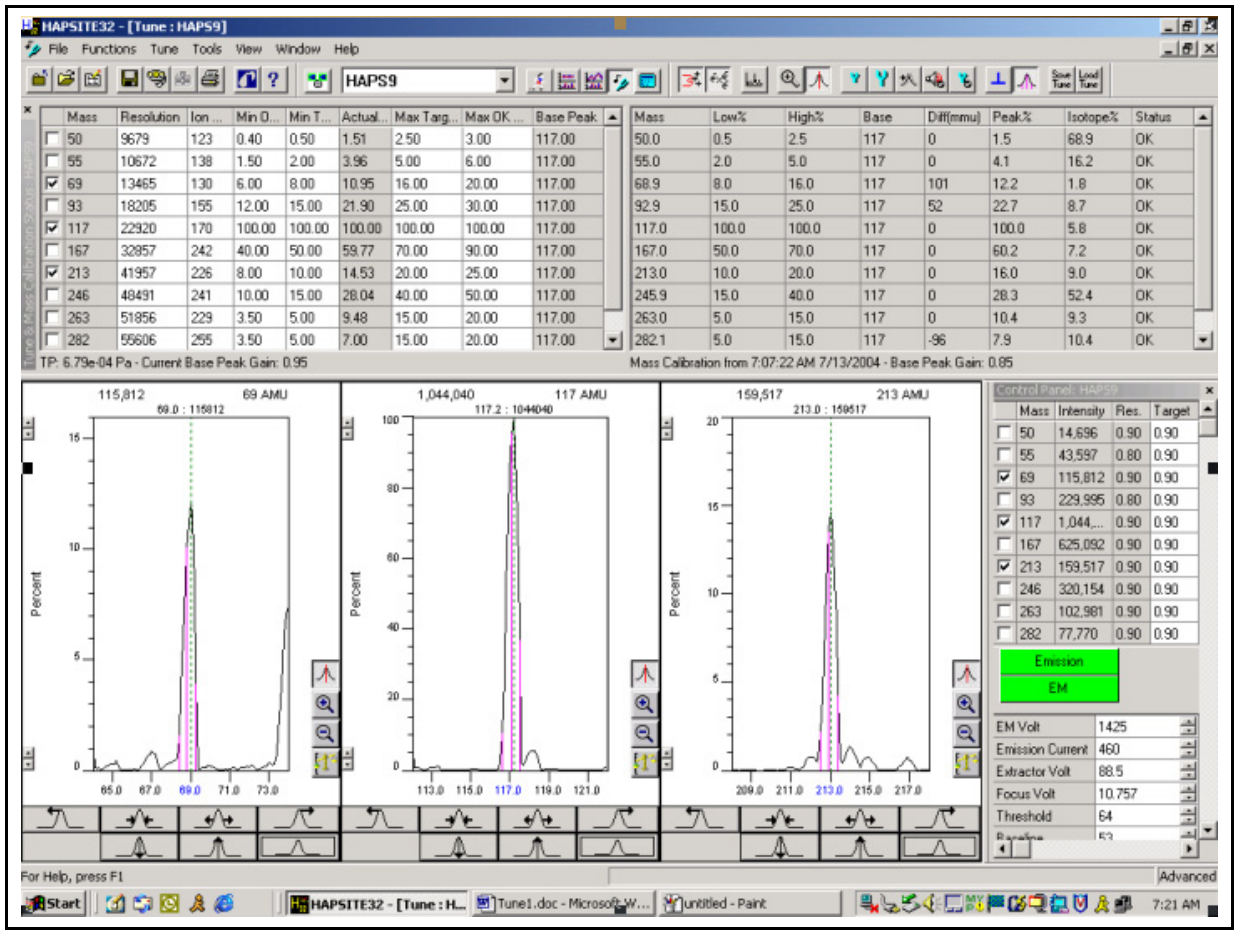
7.5 Manual Tune Settings and Controls

Manual Tune is run from the laptop computer The Manual Tune screen can be accessed by selecting the Tune icon from the System Setup screen, or by highlighting the HAPSITE Icon, clicking the right mouse button and selecting Tune. When the Manual Tune screen is selected the system will initialize all of the controls necessary to perform a Tune (e.g., turning on the filament, multiplier and calibration/tune gas supply).

NOTE: Manual Tune is only available in Advanced user mode.

See Figure 7-16 for a typical Manual Tune screen.

Figure 7-16 Manual Tune Screen



CAUTION

Adjusting other parameters without proper training may damage the instrument.

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7.5.1 Tool Bar

Figure 7-17 Manual Tune Tool Bar

Filament On/Off . . . . . Turns the emission On or Off.

Multiplier On/Off . . . . . Turns the Electron Multiplier On or Off.

Full Scan . . . . . Switches between Full Scan display mode and Peak Scan display mode.

Zoom . . . . . Enables the cursor to select a section of Full Scan or Peak Scan and zoom to that section.

Mass Adjust . . . . . Enables the cursor to select a mass peak and drag the mass peak to a different position on the mass axis.

Short Autotune . . . . . Starts the Short Autotune function.

Long Autotune . . . . . Starts the Long Autotune function.

Mass Calibration . . . . . Checks and corrects the ten calibration masses for correct location within the mass range.

Noise Check . . . . . Scans a "quiet" mass range (no peaks) to determine the electronic baseline and threshold noise level.

Perform Tune Checkup . . . Runs a mass calibration and noise check.

Show Target . . . . . Displays the target bar for the mass peak center and peak width at 10% peak height. Displays the target high and low percentage bars for each mass peak.

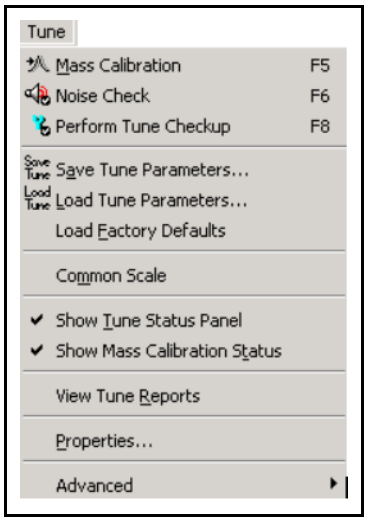
Show Bounds . . . . . Displays the peak centroid and the target peak width at 10% peak height.

Save Tune . . . . . Saves the Tune File.

Load Tune . . . . . Loads a new Tune File and restarts tuning.

7.5.2 Tune Drop Down Menu

Figure 7-18 Tune Drop Down Menu



Mass Calibration . . . . . Checks and corrects the ten calibration masses for correct location within the mass range.

Noise Check . . . . . Scans a "quiet" mass range (no peaks) to determine the electronic baseline and threshold noise level.

Perform Tune Checkup . . . . . Runs a mass calibration and noise check.

Save Tune Parameters... . . . . . Saves the Tune File.

Load Tune Parameters... . . . . . Loads a new Tune File and restarts tuning.

Load Factory Defaults . . . . . Loads the default tune settings from a factory tune file. This is intended to provide a starting point for tuning.

Common Scale . . . . . Sets all of the Mass Peak windows to the same common scale (Y-axis), based on Mass 117.

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Show Tune Status Panel . . . . . Displays the Tune and Mass Calibration Status panel.

Show Mass Calibration Status . . . Displays the Mass Calibration Status panel.

View Tune Reports . . . . . Displays the Tune Reports screen.

Properties . . . . . Displays the Properties window, which is used to set the default screen display and startup/exit conditions for Manual Tune. See Figure 7-19.

Advanced . . . . . Displays the Advanced tune functions.

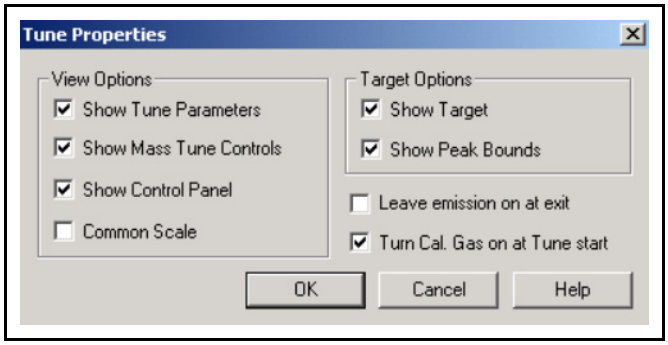
Linearize DACS . . . . . Repositions the tune gas mass peaks on the mass axis by linear extrapolation of the digital to analog control settings.

Autotune Tolerances . . . . . Sets the autotune tolerance for mass resolution and mass axis position.

NOTE: The Advanced functions should only be used under the direction of INFICON Support personnel.

7.5.2.1 Tune Properties Window

Figure 7-19 Tune Properties Window



Show Tune Parameters . . . . . Displays the EM Voltage, Ionizer control, Baseline, Threshold and Rod polarity settings on the Control Panel

Show Mass Tune Controls . . . . . Displays the Mass Tune Controls on the Mass Peak Scan windows.

Show Control Panel . . . . . Displays the Control panel.

Common Scale . . . . . Sets the Mass Peak Scan windows to a common scale based on mass 117.

Show Target . . . . . Displays the target bar for the mass peak center and peak width at 10% peak height. Displays the target high and low percentage bars for each mass peak.

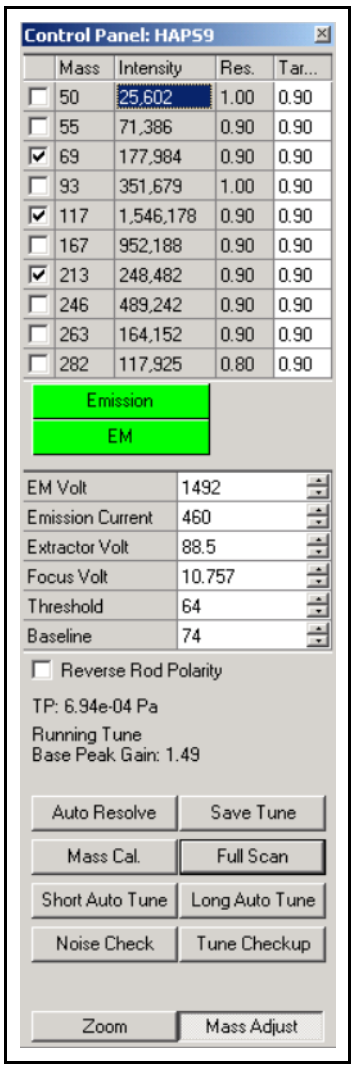
Show Peak Bounds . . . . . Displays the peak centroid and the target peak width at 10% peak height.

Leave emission on at exit . . . . . Leaves the filament and Electron multiplier on when exiting tune. This should not be used except for special service procedures.

Turn Cal. Gas on at Tune start. . . . Turns ON the Calibration gas when the tune program is started. This is checked for normal operation.

7.5.3 Tune Control Panel

Figure 7-20 Tune Control Panel



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The Tune Control Panel (refer to Figure 7-20) provides access to display individual mass peak scans by selecting the check box next to the Mass. The measured intensity and resolution are displayed. The Target Resolution is also displayed and can be modified. Changing the Target Resolution will force an Auto Resolve. Decreasing the Target Resolution narrows the peak, increasing the resolution and lowering the peak percentage. Increasing the Target Resolution will widen the peak, decreasing the resolution and increasing the peak percentage.

The Emission button turns the filament ON or OFF, the EM button turns the Electron Multiplier ON or OFF. Green signifies ON and is the default condition when the Tune window is opened.

7.5.3.1 Tune Parameters

EM Volt . . . . . Used to increase or decrease the gain of the system. EM voltage should be set to a value that achieves a Base Peak Gain of between 0.8 and 2.0.

Emission Current . . . . . Used to optimize the ionization efficiency of the ionizer. Emission Current is set to achieve maximum intensity for mass 117. Range is 100 - 1000.

Extractor Volt . . . . . Used to optimize the ionization efficiency of the ionizer. Extractor Volt is set to achieve maximum intensity for mass 117. Range is 0 - 100.

Focus Volt . . . . . Used to optimize the ionization efficiency of the ionizer. Focus Volt is set to achieve maximum intensity for mass 117. Range is -12 to +12.

Threshold . . . . . One standard deviation of the Baseline. Threshold determines if a measured point is used in the peak area integration. If the point is used, the baseline is subtracted before use.

Baseline . . . . . The mean value of the measured noise level.

Reverse Rod Polarity . . . . . Changes the Rod polarity on the Mass filter and is selected for optimum performance at mass 117.

TP . . . . . The total MS pressure.

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Running Tune Base Peak Gain . . . . . .Current measured Base Peak Gain.

NOTE: The base peak gain will switch to Red when BPG is outside the target range.

Auto Resolve . . . . . Adjusts the resolution of all Mass Peaks to the target resolution.

Save Tune . . . . . Save the Tune File

Mass Cal.. . . . . Checks and corrects the ten calibration masses for correct location within the mass range.

Full Scan . . . . . Switches between Full Scan display mode and Peak Scan display mode

Short Auto Tune . . . . . Starts the Short Autotune function

Long Auto Tune . . . . . Starts the Long Autotune function

Noise Check . . . . . Scans a "quiet" mass range (no peaks) to determine the electronic baseline and threshold noise level.

Tune Checkup. . . . . Runs a mass calibration and noise check.

Zoom . . . . . Enables the cursor to select a section of Full scan or a peak scan and zoom to that section.

Mass Adjust . . . . . Enables the cursor to select a mass peak and drag the mass peak to a different position on the mass axis.

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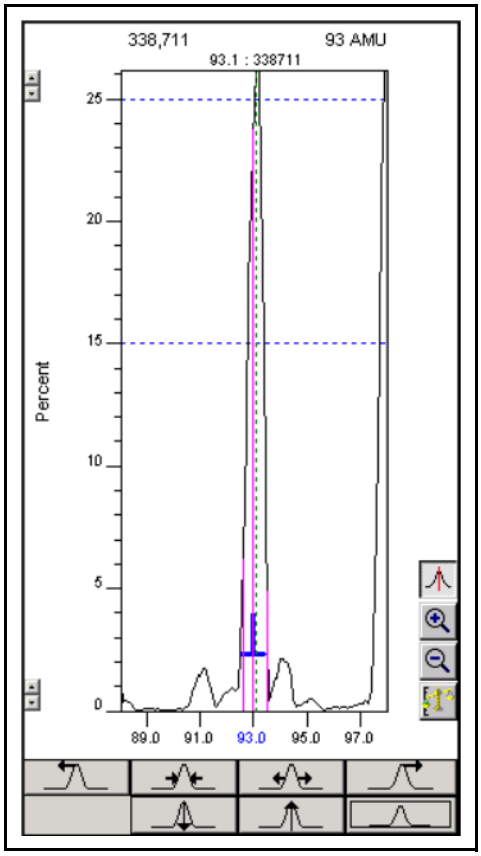
7.5.4 Peak Scan Window

The Peak Scan Window, see Figure 7-21, displays the mass peak and enables the user to manually control/tune the mass peak.

Figure 7-21 The Peak Scan Window and Controls



7.5.4.1 Peak Scan Window Controls

Mass Adjust . . . . . Enables the cursor to select a mass peak and drag the mass peak to a different position on the mass axis.

Zoom . . . . . Enables the cursor to select a section of the peak scan window and zoom to that section.

Zoom Out. . . . . Returns the window to the original X axis and Y axis scale.

Zoom Out Y axis . . . . . Returns the Y axis to original scale.

Y Axis Scale . . . . . Increase or decreases the Y axis scale.

NOTE: For the following controls, The Left Mouse Button (LMB) is used to increment by 1, shift-LMB increments by 10, Ctrl-LMB increments by 100.

. . . . . Shifts the mass peak left.

. . . . . Increases the peak resolution.

. . . . . Decreases the peak resolution.

. . . . . Shifts the mass peak right.

. . . . . Decreases the Ion energy.

. . . . . Increases the Ion energy.

. . . . . Zooms to a single peak scan display window.

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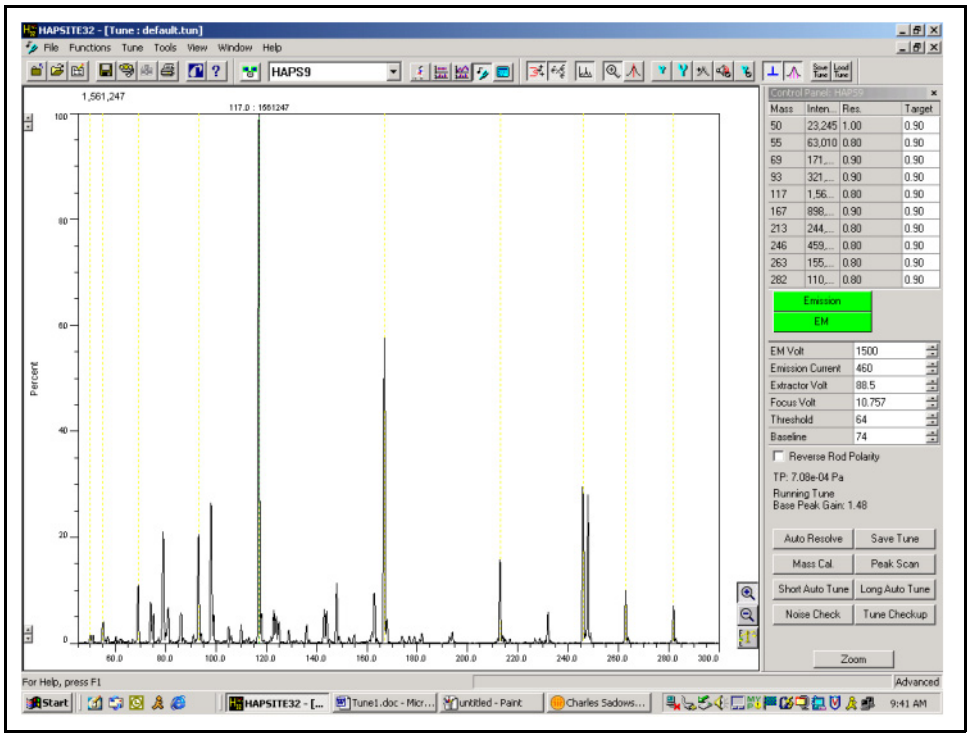
7.5.5 Full Scan Window

The Full scan window (see Figure 7-22) is used for display purposes to evaluate the performance of the MS. All tune adjustments should be made using the Peak Scan windows.

Figure 7-22 Full Scan Window and Controls



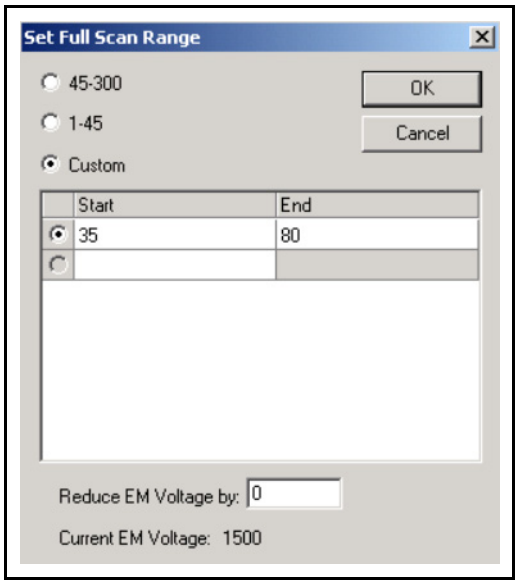
Zoom . . . . . Enables the cursor to select a section of the peak scan window and zoom to that section.

Zoom Out. . . . . Returns the window to the original X axis and Y axis scale.

Zoom Out Y Axis. . . . . Returns the Y axis to the original scale.

Placing the mouse cursor on the x axis of the full scan window and pressing the right mouse button will display the Set Scan Range Window, see Figure 7-23. This allows a custom scan range to be entered and viewed.

Figure 7-23 Setting the Full Scan Range



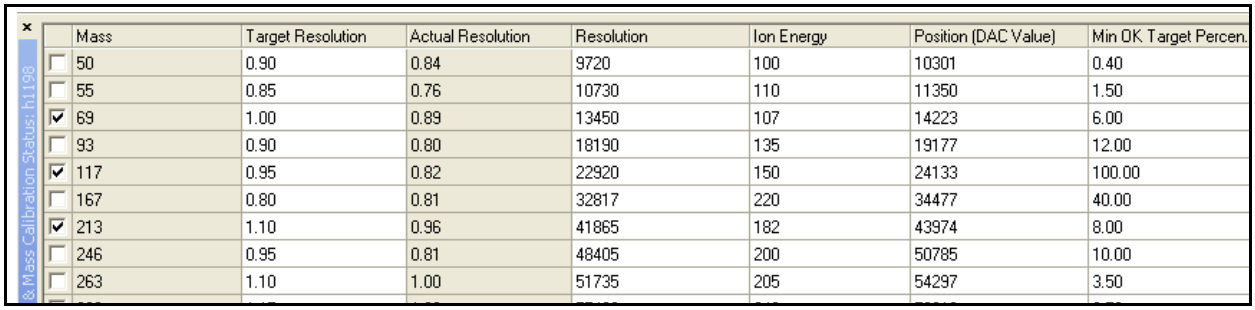
Default Scan ranges of 45 - 300 AMU or 1 - 45 AMU can be selected.

NOTE: The EM voltage will automatically be decreased by 500 volts (default) anytime a range below mass 45 is scanned. Custom scan ranges can also be viewed by selecting the custom button and entering a start and end mass.

7.5.6 Tune and Mass Calibration Status

The Tune & Mass Calibration Status screen is shown in Figure 7-24.

Figure 7-24 Tune & Mass Calibration Status Panel



Mass	Target Resolution	Actual Resolution	Resolution	Ion Energy	Position (DAC Value)	Min OK Target Percen.
50	0.90	0.84	9720	100	10301	0.40
55	0.85	0.76	10730	110	11350	1.50
69	1.00	0.89	13450	107	14223	6.00
93	0.90	0.80	18190	135	19177	12.00
117	0.95	0.82	22920	150	24133	100.00
167	0.80	0.81	32817	220	34477	40.00
213	1.10	0.96	41865	182	43974	8.00
246	0.95	0.81	48405	200	50785	10.00
263	1.10	1.00	51735	205	54297	3.50

The Tune Status Panel displays information pertinent to tune and can be used to change some parameters of the Tune. The Tune and Mass Calibration Status Panel can be displayed with a right mouse click in the Peak Scan window or by using the Tune drop down menu and selecting the Tune Status Panel. Columns can be displayed or hidden with a right mouse click on the column headings. See Figure 7-25.

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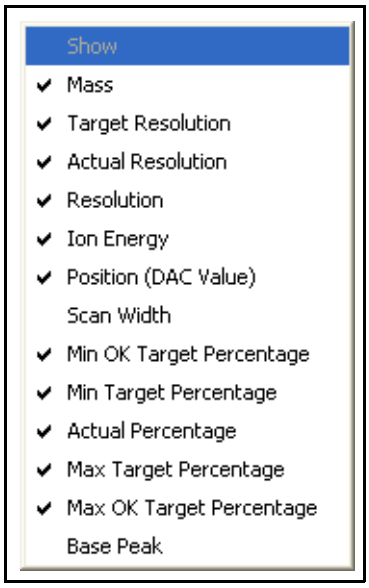
Figure 7-25 Tune and Mass Calibration Status Menu



Mass . . . . . The mass number of the peak. When a mass is selected to display, the mass immediately below and above are also displayed.

Target Resolution . . . . . Target resolution at 10% peak height.

Actual Resolution . . . . . Measured resolution at 10% peak height.

Resolution . . . . . Resolution value; can be used to input a change in resolution value.

Ion Energy . . . . . Ion energy value; can be used to input a change in Ion energy value.

Position (DAC Value) . . . . . Current DAC setting for mass position.

Scan Width . . . . . Displays the points measured per AMU.

Min OK Target Percentage . . . . . Displays the minimum target percentage required for the mass peak to meet the OK LOW criteria.

Min Target Percentage . . . . . Displays the minimum target percentage required for the mass peak to meet OK criteria. Will turn red if actual percentage is below the minimum percentage.

Actual Percentage . . . . . Displays the actual measured target percentage.

Max Target Percentage . . . . . Displays the maximum target percentage required for the Mass Peak to meet OK criteria. Will turn red if actual percentage is above the maximum percentage.

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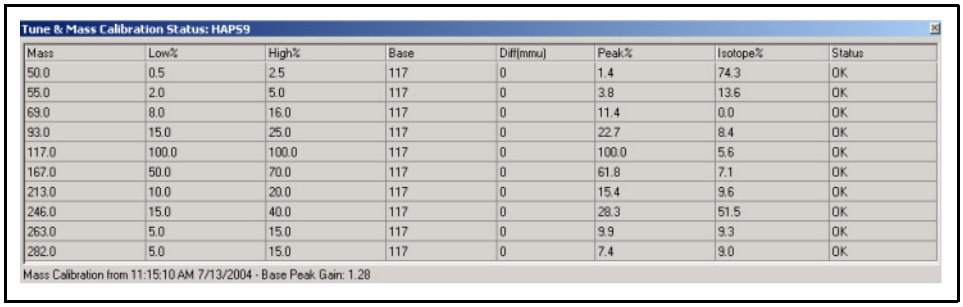
Max OK Target Percentage . . . . . Displays the maximum percentage required for the mass peak to meet the OK High criteria.

Base Peak . . . . . Displays the base peak that the mass peak percentage is measured against.

7.5.7 Mass Calibration Status

The dark gray Tune and Mass Calibration Status panel displays the status of the last Mass Calibration Tune. See Figure 7-26. The Mass Calibration Status panel can be displayed by Right Mouse Button (RMB) click in the Peak Scan window, or by using the Tune drop down menu and selecting the Mass Calibration Status.

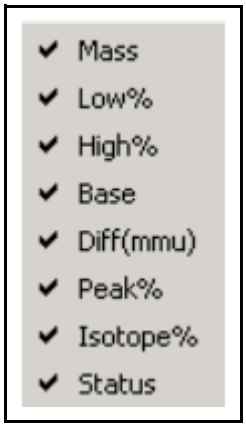
Figure 7-26 Mass Calibration Status



Mass	Low%	High%	Base	Diff(mmu)	Peak%	Isotope%	Status
50.0	0.5	2.5	117	0	1.4	74.3	OK
55.0	2.0	5.0	117	0	3.8	13.6	OK
69.0	8.0	16.0	117	0	11.4	0.0	OK
93.0	15.0	25.0	117	0	22.7	8.4	OK
117.0	100.0	100.0	117	0	100.0	5.6	OK
167.0	50.0	70.0	117	0	61.8	7.1	OK
213.0	10.0	20.0	117	0	15.4	9.6	OK
246.0	15.0	40.0	117	0	28.3	51.5	OK
263.0	5.0	15.0	117	0	9.9	9.3	OK
282.0	5.0	15.0	117	0	7.4	9.0	OK

Columns can be displayed or hidden with a right mouse button click on the column headings. See Figure 7-27.

Figure 7-27 Mass Calibration Menu



Mass . . . . . Mass number.

Low% . . . . . Minimum percentage for peak status OK.

High% . . . . . Maximum percentage for peak status OK.

Base . . . . . Reference mass for peak percentage calculations.

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Diff(mmu) . . . . . Adjustment to DAC value for mass peak alignment, since the last mass calibration check. 100 mmu = 0.1 AMU.

Peak% . . . . . Actual peak percentage.

Isotope% . . . . . Percentage of the Carbon 13 isotope peak as measured against the mass fragment.

Status . . . . . Status of mass peak.

OK . . . . . Within minimum and maximum values.

OK LOW. . . . . Outside of minimum value but within acceptable tolerance.

OK HIGH . . . . . Outside of maximum value but within acceptable tolerance.

LOW . . . . . Below minimum value; needs adjustment.

HIGH. . . . . Above maximum value; needs adjustment.

FAILED. . . . . Cannot located mas peak within window. Autotune or Manual Tune is required.

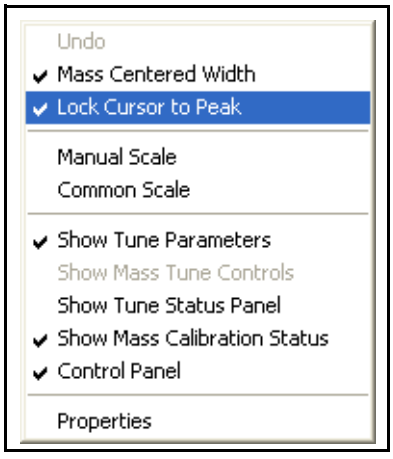
7.5.8 Right Mouse Button (RMB) Menus

In addition to the functions described above, the following menu items are available by pressing the right mouse button (RMB).

7.5.8.1 RMB in Scan Window

Placing the Mouse Cursor in the Peak Scan or Full Scan Window and pressing the RMB displays the menu shown in Figure 7-28.

Figure 7-28 Scan Window Options



Undo . . . . . Undo last function.

Mass Centered Width . . . . . Width in AMU that correctly aligns the calibration peak with the correct position on the mass axis.

Lock Cursor to Peak . . . . . Locks the cursor to the mass peak for adjustment of mass position.

Manual Scale . . . . . Allows the mass peak windows to be set to user defined scale.

Common Scale . . . . . Sets the mass peak scan windows to a common scale based on mass 117.

Show Tune Parameters . . . . . Displays the EM voltage, Ionizer Control, Baseline, Threshold and Rod Polarity settings on the Control Panel.

Show Mass Tune Controls . . . . . Displays the mass tune controls on the mass peak scan windows.

Show Tune Status Panel . . . . . Displays the tune status panel.

Show Mass Calibration Status . . . . . Displays the mass calibration status control panel

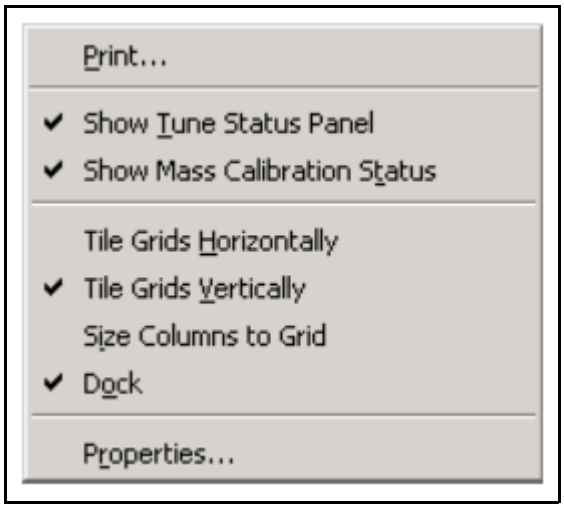
Control Panel . . . . . Displays the control panel.

Properties . . . . . Displays the properties window.

7.5.8.2 RMB in Tune Status Window

Placing the Mouse Cursor in the Tune Status panel or the Mass Calibration Status panel and pressing the Right Mouse Button will display the menu shown in Figure 7-29.

Figure 7-29 RMB Menu in Tune Status Panel



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NOTE: The menu from the control panel is the same as above with the exception of no print function.

Print... . . . . . Prints the Tune Status panel or the Mass Calibration Status panel.

Show Tune Status Panel . . . . . Displays the Tune Status panel.

Show Mass Calibration Status . . . . . Displays the Mass Calibration Status panel.

Tile Grids Horizontally . . . . . Tiles the Status and Calibration Status panels horizontally.

Tile Grids Vertically . . . . . Tiles the Status and Calibration Status panels vertically.

Size Columns To Grid . . . . . Resets the column size to the current grid.

Dock. . . . . Locks the display position to a fixed position.

Properties.... . . . . Displays the Properties window.

7.5.8.3 RMB on Y Axis

Positioning the mouse cursor on the Y axis scale near the top and selecting the right mouse button will bring up a Y axis scale scroll window.

7.6 Performing Manual Tune

CAUTION

Manual tune is a procedure that should only be attempted by experienced HAPSITE users who preferably have taken the Advanced Training course provided by INFICON.

Read section 7.5, Manual Tune Settings and Controls, on page 7-9 to learn about the various controls and settings involved in manual tune. Remember when attempting a manual tune, if after a few cycles through the manual tune process the HAPSITE is still not tuning, call INFICON Support for additional guidance. Below are general guidelines for performing a manual tune.

NOTE: Do not save a Tune file from a Manual Tune if it indicates the HAPSITE is not tuned.

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7.6.1 Adjusting Base Peak Gain

1 Double-click on the **Smart IQ icon**. See Figure 7-30.

Figure 7-30 Smart IQ Icon

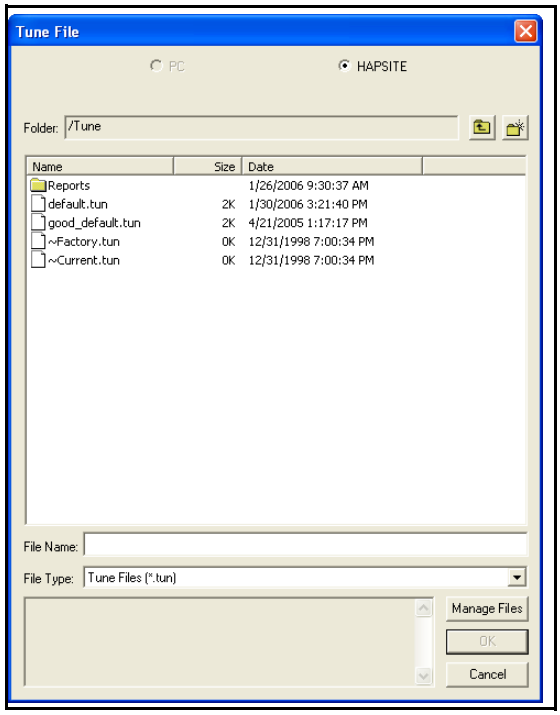
2 Double-click on the **Tune Icon**. See Figure 7-31.

HINT: Manual Tune can only be opened in Advanced User Mode.

Figure 7-31 Manual Tune Icon

3 Select **default.tun** file and press **OK**. See Figure 7-32.

Figure 7-32 Select default.tun File



4 Wait for the automated process of opening the tune to complete.

5 Check the **Base Peak Gain (BPG)**. Is the value between **0.8 and 2.0**? See Figure 7-33.

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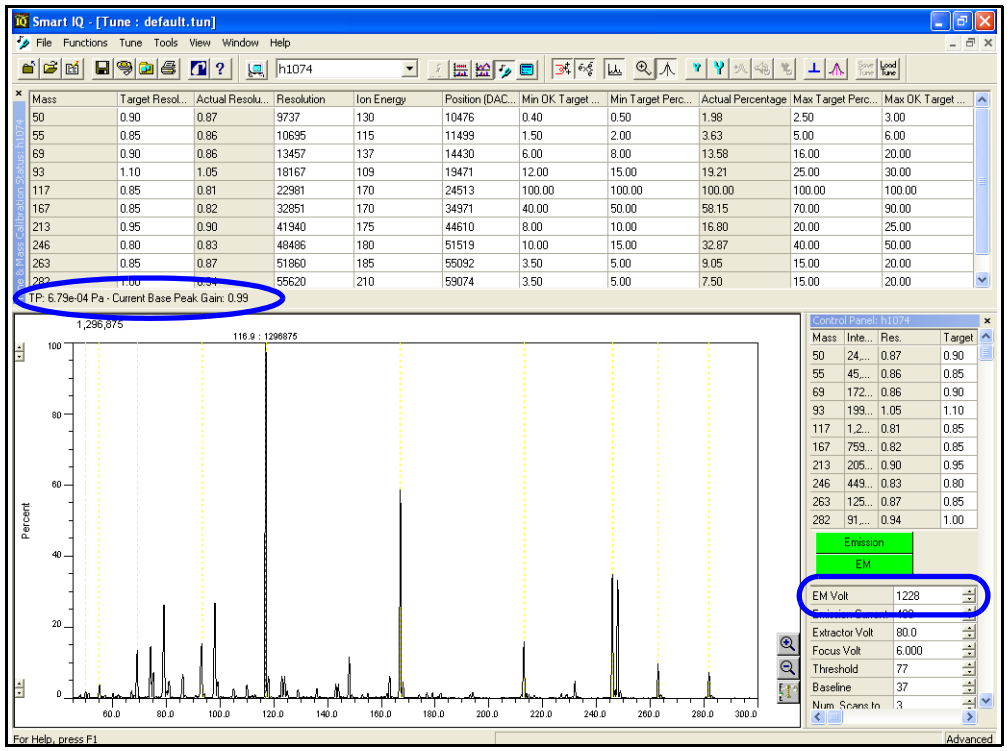
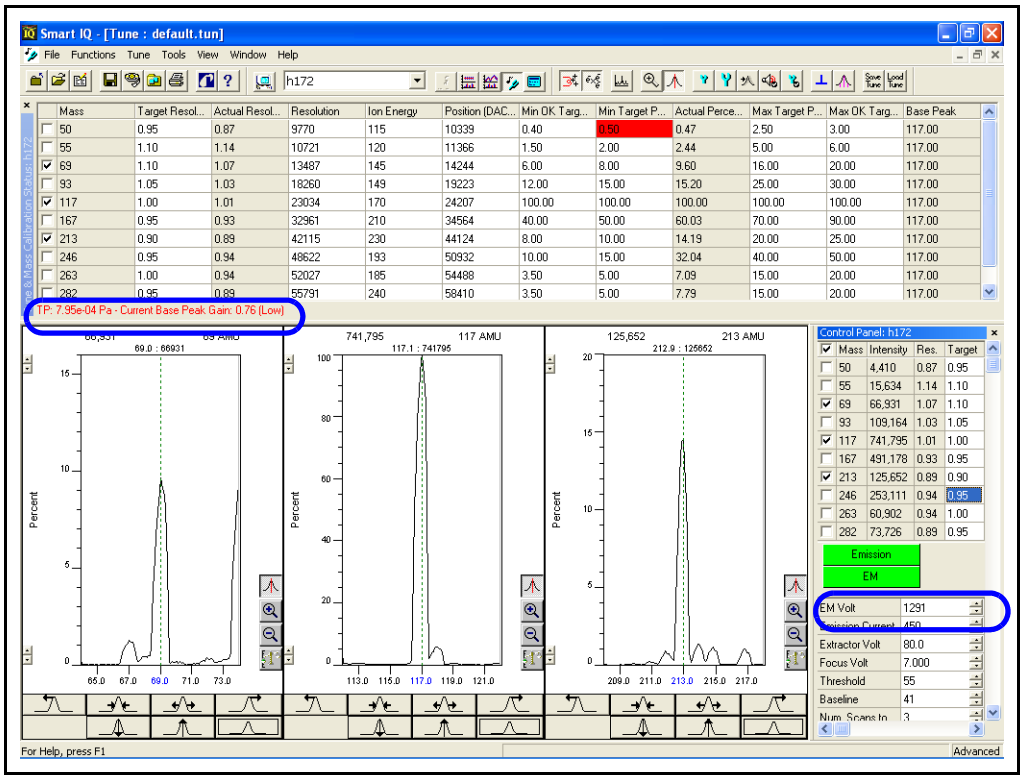
Figure 7-33 Checking BPG and EM Voltage



5a If **yes**, then the BPG does not need adjustment. **Proceed** to Step 8.

5b If **no**, the BPG will need to be adjusted. **Proceed** to Step 6.

Figure 7-34 BPG Low



6 To **raise** the BPG, **increase** the value of the **EM Voltage** by **25 volts**. To **lower** the BPG, **decrease** the value of the **EM Voltage** by **25 volts**. See Figure 7-34.

7 Check the **BPG value** to see if the BPG is now in the **range (0.8 to 2.0)**.

7a If the **Base Peak Gain** is still **out of range**, **repeat** Step 6 until the value comes into range.

7b If the **Base Peak Gain** is in **range**, continue with Step 8.

8 Check the Tune and Mass Calibration Status panel to see if any of the masses are highlighted in red. A red box indicates the mass is **High** or **Low**. See Figure 7-35.

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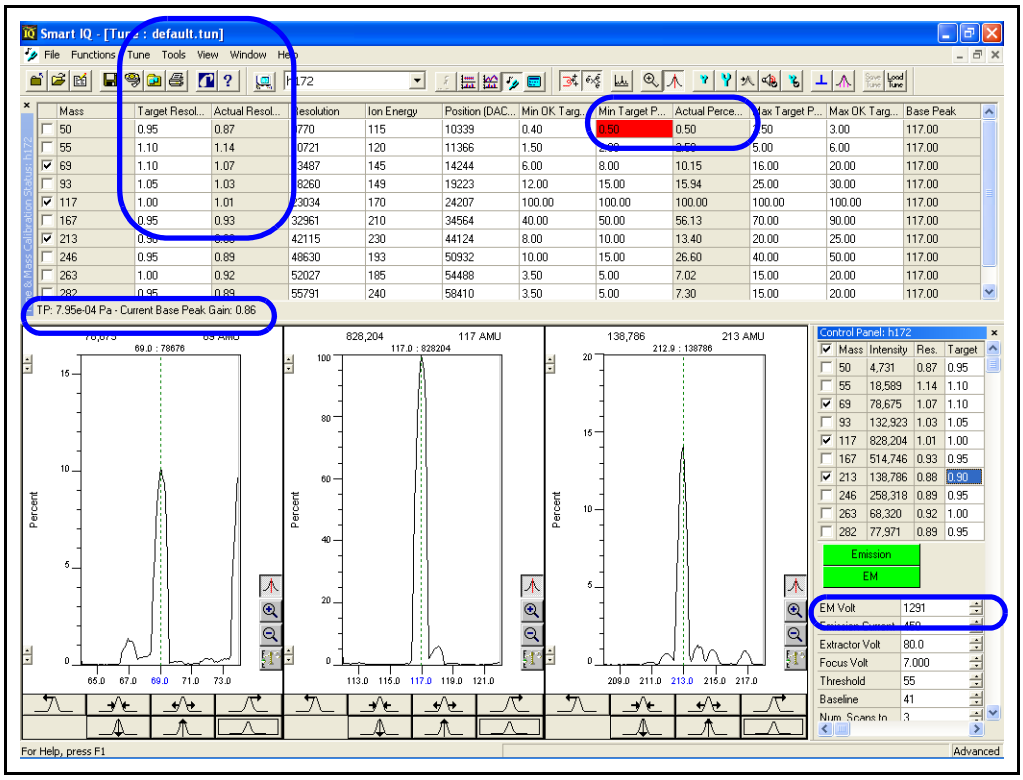
Figure 7-35 BPG Good with Mass 50 Low



8a If all mass percentages are within limits, then the instrument is tuned. Proceed to section 7.6.3, Adjusting the Ion Energy, on page 7-31.

8b If any mass percentages are High or Low (red boxes), then proceed to section 7.6.2, Adjusting Resolution, on page 7-29.

7.6.2 Adjusting Resolution

1 Before adjusting Resolution, Base Peak Gain must be adjusted. Refer to section 7.6.1, Adjusting Base Peak Gain, on page 7-26.

2 Resolution needs to be adjusted for masses that read High or Low in the Tune and Mass Calibration Status panel. Ideally the tune report should have an OK reading for all masses (no red boxes).

HINT: Resolution can also be adjusted for masses that read OK High and OK Low in the Mass Calibration Report (press F5 to update the report).

3 On the Tune and Mass Calibration Status panel the resolution will appear in two columns as Target Resolution and Actual Resolution. Actual Resolution is the actual reading and Target Resolution is the resolution setting. The range for the Target Resolution is between 0.85 and 1.10. See Figure 7-36.

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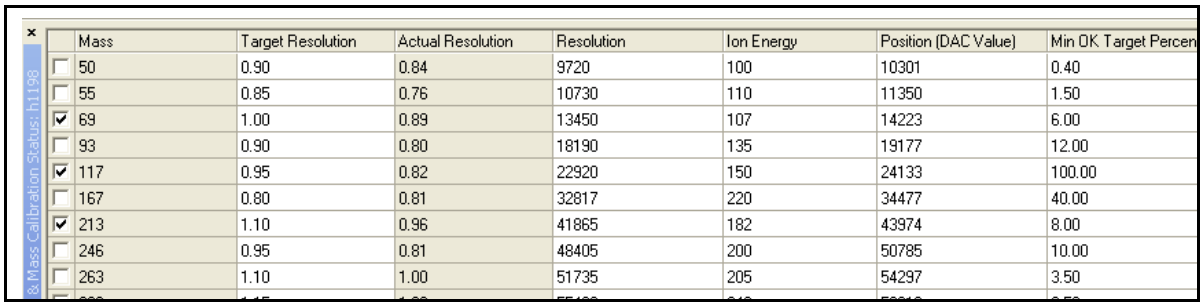
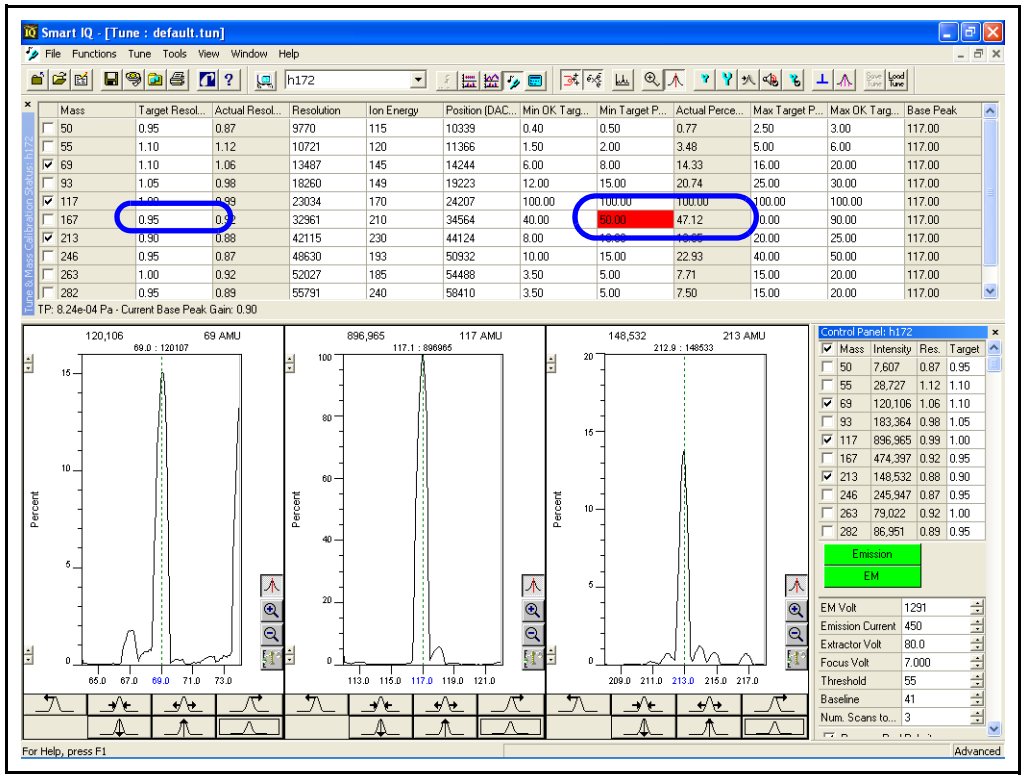
Figure 7-36 Actual Resolution and Target Resolution



Mass	Target Resolution	Actual Resolution	Resolution	Ion Energy	Position (DAC Value)	Min OK Target Percen
50	0.90	0.84	9720	100	10301	0.40
55	0.85	0.76	10730	110	11350	1.50
69	1.00	0.89	13450	107	14223	6.00
93	0.90	0.80	18190	135	19177	12.00
117	0.95	0.82	22920	150	24133	100.00
167	0.80	0.81	32817	220	34477	40.00
213	1.10	0.96	41865	182	43974	8.00
246	0.95	0.81	48405	200	50785	10.00
263	1.10	1.00	51735	205	54297	3.50

3a If the red box is in the **Min Target Percentage** column, the Target Resolution will need to be increased. Use increments of 0.05 to change the Target Resolution. If the Target Resolution reaches 1.10, proceed to Step 4 and follow with Step 4c, if needed. See Figure 7-37.

Figure 7-37 Target Percentage Low



3b If the red box is in the **Max Target Percentage**, the **Target Resolution** needs to be decreased. Use increments of 0.05 to make changes to the Resolution. If the **Target Resolution** reaches **0.85**, proceed to Step 4 and follow with Step 4c, if needed.

4 Check to see if the Resolution is in range (red box has disappeared).

4a If the Resolution is in range, proceed to Step 4, section 7.6.3, Adjusting the Ion Energy, on page 7-31.

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4b If the **Min or Max Target Percentage** is red and the Target Resolution is within 0.85 and 1.10, repeat Step 3 and Step 4 until the masses all no longer show red.

4c If the **Min or Max Target Percentage** is red and the Target Resolution is at the end of the range, either 0.85 and still needs to be lowered to correct the Resolution or 1.10 and still needs to be raised to correct the Resolution, then the Ion Energy is in need of adjustment. Proceed to section 7.6.3, Adjusting the Ion Energy, on page 7-31. See Figure 7-38.

7.6.3 Adjusting the Ion Energy

1 Prior to performing this procedure, follow the steps outlined in section 7.6.1, Adjusting Base Peak Gain, on page 7-26 and section 7.6.2, Adjusting Resolution, on page 7-29.

2 Check the Actual Percentage column:

2a If the **Actual Percentage** is above the acceptable range. (Red box appears to the right of the column, indicating the mass response is too high) The ion energy needs to be reduced. Lower the ion energy by increments of 5 at a time.

2b If the **Actual Percentage** is below the acceptable range. (Red box appears to the left of the column, indicating the mass response is too low). The ion energy needs to be increased. Raise the ion energy by increments of 5 at a time. See Figure 7-38.

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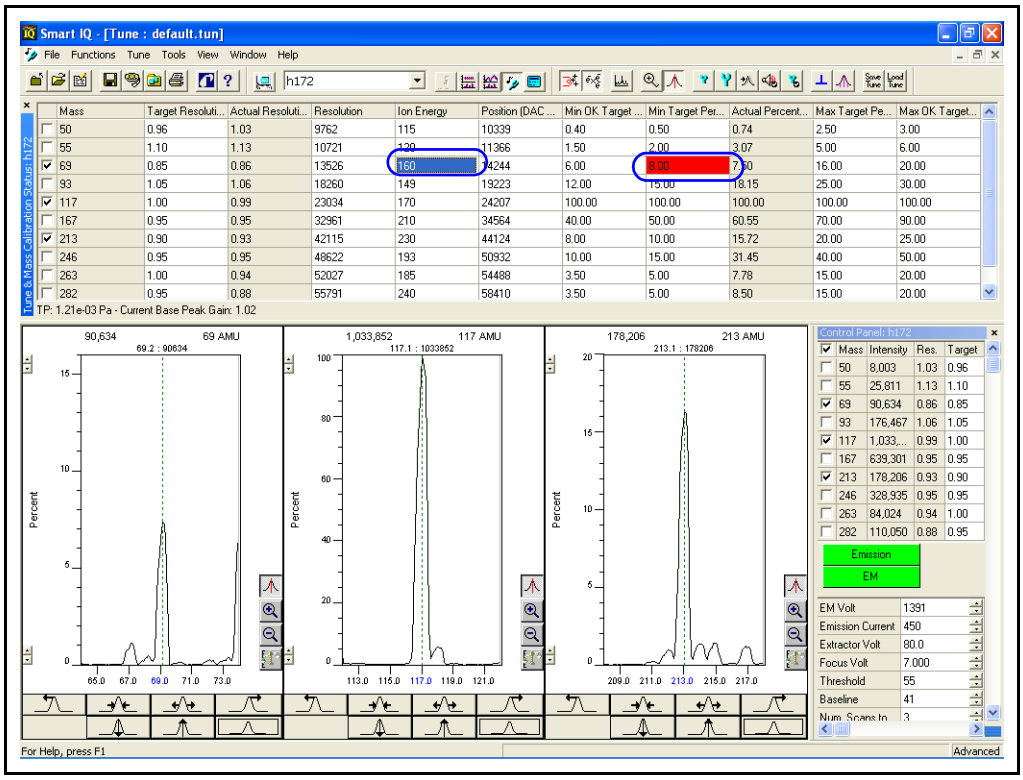
Figure 7-38 Ion Energy Needs to be Increased



NOTE: When adjusting ion energy, there are low and high limits for each mass. Make sure manual adjustments stay within the following limits:

Table 7-1 Manual Adjustments Guidelines

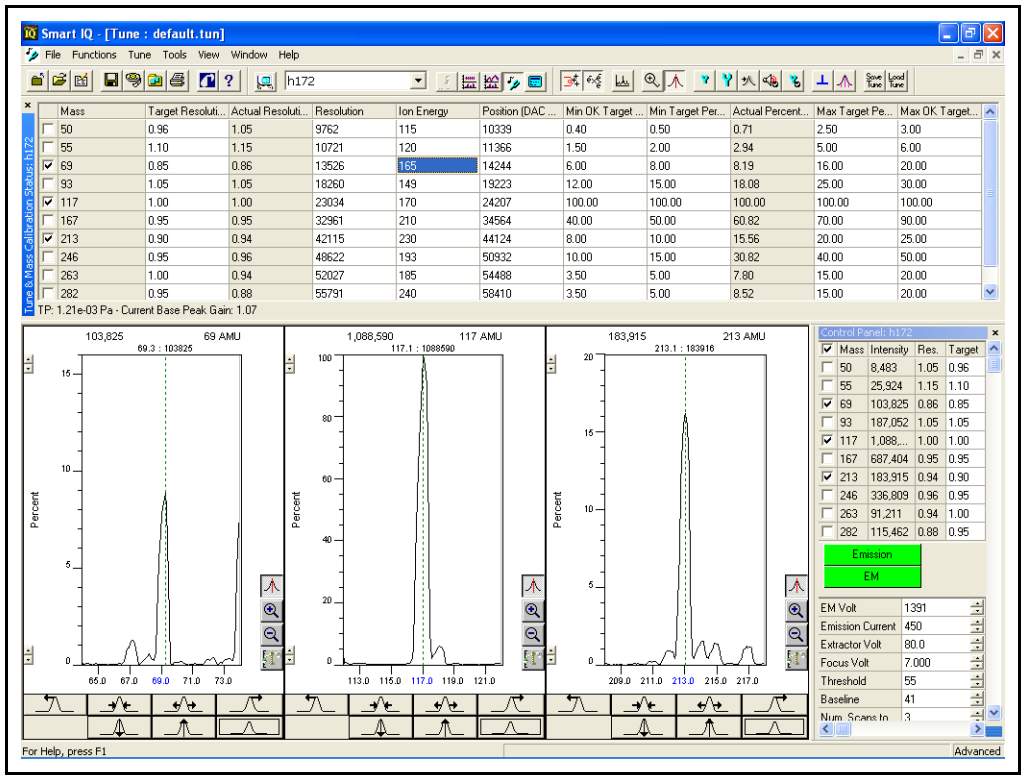
MASS	IE low	IE high
50	90	170
55	90	170
69	90	170
93	90	170
117	140	170
167	140	220
213	175	230
246	180	230
263	185	250
282	190	255

3 After making Ion Energy adjustments:

3a If the red boxes no longer appear, indicating the Actual Resolution is within range, proceed to Step 4. See Figure 7-39.

3b If the HAPSITE is failing to Tune, then repeat the Manual Tune procedure. Proceed to section 7.6.1, Adjusting Base Peak Gain, on page 7-26. If this procedure is repeated more than 2 times, contact INFICON.

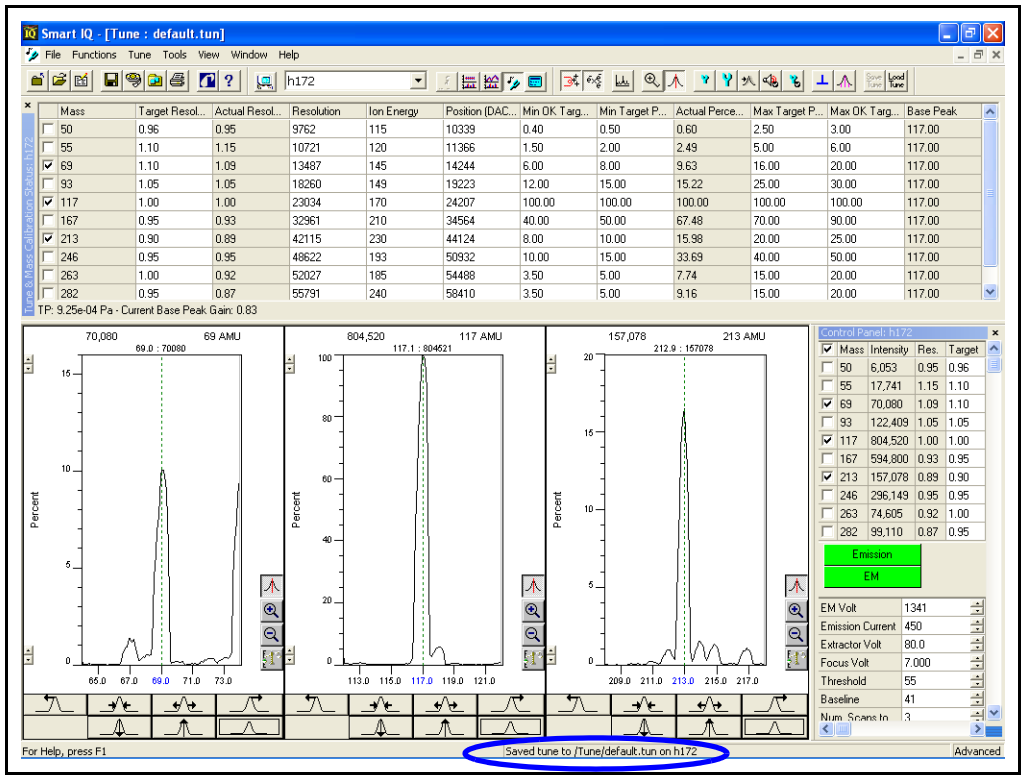
Figure 7-39 Good Manual Tune



4 Save the Tune file. Click **Save Tune** button on the upper Toolbar. See Figure 7-40 and Figure 7-41.

Figure 7-40 Save Tune Button

Figure 7-41 Tune Saved



5 Exit Manual Tune by closing the Tune window. The HAPSITE is ready for sampling.

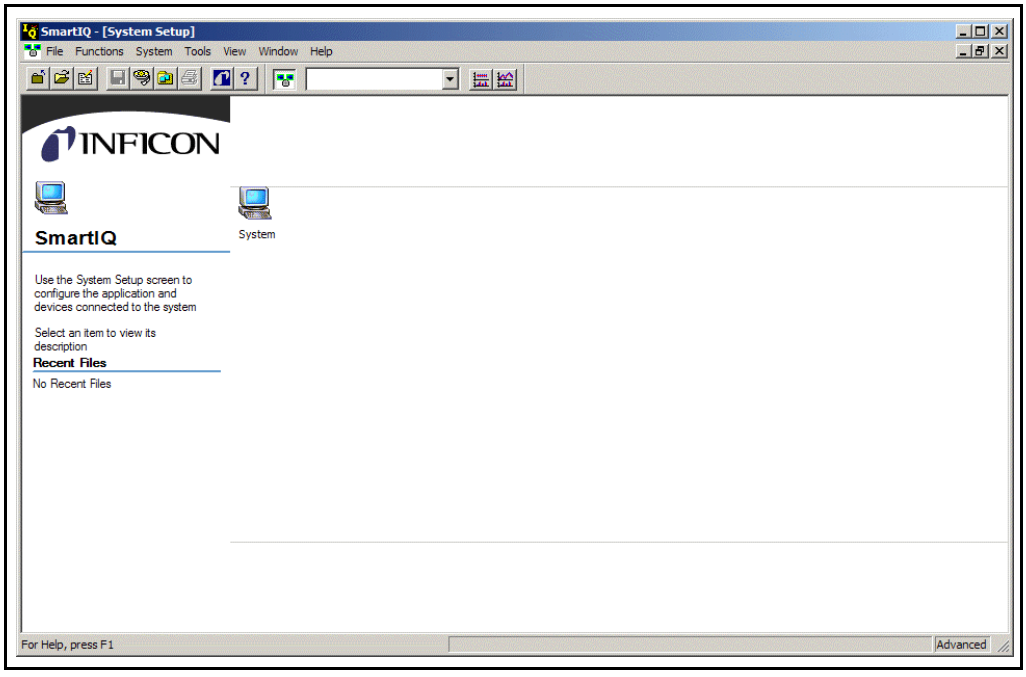
Chapter 8
Smart IQ Software

8.1 The HAPSITE Software - Smart IQ

Smart IQ software includes all of the functions and controls for the HAPSITE Chemical Identification System and its accessories. The software controls instrument operation and runs analyses. Smart IQ can also view and interpret data collected by HAPSITE Smart, managing files, and creating reports. The Smart IQ software operates on a Personal Computer (PC).

The main window of the Smart IQ software is called System Setup. This appears as the first screen when the Smart IQ software is run. See Figure 8-1.

Figure 8-1 System Setup View in Smart IQ Software



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8.2 Computer System Requirements

The following is the minimum recommended computer system for communication with one HAPSITE.

Processor	Pentium III 550 MHz or greater
RAM	512 MB or greater
Hard Disk Space to load Smart IQ	20 Mb
Hard Disk Space for storage	10 GB
Disk Drives	(1) Floppy, (1) CD
Monitor	15 inch, SVGA or greater
Monitor Resolution	1024 x 768 or greater
Communications	(1) RS-232 port and (1) Ethernet port
Operating System	Windows 2000 or XP

8.3 Installing and Updating the HAPSITE Smart and Smart IQ Software

The steps for installing and updating the Smart IQ software are the same.

CAUTION

The most important point to remember is to <u>always</u> update the HAPSITE Smart software prior to updating the Smart IQ software on the computer.

8.3.1 Updating the HAPSITE Smart Software

The HAPSITE Smart is delivered with factory-installed software. These instructions explain how to upgrade that software.

The HAPSITE will need to be connected to the laptop computer and communicating. Refer to Section 2.3.6, Connect Laptop (if desired), on page 2-9 if the HAPSITE and laptop are not connected. Refer to Section 8.6, Establishing Communications between the HAPSITE and Laptop Computer with a Crossover Ethernet Cable, on page 8-20 if communications need to be established. With Smart IQ running:

1. Place the CD containing the HAPSITE Smart software into the CD drive of the laptop.

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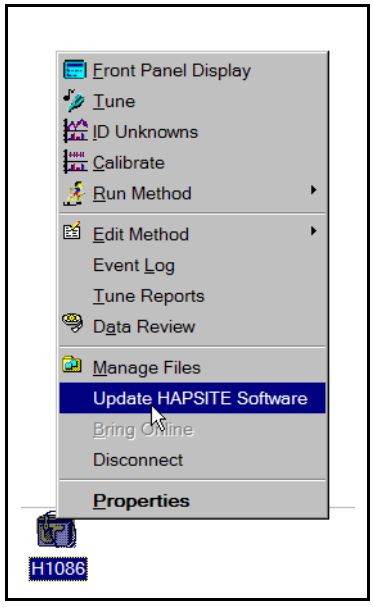
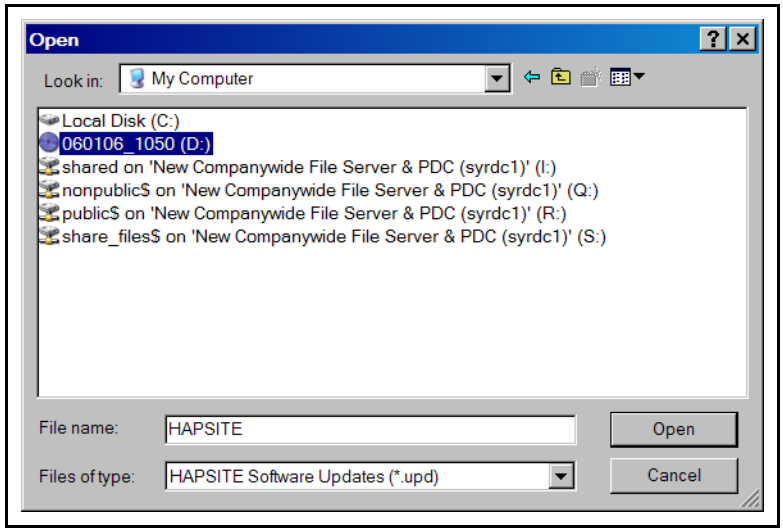
2 Right click on the HAPSITE Sensor Icon and select **Update HAPSITE Software**. See Figure 8-2.

Figure 8-2 Update HAPSITE Software



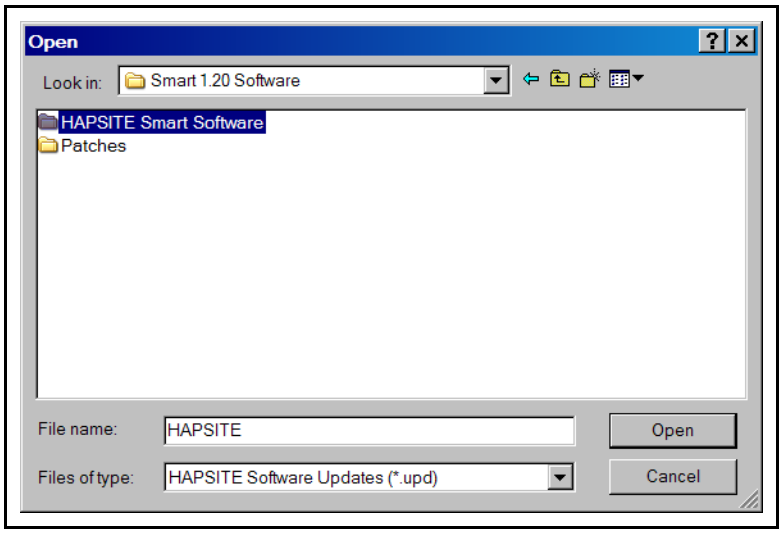
3 Click on **My Computer** to open the folder. Click on the **D drive** (or the CD drive for the laptop if different) to highlight. Press **Open.** See Figure 8-3.

Figure 8-3 Open the CD Drive



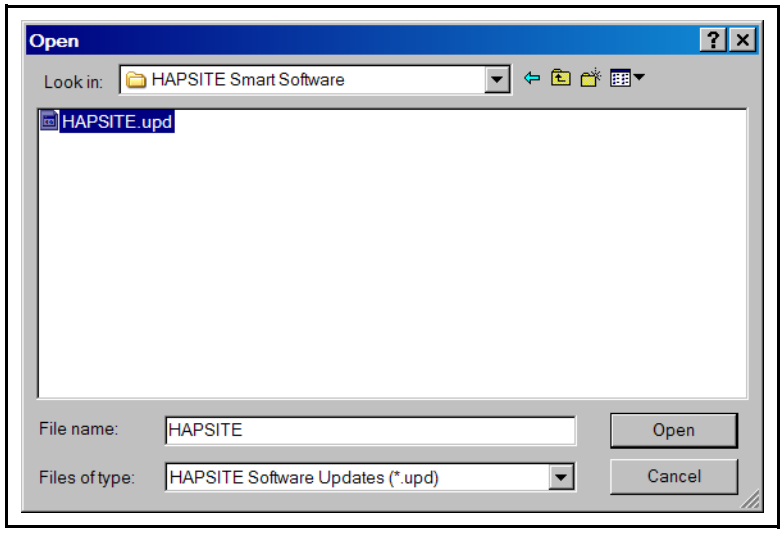
4 Select the **HAPSITE Smart Software** folder. Press **Open**. See Figure 8-4.

Figure 8-4 Selecting the HAPSITE Smart Software Folder



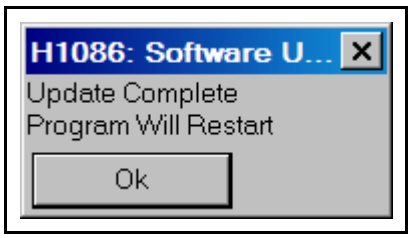
5 Select the **HAPSITE.upd** file. Press **Open**. See Figure 8-5.

Figure 8-5 Selecting the HAPSITE.upd File



6 Click **OK** when the prompt "Update Complete" is displayed. See Figure 8-6.

Figure 8-6 Update Complete Prompt



7 Continue with Section 8.3.2, Installing and Updating the Smart IQ Software, on page 8-5 (if needed).

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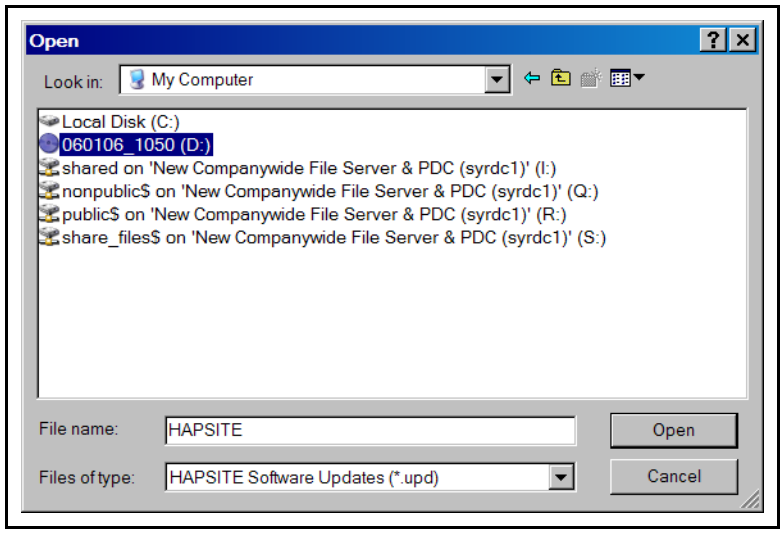
8.3.2 Installing and Updating the Smart IQ Software

CAUTION

Before performing this procedure, perform Section 8.3.1, Updating the HAPSITE Smart Software, on page 8-2.

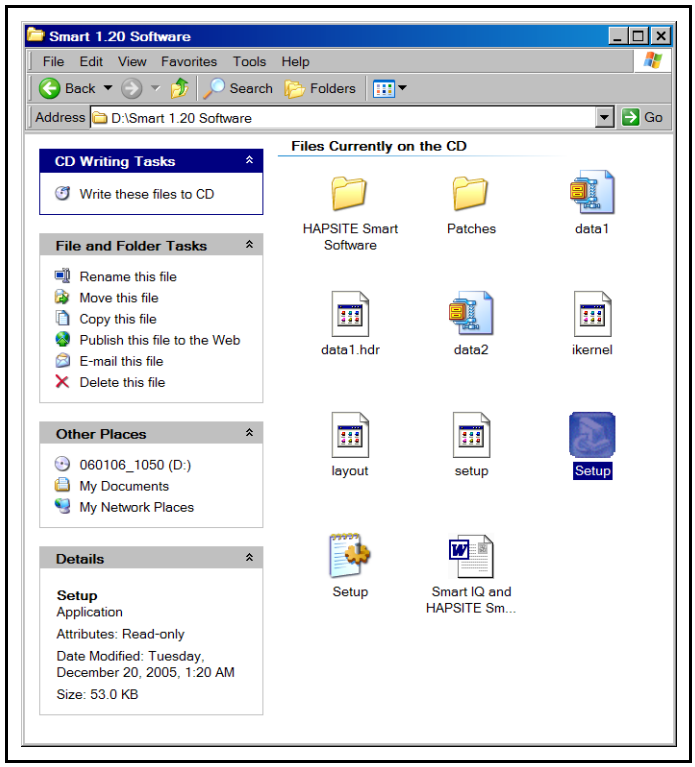
1 Click on **My Computer**. Click on the **D drive** (or the CD drive for the laptop if different) to highlight. Press **Open.** See Figure 8-3.

Figure 8-7 Open the CD Drive



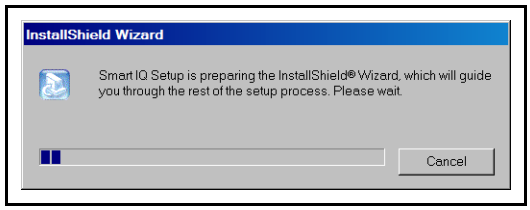
2 Select the **Setup Icon**. Double-click to **Open**. See Figure 8-8.

Figure 8-8 Selecting the Setup Icon



3 The InstallShield Wizard will load. See Figure 8-9.

Figure 8-9 InstallShield Wizard



4 An installation wizard will automatically open to the Welcome Screen. Select **Next**. See Figure 8-10.

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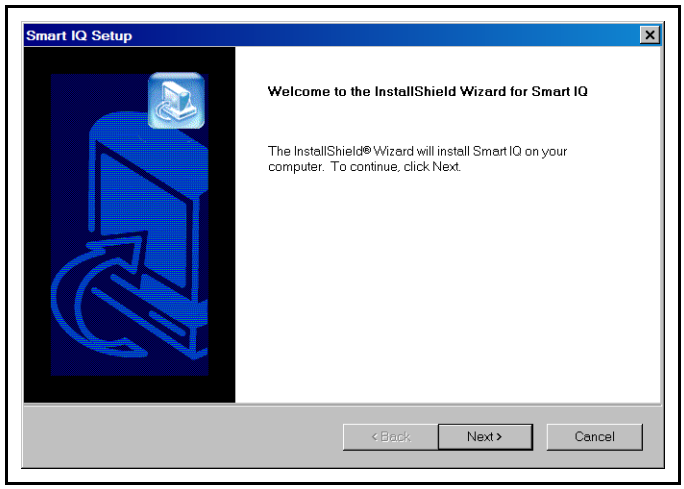
Figure 8-10 Welcome Screen

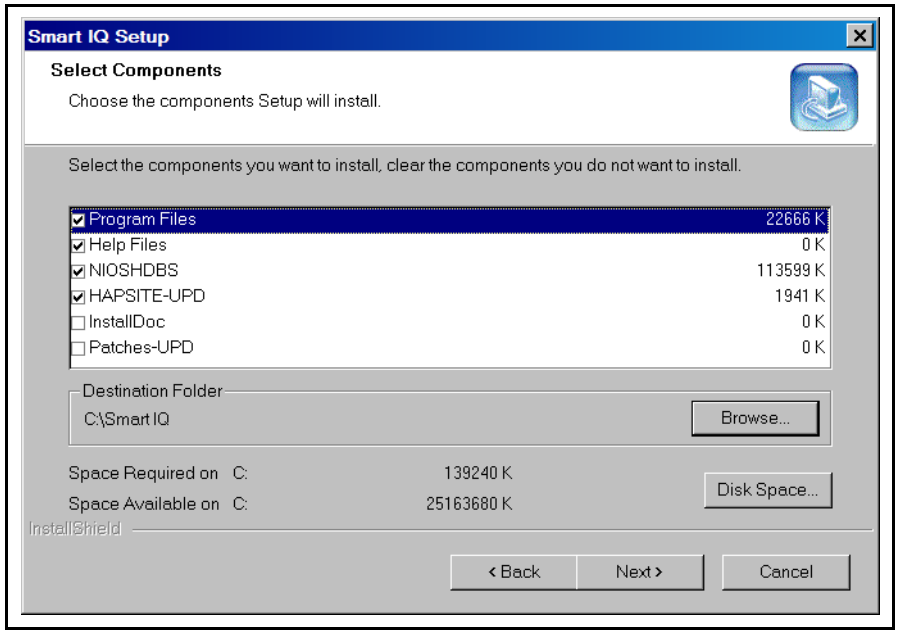


5 When prompted to select the components and destination folder of the Smart IQ program. Select the components desired and press **Next**. See Figure 8-11.

CAUTION

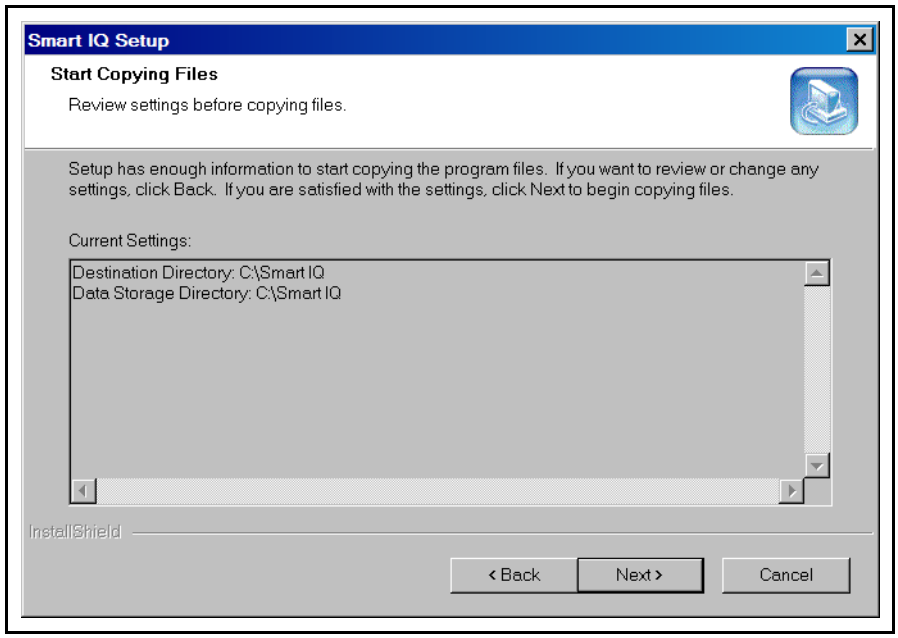
Do not change the destination folder for the Smart IQ program.

Figure 8-11 Select Components Screen



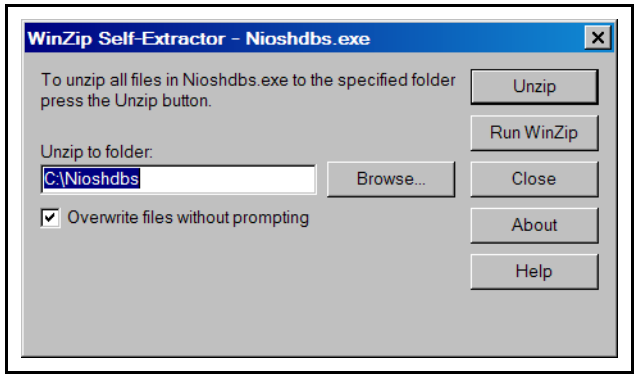
6 A prompt will appear to start copying data files, press **Next**. Copying data files will take a few minutes. See Figure 8-12.

Figure 8-12 Copying Data Files Screen



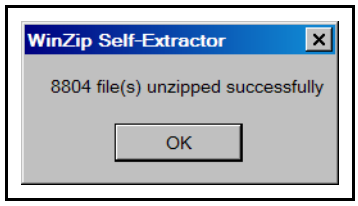
7 A WinZip window will appear asking to unzip the NIOSH Database. Select **Unzip**. See Figure 8-13.

Figure 8-13 Unzip Prompt



8 A window will appear indicating the unzip was successful, press **OK**. See Figure 8-14.

Figure 8-14 Unzip Success



9 Select **Close** on the WinZip window.

10 The installation complete message will appear. Press **Finish**. See Figure 8-15.

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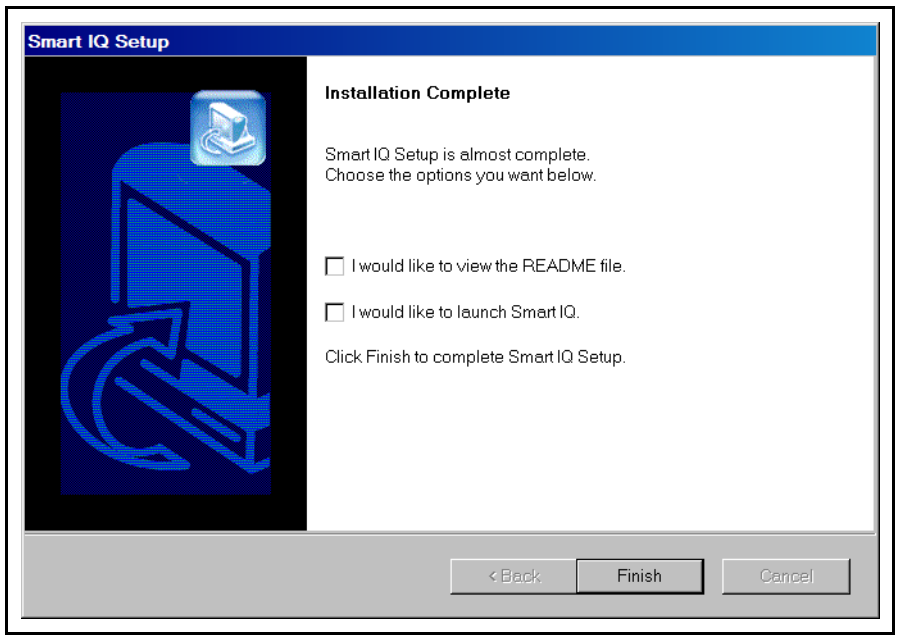
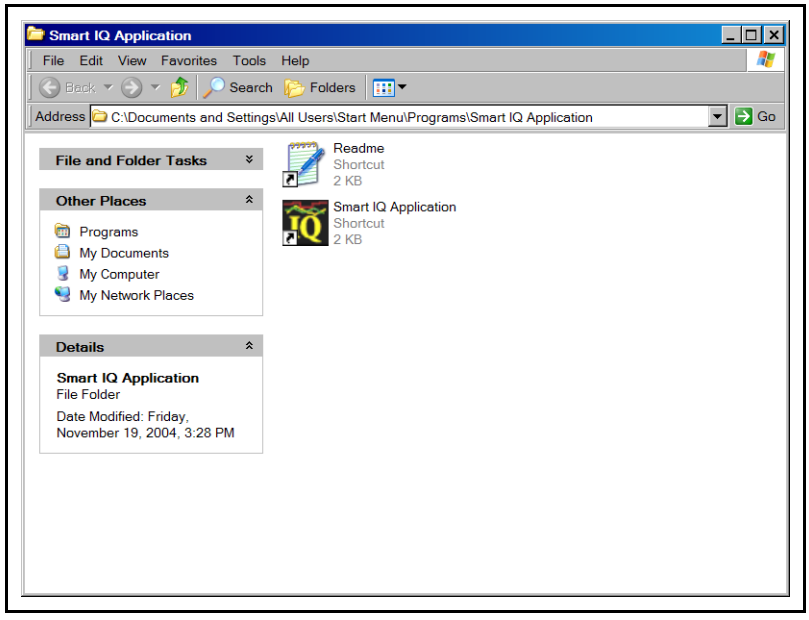
NOTE: The Smart IQ Application window shown in Figure 8-16 may appear first, the Smart IQ Setup window shown in Figure 8-15, Step 10 needs to be addressed before proceeding to Step 11.

Figure 8-15 Installation Complete



11 The Smart IQ Application window will appear containing the Smart IQ Application icon. Left click on the Smart IQ Application icon and drag to the desktop to create a shortcut. See Figure 8-16.

Figure 8-16 The Smart IQ Application Folder



12 Close the Smart IQ Application folder.

13 Close the CD Drive window.

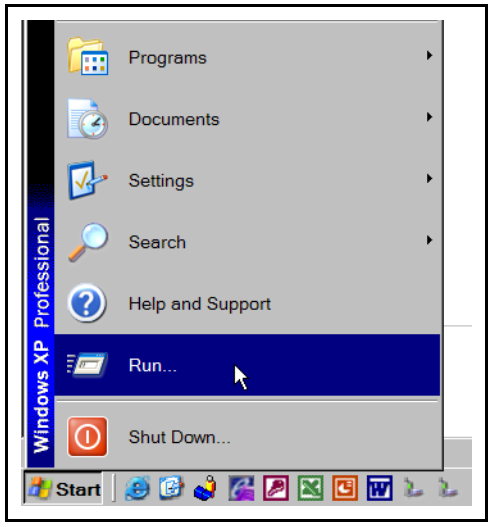
14 Installation/Update is complete.

8.4 Installing/Updating NIST and AMDIS

The NIST and AMDIS mass spectral libraries are powerful tools for identifying VOCs contained in samples.

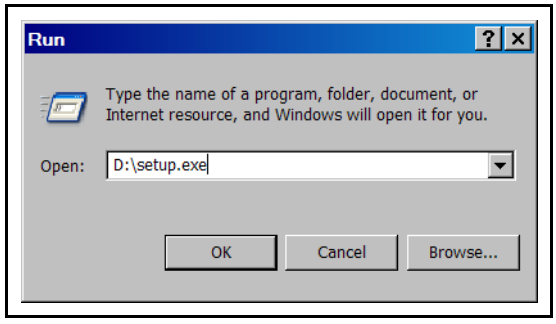
1. Insert the NIST Installation CD into the CD Drive of the laptop.
2. Select **Start>> Run**. See Figure 8-17.

Figure 8-17 Selecting the Run Function



3. Type **D:\setup.exe**. Press **OK**. See Figure 8-18.

Figure 8-18 Running the Setup.exe Program



4. The welcome window for the NIST and AMDIS setup will appear, press **Next**. See Figure 8-19.

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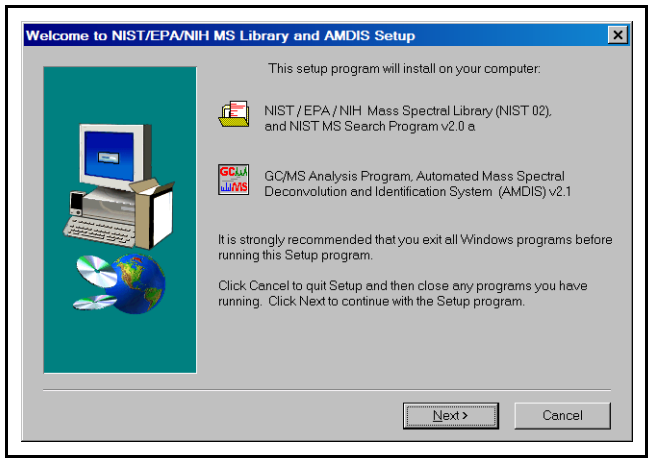
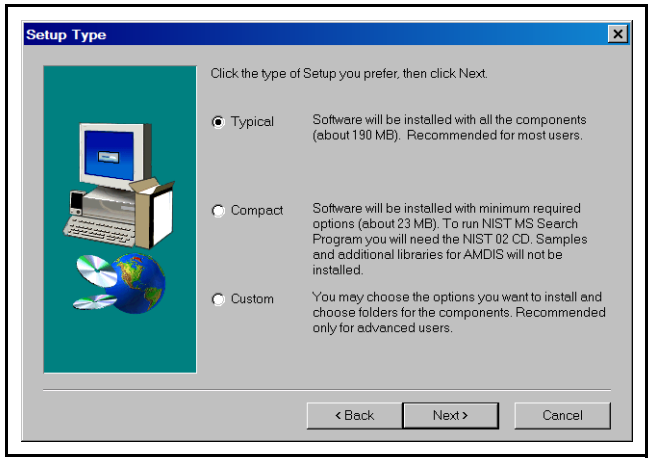
Figure 8-19 NIST and AMDIS Installation Welcome Window



5 On the Setup window, select **Typical**. See Figure 8-20.

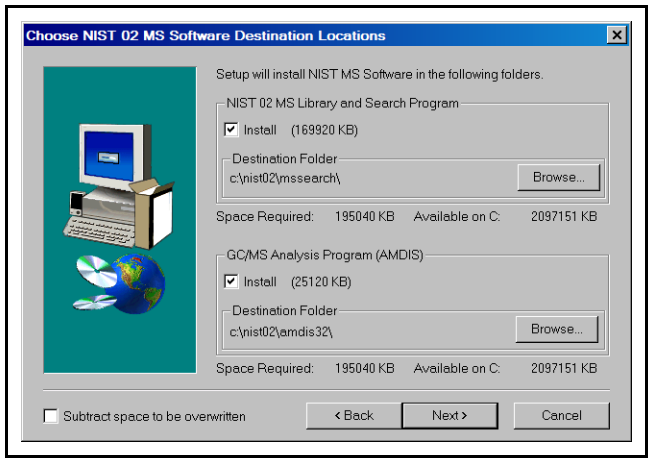
Figure 8-20 NIST and AMDIS Installation Setup Window



6 Press **Next**. See Figure 8-20.

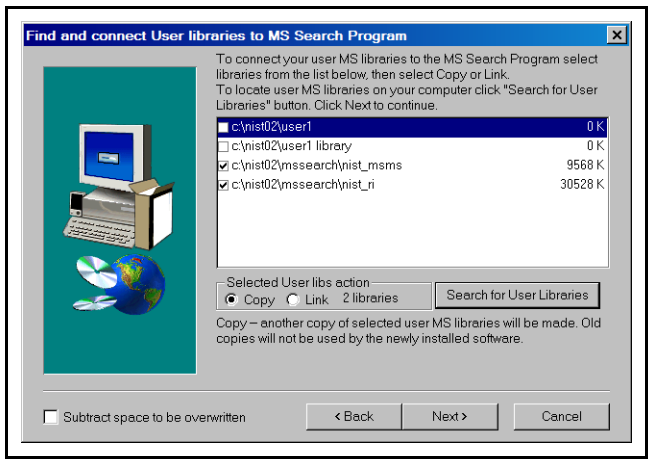
7 When prompted to choose the software destination location, ensure the **Install** check boxes are checked for NIST and AMDIS and press **Next**. See Figure 8-21.

Figure 8-21 NIST and AMDIS Program Designation Window



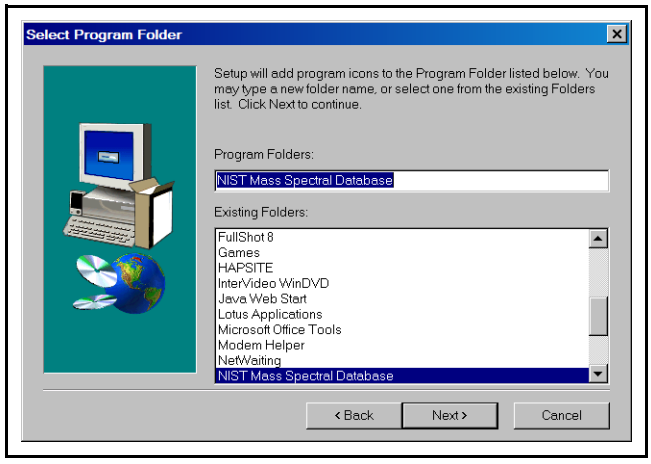
8 When prompted to find and connect to user libraries make the selections shown in Figure 8-22 and press **Next**.

Figure 8-22 NIST and ADMIS Libraries



9 When prompted to select a program folder, use the default shown in Figure 8-23 and press **Next**.

Figure 8-23 Choosing the NIST and AMDIS Program Folder



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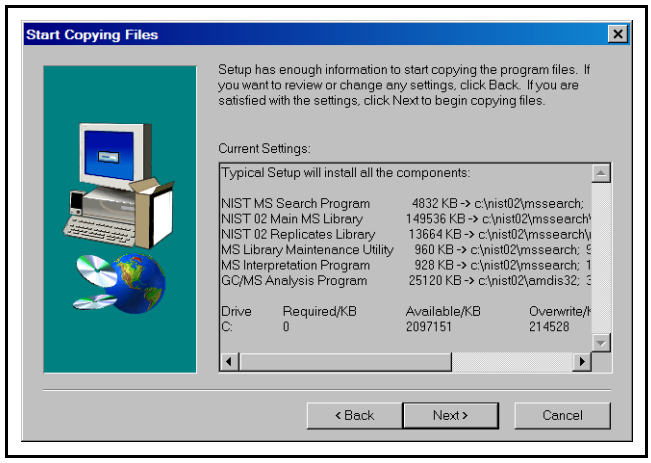
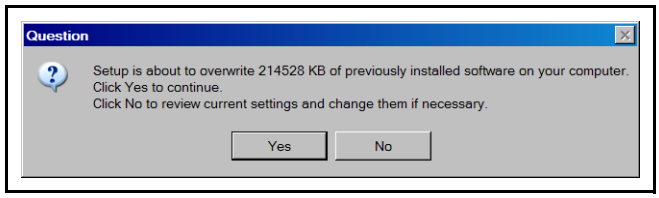
10 Press **Next** to start copying files. See Figure 8-24.

Figure 8-24 NIST and AMDIS Installation Copying Files



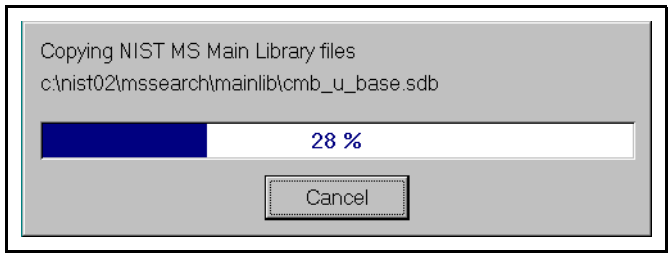
11 If a window appears asking to overwrite existing files, press **Yes**. See Figure 8-25.

Figure 8-25 Overwrite Files Prompt



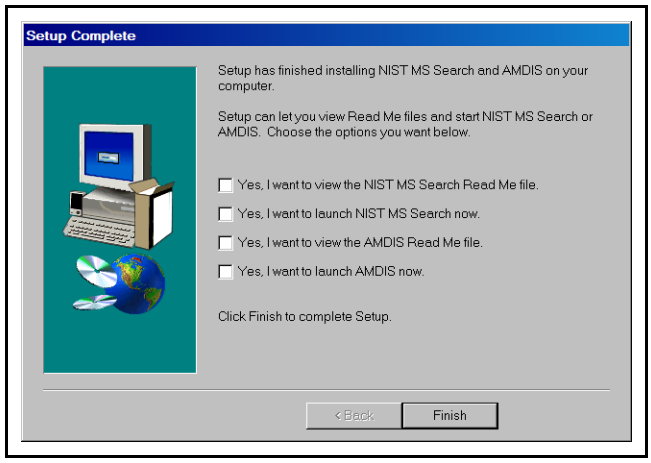
12 The installation will proceed automatically, lasting a few minutes. See Figure 8-26.

Figure 8-26 NIST and ADMIS Installation Progress Window



13 A series of setup windows will appear, followed by a create program files window. When the Setup Complete window appears, press **Finish** to close the installation program. See Figure 8-27.

Figure 8-27 NIST and AMDIS Installation Complete Window



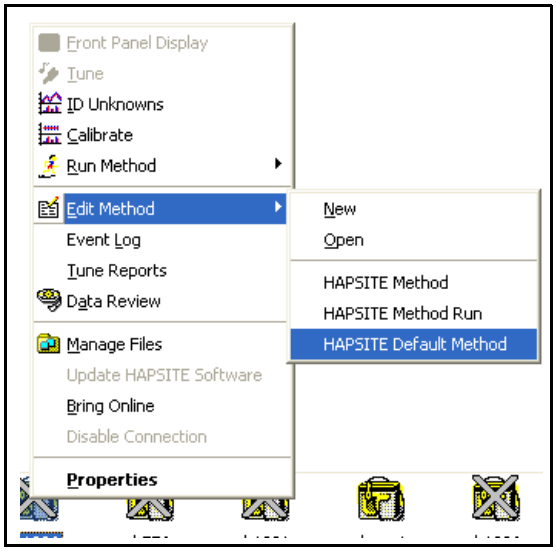
8.5 Reloading Default HAPSITE Methods

All of the default methods are saved on the laptop. These methods can be loaded and modified or used as they are.

8.5.1 Locating Default Methods

Right click on the HAPSITE icon to access the menu. Highlight the **Edit Method** option and a second menu will appear. On this menu the bottom choice is **HAPSITE Default Method**, which provides access to the default methods. See Figure 8-28.

Figure 8-28 Finding Default Methods



Clicking on the **HAPSITE Default Method** option will bring up a window with the default methods. Refer to Figure 8-29.

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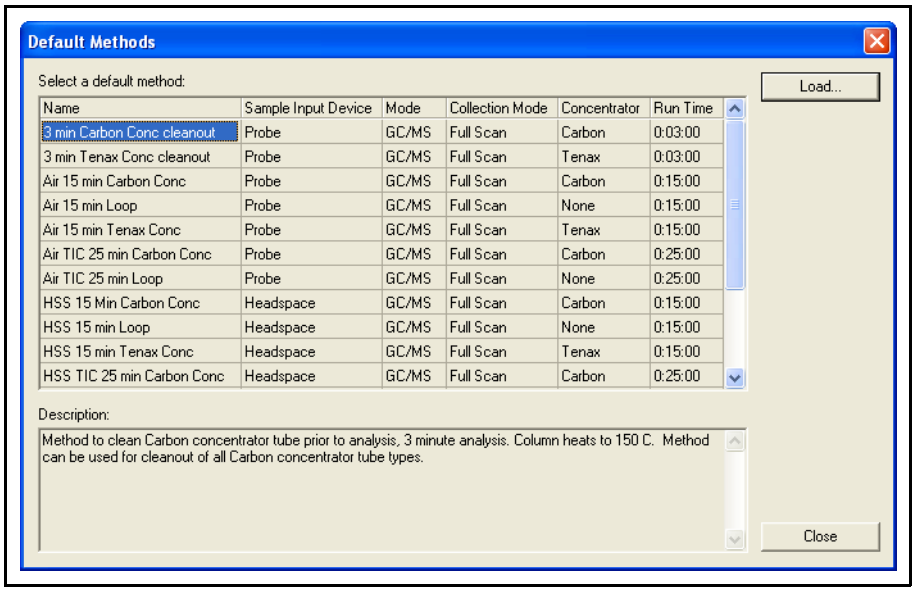
Figure 8-29 HAPSITE Default Methods



The methods found in the **Default Methods** window are general purpose methods for each of the HAPSITE Smart configurations.

3 min Carbon Conc cleanout. . . . . Method to clean the Tri-Bed and Carbopack Concentrator tubes prior to analysis, 3 minutes.

3 min Tenax Conc Cleanout. . . . . Method to clean the Tenax Concentrator tube prior to analysis, 3 minutes.

Air 15 Min Carbon Conc. . . . . Basic Carbon Concentrator method, 15 minute analysis time.

Air 15 Min Loop . . . . . VOC and Chemical Warfare Agent analysis using Sample Loop, 15 minute analysis time.

Air 15 Min Tenax Conc . . . . . VOC and Chemical Warfare Agent Air Analysis using Tenax Concentrator, 15 minute analysis sample time. 1 minute inlet purge plus one minute sample collection.

HSS 15 Min Carbon Conc . . . . . VOC and Chemical Warfare Agent Headspace Solid/Liquid analysis using the Tri-Bed or Carbopack Concentrator, 15 minute analysis time.

HSS 15 Min Loop . . . . . VOC and Chemical Warfare Agent Headspace Solid/Liquid analysis using Sample Loop, 15 minute analysis time.

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HSS 15 Min Tenax Conc. . . . . VOC and Chemical Warfare Agent Headspace Solid/Liquid analysis using Tenax Concentrator, 15 minute analysis time.

SP 15 Min Carbon Conc. . . . . General purpose analysis for VOCs in a water matrix using the Tri-Bed or Carbon concentrator and SituProbe, 15 minute analysis.

SP 15 Min Loop . . . . . General purpose analysis for VOCs in a water matrix using loop injection and SituProbe, 15 minute analysis.

SP 15 Min Tenax Conc . . . . . General purpose analysis for VOCs in a water matrix using Tenax concentrator and SituProbe, 15 minute analysis.

Survey . . . . . Quick analysis to determine if there are VOCs in an area, by-passes GC, analysis time is determined by the user, 2 minutes is suggested.

NOTE: In addition to the standard 15 minute methods there are 25 minute methods for the Sample Loop and concentrators. The analysis of Toxic Industrial Chemicals is the suggested use for these methods. The extended analysis time provides improved resolution of multiple compounds and elution of higher boiling point compounds.

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8.5.2 Loading a Default Method to the HAPSITE

1. From the Default Methods Menu, select the default method to load. See Figure 8-29.

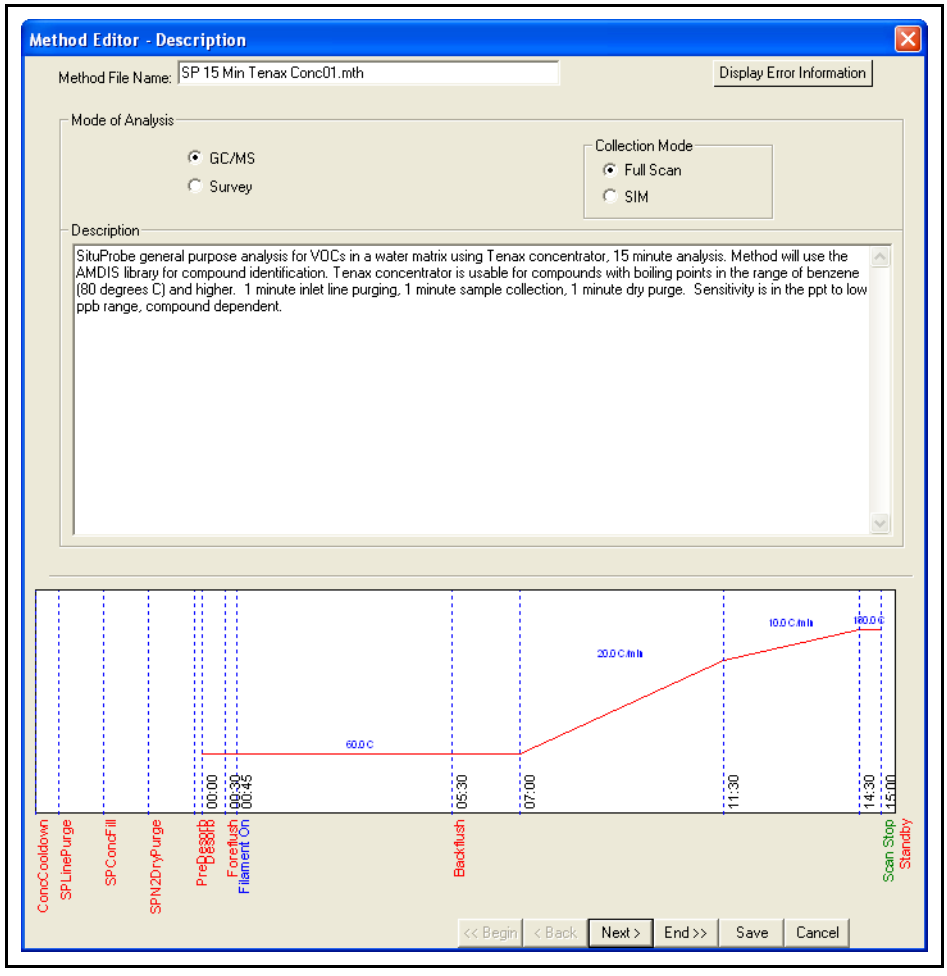
   HINT: Refer to Section 8.5.1, Locating Default Methods, on page 8-14 to find the default methods.

2. Press the **Load** button. See Figure 8-29.

3. Press the **Save** button at the bottom of the Method Editor Description window. See Figure 8-30.

   NOTE: The method file name is built based on the default method name with a two digit number appended (e.g., 01). If the two digits are not desired, then remove them from the file name before pressing the **Save** button.

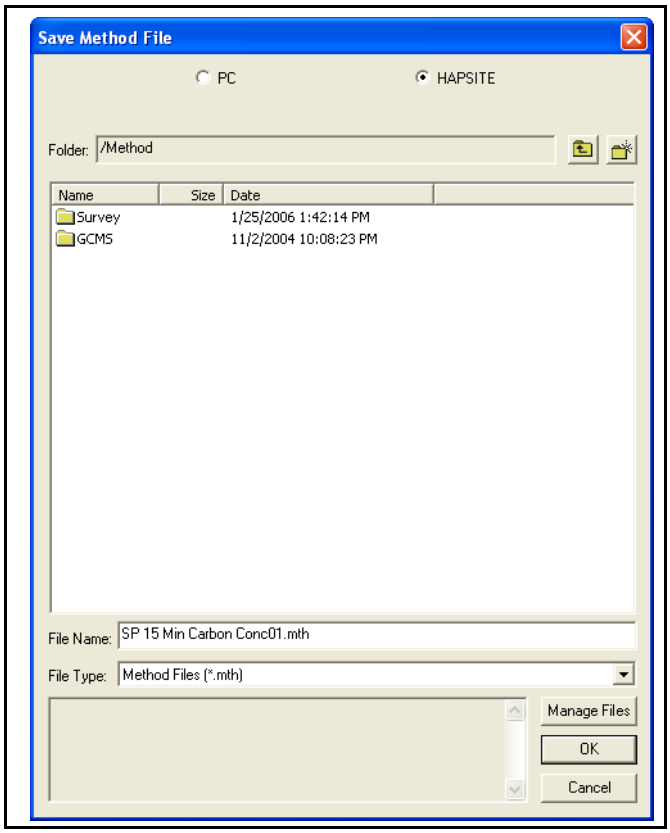
Figure 8-30 Default Methods Method Editor Description Window



4 Double-click the **GCMS** folder (or Survey folder for a Survey method). See Figure 8-31.

HINT: Make sure HAPSITE is selected at the top of the Save Method File dialog. See Figure 8-31.

Figure 8-31 Choosing the GCMS Folder



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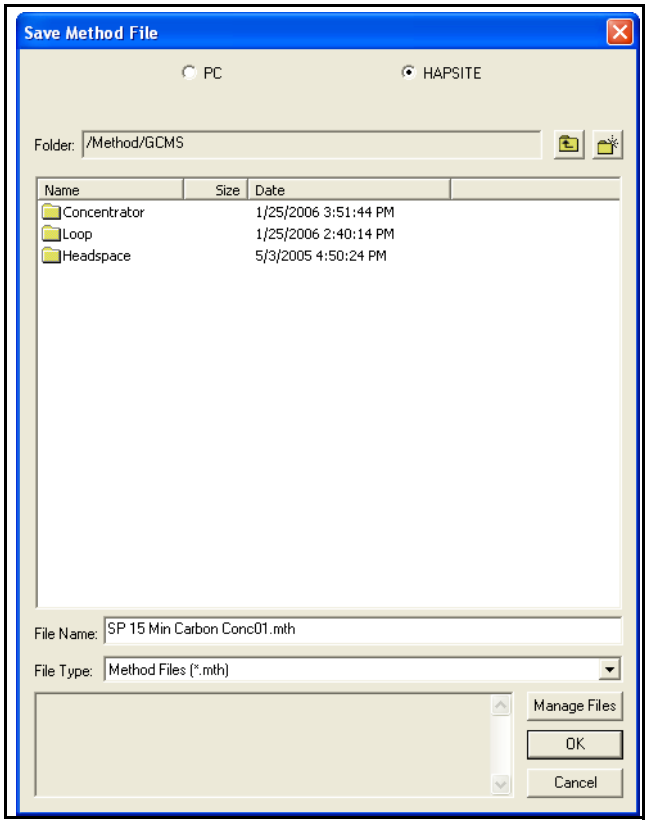
5 Double-click on the appropriate folder for the method to be saved. SeeFigure 8-32.

HINT: If using a Survey Method, skip Step 5.

Figure 8-32 Choosing the Concentrator Folder



6 The default name is automatically modified by Smart IQ, or it can be manually renamed. Press **OK**. The method is now saved to the HAPSITE.

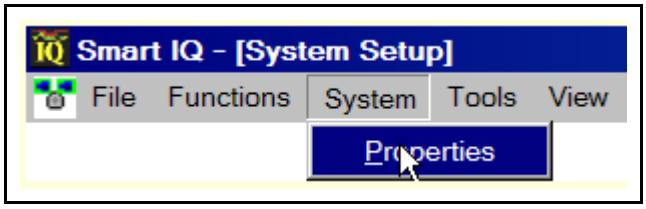
8.6 Establishing Communications between the HAPSITE and Laptop Computer with a Crossover Ethernet Cable

Establishing communications between the HAPSITE, laptop and Service Module (if connected) is necessary to perform many advanced functions. The sections which follow explain the steps needed to establish communications.

8.6.1 Setting Up Communications

1 Open Smart IQ. From the System drop-down menu, select Properties. See Figure 8-33.

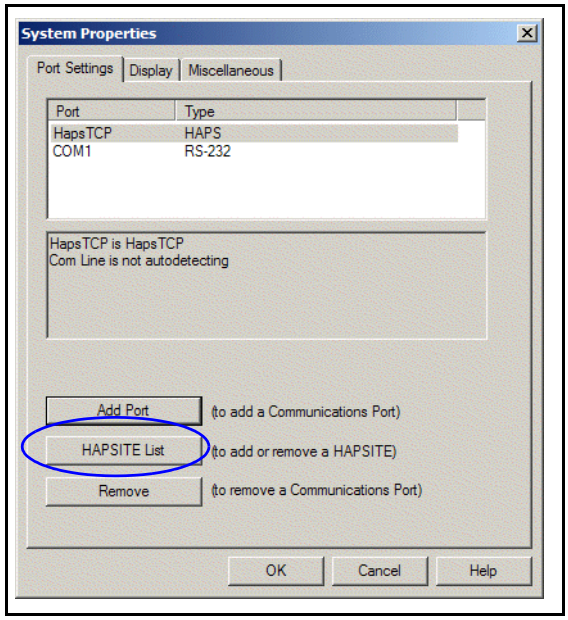
Figure 8-33 Selecting Properties from the System Drop-down Menu



NOTE: You must be in Advanced User Mode to set up communications. See Section 8.10, Access Levels, on page 8-34.

2 Press the **HAPSITE List** button. See Figure 8-34.

Figure 8-34 HAPSITE List Button



3 Enter the letter "**H**", followed by the last **3 or 4 significant digits of the Serial Number** of the HAPSITE that requires communication setup. (The Serial Number can be found on the inside front cover of the HAPSITE.) For example: "**H1086**". Select **Add**. See Figure 8-35.

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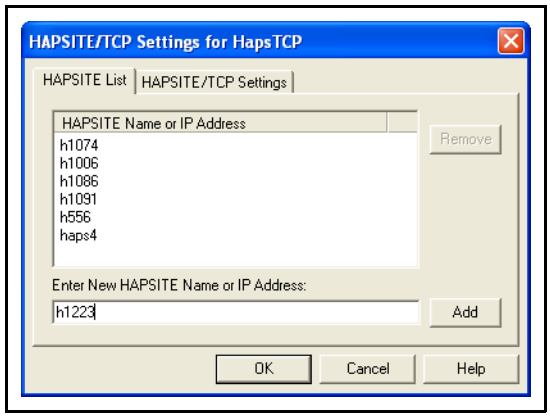
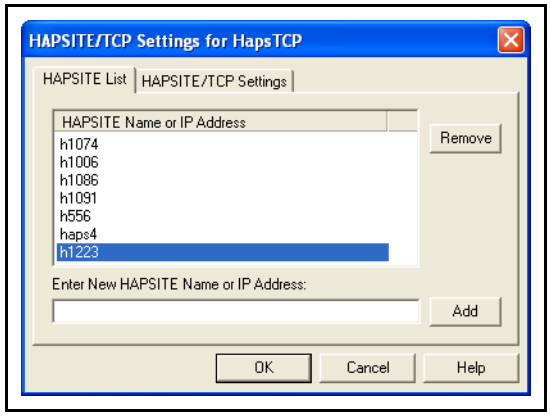
Figure 8-35 Add HAPSITE to Port Settings List



4 The newly added HAPSITE will appear in the HAPSITE List. Press **OK**. See Figure 8-36.

Figure 8-36 New HAPSITE on Port Settings List



5 Press **OK** on the System Properties Window. See Figure 8-34.

6 The newly added HAPSITE icon will now appear at the bottom of the System Setup Window. If the HAPSITE appears as in Figure 8-37, then communications have been established.

Figure 8-37 Newly Added HAPSITE

6a If the HAPSITE icon appears with a Blue "X" through the icon, then communication has not been fully established. See Figure 8-38.

Figure 8-38 HAPSITE Sensor Icon with Blue "X"

6b Continue with Section 8.6.2, Configuring the HAPSITE for Communications, on page 8-22.

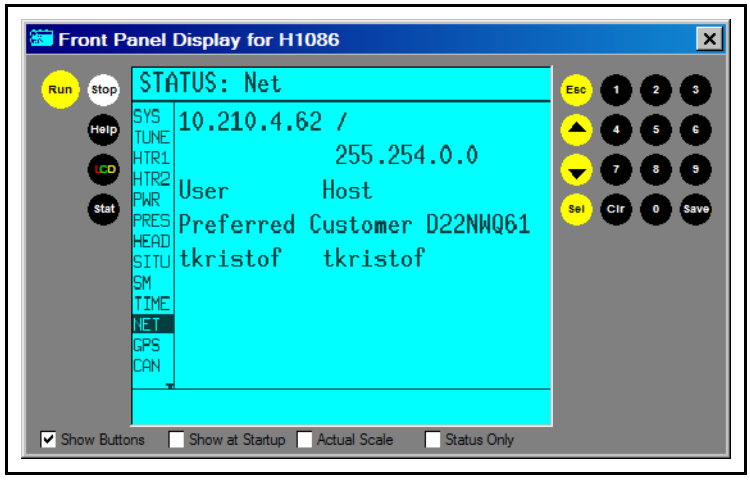
8.6.2 Configuring the HAPSITE for Communications

1 If communication between the HAPSITE and the laptop could not be established using Section 8.6.1, Setting Up Communications, on page 8-20 continue with Step 2.

2 Press the STAT key on the Front Panel of the HAPSITE.

3 Use the arrow keys to select NET. The IP address of the HAPSITE will be displayed. Example: 10.210.4.62 / 255.254.0.0. Each HAPSITE will have a unique IP address. See Figure 8-39.

Figure 8-39 HAPSITE IP Address



4 On the laptop, press **Start**. Depending on the laptop's setup follow either Step 4a or Step 4b.

4a Click on **Settings**, drag the cursor over **Network Connections,** drag the cursor over **Local Area Connection** and click the **left mouse button**. See Figure 8-40.

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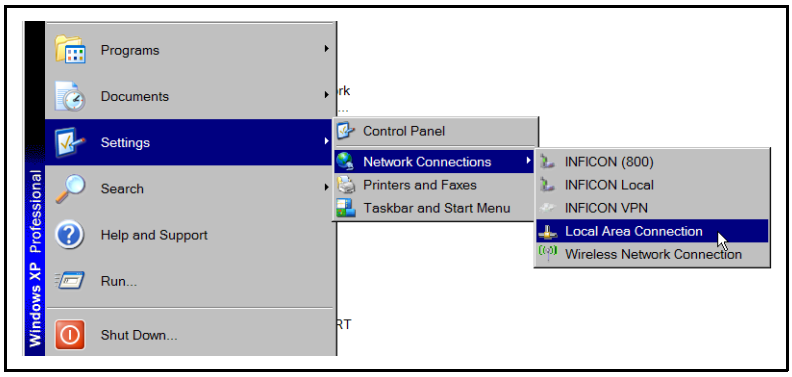
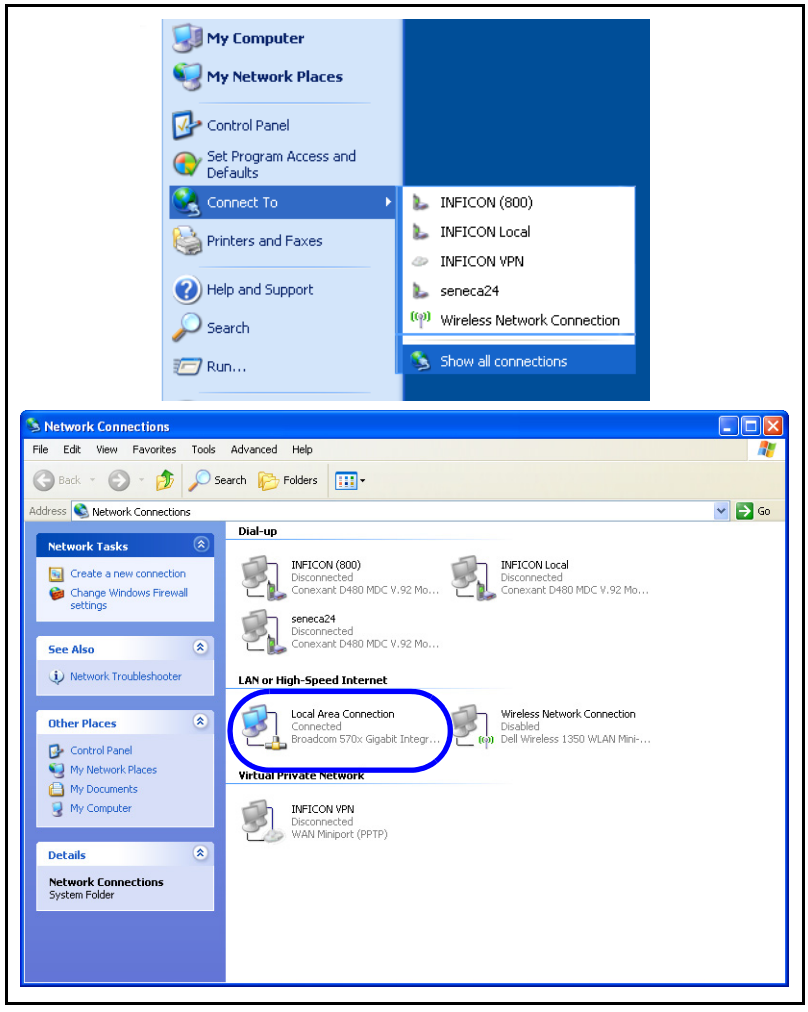
Figure 8-40 Network Connections Classic View



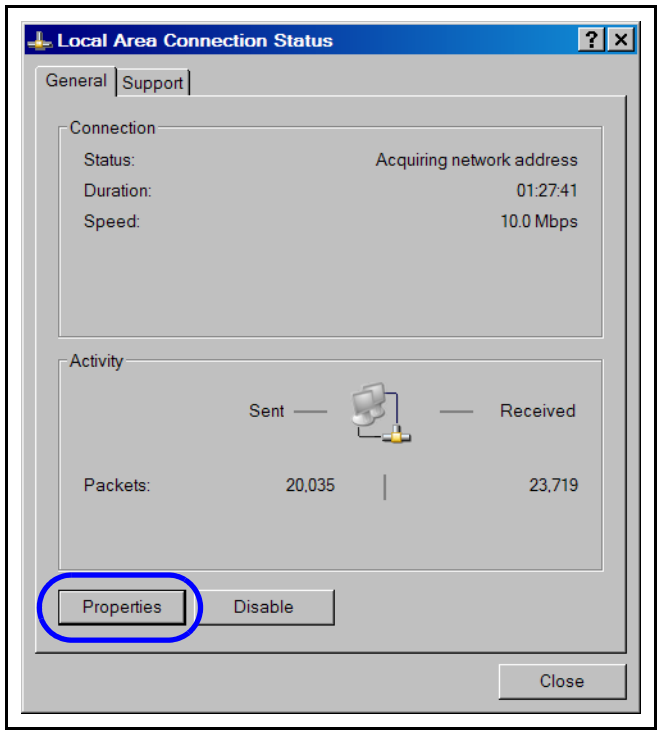
4b Click on **Connect to**, drag the cursor over **Show All Connections** and click **left mouse button**. Click on **Local Area Connection**. See Figure 8-41.

Figure 8-41 Network Connections Standard View



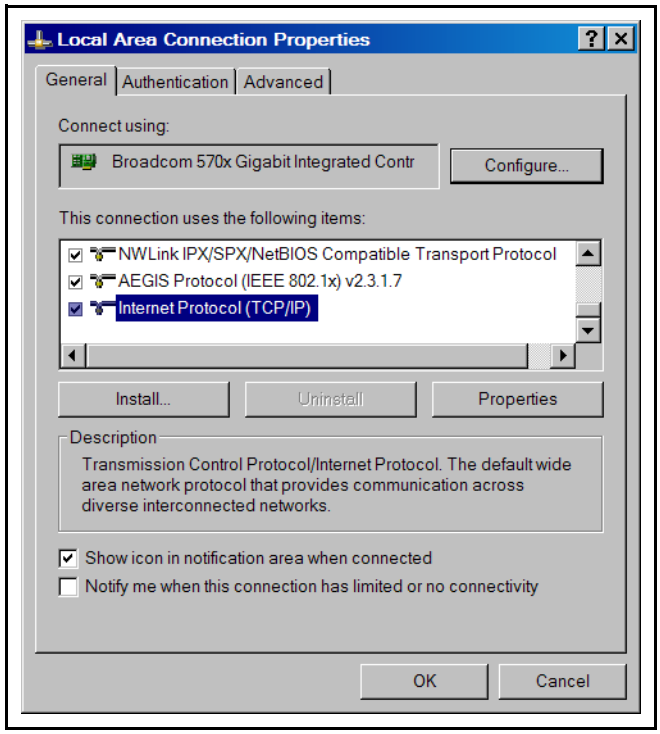
5 The Local Area Connection Status Window will open, press **Properties**. See Figure 8-42.

Figure 8-42 Local Area Connection Status Window



6 In the General tab, scroll down and highlight **Internet Protocol (TCP/IP)**, press **Properties**. See Figure 8-43.

Figure 8-43 Selecting Internet Protocol (TCP/IP)



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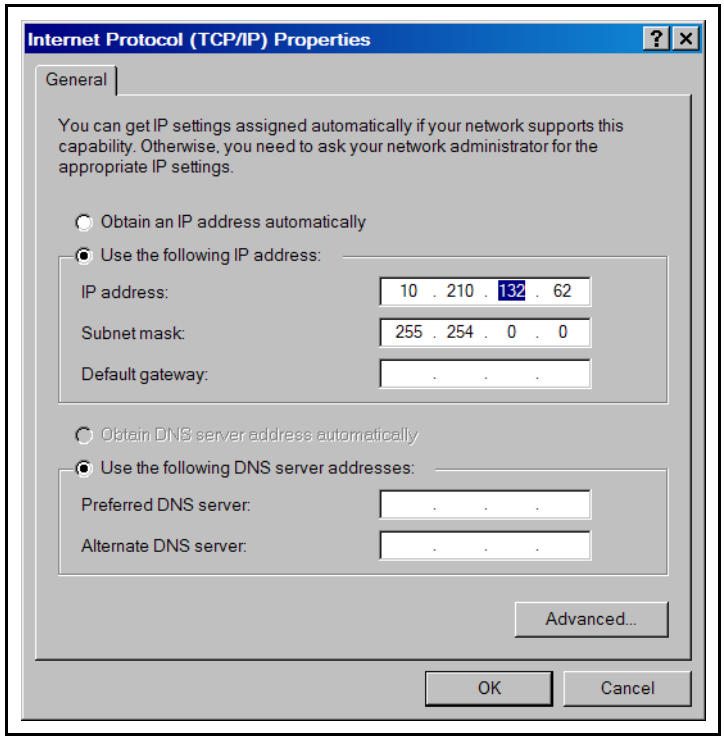
7 Select **Use the following IP address** and enter the IP address of the HAPSITE, (refer to Step 3), with the number 128 added to the third number of the first line of the IP address. This is necessary in order for the system to configure communications properly. Example: 10.210.4.62 becomes 10.210.132.62. See Figure 8-44. Press **OK**.

Figure 8-44 Entering IP Address



8 Press **OK** in the Local Area Connection Properties Window to close the window. See Figure 8-43.

9 Communication between the HAPSITE and the laptop is now established as indicated by the HAPSITE Sensor in the Smart IQ System Setup Window. See Figure 8-45.

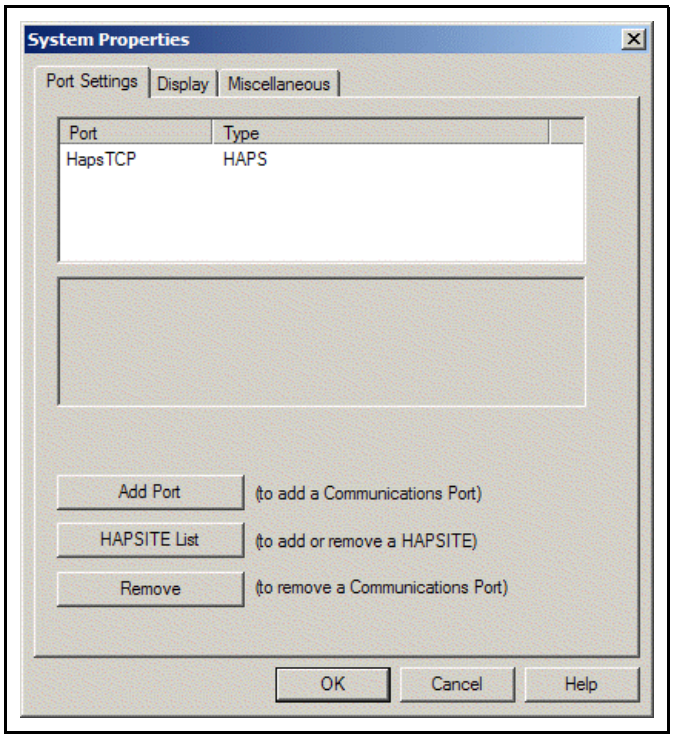
Figure 8-45 Active HAPSITE Sensor Icon

8.6.3 Establishing Communication with the Service Module

Service Module communications will be established automatically if a COM port has been selected. Smart IQ has been set up with COM1 communications, so Smart IQ will automatically recognize and communicate when a Service Module is connected using a RS-232 cable.

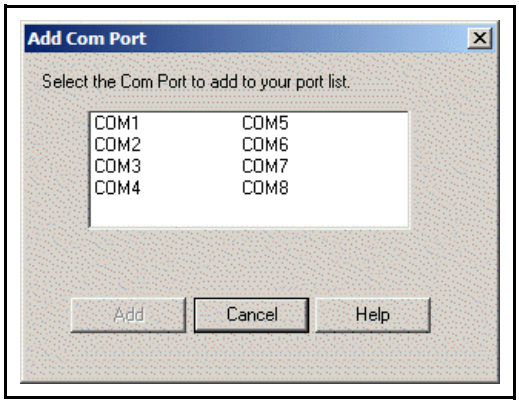
In case the COM port communication has been removed, select the **Add Port** button, shown in Figure 8-46.

Figure 8-46 Port Settings in System Properties Window



When **Add Port** is selected, the window shown in Figure 8-47 will appear. Select the appropriate COM port to add. Select **COM1** or the appropriate COM port.

Figure 8-47 Selecting a COM Port to Add



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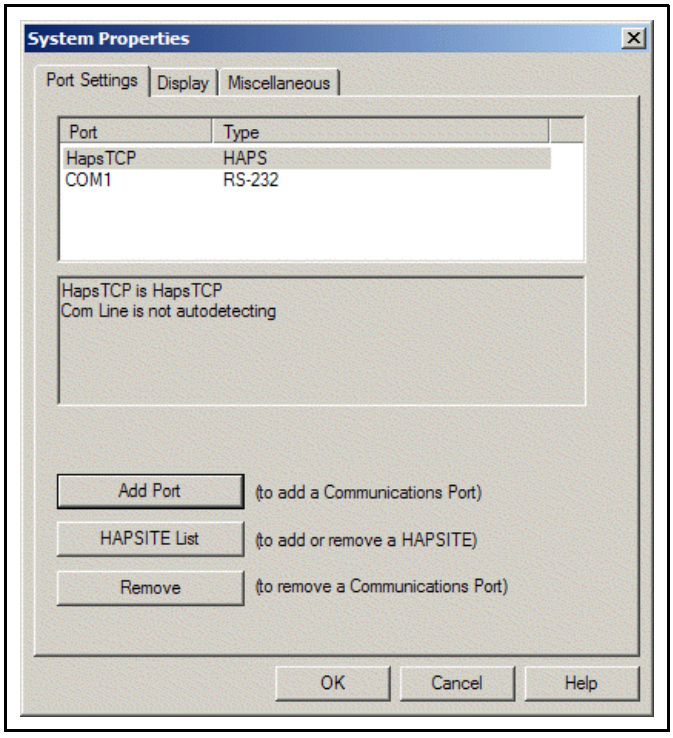
After the COM port has been selected, the COM port will appear in the **Port** list in the System Properties window, as shown in Figure 8-48.

Figure 8-48 Port List in Port Settings Tab of System Properties



Press the **OK** button and the system will automatically establish communications with a Service Module (if powered on and connected) using a RS-232 cable. Please refer to Section 2.7.1, Setting Up the Service Module, on page 2-18 for more details.

8.7 Establishing Communications between the HAPSITE and Laptop Computer Using the Wireless Connection

Refer to Chapter 4, Wireless and USB for information on configuring the HAPSITE Smart to communicate via the wireless connection with the laptop computer.

8.8 Designating a Startup Method

Designating a Startup Method allows the HAPSITE to autotune and automatically run a blank when started.

1 Run the **Smart IQ** software. See Figure 8-49.

HINT: Advanced access level required. Refer to Section 8.10, Access Levels, on page 8-34 for additional information.

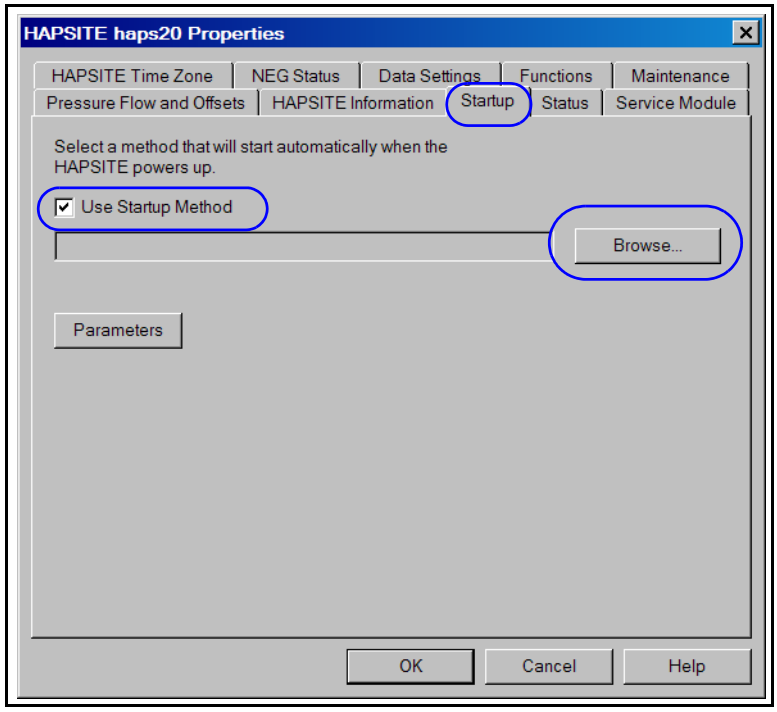
Figure 8-49 Smart IQ Icon

2 Double click on the **HAPSITE Sensor Icon**. See Figure 8-50.

Figure 8-50 HAPSITE Sensor Icon

3 Click on the **Startup** tab. See Figure 8-51.

Figure 8-51 Startup Tab



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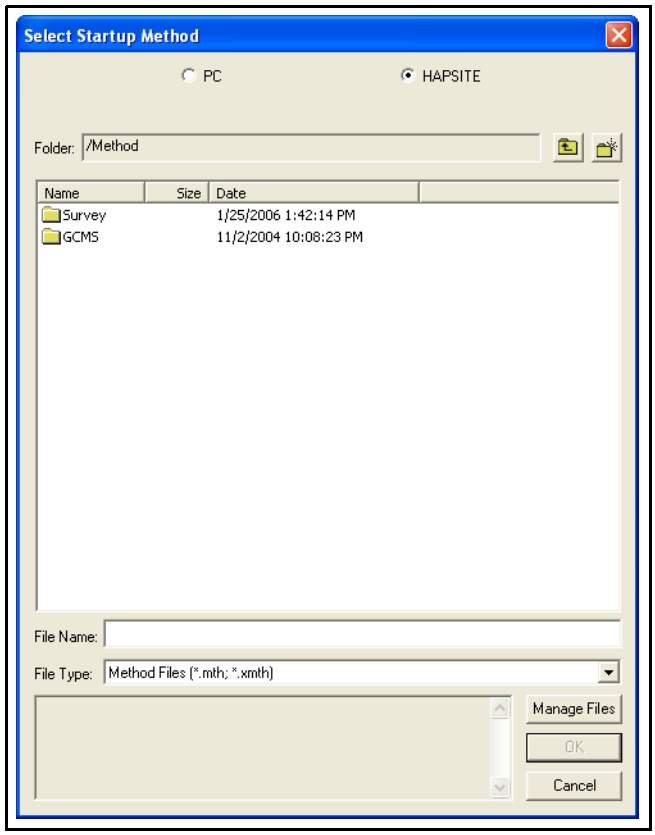
4 **Check** the box for **Use Startup Method**. See Figure 8-51.

5 **Click** on **Browse** to select a method. See Figure 8-51.

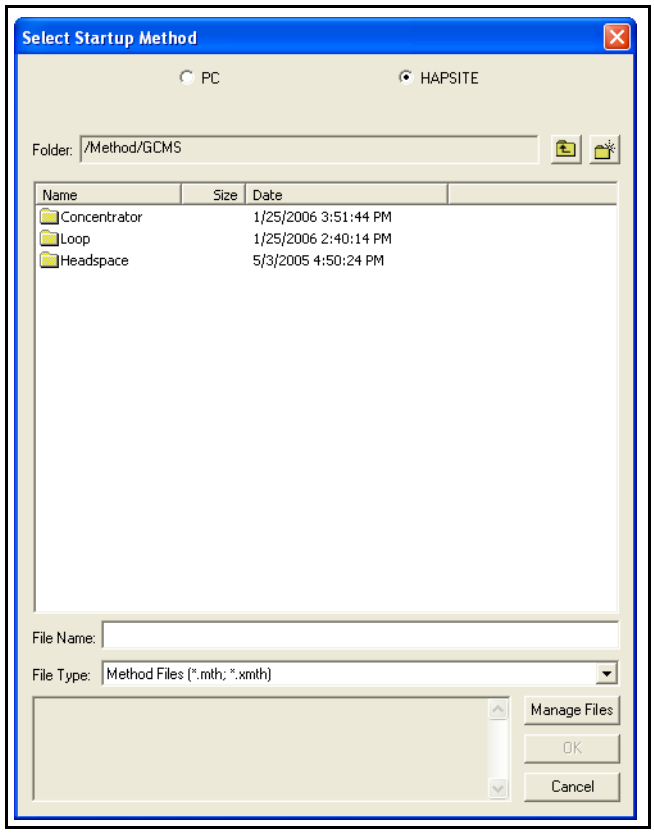
6 **Double-click** on the desired method folder (Example:GCMS). See Figure 8-52.

Figure 8-52 Selecting Startup Method



7 **Double-click** on the desired configuration (EXAMPLE: Loop). See Figure 8-53.

Figure 8-53 Method Folders



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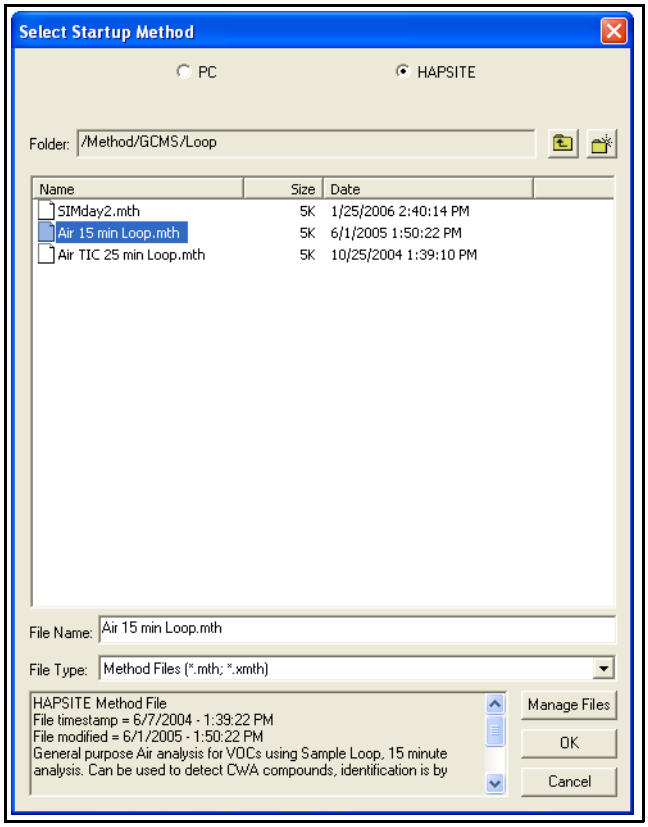
8 **Double-click** on the desired method. (EXAMPLE: Air 15 min Loop) See Figure 8-54.

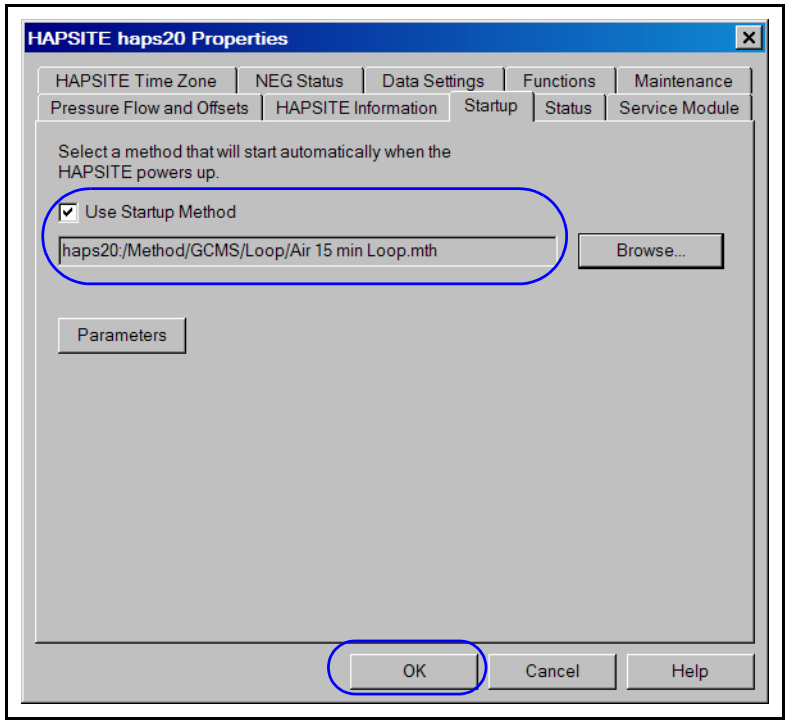
Figure 8-54 Choose Method



9 Press **OK**. See Figure 8-54.

10 The selected method should be entered on the line below *Use Startup Method*. See Figure 8-55.

Figure 8-55 Startup Method Selected



11 Press **OK** to finish. Refer to Figure 8-55. This method will automatically run whenever the HAPSITE is turned on.

8.9 Setting the HAPSITE Time Zone

Setting the HAPSITE to the correct time zone is important and is accomplished with a few easy steps.

1 Open the **Smart IQ** software. See Figure 8-56.

Figure 8-56 Smart IQ Icon

2 On the System Set-up Page, **double-click** on the **HAPSITE Sensor Icon**. See Figure 8-57.

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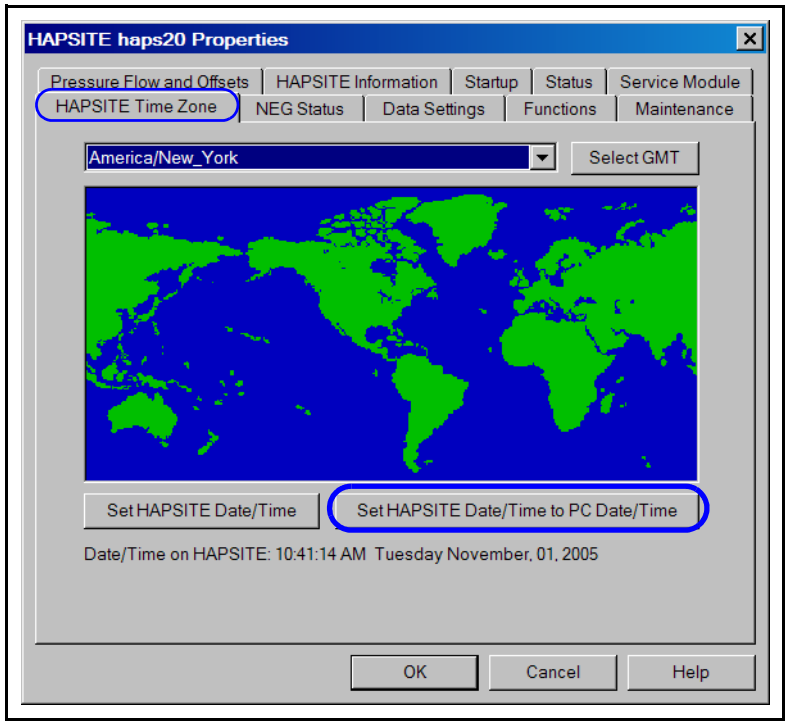
Figure 8-57 HAPSITE Sensor Icon

3 Click on the **HAPSITE Time Zone** tab in the Properties Window. See Figure 8-58.

Figure 8-58 HAPSITE Time Zone Tab



4 Select the correct Time Zone from the drop-down list above the map.

5 Press **OK** and restart the HAPSITE. A restart is required to set the Time Zone.

6 Return to the dialog shown in Figure 8-58 to synchronize the PC and HAPSITE data and time.

7 Click on **Set HAPSITE Date/Time to PC Date/Time**. Press **OK**. Refer to Figure 8-58.

8 The HAPSITE will be synchronized with the Date and Time of the computer.

8.10 Access Levels

There are two user Access Levels which can be set in Smart IQ: **Normal** and **Advanced**. Neither Access Level is installed with a password.

Normal users can run samples, view results and reports, and perform basic operations with HAPSITE Smart.

Advanced is a higher level which allows access to all user operations, including everything a Normal user is allowed plus Tune, Method Editor, and some service actions.

The default access level is Normal, and no password is set by default. To restrict access to advanced functions, an Advanced user password should be set. Once the password is set, the password must be entered each time the Smart IQ program is restarted, or whenever the access level is changed from Normal to Advanced.

8.10.1 Changing Access Levels

NOTE: When **Normal** access level is selected, a message will appear stating that some areas of Smart IQ will be restricted from access.

1 To change the access level, click on Tools on the System Startup Page.

1a Select **Set Access Level...**. See Figure 8-59.

Figure 8-59 Choose Set Access Level.... from Tools Menu

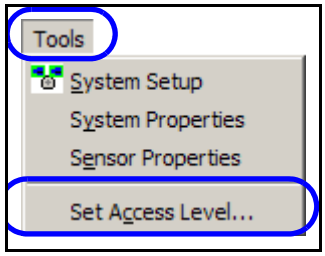
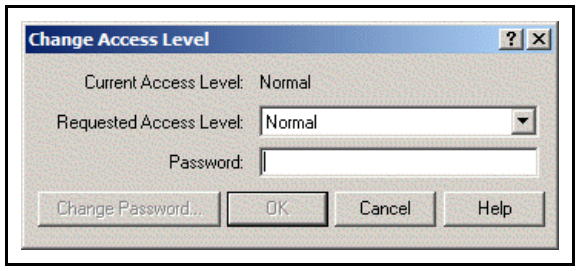


Figure 8-60 Change Access Level Window



2 To select advanced access, click on the **Requested Access Level** pull-down menu and select **Advanced**. If a password has been entered, the **current password** will need to be entered in the Password box before pressing **OK**. See Figure 8-60.

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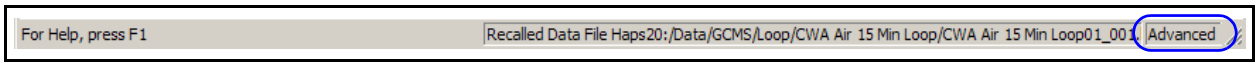
3 The current access level of the system is shown at the bottom right corner of the Smart IQ program, in the Status Bar, as shown in Figure 8-61 below.

Figure 8-61 Current Access level, shown in Status Bar



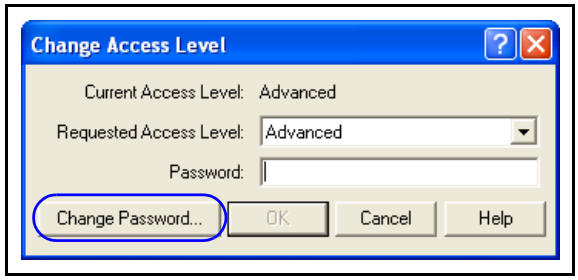
8.10.2 Setting or Changing the Access Level Password

1 To change the Advanced level password, first enter Advanced level. Refer to Section 8.10, Access Levels, on page 8-34.

2 Once in Advanced level, refer to Section 8.10.1, Changing Access Levels, on page 8-34, Step 3 for additional information, return to the **Change Access Level Window.** See Figure 8-60.

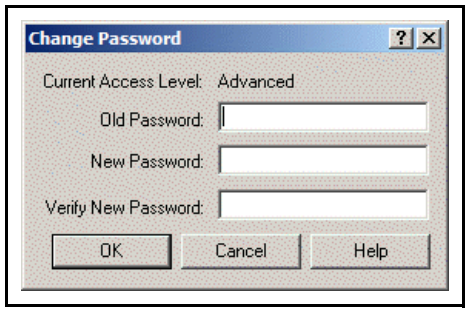
3 Press the **Change Password** button. See Figure 8-62.

Figure 8-62 Change Password Button



4 The window shown in Figure 8-63 will appear.

Figure 8-63 Change Password Window



5 In order to change the password, the correct existing password must be entered in the **Old Password** box, and the new password must be entered in both **New Password** and **Verify New Password** boxes. Press **OK** to set the new password, or cancel to exit without resetting the password.

6 Once the new password has been entered, the Change Access Level window will re-appear. Press the **Cancel** button to close the window. Refer to Figure 8-62.

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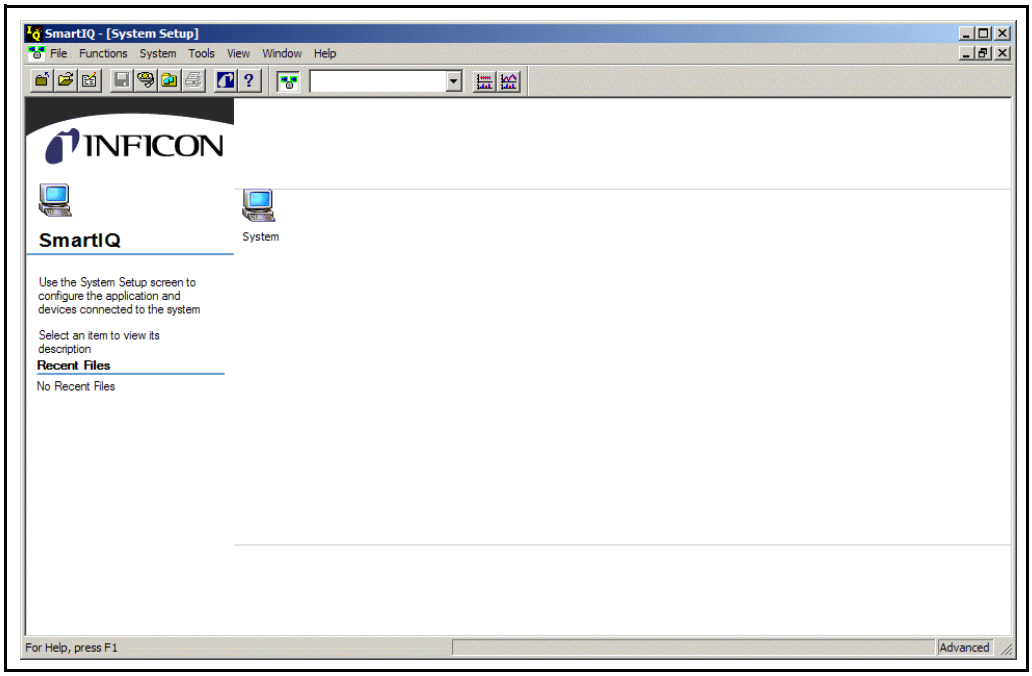
HINT: Smart IQ remembers the last access level when closed. When the program is re-opened, the system will default to the last access level used. If a password has been set, the user will be required to enter the correct password to open with Advanced access. If the password is not known, the user can select Normal access and continue.

8.11 Smart IQ Controls

The System Setup Page is the main screen of the Smart IQ software. The System Setup Page appears as shown in Figure 8-64 upon initial installation.

Figure 8-64 Smart IQ - System Setup View



The screen includes various user interfaces, including:

- A menu, located at the top of the window
- Toolbars to perform various actions
- A main screen which displays component connections, such as HAPSITE and Service Modules connected. This screen also shows the status of the selected HAPSITE or Service Module.
- When a HAPSITE sensor or Service Module sensor is selected, the sensor displays icons to execute functions for that device.

NOTE: The Menu items and functions available will change depending upon the Access Level selected (Normal or Advanced). Normal users may be restricted from performing certain functions.

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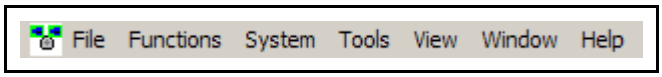
8.11.1 System Setup Main Menu

The Main Menu in the System Setup view includes entries which can change, depending upon the item selected and the user Access Level selected. See Figure 8-65.

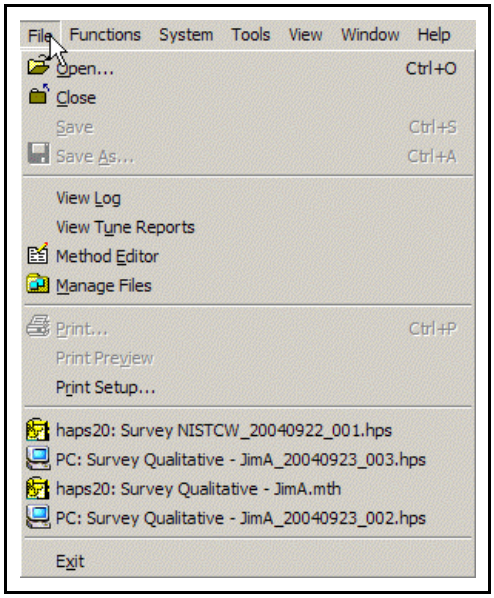
Figure 8-65 System Setup Main Menu



8.11.1.1 File

The **File** drop-down menu is shown in Figure 8-66.

Figure 8-66 File menu selection



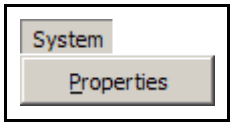
8.11.1.2 Functions

Functions are only available when a component is selected (System, HAPSITE, Service Module, etc.).

8.11.1.3 System

The **System** menu accesses **Properties**. See Figure 8-67.

Figure 8-67 System Menu



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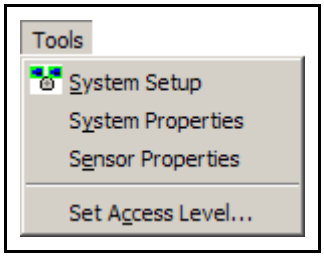
8.11.1.4 Tools Menu

The **Tools** menu, shown in Figure 8-68, is consistent for all screens in Smart IQ. Tools includes **System Setup**, which allows switching back to the System Setup view. The menu also includes **System Properties**, **Sensor Properties**, and **Set Access Level...**.

Figure 8-68 Tools Menu



8.11.1.5 View Menu

The View menu provides selections for displaying and removing parts of the user interface. There is also a choice to use large Toolbar buttons.

8.11.1.6 Window Menu

The window menu is a standard menu for maximizing and minimizing windows in the program.

8.11.1.7 Help Menu

The Help menu provides version information about Smart IQ. At this time, no online help is provided with the program.

8.12 Software Versions for the HAPSITE and Laptop

Table 8-1 Smart IQ and HAPSITE Smart Compatibility Guide

Smart IQ Version (PC)	HAPSITE Smart (AM)	Release Date	Notes
1.05	1.00	Nov. 2004	Initial Release Date
	1.02	Nov. 2004	
1.06	1.14	Jul. 2005	Added features and software fixes
	1.16	Aug. 2005	
1.20	1.20	Dec. 2005	Added features and software fixes
1.24	1.24	July 2006	Software fixes

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HAPSITEs use HAPSITE Smart software. Laptops use SMART IQ software. Even though the two programs usually are distributed on the same CD, the programs are not the same and require separate installations. Refer to Section 8.3, Installing and Updating the HAPSITE Smart and Smart IQ Software, on page 8-2.

Click on the Smart IQ Information icon to check the software version for the laptop.

Figure 8-69 Smart IQ Information Icon

Refer to Section 3.2.6, STAT, on page 3-16 to determine how to check the version of the HAPSITE Smart software installed on the HAPSITE.

CAUTION

If possible both the laptop and HAPSITE should always have installed the most current version of the software available. The chart above shows the compatibility of the Smart IQ and HAPSITE Smart software. Do not try to run incompatible versions of software together. (For example Smart IQ 1.05 and HAPSITE Smart 1.16)

8.13 HAPSITE Icons

Icon	Description
	Starts Smart IQ Software from Desktop.
 System	System Properties (Communications, Display, Miscellaneous).
 haps4	HAPSITE Sensor. Right Mouse Button to access menu.
 Data Review	Data Review. Accesses all saved data.

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Icon	Description
 Run Method	Accesses methods to initiate a run.
 NIST	Accesses the NIST software and Library.
	Accesses the NIOSH Database.
 AMDIS	Accesses the AMDIS software and library.
 Manage Files	Allows transfer of files between HAPSITE and Laptop.
 Method Editor	Allows editing and creating methods.
 Service Module	Accesses the Service Module when attached.
 Status	Accesses HAPSITE Properties.
 Tune	Accesses the HAPSITE tune program.
 Front Panel	Opens the HAPSITE Front Panel display on the Laptop screen.

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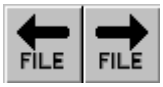
Icon	Description
	Accesses Data file information.
	Accesses Help. (Not available.)
	Returns the current screen to the System Setup screen.
	Accesses Smart IQ software information.
	Accesses the Calibrate function.
	Accesses the ID Unknowns function.
	Navigates through files in Data Review.
	Navigates through peaks in “search for peaks”.
	Returns to the complete full chromatogram (TIC) display in “search for peaks”.

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Chapter 9
Data Review

9.1 Introduction to Data Review

The **Data Review** section of the HAPSITE SMART software allows access to previously acquired data for review and analysis, or to view data that is being acquired in real time. Data Review functionality includes:

- Search quickly for individual components using the NIST Library and the F7 key.
- **Search for Peaks** function to scan and tentatively identify all peaks in a Total Ion Chromatogram (TIC), as well as generate a report.
- Specify which masses to view in a Reconstructed Ion Chromatogram (RIC)
- Select Scan ranges to be viewed in the TIC.
- Zoom in/out of TIC/RIC.
- Subtract backgrounds from TIC.
- Subtract specific scans from acquired spectra.
- Grab spectra for analysis utilizing the full NIST database program.
- Go to **AMDIS** (**A**utomated **M**ass Spectral **D**econvolution and **I**dentification **S**ystem) with TIC for qualitative identification.
- Review data file information.
- Label TIC and individual spectra.
- View the method used to acquire data.
- View the GC column temperature profile (if applicable).
- Adjust properties of the Data Review (Monitor).

These features will allow the tentative identification of unknowns using the NIST or AMDIS spectral libraries, and prepare reports that will aid in the identification of unknown chemicals.

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9.2 Accessing the Data Review Feature

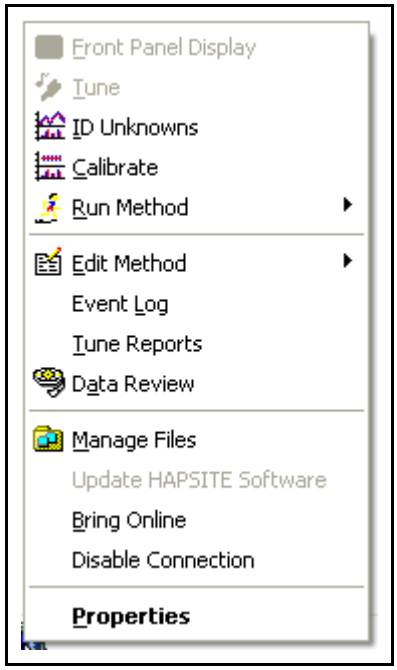
The **Data Review** feature can be accessed as follows:

- Double click the **Data Review** icon, see Figure 9-1, or

Figure 9-1 Data Review Icon

- Right click the HAPSITE icon. The menu shown in Figure 9-2 will appear. Click **Data Review**.

Figure 9-2 Data Review Menu



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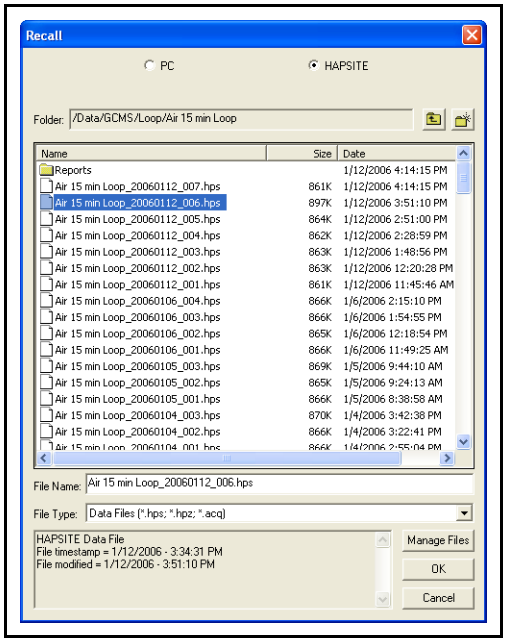
The Recall window will appear. Select the desired data file, either from the PC or the HAPSITE. See Figure 9-3.

Figure 9-3 Data Recall Window



There are three data file extensions that are available:

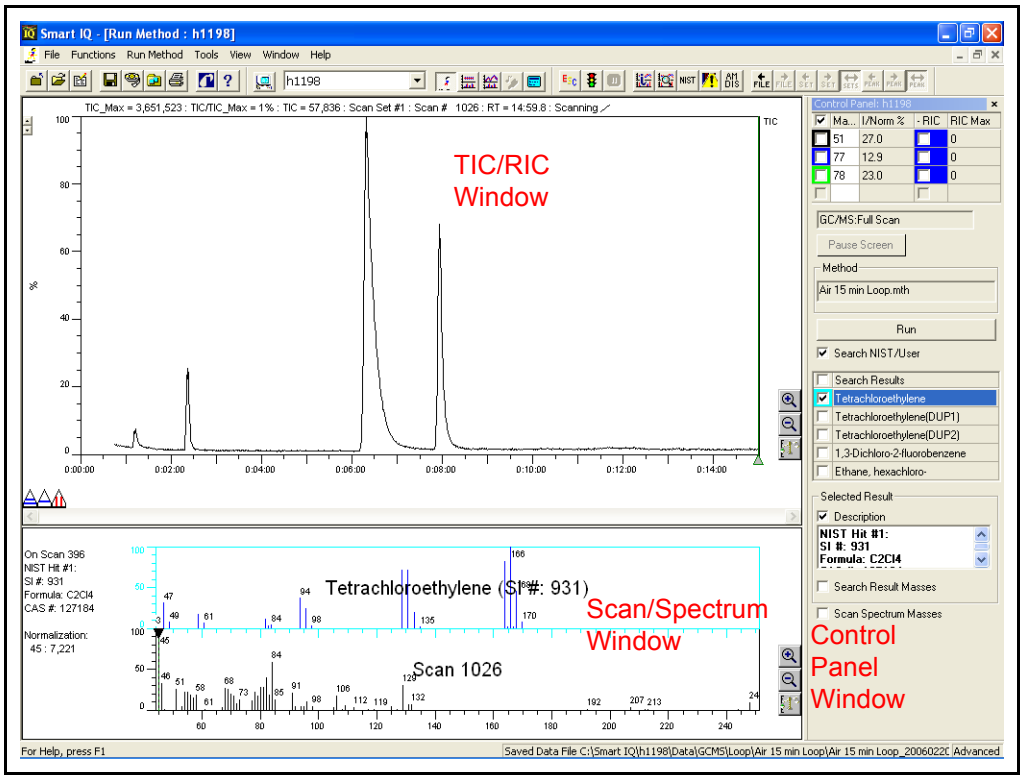
***.hps** . . . . . HAPSITE Smart data file extension

***.hpz** . . . . . Compressed HAPSITE Smart data file extension

***.acq** . . . . . HAPSITE 5.2 and below data file extension

Once selected, the Data Review screen with the requested data file will be displayed. The Data Review screen divides into three sections, as shown in Figure 9-4.

Figure 9-4 Sections of the Data Review Screen



TIC/RIC Window . . . . . This window displays the Total Ion Chromatogram. This is the screen where basic data analysis, such as background subtraction and selecting peaks, is conducted.

Control Panel Window . . . . . This window allows the input of masses to plot RICs for the specified mass. Check **Search NIST/User** to search the NIST library for the current spectrum.

Scan/Spectrum Window . . . . . This window displays the spectrum generated from the TIC/RIC window. This window will also display NIST matches if **Search NIST/User** is checked in the Control Panel.

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9.3 Data Review Toolbar

The Data Review toolbar is shown in Figure 9-5.

Figure 9-5 Data Review Toolbar

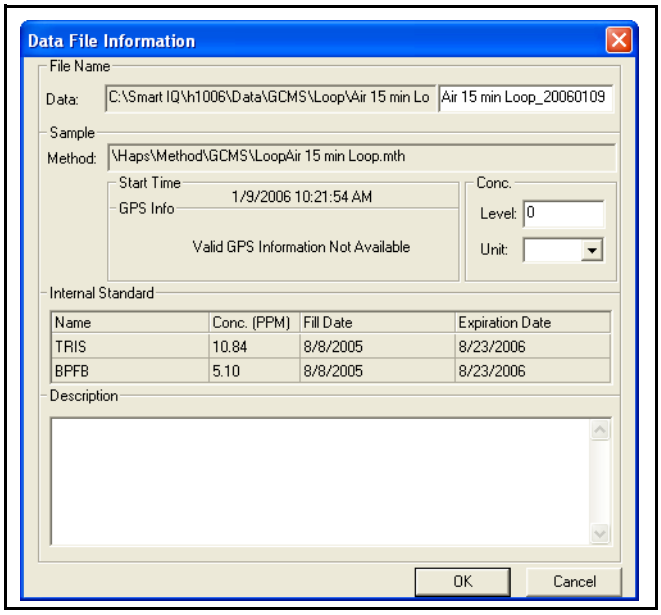
. . . . . Aborts a running method.


. . . . . Start/Stop a method.


. . . . . Pause a Run in Progress.


. . . . . Access Data File Information Page (see Figure 9-6).

Figure 9-6 Data File Information Page




. . . . . View search reports for this data file.

. . . . . Open NIST Program.


. . . . . Open NIOSH Database.

. . . . . Open AMDIS Program.

. . . . . Opens the previous file in the current directory.

. . . . . Opens the next file in the current directory.

. . . . . Open previous SIM Set (used when scanning by SIM).

. . . . . Open next SIM Set (used when scanning by SIM).

. . . . . Open all SIM Sets.

. . . . . Move to previous peak when **Search for Peaks** function has been run.

. . . . . Move to next peak when **Search for Peaks** function has been run.

. . . . . Returns to the full chromatogram display.

9.4 RMB Menus within Data Review

All functions within Data Review can be obtained by right-clicking the mouse button on the appropriate window, be it the TIC window, the Spectrum window, the RIC window, or the Control Panel window.

9.4.1 RMB in the TIC/RIC Window

The Figure 9-7 shows the functions available when right-clicking on the TIC window.

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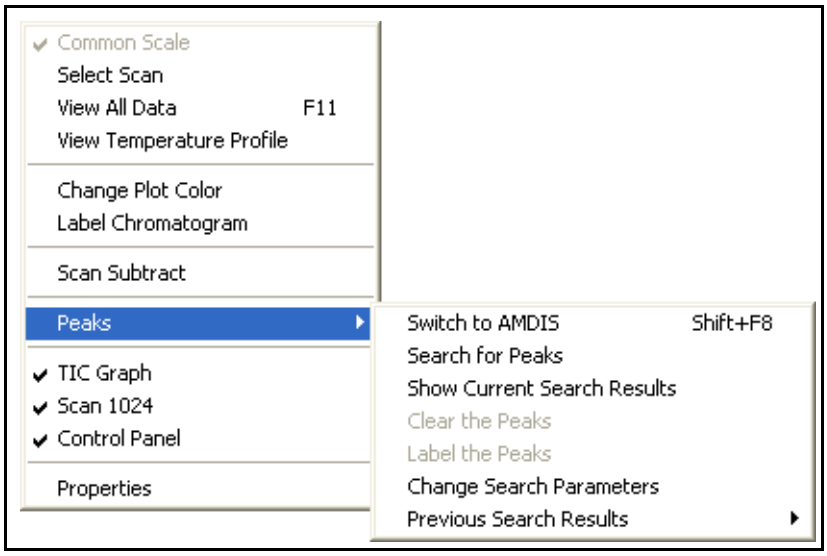
Figure 9-7 RMB Menu in TIC/RIC Window



Common Scale . . . . . When checked all RIC plots will be plotted to the same scale; when not checked all RIC plots will be individually scaled to 100%.

Select Scan . . . . . Allows the scan cursor to select a specific scan.

View All Data . . . . . Rescales the plot to display the entire run. Also accessed by **F-11**.

View Temperature Profile . . . . . Graphically show the GC temperature profile from the method.

Change Plot Color . . . . . Changes the color of the TIC plot.

Label Chromatogram . . . . . Brings up a text box to label the chromatogram. The label can be moved with the cursor and can be saved with the data file.

Scan Subtract . . . . . Subtracts the current scan from the displayed RIC plots.

Peaks gives you the following submenu

Switch to AMDIS . . . . . Switches to the AMDIS program. Also accessed by **Shift+F8**.

Search for Peaks . . . . . Search the TIC for peaks.

Show Current Search Results . . . . . Displays the results of the Search for Peaks selection.

Clear the Peaks . . . . . Clears the identification of peaks from the TIC graph.

Label the Peaks . . . . . Labels identified peaks with retention time and area.

Change Search Parameters. . . . . Displays the peak search parameters, enables modification of the parameters.

Previous Search Results . . . . . View results from a previous search. (Drop down menu of previously opened data files.)

TIC Graph . . . . . When checked, displays TIC window.

RIC Graph . . . . . When checked, displays the RIC window.

Scan ### . . . . . When checked, displays current Spectrum/Scan window.

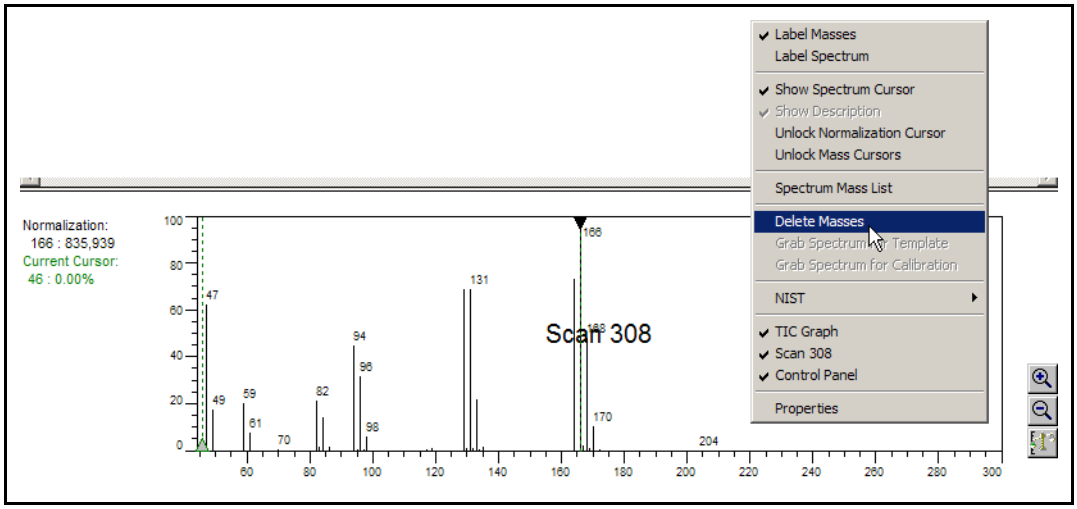
Control Panel . . . . . When checked, displays the Control Panel.

Properties . . . . . Allows access to the properties of the display.

9.4.2 RMB in the Spectrum Display Window

The Spectrum display is shown in the Scan Window. Every time the LMB is double clicked in the TIC window, a spectrum for that scan is displayed. Clicking the RMB in the Scan/Spectrum window will access the menu shown in Figure 9-8.

Figure 9-8 Spectrum Display Menu



Label Masses . . . . . When checked, will display the mass numbers in the Spectrum window.

Label Spectrum . . . . . Brings up a text box to allow the analyst to manually label the spectrum in the Spectrum window.

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Show Spectrum Cursor . . . . . Shows the Spectrum Cursor in the Spectrum window.

Show Description . . . . . Will display the description of the Scan Cursor location and normalization mass. If Search the NIST Library is checked, this will display the NIST match information in the spectrum window along with providing additional description options in the Control Panel Window.

NOTE: Is only active if Search NIST/User is selected.

Unlock Normalization Cursor . . . . Must be unlocked to move the normalization cursor to a mass other than the 100% mass fragment.

Unlock Mass Cursors. . . . . Unlocks the mass cursors to change any RICs assigned to the display.

Spectrum Mass List . . . . . Displays a report of all the masses in the spectrum.

Delete Masses. . . . . Deletes masses from the display and for the purpose of searching the NIST library. (Does not delete data.)

Grab Spectrum for Template . . . . . Used for target compound methods. See Chapter 12, Target Compound Methods.

Grab Spectrum for Calibration . . . Used for survey target compound methods. See Chapter 12, Target Compound Methods.

NIST . . . . . Allows the analyst to utilize the NIST database for qualitative identification of the displayed spectrum.

TIC Graph . . . . . When checked, displays TIC window.

Scan ### . . . . . When checked, displays current Spectrum/Scan window.

Control Panel . . . . . When checked, display the Control Panel.

Properties . . . . . Allows access to the properties of the display.

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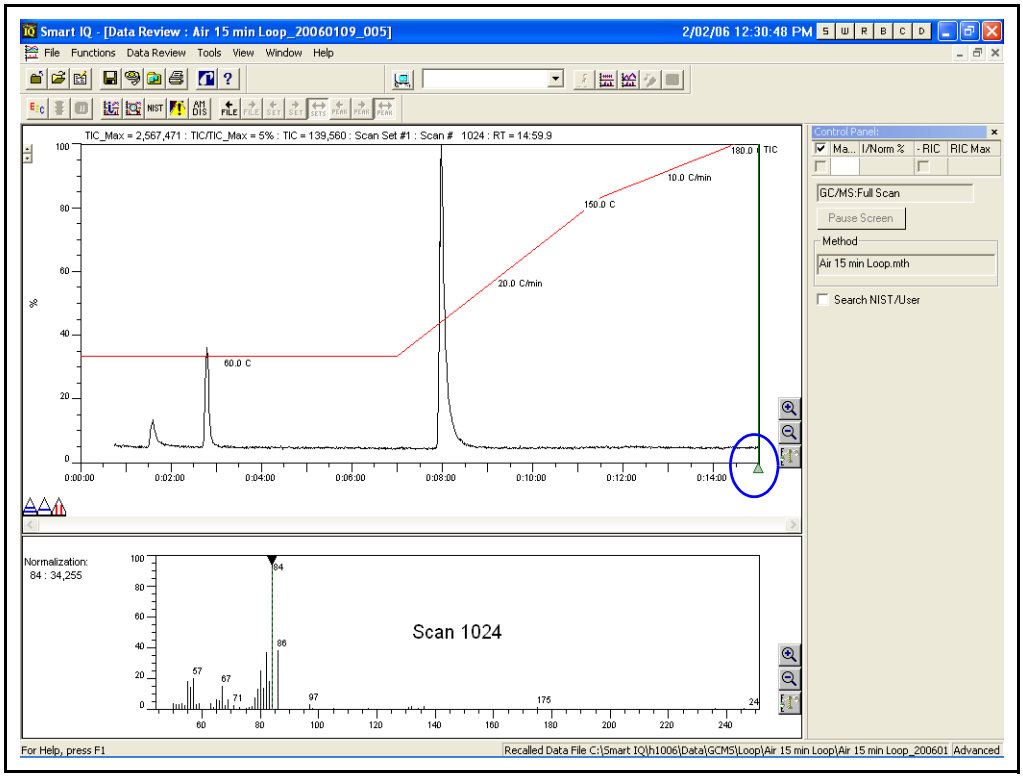
9.5 The TIC/RIC Display Functions

There are tools available to assist in the Data Review process.

9.5.1 How to Access the Scan Cursor

The specific scan displayed in the Spectrum window is accessed using the Scan Cursor in the TIC window. See Figure 9-9.

Figure 9-9 Location of the Scan Cursor



The Scan Cursor can be moved to the desired location by:

- Placing the mouse cursor over the Green Triangle, click and hold the LMB, then drag the cursor to the peak/area of interest, or
- Double-click the left mouse button over the peak/area of interest.

9.5.2 How to Use Background Subtraction

Background subtraction is a key component in "cleaning up" spectra before attempting to search against a database such as NIST. In order to obtain background spectra, there are two triangles ("cursors"), one with one blue line - designated as Background 1 (B1), the other with two blue lines designated as Background 2 (B2), located at the bottom left of the TIC window.

NOTE: All background subtractions are indicated in the Spectrum window by the designation **Scan Number - B1(range) - B2(range).**

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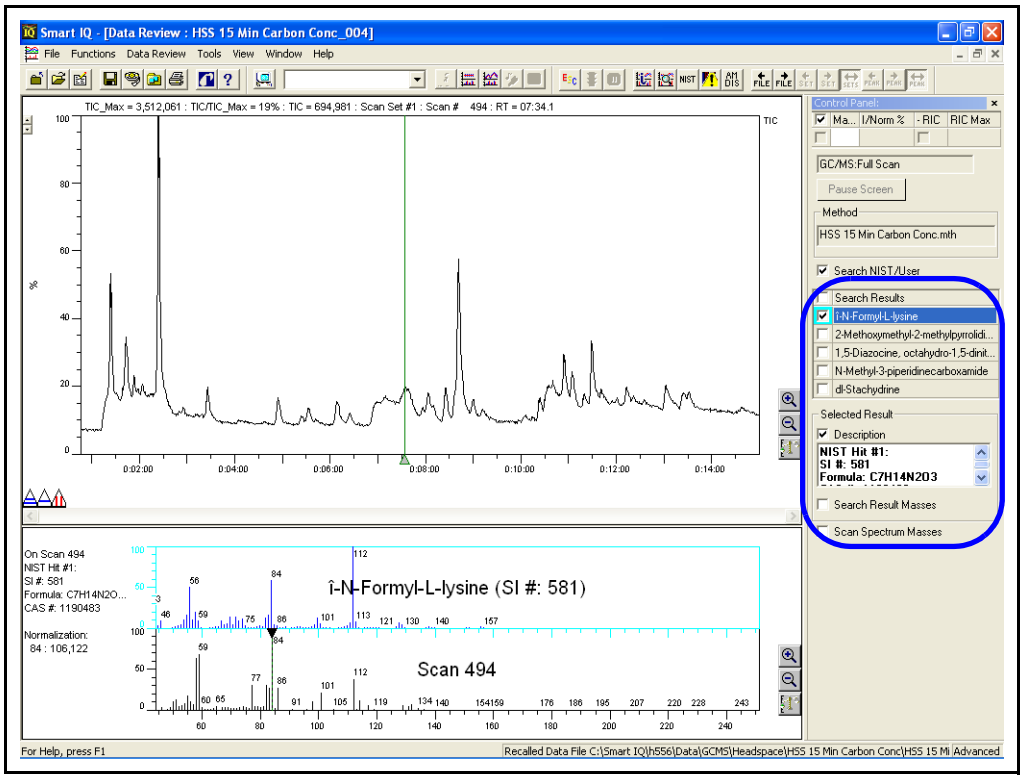
9.5.2.1 Steps Required to Perform a One Point Background Subtraction

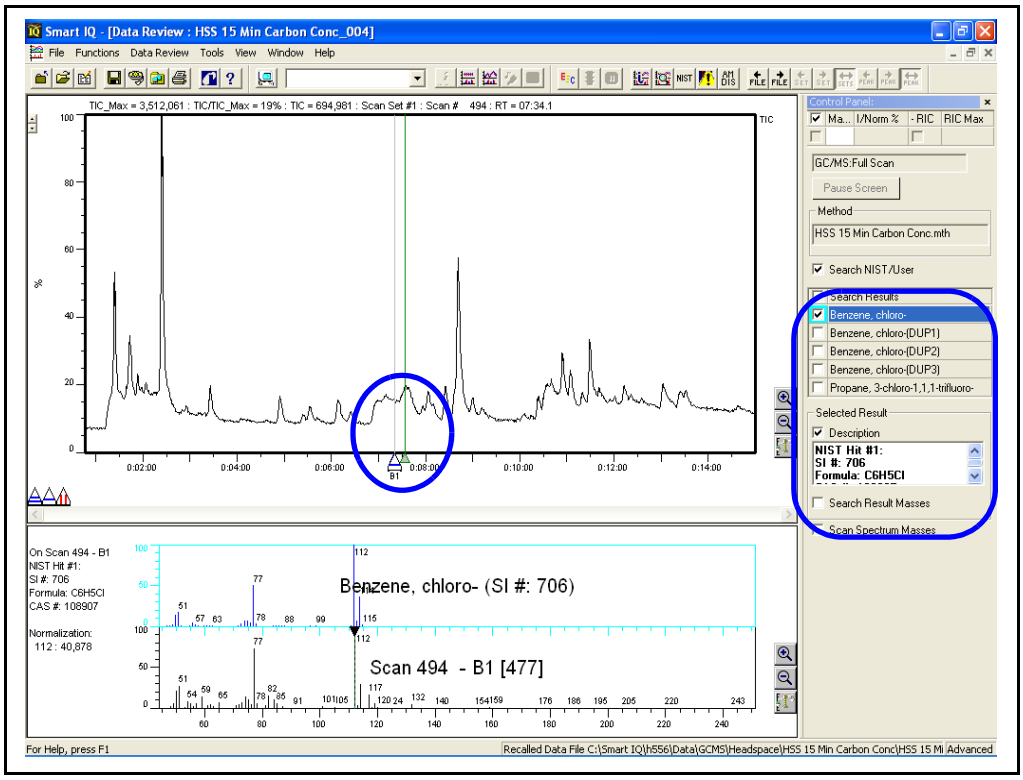
Figure 9-10 Original Chromatograph



1 Using the Scan Cursor, select a peak of interest in the chromatograph. Refer to Figure 9-10.

2 Perform a manual NIST search by pressing "F7" key or by checking the box in the Control Panel. The search shows multiple results. Refer to Figure 9-10.

Figure 9-11 Using Background Subtract



3 Select the background subtract blue triangle from the lower left side of the chromatogram and drag to an area on either side of the selected peak. Refer to Figure 9-11.

4 The identification is now chlorobenzene with three duplications. The first ID has an SI# of 706. Refer to Figure 9-11.

NOTE: Both background subtract tools can be used if two background subtract ranges are desired.

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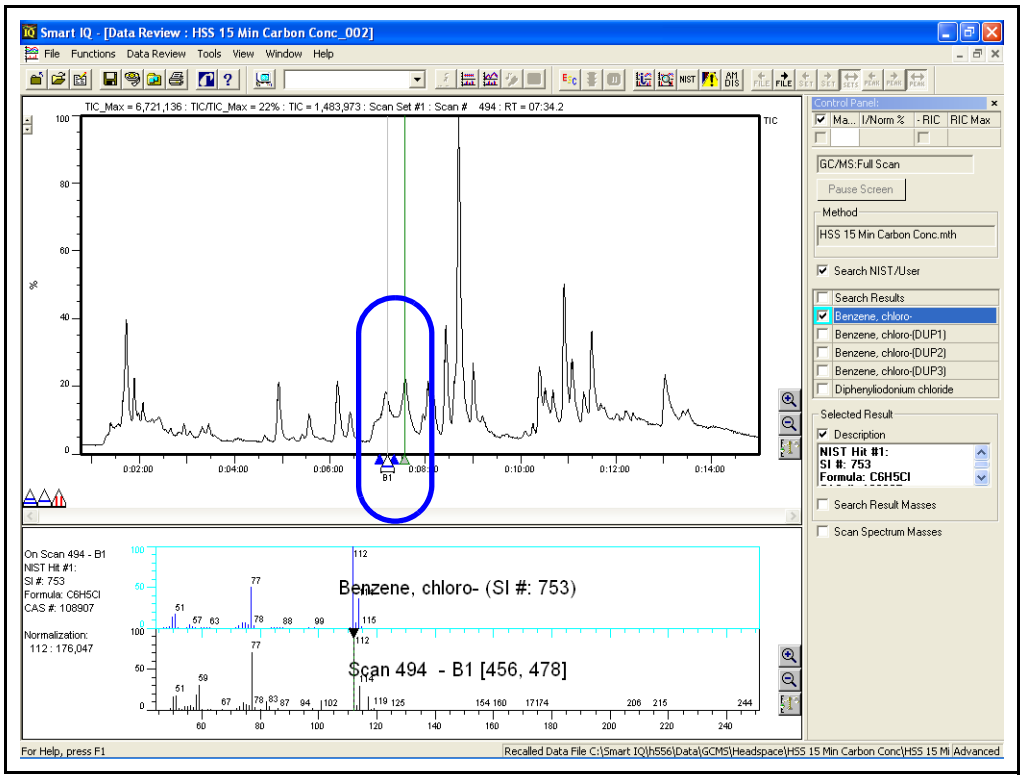
9.5.2.2 Background Subtraction Using a Range of Points

Figure 9-12 Using Background Subtraction to Remove a Smaller Peak



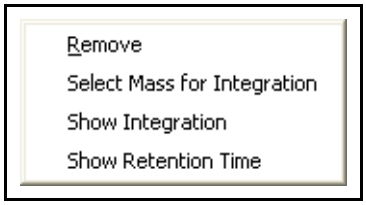
When multiple points in an area such as a smaller peak on the side of a larger peak complicate the chromatograph, the background can be widened to remove an area. Refer to Figure 9-12.

1. Place the cursor on the triangle with ONE blue line (B1). Click and hold the LMB, then drag B1 to the location where the background should be subtracted.
2. Move the cursor to the tip of the B1 marker. The cursor should change to a vertical double headed arrow. Holding the Left Mouse Button while moving the double headed arrow up widens or selects a range for the background. Moving it down narrows the range of the background.
3. Repeat Step 2 for Background 2 (if desired) using the triangle with TWO blue lines (B2).

9.5.2.3 Additional Features of the Background Tool

If the cursor is placed over B1 or B2, and the right mouse button is clicked, see Figure 9-13, a menu will pop-up that will give the analyst the option to:

Figure 9-13 Background Subtract RMB Menu



Remove . . . . . Remove the Background cursor

Select Mass for Integration . . . . . Select the TIC or RIC for Integration

Show Integration . . . . . Displays the integration on the x-axis

Show Retention Time. . . . . Displays the retention time on the x-axis

9.5.3 Utilizing the Range Tool

The Range Tool provides the analyst the ability to average spectra over a "range" of scans in a given peak. This is helpful when analytes are in low concentrations or to select a section of a peak when there is co-elution. The ability to establish a range and average the spectra within that range will allow better matches with the NIST database. The range tool is the triangle with the two red vertical lines located at the bottom left hand of the TIC window.

Figure 9-14 displays a TIC/RIC window showing how it would look if ranging is initiated.

NOTE: All ranges are indicated in the Scan/Spectrum window by the designation: R1 [Range Start Scan, Range End Scan].

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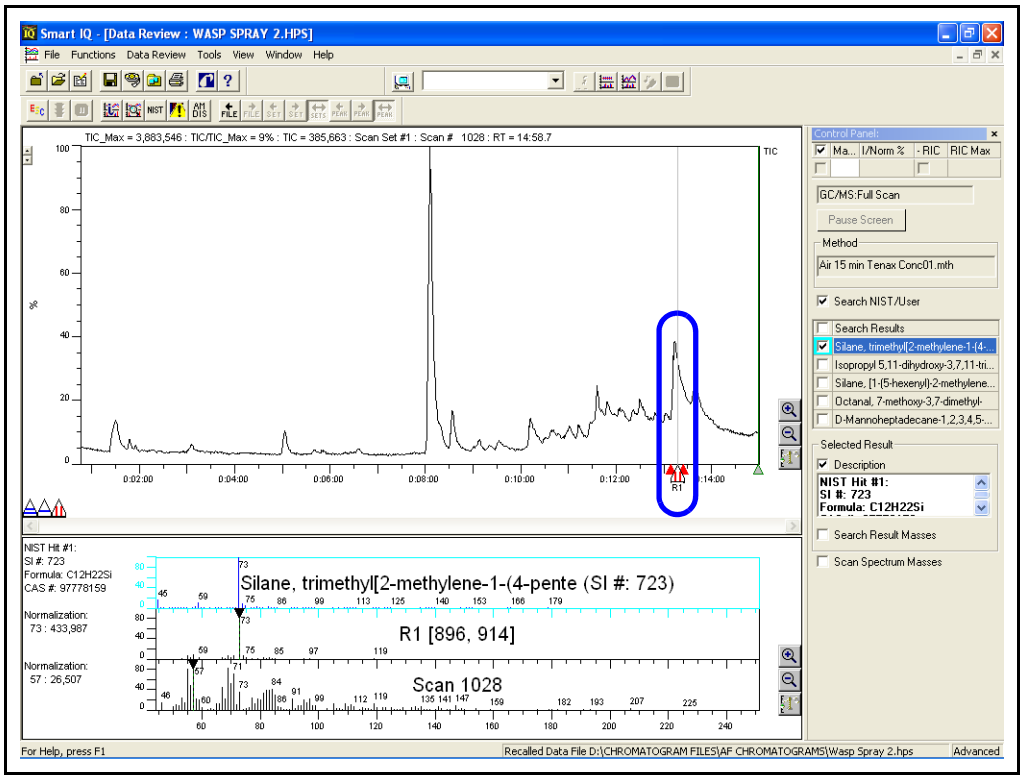
Figure 9-14 Using the Range Tool



9.5.3.1 Steps Required to Range Acquisition

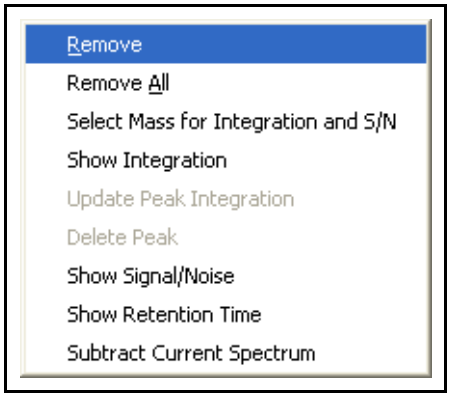
1 Place cursor on the triangle with Two Red Vertical Lines (R1). Click and hold the LMB, then drag R1 to the location where the scans should be averaged. Refer to Figure 9-14.

2 Move the cursor to the tip of the R1 marker. The cursor should change to a vertical double headed arrow. Holding the LMB, moving the double headed arrow up widens a range. Moving the arrow down narrows the range of the peak averaging. The red range lines should intersect the peak sides at 50% of their height.

9.5.3.2 Additional Features of the Range Tool

If the cursor is placed over R1, and the RMB is clicked, the following menu items are available. Refer to

Figure 9-15 Range Tool RMB Menu



Remove . . . . . Remove the Range cursor

Select Mass for Integration . . . . . Select the TIC or RIC for Integration

Show Integration . . . . . Displays the integration on the x-axis

Show Retention Time . . . . . Displays the retention time on the x-axis

Show Signal/Noise . . . . . Show Signal to Noise Ratio. A Background Must be Selected using B1 first.

Subtract Current Spectrum . . . . . Subtract the current spectrum (Green Triangle) from the range.

9.6 Using the Zoom Function

The Zoom function allows targeting a particular section of the chromatogram for a detailed view.

Co-elution of peaks can be detected by zooming in on odd shaped peaks.

9.6.1 Using the Zoom Function in the TIC/RIC Window

There are two ways to Zoom into a TIC/RIC:

1 Move the mouse cursor to the Magnifying glass with the "+" inside. When the Left Mouse Button (LMB) is clicked, there will appear two vertical lines on the TIC/RIC graph window. Place the cursor on one of the vertical lines, click and hold the LMB and drag the vertical line to where zooming may begin. Repeat the actions of the previous sentence for the second vertical line. See Figure

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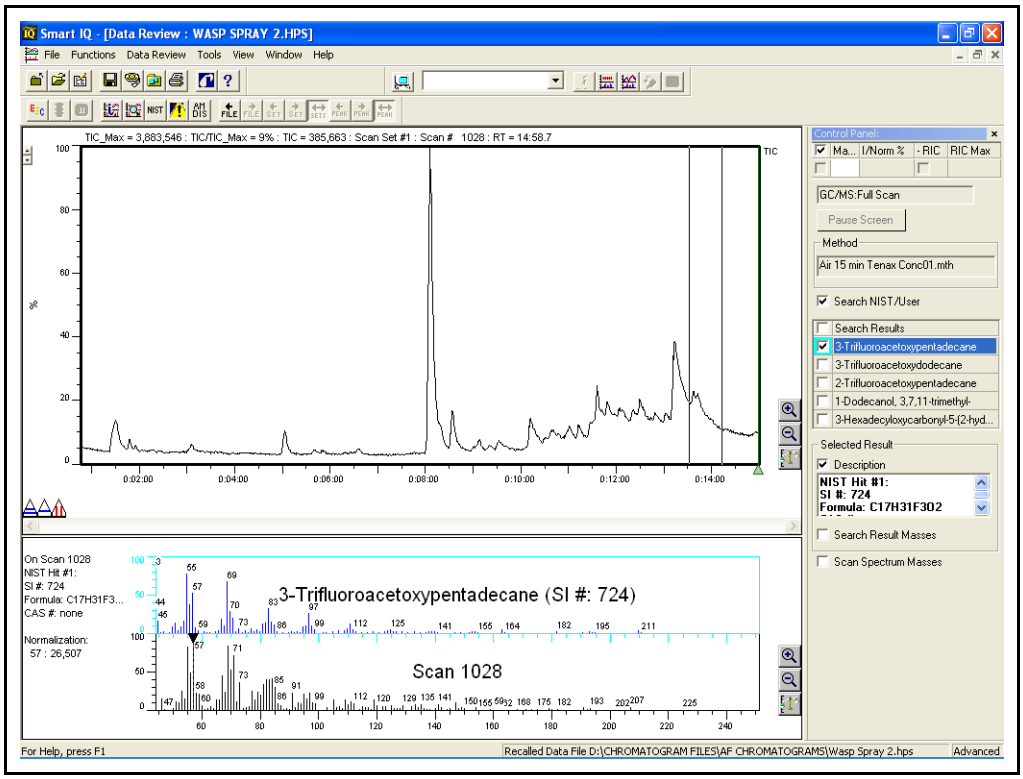
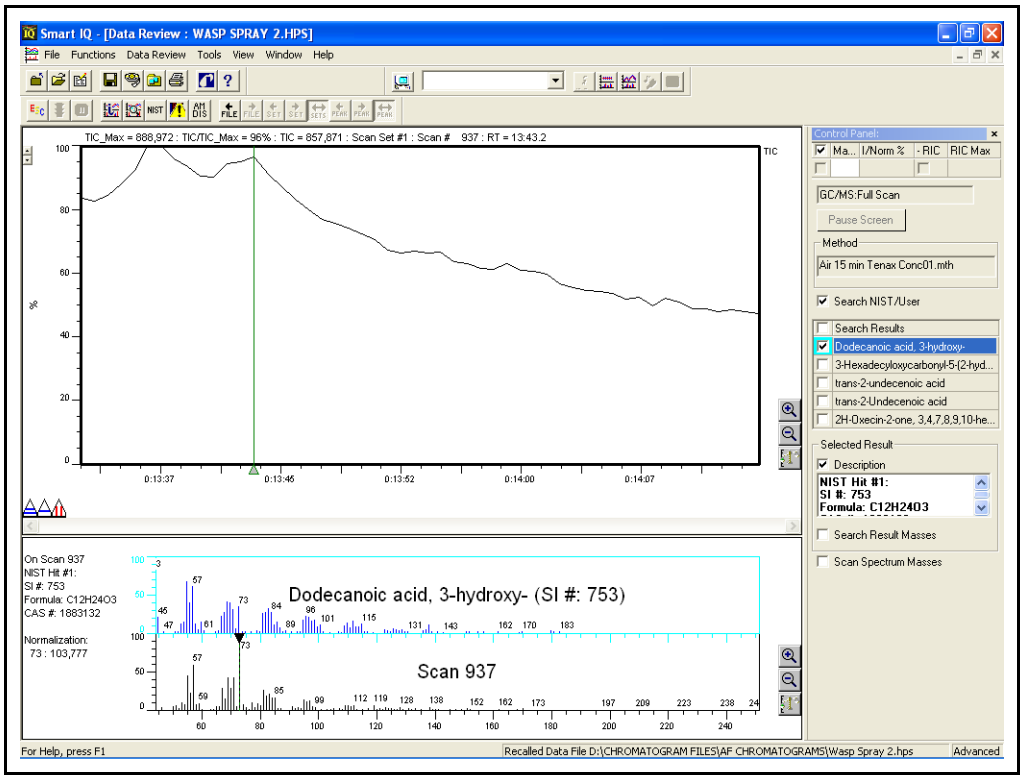
9-16. Once the zoom range has been set, move the mouse cursor within the range, the cursor will turn into a magnifying glass. Click the LMB, and the display will zoom in on the area selected.

Figure 9-16 Selecting Area to Zoom



2 Click and hold the LMB at the point in the TIC where Zoom should begin. A vertical line will appear. Drag the cursor to the position that Zoom should end, and release LMB. Place the mouse cursor within the two vertical lines, the cursor will turn into a magnifying glass. Click the LMB, and the display will zoom in on the area selected. Refer to Figure 9-17.

Figure 9-17 Zoomed Spectrum



3 To UNZOOM, either Click on the Magnifying Glass with the "-" inside or move the cursor below the x-axis of the TIC window, then click the LMB.

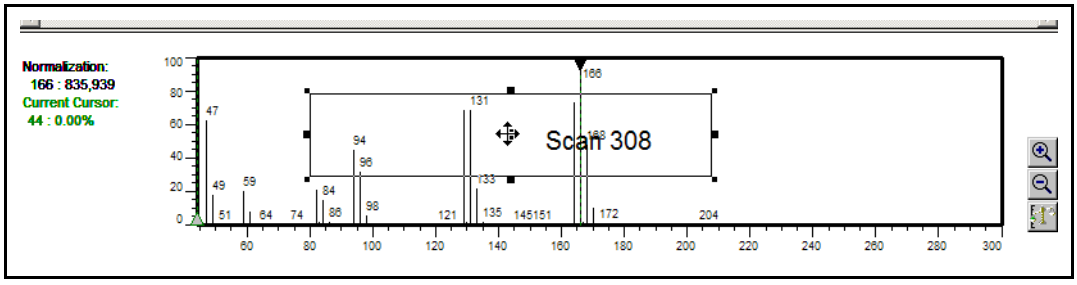
9.6.2 Using The Zoom Spectrum Function

Zooming into a spectrum requires selection of the zoom buttons on the right side of the spectrum window.

1 Click the zoom button, and a rectangle is displayed in the spectrum window.

2 Place the cursor in the middle of the rectangle until the cursor turns into a four-headed arrow. See Figure 9-18.

Figure 9-18 Selecting Area to Zoom



3 Press and hold the LMB, then drag the box to the zoom location.

4 Adjust the box size to the desired zoom area.

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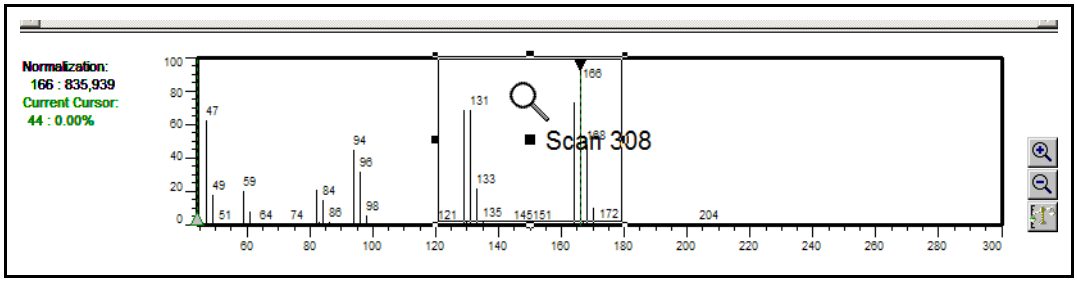
5 Place cursor within desired zoom area, the cursor will turn into a magnifying glass. Click the LMB. See Figure 9-19.

Figure 9-19 Placing Cursor in Area to Be Zoomed



To unzoom, either one of the following actions will accomplish the task:

- Click on the magnifying glass on the right hand side of the window with the "**-**" inside the magnifying glass, or
- Clicking the cursor outside, just underneath the x-axis.

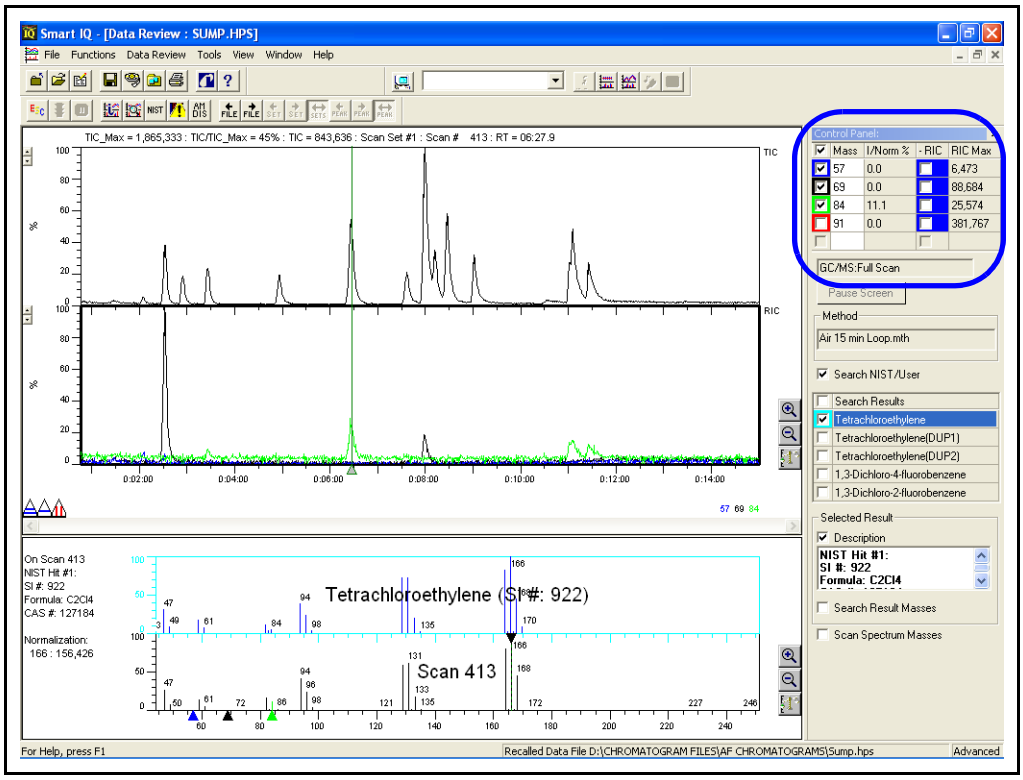
9.7 Displaying Reconstructed Ion Chromatograms (RIC)

RIC plots are useful when locating specific compounds in a chromatogram. A RIC plot of the top 2 or 3 mass fragments can help locate the peak of interest.

There are two ways to display RICs:

- Using the Control Panel window, click on the **Mass** box, type in the desired RIC mass, then press the **Enter** key. Multiple masses can be entered and displayed in the RIC plot. Each RIC will have a unique color plot displayed in the RIC window, and the same color Control Panel check box. See Figure 9-20.
- Select a scan to be displayed in the Spectrum Window. Double clicking on a mass in the Scan Window will automatically insert the selected mass in the Control Panel table as well as display the RIC for the selected mass. Multiple masses can be shaded and displayed.

Figure 9-20 RIC Plot



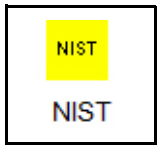
When the box in the Control Panel labeled **-RIC** is checked, the TIC/RIC window will display the TIC minus the RIC selected.

9.7.1 RIC Plot to Locate Specific Compounds

NOTE: Before running NIST, position the scan cursor over the peak of interest in the TIC plot.

1 Either from the System Setup View or the Data Review screen, double-click on the **NIST** icon. See Figure 9-21.

Figure 9-21 NIST Icon



2 Click on the **NAMES** tab at the bottom of the NIST screen. See Figure 9-22.

Figure 9-22 NIST Names Tab

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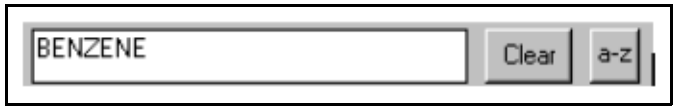
3 Enter the name of the compound, to be located, in the box on the top left of the screen. EXAMPLE: Benzene. See Figure 9-23.

Figure 9-23 NIST Name Entry

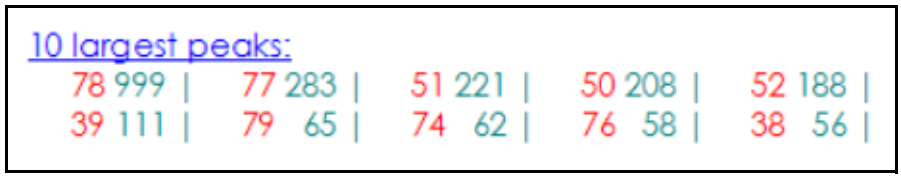


4 The spectrum and information about the compound will appear in the two boxes to the right of the names column.

5 In the bottom right box, the **10 Largest Peaks** will be listed. Make a note of the three largest mass peaks that are between 45-300 AMU.

HINT: Peaks are listed in order from the largest to the smallest. EXAMPLE: Benzene's 3 largest peaks are masses 78, 77 and 51. See Figure 9-24.

Figure 9-24 Top 10 Masses

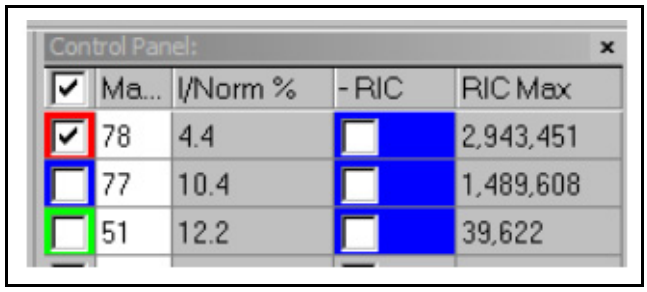


6 Minimize the NIST window and return to the Smart IQ Data screen displaying the TIC chromatogram.

7 Enter the 3 largest peaks, from the compound in step 5, in the control panel box. Enter each mass number in the boxes under the **Ma...** (Mass) column. See Figure 9-20.

8 Check the box to the left of the mass or press ENTER. This will plot the mass in the RIC window and create a new row in the control panel for an additional mass to be entered. See Figure 9-25.

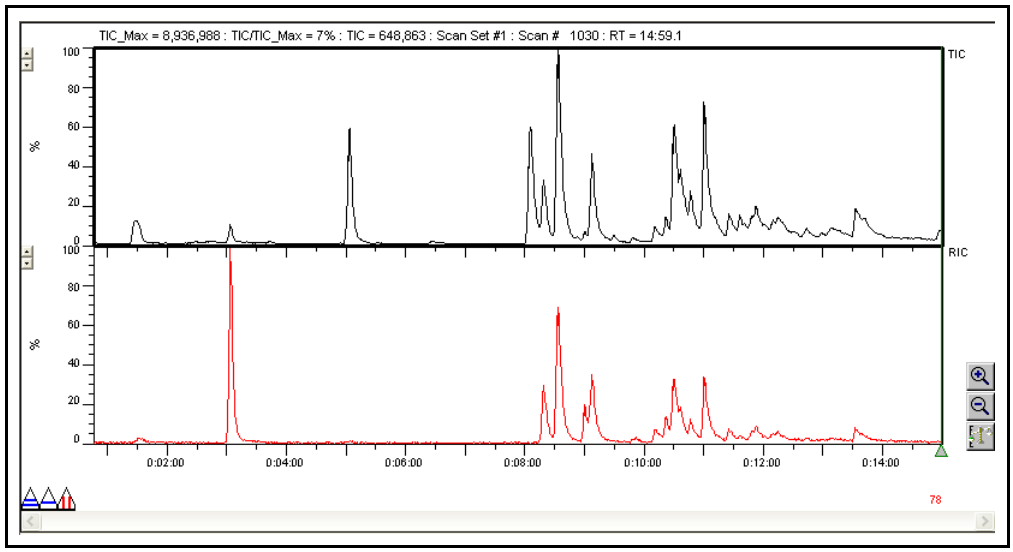
Figure 9-25 Entering Masses in Control Panel



9 As soon as the first mass is checked, a RIC plot will open directly under the TIC plot. See Figure 9-26.

NOTE: This RIC window can be closed by un-checking the masses selected in the control panel.

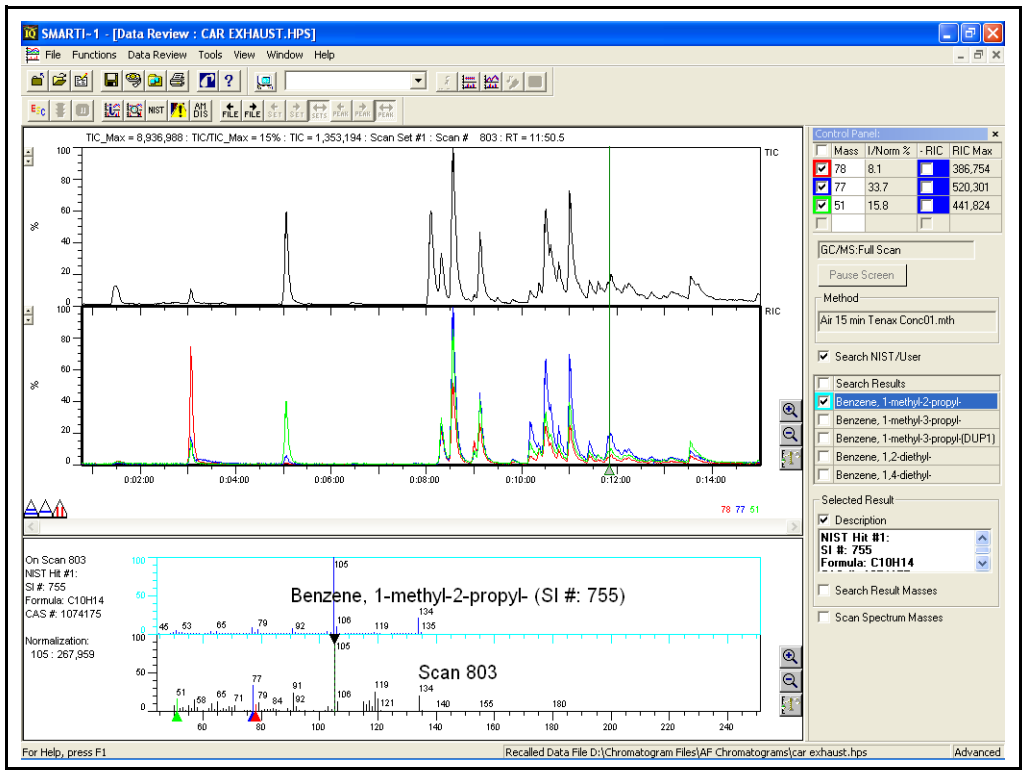
Figure 9-26 RIC Plot for Suspected Benzene One Mass Selected



10 The compound may be present in the unknown sample if all three masses (peaks) align in the RIC plot. Use F7 NIST program to confirm identification of the suspected compound. See Figure 9-27.

NOTE: There may or may not be a peak visible in the TIC plot.

Figure 9-27 RIC Plot to locate Benzene — Three Masses Selected



11 The compound was not detected in the unknown sample if all three masses (peaks) are not present, or do not align together in the RIC plot.

9.8 NIST Library Searches

A TIC or sequential SIM peak qualitative identification can be accomplished using the Smart IQ software utilizing the integrated features of the NIST Mass Spectral Database.

Figure 9-28 Searching a Library

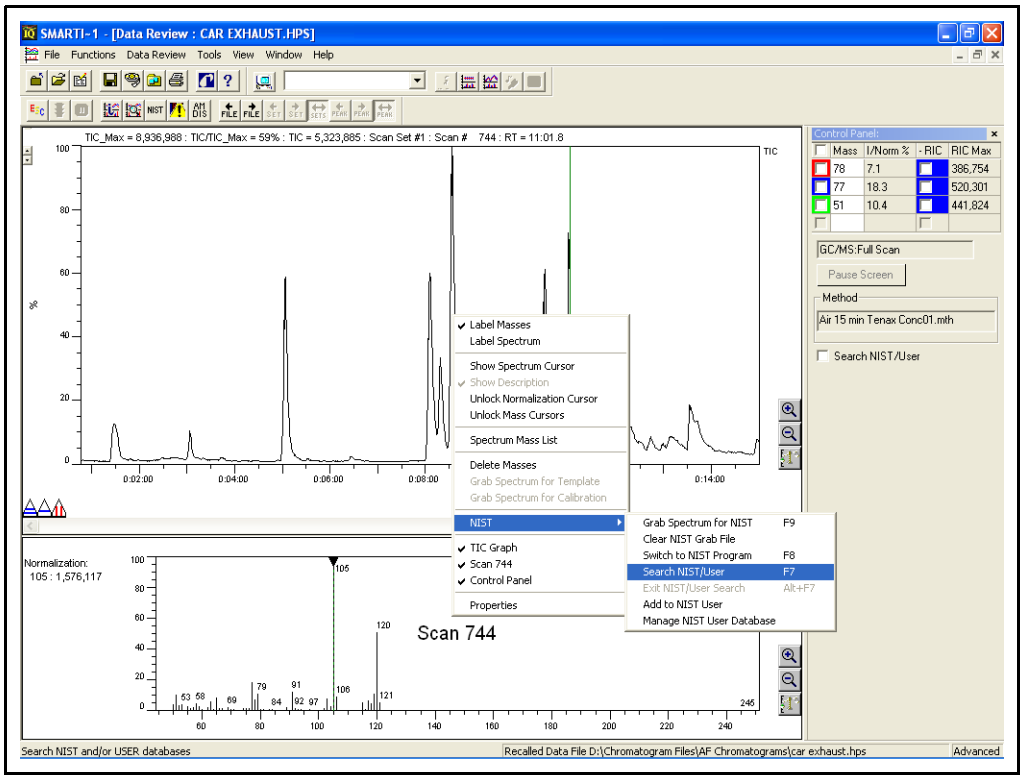


Figure 9-28 shows the TIC Window, the Spectrum Window and the Control Panel Window. Steps required to invoke a qualitative search are:

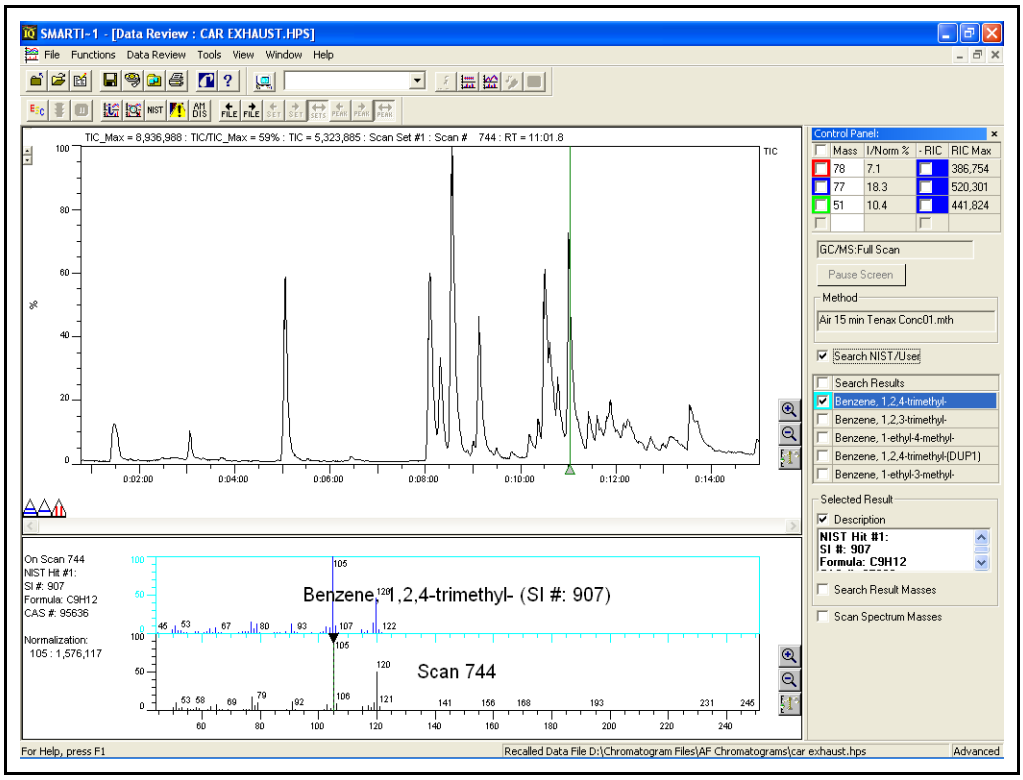
1 Click the cursor on the TIC of interest in the TIC window

2 The spectrum will be displayed in the Spectrum window.

3 Press the **F7** key, or use the **RMB** to display the pop-up windows as shown, or check the **Search NIST/User** box in the Control Panel window to initiate a NIST search.

4 The search results are displayed both in the Spectrum window as well as the Control Panel window. See Figure 9-29.

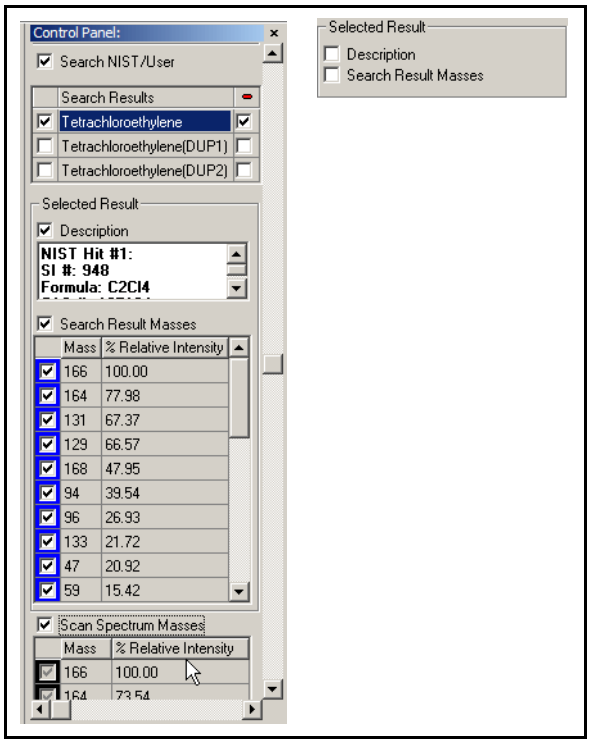
Figure 9-29 Search Results Display



Additional information may be obtained by checking the boxes in the Control Panel.

These boxes, when checked, will provide information so that the NIST Match and the spectrum generated by HAPSITE Smart IQ can be compared. See Figure 9-30.

Figure 9-30 Comparison of NIST and Spectrum



If **Description** box is checked, the NIST header information such as Match Quality (SI), Formula, and CAS number will be displayed.

If the **Search Result Masses** box is checked, the masses and relative intensities are displayed for the NIST reference spectrum.

If the **Scan Spectrum Masses** box is checked, the HAPSITE Smart IQ masses and relative intensities are displayed for the unknown spectrum.

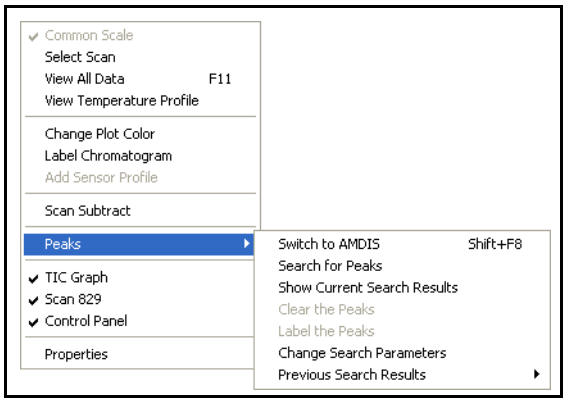
9.8.1 Searching Peaks

The **Search for Peaks** function allows the analyst the capability to search the entire TIC for qualitative identification of each peak detected by the search function. The **Search for Peaks** function will also integrate each peak area that meets the search criteria, then give the analyst a report showing the area percent that peak contributed to the total area of all peaks found.

The **Search for Peaks** function is accessed by clicking the RMB on the TIC/RIC window.

Select **Peaks**, then the submenu pops up displaying the choices. See Figure 9-31.

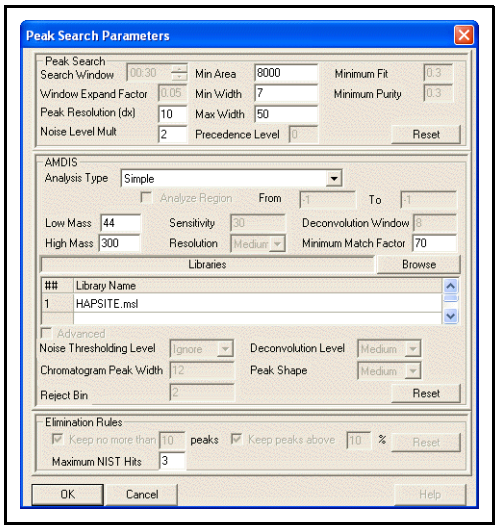
Figure 9-31 Peaks Menu Choices



To view and adjust the search parameters, select **Change Search Parameters** from the submenu.

Figure 9-32 displays the parameters that will determine what peaks are found. The Peak Search Parameters window is divided into sections of **Peak Search, AMDIS, Libraries, and Elimination Rules**. These can be modified to make the search as selective or as general as required.

Figure 9-32 Peak Search Parameters Window



After the Peak Search parameters have been optimized, select **Peaks >> Search for Peaks**. After analysis, the following will be displayed (see Figure 9-33):

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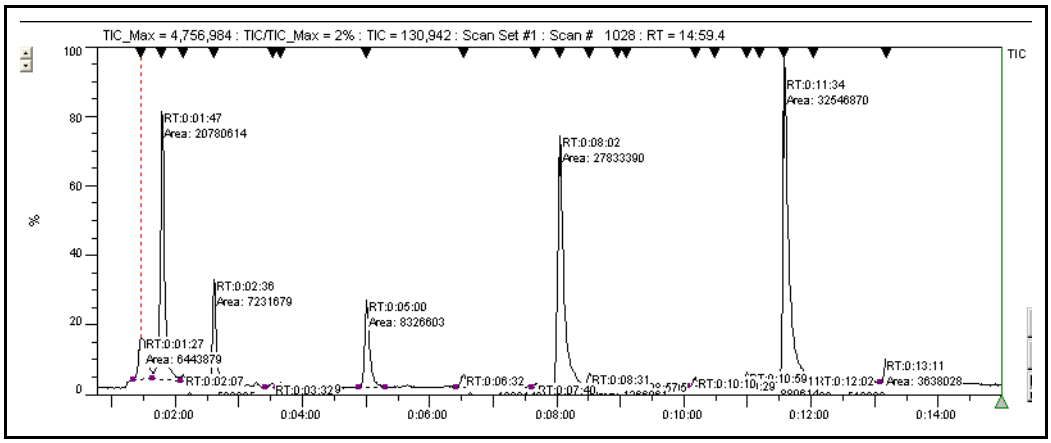
Figure 9-33 Post Analysis Display

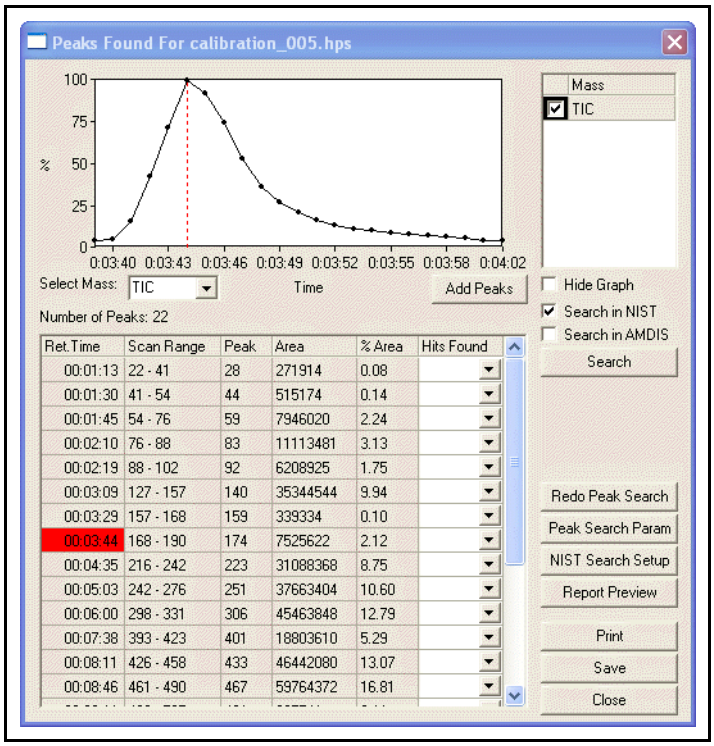


In Figure 9-33, both the **Search for Peaks** function and the **Label the Peaks** function have been selected. Therefore, the retention time of each peak is displayed in the TIC/RIC window. At the top of the TIC/RIC window, the black triangles mark each peak that met the search parameters.

To display the results, select **Peaks >> Show current search results**. The results screen will be displayed.

The results screen displays the information pertaining to each peak that met the search criteria. See Figure 9-34.

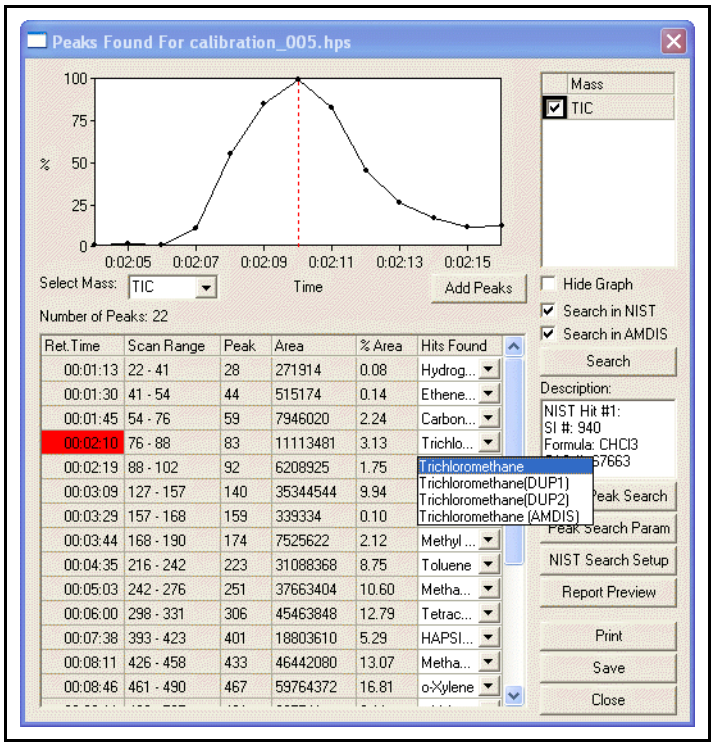
Figure 9-34 Results Display



Ret.Time	Scan Range	Peak	Area	% Area	Hits Found
00:01:13	22 - 41	28	271914	0.08	
00:01:30	41 - 54	44	515174	0.14	
00:01:45	54 - 76	59	7946020	2.24	
00:02:10	76 - 88	83	11113481	3.13	
00:02:19	88 - 102	92	6208925	1.75	
00:03:09	127 - 157	140	35344544	9.94	
00:03:29	157 - 168	159	339334	0.10	
00:03:44	168 - 190	174	7525622	2.12	
00:04:35	216 - 242	223	31088368	8.75	
00:05:03	242 - 276	251	37663404	10.60	
00:06:00	298 - 331	306	45463848	12.79	
00:07:38	393 - 423	401	18803610	5.29	
00:08:11	426 - 458	433	46442080	13.07	
00:08:46	461 - 490	467	59764372	16.81	

Qualitative identification of each peak found by the Search function can be done by checking either **Search in NIST, Search in AMDIS** or both. After the search is selected and the **Search** button is clicked, the screen shown in Figure 9-35 is displayed.

Figure 9-35 Identification of Each Peak



When the search is completed, each peak will have identifications in the **Hits Found** section of the table. Click on the arrow button next to each peak in the Hits Found section to display all of the hits as per the Search Parameters.

NOTE: When the Hits Found are displayed, the hits found in the AMDIS library will have the words (AMDIS) displayed. NIST hits do not display the word (NIST).

From the Peaks Found screen, other functions can be accessed:

- **NIST Search Setup,** where the libraries that NIST will use are defined
- **Peak Search Parameters**, where parameters can be changed to improve the search
- **Redo Peak Search**, where the search can be reanalyzed after changes to the Peak Search Parameters have been made.

To print a report of the results, click on the **Report Preview** button**.** This will result in the following screen being displayed.

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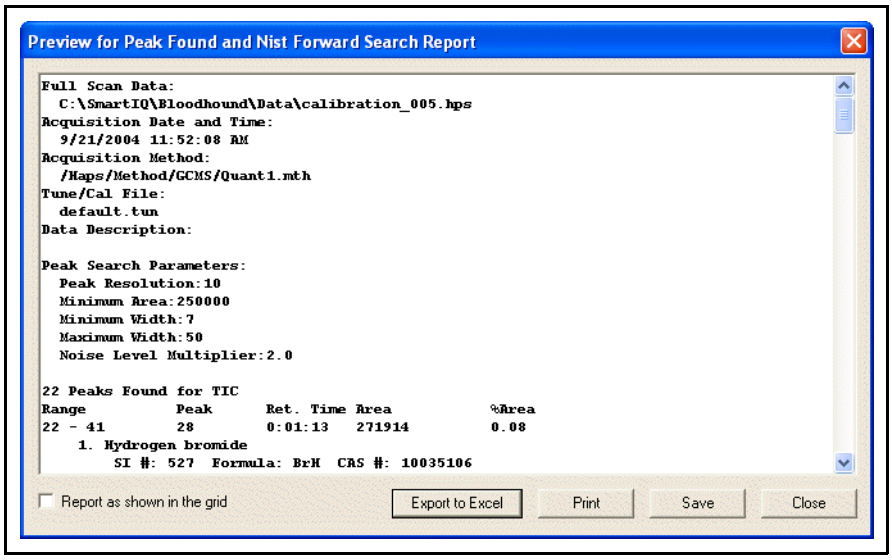
Figure 9-36 Preview Screen



The report is displayed, refer to Figure 9-36. Some options are:

- Check the box that says **Report as shown in the grid**. This will only display the first hit found for each peak. With the box unchecked, all hits for each peak are displayed.
- **Export to Excel** will create an Excel text file, open Excel and display the file.
- **Print** will print the report as displayed.

9.8.2 Analyzing Data Using AMDIS

AMDIS is an additional program provided by NIST and can be used to analyze data generated by the HAPSITE Smart IQ. AMDIS is the acronym for Automated Mass Spectrum Deconvolution and Identification System.

AMDIS utilizes its own databases. The HAPSITE Smart IQ utilizes the **HAPSITE.msl** AMDIS library.

9.8.3 How To Access AMDIS

AMDIS can be accessed by the following methods:

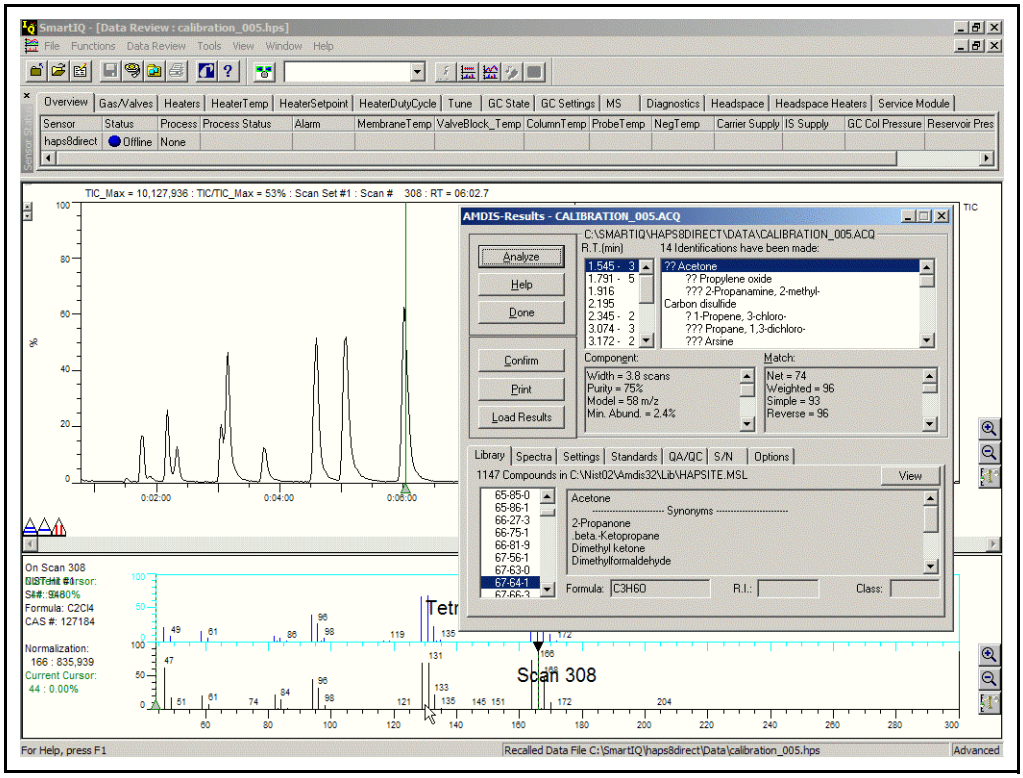
- Selecting the AMDIS button on the Function Toolbar, **or**
- Right click in the TIC window, then select **Peaks >> Switch to AMDIS**, or
- With the TIC window as the active window, press the **Shift+F8** key.

NOTE: AMDIS only works on the TIC data. AMDIS does not use spectrum data.

When the analyst invokes AMDIS, upon completion of the analysis, the program returns the **Results Screen**. See the inset in Figure 9-37. The results screen includes:

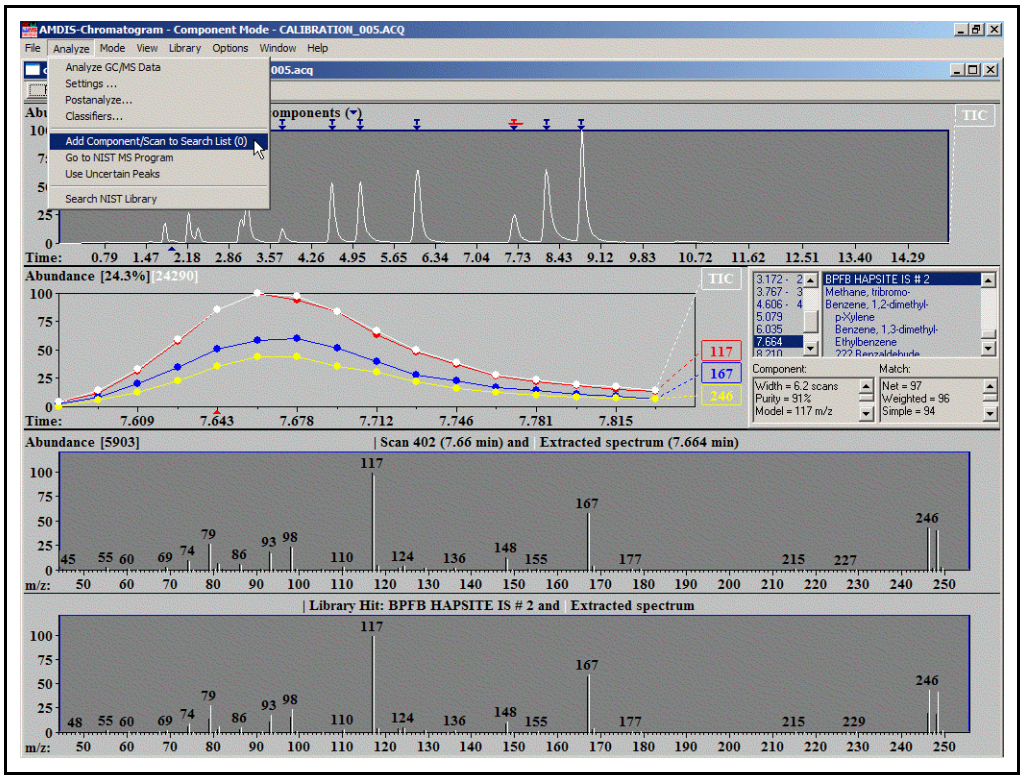
- Retention Time Window
- Identifications Window
- Component Window
- Match Quality Window
- Library Tab

Figure 9-37 AMDIS Results Screen



This provides the results of the AMDIS data analysis and provides all the data that most analysts need. If a particular analysis needs additional confirmation, press the **Confirm** button to access the Confirm Window, see Figure 9-38.

Figure 9-38 AMDIS Confirm Window



This window shows the complete analysis, peak by peak. If there are any peaks that were not identified by AMDIS, use the NIST database to identify them.

9.8.3.1 Accessing NIST from AMDIS

To use the NIST database to identify a peak not identified by AMDIS:

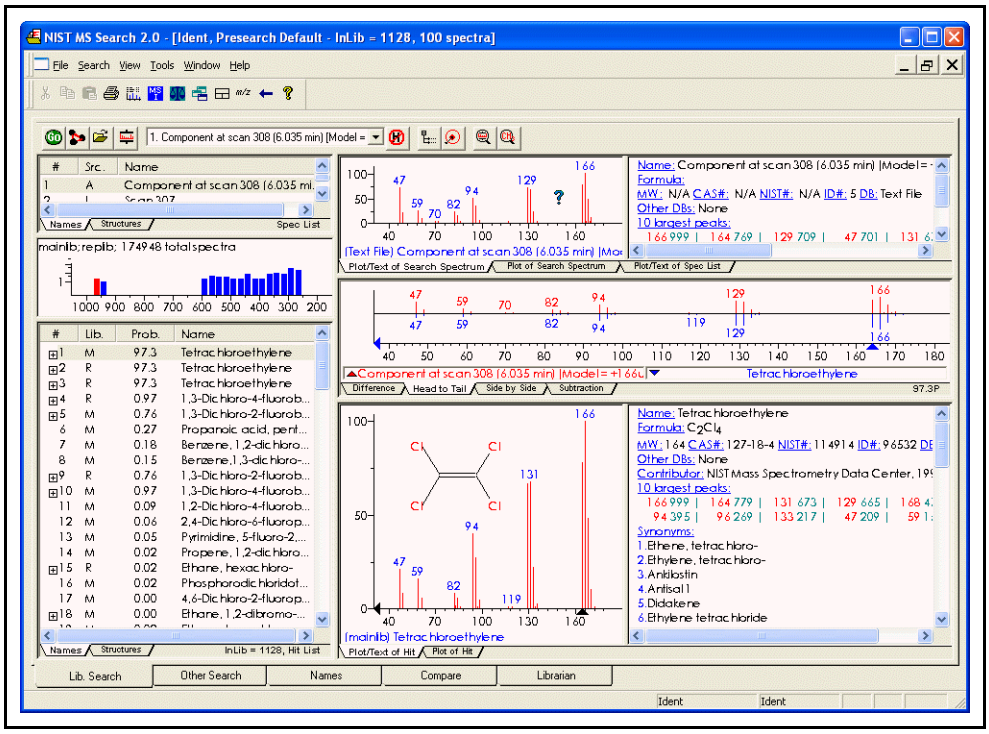
1 Highlight the peak not identified by clicking on the triangle above the peak

2 Select **Analyze >> Add component/scan to search list**

3 Select **Analyze >> Go to NIST MS Program**

This will place the selected component scan from the search list into the NIST program and will utilize the NIST database for identification. See Figure 9-39.

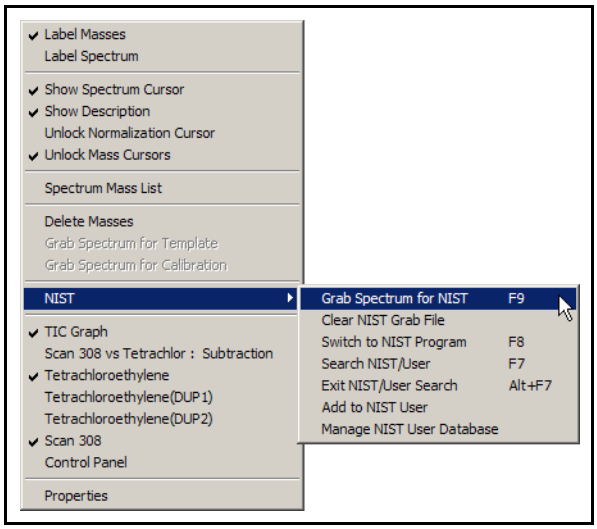
Figure 9-39 NIST Database Search



9.8.4 Analyzing Data Using NIST

By right clicking on the Spectrum window, the NIST menu appears. See Figure 9-40.

Figure 9-40 NIST Menu



Grab Spectrum for NIST (F9). . . . . This function will grab the spectrum selected and put the spectrum in the grab file for use within the NIST program.

Clear NIST Grab file . . . . . Clears the grab file of previous files.

Switch to NIST Program (F8) . . . . . Starts the full NIST program and will place any files that are in the grab file into the Spec List, then begin analysis of them.

Search NIST/User (F7) . . . . . Starts the NIST program and does searches. Displays matches on the Scan /Spectrum window and Control Panel.

Exit Search NIST/User (Alt+F7) . . . Exits the Search NIST/User database search function.

Add to NIST User . . . . . Add selected spectrum to a Search NIST/User database.

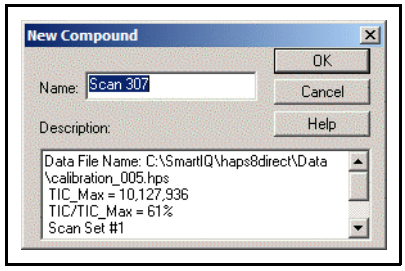
Manage NIST User Database . . . . . Display, delete or plot entries in a Search NIST/User database.

9.8.5 How to Grab Spectra/Utilize the Full NIST Program

The sequence of events required to utilize the full NIST program are:

1. Double-click on the peak in the TIC/RIC window for the NIST Full Program analysis.
2. Place the cursor in the Spectrum window and RMB click. Select **NIST >> Clear NIST Grabfile**
3. Place the cursor in the Spectrum window and RMB click. Select **NIST >> Grab Spectrum for NIST**. See Figure 9-41.

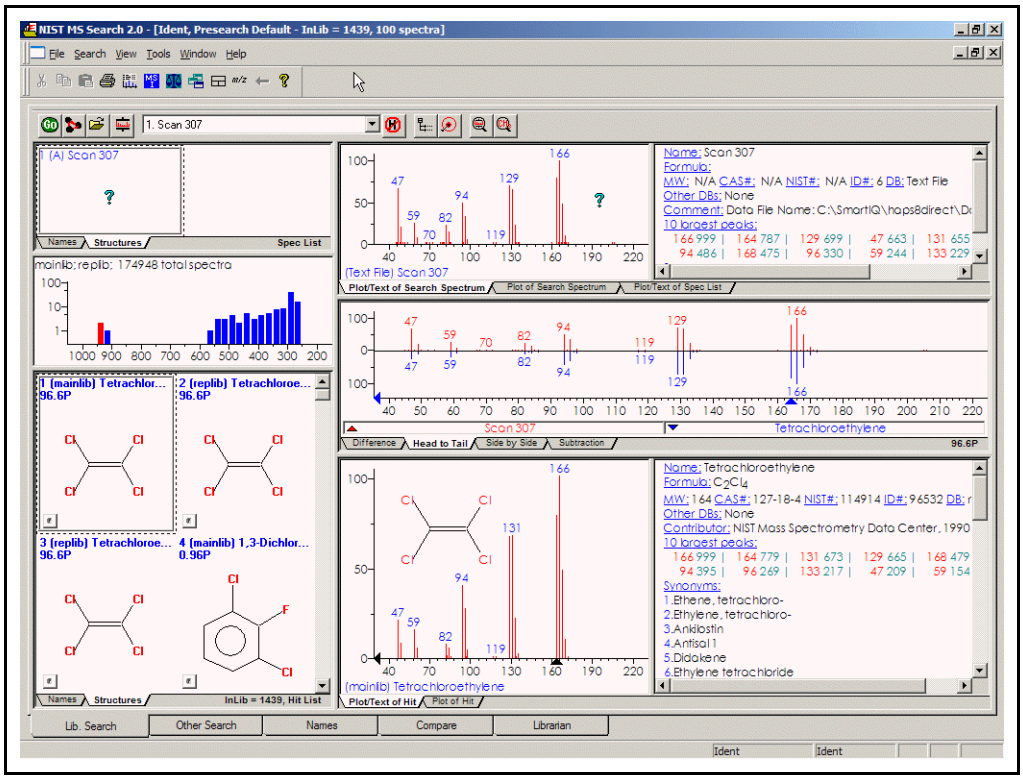
Figure 9-41 Pop-Up WIndow, Grab Spectrum for NIST



4. After the spectrum has been grabbed, either:
   - press **F8** to open the full NIST program.
   - select **NIST >> Switch to NIST Program.**

Once inside the NIST Program, the analysis will be performed. There are many other features that the NIST program has to offer. See Figure 9-42.

Figure 9-42 NIST Database



Notice the tabs at the bottom of the NIST window. These are multiple windows that make use of all the functions in the NIST software.

The NIST program is a third-party software that comes with the HAPSITE Smart IQ software. Instructions on how to fully utilize the NIST and AMDIS software are included in the **NIST Mass Spectral Database** folder on the laptop and the **HELP** selection of either program from the Menu selection.

9.9 Reporting and Printing Data

Reports are generated in Data Review utilizing the HAPSITE Smart IQ software by:

- the method that acquired the data.
- utilizing the Search for Peaks function.
- print a report.

9.9.1 Method Generated Reports

To access reports generated by the method that acquired the data being reviewed, the **View Search Results** icon should be accessed from the Results screen. Alternately, **View Search Results** may be accessed in the Data Review pull down menu. It will display the screen shown in Figure 9-43

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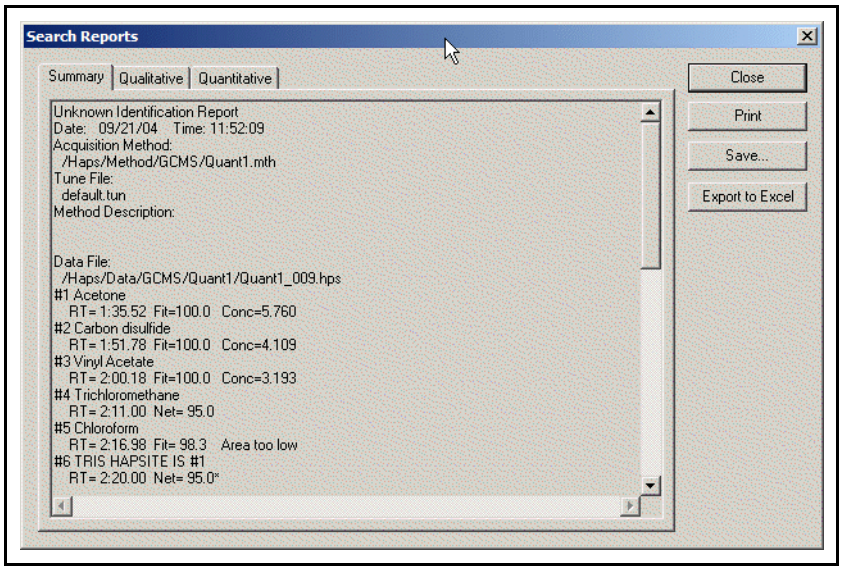
Figure 9-43 Search Reports Screen



There are a total of three maximum reports available, depending upon the method used to generate the data was configured. They are:

Summary . . . . . Generates a report based upon the Qualitative and Quantitative results. It will display quantitative results for identified compounds included in the Target Library. Compounds not included in the Target Library will be identified by the AMDIS Library.

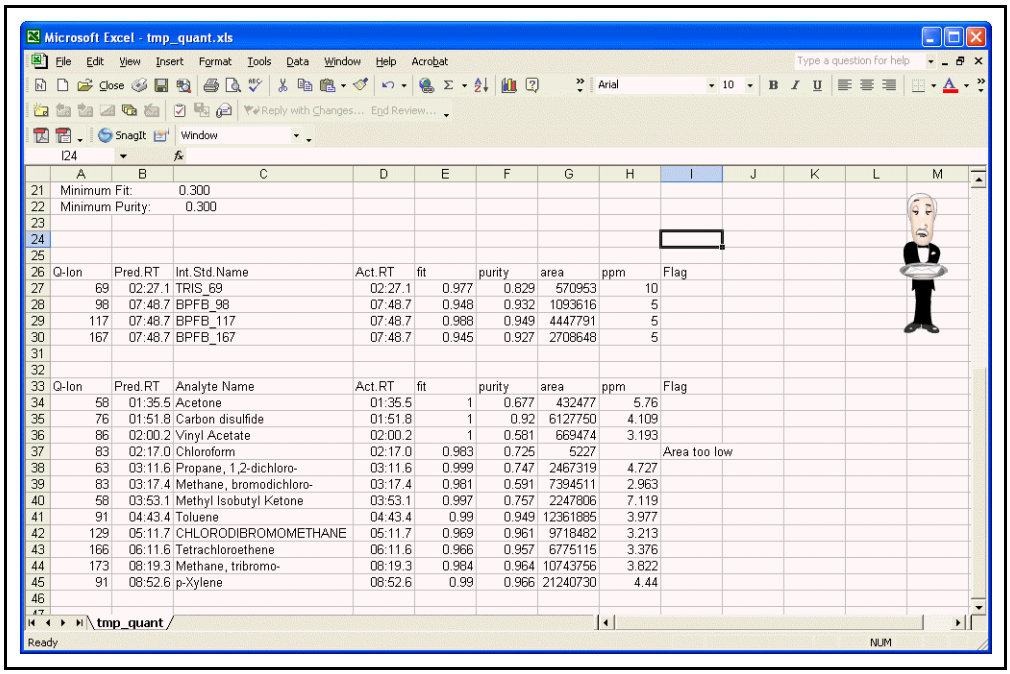
Qualitative . . . . . Generates a report based upon searching the ADMIS library and displaying a predetermined number of matches based upon the search criteria

Quantitative . . . . . Generates a report based upon a calibrated Target Compound Library. Results are reported in the specified units. This report can be exported to Excel.

NOTE: This will be empty if no calibration library is in use.

To export the Quantitative Report to Excel® for further work, click on the **Export to Excel** button, which will produce the window shown in Figure 9-44.

Figure 9-44 Qualitative Report in Excel



Microsoft Excel - tmp_quant.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M
21	Minimum Fit:		0.300										
22	Minimum Purity:		0.300										
23													
24													
25													
26	Q-Ion	Pred.RT	Int.Std.Name	Act.RT	fit	purity	area	ppm	Flag				
27	69	02:27.1	TRIS_69	02:27.1	0.977	0.829	570953	10					
28	98	07:48.7	BPFB_98	07:48.7	0.948	0.932	1093616	5					
29	117	07:48.7	BPFB_117	07:48.7	0.988	0.949	4447791	5					
30	167	07:48.7	BPFB_167	07:48.7	0.945	0.927	2708648	5					
31													
32													
33	Q-Ion	Pred.RT	Analyte Name	Act.RT	fit	purity	area	ppm	Flag				
34	58	01:35.5	Acetone	01:35.5	1	0.677	432477	5.76					
35	76	01:51.8	Carbon disulfide	01:51.8	1	0.92	6127750	4.109					
36	86	02:00.2	Vinyl Acetate	02:00.2	1	0.581	669474	3.193					
37	83	02:17.0	Chloroform	02:17.0	0.983	0.725	5227		Area too low				
38	63	03:11.6	Propane, 1,2-dichloro-	03:11.6	0.999	0.747	2467319	4.727					
39	83	03:17.4	Methane, bromodichloro-	03:17.4	0.981	0.591	7394511	2.963					
40	58	03:53.1	Methyl Isobutyl Ketone	03:53.1	0.997	0.757	2247806	7.119					
41	91	04:43.4	Toluene	04:43.4	0.99	0.949	12361885	3.977					
42	129	05:11.7	CHLORODIBROMOMETHANE	05:11.7	0.969	0.961	9718482	3.213					
43	166	06:11.6	Tetrachloroethene	06:11.6	0.966	0.957	6775115	3.376					
44	173	08:19.3	Methane, tribromo-	08:19.3	0.984	0.964	10743756	3.822					
45	91	08:52.6	p-Xylene	08:52.6	0.99	0.966	21240730	4.44					
46													

tmp_quant

Ready NUM

9.9.2 Reports Generated from Peaks Menu

The function **Show Current Search Results** has the option to generate a qualitative search report, utilizing either the NIST database, the AMDIS database, or both.

The report is displayed as shown in Figure 9-45. Some options are:

- Check the box that says **Report as shown in the grid**. This will display the best match of the search in the report.
- **Export to Excel** will create an Excel text file, then open and display the file in Excel.
- **Print** sends the report to a printer.

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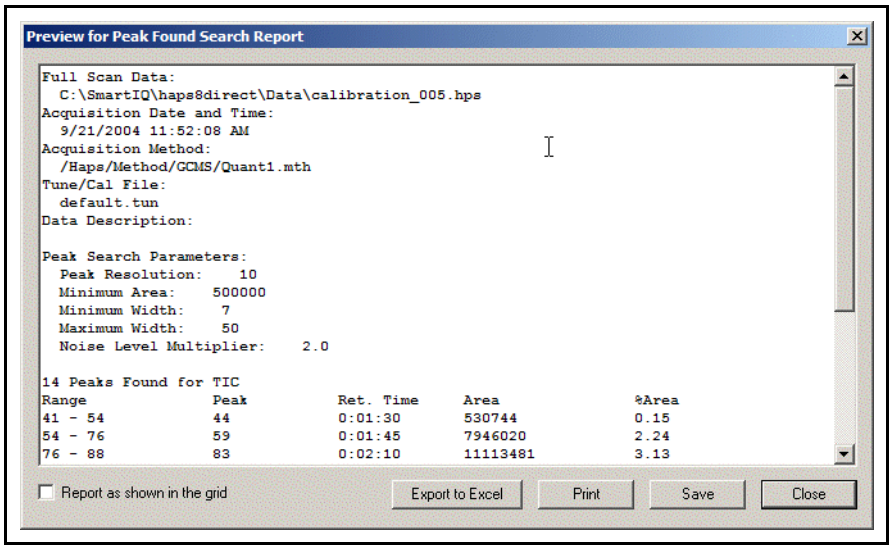
Figure 9-45 Peak Found Search Report



9.10 Smart IQ Hot Keys

Table 9-1 Smart IQ Hot Keys

Keys	Functions
Crtl+o	Open data file
F3	Datafile Info
F7	Search NIST (when a peak is selected)
Alt+N	Next NIST Hit (when NIST is showing)
Alt+P	Previous NIST Hit (when NIST is showing)
F8	Switch to NIST Program
F9	Grab spectrum for NIST
Shift+F8	Switch to AMDIS
F11	Full Plot (resumes chromatogram to live data, or restores a zoomed area)
Ctrl+P	Print
Page up	Expands the Y Axis view to show twice the current max scale (if it was 100%,it will show 200% after it is pressed-up to 800%)
Page down	Zooms the Y Axis view to show half the current max setting (if it was 100%, it will show 50%-down to 0.4%)

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Chapter 10
Saving and Managing Files

10.1 Saving Files on the HAPSITE

File types are created two ways, either by the HAPSITE software or user when analyses are performed. The list of possible file types includes:

- Method files
- Event Log files
- Data files
- Tune files
- Report files

10.1.1 Method Files

Method files are created using the HAPSITE Smart IQ software to direct the instrument how to collect and analyze samples. Once created and saved, a Method file can be selected to run samples. Method files are created and saved, using the Method Editor, either to a directory on the PC or to the HAPSITE hard drive.

To save a newly created method from the Method Editor, press the **Save** button at the bottom of the Method Editor window. The dialog window shown in Figure 10-1 is displayed. Notice that the default location to save a method file is to the HAPSITE.

NOTE: Method files can be saved to the HAPSITE only if the HAPSITE is connected to the PC. Refer to section 2.3.6, Connect Laptop (if desired), on page 2-9 for additional information on how to connect the laptop and HAPSITE.

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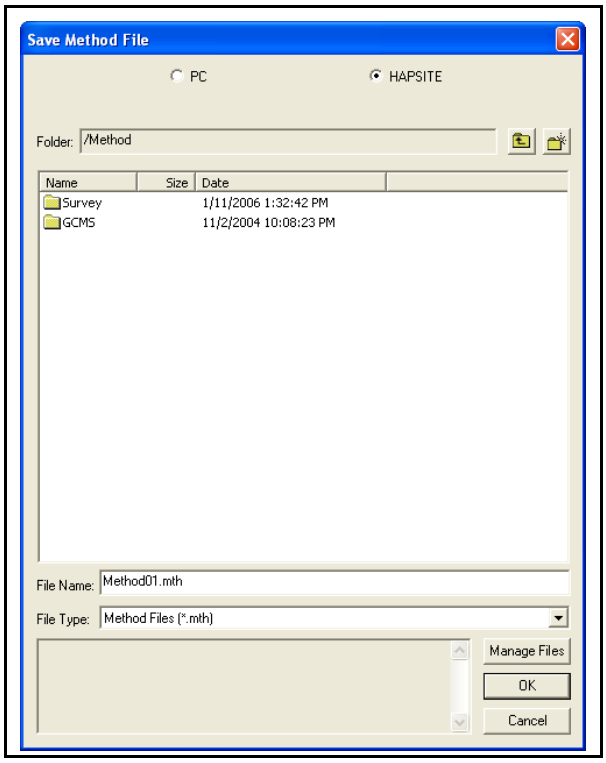
Figure 10-1 Save Method File Dialog Window - HAPSITE Option Selected

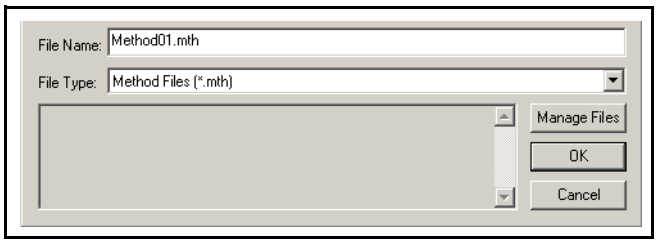


Enter the new file name in the box labeled **File Name**. The file location may be changed to save in the **GCMS** or **Survey** directory, or a new one may be created using the **Create Folder** button, as shown in Figure 10-2.

Figure 10-2 Create Folder Button

To create a new folder, name the new folder then open the new folder before saving the Method file. Once the location and name have been chosen, press **OK** to save the file. See Figure 10-3.

Figure 10-3 Entering a New Method File Name



HINT: The HAPSITE Smart software is case sensitive. Folder names on the HAPSITE and laptop must be exactly the same. Example: Bakeout and Bakeout NOT bakeout or BAKEOUT.

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10.1.2 Event Log Files

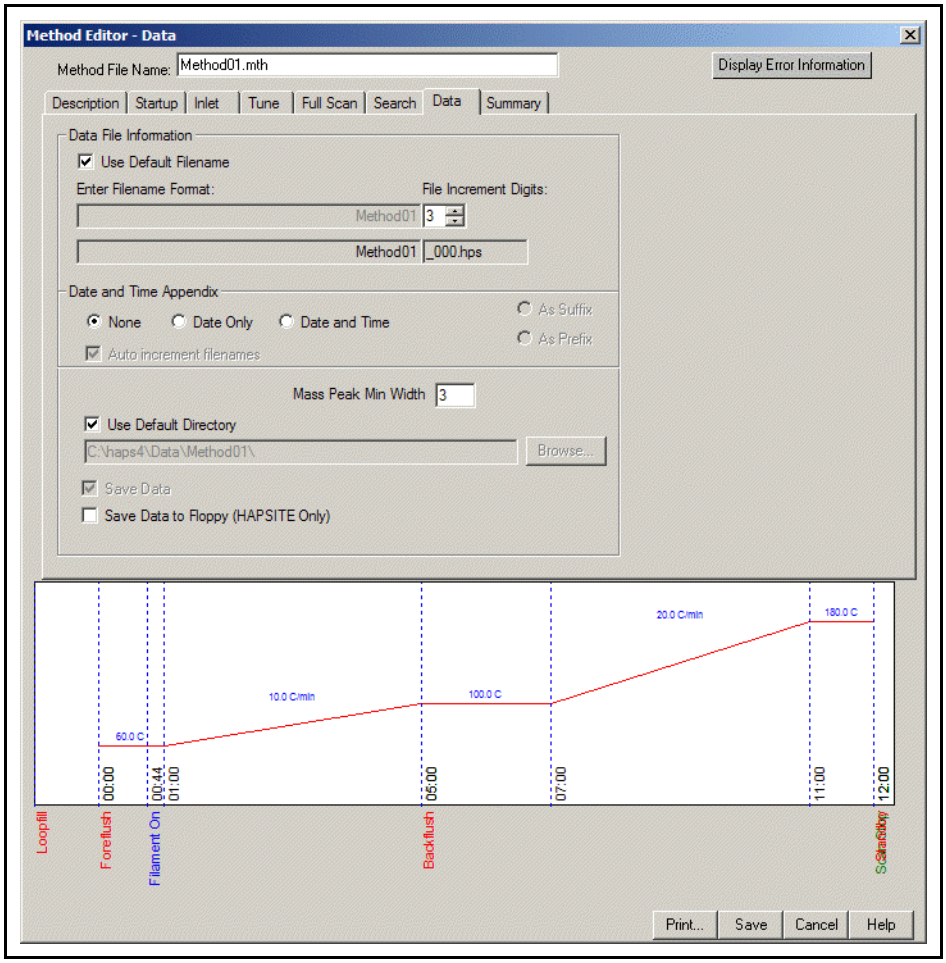
Event Log Files are created automatically by the system to record system state information (such as heating, valve changes, etc.) for future reference. These files are created daily when running the HAPSITE using the PC software. These files are saved on the PC. Refer to section 10.2, Saving Files to the PC, on page 10-8, for more information.

10.1.3 Data Files

Data files are automatically saved to the HAPSITE hard drive, in a data directory under a folder named the same as the Method used to run the analysis. For example, in the case where a Method named Method01 was used to run the analysis, the folder where files are saved for that method would be data\Method01\.

The default naming convention for these files is to use the method name and add an underscore and 3 digits to the end, starting with _001. This file name would then be incremented each time a new analysis is performed. The name may be modified by selecting the **Method Editor - Data** page, shown in Figure 10-4.

Figure 10-4 Method Editor - Data, Showing File Name Options



The system allows flexibility to add Date or Date and Time as a prefix or suffix, or use a different naming convention if **Use Default Filename** is not selected.

10.1.4 Tune Files

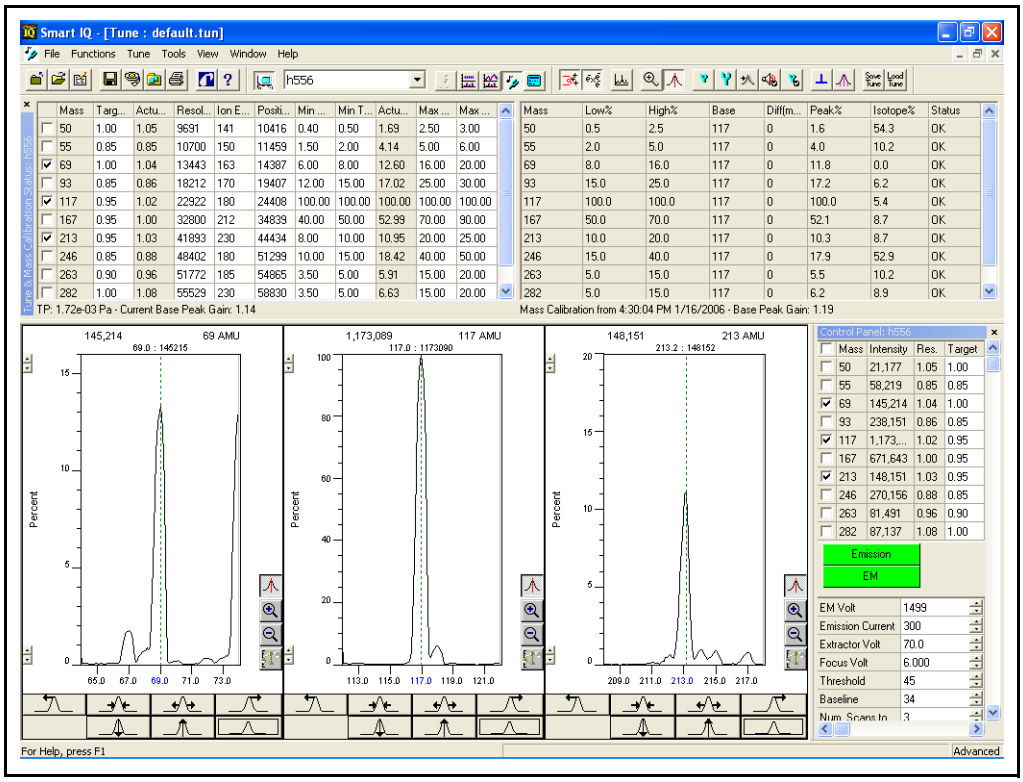
If Tune is performed automatically (Autotune as part of normal operation), then the file name is specified as part of the Method file. Also, the updated Tune is saved automatically under the name specified in the Method file. Refer to Chapter 7, Tune for additional information on Tune.

NOTE: Manual Tuning requires Advanced access. Normal users do not have access to Manual Tune. Refer to section 8.10, Access Levels, on page 8-34 for additional information on Access Levels.

If Manual Tune is performed, the file must be saved to the Tune folder on the HAPSITE. Figure 10-5 shows a typical Manual Tune screen, which is opened by selecting the **Tune** icon in System Setup, or by right clicking on a sensor icon and selecting **Tune**. To save changes made during manual tuning, press the **Save Tune** button on the Function toolbar and tune will be saved immediately. Other ways to save a tune file include using **File >> Save**, **File >> Save As**, or **Tune >> Save Tune Parameters**.

NOTE: Tune files are saved, by default, to the HAPSITE hard drive under the \Tune folder.

Figure 10-5 Manual Tuning Screen Showing Save Tune Button



When an attempt is made to exit manual tune without saving, a window will appear asking "Do you want to save the changes to a tune file?". See Figure 10-6. To save the file, press **Yes**. If not saving the tune file, press **No**. Pressing **Cancel** will abort exiting tune without saving the tune file. If saving the tune file, the **Save Tune File** window will appear as shown in Figure 10-7. Select a Tune file name and press **OK**.

HINT: It is highly recommended to always save the tune as **`default.tun`**.

Figure 10-6 Save Changes Prompt

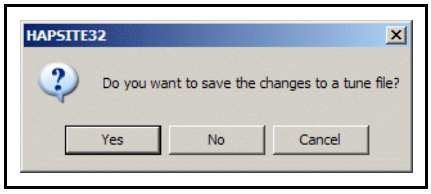
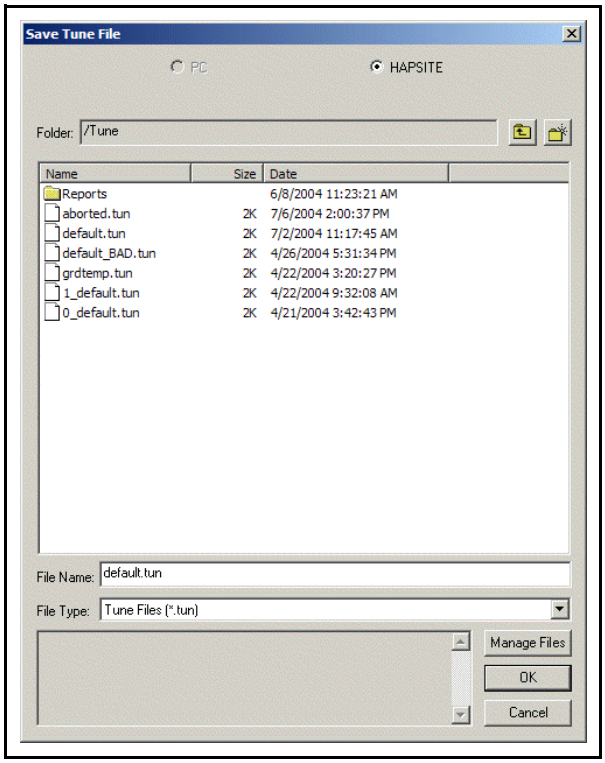


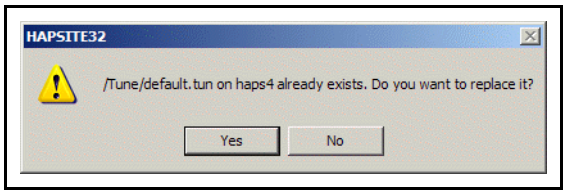
Figure 10-7 Save Tune File Screen



Once the Tune file is saved, the Save Tune File and Manual Tune windows will be closed.

If the Tune file already exists, a prompt will appear to confirm that the file will be overwritten. The confirmation window is shown in Figure 10-8.

Figure 10-8 Overwrite Existing Tune File Confirm Window

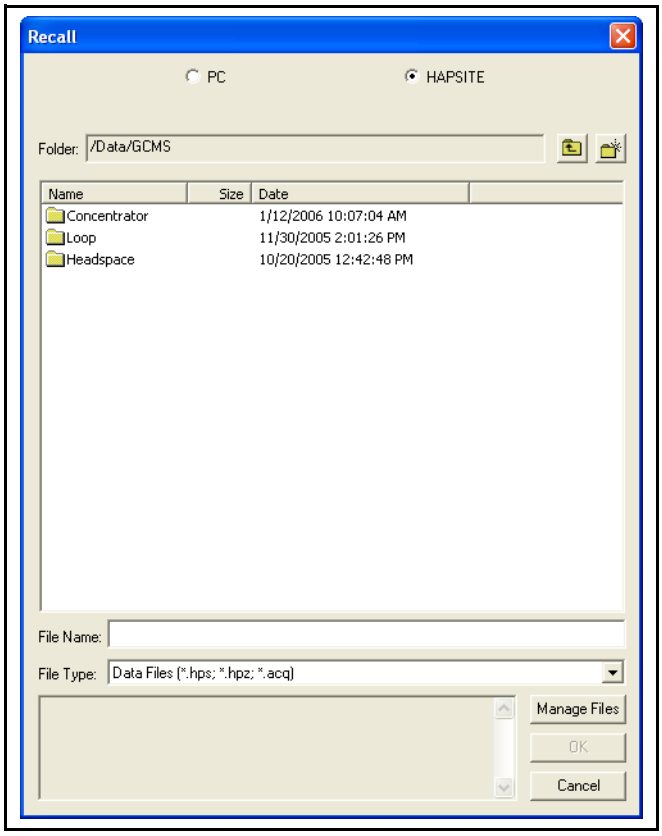


To overwrite the file, select **Yes**, otherwise select **No**. If **No** is selected, the **Save Tune File** window will appear.

10.1.5 Data Review

Data review is used to view and analyze data files. To open files, double click on the **Data Review** icon in the System Setup window, or right click on a sensor and select **Data Review**, or select a file from the **Recent Files** list in System Setup view. The Data Review window is shown in Figure 10-9. Refer to Chapter 9, Data Review for additional information on Data Review.

Figure 10-9 Data Review Recall Window



The window opens showing the data folder for the currently selected HAPSITE Data Files, organized the same as method files. Data files are saved under **`/Data/method_folder_name/`** with which the data files were run. For example, if the method called Default was used to run the analysis, the folder would

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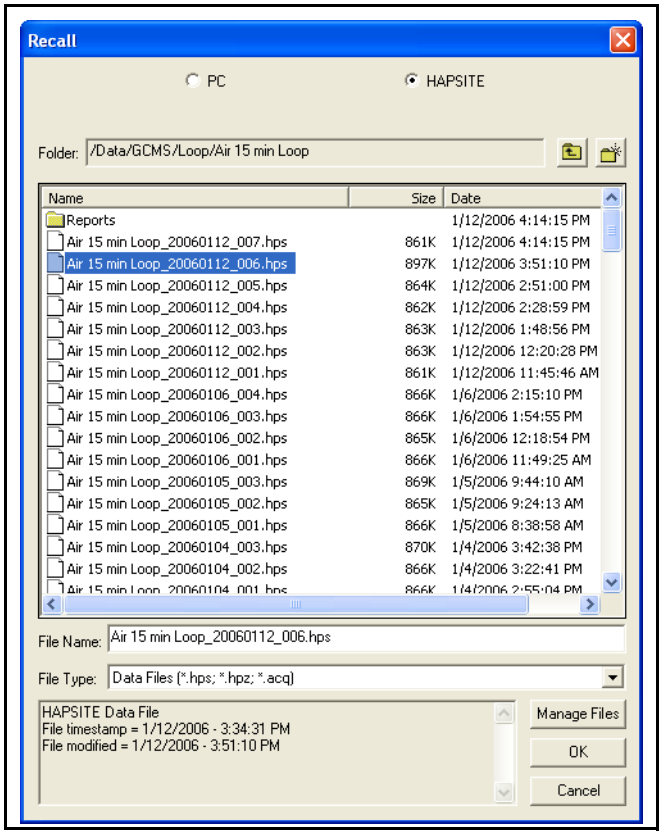
be Data/Default. To select a file to open, open a folder then click on the desired data file to open, then click the **OK** button. See Figure 10-10, which shows a data file being selected.

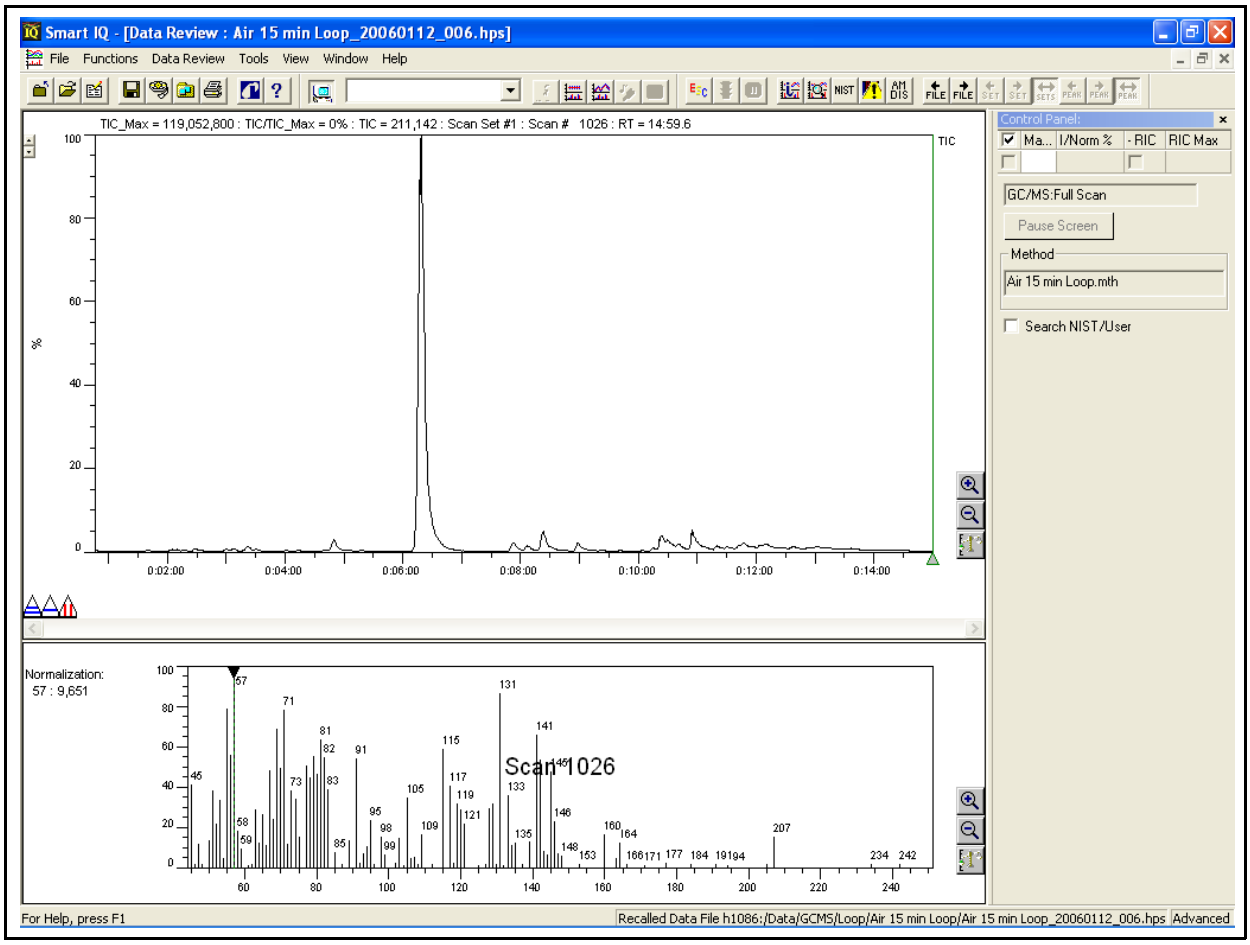
HINT: Smart IQ data files are saved with a .hps extension at the end of the filename.

Figure 10-10 Data Review Recall Window



The data file is opened in the Recall window, as shown in Figure 10-11.

Figure 10-11 Viewing Results in the Data Review Window



Data files stored on the PC may also be opened for review. To open files on the PC, select the **PC** button at the top of the Recall Data window, then select the appropriate file from the PC hard drive.

NOTE: Alternately, select **Manage Files**, to copy files, manage folders, or delete files on either the HAPSITE or PC hard drive.

10.2 Saving Files to the PC

File types are created two ways, either by the analyst or by the HAPSITE software when analyses are performed. The list of files possible includes:

- Method files
- Event Log files
- Data files
- Tune files
- Report files

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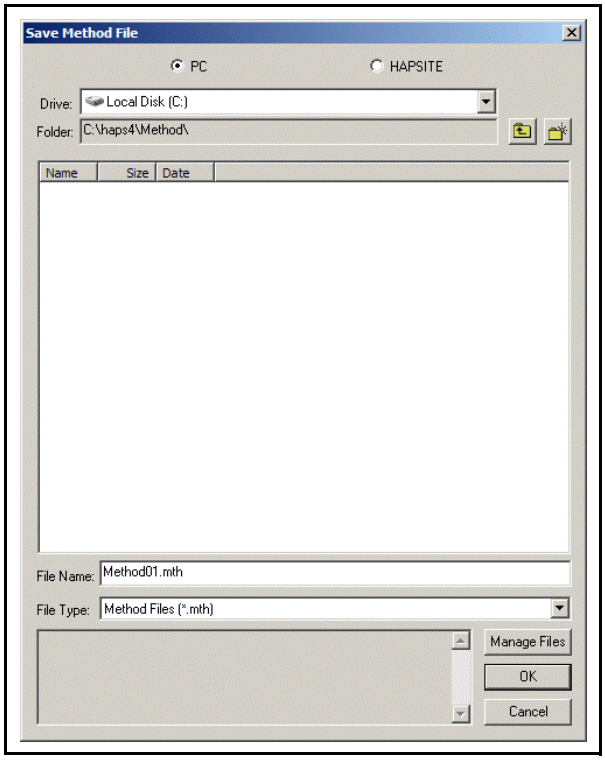
10.2.1 Method Files

Method files are created using the HAPSITE Smart IQ software to direct the instrument how to collect and analyze samples. Once created and saved, a Method file can be selected to run samples. Method files are created and saved using the Method Editor, either to a folder on the PC or to the HAPSITE hard drive.

After method parameter changes are entered, the method needs to be saved. When ready to save the method, press the **Save** button at the bottom of the Method Editor window and the dialog window below is displayed. Notice that the default location to save a method file is to the HAPSITE. Method files are created using the Method Editor. Method files may be saved to the PC hard drive similar to the way they are saved to the HAPSITE.

To save Method files to the PC, select the **PC** option as shown below in Figure 10-12.

Figure 10-12 Save Method File Dialog Window - PC Option Selected



Selecting a different PC disk drive is achieved by clicking on the drop-down box (Figure 10-12 shows **Local Disk (C:)** selected). To change folders, move up using the **Up One Level** button (shown in Figure 10-13), or by double-clicking on an entry in the main file list. New folders may be created by selecting the **New Folder** button.

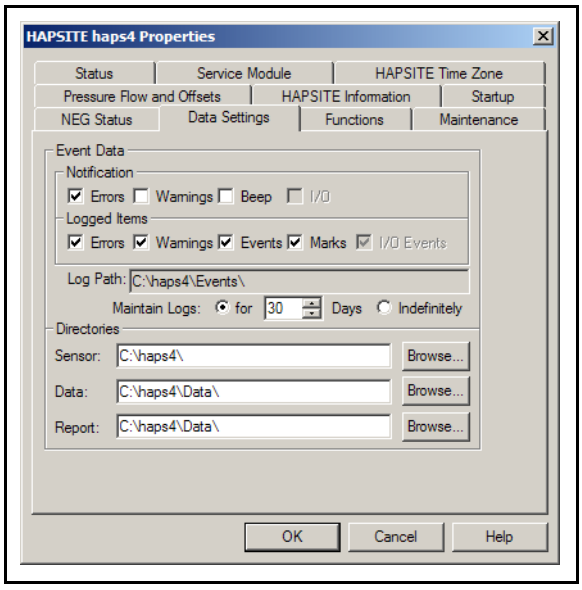
Figure 10-13 Up One Level Button

10.2.2 Event Log Files

Event Log Files are created automatically by the system to record system state information, such as heating or valve changes, for future reference. These files are created daily when running the HAPSITE using the PC software. These files are saved in the Sensor directory Events folder (as shown in Figure 10-14) as **`C:\haps4\`**. The events would be saved in **`C:\haps4\Events`** by specifying this location. The location where log files are saved can be changed only by changing the Sensor directory.

By default, log files are deleted after 30 days. To modify how long the files are saved, open up sensor properties by right clicking on a **Sensor** icon and selecting **Properties**; or by double clicking on a sensor; or by selecting the menu item **Tools >> Sensor Properties**. Select the **Data Settings** tab. The window shown in Figure 10-14 below will appear.

Figure 10-14 Sensor Properties - Data Settings



On the **Maintain Logs** line of Data Settings, the number of days which the log file will be saved may be changed or to save all log files created indefinitely. If a number of days is selected, each time HAPSITE Smart IQ is run the HAPSITE will erase files which are older than the number of days selected.

NOTE: This setting is saved in the HAPSITE Smart IQ.ini file in the HAPSITE Smart IQ program install directory. If for any reason the HAPSITE.ini file is reloaded or deleted, the setting will change back to the default setting of **Maintain Logs** for 30 days. Log files use the naming convention: LogYYYYMMDD.evt, where YYYY is year, MM is month, and DD is day.

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10.2.3 Data Files

Data files are automatically saved to the HAPSITE hard drive and to the PC if the PC is connected and running Smart IQ when the method finishes. To save these files to the PC, use the Manage Files dialog to transfer the files from the HAPSITE to the PC. For more information on transferring files, see section 10.3, Transferring Files Between the HAPSITE and PC, on page 10-11.

10.2.4 Tune Files

Tune files are automatically saved to the HAPSITE hard drive. To save these files to the PC, use the Manage Files dialog to transfer the files from the HAPSITE to the PC. For more information on transferring files, see section 10.3, Transferring Files Between the HAPSITE and PC, on page 10-11.

10.2.5 Report Files

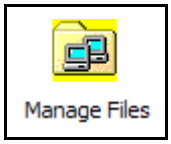
Report files are automatically saved to the HAPSITE hard drive. To save these files to the PC, use the Manage Files dialog to transfer the files from the HAPSITE to the PC. For more information on transferring files, see section 10.3, Transferring Files Between the HAPSITE and PC, on page 10-11.

NOTE: Report files are embedded in the data files so copying them to the PC is not critical.

10.3 Transferring Files Between the HAPSITE and PC

Transfer of files between the HAPSITE and PC in the HAPSITE Smart IQ software can be performed using Manage Files. To open the Manage File dialog, either right click on a sensor icon then select **Manage Files**, or select a sensor then double click on the **Manage Files** icon in the System Setup view. The **Manage Files** icon is shown in Figure 10-15.

Figure 10-15 Manage Files Icon in System Setup View



The Manage Files dialog allows the transfer files directly from the HAPSITE to the PC, or from the PC to the HAPSITE. The Manage Files dialog is shown in Figure 10-16.

NOTE: Data files cannot be copied from the PC to the HAPSITE.

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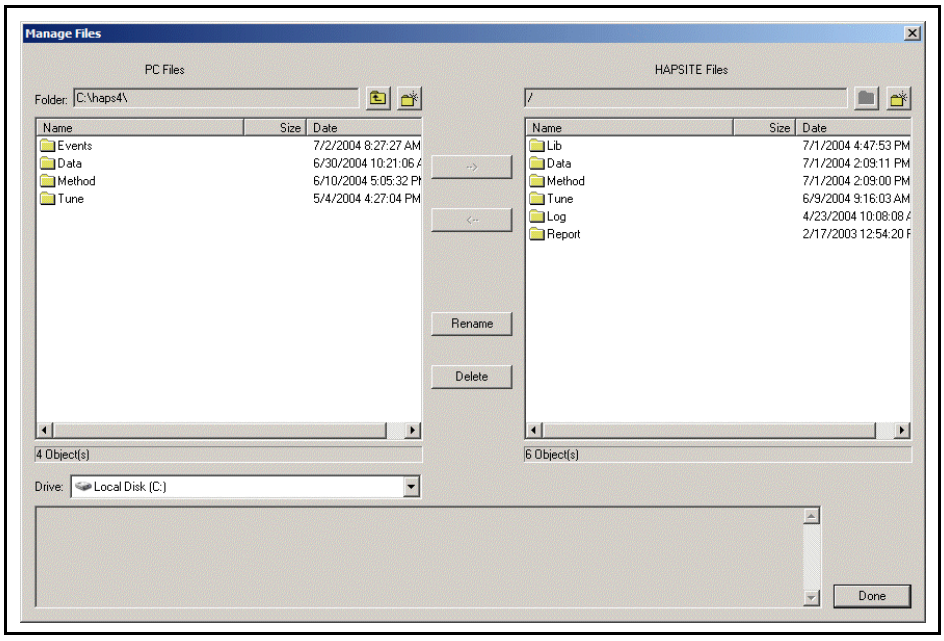
Figure 10-16 Manage Files Dialog Window

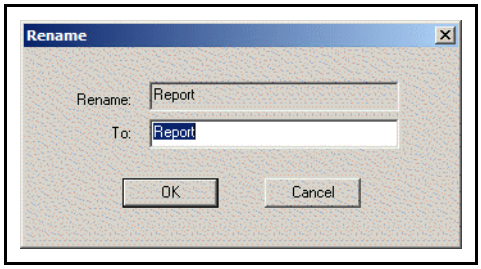


In the Manage Files window, the left side displays PC files while the right side displays HAPSITE files. The current folder directory is listed for both the PC and HAPSITE at the top of the window. The PC drive can be changed by clicking on the **Drive** pull-down list and selecting another available drive. Pressing the **Up One Level** button will move the directory back to the parent directory. Double-clicking on a folder will open the folder.

HINT: The **Name**, **Size**, and **Date** columns can be resized by clicking and holding the left mouse button on the line at the right edge of the field, then dragging it to resize. Double clicking on the right edge of any field will size the field to fit the data.Single clicking on a column heading will sort the list based on that column.

Folders or files may be renamed by selecting the appropriate file or folder, then pressing the **Rename** button. The rename dialog is shown in Figure 10-17.

Figure 10-17 Manage Files - Rename Window



Files or folders may be deleted using the **Delete** button. Select the desired file or folder to delete, then press the **Delete** button. A window will appear asking for confirmation to delete the file or folder. Select **Yes** to perform the delete, otherwise select **No**. The delete confirm window is shown in Figure 10-18.

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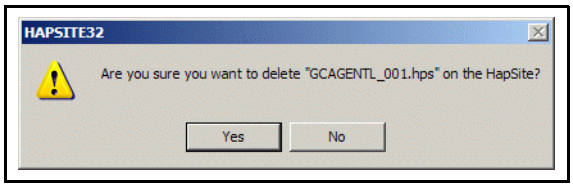
Figure 10-18 Manage Files - Delete Confirm Window



Folders or individual files or groups of files within a folder may be moved between the PC and HAPSITE. To move a single file, make sure the desired destination directory is already opened, then click on the file and press the arrow button to move the file to the selected directory. A section of files may be moved by clicking on the first file in the section, then holding the shift key, then clicking on the last file in the section to move. Individual files may also be added to the list by holding down the Ctrl key and clicking on files. To complete the transfer, press the arrow button.

HINT: To move files from the PC to the HAPSITE, use the right pointed arrow (see Figure 10-19). To move files from the HAPSITE to the PC, use the left pointed arrow.

NOTE: Only method files may be moved to the HAPSITE.

Figure 10-19 Right Pointed Arrow, For Moving Files From The PC To The HAPSITE

HINT: New folders may be created using the **Create Folder** button.

NOTE: Information about a selected file is listed in the bottom box of the window. The information will vary based on the type of file selected and the description information entered for that file.

When finished, click the Done button to close the Manage Files window.

10.4 Saving, Retrieving and Reviewing Files Using the USB Drive

Refer to section 4.8, Saving Files to the USB, on page 4-13, section 4.9, Retrieving Files from the USB Drive, on page 4-15, and section 4.10, Reviewing the Data Retrieved from the USB, on page 4-17 for information on using the USB Drive.

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Chapter 11
Method Editor

11.1 The Method Editor

The HAPSITE Method File provides for the total identification and qualitative analysis of volatile compounds in the sample. The main components covered in this section, which are used to build the HAPSITE Method File, are the Inlet component, which is built on the Inlet page, the Acquisition component, which is built on the Full Scan page, and the Calibration/Quantitation component, which is built on the Search page.

When completed, this HAPSITE Method File can be downloaded to the HAPSITE so that the HAPSITE can run in Portable Mode, without the need for an external computer. This chapter will instruct how to build a method to quantify a VOC (Volatile Organic Compound).

The Method file is employed at an incident site where the hazard has not been identified. A HAPSITE Method File will allow a search from a default range of 45 to 300 AMU and generate a data file for analysis. The file will include many expected (or target) compounds, for which the instrument can be calibrated, but may also include unexpected compounds. The unexpected compounds are tentatively identified by a NIST library search, for which quantitation can only be approximate.

Before being able to quantify a compound, one must develop a HAPSITE Method File to specifically target suspected compounds. The information needed for each component of the HAPSITE Method File is programmed on the following pages:

- The **Description** page, which specifies the type of Method being built.
- The **Startup** page, where all initial temperatures are set, and where the input device is determined (i.e. Probe, Headspace or SituProbe).
- The **Inlet** page, which provides the **Inlet** component, defining the temperatures, timing, and other gas chromatograph parameters as well as the control parameters of the Headspace Sampler, if installed.
- The **Tune** page provides the **Tune/Calibration** component, which is essentially the selection of a file that provides the expected response to the target compounds and the internal standards. The **Tune Report** is also available on the Tune page.
- The **Full Scan** component, which defines the mass range and other parameters of the Mass Spectrometer operation, is defined on the **Full Scan** page. For **SIM** collection, this component is configured on the **SIM** page.

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- The **Search** page sets the **Calibration/Quantitation** component, which designates which library file to access and search, the global GC/MS peak designation/integration parameters, and various reporting options.
- The **Data** page, which sets the **Data File (file extension.hps)** component, and specifies where the data will be stored. By default, data files are located in the \data folder, under the program folder and a subfolder named from the Method name, e.g. **C:\HAPSITE32\Method01\data\filename.hps.**
- A **Summary** page is provided, at the end of the Method Editor, which allows for review and printing of the Method before it is saved.

Each functional page of the Method Editor shows a common profile at the bottom, which depicts the **Inlet States** and **Temperature Profile**. Newly created Methods start with a default set of **Inlet States** and a default **Temperature Profile**. These should be changed according to the application.

The Method Editor can be run in a "Wizard" mode, which displays one page at a time and moves through the pages in a logical sequence while allowing movement forward or back through the pages to make or review changes (see Figure 11-1).

Figure 11-1 Method Editor Navigation Buttons

In "non-Wizard" mode, which is recommended only for experienced users, all pages are available through a tab interface. The "Wizard" mode setting is available to change through the **System Properties >> Miscellaneous** page (see Figure 11-2). The Method Editor must be closed to change and affect this setting.

Figure 11-2 System Properties Miscellaneous Page Wizard Setting

All Method parameters, on each page of the **Method Editor**, are checked for synchronization and correctness. The Method Editor automatically adjusts timing of the Inlet and Acquisition components to force synchronization. Prior to making automatic adjustments, the Method Editor colors the background of all questionable parameters with yellow. Each Method Editor page also has an **Error Information** button (see Figure 11-3), which is colored yellow when parameters are not synchronized. The editor permits movement from page to page, even when errors are present, because some errors may be repaired on one of many pages and some require repair on specific pages.

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Figure 11-3 Error Information Button

The order of pages that appear in Wizard mode for different collection and analysis modes are listed in Table 11-1.

Table 11-1 Method Editor Page Flow

GC/MS Full Scan	GC/MS SIM	Survey Full Scan	Survey SIM
Description	Description	Description	Description
Startup	Startup	Startup	Startup
Inlet	Inlet	Tune	Tune
Tune	Tune	Full Scan	SIM
Full Scan	SIM	Search	Search
Search	Search	Data	Data
Data	Data	Summary	Summary
Summary	Summary		

Development of a Method starts with a default set of components. The default settings are extracted from the software when editing a **New** Method. A **New** method is also supplied with a default Method filename, which can be changed on any page of the editor. The editor will automatically increment the default name with each successful launch and exit of the editor, provided the resulting Method is saved.

The remainder of section 11.2, Description Page, on page 11-3 and all subsections will describe and define the Method Editor interface and parameters used to create a HAPSITE Method File. A HAPSITE Method File can be deployed in numerous configurations; however, development of the complete method is done only on the PC and is then downloaded to the HAPSITE.

11.2 Description Page

The first page displayed in the Method Editor is the **Description** Page (Figure 11-4), which provides selections for the **Mode of Analysis** and **Collection Mode**. These selections determine the default content of the remaining Editor pages and the content of the Method file itself.

NOTE: A Method File ends with a file extension of.mth.

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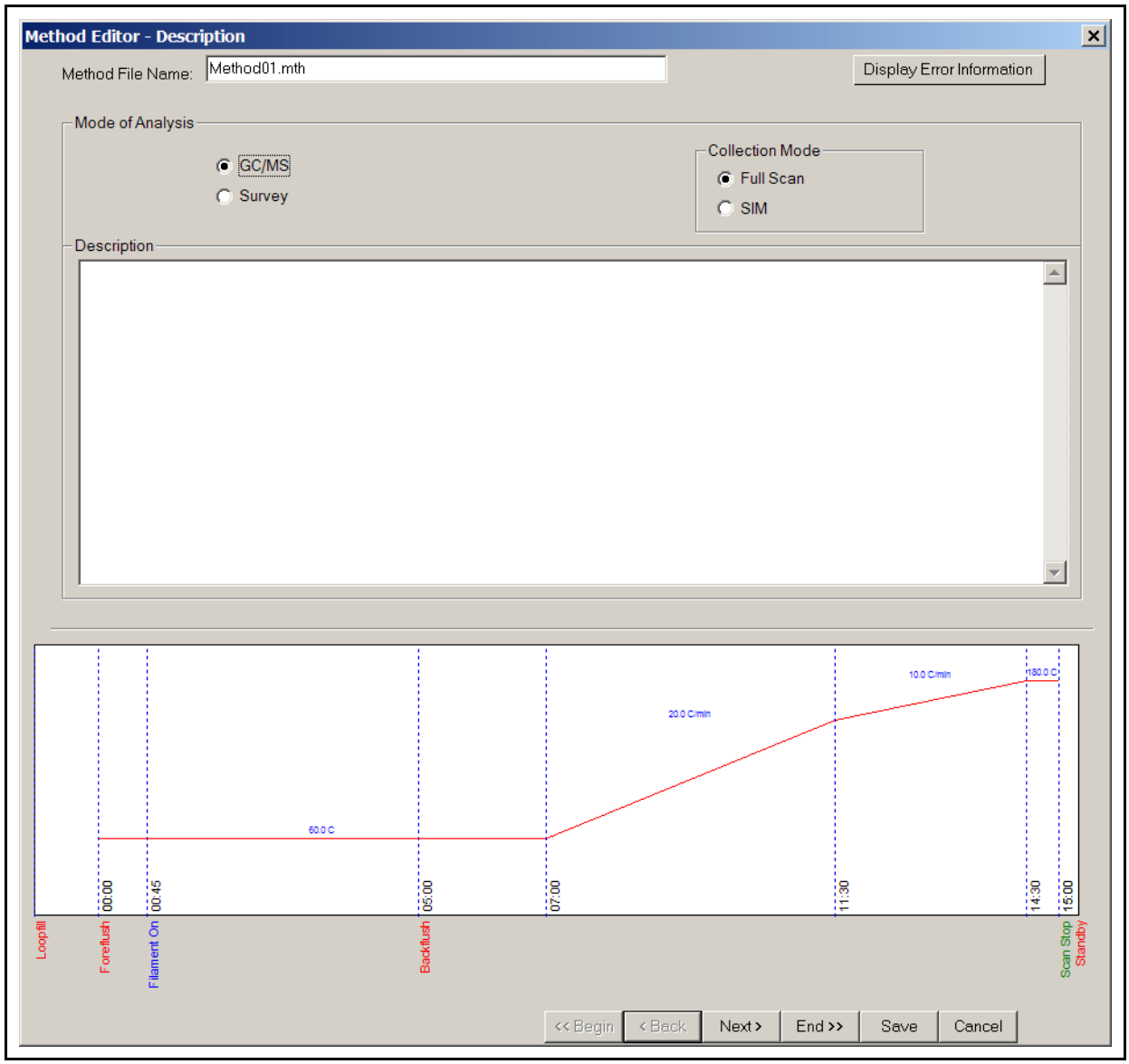
Figure 11-4 Method Editor Description Page



Mode of Analysis

GC/MS . . . . . This analysis uses both the Gas Chromatograph (GC) and Mass Spectrometer (MS) to separate and analyze the sample of known and unknown compounds. Compounds are tentatively identified by a library search.

Survey . . . . . This mode uses only the Mass Spectrometer and provides an immediate response and approximate quantitation. Samples flow directly to the Mass Spectrometer, with no separation of gases performed by the GC.

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Collection Mode

Full Scan . . . . . This mode scans all the masses across a given range. This is used for general analysis of samples when several compounds are to be quantified or when attempting to identify unknowns. Full Scan is available for both GC/MS and Survey modes of analysis.

SIM . . . . . Selected Ion Monitoring, this mode is used for specific target compounds expected to be in the sample. A higher degree of sensitivity is provided with this mode of collection. SIM is available for both GC/MS and Survey modes of analysis. Survey Analysis in SIM Mode can be used for Leak detection.

11.2.1 Full Scan Method

A GC/MS Scan is the full speciation and quantitation of all volatile compounds in the sample.

This type of analysis is typical of work at stationary sources such as stacks and process vents. The analysis will include many expected (or target) compounds (for which the instrument will be calibrated), but may also include unexpected compounds, which must be tentatively identified by a library search, and for which the quantitation can only be approximate.

Method elements are:

- If the HAPSITE is to operate separate from the Service Module, the HAPSITE must have a NEG pump installed and activated. Refer to section 2.7, Service Module, on page 2-18 and Chapter 14, Service Module.
- The quantitation sequence method must be defined. This includes the definition of:
  - the Data file (where the data will be stored),
  - the Full-scan parameters (which defines the mass range and other parameters of the mass spectrometer operation),
  - the Library Search parameters (which designates which library file to access, global GCMS peak designation/integration parameters, and various reporting options),
  - the Inlet parameters (which defines the events and the order in which they occur, the temperature profile and ramping rate, the filament delay time, as well as the control parameters of the HSS or SituProbe, if installed),
  - the Tune file (which provides the expected response to the target compounds and the internal standards),

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- if the instrument is to operate without the external computer, the appropriate files must be downloaded to the HAPSITE,
- the instrument must be tuned. (see Chapter 7, Tune),
- the instrument must be calibrated to the target compounds. (See Chapter 12, Target Compound Methods.)

11.2.2 SIM Method

The SIM GC/MS method is the full speciation and quantitation of only specific (or target) compounds expected to be in the sample.

This type of analysis should be used where the highest sensitivity (lowest minimum detectable concentration) is required, and where the compounds to be measured are known. The SIM GC/MS method might include one or many specific compounds for which the instrument will be calibrated.

This work may be carried out with the HAPSITE installed on the Service Module or separate from the Service Module; with the use of the laptop or without the laptop; and with or without a HSS, SituProbe, or sample conditioning probe. Regardless of the configuration, certain method elements must be defined and set-up procedures must be carried out. The method elements are:

- If the HAPSITE is to operate separate from the Service Module, the HAPSITE must have a NEG pump installed and activated. Refer to section 2.7, Service Module, on page 2-18 for additional information on the Service Module.
- The quantitation sequence method must be defined. This includes the definition of:
  - the Data file (where the data will be stored),
  - the Selected Ion Method parameters (which defines the masses to be monitored and the elution times expected, as well as other parameters of the mass spectrometer operation),
  - the Library Search parameters (which designates which library file to access, global GCMS peak designation/integration parameters, and various reporting options),
  - the Inlet method file (which defines the temperatures, timing, and other gas chromatograph and head space parameters),
  - the Tune/calibration file (which provides the expected response to the target compounds and the internal standards),
  - the Peak Plot file (which defines the handling and presentation of the data from the analysis),
  - the Setup file (which defines the parameters for the standby state of the HAPSITE),

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- the instrument must be tuned, either with the Smart tune or manual tune program, (see Chapter 7, Tune),
- the instrument must be calibrated to the target compounds, as defined in the analyte library file. (See Chapter 12, Target Compound Methods.)

11.3 Startup Page

The Startup Page, shown in Figure 11-5, allows for setting the initial parameters for the HAPSITE system heaters and selection of the sample input device.

Figure 11-5 Method Editor Startup Page for GC/MS Methods

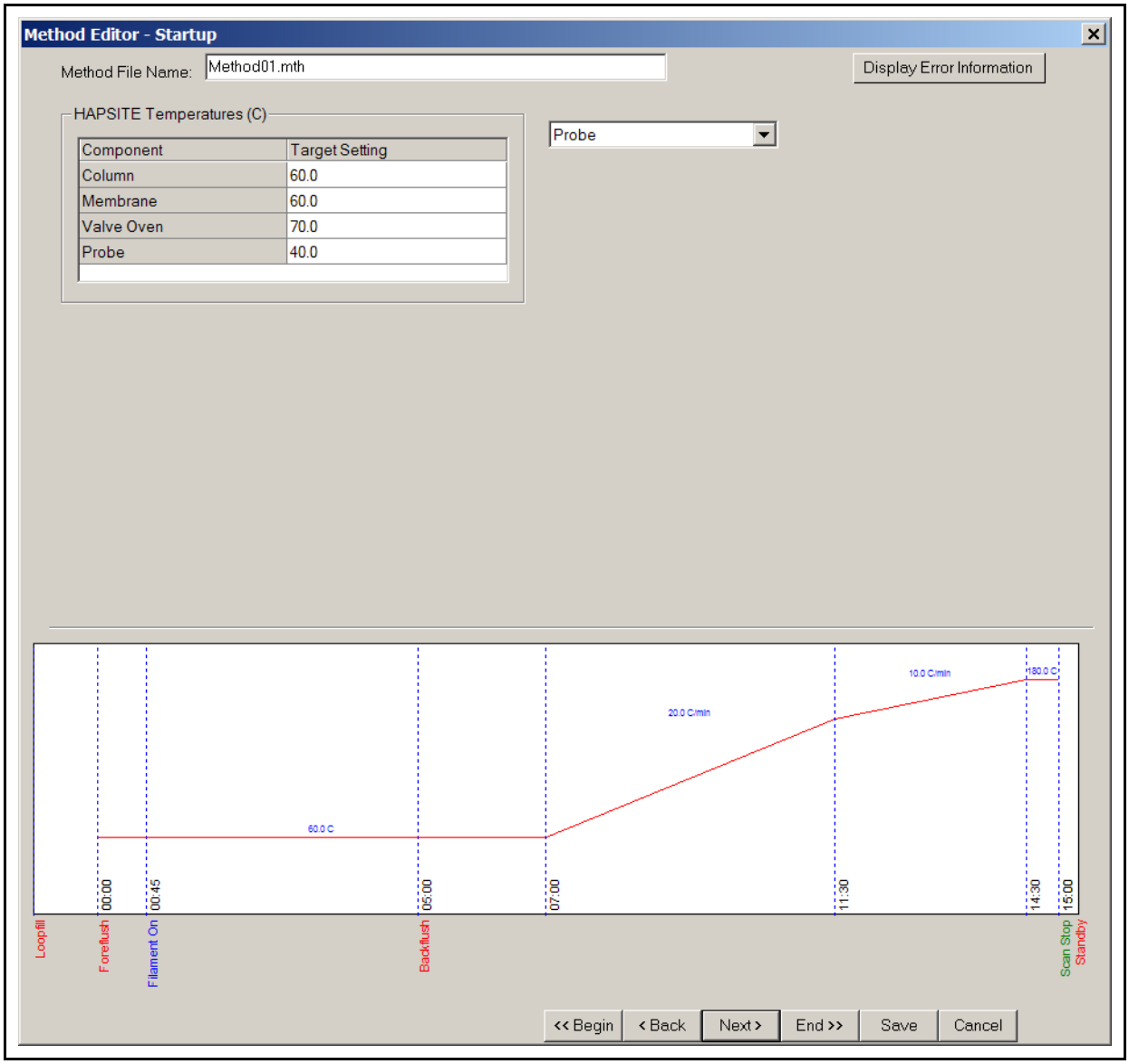

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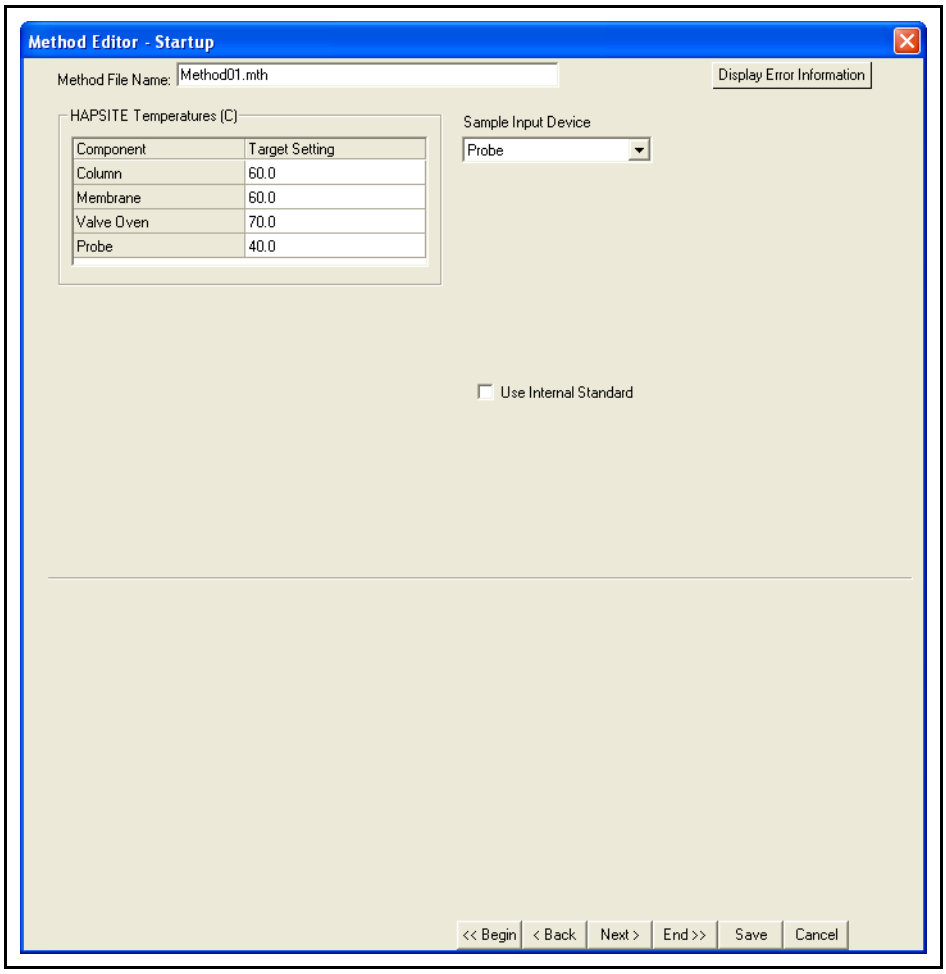
Figure 11-6 Method Editor Startup Page for Survey Methods



The parameters on the Startup page are:

Use Internal Standard . . . . . This option is shown on the Startup Page for survey methods. See Figure 11-6.

HAPSITE Temperatures (C)

Column . . . . . The target temperature the system will achieve on the Column before starting data acquisition. (Not used for survey methods.)

Membrane . . . . . The target temperature the system will achieve on the Membrane before starting data acquisition.

Valve Oven . . . . . The target temperature the system will achieve in the Valve Oven before starting data acquisition.

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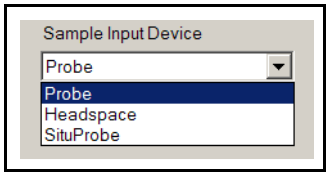
Probe . . . . . The target temperature the system will achieve in the Probe before starting data acquisition. This setting is not available when the Headspace or SituProbe is enabled.

Headspace. . . . . This system is used for analyzing solids and liquids for volatile organic compounds.

SituProbe . . . . . This instrument is used for analyzing liquid samples directly in the environment of interest. For example directly in a river.

In selecting a method, the Probe will automatically be highlighted in the drop down box for the Sample Input Device Options. See Figure 11-7.

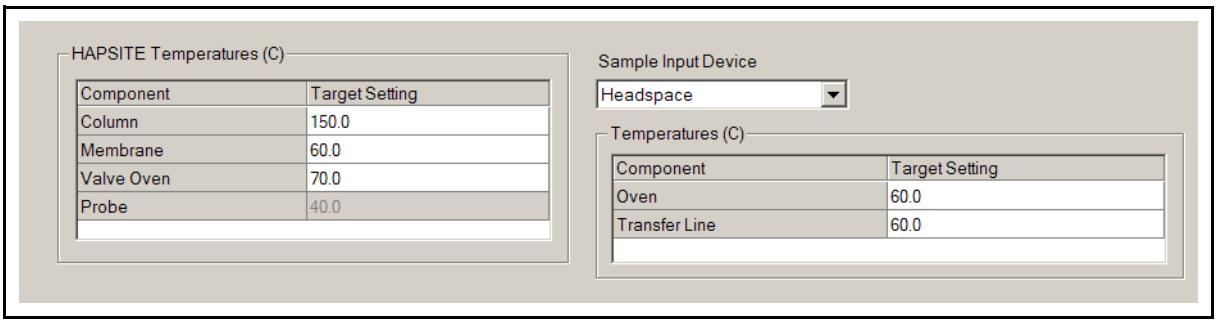
Figure 11-7 Sample Input Device Options



11.3.1 Headspace

To create a Headspace method, choose the **Headspace Sample Input Device**. This will bring up another temperature setting window for setting the headspace oven and transfer line temperature. See Figure 11-8.

Figure 11-8 Headspace Parameters



Headspace Temperatures (C)

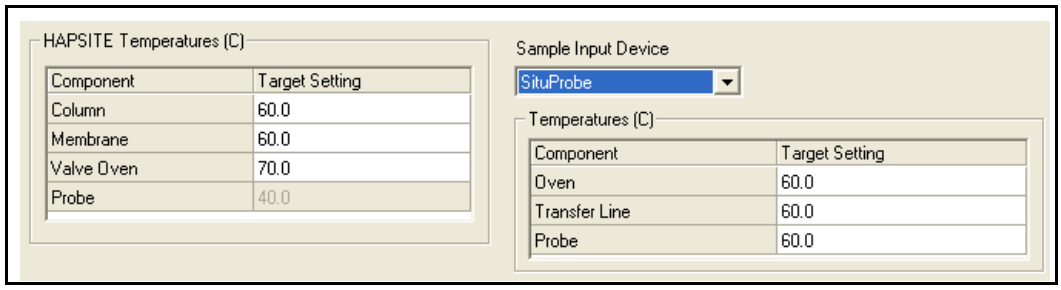
Oven . . . . . The target temperature the system will achieve in the Oven before starting data acquisition. This setting is not available when the Headspace or SituProbe is disabled.

Transfer Line. . . . . The target temperature the system will achieve on the Transfer Line before starting data acquisition. This setting is not available when the Headspace or SituProbe is disabled.

11.3.2 SituProbe

To create a SituProbe method, choose the **SituProbe Sample Input Device**. This will bring up another temperature setting window for setting the SituProbe oven and transfer line temperatures. See Figure 11-9.

Figure 11-9 SituProbe Parameters



SituProbe Temperatures (C)

Oven . . . . . The target temperature the system will achieve in the Oven before starting data acquisition. This setting is not available when the SituProbe or Headspace is disabled.

Transfer Line. . . . . The target temperature the system will achieve on the Transfer Line before starting data acquisition. This setting is not available when the SItuProbe or Headspace is disabled.

Probe . . . . . The target temperature the system will achieve in the SituProbe before starting data acquisition.

11.4 Inlet Page

NOTE: The Inlet page is not used (or displayed) when creating survey methods.

Figure 11-10 shows the default settings for the Inlet page for a GC/MS Full Scan Method. From this page, the Inlet States, GC Temperature Profiles and Run Time are integrated and synchronized to form the Inlet Component of the Method. Changing one item on this page often affects others and that effect is shown in the profile, at the bottom of the page, for clarity. There is a direct connection on this page between the start time of the Standby Inlet Event, the total time of the Temperature Profile, and the Run Time. Changing a time related to one of these items will automatically change a related time in the other items, in most cases.

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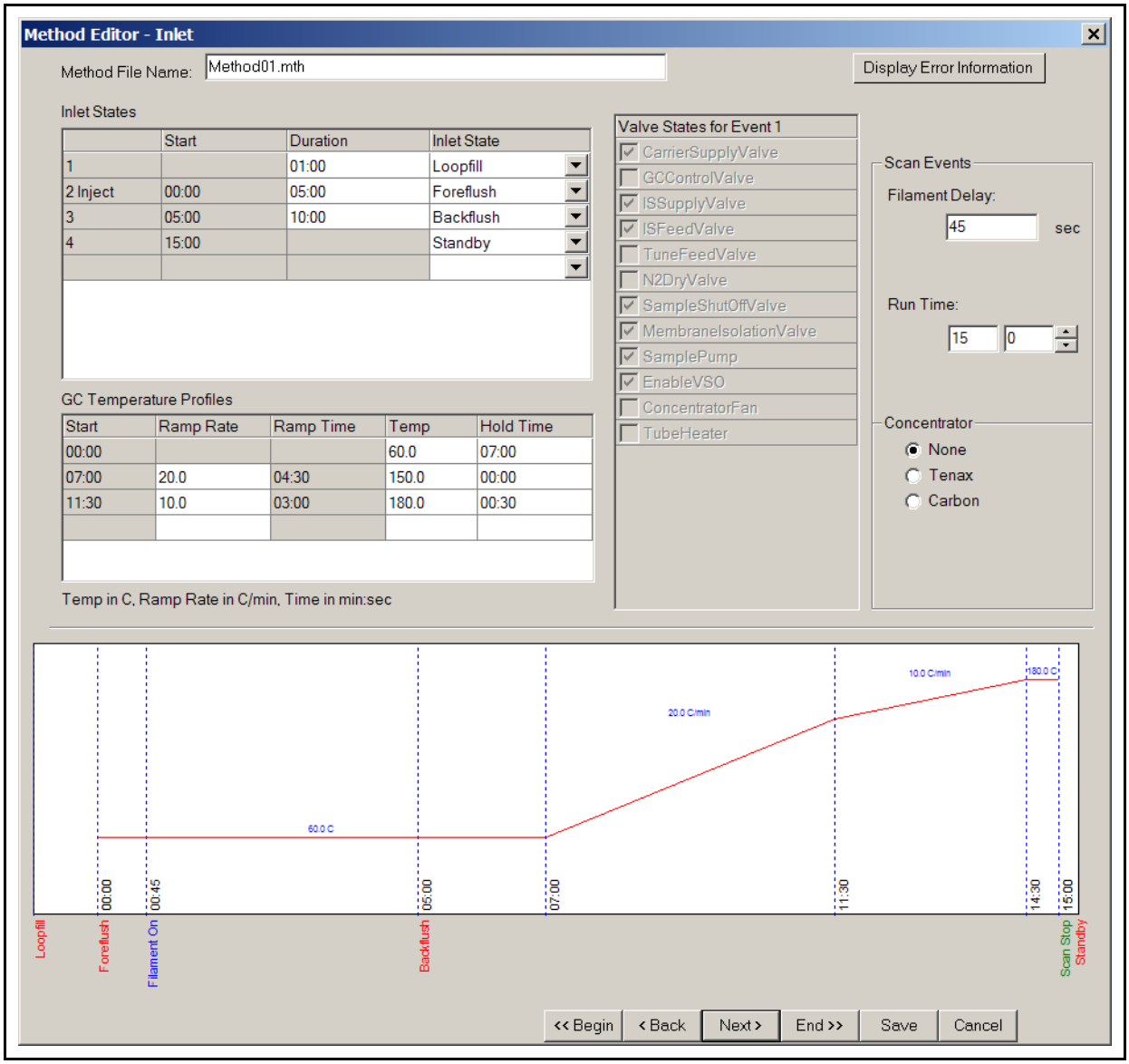
For example, in Figure 11-10, increasing the Run Time will increase the Duration of the Backflush Inlet State and will result in an increased Start time for the Standby event. The increase will also result in an increase to the Hold Time for the 180 degrees Temperature in the GC Temperature Profiles.

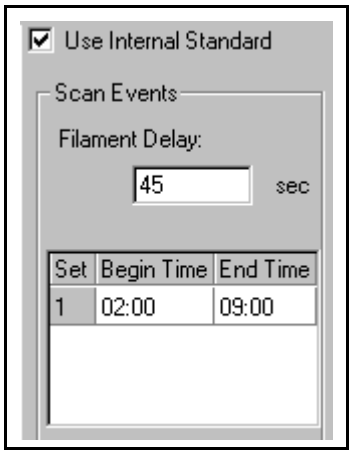
NOTE: In the rare case that the settings cannot be automatically synchronized, the incorrect cells are colored yellow as a guide to what needs correction.

Figure 11-10 Method Editor Inlet Page for GC/MS Full Scan



The only difference on the Inlet page between a GC/MS Full Scan method and a GC/MS SIM method is that the Run Time parameter entry is replaced with a table showing the SIM Sets as programmed on the SIM page (refer to section 11.2.2, SIM Method, on page 11-6). This difference is shown in Figure 11-11.

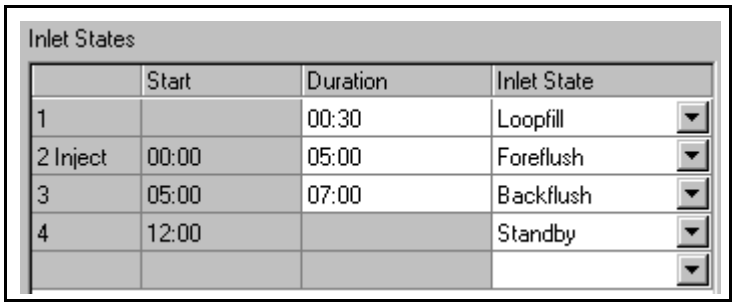
Figure 11-11 Inlet Page for GC/MS SIM



11.4.1 Inlet States

Inlet States specify the valve settings for the HAPSITE and control the sampling, analysis and clean-out of the HAPSITE or HAPSITE with Headspace Sampling System. The Inlet component of the Method will contain multiple Inlet States, which are programmable for duration but not for valve settings. One generic Inlet State, Other, is available for creating a custom set of valve settings. Figure 11-12 shows the grid used to program the Inlet States in a GC/MS Method. All Grid Controls are in effect for this grid.

Figure 11-12 Method Editor Inlet Page: Inlet States



The basic steps when editing the Inlet States grid is that, first, the desired Inlet State is chosen in the **Inlet State** column and then the duration for that Inlet State is entered in the **Duration** column. After the duration is entered, the editor will automatically calculate and enter the **Start** time for the next Inlet State. There is always a default Inlet component of Method; this can be modified by highlighting any cell in the grid and pressing the Delete key, to remove a row, or the Insert key to add a row. After adding a row the first thing entered must be the Inlet State.

HINT: When editing from the keyboard, the Alt+DownArrow key combination will "pull" the pull-down in the Inlet State column. Also, the Insert and Delete keys work for this grid.

The following parameters are contained in the **Inlet States** section of the Inlet page:

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Start . . . . . This is the starting time of each Inlet State and is not programmable. The first state can start before "time zero"; the start of the Run Time actually is the start of the first Injection event. Each state after the first state starts at the end of the duration of the previous state.

Duration. . . . . This is the amount of time, in minutes and seconds, that the selected Inlet State event will be active.

Inlet State . . . . . The flow order of the entire Method is programmed via the Inlet States grid and specifically via the Inlet State column. A set of predetermined Inlet states exist and are selectable from the pull-down menu in the Inlet State column. Selection of an Inlet State will show the Valve States used for that Inlet State (see Figure 11-13). An Inlet State of Other can be selected, which allows for a custom set of Valve States to be set for that particular Inlet State. See Figure 11-14. The selection of some Inlet States is dependent on hardware or desired location (in time) within the Method. Some Valve States cannot be changed for certain Inlet States.

NOTE: The list of Valve States may also include pumps, heaters and fans, depending on the system hardware. Selecting a component on the Valve States list tells the system to open the component, when the component is a valve, or turn the component on, when the component is something other than a valve. A checkbox that is empty (not check marked) tells the system to close the valve or turn off the component.

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Figure 11-13 Valve States for an Inlet State Event

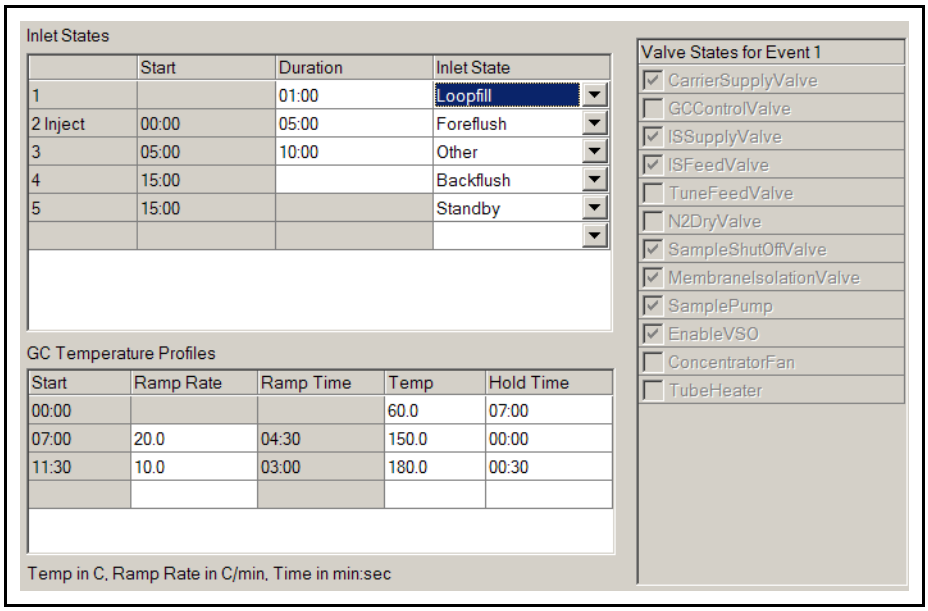
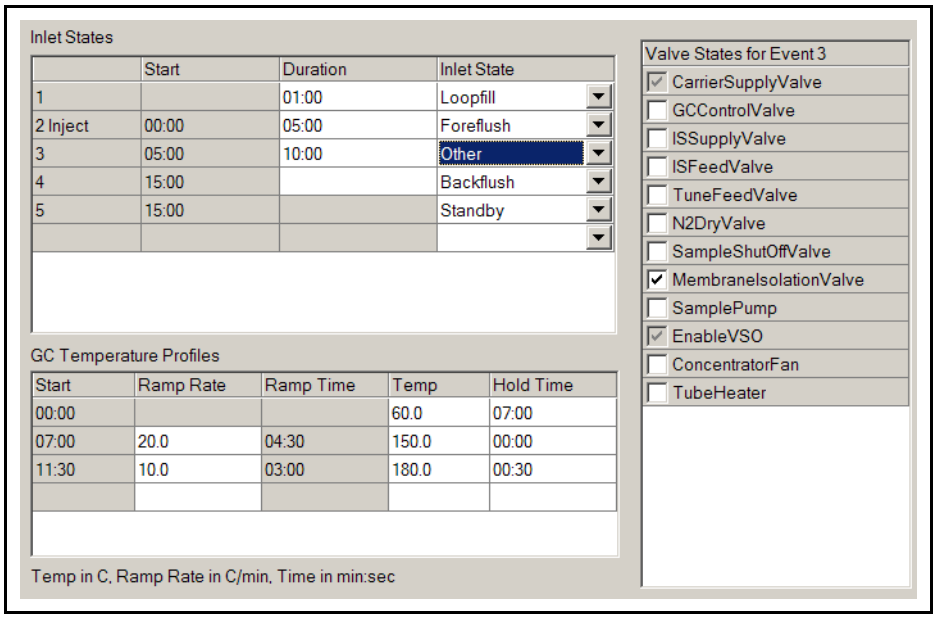


Figure 11-14 Customizing the Valve States for an Inlet State



Any Inlet State can be selected from the pull-down within the Inlet State column as shown in Figure 11-15. Some Inlet States are not available as the first state and some are only available after specific states have been selected. Some Inlet States can be programmed to occur before Start time 00:00, which is considered the Inject event.

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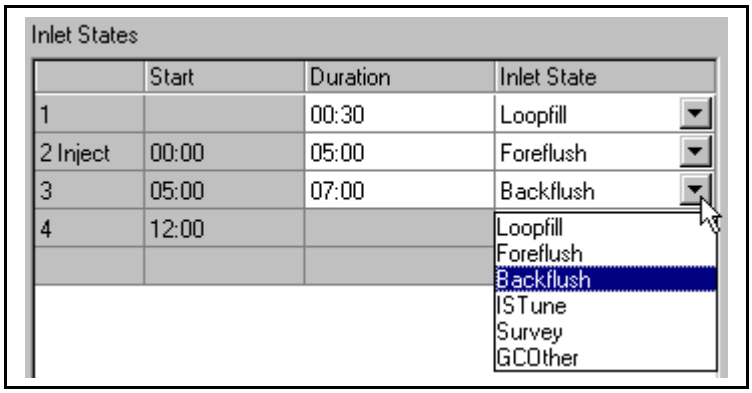
Figure 11-15 Accessing the Inlet States



The following choices are available in the Inlet States column:

Loopfill. . . . . This sets the GC valves so that the sample pump pulls the sample either through the sample loop. The recommendation is the Loopfill duration be at least 60 seconds to allow for clearing the sample line of the previous sample as well as good mixing with the Internal Standard (if used).

Foreflush . . . . . This sets the GC valves so that carrier gas will push sample out of the sample loop and onto the precolumn. The Foreflush time should be set so that all of the volatile compounds of interest will pass through the precolumn and onto the analytical column prior to Backflush.

Backflush . . . . . This Inlet State sets the valves on the GC so that carrier gas is directed to the input of the analytical column and into the output of the precolumn. The Backflush state provides the ability to customize the GC method so volatile compounds that pass quickly through the precolumn and onto the analytical column, during the Foreflush state, can be separated from less volatile compounds. The less volatile compounds are pushed back out of the precolumn quickly to clear the GC for the next analysis, while the volatile compounds of interest are separated on the analytical column for MS analysis.

ISTune . . . . . This state sets the GC valves so the internal standard gas is directed to the Mass Spectrometer for MS tuning.

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Survey . . . . . This Inlet State sets the GC valves and turns on the sampling pump so the sample will by-pass the GC and be directed to the inlet of the MS for real time analysis.

NOTE: Survey is the Inlet State used (by default) in the Survey and Direct Sample, Single Compound Methods. This cannot be changed.

Other . . . . . This allows the customization of each specific GC valve for a custom GC valve state. Useful for GC troubleshooting.

Standby . . . . . This Inlet State must be included in every Method as the last state. Standby closes the Membrane Isolation valve and turns the Mass Spectrometer filament off.

The following Inlet States are available in the Inlet States column when a Concentrator is being used:

ConcFill . . . . . Equivalent to loopfill when a concentrator is used.

ConcCooldown . . . . . This Inlet State provides a duration of time that lets the concentrator cool down to a desired operating temperature.

Line Purge . . . . . This Inlet State pulls the sample through the probe and out through the exhaust vent. The sample does not go through the concentrator.

PreDesorb . . . . . PreDesorb begins the process of removing the analytes adsorbed on the concentrator and moving them to the instrument for analysis.

Desorb . . . . . This completes the desorption of analytes off the concentrator and into the GC.

The following Inlet States are only available in the Inlet States column when the HSS is enabled for use:

HSSample . . . . . This Inlet State sets the valves of both the HAPSITE and HSS and turns on the sample pump for collecting a sample for GC/MS analysis. This passes the headspace of the sample through the transfer line and to the HAPSITE Analytical module.

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The suggested HSSample duration is approximately 15 seconds.

HSPurge . . . . . This state sets the valves for nitrogen to flow through the lines and needle assembly, then through the transfer line. This removes moisture and cleans out the previous sample. The needle should be inserted into a clean, dry vial during purge.

HSConcDry . . . . . This Inlet State purges the Headspace system with dry N_2. This should only be used if the Headspace system is connected to an external cylinder of carrier gas.

The following Inlet States are only available in the Inlet States column when the SituProbe is enabled for use:

SPLinePurge . . . . . This state sets the valves for nitrogen to flow through the lines and SituProbe assembly, then through the transfer line. This cleans out the previous sample. The recommended event duration is at least 60 seconds to allow for clearing the sample line of the previous sample as well as good mixing with the Internal Standard (if used).

SPConcFill . . . . . This sets the GC valves so that the sample pump pulls the sample through the concentrator.

SPLoopFill. . . . . This sets the GC valves so that the sample pump pulls the sample through the sample loop. The recommended duration is at least 60 seconds to allow for clearing the sample line of the previous sample as well as good mixing with the Internal Standard (if used).

SPN2DryPurge . . . . . This Inlet State purges the transfer line and concentrator system with dry N2 before sample injection to remove moisture.

11.4.2 GC Temperature Profile

GC Temperature Profiles (see Figure 11-16) specify the temperature ramp and hold settings for the HAPSITE Method. Any profile can be edited by changing the value in the **Temp**, **Ramp Rate** or **Hold Time** column. When a new profile is added, the first value entered will force the other values to be calculated and entered automatically. However, this automatic entry does not prohibit the values from

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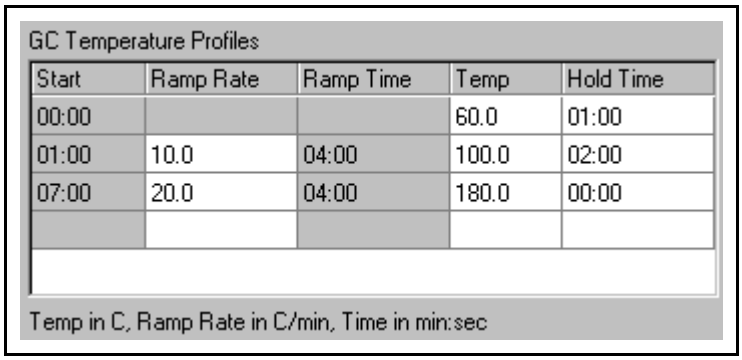
being edited. The **Start** time of each profile is automatically derived from the preceding profile. The **Ramp Time** is automatically calculated based on the **Ramp Rate** and **Temp** entries and cannot be edited directly.

Figure 11-16 Method Editor Inlet Page: GC Temperature Profiles



The Insert key does not work for this grid. Changes to the profiles must be made by editing the **Temp**, **Ramp Rate** or **Hold Time** and adding heater profiles.

11.4.3 Use Internal Standard

The selection to use an Internal Standard is available for Loopfill and LinePurge events.

Figure 11-17 Selection to Use Internal Standard

If **Use Internal Standard** is checkmarked, the Internal Standard will automatically be mixed at a ratio of 1:10 with the sample to be analyzed.

NOTE: Use Internal Standard is not available when the Headspace is enabled.

11.4.4 Scan Events

The following describes the Scan Events of the Method (Figure 11-18).

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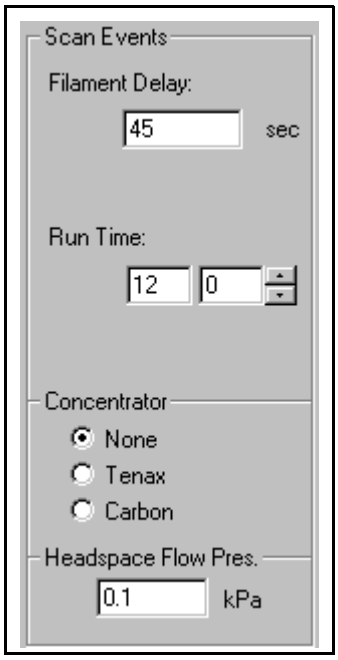
Figure 11-18 Scan Events



The **Filament Delay** is a delay, after the start of analysis, which must pass before the filament is turned on. This delay should be set as a protection for the filament; enough delay should be set to allow the components of the air peak or solvents to pass through the Mass Spectrometer before turning the filament on.

HINT: In some applications, if the Mass Spectrometer starts collection of data too soon, then the high pressure burst caused by a solvent peak may shut down the Mass Spectrometer and stop the analysis.

The **Run Time** is calculated based on the Inlet Events and GC Temperature Profiles and is the cumulative time of the Method.

11.4.5 Concentrator Selection

There are three selections available for the **Concentrator**:

None . . . . . Select this when no concentrator will be used with this Method.

Carbon . . . . . Select this when a Tri-Bed or Carbopack concentrator will be used with this Method.

Tenax . . . . . Select this when a Tenax concentrator will be used with this Method.

11.4.6 Headspace Flow Parameter

Headspace Flow Pressure controls the flow rate of nitrogen through the HSS during the Sample and Purge states. This parameter is only available when the HSS is used.

11.4.7 SituProbe Flow Parameter

SituProbe Flow Pressure controls the flow rate of nitrogen through the SituProbe during the Sample and Purge states. This parameter is only available when the SituProbe is used.

11.5 Tune Page

The **Tune** Page is divided into two pages - Report and Param - that each provide information about the Tune file.

11.5.1 Param Page

The **Param** Page (see Figure 11-19) provides the filename of the Tune file on the HAPSITE, which provides the MS tune parameters used with the method. These parameters are updated after every successful tune. The default filename is **`default.tun`**. If a different Tune file exists on the HAPSITE then the **Browse** button can be used to locate and specify the desired tune for the Method. The **`default.tun`** file always contains the most recent Tune parameters.

This page also has a **Show Details** checkbox (Figure 11-20), which will produce a grid of Tune parameters contained in the file and produced by the Tune Report. These parameters cannot be edited.

11.5.2 Report Page

The **Report** Page (Figure 11-21) provides a printable report saved after the most recent execution of Autotune.

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Figure 11-19 Method Editor Tune Parameter Page

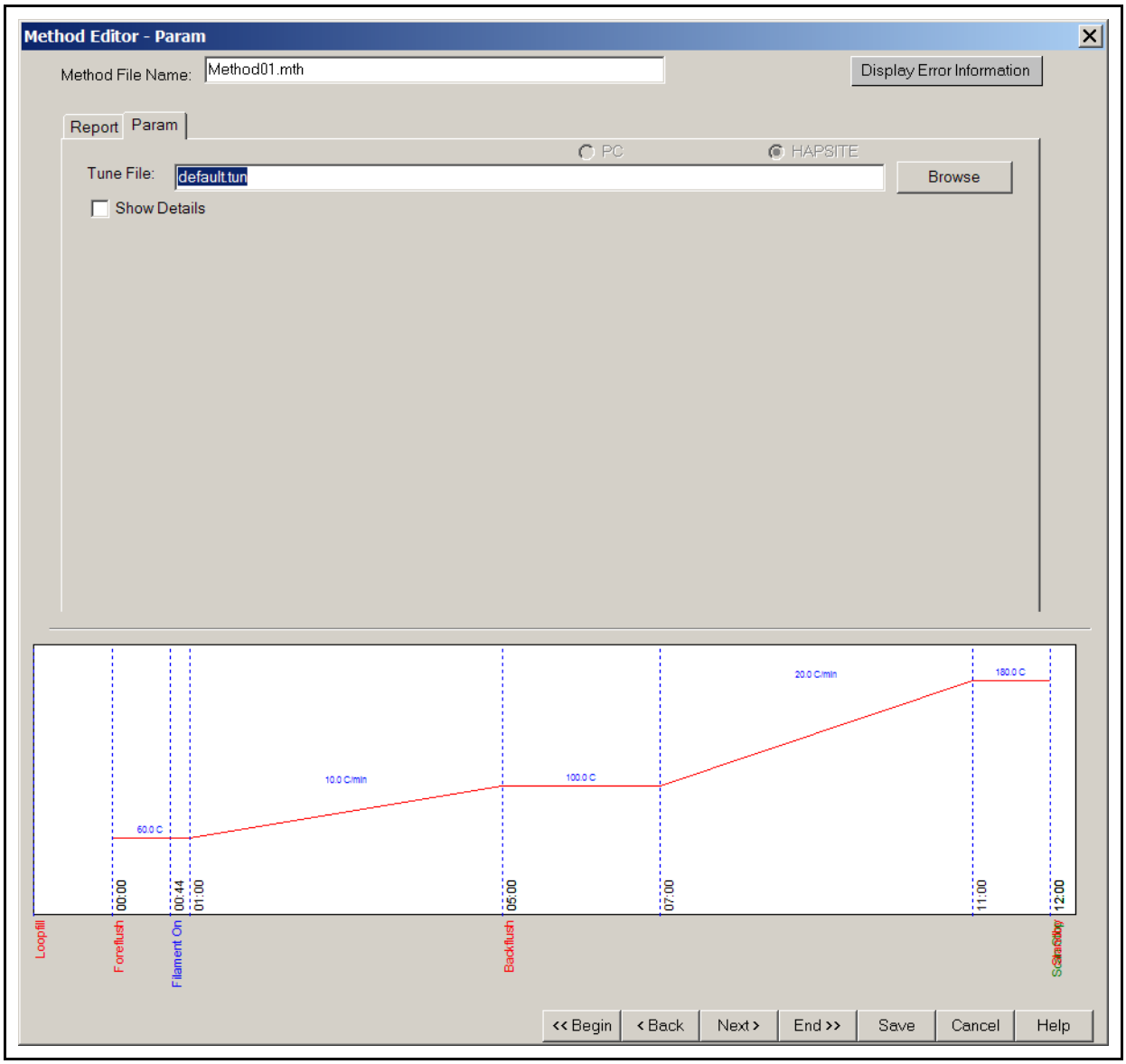


Figure 11-20 Method Editor Tune Parameter Page - Show Details

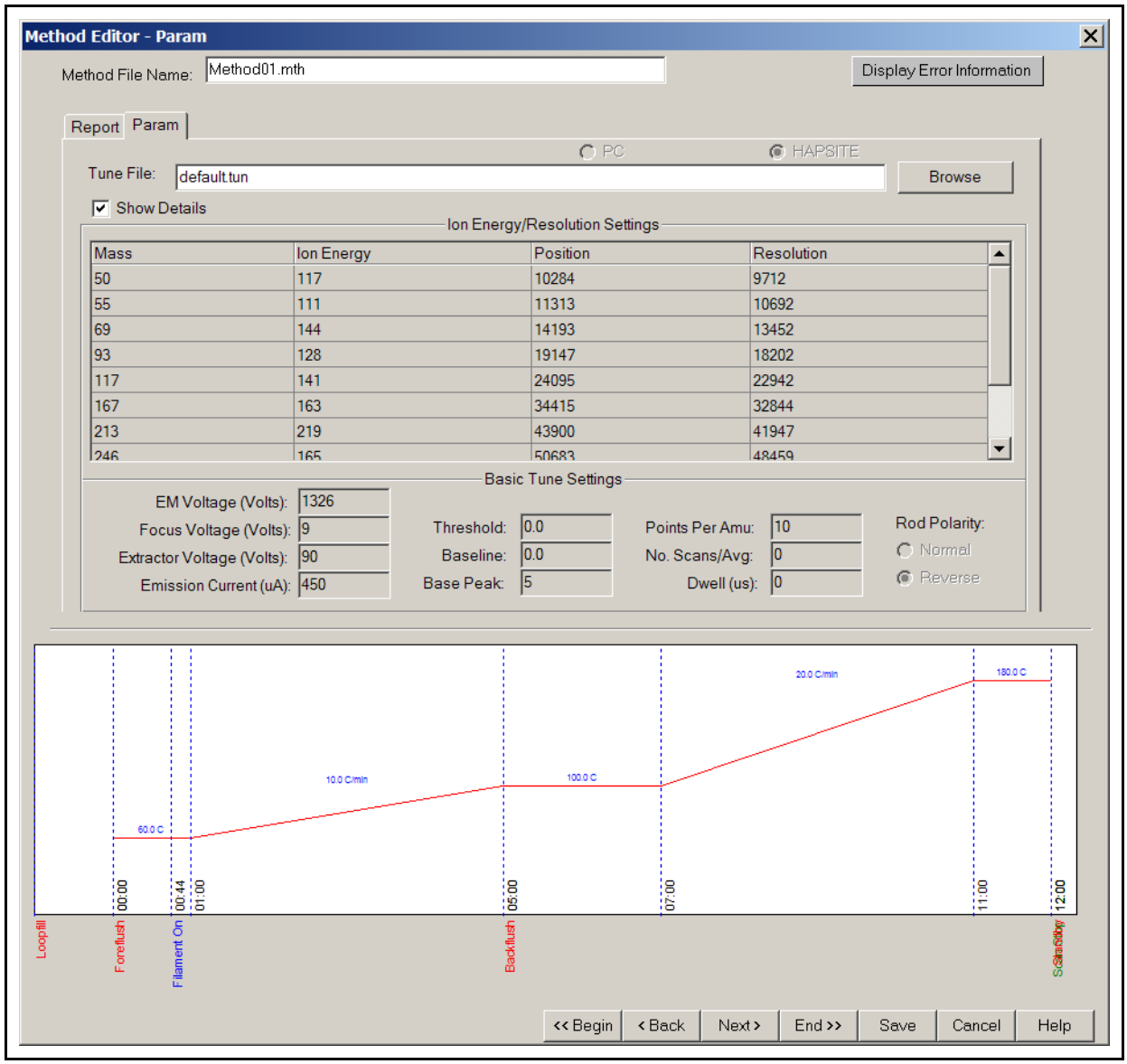
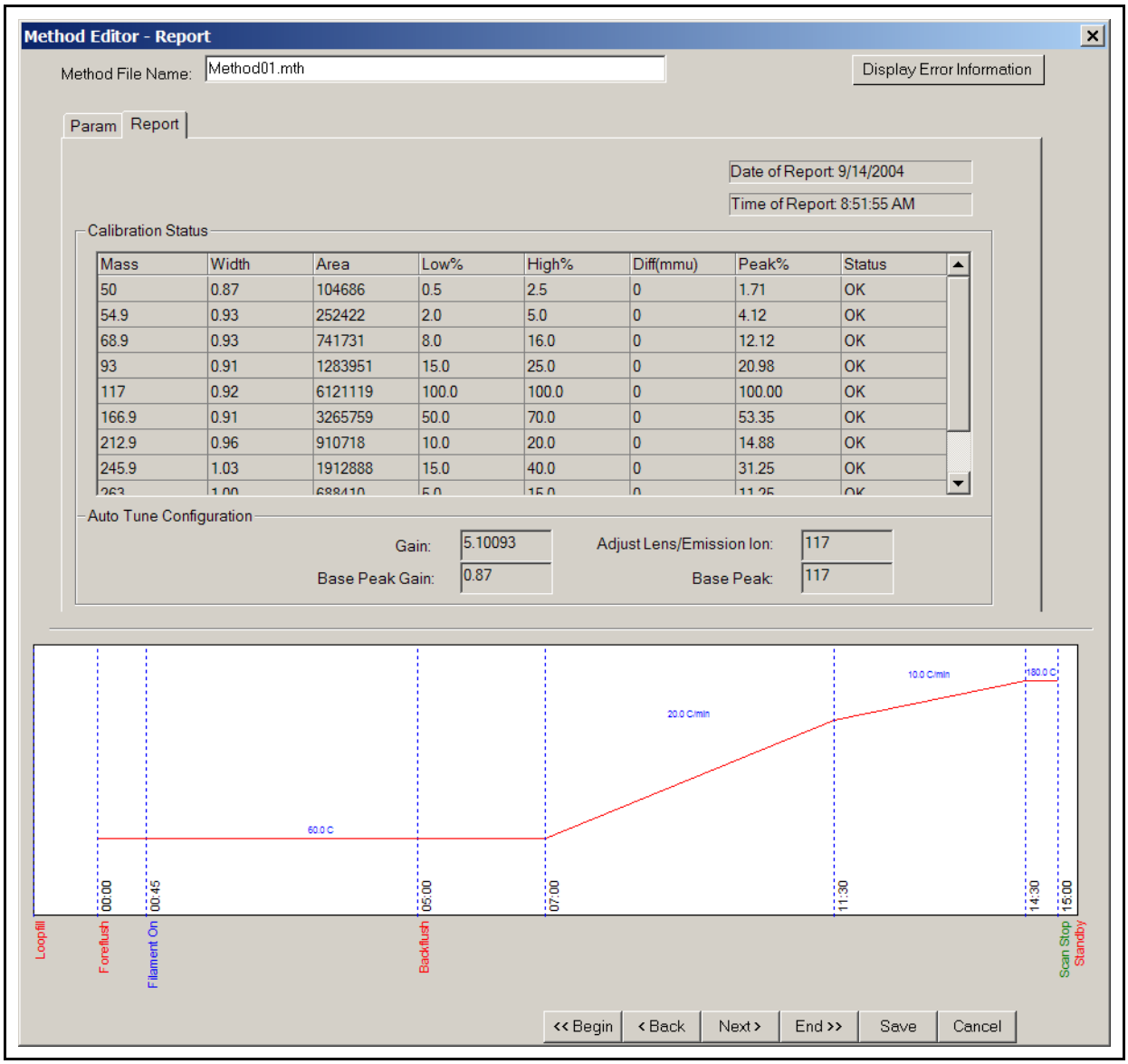


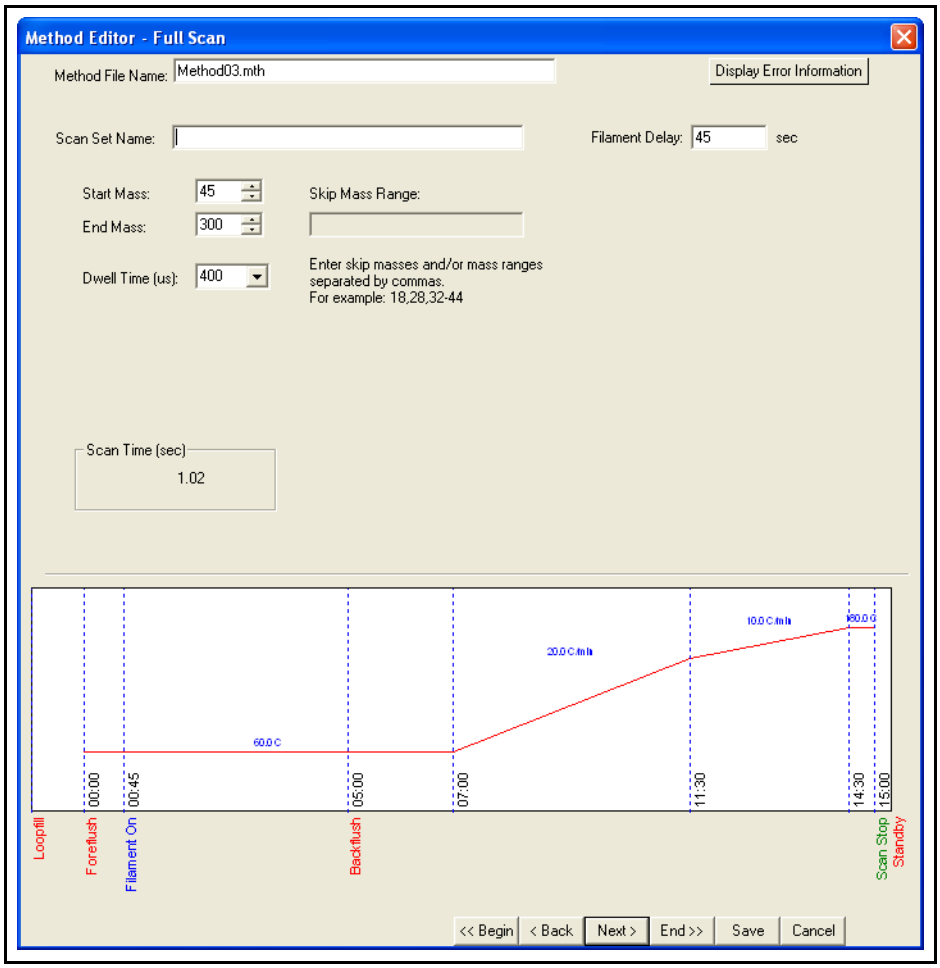
Figure 11-21 Method Editor Tune Report Page



11.6 Full Scan Page

The **Full Scan** page contains the mass range and other parameters of the Mass Spectrometer operation (see Figure 11-22). The full parameter set can be assigned a **Scan Set Name** for easy identification, if desired. The **Filament Delay**, from the **Inlet Page** (see section 11.4.4, Scan Events, on page 11-18), is also shown on the **Full Scan** page. Changing the **Filament Delay** on this page may require a review of, and changes to, the **Inlet Page**.

Figure 11-22 Method Editor Full Scan Page



The following Mass Spectrometer parameters can be programmed:

Start Mass . . . . . The mass at which the Mass Spectrometer will start to scan. The starting mass can be set from 1-300 AMU.

NOTE: Start as high as possible to decrease the scan time and collect as many scans as possible.

NOTE: If possible, avoid starting below 45 AMU. There is a significant response to components of air at mass 44 and below. This would add to the instrument background and make it more difficult to detect low concentrations of other compounds in the TIC.

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End Mass. . . . . The mass at which the Mass Spectrometer will end a scan. The end mass can be set from 1-300 AMU.

NOTE: End the scan at least 2 AMU above any mass used for compound identification. End as low as possible to decrease the scan time to collect as many scans as possible.

Skip Mass Range . . . . . *This function is not yet implemented in the software.* This entry box accepts entry of individual masses or mass ranges to be skipped by the Mass Spectrometer during scanning. Masses can be entered in the form of single masses, e.g. 18,28,36 or in the form of a range, e.g. 18-36 or a mixture of single masses and ranges. The masses entered do need to be within the **Start Mass** and **End Mass** to be included in the Method. Entry of a mass outside of the Start/End Mass range will cause an error that must be fixed before the Method can be saved and run.

Dwell Time. . . . . The Dwell Time is the length of time the Mass Spectrometer will sample data at each sampling point. The longer the Dwell Time, the better the signal to noise ratio of the Analyte.

11.7 SIM Page

Figure 11-23 shows the **SIM** page, which is presented with different content depending on the mode of analysis — GC/MS or Survey (Figure 11-24). **Selected Ion Monitoring** (**SIM**) uses a set or sets of specific masses to scan with the highest sensitivity for known compounds.

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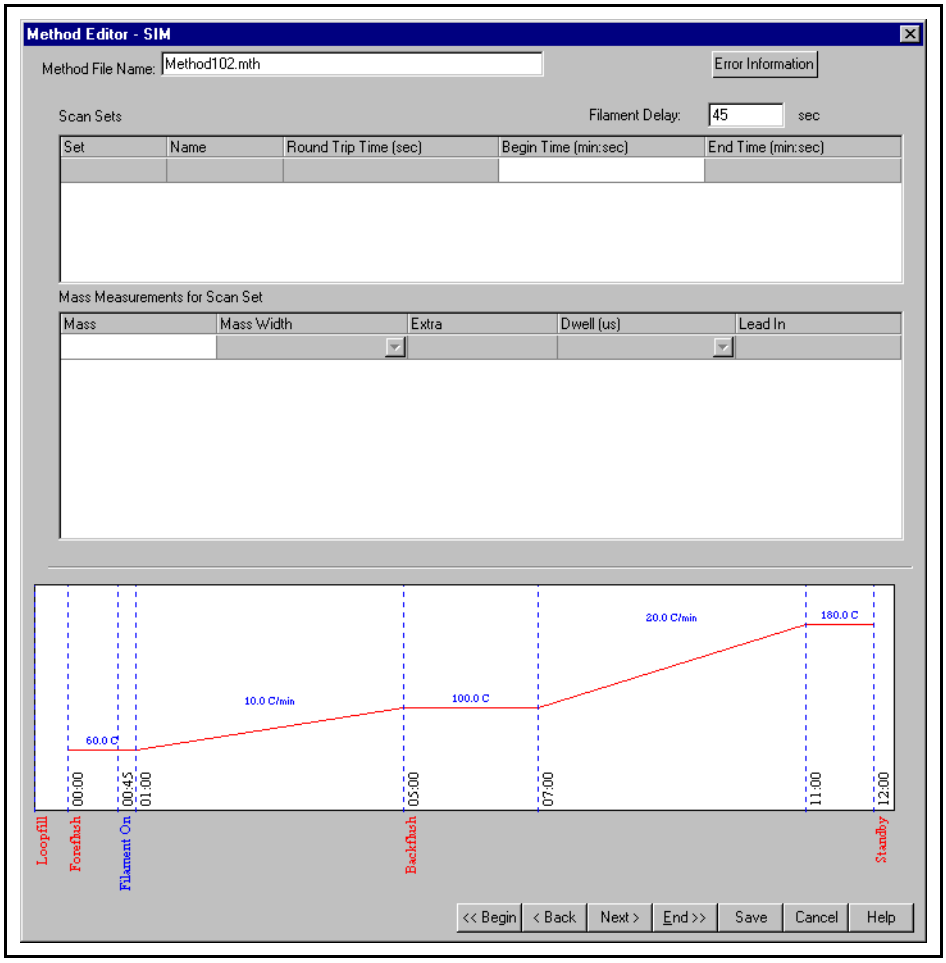
11.7.1 SIM for GC/MS

Figure 11-23 Method Editor SIM Page for GC/MS Analysis



SIM for the GC/MS mode allows for creation of multiple sets of masses. Each set has a **Begin Time** and an **End Time** which must be entered when programming the **Set**. After the **Begin** and **End Times** are entered, as well as an optional **Name**, the **Mass** list for the **Set** can be entered. Default settings for each **Mass** are automatically entered based on the previous **Mass**. As the **Mass** list is entered, the **Round Trip Time** is automatically calculated and entered in the **Scan Sets** grid.

The Scan Sets fields are as follows, in the order recommended for editing:

Begin Time . . . . . In minutes: seconds, the time at which collection of the listed masses should start.

End Time . . . . . In minutes: seconds, the time at which collection of the listed masses should stop.

Name . . . . . Each Scan set can be assigned a name for identification purposes. This entry is optional.

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NOTE: One of the column entries listed above must be highlighted to enable editing of the **Mass** list for that specific **Scan Set**.

Mass . . . . . The masses for each set are entered here in a list. The title above the Mass column - "*Mass Measurements for Scan Set x*" - indicates which Scan Set is being edited.

Mass Width . . . . . This defines the number of points, the mass spectrometer will scan, around the selected mass in tenths of an AMU. For example, a **Mass Width** of 0.6 will scan 0.3 on each side of the peak centroid.

Extra . . . . . This sets the number of extra scans, from 0 - 10, for each mass. Extra scans lower the detection limits by increasing the intensity within the Mass Spectrometer. Extra scans should be used when scanning for ppb level compounds. Do not set this for Internal Standards because this will lower the intensity from the other masses, causing loss of possible target masses.

Dwell . . . . . This is the amount of time the mass spectrometer will sample data at each sampling point. The dwell can be set from 128 µs - 4000 µs. 400 µs is recommended. Increasing the **Dwell** decreases the detection limit.

Lead In . . . . . This determines the number of points the mass spectrometer will skip prior to scanning the desired mass peak. Best practice is to set the **Lead In** to at least a 1000 µs delay prior to collecting data. The delay is based on **Lead In** multiplied by the **Dwell**.

NOTE: The **Mass Width**, **Extra**, **Dwell** and **Lead In** values for each newly entered Mass are inherited from the value in the row above the new entry.

NOTE: To automatically fill any column, click in the desired cell and press Ctrl+D. This automatically fills "down", with that cell's value, to the end of the column.

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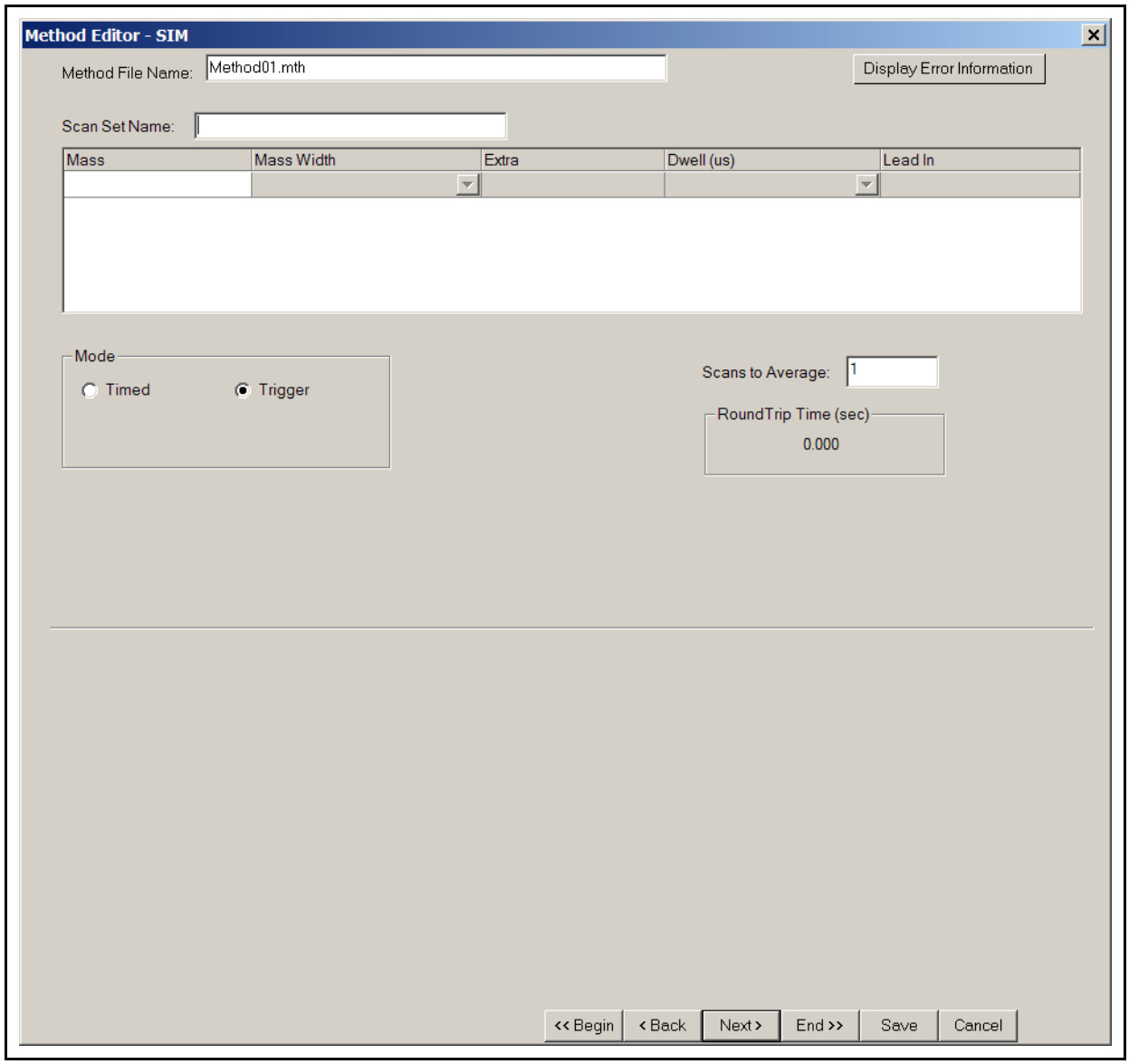
11.7.2 SIM for Survey

Figure 11-24 SIM Page, Differences for Survey Analysis



The SIM page for Survey mode provides the ability to create only one Scan Set of multiple masses. Refer to Figure 11-24.

Scan set name . . . . . A name should be created here to reference the specific set of ions being detected.

Timed Mode . . . . . When selected, allows the time of the survey method to be set to a determined length. This method will run for a programmed amount of time.

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Trigger Mode . . . . . When selected, programs this method to start stop based on the **Run** button. When the **RUN** button is pressed the sample pump will turn on, signaling the beginning of the run. Pressing **RUN** again will turn off the sample pump and end the sample run.

Scans to average . . . . . This determines how many scans will be collected and averaged before the results are updated on the chromatogram.

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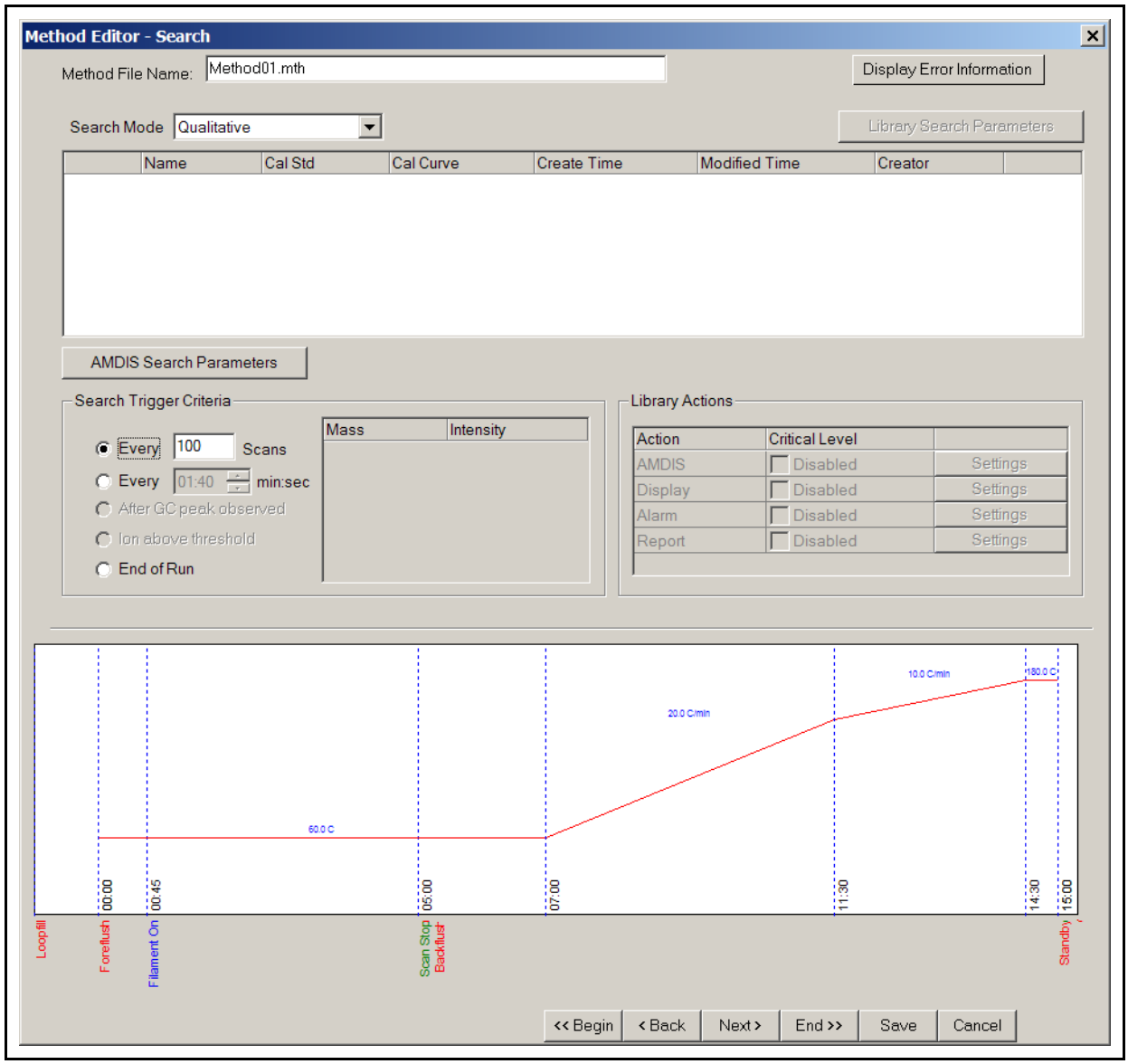
11.8 Search Page

The **Search Page** provides all the criteria needed to qualify and quantify data. Calibrated libraries will need to be created in order to quantify results. The setting of parameters on this page mostly govern the actions that take place during front panel operation of the HAPSITE. See Figure 11-25.

HINT: SIM Method only allows **No Search** as the search option.

Figure 11-25 Method Editor Search Page



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There are four choices in the **Search Mode** drop down menu.

No Search . . . . . If this option is highlighted no library search will be conducted and no report will be displayed on the front panel at the end of a run.

Qualitative . . . . . This will allow the AMDIS library to be searched during the run, providing real-time identifications. A report will be generated at the end of the run, to be viewed on the front panel display.

Quantitative . . . . . This will allow for a quantitative report to be generated at the end of a run, referencing the library designated by the Library Search Parameters.

Qualitative / Quantitative . . . . . This option allows for both the AMDIS library to be searched during analysis and for the quantitation library to be searched giving results at the end of a run.

11.8.1 Setting Up a Qualitative Search

To set up a qualitative search, the drop down menu for the Search Mode must be set to **Qualitative**. This tells the method that chemical identifications are required. Once this is selected, the method must be told where to look for the identifications. This is done using the **AMDIS Search Parameters** button. See Figure 11-26.

Figure 11-26 AMDIS Search Settings

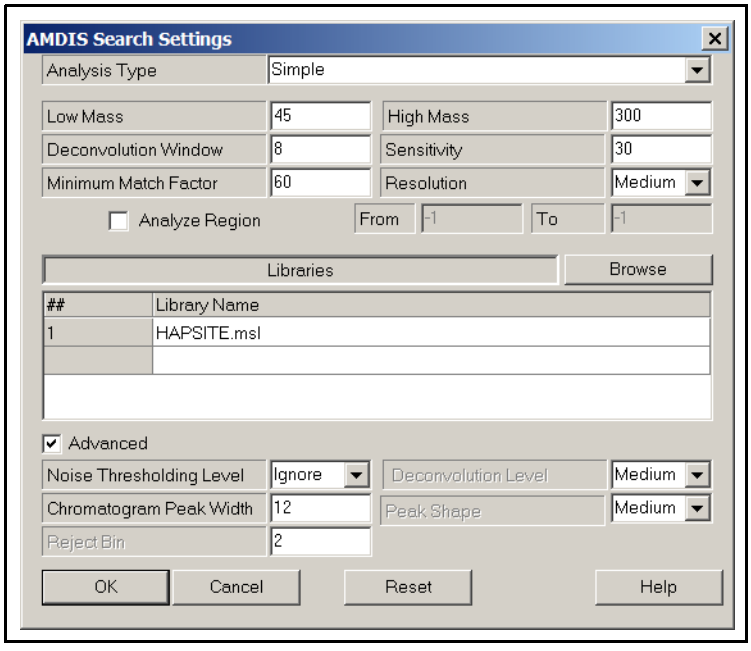
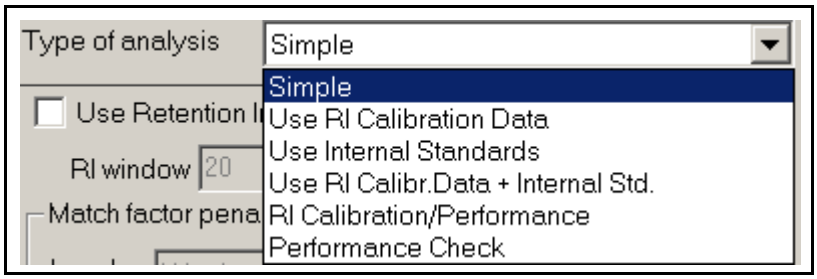


Figure 11-27 lists the different analysis types available for the search.

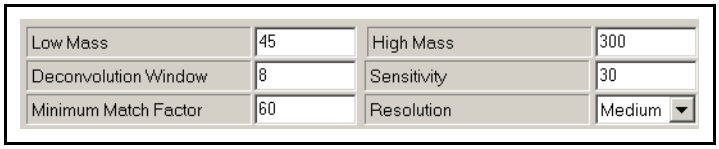
Figure 11-27 Type of Analysis



Analysis Type

- **Simple** - Uses only the mass spectral data for the individual target compounds in the library to identify the compounds. The calculated match factor depends only on the quality of the match between the deconvoluted component spectra and the target library spectra.
- **RI Calibration Data** - This type of analysis uses an external calibration file. This analysis assumes that on a periodic basis, an experiment is run to generate a correlation between retention time and retention index for a set of retention index standards. In addition to mass spectral data, if the identified compound is not within a specified retention window, the program will penalize the match factor by a specified amount.
- **RI Calibr. Data + Internal Std.** - In this mode the retention indices are calculated from the external calibration file as in Use RI Calibration Data type of analysis. The internal standards are used only to insure that the instrument functioning correctly or that the sample preparation has been performed correctly. The internal standards are not used to calculate retention indices.
- **RI Calibration/Performance** - Unlike all of the previous analysis modes, this is presumed to be run on a clean mixture of known composition. This analysis establishes the correlation between the retention time of a component and the retention index using the set of standards specified in the calibration library. Usually, the C-series or the normal hydrocarbons are used as retention index standards, but there is no requirement that this be the case. Retention standards that are not uniform can even be used.
- **Performance Check** - This analysis type only checks the performance for compounds identified as performance compounds in the CSL library. The analysis does not perform a calibration. The results of the performance check appear in QA/QC Performance window from the Info button. See Figure 11-28.

Figure 11-28 QA/QC Performance Window



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Low Mass . . . . . The lowest mass in the range of masses being considered. For most cases involving the HAPSITE this value is 45.

Deconvolution Window . . . . . The number of adjacent peaks subtracted from the deconvoluted peak.

Minimum Match Factor . . . . . The threshold net match factor value for an identification to be reported. Values at or above 80 are good matches, 70-79 are fair and less than 70 is poor. For most cases a match factor of 80 is the minimum that should be used if identification rather than detection is desired.

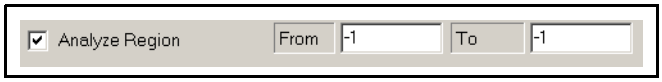
High Mass . . . . . The highest mass in the range being considered. The maximum value for the HAPSITE is 300.

Sensitivity . . . . . 1-30, used in model peak perception ranges: 30, 15, 10, 3, 1 As the value for this parameter increases, increasingly noisy and broad peaks are sought at the expense of analysis time and increased risk of false positives. An increase in the sensitivity will extract broader peaks, resulting in an increase in the extraction of smaller and noisier peaks.

Resolution . . . . . High/Medium/Low, Default Medium: As the level of resolution goes up, the program separates peaks that are closer together.

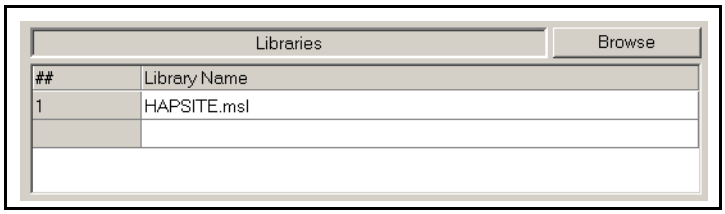
If **Analyze Region** is selected, see Figure 11-29, the AMDIS is directed to only search in the scan range selected. This is for specialized use, and does not need to be utilized for normal usage. The default of **Analyze Region** off (i.e., unchecked) will search the entire range specified by **Low Mass** and **High Mass**.

Figure 11-29 Analyze Region



When setting up the AMDIS library for qualitative analysis the HAPSITE.msl is the default library for the system. See Figure 11-30.

Figure 11-30 The Libraries



To view other library choices, select the Browse button, refer to Figure 11-30. There are several small and specific libraries in addition to the HAPSITE.MSL See Figure 11-31. Many of the compounds found in these small libraries, that can be detected by the HAPSITE, are incorporated in the HAPSITE.MSL file.

NOTE: INFICON recommends using HAPSITE.MSL.

- HAPSITE.MSL
- NISTEPA.MSL
- NISTCW.MSL
- NISTFDA.MSL
- NISTFF.MSL
- NISTDRUG.MSL

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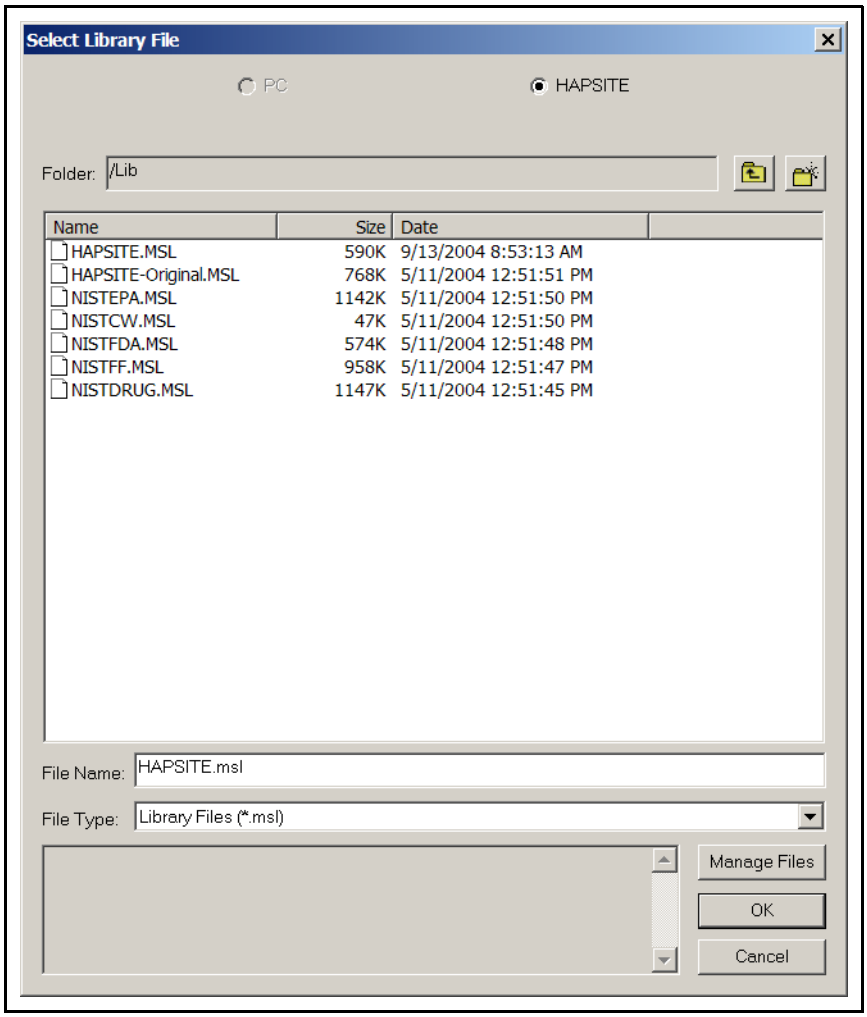
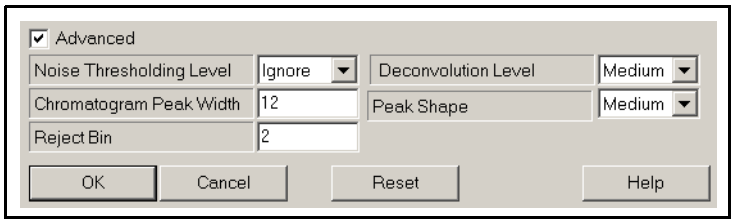
Figure 11-31 Library Options



Advanced Settings

Figure 11-32 Advanced Settings



NOTE: INFICON recommends leaving the Advance Settings at their default settings.

Noise Thresholding Level . . . . . Refers to the minimum signal recorded. Will filter out noise along the baseline.

Chromatogram Peak Width . . . . . Forces deconvoluted peaks to have the same shape by specifying width in AMUs.

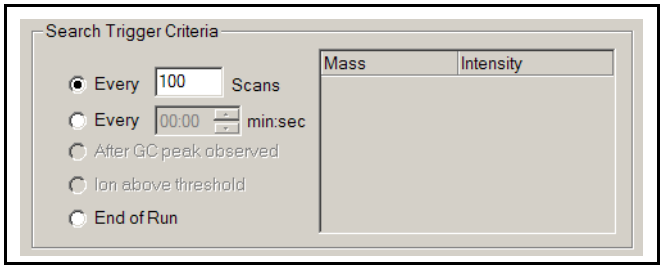
Reject Bin . . . . . Rejects peaks with less than set number of scans.

Deconvolution Level . . . . . High/Medium/Low, Default Medium: As the level of resolution goes up, the program separates peaks that are closer together.

Peak Shape . . . . . The shape requirement is a way of forcing all of the deconvoluted peaks to have the same shape. As the shape requirement increases, the shape of the individual ions must be more nearly the same.

In the **Search Trigger Criteria** section of the **Search** page, the decision of how often and when to run an AMDIS search is determined. There are three choices, see Figure 11-33.

Figure 11-33 Search Trigger Criteria



Every ____ Scans . . . . . The value typed into the box determines the interval at which AMDIS will run a search. The default value for this is 100 scans.

Every ____ min:sec . . . . . The value typed into the box determines the time interval in which AMDIS will run a search.

End of Run . . . . . If this is selected, an AMDIS search will only be conducted at the end of a run.

11.8.2 Setting Up a Quantitative Search

When setting up a quantitative method, a quantitative library needs to be created using the Calibration function of the software. See Chapter 12, Target Compound Methods.

Writing a quantitative method still begins with Method Editor, but certain buttons will not be available until the library is created. All the settings described in section 11.8.1, Setting Up a Qualitative Search, on page 11-31 still apply to the creation of a quantitative method. In addition two more options become active, The Library Search Parameters button and the Library Actions window, see Figure 11-34.

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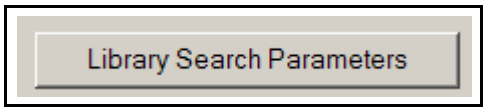
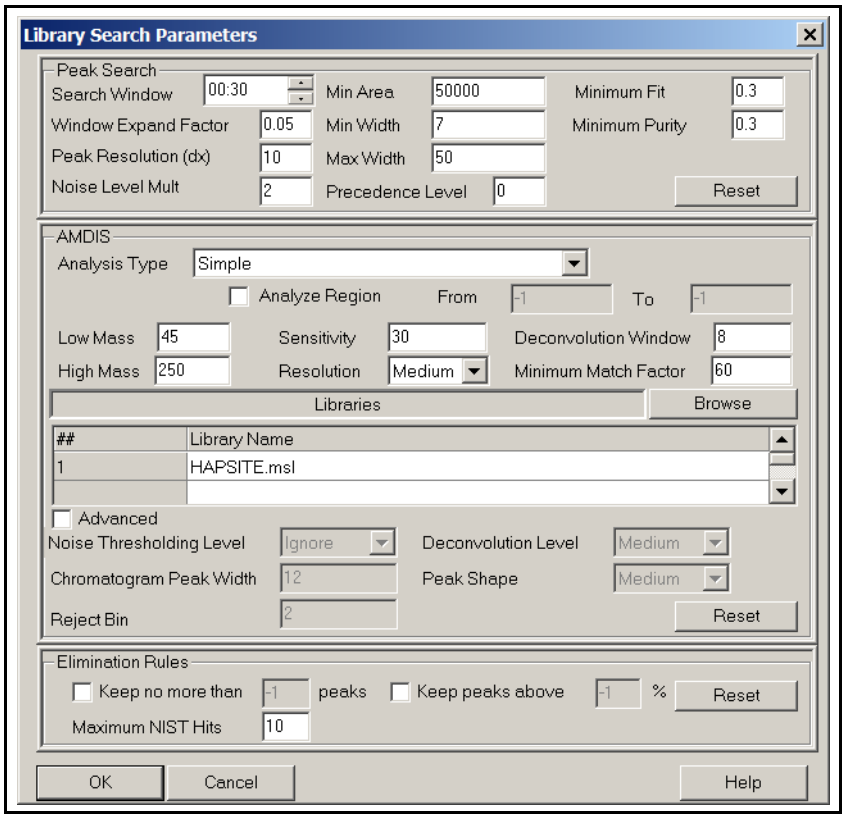
Figure 11-34 Library Search Parameters Button



Clicking the Library Search Parameters button opens the window shown in Figure 11-35. The center section refers to the AMDIS parameters and is exactly the same as described in Figure 11-26.

Figure 11-35 Library Search Parameters Window



The Peak Search section is comprised of all the elements that define a peak in the chromatogram.

Search Window. . . . . This value indicates the time window allowed for a peak to appear. 30 seconds indicates that the acceptable window for a peak is 15 seconds on either side of the expected retention time.

Window Expand Factor . . . . . This value has a default of 0.05. This value is multiplied by the run time and then added to the search window time. The search window is then expanded by the time calculated.

Peak Resolution (dx) . . . . . This number indicates the minimum number of scans between two peaks which is used to determine whether to split a peak into two or consider it as one peak.

Noise Level Mult . . . . . A peak intensity must be greater than this number multiplied, by the baseline noise, in order to be called an analyte.

Min. Area . . . . . This number discriminates against low responses which are usually attributed to noise rather than detection of the analyte. Increase this number to 10,000 or more if false hits are encountered.

Min. Width . . . . . This number specifies the minimum number of scans to comprise a peak. This is another discrimination against low responses or noise.

Max Width . . . . . This number specifies the maximum number of scans to comprise a peak. This allows discrimination against a very broad peak.

Precedence Level . . . . . When compared to the compound-specific precedence level, determines which search parameters to use — the global parameters specified in Figure 11-35 or the compound-specific parameters. As a general rule, leaving this set to 0 allows one to use specific search parameters for individual compounds as discussed in Chapter 12.

Min. Fit . . . . . This compares the expected mass intensities relative to each other to those saved in the library. Reasonable values depend on how selective the calibration, but typically 0.5 to 0.9 is used. This value is a way of lowering false positives, where a higher number is more discriminative.

Min. Purity . . . . . This measures the purity level of the peak detected compared to the mass peak in the library. Reasonable values depend on how selective the calibration, but typically 0.5 to 0.9 is used. This value is a way of lowering false positives, where a higher number is more discriminative.

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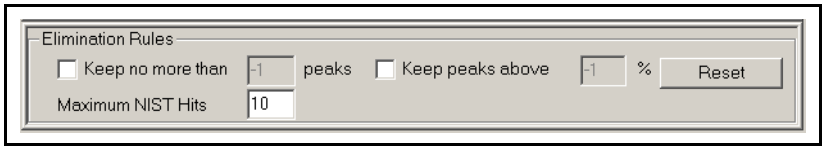
The Reset button allows for default values to be reset in the Peak Search window. See Figure 11-36.

Figure 11-36 Resetting Default Search Parameters

The Elimination Rules section gives parameters for peaks to be reported. There are three options. See Figure 11-37.

Figure 11-37 Elimination Rules Window



Keep no more than . . . . . This check box determines how many peaks are to be shown. This refers to the Mass Spectrum. If 10 is selected, only the top ten peaks will be displayed.

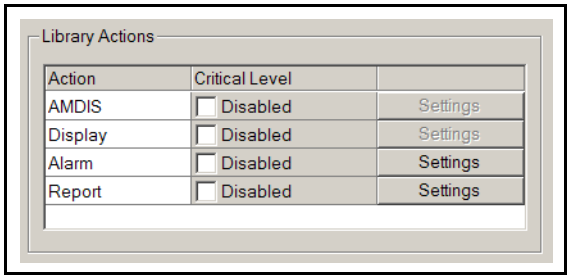
Keep peaks above . . . . . This check box defines the percent intensity of a mass peak to be displayed on the mass spectrum. 15 is generally used as the low end for intensity.

Maximum NIST Hits . . . . . This value is the number of matches reported by NIST.

NOTE: This section also has a Reset button, which will set any changed values back to the default setting.

The Library Action box has four main sections. Each can be enabled using a check box. See Figure 11-38.

Figure 11-38 Library Actions



AMDIS . . . . . When enabled, a concentration can be entered. This will determine the critical level of concentration at which AMDIS will identify the chemical on the front panel display of the HAPSITE.

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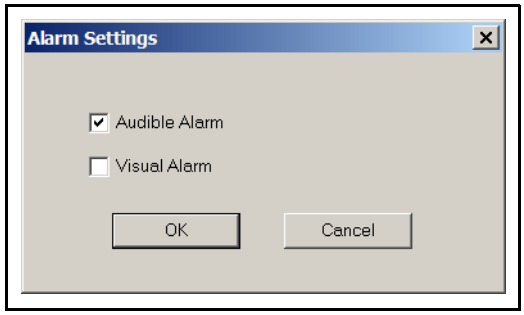
Display . . . . . When enabled, a concentration can be entered which will determine the critical concentration level at which a peak will be displayed.

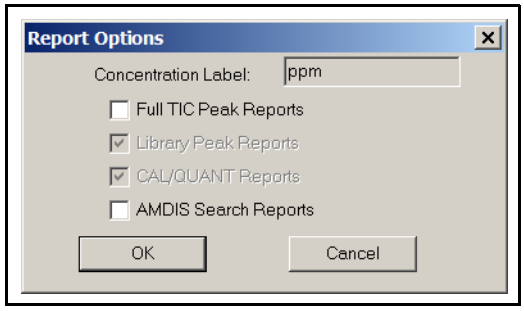
Alarm . . . . . When enabled, a concentration can be entered which will trigger an alarm. The alarm can be set to be either visual or audible by using the Settings button. See Figure 11-39.

Figure 11-39 Setting the Alarm



Report . . . . . When enabled, a concentration can be entered which will create a report when the critical concentration level is reached. See Figure 11-40.

Figure 11-40 Setting the Report



There are two choices for reports, the Full TIC Peak Report and the AMDIS Search Report.

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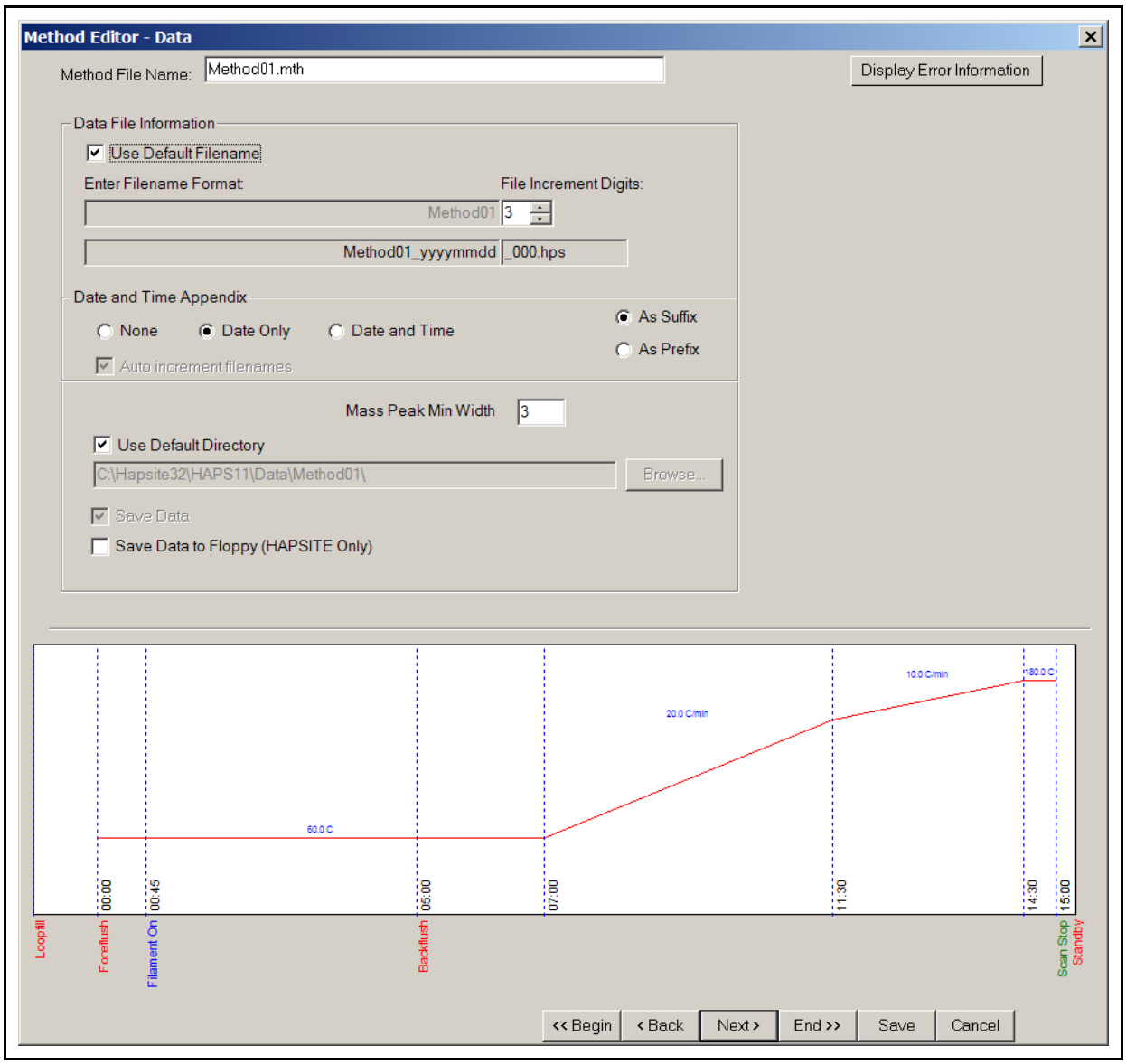
11.9 Data Page

The **Data Page** provides the capability to customize the data filenames, and storage of data files, for the Method. Defaults are provided that assure automatic storage of data in a filename format that increments with each data file stored.

Figure 11-41 Method Editor Data Page



The following parameters can be set on the **Data Page**:

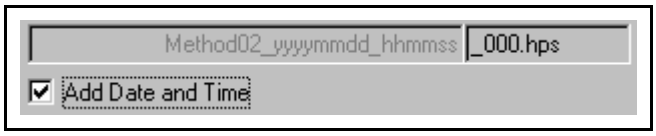
Use default filename . . . . . This check box, which is selected as a default, allows the Method to use a default format for the data filename. The default filename is a combination of the Method filename and an index, which is automatically incremented with each saved data file.

File increment digits . . . . . This parameter sets the number of digits used in the index, starting at 000 and incrementing up to the maximum number provided by the index digits (in this case, 999). By default, the index is three digits, but can be specifically changed here for this method or for the entire system on the **System Properties >> Miscellaneous** page.

Add Date and Time. . . . . This parameter adds the date and time, in the format yyyymmdd_hhmmss to the filename (see Figure 11-42). This can be added as a suffix, which uses an underscore before the "yyyy" information, or as a prefix, which uses an underscore after the "ss" information. The format of the date and time is:

- yyyy is the year the data was collected
- mm is the month the data was collected
- dd is the day the data was collected
- hh is the hour data collection was started
- mm is the minute data collection was started
- ss is the second data collection was started.

Figure 11-42 Example of Date and Time Appended to the Filename



Add as Suffix . . . . . When selected, along with **Add Date and Time**, the date and time are added to the end of the filename, preceded by an underscore.

Use default directory . . . . . This selection sets the Method to store all data, collected with this Method, in the default directory specified in the ***Data File Path***. When this selection is unchecked, any valid path can be entered in the ***Data File Path*** to specify data storage.

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Data File Path . . . . . The entry box for the data file path is used to specify where this method should save the data. This entry box is automatically filled with the default path, derived from the **HAPSITE Properties >> Data Settings** page, if the **Use default directory** box is checked.

Save Data . . . . . This selection is always enabled and can not be changed. Data is saved to the hard drive in the folder (directory) shown immediately above this check box.

Save Data to Floppy . . . . . This parameter, when checked, automatically saves the data file to the floppy disk drive of the HAPSITE. Data is also saved to the hard drive regardless of this selection. Use of this selection is only recommended when quick transfer of data from portable operation is required.

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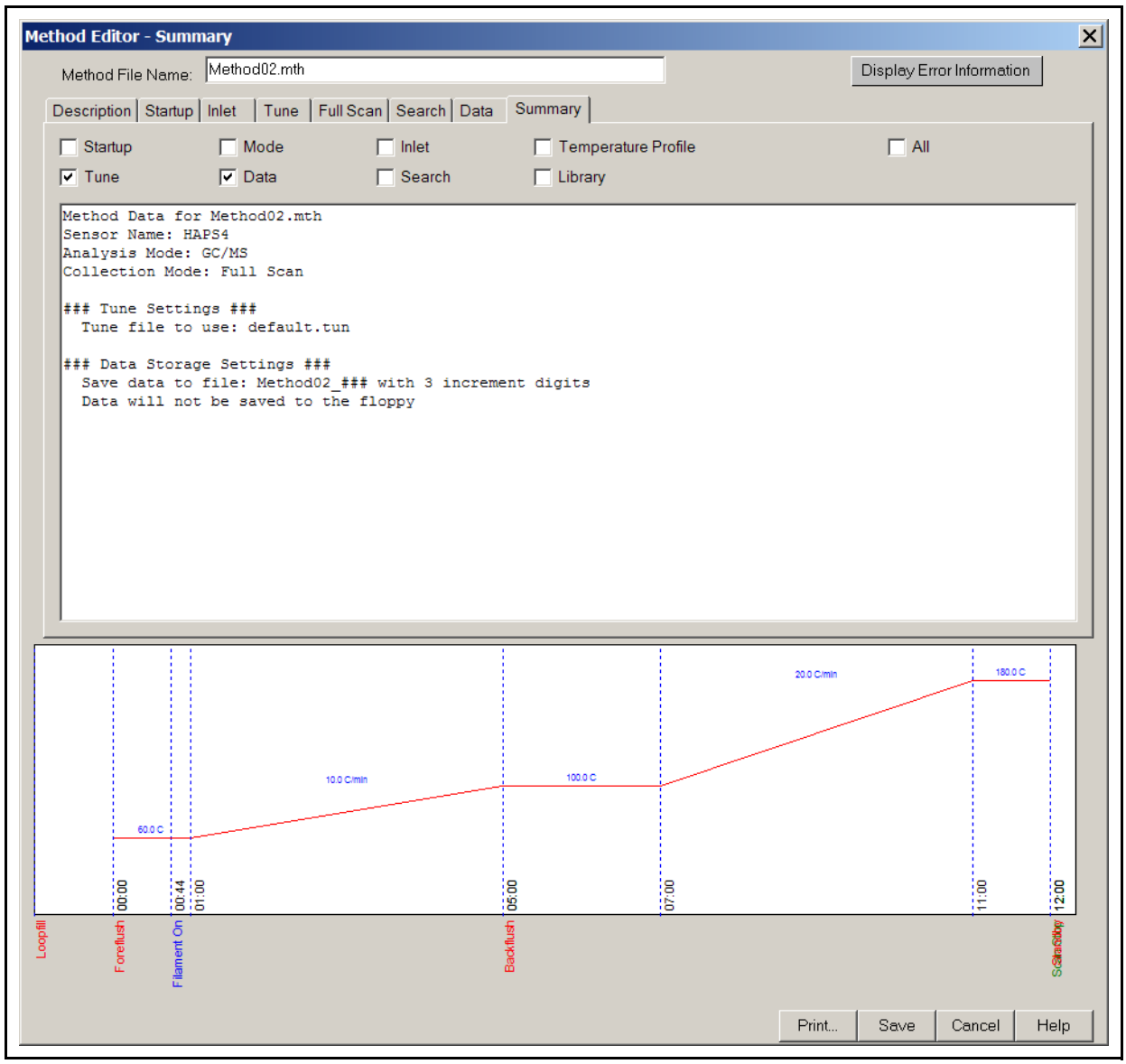
11.10 Summary Page

The **Summary Page**, see Figure 11-43, provides selections to show any component, or all components, of the Method in a text summary. These selections effect both the displayed and printed information. This page allows for a review of the Method settings before saving the Method to a file.

Figure 11-43 Method Editor Summary Page



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11.11 How to Create a Method

CAUTION

Read all of Chapter 11 before creating a method.

HINT: For questions relating to specific settings, refer to the previous sections of this chapter.

Creating a method is a very involved process. Creating a method from scratch is best left to experts, however, custom methods can be written by modifying a default method.

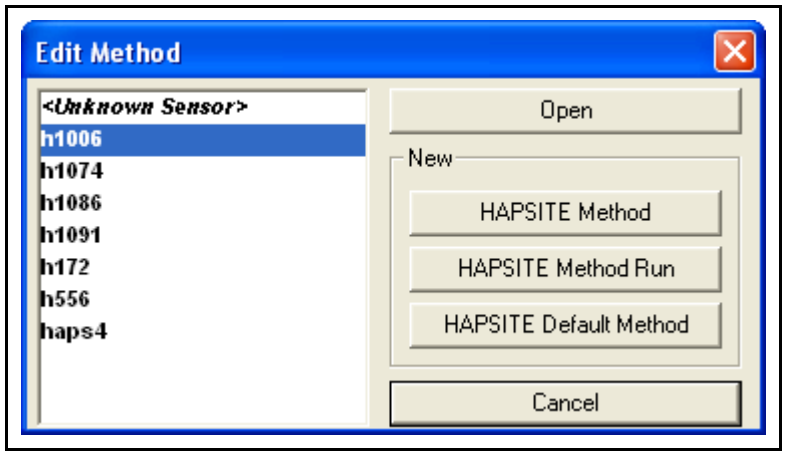
11.11.1 Creating a New Custom Method from an Existing Method

1 On the System Setup View double-click on the **Method Editor** icon. See Figure 11-44.

Figure 11-44 Method Editor Icon

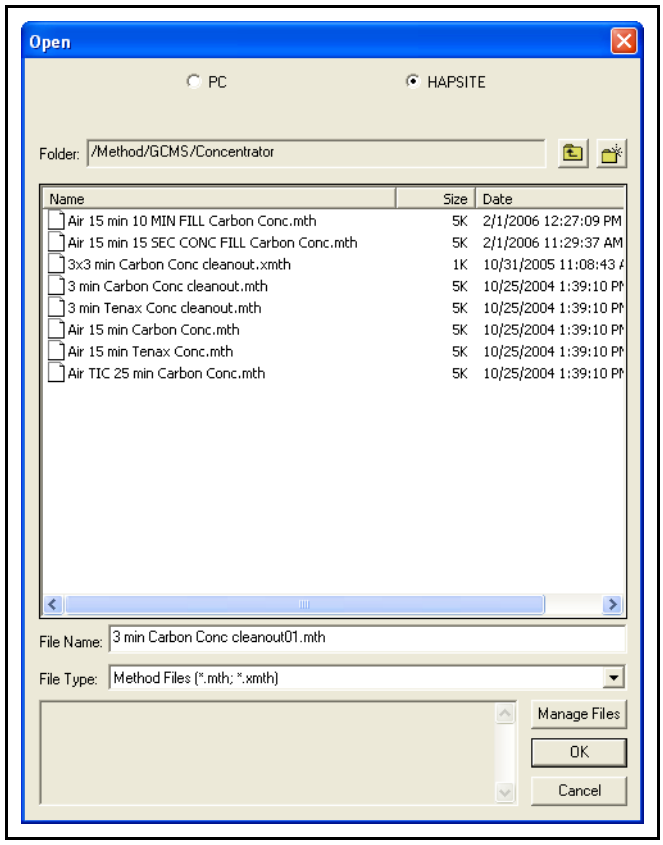
2 Choose the HAPSITE the method will be applied to and click **Open**. See Figure 11-45.

Figure 11-45 Method Editor Open Window



3 Chose the method file to be the template for the new method. Click **OK**. See Figure 11-46.

Figure 11-46 Choose Method



4 Refer to section 11.2, Description Page, on page 11-3 through section 11.9, Data Page, on page 11-41 for details on changing options.

5 To save a newly created method from the Method Editor, press the **Save** button at the bottom of the Method Editor Summary Page (see Figure 11-43). The dialog window shown in Figure 11-47 is displayed. Notice that the default location to save a method file is to the HAPSITE.

NOTE: Method files can be saved to the HAPSITE only if the HAPSITE is attached to the PC. Refer to section 2.3.6, Connect Laptop (if desired), on page 2-9 for additional information on how to connect the laptop and HAPSITE.

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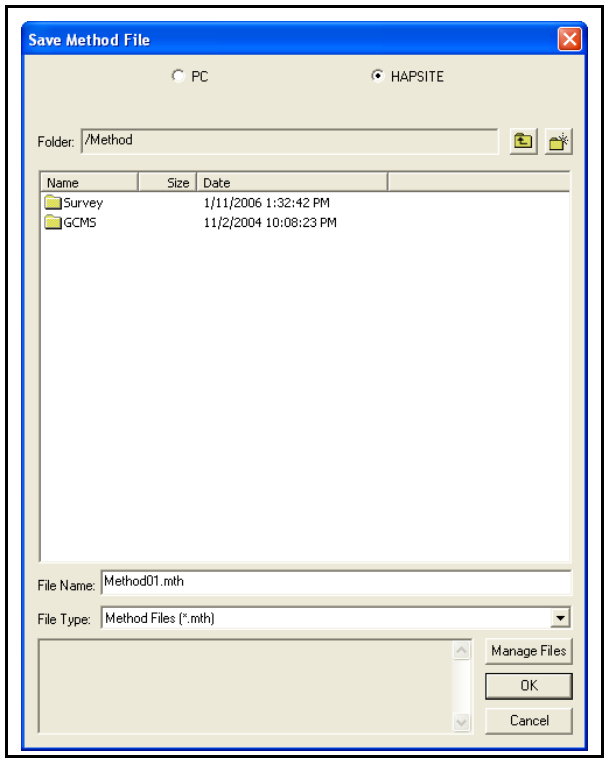
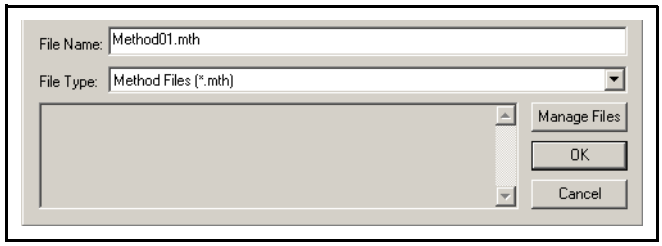
Figure 11-47 Save Method File Dialog Window - HAPSITE Option Selected



6 On the **File Name** line type a **NEW** file name. Refer to Figure 11-48.

Figure 11-48 Entering a New Method File Name



7 The file location may be changed to save in the **GCMS** or **Survey** directory, or a new one may be created using the **Create Folder** button, as shown in Figure 11-49.

Figure 11-49 Create Folder Button

7a If creating a new folder, name the new folder and then open the new folder before saving the Method file.

CAUTION

Saving the new method file with the original name will overwrite (replace) the method that was used as the template.

8 Once the location and name have been chosen, press **OK** to save the file. Refer to Figure 11-48 or Figure 11-47.

11.12 How to Sequence Methods

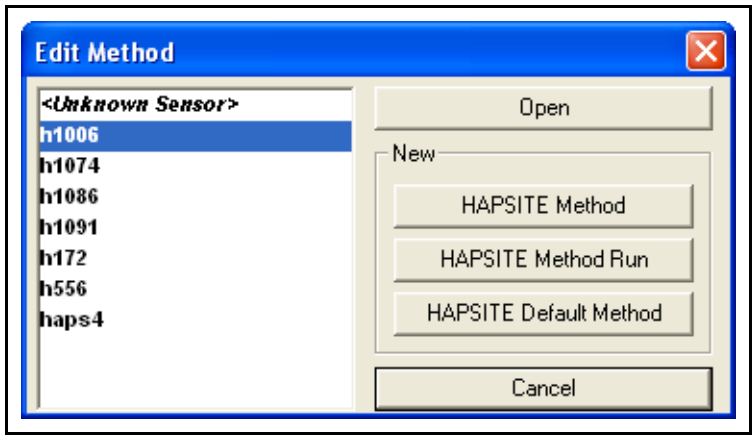
Sequencing methods is very useful when a group of methods needs to be run unattended, repeatedly, or at timed intervals.

1 From the Smart IQ system setup screen, double-click the **Method Editor** Icon. See Figure 11-50.

Figure 11-50 Method Editor Icon

2 Select "**HAPSITE Method Run**". SeeFigure 11-51.

Figure 11-51 Method Editor Open Window



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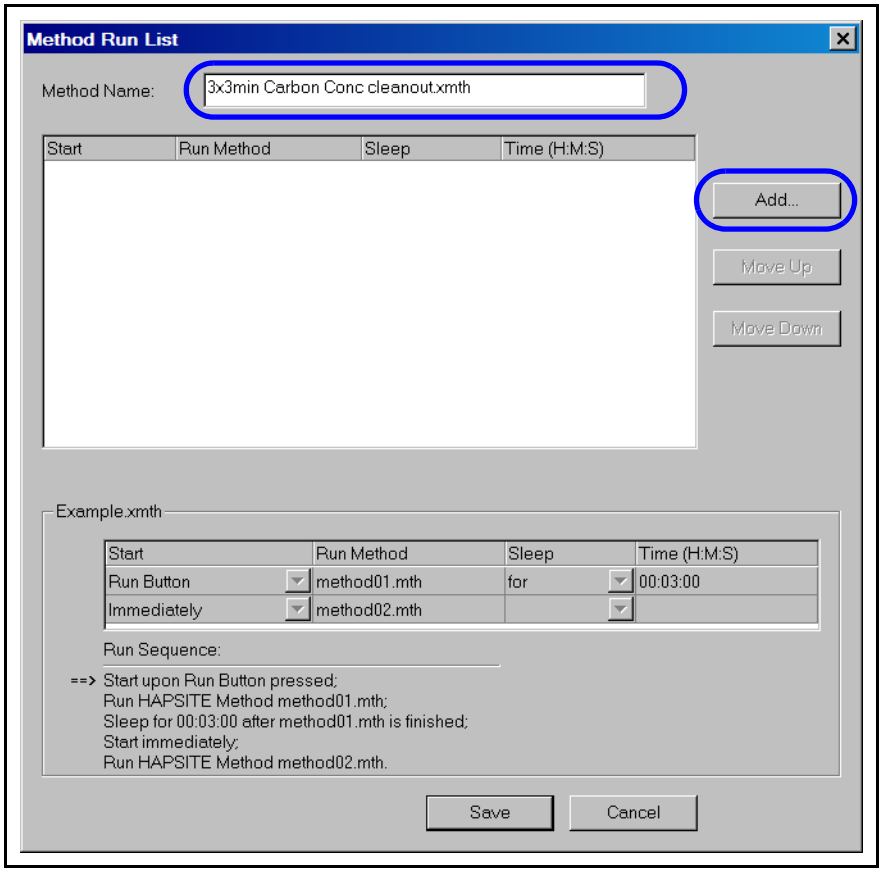
3 Type a new name for the sequenced method. See Figure 11-52.

NOTE: Method runs (i.e., sequence of methods) use the **`.xmth`** file extension.

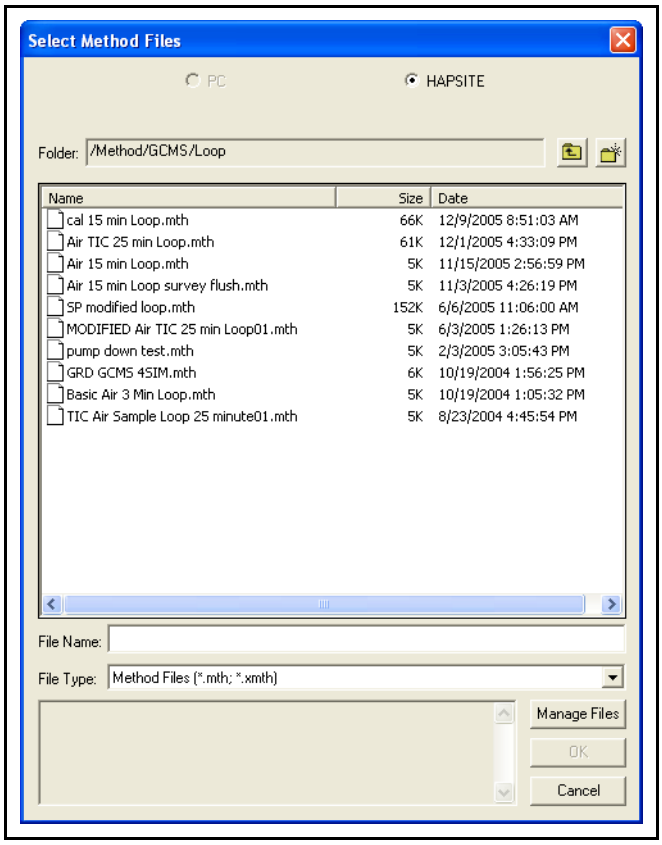
4 Click **Add**. See Figure 11-52.

Figure 11-52 Method Run List



5 Chose a method file to add to the sequence. Click **OK**. See Figure 11-53.

Figure 11-53 Chose Method



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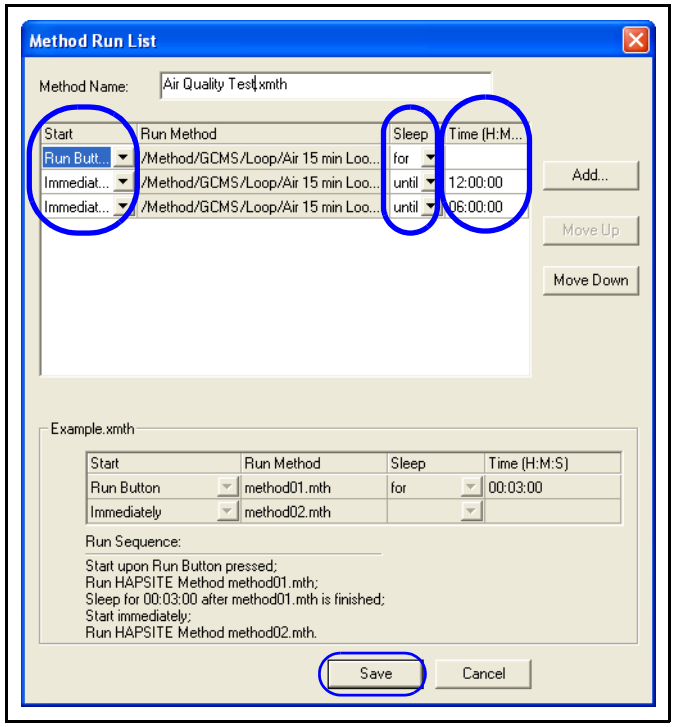
6 **Repeat** Step 5 until all desired methods are listed in the Method Run List. See Figure 11-54.

Figure 11-54 Sequenced Method Options



7 In the Start column chose either **Run Button** or **Immediately** for each method. This selection determines how each method in the run is started. Refer to Figure 11-54.

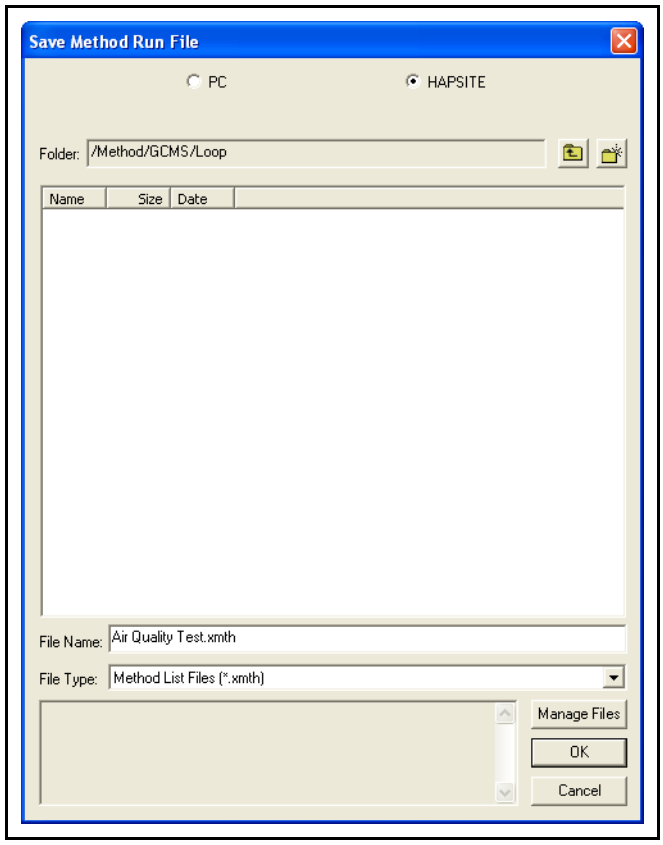
8 In the Sleep column, chose **for** or **until** for each method. Refer to Figure 11-54.

9 In the Time column enter the desired **time** for the next method to start or the length of **time** to sleep before the next method starts. Refer to Figure 11-54.

10 Click **Save**. Refer to Figure 11-54.

11 Save the sequenced method to the desired location. Click **OK**. See Figure 11-55.

Figure 11-55 Saving Sequenced Method



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Chapter 12
Target Compound Methods

12.1 Introduction To Quantitative Analysis

Quantitative analysis is the process of building a method calibration library of target compounds, analyzing samples and converting target compound responses to concentration results. The process of building a quantitative analysis method includes the following steps:

1. Preparation of a standard or standards at multiple concentrations.
2. Collecting representative data files of the compounds at one or more concentration levels.
3. Identifying the compounds and building a target compound library.
4. Calibrating the library.
5. Collecting and processing unknown samples for target compounds.

The Calibrate function of the HAPSITE software is used to set up or define the quantitative method. The **ID Unknowns** function is used to process and review results from a quantitative method. Quantitative results are automatically displayed on the HAPSITE front panel display after data collection.

The process of quantitative analysis by developing a HAPSITE method to collect the standard data. This method must meet the chromatography performance requirements of the application, e.g. retention times, compound separations, sensitivity, etc., and will be used throughout the process of building the library and processing results. Refer to Chapter 11, Method Editor for additional information on building a method.

The library is the key component in the quantitative method. The library contains three types of information; the retention time (time for the compound to elute from the column), mass spectral data used to confirm compound identity, and the response factor that is used to calculate the concentration of the compound.

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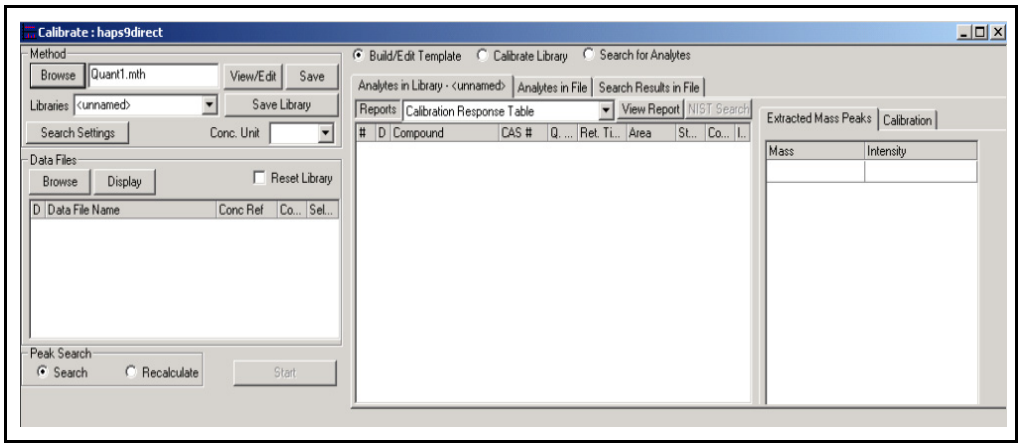
12.2 Definition of Terms in the Calibrate Window

Figure 12-1 Calibrate Window



12.2.1 Method

Browse . . . . . Brings up the Method Selection window.

View/Edit . . . . . Opens the Method Editor with the current method.

Save . . . . . Saves the current Method.

Libraries . . . . . Displays the currently saved libraries.

Save Library . . . . . Brings up the dialog box to save the library.

Search Settings . . . . . Displays the search parameter settings.

Conc. Unit . . . . . Used to input or select the concentration units.

12.2.2 Data Files

Browse . . . . . Used to select the data files for building and calibrating the library; when a data file is selected the data is listed as follows:

D . . . . . Shows the data file reference number.

Data File Name . . . . . Displays the data file name and path.

Conc Ref . . . . . Basis for calculating the concentration. Global (all analytes are at the same concentration) or Analyte (analytes are in file at specific concentrations).

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Conc/Factor . . . . . Data file concentration of analytes if Global is selected, or Concentration Multiplier if Analyte is selected.

Selection . . . . . If checked, file will be processed when **Start** is pressed.

Display . . . . . Displays the chromatogram for the selected data file.

Reset Library . . . . . If checked, will reset the calibration curve, deleting all points currently contained in the library.

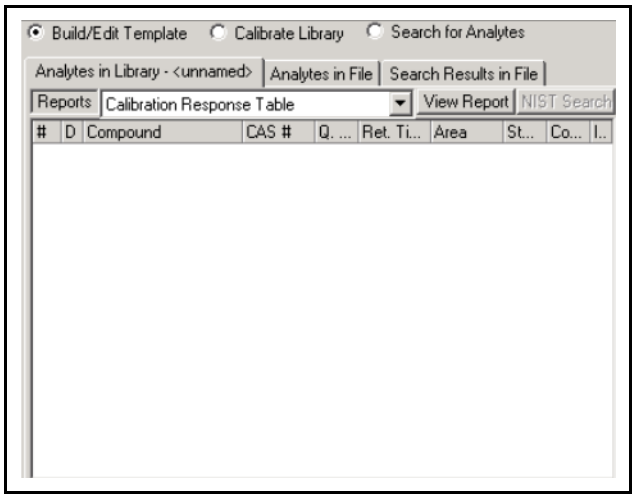
12.2.3 Peak Search

Search . . . . . Performs two functions, depending on whether **Build/Edit Template** or **Calibrate Library** is selected. When Build/Edit is selected, the Search performs a peak detection and integration on the selected files and loads the results into the library template. When Calibrate is selected, search performs the calibration of the library and calculates response factors.

Recalculate . . . . . Recalculates the peak areas and response factors without performing a peak search. This is most useful following manual editing of peak baseline points.

Start . . . . . Initiates the Search or Recalculation. See Figure 12-2.

Figure 12-2 Search for Recalculation



Build/Edit Template . . . . . Selects the mode in which a data file is searched to locate compounds, and loads/edits compounds into the library template.

Calibrate Library. . . . . When selected, data files are processed to calibrate the library

Search for Analytes . . . . . Enables a search to be performed on the selected data file/files without adding the detected analytes automatically to the library. This enables review of data files and the addition of all or selected compounds to the library template.

NOTE: When adding compounds to an existing library or Template, use **Search for Analytes**. If using **Build/Edit Template**, the original template is lost.

12.2.4 Analytes

Analytes in Library. . . . . Displays the analytes in the library

Analytes in File. . . . . Displays the analytes in the currently displayed or selected file

Search Results in File . . . . . If a search has been performed with **Search for Analytes** selected, a review of the analytes detected in the file is enabled. Individual analytes can then be added to the template by right mouse clicking on the compound name and then selecting **Add To Template** or **Add All** to add all compounds detected in the file.

12.2.5 Reports

Calibration Response Table . . . . . Report that displays the response factor and curve statistics based on the selected curve type.

Calibration Report . . . . . Report that displays the area fit and purity for the calibration standards.

View Report. . . . . Displays the selected report.

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NIST Search . . . . . The initial search when building a template/library is performed using the AMDIS library. If peaks are detected and loaded into the template without an identification, the NIST Search can be used to identify these compounds.

. . . . . Shows the analyte number in the library

D . . . . . Data Reference, shows the reference to the data file in which the analyte was found.

Compound . . . . . Shows the compound name found in AMDIS, NIST library or assigned by the user for the analyte.

CAS # . . . . . Shows the Chemical Abstracts Service Number for the analyte from the AMDIS or NIST library.

Q ION . . . . . Shows the Quantitation Ion for the analyte.

Ret. Time . . . . . Show the Retention Time for the analyte.

Area . . . . . Displays the analyte integrated quantion area.

Standard . . . . . Designates the compound as an Analyte or an Internal Standard.

Conc: . . . . . Shows the concentration of the analyte or internal standard in the displayed file. (Note: this field is not used if the concentration flag is set to global.)

IS Ref . . . . . Displays the Internal Standard reference number for analyte quantitation.

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12.2.6 Extracted Mass Peaks

Displays the mass peaks and relative percentages for the selected analyte. See Figure 12-3.

Figure 12-3 Extracted Mass Peaks

Extracted Mass Peaks | Calibration

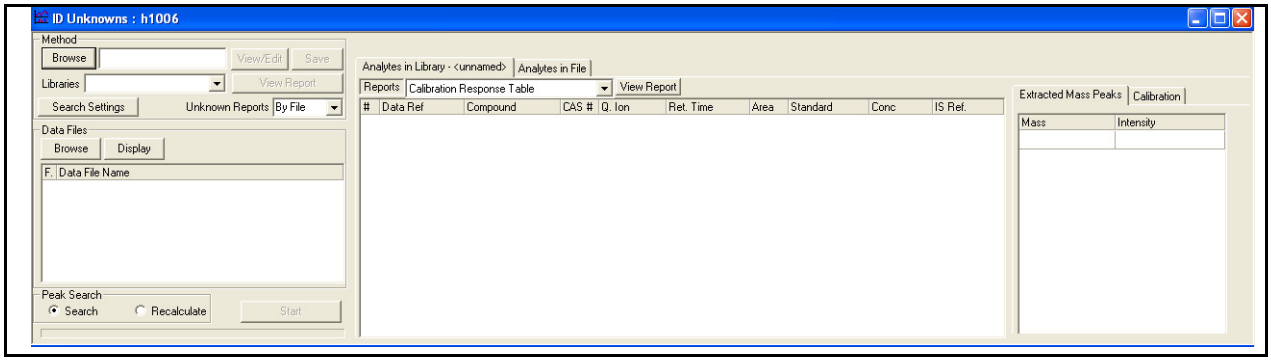
Mass	Intensity
213.0	100
69.0	84
163.0	69
75.0	47
144.0	40
143.0	40
232.0	28
125.0	22
99.0	16
194.0	16

12.2.7 Calibration

Displays the calibration curve and curve statistics for the selected analyte.

12.3 Definition of Terms in the ID Unknowns Control Panel

Figure 12-4 ID Unknowns Control Panel



12.3.1 Method

Browse . . . . . Brings up the Method selection window.

View/Edit . . . . . Opens the Method editor with the current method.

Save . . . . . Save the current Method.

Libraries . . . . . Displays the currently saved libraries.

View Report . . . . . Displays a report of the last processed data files.

Search Settings . . . . . Displays the search parameter settings.

Unknown Reports

By File . . . . . Displays report by file.

By Analyte . . . . . Displays report by analyte.

12.3.2 Data Files

Browse . . . . . Used to select the data file processing. When a data file is selected, the data is listed as follows:

File Entry . . . . . Lists the reference number for the file.

Data File Name . . . . . List the file name and path of the selected files.

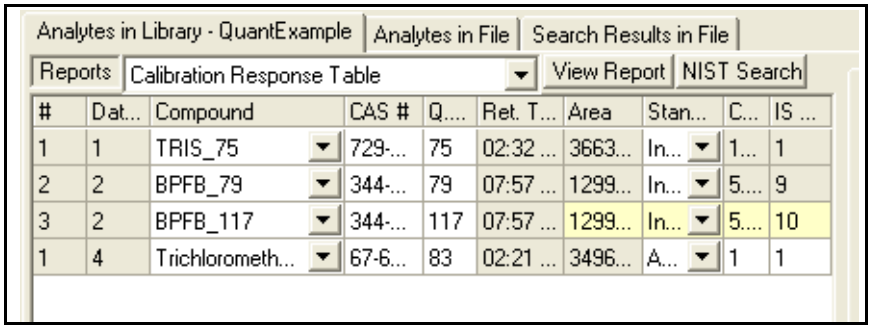
12.3.3 Peak Search

Search . . . . . Performs a peak detection and integration on the selected files, producing the quantitation report.

Recalculate . . . . . Integrates analyte peak areas and recalculates the concentrations without performing a peak search. Typically used following manual editing of peak baseline points.

Start . . . . . Initiates the Search or Recalculation. See Figure 12-5.

Figure 12-5 Analytes Display



12.3.4 Analytes

Analytes in Library . . . . . Displays the analytes in the library.

Analytes in File . . . . . Displays the analytes in the currently displayed or selected file.

12.3.5 Reports

Calibration Response Table . . . . . Report that displays the response factor and curve statistics based on the selected curve type.

Calibration Report . . . . . Report that displays the area fit and purity for the calibration standards.

View Report . . . . . Displays the selected calibration report.

. . . . . Shows the analyte number in the library.

D . . . . . Data Reference, list the reference to the data file that the analyte was found in.

Compound . . . . . Shows the compound name found in AMDIS, NIST library or assigned by the user for the analyte.

CAS # . . . . . Shows the Chemical Abstracts Services Number for the analyte from the AMDIS or NIST library.

Q ION . . . . . Shows the quantitation Ion for the analyte.

Ret. Time . . . . . Shows the Retention time for the analyte.

Area . . . . . Displays the analyte integrated quantion area.

Standard . . . . . Designates the compound as an Analyte or an Internal Standard.

Conc: . . . . . Shows the concentration of the analyte or Internal standard in the displayed file.

NOTE: The field is not used if the concentration flag is set to global.

IS Ref . . . . . Displays the Internal Standard reference number for analyte quantitation.

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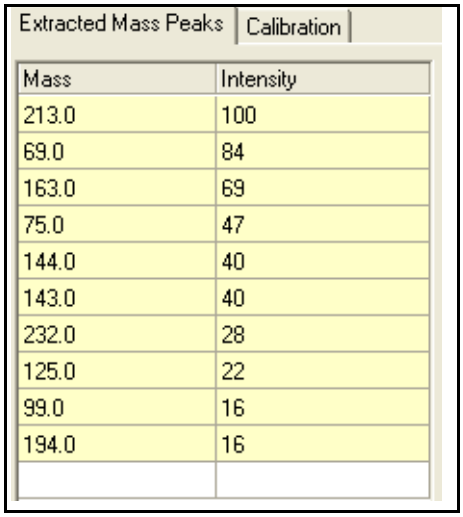
12.3.6 Extracted Mass Peaks

Displays the mass peaks and relative percentages for the selected analyte. See Figure 12-6.

Figure 12-6 Extracted Mass Peaks



12.3.7 Calibration

Displays the calibration curve and curve statistics for the selected analyte.

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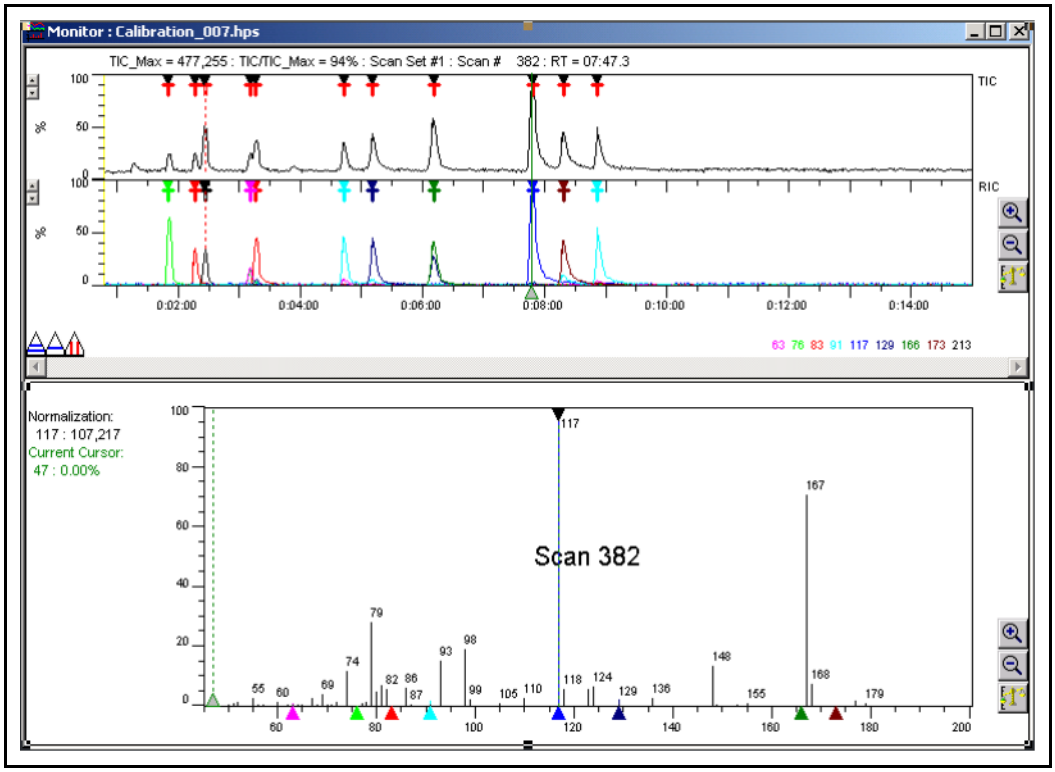
12.4 Display Function

The Display Function displays the selected data file for both Calibration and ID Unknowns. To review identifications, select chromatographic peaks and spectra (compounds), add to a library, and manually reintegrate peaks. See Figure 12-7 on page 12-10

To display a chromatogram from Calibrate or ID Unknowns, select the file by highlighting with the left mouse button and selecting the Display button.

The controls of the Display function are similar to the data review functions for working with RICs (Reconstructed Ion Chromatograms) and Mass Spectra. Data Review is described in Chapter 9, Data Review. Additional features are described below.

Figure 12-7 Calibration Display



See Figure 12-8. With the **Build/Edit Template** option selected in the **Calibrate** screen, the **Display** button will show the peaks detected and selected for the library template when a peak search is performed. Peaks selected for the template are indicated on the plot with a T. The quant mass for each analyte is displayed on the RIC plot with the T symbol corresponding in color to the mass as displayed in the lower right corner of the RIC graph. If a peak has not been detected, the mass spectrum of that peak can be manually selected to add the compound to the library

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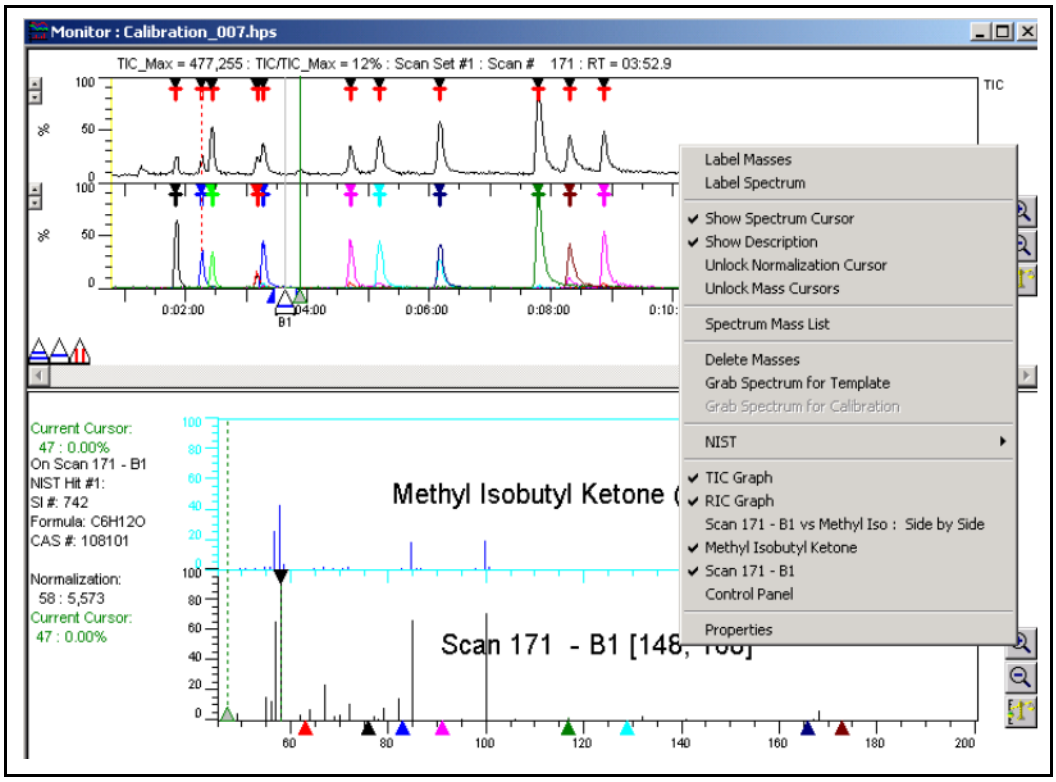
template. After selecting the Spectrum for the compound to be added, place the cursor in the mass spectrum window and click the right mouse button to open up the spectrum pop-up menu. Select the **Grab Spectrum for Template** menu option.

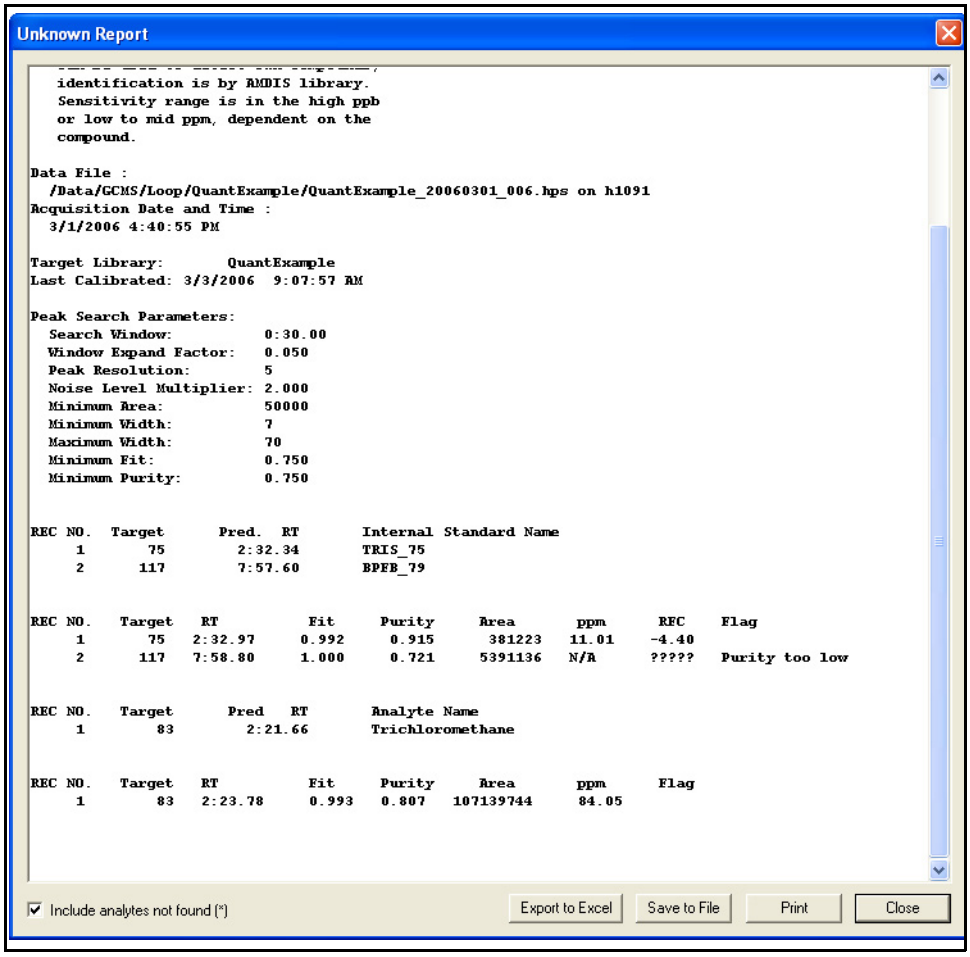
Figure 12-8 Calibration Display



12.5 The Quantitation

When the **ID Unknown** function is used and a known compound is detected, the quantitation result will be displayed in the Quantitative Report. See Figure 12-9.

Figure 12-9 Quantitative Report



12.6 Using the Calibrate Function

1 A standard or series of standards must be prepared from the list of analytes to be quantified. If practical, prepare all standards in a single sample. If not, the template/library can be built from multiple files. If possible prepare standards for multi level calibration by serial dilution. Analytes can be prepared at the same concentration for all compounds or at different concentrations. When using individual concentrations, an initial concentration of each analyte must be entered into the library using the method editor. Additional concentration levels are then processed by using the dilution factor to calculate the concentration at each level.

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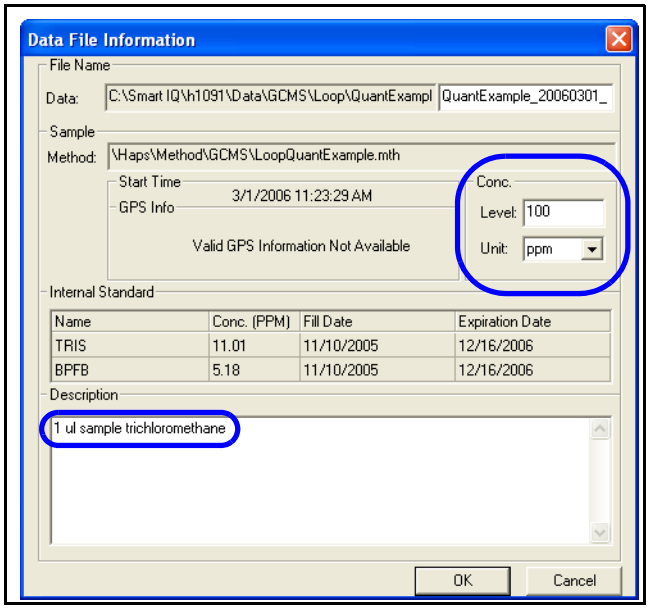
2 After the standard(s) have been prepared, a method must be developed to collect the data. The method can be a default method or a modified method using the Method Editor. All method development and chromatographic changes which can affect the retention time must be made prior to collecting the standard runs that are to be used for building and calibrating the library. Refer to Chapter 11, Method Editor for additional information on method development.

HINT: When running each sample, enter the concentration and a description on the Data File Information page. See Figure 12-10.

Figure 12-10 Data File Information Page



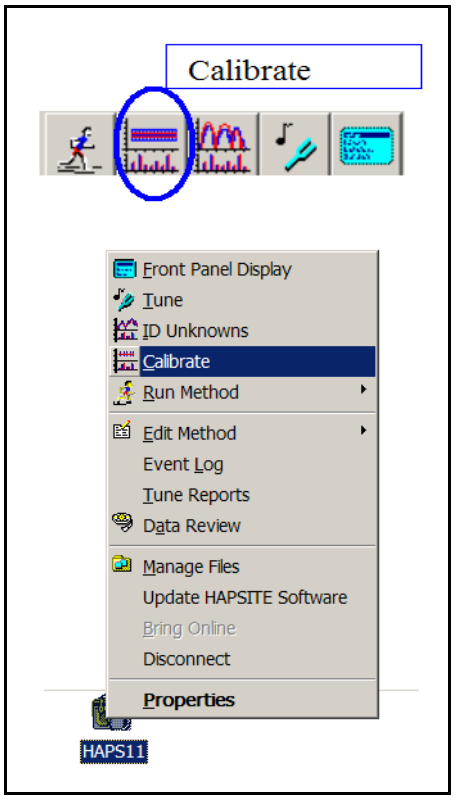
NOTE: In this example, a series of standards at four concentration levels were prepared by serial dilution. The method, QuantExample, was used to collect the data. Start with one method for collection and continue with that method. These are arbitrary concentrations for example only and NOT actual concentrations.

- QuantExample_20060301_005 = 150 PPM
- QuantExample_20060301_004 = 50 PPM
- QuantExample_20060301_002 = 200 PPM
- QuantExample_20060301_001 =100 PPM

3 After the data has been collected, open the **Calibration** function.

3a The **Calibrate** function can be accessed from the drop down menu, by right mouse button click on the **HAPSITE** icon, by the toolbar icon or via the **Status** icon and **Function** tab. See Figure 12-11.

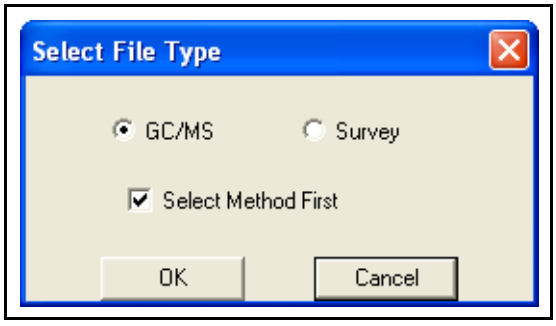
Figure 12-11 Accessing the Calibrate Function



3b Selecting the **Calibrate** function will display a dialog box used to select the type of quantitative method being developed — GC/MS or Survey. See Figure 12-12.

NOTE: Methods can be built for Full Scan data or SIM (Selected Ion Monitoring) data. Best practice is for the **Select Method First** box to be checked, as the library is linked to the method.

Figure 12-12 Selecting the Type of Quantitative Method



3c Click **OK**.

3d The Method File window will be displayed. Select the method which will contain the library. This will open the **Calibration Control Panel**.

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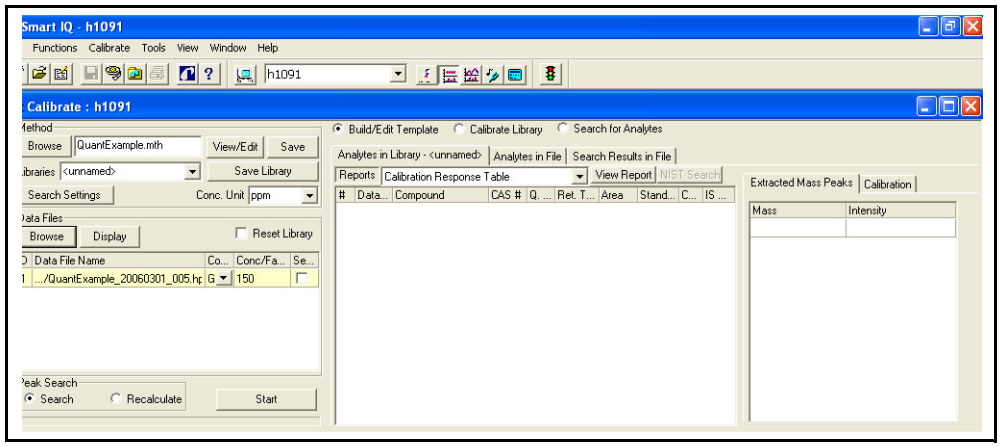
4 Use the **Browse** button under **Data Files** to select the data file to be used to create the library template. This should be a data file (or files) collected when running known samples. See Figure 12-13.

Figure 12-13 Calibration Control Panel with Data File Selected



NOTE: Best practice is to use a high or mid range standard and not the lowest concentration level for calibration library development. Low concentration standards will not provide full spectra.

HINT: Step 5 and Step 6 will be automatically completed if the information was entered in the Data File Information screen when the sample was run.

5 Enter or select the concentration units.

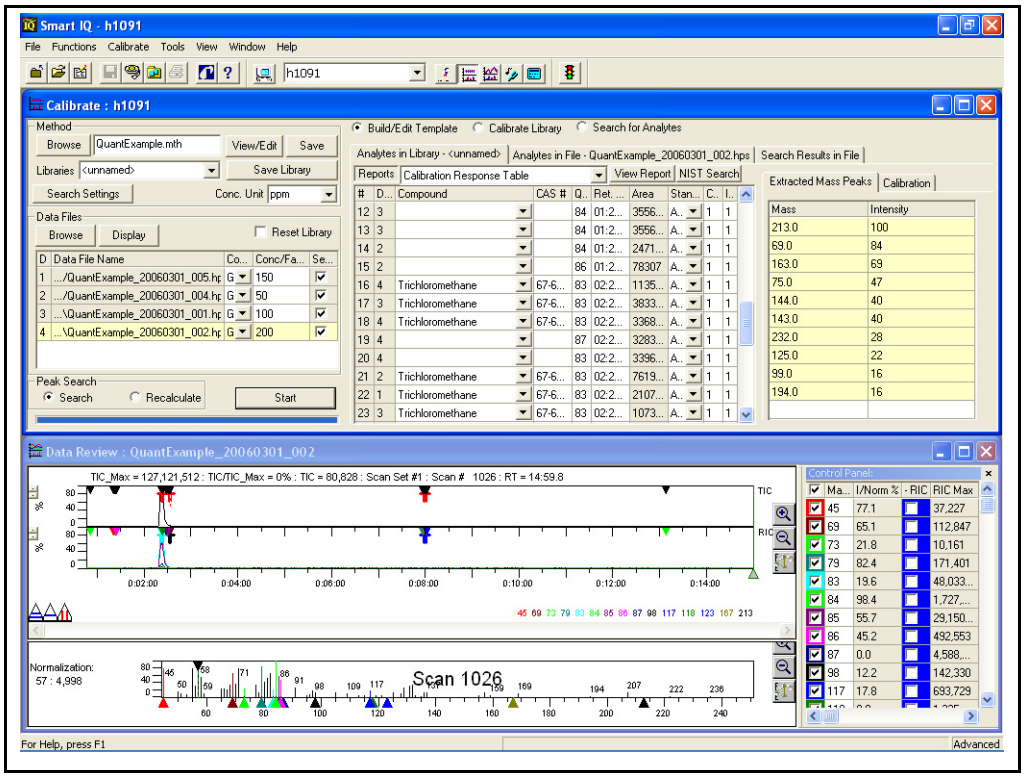
6 Select the **Concentration field** and enter the concentration of the standard. The Concentration reference should be set to **Global**.

7 Check the selection box.

8 Make sure the **Build/Edit Template** button is selected and then select **Start**. The data file will be processed and the detected compounds displayed. Peaks are detected according to the **Search Settings**. The library template will be filled in with the detected peaks. The compounds identified by AMDIS will have Compound names and CAS#'s. See Figure 12-14. The Chromatogram display window will automatically open below the calibration control panel to display the plot and the detected peaks.

The peaks marked with a T have been identified by AMDIS, and those with only the black triangle have not been identified. All of the features described in Chapter 9, Data Review can be used to interact with the plot.

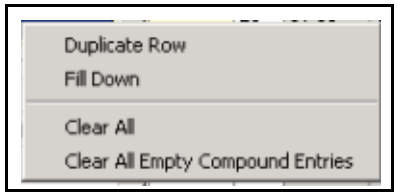
Figure 12-14 Calibrate Display with Detected Peaks



9 The template can now be edited to remove duplicate and unidentified entries from the analyte list. Place the mouse cursor over the compound name of an entry to be deleted or edited. Refer to Figure 12-14 and Figure 12-16.

HINT: Only keep one entry for each compound. In this example the Internal Standards and the compound of interest are repeated multiple times. Delete the duplicate entries.

Figure 12-15 Right Mouse Button in Calibration Control Panel



Select the right mouse button. The options available are:

Duplicate Row. . . . . Creates a duplicate entry for the highlighted row.

Fill down . . . . . Replaces the contents of all rows below the highlighted row with the name of the selected compound.

Clear All. . . . . Erases all entries in the Template.

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Clear All Empty Compound Entries . . . . . Deletes all entries that do not have a compound name associated with them.

NOTE: The down arrow next to the compound name can be used to select a different name if more than one possible match has been determined by the AMDIS search.

9a For this file, all of the blank entries are to be deleted. Click the right mouse button in the **Compound** field and select **Clear All Empty Compound Entries**. Refer to Figure 12-14.

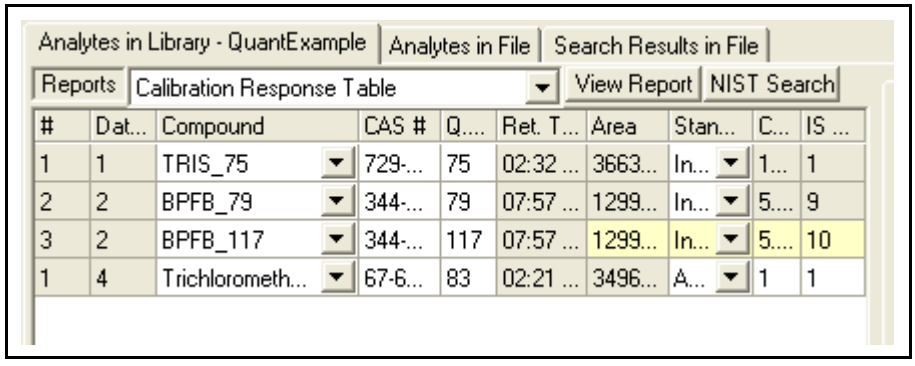
HINT: If a compound is unidentified (blank), but is known to the analyst, name the peak by highlighting the blank compound name field and entering the name.

9b Next, the Internal Standards must be selected. When using Internal Standards, best practice is to use a quant Ion from the Internal Standard that is close in mass to the quant Ion of the compound to be quantitated. The software always selects the largest mass fragment in the spectrum as the quant Ion. To change the quant ion, highlight the field and type in the new number. Change the quant Ion for TRIS from **213** to **75**. The software will warn that a re-calibration is required. This is true if a quant ion is changed after calibration. To signify which quant mass is being used, change the name of **TRIS HAPSITE IS #1** to **TRIS_75**. See Figure 12-16.

NOTE: If the name of the analyte begins with TRIS or BPFB the software will recognize the analyte as a HAPSITE IS and automatically enter the concentration from the IS canister into the method for calibration and quantitation.

9c More than one quant ion can be used from a single Internal Standard peak. Highlight the second Internal Standard and click the right mouse button, select **Duplicate Row**, then change the name of the Internal Standard peaks to **BPFB_79** and **BPFB_117**. Next the **Quant Ion** should be changed to **79** and **117**. See Figure 12-16.

Figure 12-16 Finished Analytes Chart



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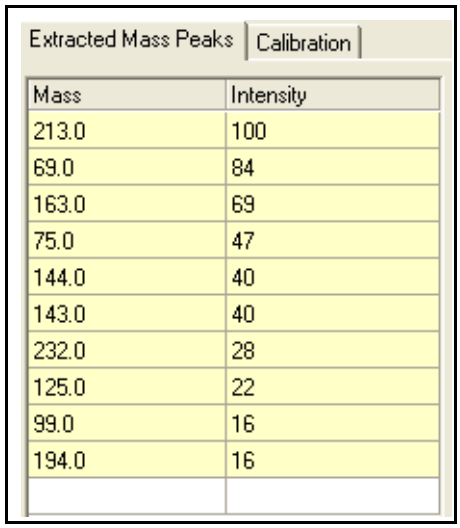
9d To finish the template, the concentration of each analyte must be individually entered if not using the global concentration flag. In this example, the concentration of all analytes is the same so Global is being used and the concentration field is not a required entry. For analyte specific concentrations, the Concentration field should contain the individual analyte concentrations for the selected data file. Each additional file would have a specific multiplication factor entered in the Conc/Factor field, in the Data Files control panel.

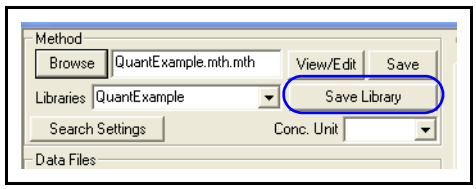
Figure 12-17 Extracted Mass Peaks



9e The Extracted Mass Peaks can also be edited to delete mass fragments with intensities below 15%. The exception would be a molecular ion if the fragmentation pattern is not very distinct. To delete unwanted mass fragments, highlight the field and press the delete key. Refer to Figure 12-17.

10 The finished library needs to be saved. Select the **Save Library** button under the **Method** controls. Enter a library name and save it as part of the method. See Figure 12-18.

Figure 12-18 Save Library Button



11 The template is complete and the library is ready for Calibration. Refer to Figure 12-19.

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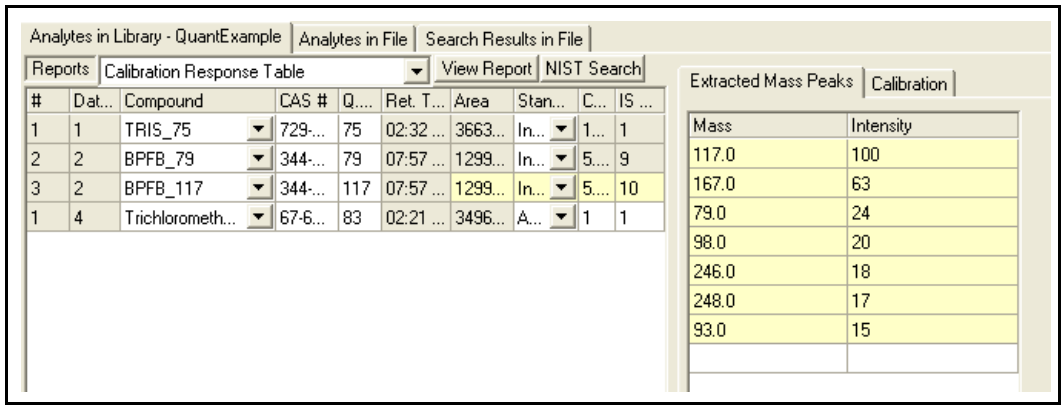
Figure 12-19 Library Ready for Calibration

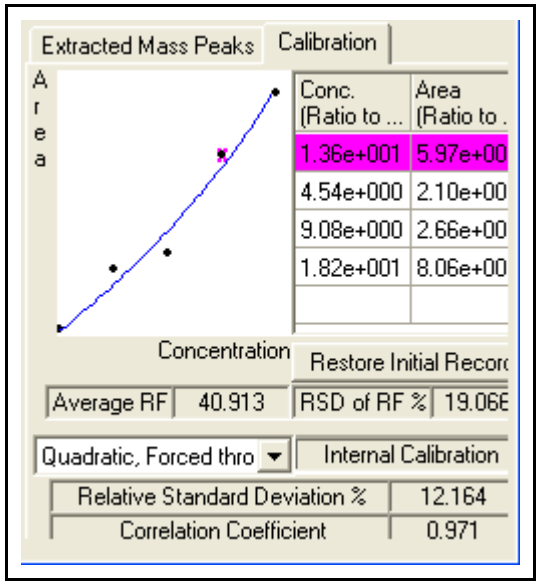


11a Prior to calibration, the curve fit should be selected. To change the curve fit from the default **Linear, Forced through Origin**, select the **View/Edit** button under the **Method** controls. Select the curve fit and save the method.

11b To calibrate the library, select the standard data files, select **Calibrate Library** and press the **Start** button under **Peak Search**.

11c Review the curves for each analyte. To review each analyte, select the **Calibration** tab and use the mouse to select each compound. See Figure 12-20.

Figure 12-20 Calibration Curve



11d Additional calibration points can be added to the curve at any time by using the **Browse** button under **Data Files**. First add the data file. Select the data file added and make sure that the previous data file is no longer selected by un-checking the select field. Select **Start** under **Peak Search**. Review the curves as with the previous data file. Each curve should have all of the calibration points.

NOTE: To investigate problems use the **View Reports** function to examine the **Calibration Report**. If an outlying point is detected on the curve, delete the point by highlighting and clicking delete.

11e When the curve is complete, save the Library and the Method. The Quant library is now part of the Method.

HINT: Whenever this method run from the front panel or the laptop, the method will report concentration for the target compounds by selecting the **Quantitative** tab of the report.

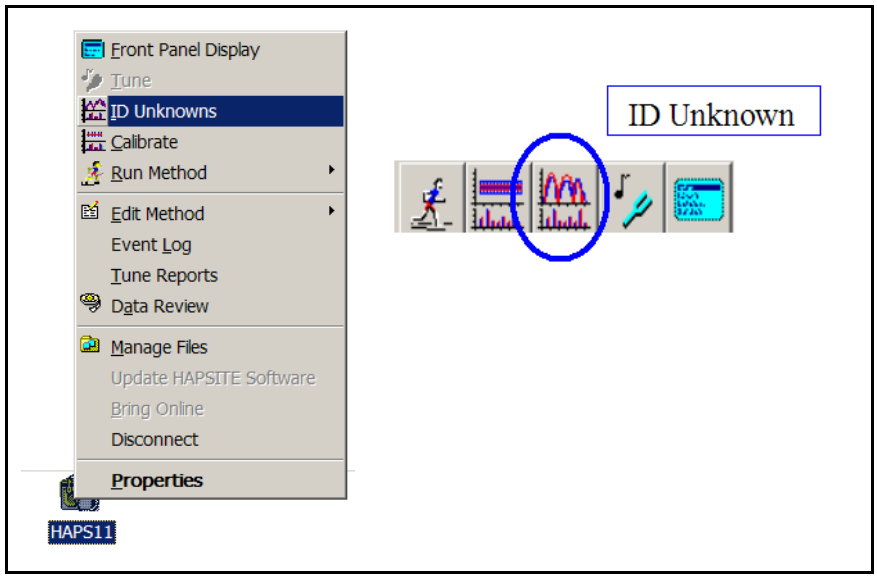
12.7 Using the ID Unknown Function

Files can be reprocessed on the laptop using the **ID UNKNOWNS** function.

1 The **ID Unknowns** function can be accessed from the **Function** drop down menu, by clicking the right mouse button on the **HAPSITE** icon, by the toolbar or via the **Status** icon and **Function** tab. See Figure 12-21.

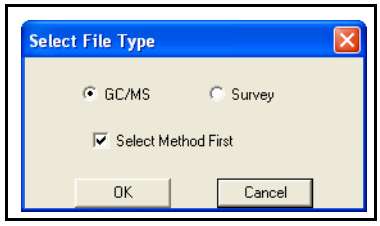
HINT: The **ID Unknowns** function is very similar to the **Calibrate** function.

Figure 12-21 Accessing ID Unknowns Function



1a Selecting **ID Unknowns** will display the **Select File Type** dialog box used to select the type of quantitative method, **GC/MS** or **Survey** (MSONLY). See Figure 12-22.

Figure 12-22 Selecting the File Type



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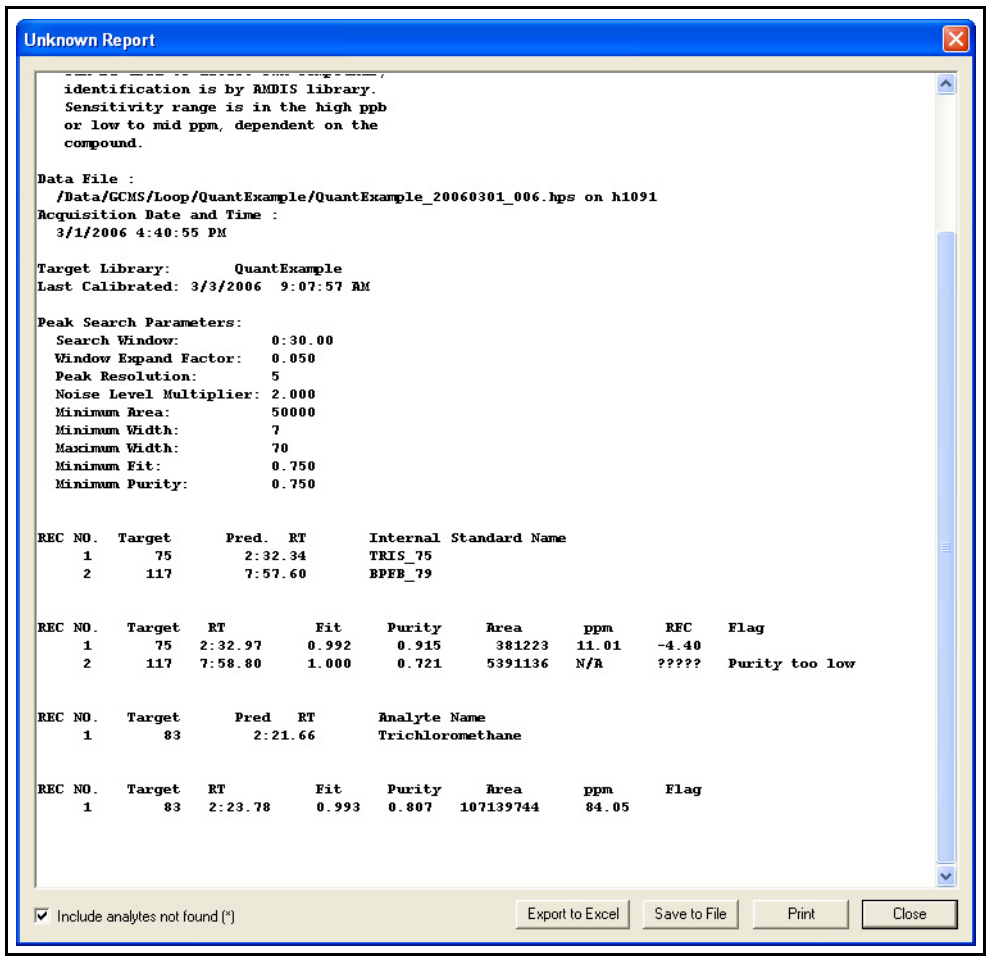
2 Select the **method** to be used to process or re-process the data. After a method is selected the **ID Unknowns** control panel will be displayed.

3 Use **browse** to select the **data file(s)**.

4 Select **Start** to reprocess the data.

5 View results. See Figure 12-23.

Figure 12-23 Quantitation Report



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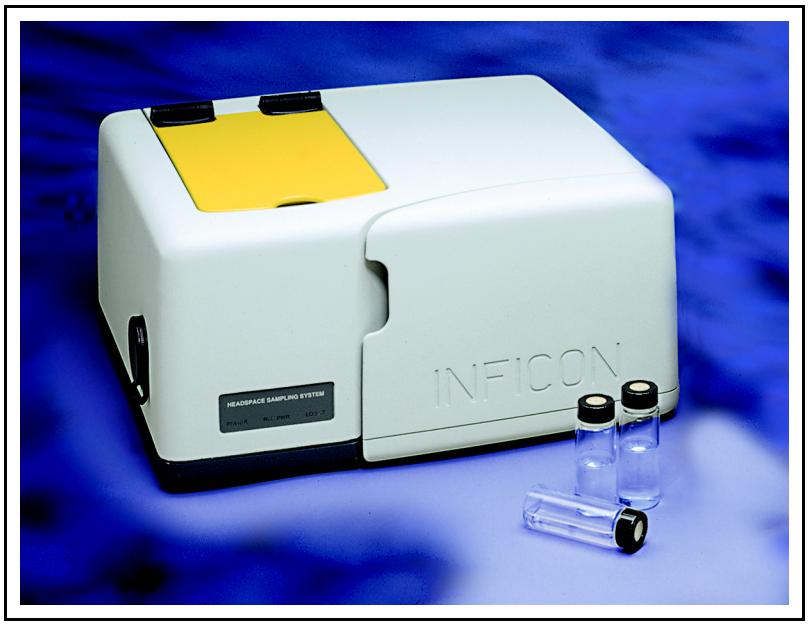
Chapter 13
Headspace Sampling System

13.1 Introduction

The Headspace Sampling System (HSS) is an accessory to the HAPSITE portable GC/MS, allowing testing for Volatile Compounds in various solid and liquid matrices, including soil and water. Used in combination with the HAPSITE, the Headspace Sampling System attachment provides the opportunity to perform soil and water analyses for quantitative and qualitative results in the field. See Figure 13-1.

Figure 13-1 Headspace Sampling System



The HAPSITE is designed to analyze volatile compounds in air, so samples must be introduced in a gas phase. HSS technology involves heating samples of soil or water, in a closed sample container, to a known temperature. Heat forces the volatile components to partition between the sample and the headspace above the sample. After allowing sufficient time for equilibration to occur, a portion of the headspace (now containing volatile compounds from the sample) is introduced to the HAPSITE as a gas sample.

Unknowns are tentatively identified using the National Institute of Standards and Technology (NIST) mass spectral library and known compounds can be quantified using a prepared calibration curve. This is accomplished using the combination of the HAPSITE's Gas Chromatograph (GC) and Mass Spectrometer (MS) in the same as air sample analysis.

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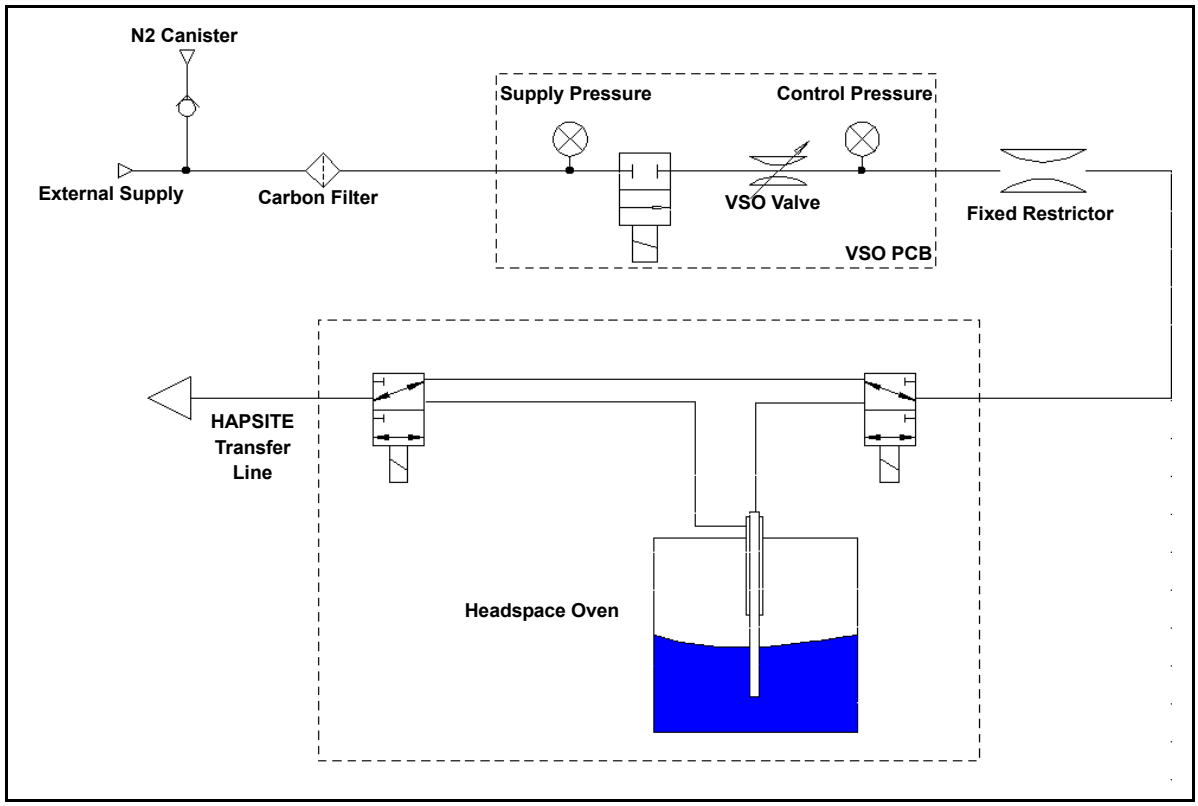
13.1.1 How the HSS Operates

The functions of the HSS are to provide consistent partition of analytes between the sample and the headspace, and to transfer a representative sample of the headspace to the HAPSITE for analysis.

Figure 13-2 is a schematic of the gas flow system which accomplishes these functions. The flow starts with the nitrogen supply, at the upper left. This can be from disposable canisters or from an external cylinder supply. The nitrogen pressure and flow are controlled by two pressure gauges, a shut-off valve, the Variable Orifice valve and a fixed restrictor. All the valves in this system are operated under software control.

Figure 13-2 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. While a sample is being transferred to the HAPSITE, the flow is directed through the long needle, below the surface of the sample. The nitrogen flow into the vial is approximately balanced by the HAPSITE's sample pump flow 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 needles into a clean vial and acknowledge by pressing **RUN**. Purge is achieved by providing a flow of clean nitrogen through the needles, heated line and sample loop in the HAPSITE, removing 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 temperature-controlled oven contains not only the sample wells, but the three-way valves and the entire sample line through the connection with the Heated Line. This design precludes the condensation of volatiles at cold spots.

13.1.2 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
Mounting Requirement	Upright, ±15°

13.1.3 HSS Indicators

The HSS has three indicators in the left side of the front panel and under the label **Headspace Sampling System**. When illuminated, these indicate **POWER**, **RMT PWR**, and **LO BAT**. The left and center indicators are green when illuminated, while the right is red when illuminated.

POWER	When the left indicator is illuminated, the HSS power is on.
RMT PWR	When the center indicator is illuminated, the HSS is connected to remote power.
LO BAT	When the right indicator is illuminated, the battery power is getting low, and HSS power will soon be lost. Either replace the battery with a charged battery or connect to a power source using the AC-to-24 V(dc) adapter.

NOTE: The HSS and the transfer line are powered by the HSS instrument. If the instrument loses power or is turned off, the temperatures of both the HSS and the transfer line will begin to drop. Power up the HSS and run a HSS method to restart the heaters.

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13.1.4 Consumables Required

The following consumables are required for routine analysis when using the HSS.

Compressed Nitrogen — A source of pressurized, high-purity nitrogen is required for analysis and purging of the system. Nitrogen canisters are available from the sales agency which provided the HSS, or an external source of nitrogen, regulated to 700 kPa, may be connected using the 3/16" Swagelok quick connect fitting located at the back of the instrument.

The nitrogen canisters are available as the following INFICON part numbers:

- Box of 6 — IPN 930-432-P6
- Box of 12 — IPN 930-432-P12
- Box of 24 — IPN 930-432-P24

NOTE: The nitrogen must have less than 50 ppb of volatile organic compounds, and argon less than 40 PPM. More detailed specifications can be obtained by contacting INFICON, see Chapter 17, Customer Support.

40 milliliter (mL) Glass Sample Vials — These vials are used for all analyses, including calibration standards, blanks, quality control samples, and samples regardless of matrix.

NOTE: The sample vials must have dimensions of 29 mm OD x 81 mm length to ensure a proper fit in the HSS sample heating block. A proper fit allows the sample heating block to most effectively heat the samples. Supelco, Inc.(800 247-6628) offers clear glass vials of this size with PTFE-silicone septa and open-top phenolic closures. The vials are Supelco part number 2-7180 (box of 100).

Water — Water is used for syringe cleaning, blank analysis, calibration standard preparation, calibration check standard preparation, as well as sample dilutions if necessary. This water must be free from volatile organic compounds, or "VOC-free".

Calibration Mix — This mix should consist of the target compounds for sample quantitation. The mix is used to prepare standards for a calibration curve. The calibration curve is used for quantification.

INFICON has created a 4 component mix used as Internal Standards for Headspace Sampling (HS) runs. This mix is added in conjunction with calibration mixes used to write calibration curves for quantification methods. The part number for this mix is:

4 component (HS) Internal Standard — IPN 071-748

NOTE: Calibration Mixes may be purchased from a variety of laboratory supply businesses in liquid form, usually in a methanol matrix. Typical laboratory mixes are readily available as off-the-shelf items, while custom mixtures can be made to specifications.

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13.1.5 Connecting the HSS to the HAPSITE

Determine a suitable location, on a level surface, where the HAPSITE and the HSS are close enough together to connect via the Transfer Line. Refer to section 2.6.2, Installing the Headspace Sampling System, on page 2-14.

CAUTION

Care must be taken to avoid sharp bends of the Transfer Line, which could lead to flow restriction or breakage.

13.1.6 Providing Power to the HSS

The HSS may use AC power from an outlet, or may also use an INFICON rechargeable battery. A description of the connections for each power supply follows.

13.1.6.1 If AC Power is Available

If AC power is available, use the Y-cable furnished to "split" the 24 V(dc) power from the HAPSITE's AC to DC power converter. Connect one connector of the Y-cable to the HAPSITE's power connection and connect the other connector to the back of the HSS. Then connect the two-cable connector to the output line of the AC to DC power converter. Finally, plug the AC to DC power converter into the AC power outlet.

NOTE: Do not use the Y-cable to power two HAPSITE instruments.

HINT: If the HAPSITE is not shut down, do not disconnect the power cable unless a charged battery is installed.

13.1.6.2 If AC Power is Not Available

For field operations, or whenever AC power is not available, batteries must be used. A battery will provide power to the HSS for approximately 3 hours of use, depending on ambient temperature and the parameters of the method being used.

13.2 Using the HAPSITE with HSS

The following instructions can be used as a guideline for sample and standard preparation unless more specific operating instructions are available.

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13.2.1 Powering on the HSS

Press the power button to turn on the HSS. See Figure 13-3.

HINT: The power button is a toggle switch, just like on the HAPSITE. Once pressed and released the switch returns back to the original position.

Figure 13-3 Powering on the Headspace Instrument

Once the HSS is connected to the HAPSITE, and the HSS power is on, run one of the Headspace methods using the Run Method icon. This will heat up the Headspace instrument. See section 5.6, GC/MS Mode with Headspace Sampling System and Sample Loop Installed, on page 5-32, section 5.7, GC/MS Mode with Headspace Sampling System and Concentrator, on page 5-36, section 3.7, GC/MS Mode with Headspace Sampling System and Sample Loop in Portable Mode, on page 3-36, and section 3.8, GC/MS Mode with Headspace Sampling System and Concentrator in Portable Mode, on page 3-40 for the standard operating procedures to run samples with the Headspace Sampling System.

13.2.2 Loading the Vials

Loading of vials is accomplished in a manner which best preserves the integrity of the sample. The HSS works on the basis of heating a sample to partition the volatiles between the sample and the headspace within the vial. Just as heat drives off volatiles, aeration also removes volatiles from a sample. Because of this, sample degradation may occur if the transfer to the sample vial is not performed carefully.

NOTE: Use Volatile Organic Compound (VOC) free water to rinse a syringe (either 25 or 50 mL size luer-lock tip syringe is suggested). No needle is required for this syringe.

To load a water sample into the vial:

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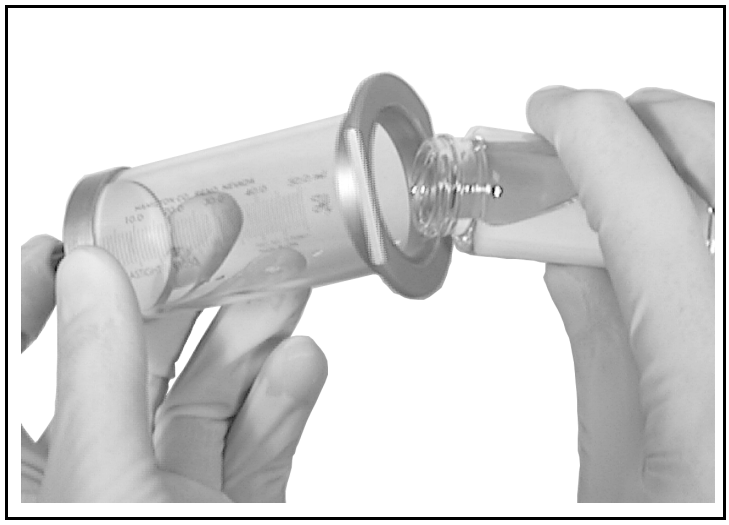
1. Rinse a small clean vessel (such as a beaker) with VOC-free water and discard the water.
2. Pour some VOC-free water in the rinsed vessel for rinsing of the sample syringe.
3. Rinse the sample syringe with VOC-free water and discard the water. Repeat three times.
4. Remove the plunger from the sample syringe. Hold the sample syringe at an angle with the large open end up, and the small end (where a needle would be) stopped against a gloved finger. See Figure 13-4. Carefully transfer the sample into the sample syringe.

Figure 13-4 Transferring the Sample into a Sample Syringe



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

5. Adjust the amount of sample in the sample syringe to 20 mL while removing the air bubble. See Figure 13-5.

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 result in failure of the vial and/or personal injury. Do not fill the vial with more then 20mL of liquid.

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Figure 13-5 Clearing the Air Bubble from the Sample Syringe

6 Add Internal Standard and Surrogates 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.

6a Rinse the 10 µL syringe, with cemented needle (pictured in Figure 13-6), to be used for the injection of the Internal Standard/Surrogate mixture, with high purity methanol three times, discarding the methanol (in a waste container, preferably in a vented hood) after each rinse.

WARNING

The needle tip is sharp, be careful to avoid injury.

6b Rinse the 10 µL syringe once with the Internal Standard/Surrogate mixture, and discard the Internal Standard/Surrogate mix from the 10 µL syringe.

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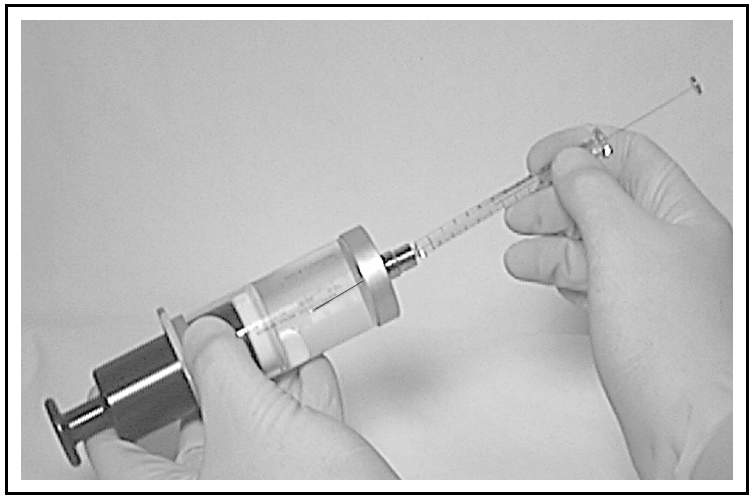
6c Inject the desired amount of Internal Standard/Surrogate mixture into the sample through the small end of the sample syringe. See Figure 13-6.

Figure 13-6 Injecting the Mix into the Sample Syringe



For calibration standard preparation, injection of the proper amount of a calibration mixture is performed to achieve the desired compound concentrations. Rinse a separate 10 µL syringe with methanol three times (discard the methanol from each rinse), rinse once with the calibration mixture (discard this as well). Inject the desired amount of the calibration mixture through the small end of the sample syringe to complete the calibration standard.

The following is a set of examples for amounts of standard mix (at 200 and 2000 µg/mL) to be injected into 20 mL of water to achieve the stated concentrations. See Table 13-1, Example Calibration Concentration Table, on page 13-9.

Table 13-1 Example Calibration Concentration Table

Concentration Desired	Amount (at 200 µg/mL) to be injected
20 PPB	2 µL
50 PPB	5 µL
100 PPB	10 µL
If using a 2000 µg/mL standard mix:	
400 PPB	4 µL
1000 PPB	10 µL

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

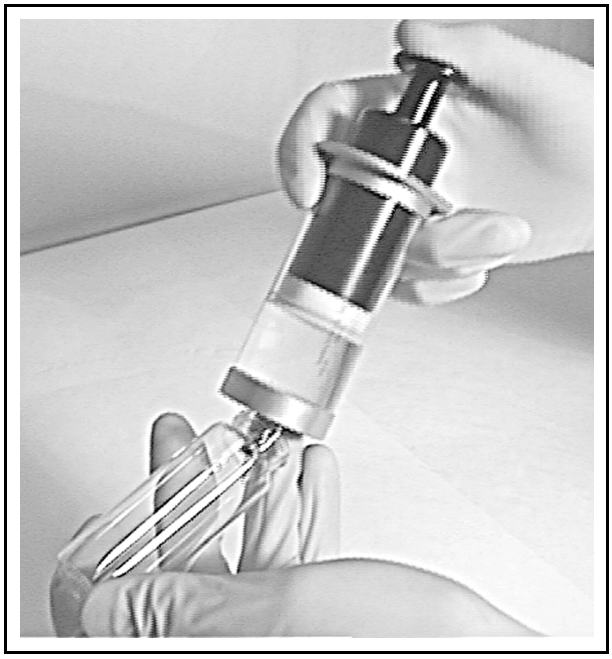
$X = C_F / C_C$ x 1000 µL/mL x 1 µg/1000 ng x 20 mL [1]

where:

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

6d Uncap a new sample vial, tilt the vial, and transfer the sample from the sample syringe, taking care to avoid aerating (bubbling) in the sample. Cap the sample vial tightly. See Figure 13-7.

Figure 13-7 Transferring the Sample to a 40 mL Vial



7 Label the vial with the appropriate information.

13.2.3 Loading the Wells

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

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

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WARNING

Be careful to avoid injury when handling hot samples vials.

WARNING

Be careful to avoid injury when loading/unloading samples, as the metal sampling needle tip 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 result in failure of the vial and/or personal injury. Do not fill the vial with more then 20mL of liquid.

2 Pull up on the needle assembly while grasping each side between the thumb and forefingers. Swivel the needle assembly left or right as needed to expose a free path to the sample well.

3 Insert the vial, plastic cap facing up, into the desired well.

4 Lower the needle, either into an empty well or an empty vial. See Figure 13-8.

NOTE: DO NOT puncture the sample septum until the sample has had adequate time to equilibrate.

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Figure 13-8 Inserting the Needle into a Vial

5 Close the yellow cover to prevent heat loss and promote thorough heating of the needle assembly.

6 Keep track of the time when each sample was inserted into the well to monitor equilibrium time. See section 13.2.4, Cycling the Vials, on page 13-12.

HINT: Consistency of heating times is very important!

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

13.2.4 Cycling the Vials

Cycling the vials is performed to thermally equilibrate and analyze samples as efficiently as possible. Four sample wells allow rotation of samples during analysis for equilibrium times which are longer than a single sample run time.

Cycling the vials to achieve the desired equilibrium time:

- Insert the first sample after the HSS sample heating block has reached the setpoint temperature. Allow the sample to equilibrate for the desired time (as determined when the calibration analyses were performed) and continue with the analysis.
- For subsequent samples, determine a strategy for achieving the desired equilibrium time while minimizing time between sample analysis.

  HINT: Develop a consistent system such as analyzing samples in the same position each time, and rotating samples clockwise or counter-clockwise to that position during each sample shift.

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

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13.2.5 Making the Measurement

To make a measurement using the HSS, a method is required. To quantify the analytes detected, a calibrated method is required.

Once the calibrated method is completed, samples may be analyzed and compared to the calibration for quantitative analysis. Sample analysis must be performed using the same procedure used to perform the calibration runs.

Refer to Chapter 11, Method Editor and Chapter 12, Target Compound Methods for additional information on developing methods and calibration for quantitative analysis.

13.3 Maintenance of HSS

Other than replacement of consumable items, most maintenance will involve routine purging of the system as needed when analyzing high concentration samples, needle replacement, or cleaning of the sample wells. Refer to section 15.10, Replacing the HSS Needle, on page 15-51.

13.3.1 Clean Out after a High Concentration Sample

When high concentration samples are analyzed using the HSS, the system can retain analytes which will be detected if the next sample has low levels of those compounds. This is typically referred to as a carry-over contamination. Carry-over contamination can be reduced to approximately 0.1% by using **Purge**. In the case of severe carryover, use the **Flush** function.

13.3.1.1 Purge Procedure

To **purge** the HSS, run a blank with the HSS needle in a clean, empty purge vial. In some cases, the blank may need to be run more than once.

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

13.3.2 Cleaning Up a High Background

High background is usually encountered because some compounds are retained in the HSS or the HAPSITE. This could be in the HSS valves, transfer line, or within the HAPSITE.

To test whether the background is in the HSS or the HAPSITE, disconnect the Transfer Line, connect the air sampling probe to the HAPSITE, and analyze a clean air sample. If the contamination is no longer present, the contamination is in the HSS or Transfer Line.

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Once the HAPSITE has been tested, test the Transfer Line by reconnecting it to the HAPSITE and disconnecting it from the HSS. Perform an analysis of clean air with the Transfer Line connected. If the contamination is not present, then the contamination is in the HSS.

13.3.2.1 Flush Procedure

Contamination may be flushed from the HSS by disconnecting the Transfer Line from the HAPSITE but leaving the line connected to the HSS. Once the Transfer Line to the HAPSITE is disconnected, press the **FLUSH** switch inside the front panel of the HSS (see Figure 13-9). This will pass nitrogen through the system while heating the sample well to 80 °C. The length of time the flush will need to operate will depend on the level of contamination.

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

HINT: Make sure that the needle is inserted into a clean, new, empty vial during flushing.

Figure 13-9 Flush Switch Inside The Headspace Instrument

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13.3.3 Cleaning the HSS Wells

The heating block is constructed of aluminum and is normally easy to keep clean. Routine cleaning of the wells is not usually necessary, but debris and liquids may be removed easily.

WARNING

Be careful to avoid burns if the surfaces are hot.

WARNING

Be careful to avoid injury from the sharp sampling needle.

The four wells may be cleaned, as necessary, using a damp paper towel or cloth. Cleaning should be performed after the heating block has been allowed to cool to ambient temperature or a reasonable temperature to avoid injury.

HINT: When cleaning the wells, position the needle assembly inside a well not currently being cleaned. Use this as a precaution against possible injury from the sharp needle point of the assembly.

To remove liquids, roll a paper towel or cloth into a tube shape which will fit easily into the well, insert, 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) Make sure no samples are in the wells before performing this cleaning method.

If necessary, water, solvents, or detergent can be used to clean the wells. Be sure to think about contamination issues if using anything other than water!

CAUTION

Do not completely fill the vials heater area with any liquids, since damage to the instrument may result.

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13.3.4 Washing the HSS

The HSS is designed to be water resistant, but not water proof. The HSS can withstand rainfall, but should be removed to a dry area as soon as possible. The front door has a seal which prevents water from passing into the instrument when the door is closed. There is also a seal around the entire instrument where the headspace cover meets the base plate of the headspace. Proceed as follows to wash the HSS.

WARNING - Risk Of Electric Shock

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

WARNING

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

WARNING

The needle tip is sharp, be careful to avoid injury;.

1. Disconnect the HSS from the external power supply.
2. Remove the battery.
3. Remove all vials from the HSS heater wells (be careful of the sharp needle).
4. Disconnect the transfer line at the back of the HSS.
5. Close access doors.
6. Install the plugs.
7. Wash the instruments using a low pressure water stream or with a soft cloth or paper towel and a mild soap. For washing, see section 13.3.3, Cleaning the HSS Wells, on page 13-15.

   NOTE: Solvents, abrasives, and strong soaps should not be used.
8. Rinse the HSS with clean water, using low water pressure (do not use a high pressure washer).
9. Allow the HSS to dry thoroughly before reconnecting any power supply.

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13.3.5 Replacing The HSS Battery

Replacement of the battery is performed on an as needed basis. The battery is used when a remote power source is not available. When the battery charge reads 20%, a battery change is needed.

NOTE: The battery level can be monitored by pressing the **TEST** button located on the front of the HAPSITE battery. While the **TEST** button is pressed, the **% Charge Level** will indicate charge in increments of 20% from **20%** to **100%**, as well as **OVER**. A charge reading of **OVER** indicates a charge above expected, and should be considered beneficial.

When the battery charge is low, the **LO BAT** indicator on the HSS is illuminated. If this warning is ignored, the HSS will eventually turn off, and the HAPSITE (or laptop, if used) will display a message stating that communication is lost.

Replacement should be performed between sample runs, and in a dry and non-hazardous environment, since the front door must be opened.

1 Open the front door and turn off the HSS by pressing the **POWER** switch located behind the front door.

HINT: The HAPSITE and laptop, if connected will display a message that communication has been lost.

2 Hold the HSS instrument in place and push the battery into the slot to free the latch.

3 Press the black button above the battery and hold while releasing the battery. The springs will push the battery out, and the battery can be easily drawn out of the slot.

4 Place a charged battery in the slot, making sure the lettering is right-side up.

5 Press the battery into the slot until snug. The latch inside the slot will hold the battery in position when properly installed.

6 Turn on the HSS by pressing the **POWER** switch located behind the front door.

HINT: The HAPSITE and laptop, if connected will reestablish communications with the HSS.

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13.3.6 Replacing The HSS Nitrogen Canister

Replacement of the Nitrogen Canister is on an as needed basis. When the pressure is below approximately 140 kPa, the canister will need to be replaced with a new Nitrogen Canister. Replacement should be performed between sample runs, and in a dry and non-hazardous environment, since the front door must be opened.

To change the Nitrogen Carrier Gas Canister:

1. Open the front door of the HSS and locate the Nitrogen Canister.
2. Press the black release tab on the left side of the Nitrogen Canister and the canister will partially pop out.
3. Remove the canister from the slot.
4. Remove the plastic protective cap from a new Nitrogen Canister and insert into the canister slot.
5. Press and hold the black release tab while pushing the Canister until the canister stops, then release the tab. The canister should be snug and locked in place.

WARNING

Do not re-fill the canisters after use. These canisters are disposable and not designed for re-filling. Canisters may fail upon refilling, causing bodily injury.

13.4 Shipping the HSS

The HSS can be readily shipped to a field location. The cardboard box in which the HSS was received, together with the cut-foam end-caps can be reused. A reinforced plastic shipping case (IPN 931-406-P1) is also available.

Before shipping the instrument, place an empty vial in one of the wells to insert the needle in, for protection. Remove the battery and the canister. No other steps are required to prepare the HSS for shipment.

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13.5 Charging the HAPSITE Battery using the HSS

INFICON HAPSITE batteries may be charged using the HSS, one at a time.

To charge a battery, connect the HSS to remote power using the AC-to-24 V(dc) adapter. Turn on the HSS by pressing the power toggle switch inside the front door. Insert the battery to be charged into the battery compartment, with the lettering right-side-up, until the battery is engaged.

Leave the HSS power on until the battery is fully charged. The battery should take approximately 12 hours to fully charge. The approximate level of the battery's charge can be monitored by pressing the TEST button on the battery. The battery level is indicated in 20% increments. Refer to section 2.11, Batteries, on page 2-41 for additional information on batteries.

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Chapter 14
Service Module

14.1 Introduction

The Service Module (also called the SM) provides several support functions for the HAPSITE. The Service Module contains pumps that create a vacuum system for the HAPSITE manifold, both during GC/MS operation in the lab and NEG Pump activation. This vacuum system comprises a Service Module Manifold, two vacuum pumps in series connected by a foreline, a Manifold Vent Valve, Foreline Vent Valve, and controllers to operate and monitor the pumping operations. The Vacuum Interconnect Valve is physically opened and closed from the Service Module. A 24 V(dc) power supply in the Service Module provides the HAPSITE with power. The Service Module also contains backup batteries to provide a controlled shutdown of the Service Module if power is lost.

The Service Module operates using two separate, but connected, pumps. These two pumps are called the Roughing pump and Turbo pump.

The Roughing pump has a two or four stage design, depending on the version. The newer version of the Rouging pump has four stages. Each stage of the Roughing pump has a rubber diaphragm which is pushed against a smooth plate several times a second in order to remove air through small holes in the plate. The Roughing pump is sometimes referred to as a Diaphragm pump.

The Roughing pump works in series with the Turbo pump to create a vacuum (typically about 1e-03 to 3e-03 Pa pressure) which is suitable for operating the HAPSITE Mass Spectrometer.

The Turbo pump has a set of precision balanced blades which rotate at approximately 1,500 Hz (1,500 revolutions/second), or 90,000 RPM.

CAUTION

Because of the rotational speed of this set of blades, the Service Module should not be moved while operating.

Service Modules are available in either 110/220 V(ac) (IPN 930-202-G1) or 24 V(dc) (IPN 930-202-G3) power models. Both models perform all the same functions. The only difference is that the 110/220 V(ac) model operates off from line voltage, while the 24 V(dc) model operates with input power from a 24 V(dc) power supply.

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14.2 Service Module Input Power

Service Modules are available in either 110/220 V(ac) (IPN 930-202-G1) or 24 V(dc) (IPN 930-202-G3) input power models. With the exception of input power, both models are identical.

14.2.1 Service Module 110 / 220 V(ac) Input

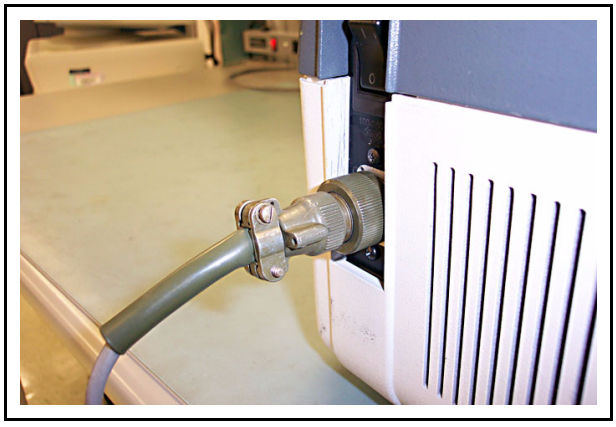
The 110/220 V(ac) model operates from 110/220 V(ac) line voltage. See Figure 14-1.

Figure 14-1 Service Module 110 / 200 V(ac) Version

14.2.2 Service Module 24 V(dc) Input

The 24 V(dc) model operates from an external 24 V(dc) power supply. See Figure 14-2.

Figure 14-2 Service Module 24 volts



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14.3 Components of the Service Module

The following section describes the components of both models of Service Modules.

14.3.1 Backup Batteries

The Service Module contains two 12 V(dc) (24 V(dc) total) lead-acid gel cells that will safely shut down the Service Module when power is lost. This includes closing the Vacuum Interconnect Valve if necessary, venting the Service Module manifold, and a controlled shutdown of the electronics. This procedure takes about 30 seconds, during which the POWER indicator on the Service Module display will remain illuminated.

CAUTION

When power is regained after a loss, any operation that was interrupted by the power loss must be restarted by the user.
When the Service Module is turned off by the user, the Service Module will undergo the same controlled shutdown procedure.
Backup batteries are kept charged whenever the Service Module is powered.

14.3.2 MDP/Turbo Pump

The Molecular Dispersion Pump (MDP), also known as MDP/Turbo Pump, provides high vacuum to the HAPSITE Manifold. The top speed is 1500 hertz (90,000 RPM). This is controlled by the MDP/Turbo Pump controller, which is controlled by the Service Module Processor. The pump is lubricated with special vacuum pump oil at its base. Over-temperature protection is built into the pump.

14.3.3 Manifold Vent Valve

The Manifold Vent Valve is located in the middle of the MDP/Turbo Pump. The Manifold Vent Valve is the main vent for the Service Module vacuum system. Normally, Manifold Vent Valve will vent the Service Module to atmosphere. If desired to vent the vacuum system to another gas (dry nitrogen for example), this can be done by connecting the gas supply to the Service Module at the port marked *VENT.* This port accepts an 1/8” OD tube. The maximum gas pressure at this vent should be 10 PSIG (25 PSIA).

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14.3.4 Foreline Vent Valve

The Foreline Vent Valve is located in the middle of the MDP/Turbo Pump. This valve vents the foreline to atmosphere through a small orifice. This valve is either off, pulsed, or continuously open, depending on the situation.

The inside surfaces of the vacuum system will absorb water vapor when exposed to the atmosphere. The amount absorbed is a function of the time exposed and humidity. When the Service Module pumps are operated, this water vapor is released and needs to be pumped out of the system. The roughing pump cannot pump this water without aid of periodic venting of the foreline by the foreline vent valve. This is controlled automatically when the operation **Attach HAPSITE** or **Activate NEG** is selected.

CAUTION

The system will not be ready for use until a MDP/Turbo Pump speed of 1480 Hz is reached. Depending on the amount of water vapor present, this may take from five minutes for a dry system to several hours in extreme cases.

The *TMP* indicator on the Service Module display will light up *ACCL* (accelerate) when the MDP/Turbo Pump is accelerating and *NORM* (normal) when the MDP/Turbo Pump has reached 1480 hertz.

14.3.5 Roughing Pump

The Roughing Pump is a diaphragm pump. During normal operation, this pump will evacuate the foreline to about 3 Torr. This pump is not designed to start when the foreline is under vacuum. Over-temperature protection is provided to the pump motor.

14.3.6 Vacuum Interconnect Valve Actuator

The Service Module contains an actuator for the Vacuum Interconnect Valve. Part of the actuator mechanism operates inside the Service Module Manifold and connects with the HAPSITE when the two are mated. This part of the actuator is driven by a high torque motor through a rotary vacuum feed through.

14.3.7 Battery Charger

The Service Module contains a battery charger that will charge a HAPSITE battery pack. The **CHARGE** indicator on the Service Module display will illuminate while the battery is charging. This light will be extinguished when the charging compartment is empty or the battery is fully charged.

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14.3.8 Power Supply

The Service Module Power Supply is a 24 V(dc) supply that provides power to the Service Module Components and is only available in the 110/ 220 V(ac) Service Module (IPN 930-202-G1) model. The Service Module Power Supply also supplies power to the Analytical Module when attached. The 24 V(dc) power is not supplied to the electrical connector at the top of the Service Module unless the Analytical Module is connected.The 24 V(dc) Service Module (IPN 930-202-G3) utilizes the external 24 V(dc) power supply to power the Service Module and Analytical Module.

14.3.9 Communications

Communications to the Service Module are made through the electrical connector on the top of the instrument. This is a RS485 communication utilized by the HAPSITE and by the PC through the HAPSITE. There is also a RS232 communication port on the side of the instrument that is used by service personnel.

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14.4 When to Use the Service Module

The Service Module (SM) can be used with the HAPSITE Chemical Identification System to provide vacuum for the Mass Spectrometer manifold.

NOTE: The Service Module is to be used as an alternative to using the NEG pump to maintain a vacuum in the MS manifold.

The Service Module is shown in Figure 14-3.

Figure 14-3 Service Module - Front And Top View

The Service Module is used:

- to change NEG pumps quickly, without sending the HAPSITE back to the INFICON Service Department.

WARNING

To avoid personal injury, maintenance personnel should obtain proper maintenance training before attempting to install and activate a NEG pump.

- an alternative, or backup method, to using a NEG pump to provide vacuum for the HAPSITE is required (i.e.: the NEG is not installed).
- to perform troubleshooting operations with guidance from an INFICON service representative.

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14.5 Smart IQ Software for the Service Module

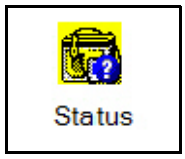
The Smart IQ for the Service Module can be accessed in three ways from the System Setup View:

- Double-click on the **Service Module** icon. See Figure 14-4.

Figure 14-4 Service Module Icon

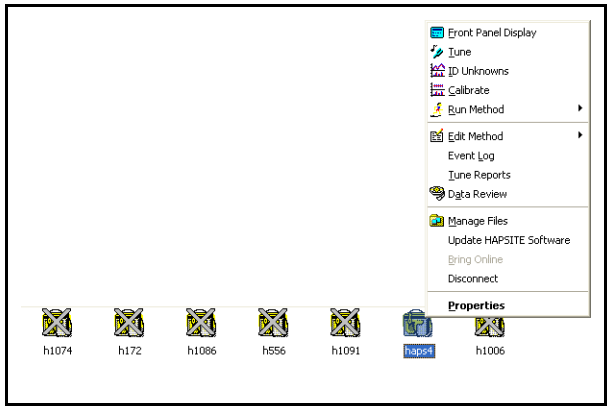
- Double-click on the **Status** icon. Click on the **Service Module** Tab. See Figure 14-5.

Figure 14-5 Status Icon



- Click on the **Sensor** icon with the right mouse button. Click on **Properties** with the left mouse button. Click on the **Service Module** Tab. See Figure 14-6.

Figure 14-6 Accessing Service Module in Smart IQ from the HAPSITE Sensor Icon



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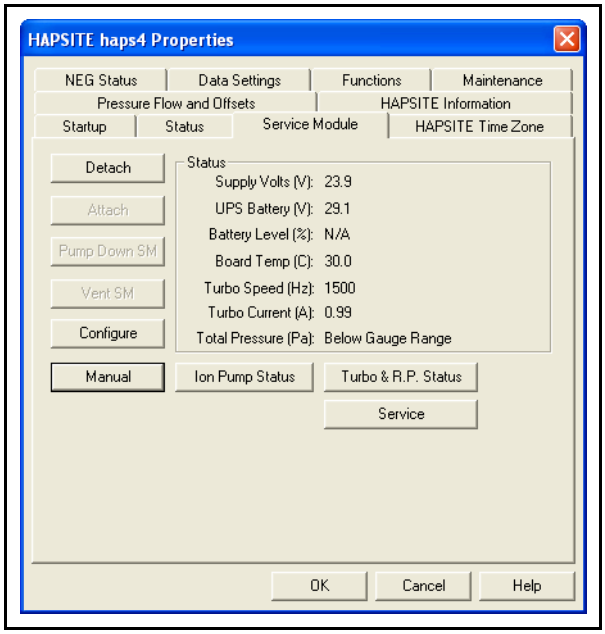
14.5.1 The Service Module Tab in Properties Window

Figure 14-7 Service Module Tab in Properties Window



The following options are available:

Detach . . . . . Used to release the vacuum between the Service Module and the HAPSITE before the physical removal. (Vacuum is maintained in the Mass Spectrometer.)

Attach . . . . . Used to create the vacuum between the HAPSITE and Service Module and within the Mass Spectrometer after physically connecting.

Pump Down SM . . . . . Used to place the Service Module in storage.

Vent SM . . . . . Used to take the Service Module out of storage.

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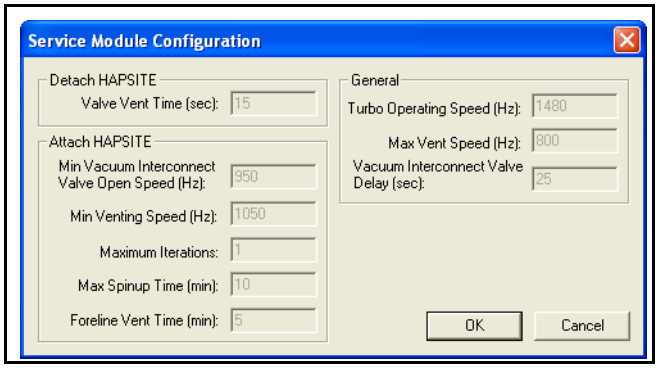
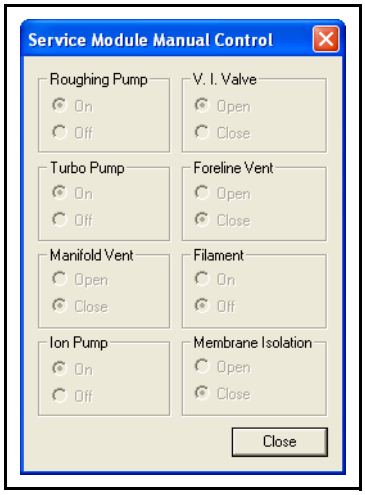
Configure . . . . . Displays control information. See Figure 14-8.

Figure 14-8 Configure Window



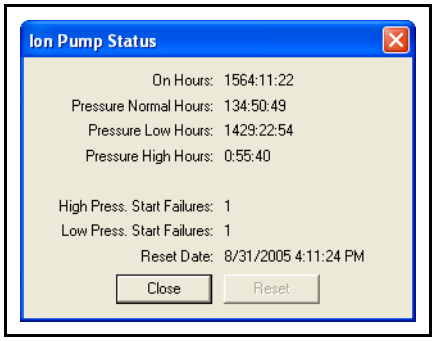
Manual . . . . . Displays additional control information. See Figure 14-9.

Figure 14-9 Manual Control Window



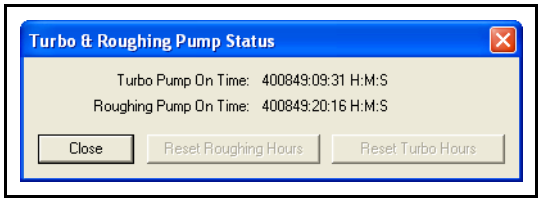
Ion PumpStatus . . . . . Displays the Ion Pump Status. See Figure 14-10.

Figure 14-10 Ion Pump Status Window



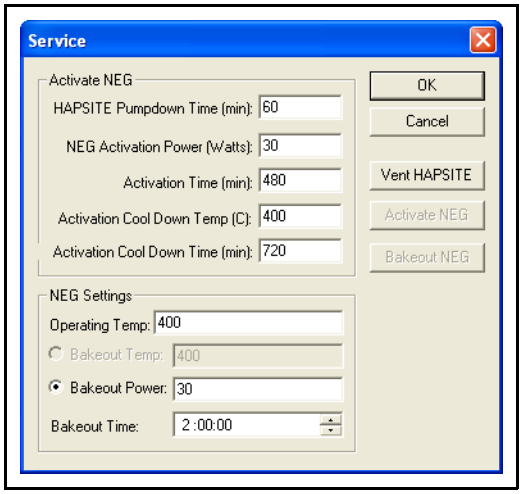
Turbo & R.P. Status . . . . . Displays the Turbo & R.P. Status. See Figure 14-11.

Figure 14-11 Turbo & Roughing Pump Status Window



Service . . . . . Contains controls to Activate NEG, Vent HAPSITE and Bakeout NEG. See Figure 14-12.

Figure 14-12 Service Window



The following status items are reported:

Supply Volts (V) . . . . . The voltage being supplied to the HAPSITE (normally about 24).

UPS Battery (V) . . . . . The Uninterrupted Power Supply (UPS) voltage, nominally 24 V.

Battery Level (%) . . . . . Displays the charge percentage of the HAPSITE battery (inserted in the battery compartment of the Service Module), as a percentage of the nominal design capacity. Displays “No Battery" if a battery is not present.

Board Temp (C) . . . . . Displays the temperature near the processor board in the Service Module in degrees centigrade.

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Turbo Speed (Hz) . . . . . Indicates the speed of the Turbo Pump in hertz (equivalent to rotational speed in revolutions per second).

Turbo Current (A) . . . . . Indicates the current draw of the Turbo Pump in amperes.

Total Press (Pa). . . . . The vacuum pressure in the Mass Spectrometer.

14.6 Starting Up HAPSITE on the Service Module

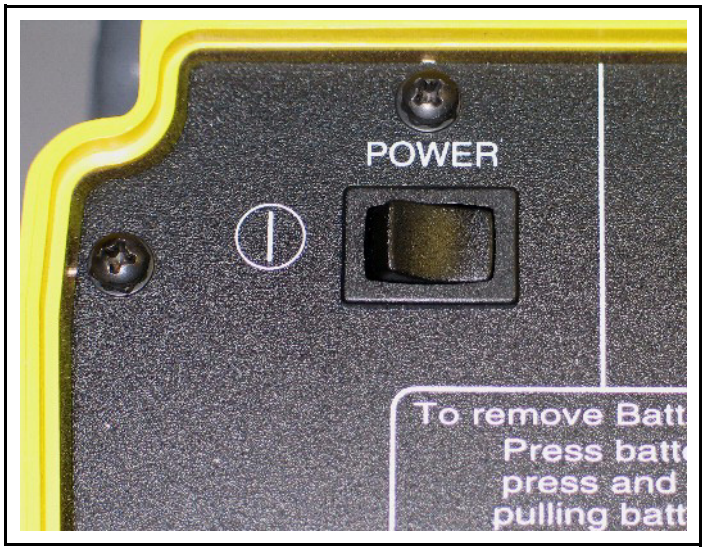
CAUTION

Damage to the Turbo pump may result from moving the Service Module while the Service Module pumps are operating. If the Service Module must be moved and the HAPSITE is Attached (Turbo Pump is running), first Detach the HAPSITE. See section 14.8, Detaching the HAPSITE, on page 14-17.

Before turning on power to the Service Module, refer to section 2.7, Service Module, on page 2-18 for the physical setup instructions.

Power for the HAPSITE is provided through the Service Module, as long as the Service Module is connected to power and turned on. Starting up the HAPSITE involves opening the front panel and pressing the toggle **Power** button, then releasing the button. The power button inside the front panel of the HAPSITE is shown in Figure 14-13.

Figure 14-13 Power Button Inside HAPSITE Front Cover



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NOTE: If the HAPSITE is already powered on, the HAPSITE does not need to be turned off before placing on the Service Module.

HINT: The HAPSITE will take approximately 60 seconds to completely power on, or "Boot Up".

WARNING

When the heater status screen is displayed, abort or press the 'esc' key. If the NEG pump is allowed to heat, the attach procedure will damage the NEG pump and may cause injury.

14.7 Attaching the HAPSITE to the Service Module

The HAPSITE should be attached to the Service Module to create the vacuum in the Mass Spectrometer. The alternative method of maintaining vacuum in the HAPSITE is to use an installed and activated NEG pump. Attaching the HAPSITE involves placing, or docking, the HAPSITE on the Service Module.

CAUTION

Before attaching the HAPSITE to the Service Module, the NEG pump must be cooled overnight to allow the NEG Pump to reach room temperature.

If the Service Module has been in storage, refer to section 2.7, Service Module, on page 2-18 before proceeding.

The HAPSITE must be turned on before proceeding (refer to section 14.6, Starting Up HAPSITE on the Service Module, on page 14-11). The HAPSITE can be attached to the Service Module using the Smart IQ software, or using the HAPSITE front panel.

CAUTION

When running the Service Module, the left and right side vents must be kept clear to allow free airflow through the Service Module. Air flows from right to left to allow cooling of the pumps. For example, a blockage on the right side vent can prevent the air from cooling the pumps properly. In such a case, the pumps may shut down to prevent damage caused by overheating.

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14.7.1 Attaching the HAPSITE to the Service Module using the Smart IQ PC Software

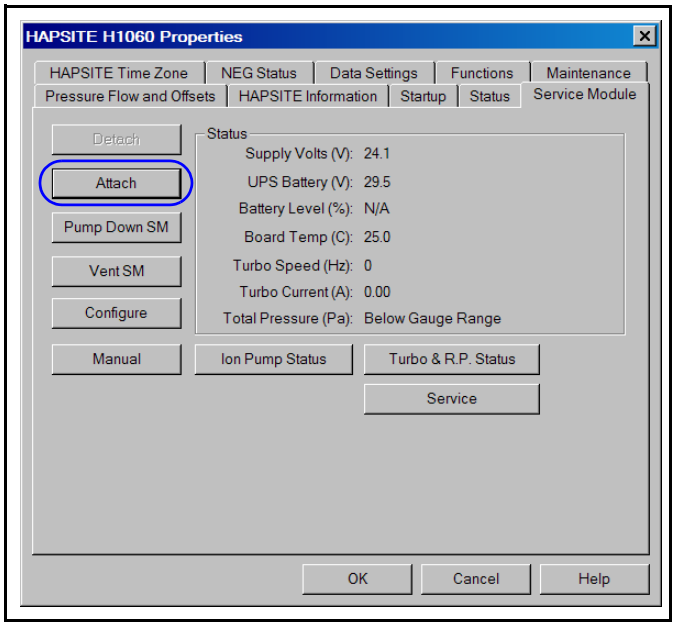
Be sure to connect the HAPSITE to the PC using an ethernet cable before continuing. Refer to section 2.3.6, Connect Laptop (if desired), on page 2-9, if a connection is needed.

In the Smart IQ software, left-click on the desired HAPSITE sensor, then double-click the **Service Module** icon, shown in Figure 14-14.

Figure 14-14 Service Module Icon in System Setup View, after Selecting HAPSITE Sensor

Double-clicking on the **Service Module** icon will open the **Service Module** tab in the HAPSITE Properties window, as shown in Figure 14-15.

Figure 14-15 Service Module Tab Selected in HAPSITE Properties Window



In the **Service Module** tab shown above, select the **Attach** button.

A confirmation window will open. Click **Yes**. See Figure 14-16.

Figure 14-16 Attach Confirmation Request

The Roughing Pump will start first, then the Turbo pump will begin to speed up, as shown on the Turbo Speed (Hz) line in Figure 14-15 above (initially listed as 0).

NOTE: The attach procedure typically takes about 5 minutes to complete.

After selecting the **Attach** button, the HAPSITE Properties window can be closed at any time.

Figure 14-17 Attach In Process

Figure 14-18 Attach Successful

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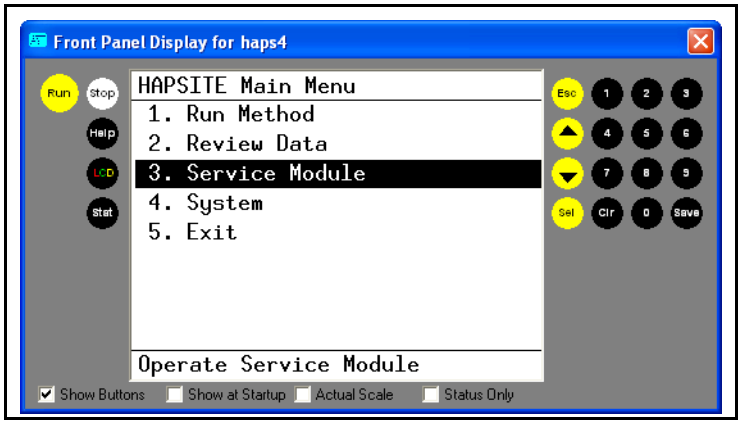
14.7.2 Attaching the HAPSITE to the Service Module using the HAPSITE Front Panel Controls

On the HAPSITE Front Panel main menu, select option number **3. Service Module**, as shown in Figure 14-19.

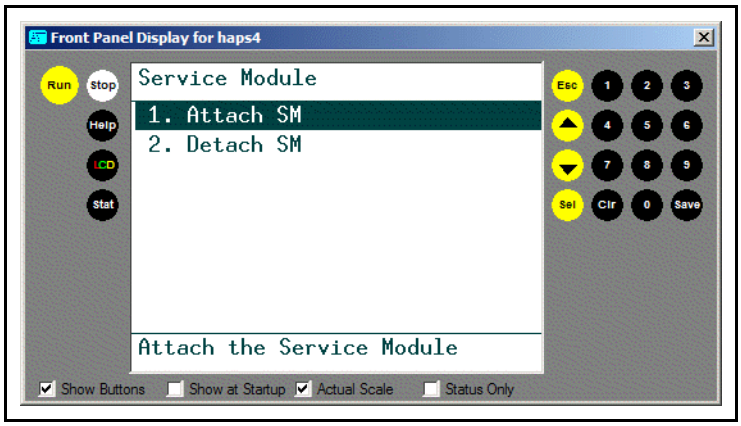
HINT: If not already at the main menu, repeatedly press the **ESC** key until the HAPSITE Main Menu is displayed.

Figure 14-19 HAPSITE Front Panel - Main Menu Listing Menu Item 3. Service Module



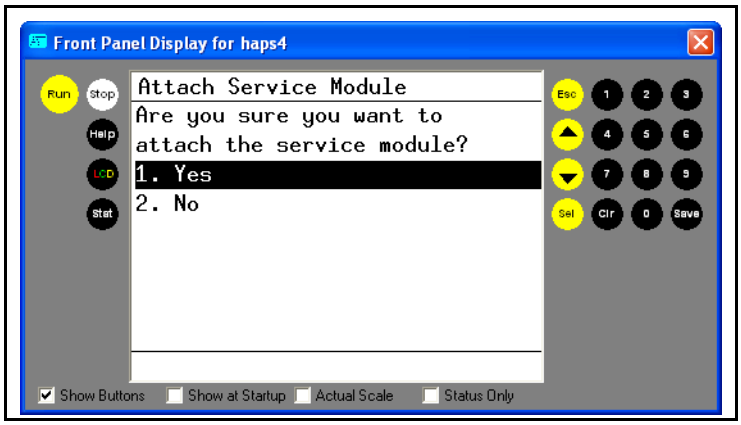
The resulting screen, shown in Figure 14-20, has two options: **1. Attach SM**, and **2. Detach SM**.

Figure 14-20 Service Module Screen on HAPSITE Front Panel Display



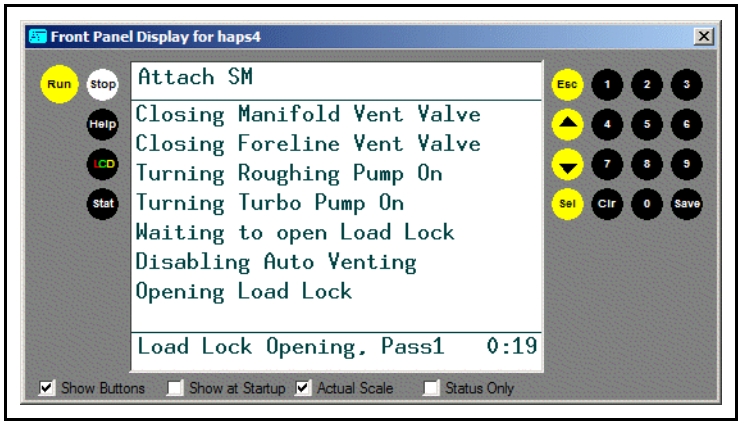
Select **1. Attach SM**. The screen shown in Figure 14-21 will appear asking to continue the Attach. Select **1. Yes**, to continue with the attach.

Figure 14-21 Service Module Attach - Confirm Screen



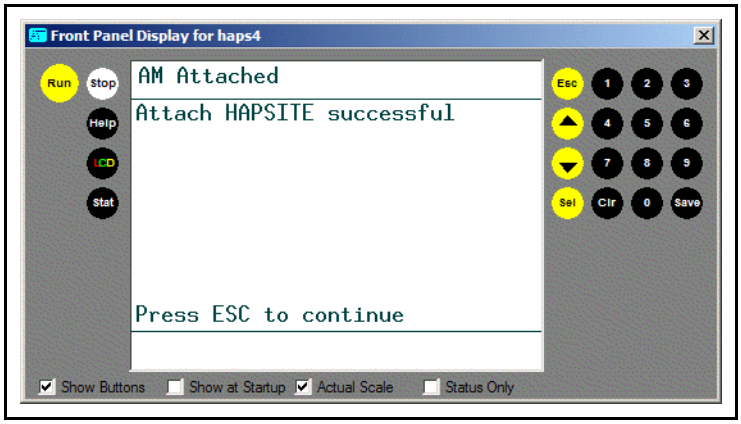
The current status of the system will be displayed and updated, as shown in Figure 14-22.

Figure 14-22 Attach HAPSITE Status



Once the Attach SM operation has completed, the system will show the Attach HAPSITE successful screen shown in Figure 14-23.

Figure 14-23 Attach HAPSITE Successful



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14.8 Detaching the HAPSITE

Detaching the HAPSITE allows the safe removal of the HAPSITE from the Service Module. The Detach procedure ensures that the interconnect plug in the HAPSITE is closed at the proper time, and the two pumps in the Service Module are properly shut down.

The detach procedure can be carried out either using the Smart IQ software, or using the HAPSITE front panel display.

14.8.1 Using the Smart IQ Software to Detach

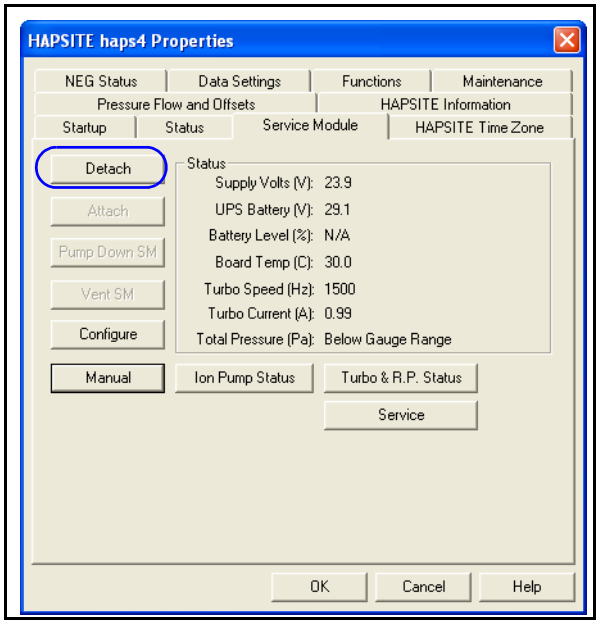
Be sure to connect the HAPSITE to the laptop using an ethernet cable before continuing. Refer to section 2.3.6, Connect Laptop (if desired), on page 2-9 if a connection needs to be made.

In the Smart IQ software, left-click on the HAPSITE sensor to detach, then double-click the **Service Module** icon, shown below in Figure 14-24.

Figure 14-24 Service Module Icon

Double-clicking on the **Service Module** icon will open the **Service Module** tab in the HAPSITE Properties window, as shown in Figure 14-25.

Figure 14-25 Service Module Tab Selected in HAPSITE Properties Window



In the **Service Module** tab shown above, select the **Detach** button. A message will appear confirming to detach the HAPSITE, as shown in Figure 14-26. Select **Yes**.

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Figure 14-26 Detach HAPSITE Confirm Window

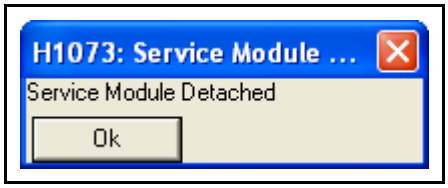
Figure 14-27 Detach In Process

The HAPSITE Vacuum Interconnect valve will close shortly after selecting **Detach**.

NOTE: The detach procedure typically takes about 3 to 5 minutes to complete.

NOTE: After pressing the **Detach** button and selecting **Yes** on the confirm window, the HAPSITE Properties window can be closed.

Figure 14-28 Detach Successful



NOTE: To place the Service Module in storage see section 14.10, Storing the Service Module, on page 14-22.

14.8.2 Using the Front Panel Display to Detach

On the HAPSITE Front Panel main menu, select **3. Service Module**, as shown in Figure 14-29.

HINT: If not already at the main menu, repeatedly press the **ESC** key until HAPSITE Main Menu is displayed at the top of the screen.

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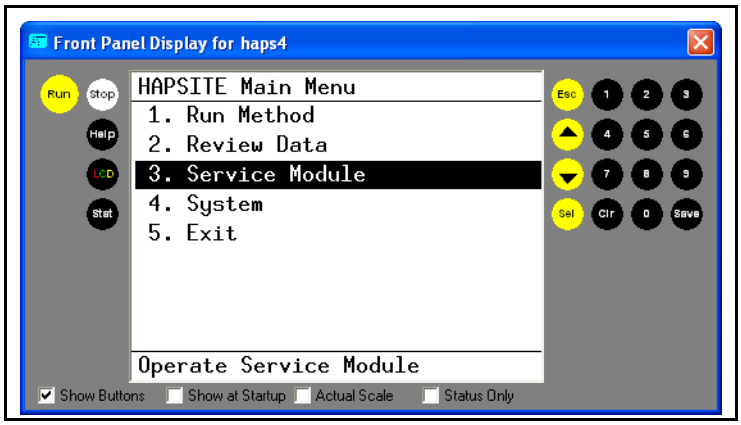
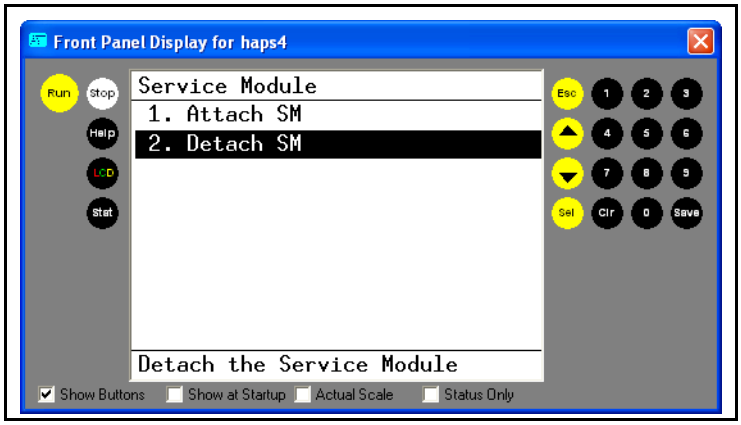
Figure 14-29 HAPSITE Front Panel - Main Menu Listing Menu Item 3. Service Module



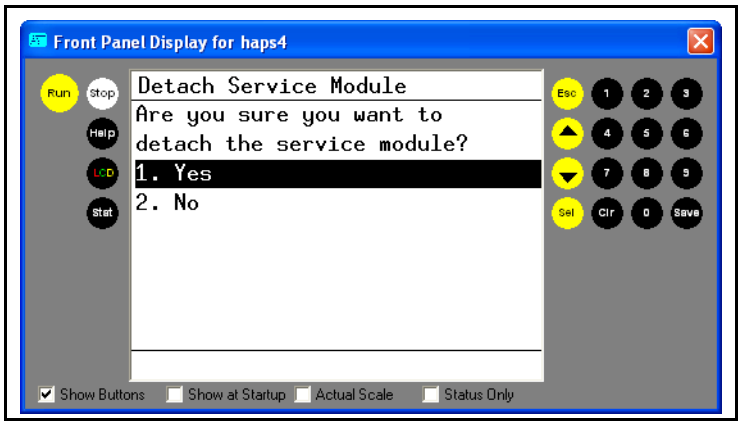
The resulting screen, shown in Figure 14-30, has two options: **1. Attach SM** and **2. Detach SM**.

Figure 14-30 Service Module Screen on HAPSITE Front Panel Display



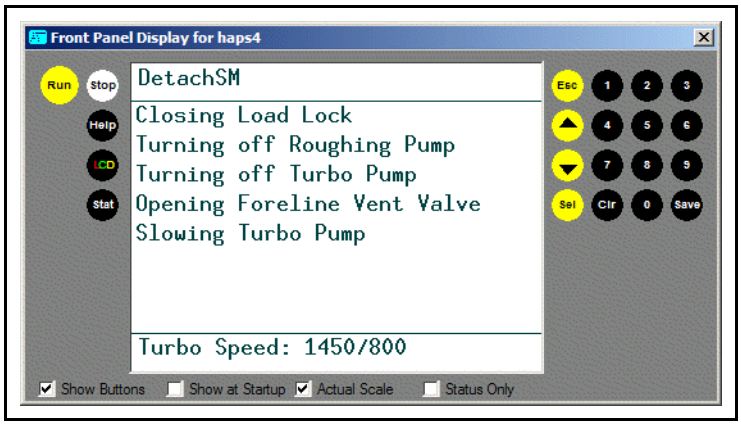
Select number **2. Detach SM**. The screen shown in Figure 14-31 will appear asking to continue the Detach. Select **1. Yes**, to continue with the detach.

Figure 14-31 Service Module Detach - Confirm Screen



The current status of the system will be displayed and updated, as shown in Figure 14-32.

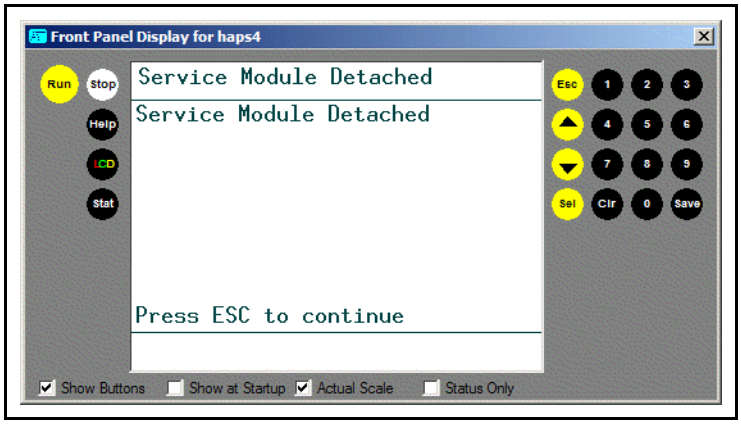
Figure 14-32 Detach HAPSITE Status



NOTE: The Detach SM procedure normally takes about 3-5 minutes to complete.

Once the Detach SM operation has completed, the system will show the Service Module Detached screen shown in Figure 14-33.

Figure 14-33 Service Module Detached



To place the Service Module in storage, see section 14.10, Storing the Service Module, on page 14-22.

14.9 Physically Removing the HAPSITE from the Service Module

The HAPSITE cannot be physically removed from the SM until a "Detach SM" has been performed, Refer to section 14.8, Detaching the HAPSITE, on page 14-17 before physically removing the HAPSITE from the Service Module.

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CAUTION

The HAPSITE should never be physically removed from the Service Module while the Turbo pump is operating. The Turbo Speed must be 0 Hz before removing the HAPSITE from the Service Module. Damage can result to both the HAPSITE and Service Module if a detach is not performed prior to physically removing the HAPSITE from the Service Module.

After the HAPSITE has been detached from the Service Module, release the latches on each side of the Service Module.

HINT: To continue using the HAPSITE place a charged battery in the HAPSITE or connect exterior power, before removing the HAPSITE from the docked position on the Service Module.

Remove the HAPSITE from the Service Module by lifting the HAPSITE straight upward off of the Service Module. Once the HAPSITE is undocked, replace the yellow plastic protective cover on the bottom of the HAPSITE, as shown in Figure 14-34.

Figure 14-34 Placing Yellow Protective Cover on Bottom of HAPSITE

This yellow cover is used to keep out dust and debris, as well as keep the opening dry during decontamination.

14.10 Storing the Service Module

When not attached to the HAPSITE, the Service Module should be stored with the aluminum storage plug in place. Storing the Service Module in this configuration includes a Pump Down procedure which turns on the Roughing pump for 60 seconds to create a partial vacuum. The vacuum holds the aluminum storage plug in place and protects the Service Module from dust, debris, and moisture, all of which can negatively affect the pumps in the Service Module.

NOTE: If the HAPSITE is Attached to the Service Module, the Service Module must first be Detached. Refer to section 14.8, Detaching the HAPSITE, on page 14-17 before proceeding.

HINT: The HAPSITE is considered Attached if the HAPSITE is docked on the Service Module, and the Turbo pump is running at a speed greater than 0 Hz.

Clean any debris or dust from the black rubber o-ring using a lint-free wipe. This will help ensure that a good seal to the aluminum storage plug is achieved, allowing the system to maintain vacuum more effectively. See Figure 14-35 shows the o-ring being cleaned.

HINT: When cleaning the Service Module rubber o-ring, use a lint-free wipe. Wipe the top of the o-ring, following the contour to clean the entire top exposed section. Avoid pushing dust or debris into the middle opening to the pumps.

Figure 14-35 Cleaning the Service Module Rubber O-ring using a Lint-free Wipe

After cleaning the rubber o-ring, make sure there are no cuts. Also look for any visible cracking of the o-ring. If the o-ring is damaged, the o-ring may need to be replaced.

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To place the Service Module in storage, the aluminum storage plug is placed on the opening where the HAPSITE connects, as shown in Figure 14-36.

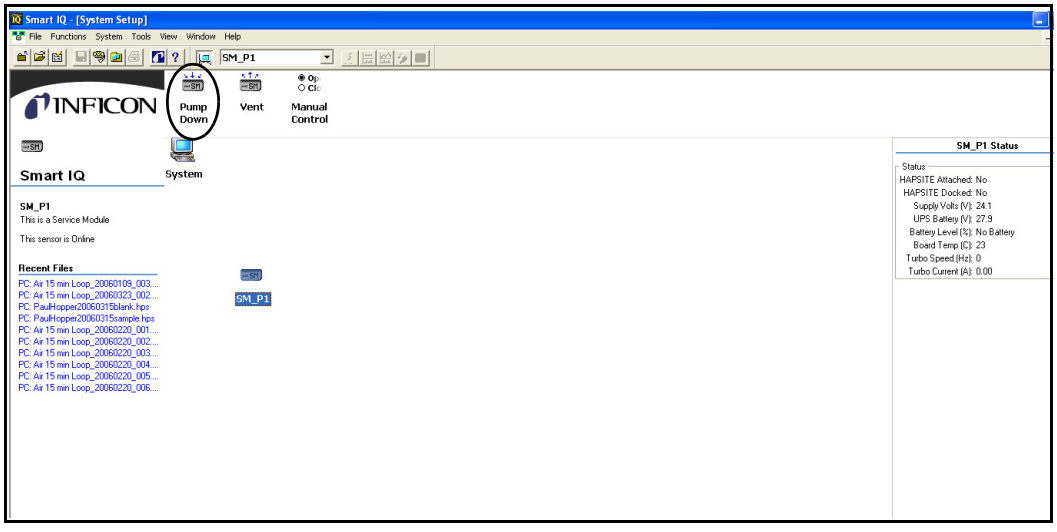
Figure 14-36 Service Module Aluminum Storage Plug in Place on Service Module

HINT: Confirm the RS-232 communication cable is connected to the Service Module and Laptop. If the RS-232 communication cable is not attached, refer to section 2.7.1, Setting Up the Service Module, on page 2-18 before proceeding.

The Service Module must be pumped down. Open the Smart IQ program.

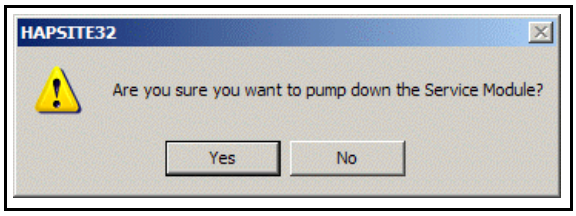
Double-clicking on the **Pump Down** icon will start the pump down process, as shown in Figure 14-37.

Figure 14-37 Service Module Pump Down Button



The prompt shown Figure 14-38 will appear to confirm pumping down the Service Module.

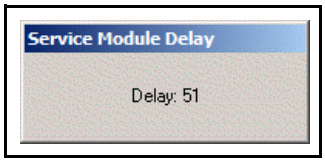
Figure 14-38 Pump Down Service Module Confirm Window



Select **Yes** to pump down the Service Module and place in storage. A window will appear counting down a sixty second delay while the pump down procedure completes, as shown in Figure 14-39.

NOTE: The Pump Down procedure turns on the Roughing pump for sixty seconds to create a partial vacuum, sealing the aluminum storage plug in place.

Figure 14-39 Pump Down Service Module Delay Screen



After the pump down is complete, place the yellow protective cover on top of the Service Module aluminum storage plug, as shown in Figure 14-40.

Figure 14-40 Yellow Protective Cover Placed Over Aluminum Storage Plug on Service Module

To complete the Service Module storage, turn off the Service Module power switch at the back left of the instrument.

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CAUTION

The Service Module should be stored in a clean and dry area. Avoid storing the Service Module in areas which are outside the temperature range of 40 to 95 °F.

14.11 When Power to the Service Module is Lost

The Service Module has an onboard battery which allows the Service Module to close the HAPSITE Interconnect Plug and shut down the pumps properly in case of a sudden loss of supplied power. This happens automatically in order to preserve the vacuum in the HAPSITE Mass Spectrometer manifold, and to protect the Service Module pumps from being damaged.

When power is restored, the HAPSITE and Service Module will need to be attached again before the Service Module will provide proper vacuum for the HAPSITE. Refer to section 14.7, Attaching the HAPSITE to the Service Module, on page 14-12.

NOTE: Refer to Chapter 15, Maintenance for additional information on using the Service Module to perform maintenance on the HAPSITE.

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Chapter 15
Maintenance

15.1 Introduction

The HAPSITE instrument is designed to require minimal service. Repairs will normally be carried out at the factory or other INFICON Service Facilities. Preventive maintenance includes the cleaning of the air filters and the replacement of certain consumables.

Additionally, the HAPSITE checks the system components each time start up is performed, and will notify the user if the following items need to have maintenance performed:

- Turbo Pump usage hours (Service Module)
- Roughing Pump usage hours (Service Module)
- Ion Pump usage hours (HAPSITE)
- NEG Pump usage hours (HAPSITE)

For Turbo Pump, Roughing Pump, and Ion Pump maintenance, service must be performed by a qualified INFICON service representative. (See Chapter 17, Customer Support.)

NEG Pump installation and removal is explained later in this section.

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15.2 Safety Considerations

WARNING

The NEG pump becomes very hot when in operation. The software-controlled sequence to remove the NEG pump provides a cool-down period; this sequencing must not be bypassed. In addition to the danger of burns from handling the hot flange, the reactive metal alloys within the pump can ignite if exposed to atmospheric pressure while hot. If this should occur, drop the pump into a bucket of sand and cover with more sand. If this is not practical, set the pump, on its black plastic base, on a non-flammable surface. The NEG pump will burn out in a few minutes.

WARNING - Risk Of Electric Shock

Whenever accessing the internal components of the Service Module, always disconnect the power cord and remove the battery to reduce the danger of electrical shock.

WARNING - Risk Of Electric Shock

The cover of the HAPSITE should never be removed while the Service Module is connected, while the battery is installed, or when the external power supply is connected as high voltages may be present.

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15.3 HAPSITE Symptom - Cause - Remedy Chart

Table 15-1 Diagnosing Problems - HAPSITE

Symptom	Cause	Remedy
1. Filament will not turn on (**`Unable to turn on filament error!`** on user interface.)	1a. Remove ion source and check to see if filament has opened.	1a. If opened, replace ion source (see section 15.8, Replacing the Ionizer of the Mass Spectrometer, on page 15-40), otherwise contact Customer Support (see Chapter 17).
2. Filament shut off. (Over pressure fault.)	2a. System shuts down filament if pressure spikes. An old ion pump will "burp" N2 and Ar which can cause the system to shut down.	2a. Replace ion pump. Contact Customer Support (see Chapter 17).
	2b. System has an air leak. Turn off carrier gas and check to see if mass 32 is relatively large (10 to 20% of peak 28)	2b. Locate the leak source and repair.
	2c. Turbo/molecular drag pump or diaphragm backing pump may need servicing.	2c. Check turbo speed in the Service Module program. Service pumps if speed is less then 1480 rps, and there are no air leaks.
	2d. NEG. is depleted.	2d. Replace NEG. pump. Using INFICON part # 930-425-P1. See section 15.7 on page 15-15.
3. “Electron Multiplier fault.” message at user interface.	3a. High pressure in vacuum system caused by the failure of the ion pump to pump Ar with a NEG installed.	3a. Contact Customer Support (see Chapter 17).
	3b. Short in electron multiplier, or fault in high voltage power supply	3b. Contact Customer Support (see Chapter 17).
4. Poor sensitivity in tune.	4a. Ion source has degraded.	4a. Replace ion Source using INFICON part # 930-205-G1. See section 15.8, Replacing the Ionizer of the Mass Spectrometer, on page 15-40 in this manual.
	4b. Quadrupole/EM assembly has degraded.	4b. Contact Customer Support (see Chapter 17).

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Table 15-1 Diagnosing Problems - HAPSITE

Symptom	Cause	Remedy
	4c. Make sure that there is a full unexpired internal standard canister in the GC, and make sure that a carrier gas can was not placed into the internal standard slot by mistake.	4c. Replace canister with a full internal standard gas can. INFICON Part # 930-433-P6
5. Communication Error - HAPSITE and laptop are not communicating.	5a. External cable has become disconnected	5a. Reconnect cable and reboot system if necessary.
	5b. Problem with port on external computer, or with the HAPSITE internal communications system.	5b. Contact Customer Support (see Chapter 17).
6. Instrument will not turn on.	6a. No 24 volts to the instrument while on battery.	6a. Check battery. Replace battery with a freshly charged one or connect instrument to external supply.
	6b. External supply, Service Module not receiving line power.	6b. Check line power.
	6c. Failure with internal power supplies.	6c. Contact Customer Support (see Chapter 17).
7. Mass spectrum drift with time. Both in resolution and position.	7a. Thermal problem on the high voltage Rf board.	7a. Contact Customer Support (see Chapter 17).
8. Instrument turns on but fails to boot properly.	8a. CPU or hard drive failure.	8b. Contact Customer Support (see Chapter 17).
9. **"Pressure to high to read"** error message at user interfaces.	9a. High back ground. If components have been changed or instrument vented, H_20 or other trace contamination could cause the base pressure above $1.0x10^{-2}$ kPa.	9b. System should clean itself out after a few hours of pumping. (Best if left over night.) Note: The pressure will decrease above the $1.0x10^{-2}$ kPa upper pressure limit while activating an NEG pump. This will shut down the filament and EM.
	9c. Pressure is high. Neg. depleted.	9c. Replace NEG. pump. Using INFICON part # 930-425-P1. See section 15.7, NEG Pump Removal, Installation and Activation, on page 15-15.
	9d. Ion pump shorted.	9d. Change Ion Pump. Contact Customer Support (see Chapter 17).

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Table 15-1 Diagnosing Problems - HAPSITE

Symptom	Cause	Remedy
	9e. Check turbo speed in Service Module program, If less then 1480 Hz, Service Module pumps may need maintenance or the system may have an air leak.	9e. Contact INFICON.
10. **"Pressure too low to read"** message at user interfaces.	10a. Pressure is too low to read. The system has a lower pressure limit of $1x10^{-4}$ Pa.	10a. Open membrane isolation valve. This will bring the pressure to $1\text{-}3x10^{-3}$ Pa.
	10b. Ion pump has failed to turn on.	10b. Close and open the membrane valve a few times. If this fails to shock the ion pump into starting. Contact Customer Support (see Chapter 17).
11. Sample carrier over from one run to the next.	11a. Cold spot in the sampling system.	11a. Check to see if heat zones are at temperature.
12. Internal Standard in back ground.	12a. Low pneumatic (carrier gas) pressure at GC 10-port valve.	12a. Check carrier gas pressure, and replace canister if low.
13. Temperature zones read 99.8 ^{o}C or higher.	13a. Component in the zone is hot.	13a. GCC card has problem and temperature zone has run away. Contact Customer Support (see Chapter 17).
	13b. If zone is relatively cold to touch.	13b. Sensor could be bad. Contact Customer Support (see Chapter 17).
14. Unable to read memory chips on gas canister.	14a. Poor connections, or damaged contact.	14a. Try re-seating canister, or try a known good can. If this fails, contact Customer Support (see Chapter 17).
	14b. Processor card failure.	14b. Contact Customer Support (see Chapter 17).
15. Water enters system during wash down.	15a. Dirt on the gaskets, or improper seal. Clean gasket and check seals. Open top cover and let instrument air dry before reattaching power.	15a. If problem can not be corrected, contact Customer Support (see Chapter 17).
16. Poor Gas Chromatographic Peaks/ Poor GC sensitivity.	16a. GC column has degraded.	16a. Replace Column using INFICON part # 930-489-G1. See section 15.9, Replacing The Column In The Gas Chromatograph, on page 15-47.

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Table 15-1 Diagnosing Problems - HAPSITE

Symptom	Cause	Remedy
	16b. Loose connections at sample loop, concentrator or ferrules.	16b. Check to see if fittings and ferrules are properly installed.
17. Temperature zone fail to heat.	17a. Open heater, or bad controller card.	17a. Contact Customer Support (see Chapter 17).
18. Retention Time in Chromatograph has drifted.	18a. Unstable carrier gas flow.	18a. Contact Customer Support (see Chapter 17).
	18b. Improper GC heating.	18b. Contact Customer Support (see Chapter 17)
19. "**Low Carrier Gas**" Error message at the user interfaces.	19a. Carrier gas pressure is low (pneumatic valve failure can occur.)	19a. Replace with a fresh canister of N2. INFICON Part Number 930-432-P6.
20. Leaking carrier or internal standard canisters while installed in the HAPSITE AM.		20a. Contact Customer Support (see Chapter 17).
21. Elevated chromatogram baseline.	21a. HAPSITE is contaminated.	21a. See section 15.5, Contamination, on page 15-7.
	21b. Improper baseline and threshold settings.	21b. Set baseline and threshold in tune.
22. Higher than normal base pressure.	22a. System could be contaminated. Check the back ground in tune. Look for excessive amounts of water or abnormal levels of organics in the spectrum.	22a. See section 15.5, Contamination, on page 15-7.
	22b. Check for a slight air leak.	22b. Determine source and repair.
23. Organic contamination in the background of the mass spectrum.	23a. System could be contaminated.	23a. See section 15.5.1, Contamination of the Mass Spectrometer, on page 15-8.

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15.4 Required Environment for General Maintenance

The HAPSITE is designed for use in the field, away from ideal laboratory conditions. However whenever the instrument is opened, appropriate care must be taken to assure the internal components remain uncontaminated. For example, removing and replacing batteries can generally be performed outdoors, while avoiding rain or foreign materials from entering the battery compartment. If the instrument is being used in a contaminated hot zone, the HAPSITE must be taken to the decontamination area before the door is opened. Opening the front door breaks the seal of the case and the internal components cannot be decontaminated by simple procedures. In such a situation, even changing batteries should be done in the decontamination area.

Changing the NEG pump or the ionizer requires the use of the Service Module. This module is not designed for use outdoors. The SM should be set up in a relatively clean indoor area with AC power available. When the vacuum flange (where the NEG pump is installed) is open, ensure dust, moisture, oils, or other contaminants are not permitted to enter the Mass Spectrometer manifold.

CAUTION

Be especially careful not to touch the inside surfaces of the manifold with bare hands. The natural oils on even clean hands will produce an interfering background signal on the HAPSITE's sensitive detection system. The use of cotton gloves is required when handling any part of the manifold system.

15.5 Contamination

Contamination of the HAPSITE is defined as the undesirable introduction of a substance or compound into the instrument. This can consist of anything from water, to organic compounds with high or low vapor pressures, to liquids. Keep in mind that the HAPSITE will have no problem detecting trace contaminates on "New Cleaned Components". Most of these contaminates can be flushed from the system by purging the instrument with clean nitrogen and elevating the temperature of heated zones. If the contamination is severe enough, major system components may have to be replaced. The two major sub-systems of the HAPSITE that can become contaminated are the Mass Spectrometer, and the Gas Chromatograph.

NOTE: High activation temperatures will cause the NEG pump to emit large amounts of unwanted compounds. This emission will diminish when the pump cools to operational temperatures.

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15.5.1 Contamination of the Mass Spectrometer

Contamination of the Mass Spectrometer manifold can occur every time an internal component is changed, or vacuum is broken. This can consist of water and/or light hydrocarbons. These will be seen in the mass spectrum even when the isolation valve is closed. (The source of contamination is not coming from the GC module.)

15.5.1.1 Symptoms

Symptoms of contamination are a high background of water or hydrocarbons in the mass spectrum, a high baseline in the TIC plot, or a higher than normal base pressure. Contaminates on the Ion Source or the NEG pump will be driven off as these components are heated. Use this heat to decontaminate the instrument.

15.5.1.2 Decontamination

Decontaminate the vacuum manifold using the Service Module. Pump for a few hours for water or light hydrocarbons, or as much as 24 hours if the contamination is heavy. Remember that various components of the vacuum manifold will get hot and aid in driving off unwanted substances. Turn the Ion Source filament ON and heat the NEG pump to 400 °C when decontaminating a system. If the contamination will not go away after a full day of pumping, the suspect component must be removed and replaced. Remember care must be taken when handling internal components of the vacuum system. Always use new gloves or a clean lint free cloth to avoid contact with skin oils.

15.5.2 Contamination of the Gas Chromatograph

Contamination of the Gas Chromatograph (GC) can occur if hot heavy organic gases are sampled, and condense in the system. These will be seen in the mass spectrum only when the isolation valve is opened. (Background may be high after the isolation valve is first closed, but will drop off after a few minutes).

15.5.2.1 Symptoms

Symptoms of contamination are a high background of hydrocarbons in the mass spectrum, or a high baseline in the TIC plot.

15.5.2.2 Decontaminate

Decontaminate the GC by moving the instrument to an area where the air is relatively clean or connect the transfer line to a canister of a pure gas (N2 or Air). Flush the sampling pathway by setting up a GC method to loop fill for 5 minutes. Repeat this method until the source of the contamination is flushed out. Heating all temperature zones to the maximum allowable setting will aid in the cleansing of the GC. Some compounds may become trapped at unheated locations and might require a longer time period to be flushed out. If the boiling point of the contaminate

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is greater than the maximum temperature of the heated zones, or if a liquid sample has been pulled into the system, the GC and Transfer Line may need to be replaced.

15.5.3 Contamination of the Probe and Probe Line

Contamination of the Probe and Probe Line can occur when the Probe Tip actually touches a sample or a compound "sticks" in the Probe Line.

15.5.3.1 Symptoms

Symptoms of contamination in the probe and probe line include a high continuous base line with the same or similar identification in Survey Mode or a persistent peak in GC/MS Mode (possibly a carryover from a previous sample.)

15.5.3.2 Decontaminate

1. Remove the probe from the HAPSITE.
2. Hold the probe and probe line in a "U" shape.
3. Holding the probe, pour methanol from a squeeze bottle in the probe nut until methanol is visually seen coming out of the probe line through the lemo connector.

WARNING

For safety precautions, wear nitrile gloves and safety glasses when handling methanol. See Figure 15-1.

Figure 15-1 Pouring Methanol into Probe and Probe Line

4. With each end of the probe in a separate hand, move the probe handle up and down until methanol comes out of either end of the probe. Repeat this a couple of times so the methanol can dissolve any contaminants in the probe line. See Figure 15-2.

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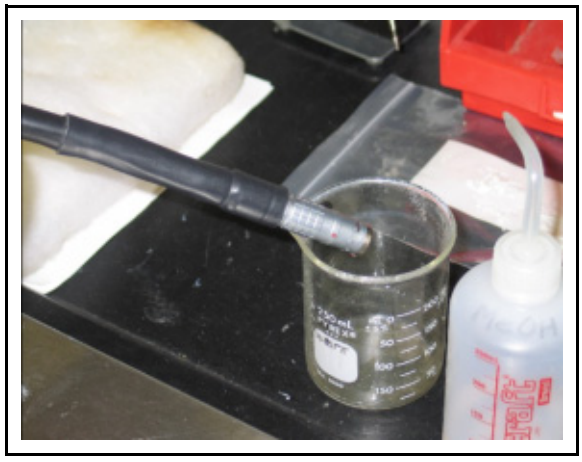
Figure 15-2 Moving Methanol Around in Probe and Probe Line

5 Empty the methanol remaining in the probe line by tipping one end of the probe line downward until all of the methanol drains from the probe line. See Figure 15-3.

Figure 15-3 Empty Methanol from Probe and Probe Line



6 Blow out the probe line with Nitrogen to remove any residual methanol that may be left in the probe line. See Figure 15-4.

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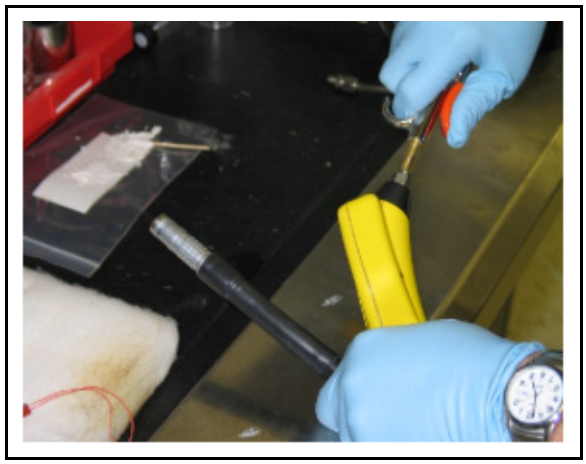
Figure 15-4 Blow Out Probe Line and Probe with N2



7 Re-attach probe line to HAPSITE.

15.6 NEG Troubleshooting

If an MS Pressure Warning message is received on the Front Panel of the HAPSITE or on the laptop (see Figure 15-5), go to the **PRES** option under the **STAT** menu or to the **Service Module Tab** in the **Properties** menu on the laptop in Smart IQ to check the MS Pressure. See Figure 15-6 and Figure 15-7.

Figure 15-5 MS Pressure Error

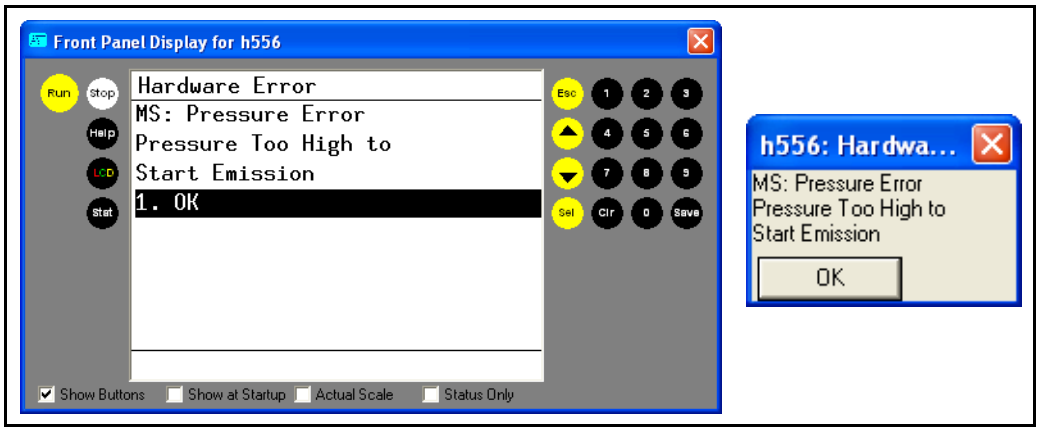


Figure 15-6 Pres Option on the Stat Menu

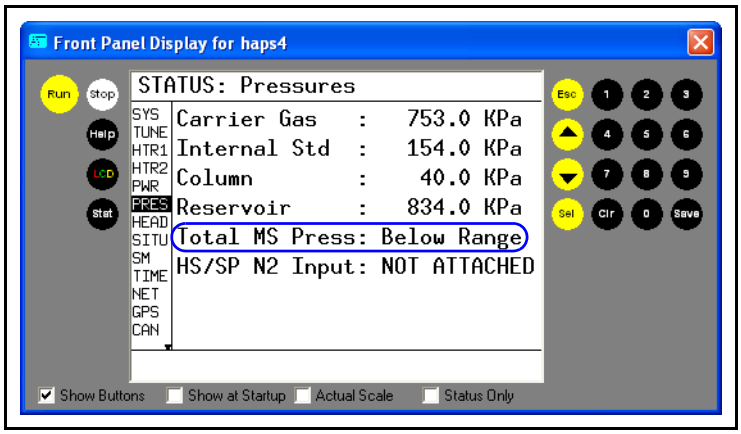
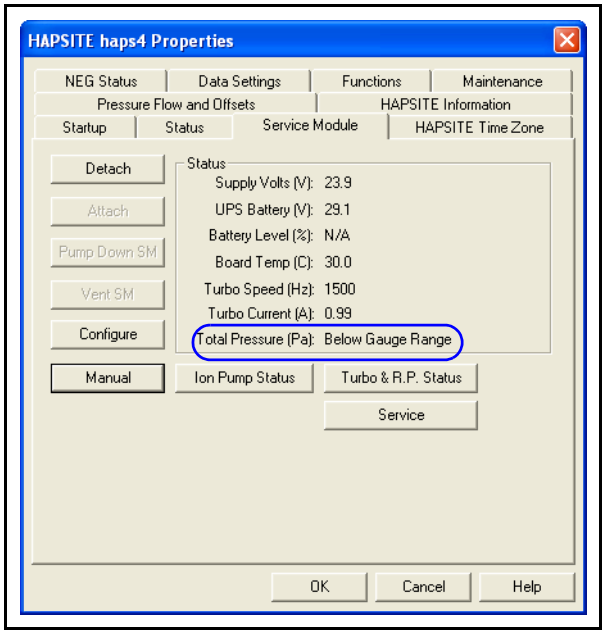


Figure 15-7 MS Pressure on the Service Module Tab



A MS Vacuum Pressure reading of "Below Gauge Range" indicates the HAPSITE is ready to sample. If the MS Vacuum Pressure is 3E-3, order a new NEG Pump. If the MS Vacuum Pressure is 6E-3, replace the NEG Pump.

NEG pumps have an expected life of approximately 150 hours. If the NEG Pump has 70 hours or less consider trying a bakeout (formerly called Reactivation) to extend the NEG Pump's life. To check the NEG Pump hours used, go to the **NEG Status** tab on the **Properties** menu.

HINT: If the NEG Pump has less than 150 hours, a bakeout or reactivation can be tried, though the results are likely to be limited.

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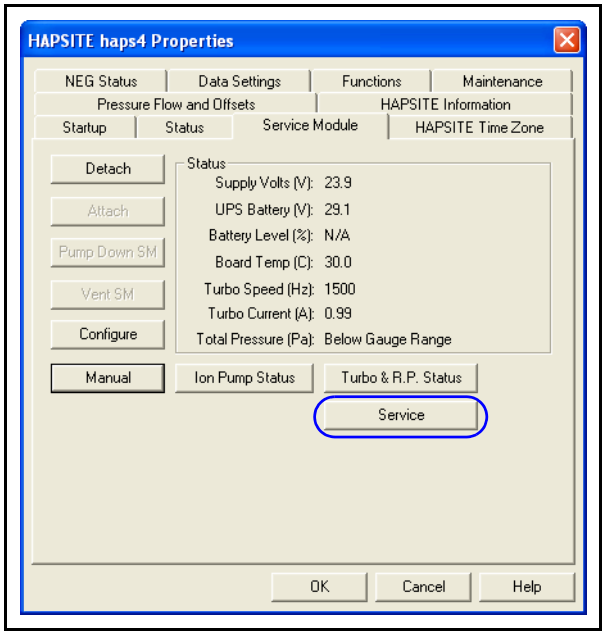
15.6.1 Bakeout Procedure

A bakeout can be performed with or without the use of the Service Module. A bakeout heats the NEG pump to 700 degrees Centigrade for a specified length of time (usually 2 hours).

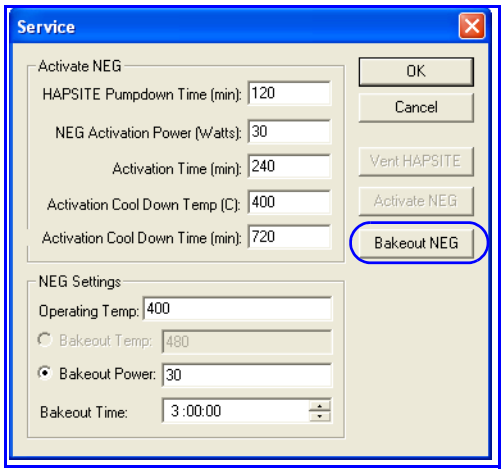
1. Click on the **Service Module** tab of the **Properties** menu.
2. Click on the **Service** button. See Figure 15-8.

Figure 15-8 Service Button on the Service Module Tab



3. Set the **Bakeout Power** to **30**. The **Bakeout Time** is usually set to **2** hours. Refer to Figure 15-9.

Figure 15-9 Service Window



4. Click the **Bakeout** button.

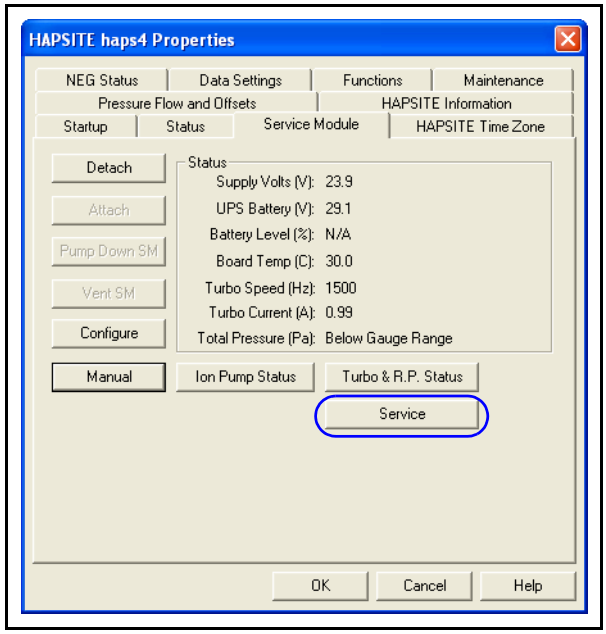
15.6.2 Reactivating the NEG Pump

Reactivating the NEG Pump requires having the Service Module attached to the HAPSITE for at least 22 hours. The procedure is basically the same as activating a new NEG pump. Refer to section 2.7, Service Module, on page 2-18 for more information on setting up the Service Module.

1 Click on the **Service Module** tab of the **Properties** menu.

2 Click on the **Service** button. See Figure 15-10.

Figure 15-10 Service Button on the Service Module Tab



3 Use the Activate NEG settings below as a guideline except change HAPSITE Pumpdown Time to **180**. See Figure 15-11.

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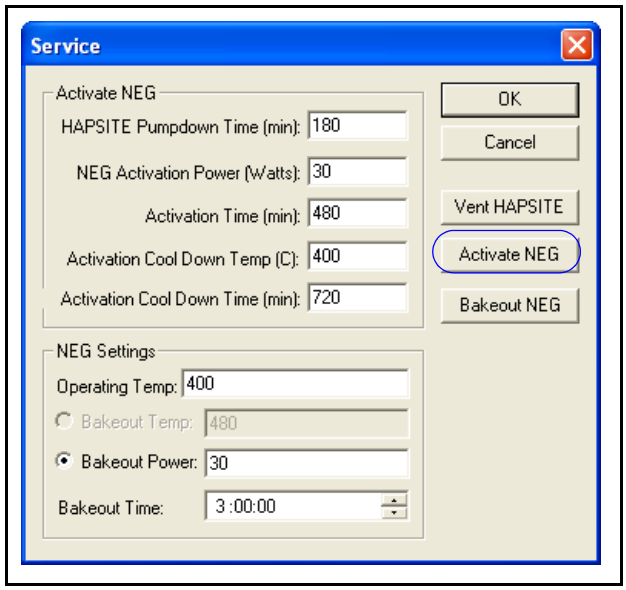
Figure 15-11 Service Window



4 Click the **Activate NEG** button.

5 At the end of the reactivation, the program will detach the HAPSITE from the Service Module as part of the process.

15.7 NEG Pump Removal, Installation and Activation

During boot-up, the HAPSITE will check system components for needed routine maintenance and will notify the analyst if the NEG Pump has reached the end of typical usable life. The notification will be shown on the front display of the HAPSITE after completing the boot-up routine. Replacement of the NEG should be considered at that time.

NEG Pump removal, installation and activation should be performed in the following order:

- Part 1: NEG Pump Removal, section 15.7.2 on page 15-17
- Part 2: Service Module Vacuum Interconnect (VI) Valve Cleaning, section 15.7.3 on page 15-22
- Part 3: Install the New NEG Pump, section 15.7.4 on page 15-27
- Part 4: Leak Check of the Vacuum System, section 15.7.5 on page 15-32
- Part 5: Activation of the NEG Pump, section 15.7.6 on page 15-38

HINT: Read all instructions before starting the procedure making special note of all cautions and warnings.

HINT: Contact INFICON prior to performing the following procedures.

15.7.1 Required Tools and Equipment

- A Service Module instrument
- laptop computer
- New NEG Pump.
- 1/4” Allen wrench.
- Torque wrench set for 70 inch/ pounds.
- gloves (cotton or latex)
- lint free wipes
- methanol
- MicroDuster® III (containing 1,1,1,2 tetrafluoroethane)

CAUTION

Wearing safety glasses and gloves, wipe all tools with methanol before starting this procedure.

Figure 15-12 Required Tools and Equipment

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15.7.2 Part 1: NEG Pump Removal

1. This procedure requires the use of a Service Module. The HAPSITE should be physically on the Service Module and attached. Refer to section 2.7, Service Module, on page 2-18 and Chapter 14, Service Module for more information on setting up and using the Service Module.
2. If the NEG Pump is hot from recent use, let the system cool overnight before performing this procedure. The NEG Pump should cool to below 60^{o} C before proceeding.

WARNING

Do not bypass this cool down step!

3. Vent the HAPSITE by choosing **Vent HAPSITE** on the Service window of the Service Module tab in the Properties window (see Figure 15-13) or from the Front Panel by selecting **System/Service HAPSITE/Vent HAPSITE** (see Figure 15-14.) This starts an automatic process which includes monitoring the cooling of the NEG Pump.

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Figure 15-13 Vent HAPSITE from Smart IQ Software

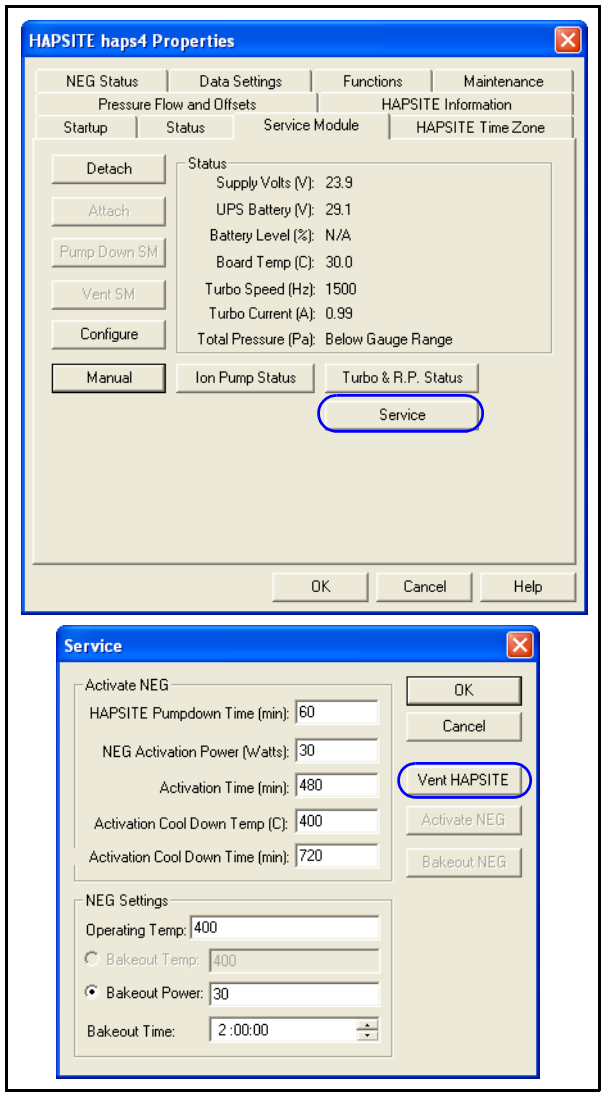

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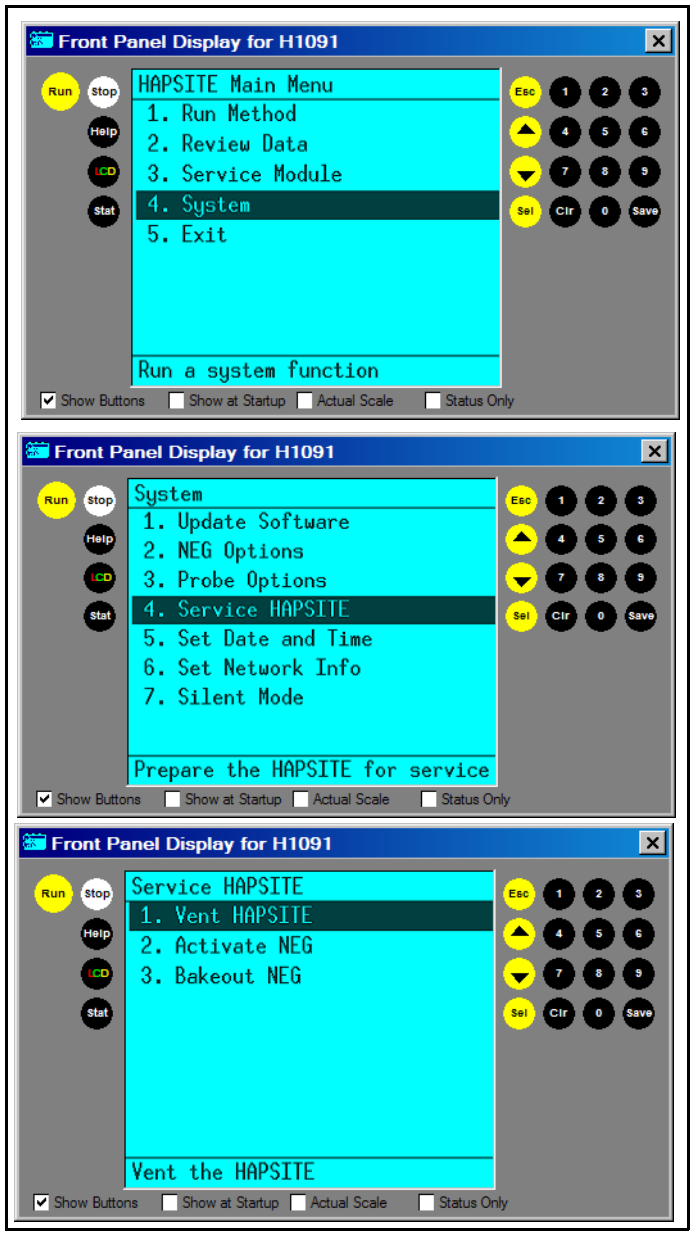
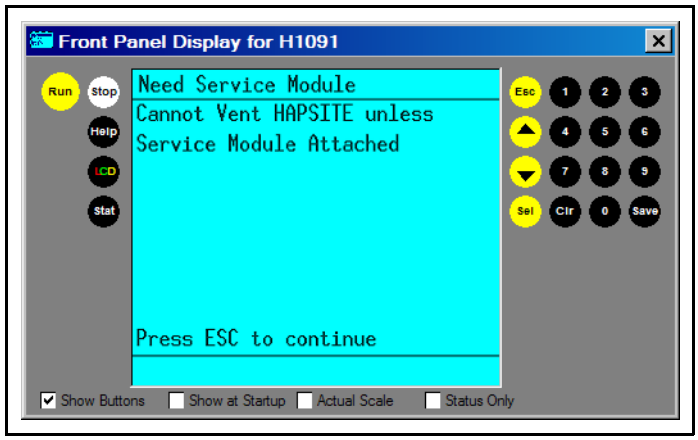
Figure 15-14 Vent HAPSITE from the Front Panel



NOTE: If the HAPSITE is not attached to the Service Module, an error message will be displayed and the process will not proceed. See Figure 15-15.

Figure 15-15 Vent HAPSITE Error Message



WARNING

The NEG Pump becomes very hot when in operation. The software-controlled sequence to remove the pump provides a cool-down period. This sequencing must not be bypassed. In addition to the danger of burns from handling the hot flange, the reactive metal alloys within the pump can ignite if exposed to atmospheric pressure while hot. If this should occur, drop the pump into a bucket of sand and cover the hot NEG Pump with more sand. If this is not practical, set the pump on its black plastic base, on a non-flammable surface. The NEG Pump will burn out in a few minutes.

4 When the screen shows **Vent Manifold Has Been Completed**, unplug the NEG Pump's black cable from the inside of the front panel by loosening the locking ring, then pull the connector straight back.

WARNING

Do not disconnect the NEG Pump before the Vent Manifold Has Been Completed message, as the temperature sensor would then be inaccessible to the controller.

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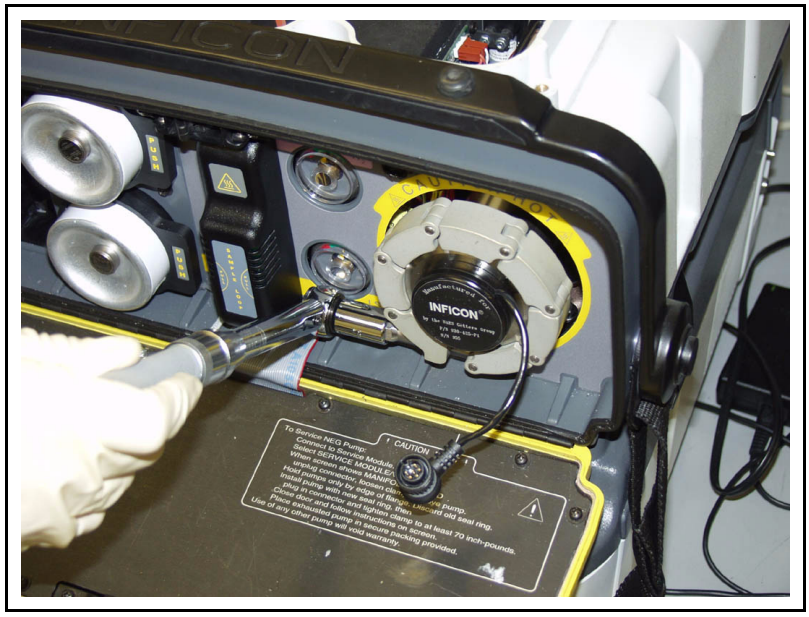
5 To loosen the chain clamp, turn the nut counter-clockwise until loose. See Figure 15-16

Figure 15-16 Loosening Chain Clamp



6 Remove chain clamp.

7 Pull the NEG Pump out.

HINT: The aluminum gasket can not be reused. Bend the old gasket to avoid possible reuse. Place the "USED" sticker which came with the new NEG Pump on the old NEG Pump. Follow the instructions provided with the new NEG Pump to return the used NEG Pump.

CAUTION

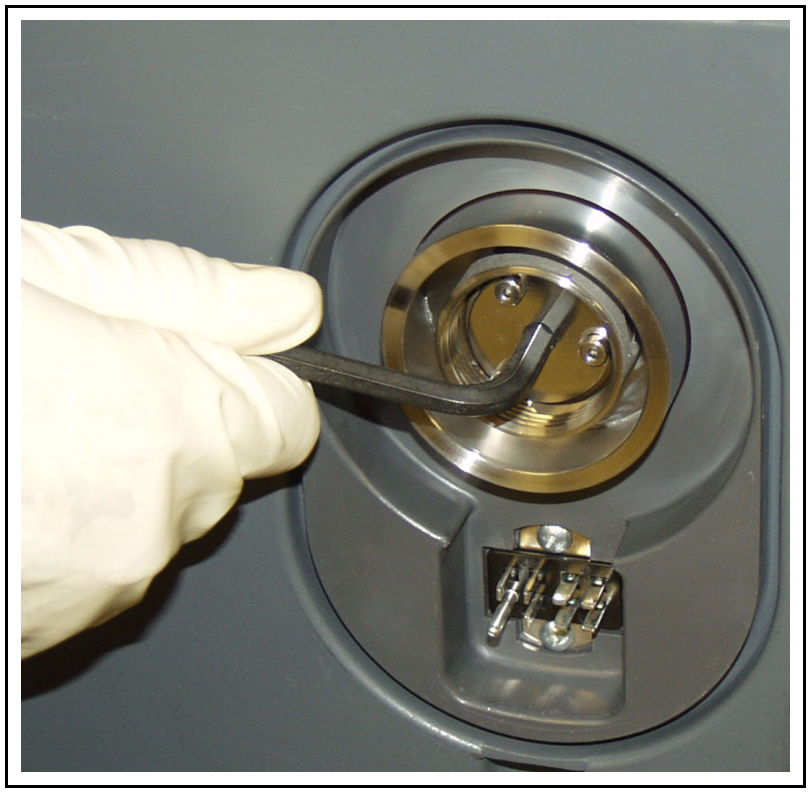
Gloves must be worn while performing all of the following steps.

8 Continue with section 15.7.3, Part 2: Service Module Vacuum Interconnect (VI) Valve Cleaning, on page 15-22.

15.7.3 Part 2: Service Module Vacuum Interconnect (VI) Valve Cleaning

1. Remove the HAPSITE from the Service Module (see section 14.9, Physically Removing the HAPSITE from the Service Module, on page 14-20).
2. On the underside of the Analytical Module remove the VI valve using the 1/4” Allen wrench. See Figure 15-17.

Figure 15-17 Removing the VI Valve



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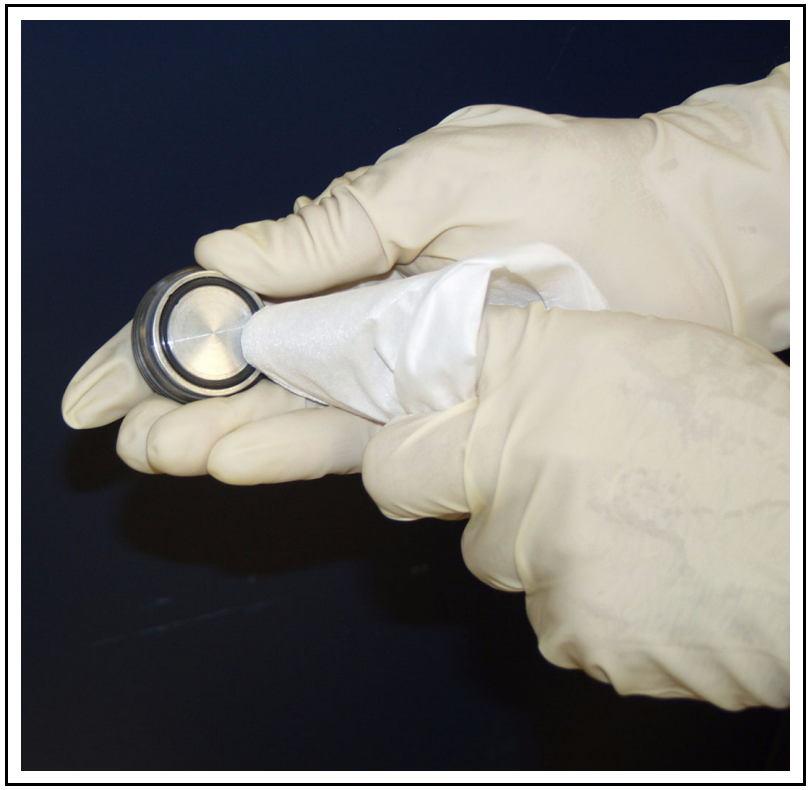
3 Wearing safety glasses and gloves, clean the o-ring on the VI valve with methanol. See Figure 15-18.

Figure 15-18 Cleaning VI Valve O-ring



4 Clean the bottom of manifold where the VI valve was removed with methanol. See Figure 15-19.

Figure 15-19 Cleaning Bottom of Manifold

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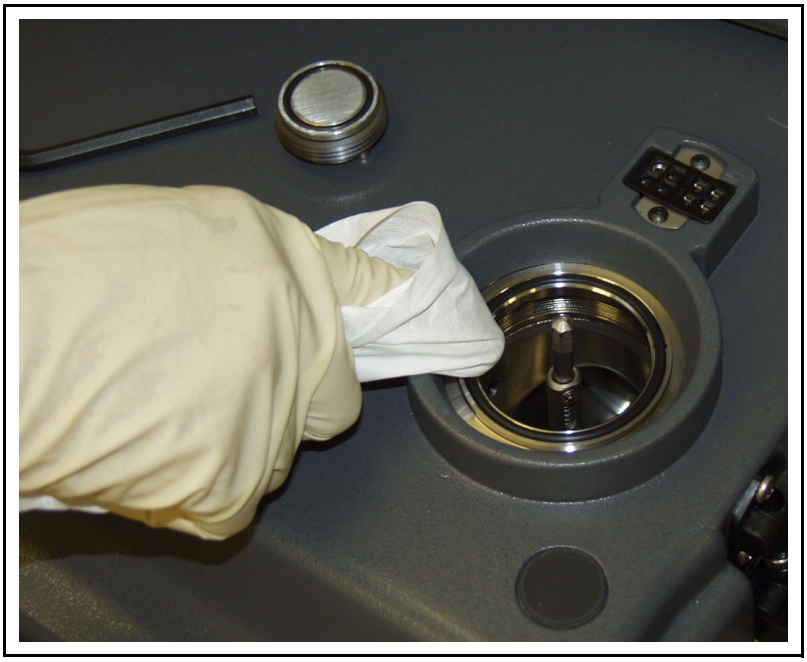
5 Replace the VI valve into the bottom of manifold. Hand tighten. See Figure 15-20.

Figure 15-20 Replacing the VI Valve

6 Clean the o-ring on the Service Module using Methanol. See Figure 15-21.

Figure 15-21 Cleaning O-ring on the Service Module



7 Place the HAPSITE on the Service Module and lock down with the black side latches. Refer to section 2.7.2, Placing the HAPSITE on the Service Module, on page 2-23 for additional instructions, if needed.

8 Continue with section 15.7.4, Part 3: Install the New NEG Pump, on page 15-27.

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15.7.4 Part 3: Install the New NEG Pump

1 Wearing safety glasses and gloves, clean the manifold flange with methanol on a lint free wipe. See Figure 15-22.

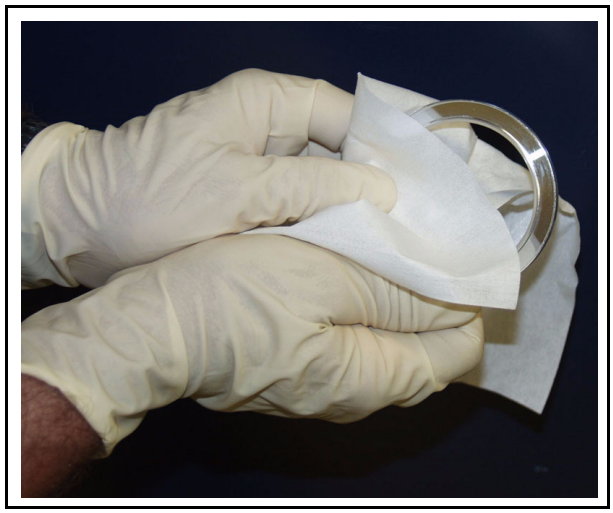
Figure 15-22 Cleaning Manifold Flange

2 Remove the new NEG Pump and aluminum gasket from the shipping container. See Figure 15-23.

Figure 15-23 New NEG Pump and Aluminum Gasket

3 Clean the aluminum gasket with methanol on a lint free wipe. Be careful to handle the aluminum gasket by the outer band. Do not let the knife-edges on the inner ring get nicked. See Figure 15-24.

Figure 15-24 Cleaning Aluminum Gasket



4 Remove the new NEG Pump from the protective container. See Figure 15-25.

CAUTION

The NEG Pump is stored under a vacuum in Nitrogen environment. The shelf life is 5 years. If the vacuum is compromised the shelf life is reduced to 1 year.

HINT: Remove the o-ring and seating ring assembly from the new NEG Pump.

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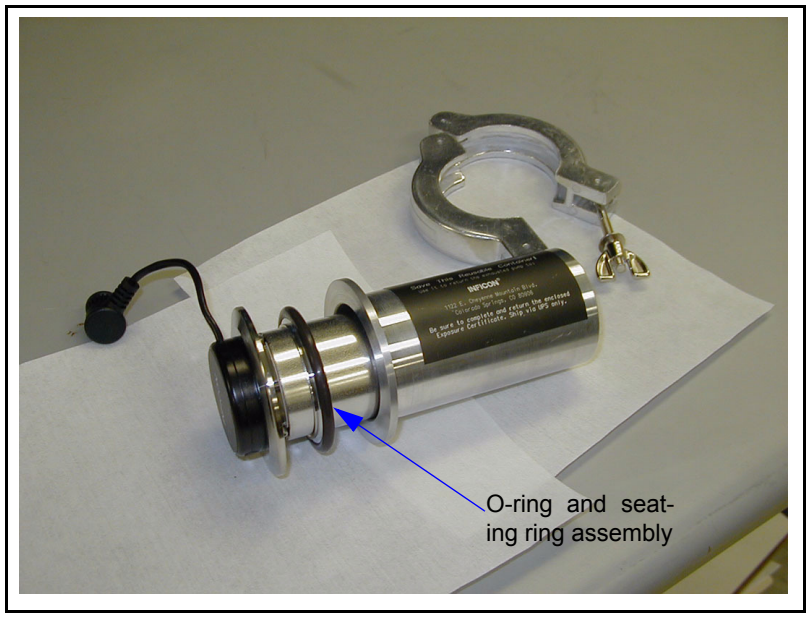
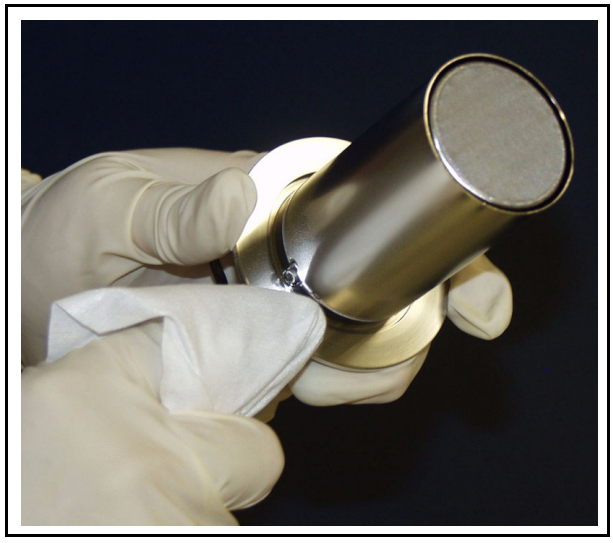
Figure 15-25 New NEG Pump



5 On the new NEG Pump, wipe inside the flange with methanol. See Figure 15-26.

Figure 15-26 Cleaning Flange with Methanol



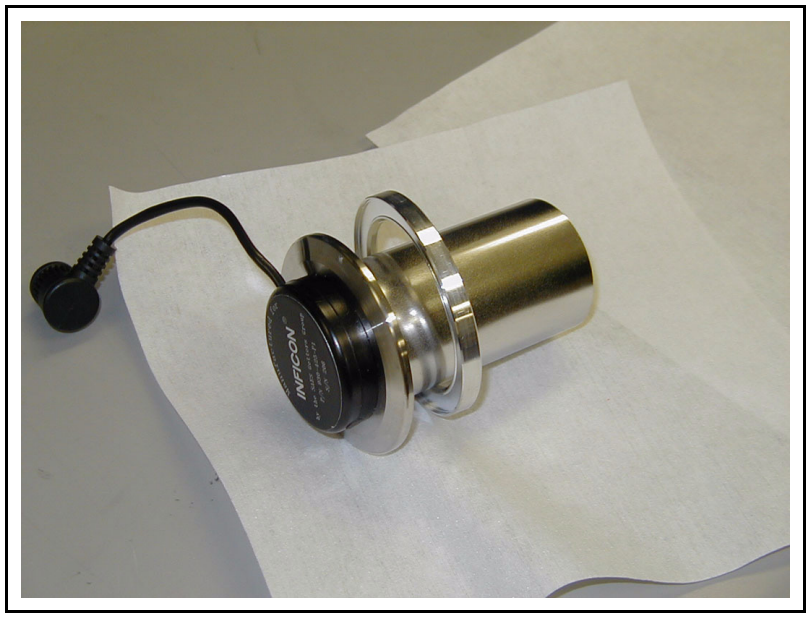
6 Save the rubber “O” ring assembly and container to dispose of the old NEG Pump.

7 Place the new aluminum gasket on the new NEG Pump. See Figure 15-27.

HINT: Inspect the manifold face, ionizer and manifold inside for nicks, residue, and scratches.

HINT: Write down the Serial Number of the New NEG Pump.

Figure 15-27 Aluminum Gasket on NEG Pump



8 Insert the new NEG Pump and aluminum gasket into the manifold. See Figure 15-28.

Figure 15-28 Installing New NEG Pump

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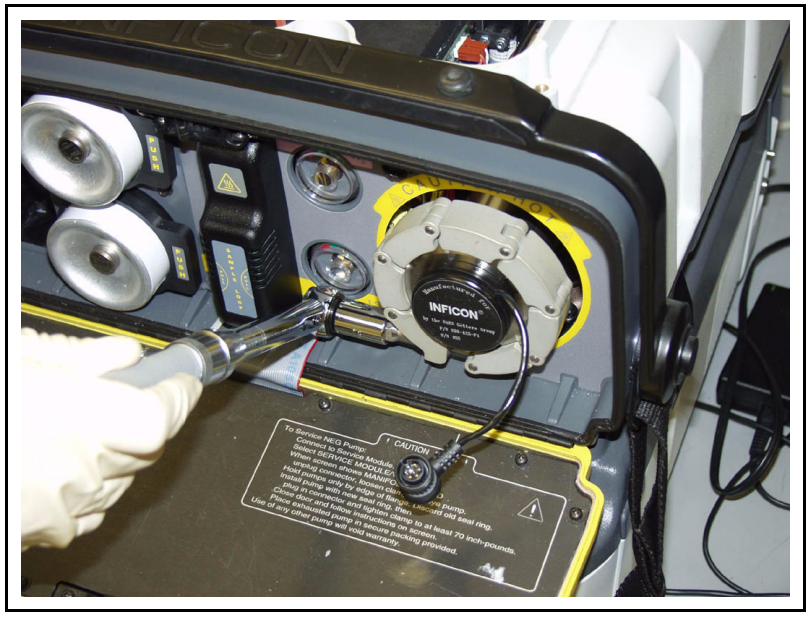
9 Replace the chain clamp insuring that the nut points to the left. Use the torque wrench and tighten to 70 inch/ pounds or 8 Nm. See Figure 15-29.

Figure 15-29 Torquing Chain Clamp



CAUTION

DO NOT connect the black plug from the new NEG Pump to the black socket at this time. This will avoid any accidental heating of the NEG Pump until the system has been leak checked and the NEG has been activated.

10 Place the old NEG Pump into the protective container with the o-ring assembly and place back in the box. See Figure 15-30.

Figure 15-30 Old NEG Pump

11 Perform an **Attach** function by selecting the **Attach** button from the Service Window on the Service Module tab of the Properties section in the Smart IQ software. Refer to section 14.7, Attaching the HAPSITE to the Service Module, on page 14-12.

12 Follow with section 15.7.5, Part 4: Leak Check of the Vacuum System, on page 15-32.

15.7.5 Part 4: Leak Check of the Vacuum System

CAUTION

Checking for leaks is very important. Air leaks will shorten NEG Pump life.

NOTE: In this instruction a MicroDuster® will be used to locate the leaks. Any aerosol type 'canned air' or dust cleaner will work as long as the canned air has the following component: 1,1,1,2-tetrafluorefloroethane. Please check the label for contents. If using a duster with different ingredients, the range and target masses will have to be adjusted to the major ions contained.

1 After the HAPSITE has pumped down for at least two hours, double-click on the **Smart IQ icon**. See Figure 15-31.

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Figure 15-31 Smart IQ Icon

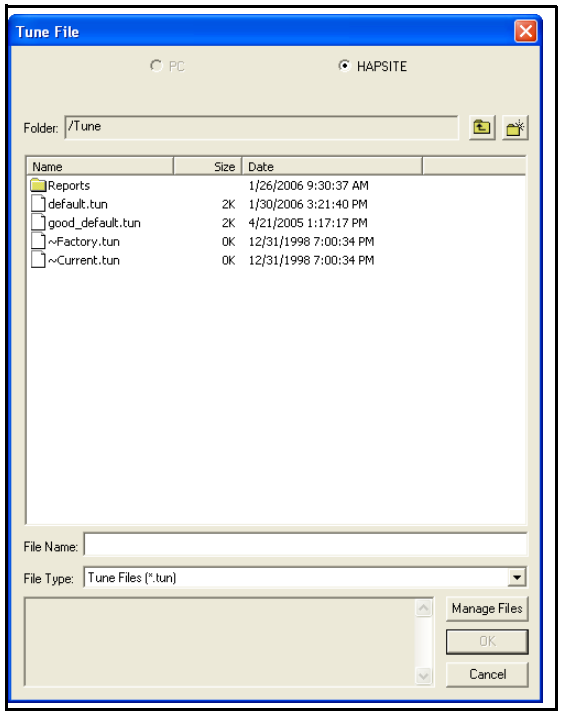
2 Click on the **Tune Icon**. See Figure 15-32.

NOTE: Only the Advanced user access can open manual tune.

Figure 15-32 Manual Tune Icon

3 Select **`default.tun`** file. See Figure 15-33.

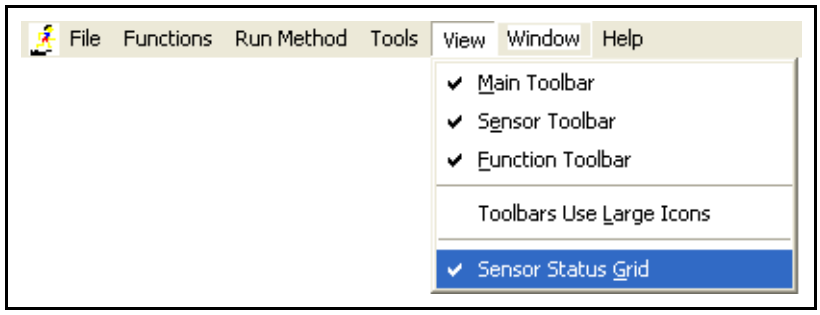
Figure 15-33 Select "default.tun" File



4 Wait for the automated process of opening tune to complete

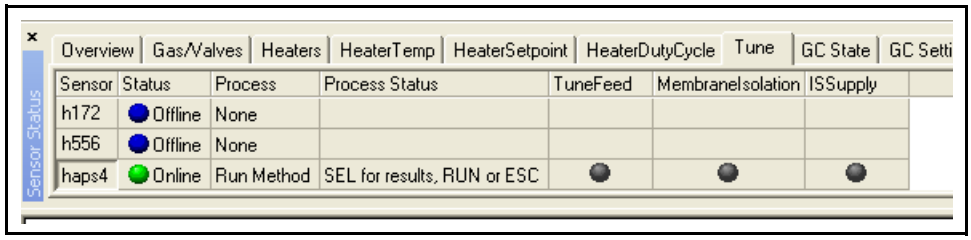
5 Click on **View/Sensor Status Grid**. See Figure 15-34.

Figure 15-34 Opening Sensor Status Grid



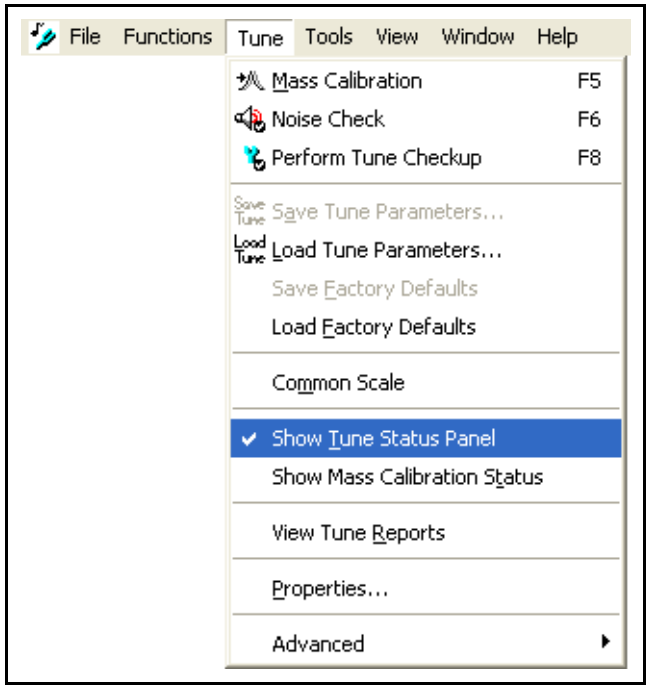
6 Turn off the **IS Supply** and **Tune Feed** valves. See Figure 15-35.

Figure 15-35 Sensor Status Grid



7 Close the Tune Status Panel and the Mass Calibration Status by deselecting each. See Figure 15-36.

Figure 15-36 Closing Tune Status Panel and Mass Calibration Status



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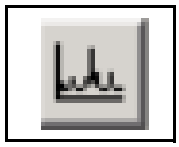
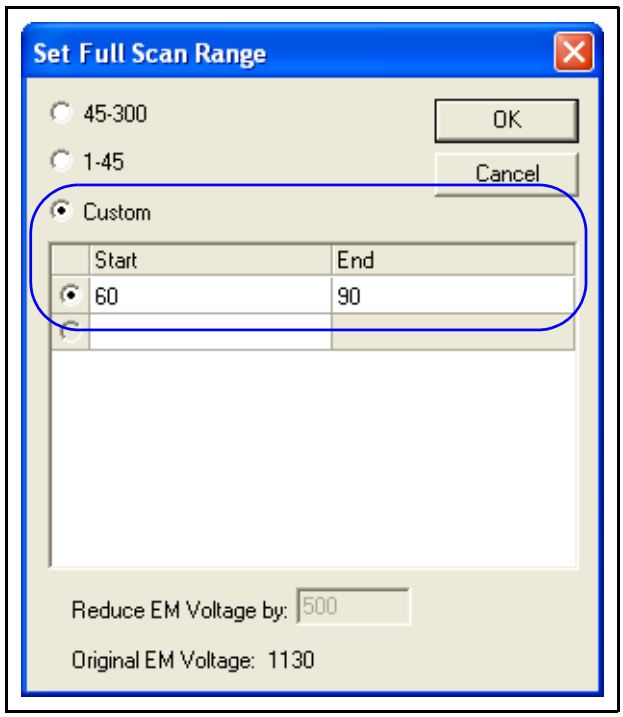
8 Click on the **Full Scan** icon in the Tune window. See Figure 15-37.

Figure 15-37 Full Scan Icon



9 Click the RMB on the X-axis to access the **Full Scan Range**. See Figure 15-38.

Figure 15-38 Setting Full Scan Range



10 Select **Custom**. Type in a range of **60 to 90**. This will enable the analyst to scan for both the **69** and **83** masses (these are the predominant masses in the MicroDuster 1,1,1,2-tetrafluorefloroethane that is being used to check for leaks). See Figure 15-39.

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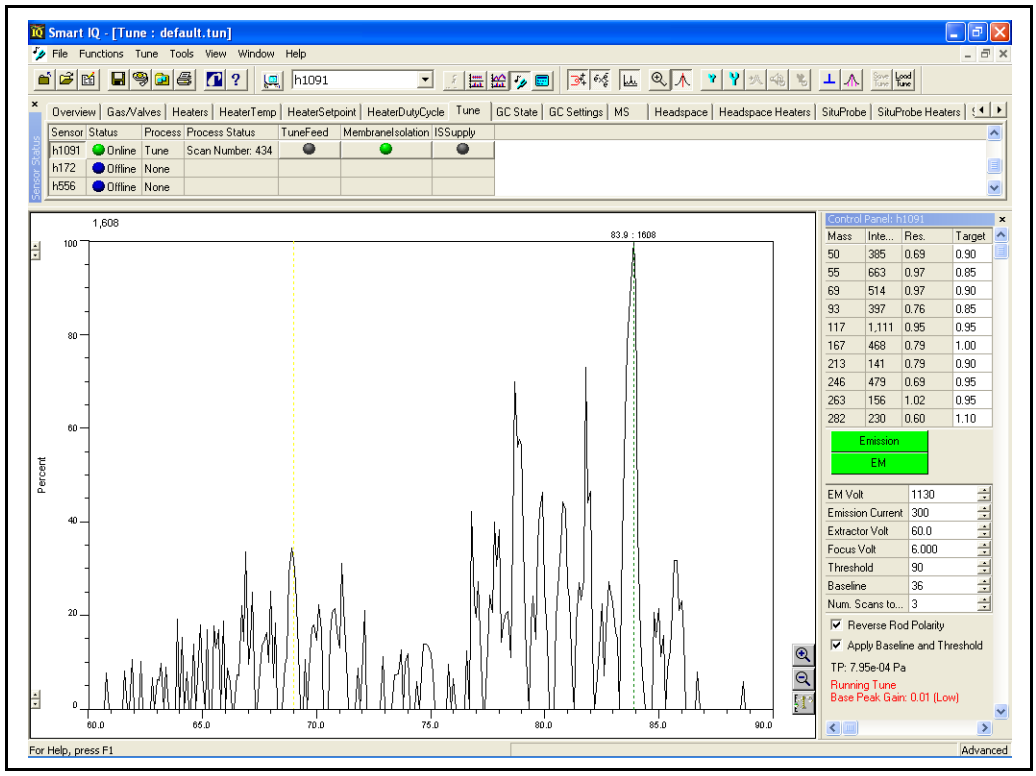
Figure 15-39 Checking For Leaks



11 Spray the MicroDuster around the orifices listed below that could be the source of a possible leak, while checking the scan on the laptop in the tune program. If there is a leak, the response for the **69** and **83 masses will** increase. See Figure 15-40.

The critical areas to be checked are:

- The seam between the NEG and the manifold.
- The seam between the Service Module and Analytical Module on the manifold side.
- The seam between the membrane and the nut that screws into the manifold.
- The seam between the Ion Pump and where it screws into the manifold.

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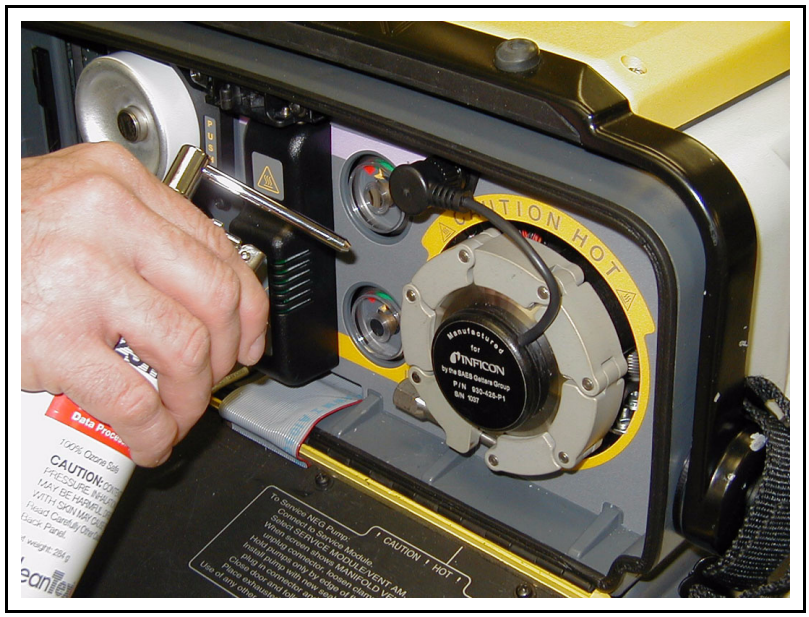
Figure 15-40 Spraying MicroDuster



12 After the manifold has been leak tested and no leaks found, then the black cable on the front of the NEG Pump can be plugged into the black socket above the NEG Pump.

13 In the Tune window, turn the **IS Supply** and **Tune Feed** on. See Figure 15-35.

14 At this point, a tune check should be performed on the system. Click on the **Short Tune** icon. See Figure 15-41. Refer to section 7.2, Autotune, on page 7-2.

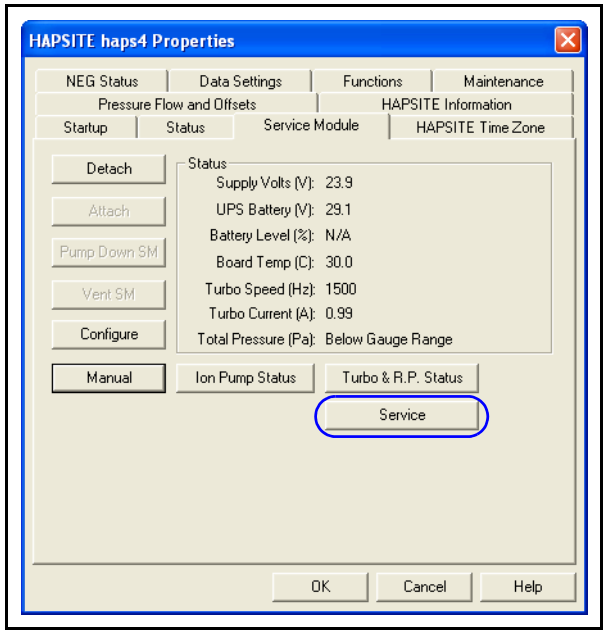
Figure 15-41 Short Tune Icon

15 Follow with section 15.7.6, Part 5: Activation of the NEG Pump, on page 15-38.

15.7.6 Part 5: Activation of the NEG Pump

1. Click on the **Service Module** tab of the **Properties** menu.
2. Click on the **Service** button. See Figure 15-42.

Figure 15-42 Service Button on the Service Module Tab



3. Use the Activate NEG settings below as a guideline.

HAPSITE Pump Down Time (min) = 60

- **NEG Activation Power (Watts) = 30**
- **Activation Time (min) = 480**
- **NEG Run Temp (C) = 400**
- **Cooldown Time (min) = 720**

See Figure 15-43.

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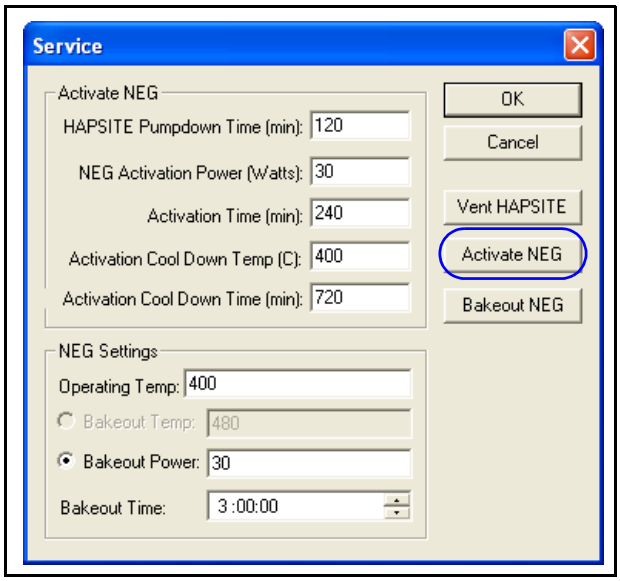
Figure 15-43 Service Window



4 Select **Activate Neg**.

5 When prompted on the Front Panel, enter the **Serial Number** of the New NEG Pump.

6 The NEG Pump will take approximately 18 hours to activate. The process is totally automated and does not need any other interactions until the process is complete.

7 Once the NEG Pump is activated, remove the HAPSITE from the Service Module. (Power the HAPSITE with battery or an external power supply.) Refer to section 14.8, Detaching the HAPSITE, on page 14-17 for instructions on safely removing the HAPSITE from the Service Module.

NOTE: When completed, the Activate NEG process will automatically detach the HAPSITE from the Service Module.

8 Repeat the leak check portion of this process. Instead of checking for a leak between the Analytical Module and Service Module, check the **VI** valve on the bottom of the HAPSITE where the Service Module physically attaches. (Refer to section 15.7.5, Part 4: Leak Check of the Vacuum System, on page 15-32.)

9 If there is a leak, the leak must be sealed by repeating section 15.7.2, Part 1: NEG Pump Removal, on page 15-17 through section 15.7.4, Part 3: Install the New NEG Pump, on page 15-27, the leak check in section 15.7.5, Part 4: Leak Check of the Vacuum System, on page 15-32 repeated and the NEG Pump reactivated by performing section 15.7.6, Part 5: Activation of the NEG Pump, on page 15-38.

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15.8 Replacing the Ionizer of the Mass Spectrometer

The ionizer is located in the mass spectrometer vacuum manifold behind the NEG Pump, or a blank off plate if a NEG Pump is not installed. The NEG pump must be removed in this procedure. If a NEG Pump is installed, the NEG Pump can be reinstalled and re-activated. Some lifetime of the NEG Pump will be lost during this process. If a NEG has greater than 50 hours (approximately 1/2 the expected life) the more economical choice may be to replace the pump, based on the reduced lifetime after exposure to atmospheric pressure.

Tools/equipment required

- Flat head screw driver
- Ionizer removal tool
- 13 mm open end wrench
- 13 mm torque wrench.
- methanol
- lint free cloth
- powder free gloves
- replacement aluminum seal ring (if NEG is to be installed)

CAUTION

If the NEG is to be reinstalled, the NEG Pump must be removed when it is at room temperature. If the NEG Pump has been used within 8 hours, let it cool overnight prior to removal.

1. This procedure requires the use of a Service Module. The HAPSITE should be physically on the Service Module and attached. Refer to section 2.7, Service Module, on page 2-18 and Chapter 14, Service Module for more information on setting up and using the Service Module.
2. If the NEG Pump is hot from recent use, let the system cool overnight before performing this procedure. Refer to section 15.7.2, Part 1: NEG Pump Removal, on page 15-17.

WARNING

Do not bypass this cool down step!

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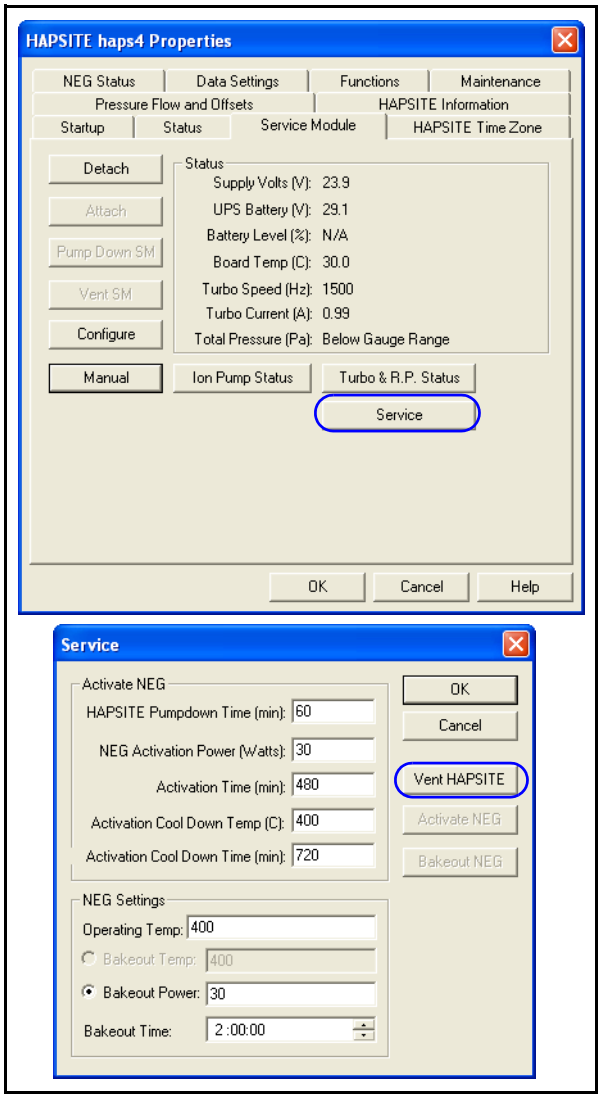
3 Vent the HAPSITE by choosing **Vent HAPSITE** on the Service window of the Service Module tab in the Properties window or from the Front Panel by selecting **System/Service HAPSITE/Vent HAPSITE.** This starts a process which includes monitoring the cooling of the NEG Pump. See Figure 15-44.

Figure 15-44 Vent HAPSITE from Smart IQ Software



CAUTION

The NEG Pump becomes very hot when in operation. The software-controlled sequence to remove the pump provides a cool down period time to cool. This sequencing must not be bypassed. In addition to the danger of burns from handling the hot flange, the reactive metal alloys within the pump can ignite if exposed to atmospheric pressure while hot. If this should occur, drop the pump into a bucket of sand and cover the hot NEG Pump with more sand. If this is not practical, set the pump on the black plastic base, on a non-flammable surface. The NEG Pump will burn out in a few minutes.

4 When the screen shows **Vent Manifold Has Been Completed**, unplug the NEG Pump's black cable from the front panel by loosening the locking ring, then pull the connector straight back.

WARNING

Do not disconnect the NEG Pump before the Vent Manifold Has Been Completed message, as the temperature sensor would then be inaccessible to the controller.

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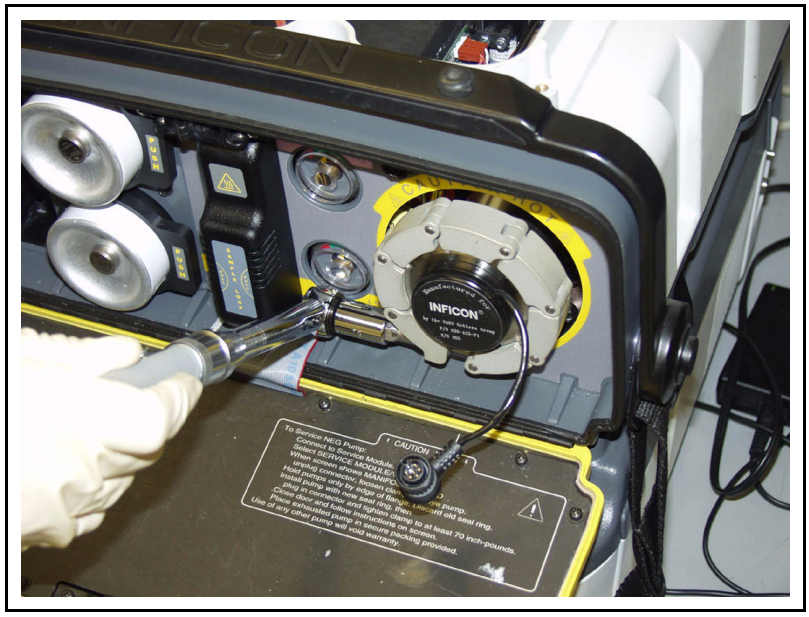
5 To loosen the chain clamp, turn the nut counter-clockwise until loose. See Figure 15-16.

Figure 15-45 Loosening Chain Clamp



6 Remove chain clamp.

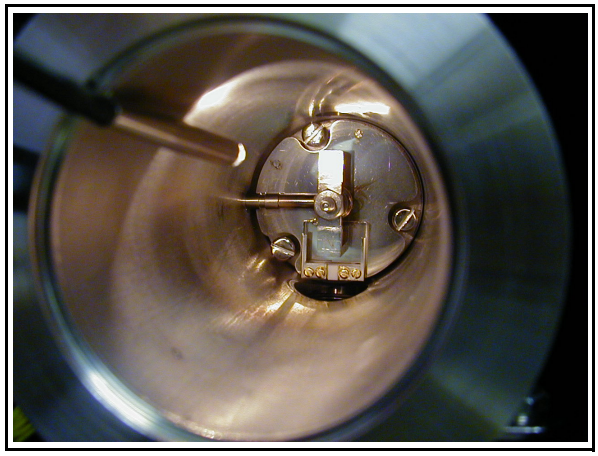
7 Pull the NEG Pump out, remove the NEG Pump and place on a lint free cloth.

8 Immediately bend and discard the old aluminum seal ring.

NOTE: Be careful not to touch any part of the pump with hands.

9 Look inside the manifold to see the ionizer, and a 3/16 inch diameter stainless steel tube entering the manifold from the left and connecting to the small cylindrical ion volume at the center of the ionizer. See Figure 15-46. This tube transfers the sample from the membrane isolation valve into the ion volume, and must be detached and slid into the ion volume before the ionizer can be removed.

Figure 15-46 Ionizer



CAUTION

Insure all tools are clean, (wipe them with methanol), and wear powder free gloves for the rest of the procedure.

10 Insert the forked end of the ionizer removal tool (see Figure 15-47) behind the collar on the stainless steel tube about 1/4 inch from the left side manifold wall.

11 Insure the stainless steel pin on the ionizer removal tool is facing toward the left manifold wall.

Figure 15-47 Ion Source Removal Tool

12 Apply pressure, using the stainless steel pin as a leverage point, slide the extension tube from the membrane isolation valve into the ion volume. The extension tube should disengage completely from the membrane isolation valve.

NOTE: If the extension tube does not slide easily into the ion column, loosen the ionizer then use the ionizer removal tool to reposition the ionizer, enabling the extension tube to slide into the ion volume as displayed in Figure 15-48.

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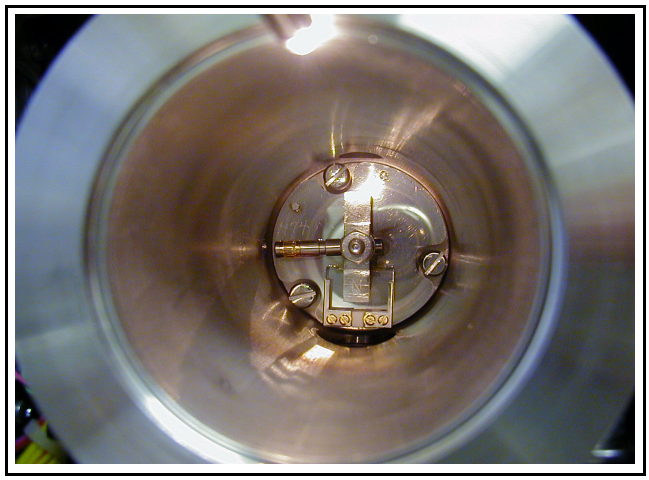
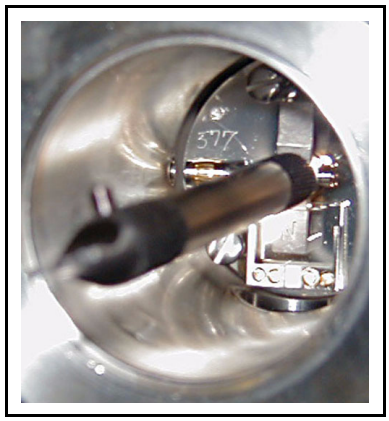
Figure 15-48 Extension Tube Slid into the Ion Volume



13 Use the flat head screw driver to loosen the three screws which secure the ionizer to the quadrupole within the manifold. The screws are captive and will not fall out.

14 Thread the ionizer removal tool onto the stud in the center of the ionizer. See Figure 15-49.

Figure 15-49 Ionizer Removal Tool



15 Use a slight rocking motion pulling straight back and remove the ionizer from the manifold.

16 Remove the extension tube from the old ionizer and carefully insert into the ion volume of the new ionizer.

17 Thread the ionizer removal tool onto the stud in the center of the new ionizer, and insert the ionizer into the manifold. Position the ionizer so the ceramic filament holding block is at the bottom. When the assembler feels the five connector pins registering with their respective sockets, press the ionizer firmly into place, and unscrew the tool.

18 Tighten the three securing screws with the screw driver. Tighten them alternately and gently to ensure that the ionizer is installed straight.

NOTE: As you install and tighten the ionizer, make sure the extension tube remains positioned in the ion volume and is lined up with the membrane isolation valve.

19 With the forked end of the ionizer removal tool, grab the extension tube and slide the extension tube into the membrane isolation valve so the extension tube is not protruding into the ion volume.

20 Install a new NEG Pump or reinstall the old NEG Pump, with a new aluminum sealing ring and go through the activation process. Or put the blank off flange with o-ring on the manifold.

NOTE: See section 15.7.4, Part 3: Install the New NEG Pump, on page 15-27 through section 15.7.6, Part 5: Activation of the NEG Pump, on page 15-38 for detailed information regarding NEG Pump installation.

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15.9 Replacing The Column In The Gas Chromatograph

The gas chromatograph column in the HAPSITE is a 30 m x 0.32 mm column. The flow through this column has been preset to deliver 3 mL/min flow of nitrogen through the system. Replacement columns should possess the same dimensions as the original column to ensure proper function of the HAPSITE. Before replacing the column with any other dimension, contact INFICON.

Tools/Equipment Required

- 1/4 inch open end wrench
- 1/2 inch open end wrench
- needle nose pliers
- flat head screw driver
- #2 Phillips-head screwdriver

Procedure for Replacing the GC Column

1 To replace a column first remove the top yellow cover. Remove the captive screws and the LEMO connector nut. See Figure 15-50.

Figure 15-50 Removing Yellow Cover

2 Remove the top GC cover as shown in Figure 15-51. This cover serves two purposes: (1) it keeps the heat in the oven and (2) it holds the column in place. There is a connector on the bottom of the column module that connects to the column module board. The column module sits on top of the column module board connector and the GC cover holds them all in place. Using a flat tip screw driver, unscrew the two capture screws on top of the oven cover.

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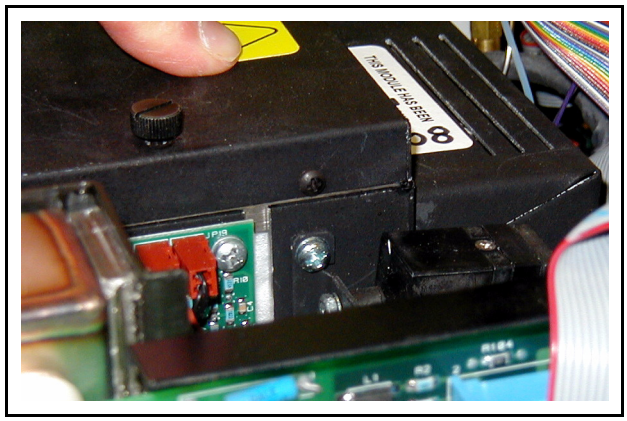
Figure 15-51 GC Cover Removal

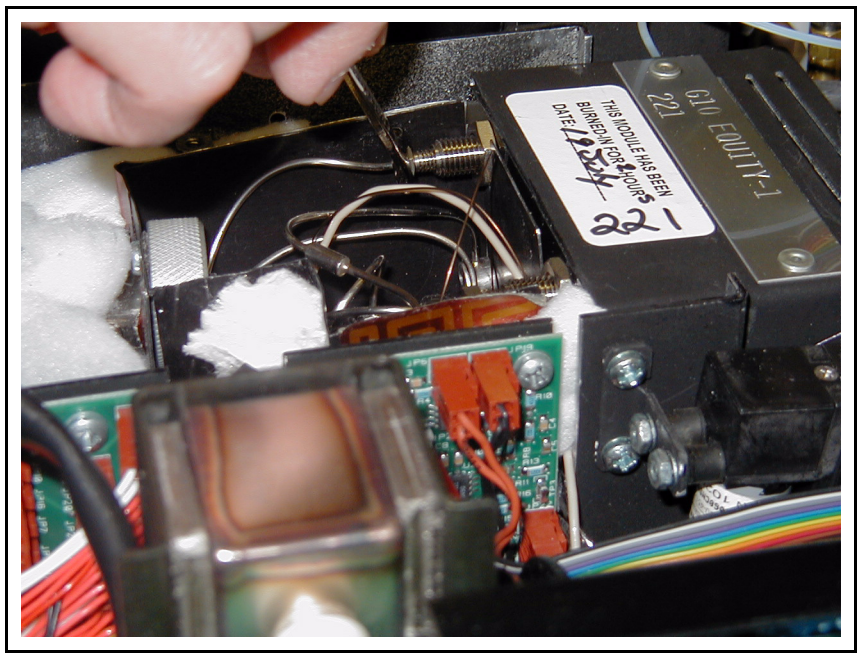


WARNING

If not cooled sufficiently, the gas chromatograph and the isolation valve may be hot enough to cause burns.

3 The lines to the column module must to be removed. Using a 1/4 wrench, unscrew both Swagelok® nuts as shown Figure 15-52.

Figure 15-52 Column Line Detach



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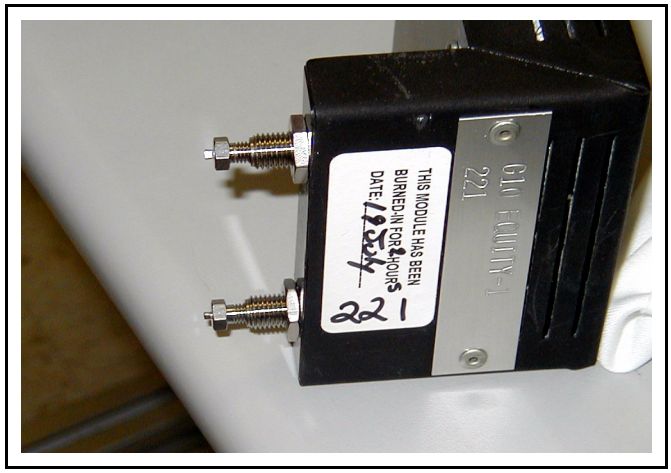
4 Lift up on the column module and remove it.

5 Unscrew the two fittings on the replacement module as shown in Figure 15-53.

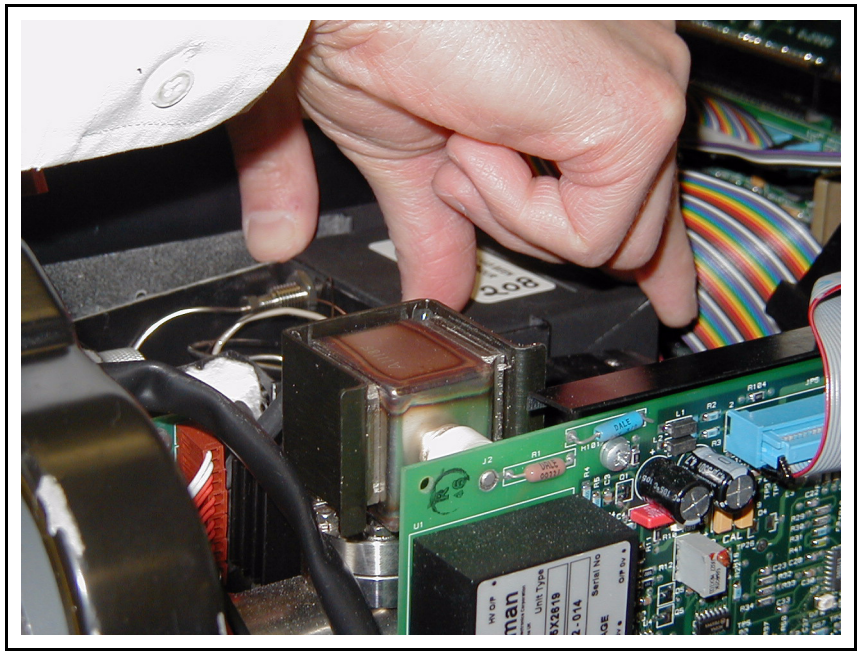
Figure 15-53 Column Module Replacement



6 Insert the replacement column in the exact same manner as the old column was removed. Ensure that the module sits correctly on the connector on the bottom of the column. See Figure 15-54.

7 Reconnect the two stainless steel lines.

Figure 15-54 Replacement Column Module



CAUTION

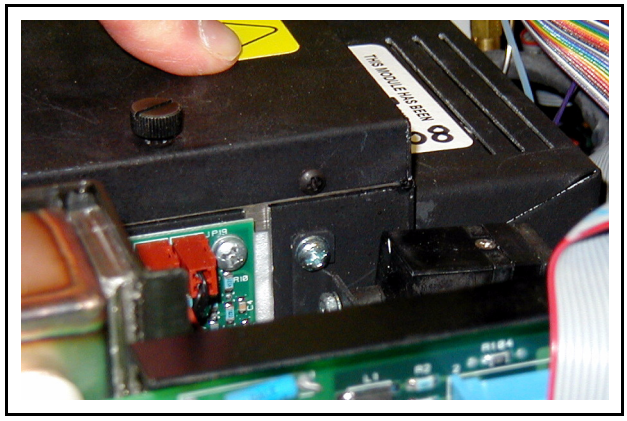
Do not tighten the bulkhead unions unless loose. The bulkhead unions only need to be snug against the wall of the column.

CAUTION

Be very careful to not cross-thread the steel fittings.

8 Replace the GC cover back on retighten the screw. Ensure the column module is seated properly. Figure 15-55

Figure 15-55 Replace GC Cover



CAUTION

The Gas Chromatograph will not operate properly without this cover in place.

9 The temperature of the new column should read room temperature on initial start up. If the temperature of Column Module is not reading accurately, then the Column module is not seated to the Column Control board properly. Reset the column to the column control board and verify the column temperature. To test the replacement column be sure the heaters warm up, the pressure is stable, and run several blank runs test the GC module (IPN 930-244-G1) and replacement column module (IPN 930-489-Gx) as a complete system.

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15.10 Replacing the HSS Needle

Replacement of the needle in the needle assembly should be performed on an as needed basis. Some situations where replacement will be necessary are when the needle becomes significantly deformed, broken, if the point becomes blunted, or if the holes become 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. Open the top yellow cover of the HSS to expose the needle assembly.
2. Using the Phillips screwdriver, loosen and remove the two screws on top of the assembly.
3. Remove the top cover of the needle assembly to expose the needle and the 1/4" connection fittings.
4. Using the 1/4" wrench, loosen both 1/4" connection fittings. Note the position of the N and S labels, which refer to Nitrogen and Sample. See Figure 15-56.

CAUTION

Nitrogen and Sample orientation is very important to avoid pulling the sample into the HAPSITE.

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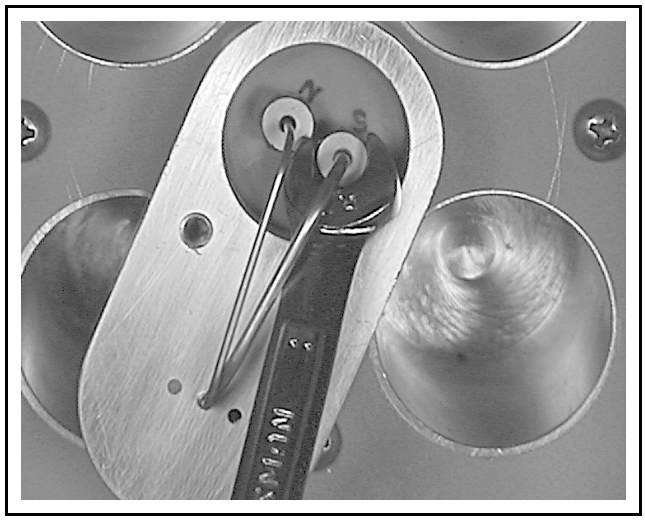
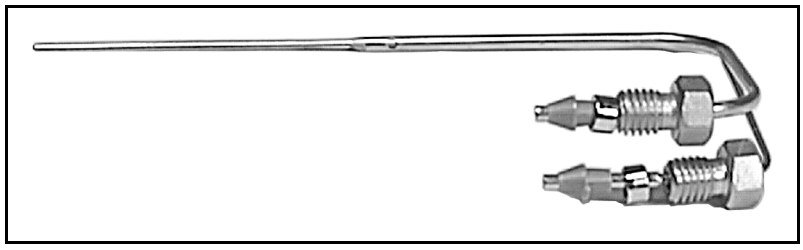
Figure 15-56 Removing the Nuts



5 Once both the connection fittings have been completely loosened, pull straight up on the needle while holding the assembly in place. Set the used needle aside, as well as the nut and ferrules at the end of the needle.

6 Place the nut and ferrules on both parts of the needle where they will be re-inserted into the assembly. See Figure 15-57.

Figure 15-57 Needle Assembly with Nuts and Ferrules



7 Place the replacement needle back through the opening from which the used needle has just been removed.

8 Guide the two connections to the appropriate openings and while firmly holding down the needle to properly seat the ferrules, snugly tighten both connection fittings using a 1/4" wrench. See Figure 15-58.

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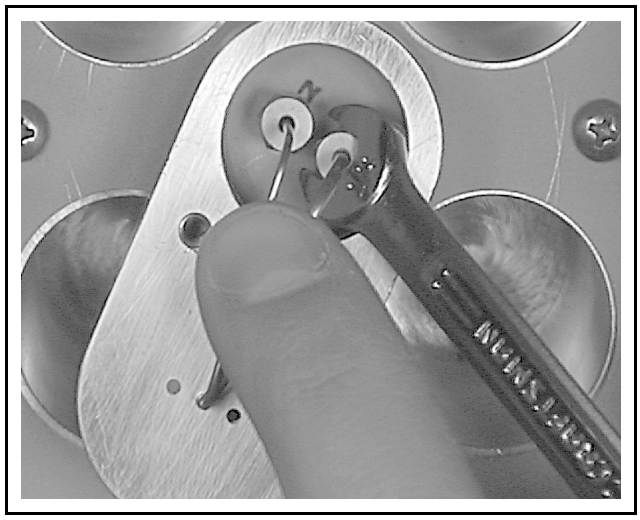
Figure 15-58 Holding Down the Needle while Tightening the Nuts (So Ferrules Seat Properly)



9 Now that the needle is securely in place, replace the cover and two screws. Tighten both screws using the Phillips screwdriver.

10 The HSS is now equipped with a new needle and is ready to operate.

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15.11 Cleaning the Air Filters in the Service Module

CAUTION

Cleaning the air filter requires that the Service Module be opened. This should be carried out only by technically qualified personnel. This must be done in a clean environment.

WARNING - Risk Of Electric Shock

Whenever necessary to gain access to the internals of the Service Module, always disconnect the power cord and remove the battery to reduce the danger of electrical shock.

WARNING - Risk Of Electric Shock

The cover of the HAPSITE should never be removed while the Service Module is connected, while the battery is installed, or when the external power supply is connected as high voltages may be present.

The Service Module has air filters on the inlet air and also on the exhaust air. Both should be checked for cleanliness periodically. The frequency of cleaning is determined by the cleanliness of the surroundings, together with the intensity of use. INFICON recommends that the filters be cleaned approximately every four months. Adjust this schedule accordingly based on filter condition.

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15.11.1 Opening the Service Module

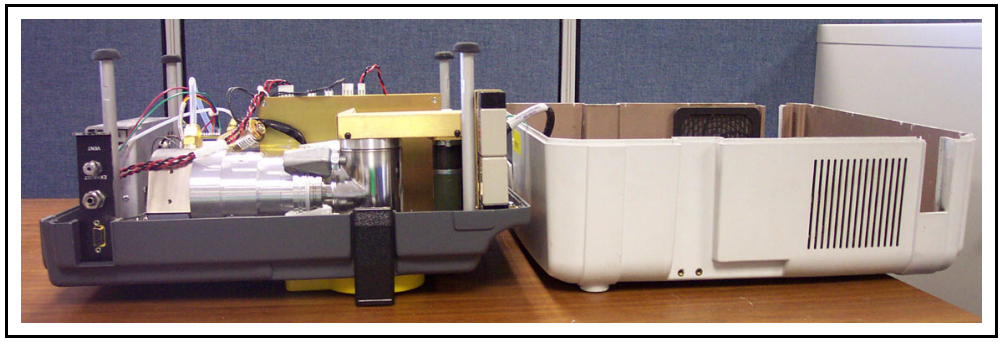
1. If the Service Module has the SM Vacuum Seal in place and under vacuum, vent the SM using the proper venting procedure. Refer to section 2.7.1, Setting Up the Service Module, on page 2-18 and Chapter 14, Service Module.

WARNING - Risk Of Electric Shock

Disconnect the power cord and remove the battery from the Service Module before proceeding!

2. With the HAPSITE disconnected, turn off the Service Module and unplug the power supply.
3. Place the soft yellow plastic cover over the Vacuum Interconnect Valve to protect the VI valve.
4. Turn the instrument over. Do not rest on the plastic latches.
5. In the middle of each of the four rubber feet are Phillips-head screws. Unscrew and remove all four. The screws will stay with the rubber feet.
6. Lift the plastic housing slightly and pivot around the front edge. See Figure 15-59. The cable connecting to the lighted panel and battery door is the pivot. The pivot does not need to be disconnected.

Figure 15-59 Opening the HAPSITE Service Module



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15.11.2 Cleaning The Air Filters

1. The filters are in the fan guards, which are held in place by four plastic clips, see Figure 15-60. Pry two adjacent clips free with finger-tips and slide the filter free.
2. Wash the two filters in soapy water, and rinse them, shaking off the rinse water.
3. Examine the blades of the fan. If they are dirty, wipe them clean or blow the dust off with compressed air.
4. Replace the filters, being sure that the clips are all engaged. The orientation does not matter.

Figure 15-60 Air Filter

15.11.3 Closing The Service Module

1. Replace the plastic cover of the Service Module, by pivoting the cover back into place.

   NOTE: Check the cable connection to the printed circuit board to be sure the connection has not loosened.

   NOTE: The brackets holding the electrical and pneumatic connections may impede the placement of the plastic cover. The cover has small ledges which go inside the brackets. As the cover drops down, however, the brackets may need to be pressed against the ledges.

2. When the cover is fully in place, the four aluminum legs will be in view through the screw holes. If any of the legs are not touching the inside of the plastic, check all around the joint between the plastic cover and the cast aluminum base plate to find out why the cover is not correctly seated. Once the cover is correctly seated, replace the four screws with their rubber feet. Tighten the screws securely. Pick up the Service Module and invert to normal position. The Service Module is now ready to be put back in service.

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15.12 Battery Charger Maintenance and Troubleshooting

WARNING - Risk Of Electric Shock

Do not attempt to open the case of the Battery Charger. There are no user-serviceable parts inside.

15.12.1 Cleaning The Battery Charger

WARNING - Risk Of Electric Shock

Disconnect the power cord and remove any batteries from the Battery Charger before proceeding.

Clean the surfaces with a damp cloth or sponge and (if desired) a mild household cleaner. Do not use excess water or allow water into the receptacles.

Be sure the cooling slots at the back are clean, as well as the holes in the aluminum base-plate. Be sure the Battery Charger is dry before applying power.

15.12.2 Troubleshooting The Battery Charger

15.12.2.1 If No Indicators are Illuminated

This indicates that AC power is not reaching the power supply within the Battery Charger.

- Check the AC outlet to be sure it is "live" by connecting some other device, such as a lamp.
- Unplug the power cord from the outlet and examine the power cord for wear or breakage.
- Disconnect the power cord from the back-panel connector and replace the fuse. The correct fuse is part number 062-0063, rated for 1.25 A, 250 V (time delay). The slider which holds the fuse can be pried open with a small screwdriver once the power cord has been withdrawn.

NOTE: If the battery charger's connector protrudes from the back panel and requires pressing a clip to open the drawer, the battery charger will contain two fuses. Perhaps only one will be blown.

If the problem persists, contact INFICON Customer Support. See Chapter 17, Customer Support.

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15.12.2.2 If the Red Indicator is Flashing

This indicates that the Battery Charger is unable to communicate with the battery (through the center pin).

First, try the battery in a different receptacle. If the problem persists, contact INFICON Customer Support. See Chapter 17, Customer Support.

If the problem is solved, proceed to charge the battery, but suspect a problem with the receptacle. Inspect the receptacle, especially examining the center pin for any insulating material or for signs of looseness. If nothing seems wrong, contact INFICON Customer Support. See Chapter 17, Customer Support.

15.12.2.3 If a Battery does not Accept a Charge

If a battery's charge status does not change during the charging cycle although the respective indicator has been green, the battery may be at the end of life.

To be certain that the problem is not with the Battery Charger receptacle, try to charge the battery in an alternate receptacle. If the problem persists, replace the battery. If the battery should not be near the end of life, contact INFICON to discuss other possible steps. See Chapter 17, Customer Support.

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Chapter 16
Glossary

16.1 Glossary

Air peak . . . . . A response by the mass spectrometer to components of air. The compounds in this peak are un-retained, or uninhibited by the standard 30 meter 1.0 μm film thickness boiling point column. This set of compounds typically elutes 1 to 1.5 minutes from the start of analysis.

Alignment . . . . . A part of the tuning process which assures that the mass peaks fall at their calibrated position on the mass scale.

AM . . . . . Analytical Module, also called the HAPSITE and HAPSITE Smart.

AMDIS . . . . . Automated Mass Spectral Deconvolution and Identification System Software

AMU . . . . . (Atomic Mass Unit) The dimension in which a number of protons and neutrons are stated.

Analyte . . . . . That portion of a sample which comprises compounds to be analyzed; that is, separated, identified and measured.

Atomic Weight . . . . . The AMU representation of the number of protons and neutrons in a specified atom.

Baseline. . . . . A measure of the intensity of the background noise of the mass spectrometer. This is determined using the Noise Check feature in the Tune program.

Calibration Curve . . . . . The mean value of the measured noise level.

Carrier Gas . . . . . The pure inorganic gas used to aid the flow of sample gas through the chromatograph for analysis. In the HAPSITE VOC-free Nitrogen is normally used.

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Column . . . . . The active element of the Gas Chromatograph. The column is a long glass capillary which is lined with a material (called the “stationary phase”) with which the analytes interact based on their physical characteristics, slowing their flow. The degree of this interaction, which is a characteristic of each compound and the chemistry of the stationary phase, progressively separates the different compounds from one another during elution.

Computed Integration Time. . . . . This is the amount of time (in milliseconds) during which the signal from each of the masses in the specified mass range will be gathered by the mass spectrometer. The computation of this time incorporates the Scan Time (sec) and the mass range.

Concentration. . . . . A measure of the amount of a compound in a given volume or weight. This is represented as a ratio, either in mass/mass, mass/volume, or volume/volume terms. For example: 10 ppm/v refers to a mix in which the specified compound is present as 1 X 10^{-5} parts of the whole, in volume terms.

DAC . . . . . Digital to Analog Converter. An element of the electronic circuitry which converts the microprocessor’s digital instructions to the analog requirements for control of the instrument.

DOC . . . . . Declaration of Contamination document that declared what type of chemicals that the instrument has been exposed to.

Electron Multiplier (EM) . . . . . The ion detector of the mass spectrometer. Arrival of an ion causes emission of a burst of electrons, each of which cause more electrons to be emitted, providing a burst of current in response to each ion.

Elution time. . . . . The time from injection of a specific compound onto the GC until the compound appears at the exit (same as Retention Time).

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Equilibrium Time . . . . . The time allowed for a solid or liquid to heat and equilibrate volatile compounds between the sample and associated headspace within a sample vial.

ET . . . . . Elapsed time of sample run. Used for MS scanning.

Extra Measurements . . . . . These determine the number of times the mass spectrometer will scan a mass in SIM analysis before scanning the next mass. Extra measurements effectively increase the response to a mass but also increases the scan time.

Filament . . . . . A hot wire in the ionizer from which electrons are emitted.

Filament Delay . . . . . This specifies the amount of time between the start of analysis and the time which the HAPSITE turns on the filament. Filament delay is a filament preserving measure which allows components of the air peak or solvents to pass through the mass spectrometer before the filament is turned on.

Fit . . . . . A description of how well a reference spectrum matches an acquired spectrum in location and intensity of peaks.

Flow Pressure . . . . . This setting controls the flow rate of Nitrogen through the HSS during the Sample and Purge states.

Flush . . . . . A Headspace Sampling System function which is used to clean out the HSS by heating the sample block and transfer line to 80 C while pushing clean nitrogen through the system (but not into the HAPSITE). Flush is initiated by disconnecting the transfer line from the HAPSITE and pressing the flush switch inside the front door of the HSS.

Full Method . . . . . Full method allows the user to specify a range of masses to scan during analysis. This is used when analyzing for several compounds (typical analysis) or for analysis of unknowns for tentative identification.

IPN 074-397-P1G

GC . . . . . Gas Chromatograph.

Global Search Parameters . . . . . This specifies the various parameters which will be used to identify compounds which have been included in the Library. These parameters are used unless a separate set of parameters is specified in the compound entry of the Library and set at a higher precedence level.

GUI . . . . . Graphical User Interface.

Hand Control Unit . . . . . The inlet probe of the HAPSITE which comprises a heated line and a hand piece with a display and (4) control keys.

HAPSITE . . . . . Analytical Module acronym that stands for Hazardous Air Pollutants on Site.

Headspace . . . . . The gaseous volume above a solid or liquid sample in a closed vial, from which a gaseous sample is taken for analysis.

Heated Line . . . . . The inlet line to the HAPSITE, comprising a PEEK tube with a heating jacket, temperature sensors and protective sheath.

HSS . . . . . Headspace Sampling System. This includes components which, when used in conjunction with the HAPSITE, allows the user to quantify and qualify volatile compounds in liquid and solid matrices.

Initialization . . . . . The act of sending target temperature and pressure settings to the HAPSITE or HAPSITE and HSS, then allowing the instruments to achieve these settings.

Injection . . . . . The application of a discrete amount of gas and/or vapor at the entrance of the gas chromatograph column.

Inlet State . . . . . This refers to a specification of the state of the valves in either the HAPSITE or HAPSITE with HSS. The states of the valves control sampling, analysis, clean-out of the HAPSITE and HSS, and can also be user specified.

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Internal Standard . . . . . a mix of known concentrations of known compounds which are installed in the HAPSITE, mixed with calibration compounds during calibration and with samples during analysis to validate the response of the HAPSITE to the target analytes.

Ion Energy . . . . . These settings in the Tune program directly affect the intensity of mass peaks. Ion energies are commonly used to set the relative mass intensities of the tuning ions.

Ion Volume . . . . . The specific space in the ionizer within which ionization of the sample takes place.

Ion . . . . . An atom or molecule which carries an electric charge due to depletion or addition of one or more electrons.

Ionizer . . . . . The assembly of parts in the mass spectrometer into which the sample flows and which projects a beam of mixed ions into the mass filter.

I.S. Reference . . . . . This section of the Compound Library identifies the target ion of the internal standard which will be used for quantification of the chosen compound.

kPa . . . . . Kilo Pascal. Unit of pressure measurement which is equivalent to approximately 0.145 PSI.

LCD . . . . . Liquid Crystal Display. This refers to the display screen on the front panel of the HAPSITE.

Lead In . . . . . The time which is allowed for the mass spectrometer to stabilize before detecting a mass during SIM analysis.

Library . . . . . A user compiled list of compounds, which includes both analytes and internal standards (if chosen). The Library keeps information such as the name, target ion, concentration, retention time, relative mass intensities, and compound specific search parameters (if selected).

LL . . . . . Left Limit.

IPN 074-397-P1G

LMB . . . . . Left Mouse Button.

Mass Calibration . . . . . A function of the HAPSITE which uses internal standard gas to check the alignment of masses, and also to check the relative intensities of the tune masses.

Mass Fragment . . . . . A molecule (or ion) resulting from the break-up of a parent molecule.

Mass Defect . . . . . The effect on a mass spectrum of the difference between the atomic weight of a compound or fragment and a whole number.

Mass spectrum . . . . . A display of the amount of each mass fragment present at the specific time, plotted as amplitude vs. molecular weight.

MDP . . . . . Molecular Dispersion Pump.

Membrane Isolation Valve . . . . . The valve which supports the Mass Spectrometer's inlet membrane and (when closed) interrupts the flow of analyte from the membrane into the Mass Spectrometer.

Method . . . . . A set of instructions for a function of the HAPSITE.

Molecular Weight . . . . . The AMU representation of the total number of protons and neutrons in a specified molecule.

MS . . . . . Mass Spectrometer.

ms . . . . . milliseconds.

MSDS . . . . . Material Safety Data Sheet.

Multiplier Voltage . . . . . The voltage applied to the multiplier in the mass spectrometer, which directly effects the amplitude of signal and background **noise.**

NEG . . . . . Non-evaporative getter as a vacuum source.

NIST Library . . . . . National Institute of Standards and Technology Mass Spectral Library, commonly referred to as NIST. This is a library of spectra of compounds which can be searched to tentatively identify unknown compounds.

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Noise Check . . . . . An option in the Tune program and on the HAPSITE LCD which checks the system for background noise. The results of the noise check are used to discriminate against baseline noise during analysis.

Pascal (pa) . . . . . Unit of pressure, equal to 1 dyne per cm^2. Equivalent to 7.5×10^{-3} Torr and 1.45×10^{-4} PSI.

PEEK . . . . . Polyetheretherketone. A contamination resistant material used for a number of fittings in the HAPSITE and HSS.

Phase . . . . . The coating on the inside of the gas chromatograph column by which organic vapors are retained.

PPB . . . . . Parts per billion concentration level.

PPE . . . . . Personal Protective Equipment.

PPM . . . . . Parts per million concentration level.

PPT . . . . . Parts per trillion concentration level.

Purge . . . . . A Headspace Sampling System state which is used to remove moisture and sample from the system by pushing clean nitrogen through the HSS and HAPSITE. This function is specified in the Inlet Method in the Acquire program.

Purity . . . . . A description of how well an acquired spectrum matches a reference spectrum in location and intensity of peaks.

Recalculate . . . . . An option in the Calibration section of the Run Method screen which allows the user to compare an analysis to the calibration curve without changing peak integrations. This should be used when the user would like to re-calibrate using the existing parameters. The alternate choice is Search, which does peak integration automatically based on selected calibration curves.

Remote Power . . . . . Power supplied to the HAPSITE and HSS either from the Service Module (for the HAPSITE) or external AC - 24 V(dc) converter.

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Resolution . . . . . These settings in the Tune program affect the way the mass spectrometer resolves peaks. Increasing the resolution narrows the peaks in that mass range, while lowering the resolution will broaden the peaks.

Retention Time . . . . . The time from injection of a specific compound onto the GC until the compound appears at the exit (same as elution time).

Reverse Search . . . . . A function of the NIST search (tentative unknown identification) library which allows compounds which are specified in the user Library to be identified as part of the search.

RH . . . . . Relative humidity.

RIC . . . . . (Reconstructed Ion Chromatogram) A presentation of the chromatographic record which extracts from the TIC and displays the intensity of the ion or ions specified.

Round Trip Time . . . . . The amount of time required to complete a scan of all the masses specified in a SIM method. This includes the number of masses, integration time, number of extra measurements, lead in time, and peak width.

RL . . . . . Right Limit.

RMA . . . . . Return material authorization document. Returning material can not be sent back without this document.

RMB . . . . . Right Mouse Button.

% RSD . . . . . Percent Relative Standard Deviation. This is a measure of the linearity (using mathematical regression analysis) of the concentration levels in the calibration curve for each compound.

Sample Loop . . . . . The portion of the gas chromatograph through which the inlet flow is directed and from which the injection is made.

Sample Vial . . . . . In this situation, sample vial refers to a 40 mL glass vial with a plastic cap and PTFE/silicon septum.

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Sample Well . . . . . A section of the HSS which allows insertion of a 40 mL sample vial, and is used to heat the sample during equilibrium.

Scan Method . . . . . This method specifies the masses to be scanned by the MS, length of the run, filament delay, and scan and integration times.

Scan Time . . . . . In Full Scan analysis, this refers to the cumulative time required to make a scan of all the masses in the range specified. The calculation of Scan Time includes the integration time and the points/AMU.

Septum . . . . . Rubber (usually silicone) part of a sample vial which allows piercing with a needle to inject standards while retaining an 'air tight' seal to retain volatile compounds.

SIM . . . . . (Selected Ion Monitoring) Mass analysis of one or several ion peaks without scanning the entire spectrum.

SIM Method . . . . . Selected Ion Mode method. This allows the user to set up specific masses to be detected during an analysis. This is used for better response to specific masses for known compounds.

SituProbe . . . . . The SituProbe Purge and Trap System is a sampling accessory for the HAPSITE Smart portable GC/MS for in-situ testing of volatile organic compounds (VOCs) in water. Used in combination with the HAPSITE, the SituProbe accessory performs water analyses for qualitative and quantitative results in the field. The SituProbe can be configured for both unattended and continuous sampling as well as user-initiated, manual sampling.

SM . . . . . Service Module.

AutoTune . . . . . A process that occurs when the instrument is initially started up; it automatically performs mass alignment, resolution adjustment and adjustment of relative intensity of the peaks. Smart Tune will take place once the heated zones have reached the proper temperature.

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Spectrum Grab . . . . . This action is performed in the Run Method program to store information about a compound, including name, retention time, and relative mass intensities for the 10 largest mass peaks. This information, when grabbed, is stored in a grabfile.

Target Ion . . . . . The specific ion mass which will be used for quantification or primary identification of a compound in the Library (also referred to as Compound Library).

Temperature Programmable . . . . . Software controlled temperature programming that allows the user to reach temperatures from ambient to 225 °C in a controlled ramp.

Threshold . . . . . A measure of the amplitude of the background noise of the mass spectrometer. This is determined using the Noise Check feature in the Tune program.

TIC . . . . . (Total Ion Chromatogram) A presentation of the flow from the GC as measured by the mass spectrometer, adding up the signals from all the masses programmed and presented as a function of time.

TMP . . . . . Turbo Molecular Pump

Torr . . . . . Unit of sub-atmospheric pressure. Equivalent to 133.3 pa.

Tune . . . . . A term (noun or verb) which generally refers to mass spectrometer settings used to distinguish and detect mass fragments.

Vacuum Interconnect Valve . . . . . The two-part valve which seals the HAPSITE manifold, when closed, and opens it to the vacuum pumps in the Service Module, when open. The Vacuum Interconnect Valve is powered by a motor within the Service Module, under direction of the HAPSITE.

VSO Valve . . . . . Voltage Sensitive Orifice valve. This valve uses voltage applied to the valve to control the size of its orifice. This in turn controls the flow rate of gas through the HSS and HAPSITE, when connected.

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Y-Cable . . . . . A cable which connects to the power supply and enables powering of both the HAPSITE and Headspace Sampling System simultaneously from one converter.

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Chapter 17
Customer Support

17.1 How To Contact Customer Support

Worldwide support information regarding:

- Technical Support, to contact an applications engineer with questions regarding INFICON products and applications, or
- Sales and Customer Service, to contact the INFICON Sales office nearest you, or
- Repair Service, to contact the INFICON Service Center nearest you,

is available at www.inficon.com.

If you are experiencing a problem with your instrument, please have the following information readily available:

- the serial number for your instrument,
- a description of your problem,
- an explanation of any corrective action that you may have already attempted,
- and the exact wording of any error messages that you may have received.

To contact Customer Support, see Support at www.inficon.com.

17.2 Returning Your Instrument to INFICON

Do not return any component of your instrument to INFICON without first speaking with a Customer Support Representative. You must obtain a Return Material Authorization (RMA) number from the Customer Support Representative.

If you deliver a package to INFICON without an RMA number, your package will be held and you will be contacted. This will result in delays in servicing your instrument.

Prior to being given an RMA number, you may be required to complete a Declaration Of Contamination (DOC) form if your instrument has been exposed to process materials. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the instrument be sent to a designated decontamination facility, not to the factory. Failure to follow these procedures will delay the repair of your instrument.

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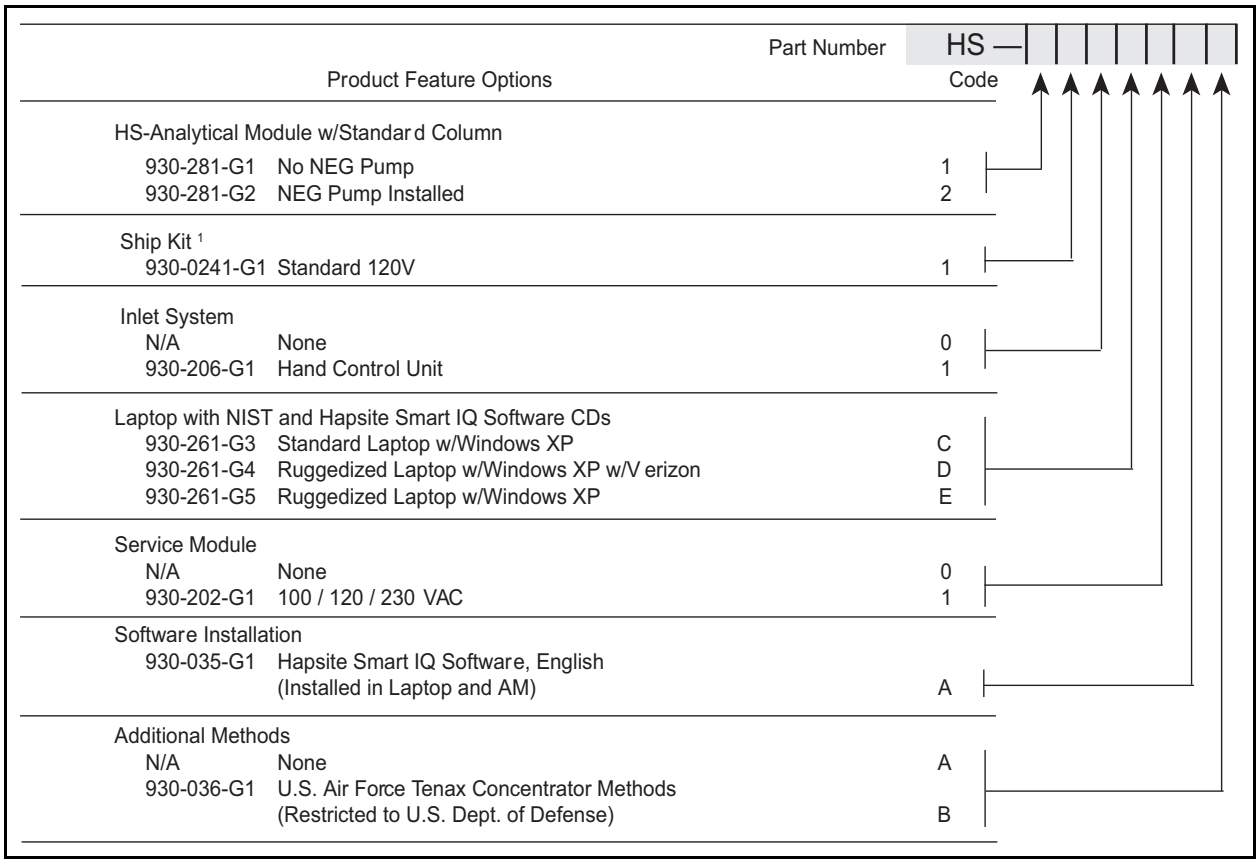
Chapter 18
Part Numbers

18.1 HAPSITE Part Number

Figure 18-1 HAPSITE Part Number



18.2 HAPSITE Smart Accessories

Service Module

930-202-G1 . . . . . 100/120/230 V(ac)

930-202-G3 . . . . . 24 V(dc)

931-205-G1 . . . . . Headspace Sampling System

932-220-G1 . . . . . HAPSITE SituProbe Sampling System

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18.3 HAPSITE Smart Spare Parts

059-329 . . . . . Quick Disconnect Stem for N2

068-002 . . . . . Battery Charger / Service Module Power Cord, U.S.

074-5004-G1 . . . . . HAPSITE Smart User Guide CD

Cables

600-1237-P1. . . . . Ethernet Communication Cable (Crossed) - Yellow Cable (12 ft.)

930-246-G1 . . . . . Hot Swap Cable (Battery Test Bracket)

Kits

930-021-G1 . . . . . Gasket Kit

930-0221-G1 . . . . . Concentrator Tube Nut and Ferrule Kit, 10 each

930-022-G1 . . . . . Tool Kit with Torque Wrench Kit

930-0231-G1 . . . . . Probe Nut and Ferrule Kit, 5 each

930-2020-G1 . . . . . Decon Cap Plug Kit

930-705-G1 . . . . . Sample Loop Tube Kit

930-206-G1 . . . . . Hand Control Unit (Probe)

930-249-G1 . . . . . Concentrator Cover

930-250-G1 . . . . . Sample Loop Cover

Concentrator Tubes

930-251-G1 . . . . . w/Heater, Tenax

930-252-G1 . . . . . w/Heater, Carbopack X (Modified)

930-716-G1 . . . . . w/Heater, Tri-Bed Concentrator Tube Kit

930-4051-P1 . . . . . Cold Weather Insulating Bag

930-4061-G1 . . . . . Battery

Line Insulation

931-405-P2. . . . . Thin Probe Insulation

931-408-P2. . . . . Heavy Probe Insulation

NIST

930-4071-G1 . . . . . NIST Version Upgrade to NIST '05

930-4081-G1 . . . . . NIST '05 (with AMDIS)

IPN 074-397-P1G

930-4141-P1. . . . . VX Conversion Tubes, 10 each

930-4551-G1 . . . . . Backpack, HAPSPACK

Shipping Cases

930-464-P1. . . . . HAPSITE

932-403-P1. . . . . HAPSITE SituProbe (replaces SPS-1062-G1)

930-4131-P1. . . . . HAPSITE Accessory Case

930-469-P1. . . . . 110 V(ac) - 24V(dc) HAPSITE Power Supply

930-470-G1 . . . . . Battery Charger

Column Modules

930-489-G1 . . . . . 30 m, Rtx-1MS, 1.0 um (Standard)

930-489-G3 . . . . . 30 m, SUPELCOWAX 10, 1 UFdF

930-489-G4 . . . . . 30 m, J&W DB-1701, 1.0 um

930-489-G5 . . . . . 30 m, SPB-624, 0.32 mm,1.8 um

930-489-G6 . . . . . 30 m, SPB-1, 4.0 um

930-489-G7 . . . . . 30 m, SPB-5; 0.32 mm

930-489-G8 . . . . . 30 m, SPB-5, 1.0 um

930-489-G9 . . . . . 30 m, Restek RTX-200, 1.0 um

930-489-G10 . . . . . 30 m, EQUITY-1,1.0 um

930-489-G11. . . . . 30 m, 1.5 um, RTX-200

930-489-G12 . . . . . 30 m, RTX-624, 0.32 mm

18.4 HAPSITE Smart Consumables

NEG Pumps

930-070-G1 . . . . . CERTIFICATE for Future Installation at Factory

930-242-G1 . . . . . Installed and Activated at Factory

930-425-P1. . . . . Spare Pump

Carrier Gas Canisters

930-432-P6. . . . . 6 each

930-432-P12. . . . . 12 each

930-432-P24. . . . . 24 each

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Extended Life Carrier Gas Canisters

930-720-G1 . . . . . Extended Life Carrier Gas Deployment Kit (110 liter)

930-4611-P1. . . . . Extended Life Carrier Gas (110 liter cylinder)

Internal Standard Canisters

930-433-P6. . . . . Canister, Internal Standard Gas, 6 each

930-433-P12. . . . . Canister, Internal Standard Gas, 12 each

930-433-P24. . . . . Canister, Internal Standard Gas, 24 each

Combo Pack Canisters

930-477-P1. . . . . Gas Combo Pack (4 Carrier Gas and 2 Internal Standard)

071-747 . . . . . Performance Standard Concentrator / Air (5 analytes) in Methanol 1.2 mL

071-760 . . . . . HAPSITE Chemical Standards Kit, 12 part (for training/practice)

930-703-G1 . . . . . Ion Pump Kit

930-205-G1 . . . . . Ionizer With Magnet

18.5 HAPSITE Upgrade (for 930-280-GX series HAPSITE)

930-718-G1 . . . . . 1 HAPSITE Smart IQ Factory Upgrade (Non-DOD)

930-719-G1 . . . . . 1 HAPSITE Smart IQ Upgrade (U.S. DOD only)

18.6 HAPSITE Smart Training

18.6.1 On-Site Training Course

Contact INFICON for course details.

930-8002-P1 . . . . . Two Day Course

930-8003-P1 . . . . . Three Day Course

930-8004-P1 . . . . . Four Day Course

930-8008-P1 . . . . . Additional students (over three)

Travel Costs

930-825-P1. . . . . Travel for On-Site Course within the continental U.S.

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930-826-P1 . . . . . Travel for On-Site Course outside the U.S. (not Asia)

930-827-P1 . . . . . Travel for On-Site Course for Asia

18.6.2 Syracuse Training Course

Contact INFICON for course details.

930-8012-P1 . . . . . Two Day Course

930-8013-P1 . . . . . Three Day Course

930-8014-P1 . . . . . Four Day Course

930-8018-P1 . . . . . Additional students (over three)

18.6.3 Usage Fees

For customers who prefer two students per HAPSITE, charges for additional instruments will be incurred.Contact INFICON for details

930-831-P1 . . . . . HAPSITE Shipping within the continental U.S.

930-832-P1 . . . . . HAPSITE Shipping outside the U.S. (not Asia)

930-833-P1 . . . . . HAPSITE Shipping to Asia

930-834-P1 . . . . . Headspace Shipping within the continental U.S.

930-835-P1 . . . . . Headspace Shipping outside the U.S. (not Asia)

930-836-P1 . . . . . Headspace Shipping to Asia

18.7 Headspace Spare Parts

070-1204 . . . . . Sample Vials, Case of 100

931-702-G10 . . . . . Vial Needle Guide,10 each

Syringes

070-1205 . . . . . 25 mL Gastight (not supplied with needle), each

070-1206 . . . . . 10 µL Gastight w/Removable Needle, each

070-1223 . . . . . 10 µL w/Fixed Needle, 6 each

070-1224 . . . . . 50 mL Luer Lock, each (not supplied with needle)

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070-1207 . . . . . Replacement 10 µL Needle for Syringe (070-1206), each

931-402-P1 . . . . . Sample Needle, Headspace

071-748 . . . . . Performance/IS Standard Headspace (4 analytes) in Methanol 1.2 mL

930-4151-P1 . . . . . VX Conversion Pads (Headspace), 10 sets

931-406-P1 . . . . . Shipping Case, Headspace

Line Insulation

- 931-405-P1. . . . . Thin
- 931-408-P1. . . . . Heavy
- 600-1131-P30. . . . . Y Power Cable

18.8 Service Module Spare Parts

068-002 . . . . . Battery Charger / Service Module Power Cord, U.S.

930-0211-G1 . . . . . Torque Wrench Kit

930-465-P1 . . . . . Shipping Case, Service Module

600-1001-P15 . . . . . RS232 Cable (15 ft.)

18.9 HAPSITE SituProbe Spare Parts

940-700-G1 . . . . . SituProbe Vessel and Plugs

933-700-G1 . . . . . Collection Tube Replacement Kit

931-401-P2 . . . . . Transfer Line

Line Insulation

- 931-405-P1. . . . . Thin
- 931-408-P1. . . . . Heavy 600-1131-P30 Y Power Cable

932-220-G1 . . . . . HAPSITE SituProbe Accessory (6'), Replacement

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Appendix A
HAPSITE Target Compounds

A.1 Compounds In Order Of Elution

Name	Formula		k	Quantion AMU	I.S. AMU	CAS #
Chloromethane	CH3Cl	a	0.08	50	50	74-87-3
Vinyl Chloride	CH2=CHCl	a	0.11	62	50	75-01-4
Bromomethane	CH3Br	b	0.17	96	9	74-83-9
Chloroethane	CH3CH2Cl	b	0.19	64	69	75-00-3
Acetone	CH3COCH3		0.27	43,58	50	67-64-1
1,1-Dichloroethylene	CCl2=CH2	c	0.37	98	99	75-35-4
Methylene Chloride	CH2Cl2	c	0.39	86	99	75-09-2
Carbon Disulfide	CS2		0.46	76	69	75-15-0
trans-1,2-Dichloroethylene	CClH=CHCl		0.51	96	69	540-59-0
1,1-Dichloroethane	CHCl2CH3	d	0.57	65	69	75-34-3
Vinyl Acetate	CH3COOC(H)CH2	d	0.57	43,86	50	108-05-4
2-Butanone	CH3COCH2CH3		0.63	43,58	69	78-93-3
cis-1,2-Dichloroethylene	CClH=CClH		0.73	96	99	540-59-0
Chloroform	CHCl3		0.78	83	69	67-66-3
1,3,5Tris(trifluoromethyl)benzene	C6H3(CF3)3	e	0.96	Note 1		729-81-7
1,2-Dichloroethane	CClH2CClH2	e	0.98	64	69	107-06-2
1,1,1-Trichloroethane	CCl3CH3		1.07	97	99	71-55-6
Benzene	C6H6		1.22	78	69	71-43-2
Carbon Tetrachloride	CCl4		1.26	117	125	56-23-5
1,2-Dichloropropane	CH2ClCHClCH3		1.51	63	69	78-87-5
Bromodichloromethane	BrCl2CH	f	1.59	83	69	75-27-4
Trichloroethene	ClCH=CCl2	f	1.61	130	99	79-01-6
cis-1,3-Dichloropropene	CClH=CCClH2(H)	g	2.08	75	69	542-75-6
4-Methyl-2-Pentanone	CH3COCH2CH(CH3)CH3	g	2.11	43,58	69	108-10-1
trans-1,3-Dichloropropene	CClH=C(H)CClH2		2.44	75	69	542-75-6
1,1,2-Trichloroethane	CHCl2CH2Cl		2.56	97	99	79-00-5
Toluene	C6H5CH3		2.8	91	79	108-88-3
2-Hexanone	CH3CO(CH2)3CH3	h	3.08	43,58	79	591-78-6
Dibromochloromethane	Br2ClCH	h	3.16	127	117	124-48-1
Tetrachloroethylene	Cl2C=CCl2		4.02	129	167	127-18-4
Chlorobenzene	C6H5Cl		5.07	122	117	108-90-7
Bromopentafluorobenzene	C6BrF5		5.59	Note 2		344-4-7
Ethyl Benzene	CH3CH2C6H5		5.91	91	79	100-41-4
Bromoform	CHBr3	i	6.24	173	167	75-25-2
m-Xylene	C6H4(CH3)2	i	6.35	106	117	1330-20-7
p-Xylene	C6H4(CH3)2	i	6.35	106	117	1330-20-7
Styrene	C6H5CH=CH2		7.25	104	117	100-42-5
o-Xylene	C6H4(CH3)2	j	7.52	91	79	1330-20-7
1,1,2,2-Tetrachloroethane	CHCl2CHCl2	j	7.52	83	79	79-34-5

Internal Standards

Note 1: 69, 75, 99, 125
Note 2: 79, 117, 167

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Appendix B
Calibrating Gas Mixtures

B.1 Acquisition, Preparation, and Handling

The HAPSITE (or any GCMS instrument) must be calibrated at one or more concentration levels of the organic compound(s) of interest for quantitative analysis of these target compounds. In the case of the HAPSITE, the target compounds must be supplied to the instrument as a gaseous mixture of known volume/volume composition (mole/mole % or ppmv levels in air or nitrogen) and at atmospheric pressure.

There are a number of important factors to consider where attention to detail is important in acquiring, preparing, and handling gaseous standard calibration mixtures. These can be organized in three groups:

1. How to establish the desired concentrations of the required compounds. See section B.1.1 on page B-1.
2. Correct delivery of the mix to the inlet of the HAPSITE See section B.1.2 on page B-3.
3. Gas cylinder safety, and contamination checks & corrective steps in the equipment. See section B.1.3 on page B-5.

B.1.1 How to Establish the Desired Concentrations

There are two basic ways to obtain several concentrations of a given mix of compounds. The most obvious is to buy the compounds, premixed to specification, in cylinders containing the several concentrations desired. The second is to buy a master cylinder of the compounds at the highest concentration needed, and dilute to the lower concentrations required. Each of these options is discussed below.

B.1.1.1 Using Cylinders Charged with Each Concentration

To perform a calibration, have the known gas mixtures on hand. A gas supplier (such as Scott Specialty Gases[1]) can provide a choice of cylinder sizes with the compounds of interest mixed in a suitable matrix at the requisite concentrations. The matrix (or balance gas) for the mixture should be specified as "VOC-free Nitrogen" or "VOC-free Air", to minimize the level of background VOC's in the calibration mix.

1.Scott Specialty Gases: (215) 766-8861

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The concentrations for calibration of the various target compounds will probably be defined in the method being followed. The method may specify, for example, 0.1 ppm, 1 ppm, and 10 ppm of each compound. Calibrate the HAPSITE to bracket the concentrations at which the target compounds will occur in samples.

The mixtures received will be tagged with the precise value of the concentration of each compound as delivered; these will be approximately the concentrations ordered. The concentration supplied will generally be within ±10% tolerance; this is termed the *blend accuracy.*

The precise values are the ones to be used in the course of building the calibration libraries, and are accurate to +2 -20 %, depending on the target concentration levels and the certification methods used; this is termed the *analytical accuracy.* The certified concentrations in each cylinder mixture will generally be stable at room temperature conditions for about six months.

The selected gas supplier should be able to advise about the reactivity of the compounds needed, and the materials of cylinder construction to provide the best long term stability of the concentration. The supplier will recommend the use of stainless steel regulators with stainless diaphragms. To minimize stagnant volumes where VOCs can accumulate the regulator body should be designed with minimum internal dead-volume. Use 1 " diameter gauges, or eliminate the gauges altogether. The regulators and the tubing following should be rated for high purity, mildly corrosive (or corrosive) service if any halogenated VOC's are to be delivered.

NOTE: A regulator/transfer line system must be well purged with pure nitrogen or air to remove any residual VOCs prior to use with a cylinder containing a lower concentration mix.

Transfer fittings should be of the stainless steel Swagelok[2] type, and transfer lines should be clean, stainless steel or nickel 1/8 inch tubing. Teflon tubing should be avoided due to its permeability. Ideally, regulators and transfer lines should be heat-traced to maintain above ambient temperatures (35-55 °C) and to reduce adsorption of the higher boiling VOC's.

B.1.1.2 Diluting the Gas On SIte

The comments above, concerning hardware, relate as well to the case of dilution systems. Guidelines to verify acceptable performance of suitable dynamic gas mixing/dilution systems are suggested in the Federal Register (vol. 59, No. 148, Aug. 3, 1994 Proposed Rules, 40 CFR Part 51 Method 205),

Systems conforming to the Method 205 suggestions are available commercially from Environics[3] (Series 2014 Computerized VOC Gas Dilution System) and Alltech[4] (GB-2 Gas Blender).

2.Swagelock (Crawford Fitting Company): (216) 248-4600
3.Environics: (203) 429-5040
4.Alltech: (800) 255-8324

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The materials in the flow stream must be inert to the VOC compounds to be used, and heat-traced to prevent condensation and accumulation of any VOC's in the flow channels. A good gas mixing system minimizes future outlay in certified cylinder gas standard mixes. This allows a lab to require only the cylinders at the highest calibration concentration levels. Lower concentrations (by as much as a factor of 1000) can be prepared by serial dilution (with VOC-free Nitrogen or air) of these cylinder mixes to the desired calibration levels with the gas mixing system. This is probably the most economic route for labs which must frequently do multi concentration re-calibrations for known VOC mixtures.

B.1.2 Correct Delivery of the Mix to the Inlet of the HAPSITE

The HAPSITE is designed to draw in samples which are at atmospheric pressure. Internal standards gas is mixed with the sample in a ratio which is dependent on the flow rate of the sample gas and the suction of the pump.

CAUTION

Connecting the inlet of the Hand Control Unit to a sample at a pressure above or below atmospheric will cause the mixing ratio of the internal standards to be incorrect, so the resultant calibration will be invalid.

There are two basic approaches to assuring that the calibration mix is at atmospheric pressure: a free flow of gas or capture of the gas mixture in an inert sample bag.

B.1.2.1 Free Flow of Gas

The free flow of gas from the regulator of a pressure cylinder is reduced to atmospheric pressure when the impedance to flow is small. This can be achieved by placing a sampling tee at the point where the line becomes large in diameter. The connection of the HAPSITE sample probe inlet should be at right angles to the direction of gas flow with 1/8" stainless steel Swagelok fittings.

WARNING

The excess vent flow (overflow) from this sampling tee (in the gas flow direction) should exit through stainless steel fittings of at least 1/4" size and a short vent line to a fume hood or other exhaust system.

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The smaller "leg" of the sampling tee is coupled to the HAPSITE. The total flow to the sampling tee should be approximately 1 liter/min. to allow sufficient excess over the HAPSITE sampling flow rate which is approximately 200 cc/min. and to prevent external air from being drawn back into the vent "leg" of the sampling tee which would alter the concentrations delivered from the cylinder or mixer.

B.1.2.2 Inert Sample Bag

Ultra clean Tedlar sample bags, dedicated to a given VOC compound mix/concentration level, will be the most economic option for regular calibration (more than once a week) and eliminates the waste of certified gas mix out of the sampling tee vent. The dedicated Tedlar bag can be filled directly from the associated gas cylinder or gas mixing system effluent.

WARNING

Regulate the gas delivery to avoid overfilling the bag.

Alternatively, a bag can be filled by delivery of a set volume of the diluent gas (via a mass flow meter), then adding a set volume of the certified cylinder VOC gas mix, followed by mixing to homogeneity in the bag to obtain the proper dilution. A 12-liter Tedlar bag will allow about 60 HAPSITE samplings of the contents between refills.

The use of properly filled Tedlar bags inherently assures that the gaseous contents are at atmospheric pressure for sampling. A properly filled Tedlar bag will have plenty of flex left in the bag walls so that the bag can be easily kneaded to mix the contents. The bag should not be filled to the point where the bag appears like a firm "air pillow", as the bag would then be at above atmospheric pressure, and could not be sampled accurately by the HAPSITE. In addition, this would lead to eventual leakage along the bag seams, destroying the integrity. The use of straight through on-off valves on the Tedlar bags (such as on 231 -XX series bags by SKC[5], Inc.) should minimize any flow restriction variation in gas delivery to the HAPSITE and are preferred.

Clean Tedlar bags to be filled with a certified gas mix should be filled once with the gas mix and allowed to stand several minutes for preconditioning, then evacuated with a transfer line and a diaphragm vacuum pump and refilled again with the mix.

Fittings on the Tedlar bags are typically 3/16" diameter; the inlet systems for the HAPSITE are 1/8" diameter. Connection of the Hand Control Unit (or the Heated Line) to the Tedlar bag can be made with a stainless steel Swagelok type adapter, 3/16" to 1/8". The recommended parts for this adapter' include:

5.SKC: (800) 752-8472

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3/16" to 1/8" Reducer . . . . . (Swagelok part# SS-300-R-2)

3/16" Teflon Ferrule Set . . . . . (Swagelok part# T-300-Set)

1/8" Nut . . . . . (Swagelok part# S-S-202-1)

1/8" Ferrule Set . . . . . (Swagelok part# SS-200-Set)

The 3/16" O.D. tube on the Tedlar bag valve will slip into and out of the 3/16" nut on the adapter, which can be easily finger tightened to seal leak free on the Teflon ferrule set. Care should be taken to not completely unscrew the 3/16" nut from the adapter each time a Tedlar bag is removed, to prevent dropped and lost nuts and ferrules. The 1/8" end of the adapter is a swaged connection to the 1/8" male Swagelok fitting on the end of the HAPSITE Hand Control Unit, so wrenches will be required to make a leak free connection here.

The Tedlar bag valve should be open only during the HAPSITE sample taking cycle, to save gas usage.

B.1.3 Gas Cylinder Safety, Contamination Checks, and Corrective Steps

WARNING

Safety of operations should always take precedence in the working environment. Gas cylinders should be properly affixed to lab benches with clamps, or chained to the wall for safety. A safety certified gas cylinder cart should be available in the vicinity of where the cylinders are normally used, for moving them and replacing empty cylinders. Gas cylinders should never be transported with the regulator attached!

Tedlar bags may be cleaned for reuse, or replaced with new bags. To clean a Tedlar bag for use with different VOC's or concentrations, partially fill with VOC-free N2 or VOC-free air, heat it to 40-50 °C by wrapping the bag with an electric blanket for several minutes, then evacuate the bag contents through the open valve with a clean transfer line to a diaphragm vacuum pump. This operation should be repeated 3 times for a normal cleaning, then the bag may be stored filled with VOC free N2 or VOC-free air until needed.

To protect the concentration integrity in the bag, care should be taken to purge and refill any standard gas mix after two weeks and to keep the standard gas mix at room temperature between samplings, with the bag valve securely closed,

This is especially important for concentrations below 1 ppmv and for VOC's of limited stability in the Tedlar sample bags. Depending on the compounds (and their concentrations) that were previously present in the bags, and if the bags are to contain less than 1 ppmv standard gas mixes, pre-analyze the bag (after the

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cleaning process above) while the bag is still filled with the VOC-free N, or VOC-free air, using the HAPSITE. The detection of any target compounds in the bag should necessitate recleaning or replacement with a bag known to be "clean".

A supply of clean Tedlar bags can be useful for quick standards preparation by direct liquid injection of VOC's not regularly analyzed into an N_2 or air matrix in the bags. This allows a more convenient and rapid alternative to gaseous cylinder mixes in such uses as new applications development or verification of unknown VOCs by component spiking. This should be qualified by saying that accurate gas standard preparation by direct liquid injection is only recommended at levels greater than 5 ppmv, because the minimum liquid volume deliverable by syringe at an acceptable accuracy and precision is about 0.5 μL. This corresponds to approximately 10 ppmv in a 12 liter Tedlar bag, or approximately 3 ppmv in a 40 liter Tedlar bag. Larger Tedlar bags are available but convenience in regular handling and the possibility of target compound adsorption on the larger interior surface area may be matters of concern.

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Appendix C
Shipping the HAPSITE and Consumables

C.1 Introduction

The HAPSITE instrument and its Service Module are designed to be easy to ship for use at remote locations. The instruments can be reshipped in the cardboard boxes (with the same cut-foam inserts) you received them in. These will probably not suffice for frequent shipping. A heavy-duty fitted shipping case for the HAPSITE is available from INFICON as part number 930-464-P1. The case for the Service Module is part number 930-465-P1. Protected by these cases, the instruments will survive handling by most airline, air freight, and trucking handlers.

While there is room for the necessary cables in each case, additional boxing must be done for certain accessories and consumables, as detailed below.

The batteries should be removed from the HAPSITE and the Service Module before shipping, as their weight, under the shock-loads of shipment, will damage the respective instrument. They will require their own packaging for shipment. The computer, if required at the remote site, should be hand-carried.

NEG pumps can easily be shipped in the box in which they are received. A NEG pump installed in the HAPSITE will not be damaged by shipment.

C.2 Shipping the Canisters

The canisters of Carrier Gas and Internal Standards Gas are pressurized to 700 kPa (100 psig) or more. The canisters are approved by the Department of Transportation (DOT), but they are considered hazardous cargo because of the pressure. They are permitted to be transported on passenger aircraft, but not in the passenger compartment, nor checked as luggage, nor in luggage. Because the labeling of the cartons and the paperwork required are exacting and can be tedious, the easiest approach is to contact INFICON and order the required gases to be shipped directly to your site.

If you choose to ship gases which you have on hand, using the original cartons can save time. Do not ship canisters installed in the HAPSITE; they are still hazardous. If you must use new cartons, refer to the cartons in which you received the canisters for the required labeling.

The regulations governing shipments of hazardous goods are found in the DOT portion of the Code of Federal Regulations: Part 171, 172 and 173 of 49 C.F.R. The gas canisters, pressurized, are classified as hazardous materials under Section 172.101. As shipped from INFICON to you, they meet all the packaging requirements set forth in Section 173.

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Federal Express, UPS, and the passenger airlines are forbidden to accept such cargo unless it is accompanied with the required "Shipper's Declaration for Dangerous Goods" in four copies. Both FedEx and UPS have their own version of this, and will be glad to instruct you in filling it out. The generic version, for use with airlines, is shown after page C-3, and the following text is provided to guide you in filling it out.

In filling out the form, it is important to be precise. In the "Transport Details" box, firmly *cross out* the term "Cargo Aircraft Only". To the right of that *cross out* the term "Radioactive".

The "Proper Shipping Name" and "UN or ID NO." are either:

- Nitrogen, Compressed, UN 1066, or
- Compressed Gases, n. o. s., UN 1956 respectively (Bromo-pentafluorobenzene, Nitrogen)

The "Class or Division" is *2.2*. "Packing Group" and "Subsidiary Risk" are left blank. "Quantity and Type of Packing" for a single six-pack would read:
6 DOT 2M Canisters in Fiberboard Box X 0.04 Kg.

For two six-packs in a single larger box (which must carry the green diamond and other placarding) this would read *12 DOT 2M Canisters in 2 Fiberboard Boxes X 0.08 Kg (Overpack Used)*. The Kg number refers to the total mass of the gas, not the gross weight.

In the "Packing Inst." column write *200*. The "Authorization" column is left blank. The signature section is very important; fill it out completely.

The "Shipper's Declaration for Dangerous Goods" is a "Style F83R" from Label master in Chicago; their phone number is 800 621-5808. They are carbon-less four-part forms and may be available from local stationary suppliers or other sources as well. The form, and all its copies, must have red markings along the borders; black and white copies will not be accepted.

Although the airline will carry the box of canisters in the same cargo hold as the goods you check as baggage, they will not accept hazardous materials at the check-in counter. Take the box of canisters with the form filled out to the desk of your airline at the ***air freight terminal*** at your airport. They will be able to accept it and get it onto the flight.

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C.3 Empty Canisters

It is important to remember that it is the *pressure* of the gas in the canisters which is considered hazardous. The gases themselves are basically nitrogen, which is a simple asphyxiant. (The amount of the organic Internal Standards compounds is 50 ppm and 100 ppm). If you leave the site and have a couple of canisters left, you may decide that they are not worth the trouble and expense to ship back to your base.

In this case, simply discharge them outdoors by inserting any small point into the valve. Once they are empty, they can be disposed of as aluminum scrap.

WARNING

When discharging the canisters, point them away from people and stand upwind of the discharge.

If you have no way to recycle the empty canisters, or are otherwise reluctant to dispose of them, you can ship them back to their point of origin for disposal:

Be certain that they are empty (less than 30 psi) then package them in a *plain* cardboard box, *without* any green diamond label. Mark the box as "**Empty Canisters for Destruction**". Ship them, prepaid, to

Scott Specialty Gases
2330 Hamilton Boulevard
South Plainfield NJ 07080

IPN 074-397-P1G

AMERICAN LABELMARK CO. — CHICAGO, IL 60646 309141-DP

SHIPPER'S DECLARATION FOR DANGEROUS GOODS

(Provide at least two copies to the airline.)

Shipper	Air Waybill No. Page of Pages Shipper's Reference Number *(optional)*
Consignee	

Two completed and signed copies of this Declaration must be handed to the operator

TRANSPORT DETAILS

This shipment is within the limitations prescribed for: *(delete non-applicable)*

PASSENGER AND CARGO AIRCRAFT | CARGO AIRCRAFT ONLY

Airport of Departure

Airport of Destination:

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

Shipment type: *(delete non-applicable)*

NON-RADIOACTIVE | RADIOACTIVE

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification					Quantity and Type of packing	Packing Inst.	Authorization
Proper Shipping Name	Class or Division	UN or ID No.	Packing Group	Subsidiary Risk			

Additional Handling Information

24 hr. Emergency Contact Tel. No._____

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Name/Title of Signatory

Place and Date

Signature
(see warning above)

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