

SPS™ -3

(SAMPLE PREP STATION)

For Use with the Torion® T-9 GC/MS Instrument



User's Guide

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Any comments about the documentation for this product should be addressed to:

User Assistance
PerkinElmer, Inc.
710 Bridgeport Avenue
Shelton, Connecticut 06484-4794
U.S.A.

EU Importer:

PerkinElmer Ltd
Chalfont Road
Seer Green
Beaconsfield
Bucks
HP9 2FX
United Kingdom

Or in the internet: <http://www.perkinelmer.com/contactus/>

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Introduction

Conventions Used in this Manual

Normal text is used to provide information and instructions.

Bold text refers to text that is displayed in the SPS-3 screens.

UPPERCASE text, for example ENTER or ESC, refers to keys on the keypad.

All eight digit numbers are PerkinElmer part numbers unless stated otherwise.

About Notes, Cautions, and Warnings

Three terms, in the following standard formats, are also used to highlight special circumstances and warnings.

NOTE: *A note indicates additional, significant information that is provided with some procedures.*

CAUTION	<p>We use the term CAUTION to inform you about situations that could result in serious damage to the device or other equipment. Details about these circumstances are in a box like this one.</p>
<p>D</p>	<p>Caution (Achtung) Bedeutet, daß die genannte Anleitung genau befolgt werden muß, um einen Geräteschaden zu vermeiden.</p>
<p>DK</p>	<p>Caution (Bemærk) Dette betyder, at den nævnte vejledning skal overholdes nøje for at undgå en beskadigelse af apparatet.</p>
<p>E</p>	<p>Caution (Advertencia) Utilizamos el término CAUTION (ADVERTENCIA) para advertir sobre situaciones que pueden provocar averías graves en este equipo o en otros. En recuadros éste se proporciona información sobre este tipo de circunstancias.</p>
<p>F</p>	<p>Caution (Attention) Nous utilisons le terme CAUTION (ATTENTION) pour signaler les situations susceptibles de provoquer de graves détériorations de l'device ou d'autre matériel. Les détails sur ces circonstances figurent dans un encadré semblable à celui-ci.</p>
<p>I</p>	<p>Caution (Attenzione) Con il termine CAUTION (ATTENZIONE) vengono segnalate situazioni che potrebbero arrecare gravi danni allo strumento o ad altra apparecchiatura. Troverete informazioni su tali circostanze in un riquadro come questo.</p>
<p>NL</p>	<p>Caution (Opgelet) Betekent dat de genoemde handleiding nauwkeurig moet worden opgevolgd, om beschadiging van het device te voorkomen.</p>
<p>P</p>	<p>Caution (Atenção) Significa que a instrução referida tem de ser respeitada para evitar a danificação do aparelho.</p>

	<p>We use the term WARNING to inform you about situations that could result in personal injury to yourself or other persons. Details about these circumstances are in a box like this one.</p>
WARNING	
D	<p>Warning (Warnung) Bedeutet, daß es bei Nichtbeachten der genannten Anweisung zu einer Verletzung des Benutzers kommen kann.</p>
DK	<p>Warning (Advarsel) Betyder, at brugeren kan blive kvæstet, hvis anvisningen ikke overholdes.</p>
E	<p>Warning (Peligro) Utilizamos el término WARNING (PELIGRO) para informarle sobre situaciones que pueden provocar daños personales a usted o a otras personas. En los recuadros como éste se proporciona información sobre este tipo de circunstancias.</p>
F	<p>Warning (Danger) Nous utilisons la formule WARNING (DANGER) pour avertir des situations pouvant occasionner des dommages corporels à l'utilisateur ou à d'autres personnes. Les détails sur ces circonstances sont données dans un encadré semblable à celui-ci.</p>
I	<p>Warning (Pericolo) Con il termine WARNING (PERICOLO) vengono segnalate situazioni che potrebbero provocare incidenti alle persone. Troverete informazioni su tali circostanze in un riquadro come questo.</p>
NL	<p>Warning (Waarschuwing) Betekent dat, wanneer de genoemde aanwijzing niet in acht wordt genomen, dit kan leiden tot verwondingen van de gebruiker.</p>
P	<p>Warning (Aviso) Significa que a não observância da instrução referida poderá causar um ferimento ao usuário.</p>

Safety Practices

Overview

This chapter describes the general safety practices and precautions that must be observed when operating the SPS-3.

This advice is intended to supplement, not supersede, the normal safety codes in the user's country. It is also a supplement to the PerkinElmer standard Safety and Health Policy. The information provided does not cover every safety procedure that should be practiced. Ultimately, maintenance of a safe laboratory environment is the responsibility of the analyst and the analyst's organization.

Please consult all manuals supplied with the SPS-3 and accessories before you start working with the device. Carefully read the safety information in this chapter and in the other manuals supplied. When setting up the device or performing analyses or maintenance procedures, strictly follow the instructions provided.

This equipment requires no specified inspection or preventive maintenance to ensure the continuous functioning of its safety features.

Precautions for the Device



WARNING

Be sure that all device operators read and understand the precautions listed below. It is advisable to supply a copy of the precautions in the device case.



AVERTISSEMENT

Assurez-vous que tous les opérateurs de périphériques lisent et comprennent les précautions énumérées ci-dessous. Il est conseillé de fournir une copie des précautions dans le boîtier de l'appareil.



WARNING

Do not operate the device with any covers or parts removed. Disconnect the power supply whenever cover is removed.



AVERTISSEMENT

N'utilisez pas l'appareil avec des capots ou des pièces retirés. Débranchez l'alimentation lorsque le couvercle est retiré.



WARNING

Do not attempt to make adjustments, replacements or repairs to this device except as described in the accompanying user documentation.



AVERTISSEMENT

N'essayez pas d'effectuer des réglages, des remplacements ou des réparations sur cet appareil, sauf comme décrit dans la documentation de l'utilisateur.



WARNING

Dispose of waste in accordance with the regulations applicable to your locality, state and/or country.



AVERTISSEMENT

Éliminer les déchets conformément à la réglementation applicable à votre localité, état et / ou pays.



WARNING

The protection provided by this equipment may be impaired if the equipment is used in a manner not specified by PerkinElmer.



AVERTISSEMENT

La protection fournie par cet équipement peut être altérée si l'équipement est utilisé d'une manière non spécifiée par PerkinElmer.

The following precautions must be observed when using the device:

- Before using the device make sure that it is placed on a stable surface. Remove any debris, like leaves or rocks, that might interfere with the devices performance. Be sure that the voltage of the device corresponds to the voltage used in your laboratory.
- If using the device in a laboratory be sure that the voltage of the devices power supply corresponds to the voltage used in your laboratory.
- If it is necessary to trap the vapors from the device do not immerse the gas exit line in a liquid, as the liquid may be drawn back into the sample holder. Instead use a non-restrictive charcoal filter to collect the vapors.

Precautions for Customers



WARNING

The laboratory manager is responsible for warning operators of this device about biohazardous materials that are processed in this device and about wastes that result from the operation of this device.



AVERTISSEMENT

Le responsable du laboratoire est responsable de la mise en garde des opérateurs de cet appareil à propos des substances biologiques dangereuses traitées dans cet appareil et des déchets résultant du fonctionnement de cet appareil.



WARNING

The laboratory manager is responsible for disposing of any biohazardous materials and minimizing any biohazards before the equipment is removed from use, transported or processed for disposal.



AVERTISSEMENT

Le responsable du laboratoire est responsable de l'élimination de tout matériel biologique dangereux et de la minimisation des risques biologiques avant que l'équipement ne soit retiré de l'utilisation, transporté ou traité pour être éliminé.

Safe Handling of Gas Cylinders

Helium is the only gas required for use with the SPS-3 device. The major hazard associated with this gas is suffocation. This can occur if the gas is allowed to escape in an enclosed area and displaces the oxygen in the air. Helium is neither explosive nor combustible.

- The Helium Gas comes in a 98 mL steel cylinder at 2500 psi that can be used for up to 150 analyses.



WARNING

The external pressure should range 80psi (551kPa) – 100psi (689kPa) for Helium (He) and Nitrogen (N2).



AVERTISSEMENT

La pression extérieure devrait varier de 551 kPa à 100 psi (689 kPa) pour l'hélium (He) et l'azote (N2).

General Operating Conditions

The SPS-3 has been designed and tested in accordance with PerkinElmer specifications and in accordance with industry safety requirements.

This equipment requires no specified inspection or preventive maintenance to ensure the continuous functioning of its safety features.

The SPS-3 can be used under the following conditions:

- Temperature: +5°C to +45°C (+41 °F to +113 °F)
- Relative humidity: 20% to 80%, without condensation
- Duty Cycle: Continuous

Avoid any adjustment, maintenance and repair of the opened, operating device. If any adjustment, maintenance and repair of the opened device is necessary, this must be done by a skilled person who is aware of the hazard involved.

Whenever it is likely that the device is unsafe, make it inoperative. The device may be unsafe if it:

- shows visible damage
- fails to perform the intended measurement
- has been subjected to prolonged storage in unfavorable conditions
- has been subjected to severe transport stresses.

Environmental Conditions



WARNING

If the device is used in a manner not specified herein, the protection provided by the device may be impaired.



AVERTISSEMENT

Si le dispositif est utilisé d'une manière non spécifiée ici, la protection fournie par le dispositif peut être altérée.

The device has been designed to be safe under the following conditions:

- Indoor or outdoor use
- Safe operating temperatures of +5 °C to +45 °C (+41 °F to +113 °F)
- Relative humidity: 20% to 80%, without condensation

Storage conditions:

- Ambient temperature: -20°C to +70°C (-4°F to +158 °F)
- Relative humidity: 20% to 80%, without condensation
- Altitude: in the range -400 m to 12,000 m (sea level to 39,370 feet)

Electrical Safety

The device has been designed to protect the operator from potential electrical hazards. This section describes some recommended electrical safety practices.

When operating in a laboratory the device must be correctly connected to a suitable electrical supply. The supply must have a correctly installed protective conductor (earth ground) and must be installed or checked by a qualified electrician before connecting the device.



WARNING

Any interruption of the protective conductor (earth ground) or disconnection of the protective conductor terminal is likely to make the connection to the power supply dangerous. Intentional interruption is prohibited.



AVERTISSEMENT

Toute interruption du conducteur de protection (terre) ou la déconnexion de la borne du conducteur de protection est susceptible de rendre la connexion à l'alimentation électrique dangereuse. L'interruption intentionnelle est interdite.



WARNING

Grounding circuit continuity is vital for safe operation of the device. Never operate the equipment with the grounding conductor disconnected.



AVERTISSEMENT

La continuité du circuit de mise à la terre est essentielle pour un fonctionnement sûr de l'appareil. Ne faites jamais fonctionner l'équipement avec le conducteur de mise à la terre déconnecté.

When working with the device:

- For use in a laboratory or with a generator connect the device to a correctly installed line power outlet that has a protective conductor connection (earth ground).
- Do not operate the device with any covers or internal parts removed.
- Do not attempt to make internal adjustments or replacements except as directed in the manuals.
- Disconnect the device from all voltage sources before opening it for any adjustment, replacement, maintenance, or repair. If afterwards, the opened device must be operated for further adjustment, maintenance, or repair, this must only be done by a PerkinElmer Service engineer or other qualified service personnel
- Whenever it is possible that the device is no longer electrically safe for use, make the device inoperative and secure it against any unauthorized or unintentional operation. The electrical safety of the device is likely to be impaired if, for example, the device shows visible damage; has been subjected to prolonged storage under unfavorable conditions; or has been subjected to severe stress during transportation.

CAUTION	<i>The protection provided by this equipment may be impaired if the equipment is used in a manner not specified by PerkinElmer.</i>
ATTENTION	<i>La protection fournie par cet équipement risque d'être moins efficace si l'équipement fait l'objet d'une utilisation différente de celle mentionnée par PerkinElmer.</i>

Electrical Requirements

Voltage	24VDC
Min. Current	4.16A

The AC Line Cord

	<p>Do not disconnect or defeat safety ground on the power cord. Ground is necessary for safe operation of the device and proper functioning of the electronic circuitry.</p>
<p>WARNING</p> 	<p>The line cord should have the electrical rating and plug appropriate for your location. See the figure below for the correct cord.</p>
<p>AVERTISSEMENT</p>	<p>Ne pas déconnecter ou vaincre la mise à la terre du câble d'alimentation. La mise à la terre est nécessaire pour un fonctionnement sûr de l'appareil et un bon fonctionnement du circuit électronique.</p> <p>Le cordon d'alimentation doit avoir la cote électrique et la fiche appropriée pour votre emplacement. Voir la figure ci-dessous pour le bon cordon.</p>

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1. Make sure you have selected the proper line cord for your location. The following table shows some typical AC line cords.
2. Ensure that the power switch is off and plug one end of the line cord into the power module on the device and the other into the AC supply.

 <p>North America NEMA-5-15 09988986</p>	 <p>Old British Standard BS 546 India 09991423</p>
 <p>Europe CEE 7 "Schuko" 09991415</p>	 <p>British Standard BS 1363 United Kingdom 09991414</p>
 <p>Europe Switzerland 09991413</p>	 <p>Australia ETSA S/86 09991417</p>
 <p>Europe Italy 09991422</p>	 <p>Israel 09991424</p>
 <p>Denmark 09991416</p>	 <p>Japan 09991425</p>
 <p>Brazil 09290996 10A Brazil 09290996 16A</p>	 <p>China 09290346</p>

ElectroMagnetic Compatibility (EMC)

Europe

All information concerning EMC standards is in the Declaration of Conformity, and these standards may change as the European Union adds new requirements.

PerkinElmer instruments have been designed and manufactured, having regard to the state of the art, to ensure that:

- the electromagnetic disturbance generated does not exceed the level above which radio and tele-communications equipment or other equipment cannot operate as intended;
- it has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use.

South Korea

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

United States (FCC)

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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential may cause harmful interference in which user will be required to correct the interference at their own expense.

NOTE: *Changes or modifications not expressly approved by PerkinElmer could cause the instrument to violate FCC (U.S. Federal Communications Commission) emission regulations, and because of this violation could void the user's authority to operate this equipment.*

Pollution Degree

This product will operate safely in environments that contain nonconductive foreign matter up to Pollution Degree 2 in EN/IEC 61010-1.

Installation Category

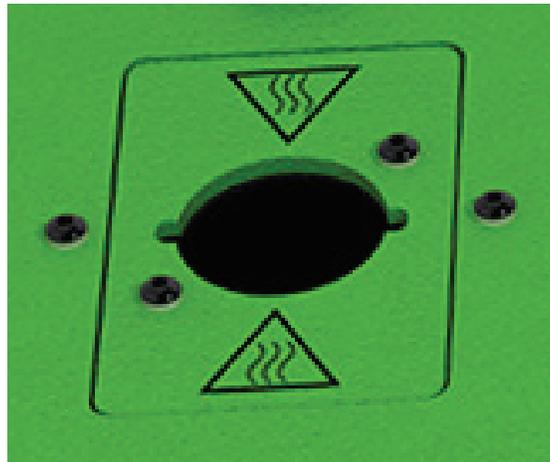
This product will operate safely in electrical power environments that are rated as Installation Category II in EN/IEC 61010-1.

Warning Signs on the Device



Caution, hot surface

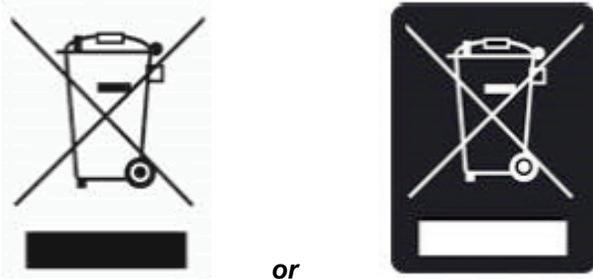
Attention surface chaude



CAUTION HOT
ATTENTION HOT



WEEE Instructions for PerkinElmer Products



A label with a crossed-out wheeled bin symbol and a rectangular bar indicates that the product is covered by the Waste Electrical and Electronic Equipment (WEEE) Directive and is not to be disposed of as unsorted municipal waste. Any products marked with this symbol must be collected separately, according to the regulatory guidelines in your area.

The objectives of this program are to preserve, protect and improve the quality of the environment, protect human health, and utilize natural resources prudently. Requirements for waste collection, reuse, recycling, and recovery programs vary by regulatory authority at your location. Contact your local responsible body (for example, your laboratory manager) or authorized representative for information regarding applicable disposal regulations. Contact PerkinElmer at the web site listed below for information specific to PerkinElmer products.

Web address:

<http://www.perkinelmer.com/WEEE>

For Customer Care telephone numbers select "Contact us" on the web page.

Products from other manufacturers may also form a part of your PerkinElmer system. These other producers are directly responsible for the collection and processing of their own waste products under the terms of the WEEE Directive. Please contact these producers directly before discarding any of their products.

Consult the PerkinElmer web site (above) for producer names and web addresses.

Decontamination

Before using any cleaning or decontamination methods except those specified by PerkinElmer, users should check with PerkinElmer that the proposed method will not damage the equipment.

Customers wishing to return instrumentation and/or associated materials to PerkinElmer for repair, maintenance, warranty or trade-in purposes are advised that all returned goods must be certified as clean and free from contamination.

The customer's responsible body is required to follow the "Equipment Decontamination Procedure" and complete the "Certificate of Decontamination".

http://www.perkinelmer.com/Content/technicalinfo/dts_instrumentdeconprocedure.pdf

If you do not have access to the internet contact Customer Care:

Customer Care USA:	1-800-762-4000	(inside the USA)
(8:30 a.m. – 7 p.m. EST)	(+1) 203-925-4602	(outside the USA)
Customer Care Canada:	800-561-4646	
Customer Care EU:	0800 40 858	(Brussels)
	0800 90 66 42	(Monza)

If you are located outside of these regions, please call your local PerkinElmer sales office for more information.

Cleaning the Device

Exterior surfaces may be cleaned with a soft cloth, dampened with a mild detergent and water solution. Do not use abrasive cleaners or solvents.

In addition, the surfaces can be decontaminated by wiping with a dilute bleach solution.

Initial Setup

When using the Custodion NT it is necessary to use pre-injection settings for the GC portion of the instrument. The pre-injection settings are used to turn the valves on and off which is used for split injections and to control pre-injection pressures. Refer to the Torion T-9 operations manual for instructions on setting up a method with pre-injection settings.

The SPS-3 Sample Prep Station



The SPS-3 is a device used to process air samples in the field. The SPS-3 transfers samples collected on a conventional trap to a Custodion-NT. In addition, the SPS-3 can be used to add internal standards to samples collected on a needle trap.

The thermal desorption module in the SPS-3 has heaters that are maintained at the appropriate temperature for sample desorption. The heaters are clamped onto the conventional trap and the heat is rapidly transferred to the trap. A controlled flow of helium goes through the conventional trap and into a Custodion-NT. This results in transfer of the sample to the needle. Once the sample is on the needle trap, analysis can be performed by injecting the sample into the Torion T-9 GC/MS.

NOTE: *It is important to control the process to minimize analyte band broadening. Broad bands of chemical result in broad analytical peaks and poor separation of the analytes.*

The SPS-3 is also equipped with an internal standard module that is used to add a specific and repeatable concentration of internal standards onto a needle trap which can then be used for quantitation. The standard is in the form of a vapor. A repeatable volume of the standard is easily pushed into the needle assembly. Use of this internal standard module in the field allows the Torion T-9 instrument to repeatedly calculate the concentration of a target compound.

Setup of the SPS-3 (Sample Prep Station)

The SPS-3 can be operated either in a laboratory environment, on house power, gas or as a standalone unit in the field.

THE INTERNAL STANDARD VIALS CONTAIN TOLUENE-D8 AND BROMOPENTAFLUOROBENZENE. THESE CHEMICALS WERE CHOSEN BECAUSE THEY ARE NOT LIKELY TO BE FOUND IN THE ENVIRONMENT AND BECAUSE THEY PRODUCE ELECTRON IONIZATION FRAGMENTS WITH SEVERAL MASS VALUES FROM WHICH TO CHOOSE.

IMPORTANT: *Turn off the SPS-3 prior to removing any external covers.*

Installing the Internal Standard Sample Vial.

1. Break the top off of the internal standard vial at the score mark.

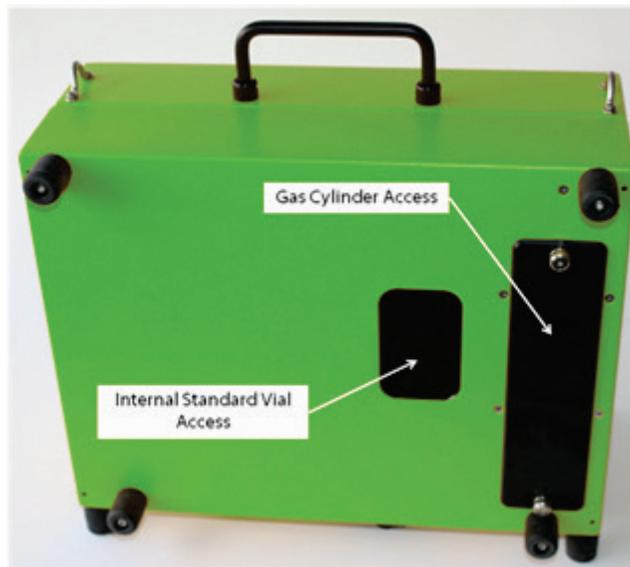


NOTE: *Wetting the score mark on the internal standard vial will make it easier to break the top off of the vial.*

CAUTION	<i>It is possible that the glass vials can break. Wear appropriate gloves or use appropriate tools when breaking open a standard vial.</i>
ATTENTION	<i>Il est possible que les flacons en verre puissent se briser. Porter des gants appropriés ou utiliser les outils appropriés pour ouvrir un flacon standard.</i>

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2. The sample prep station has feet on the bottom and on the back of the device. The feet on the back are used for installation and replacement of the internal standard vial and the carrier gas. Set the device on its back with the bottom facing forward.



3. Unscrew the internal standard vial holder access cover.
4. Slide the internal standard vial up into the opening with the open top facing into the instrument.

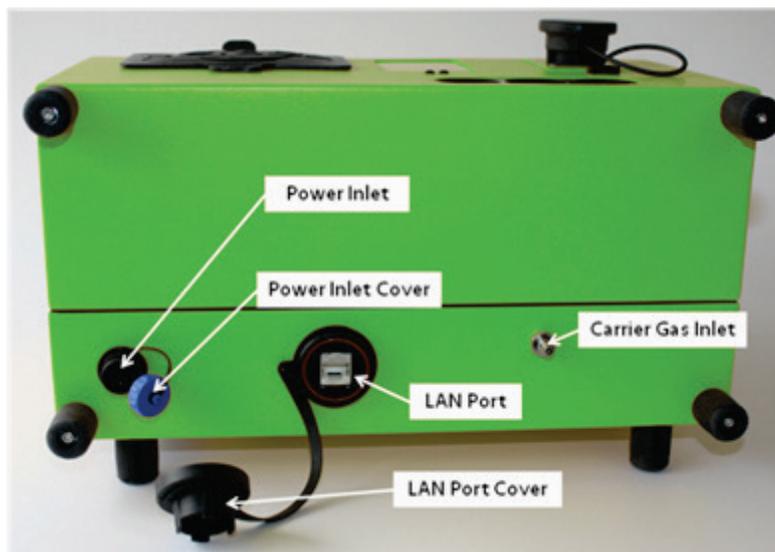


5. Screw the bottom access cap back into place until it is finger tight.

Setup of the Sample Prep Station for Laboratory Use

Operating with External Power

1. Ensure that power to the instrument is off prior to plugging in the external power.
2. The indicator light will change to indicate that the external power has been connected. The internal battery is always installed, so when the external power is connected both the line power and battery power lights will be lit. The battery power will charge when line power is connected.
3. With the correct adapters the power supply can be connected to external power from 100–250 volts 50-60 Hz AC. The following figure shows the location of the power inlet on the back of the device.



Operating with an External Carrier Gas Source

1. The desorption device uses helium as a carrier gas. The gas can be supplied either by an external cylinder or from a small internal cylinder that is installed directly in the device.
2. For stationary (non-portable) operation the desorption device can be connected to an external carrier supply.
3. The external gas fitting that connects to the device is a quick connect fitting that is attached to a 1/16-inch PEEK tube. This assembly is provided with the device. It is the responsibility of the user to provide connection from the external cylinder to the open end of the 1/16-inch PEEK tube. The following is an image of the tubing and quick connect assembly.



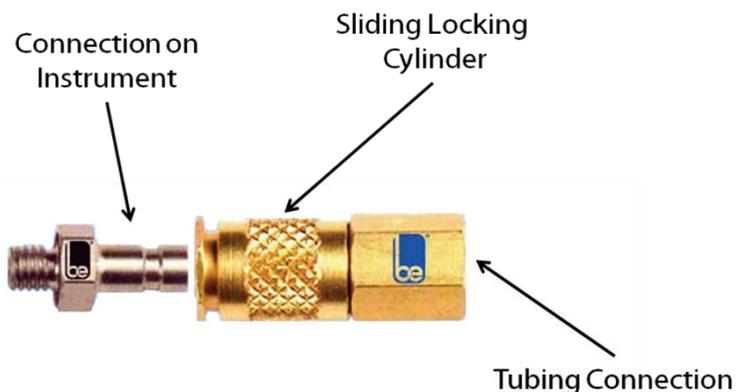
4. If an internal gas cylinder is installed in the device, an external gas source may also be attached to the back of the device at the same time. The pressure of the internal gas cylinder is regulated to 65 ± 7 PSI.

As long as the external gas source has a pressure of 80 PSI or greater the gas in the internal cylinder will be preserved, and can be used after disconnecting from the external gas source.

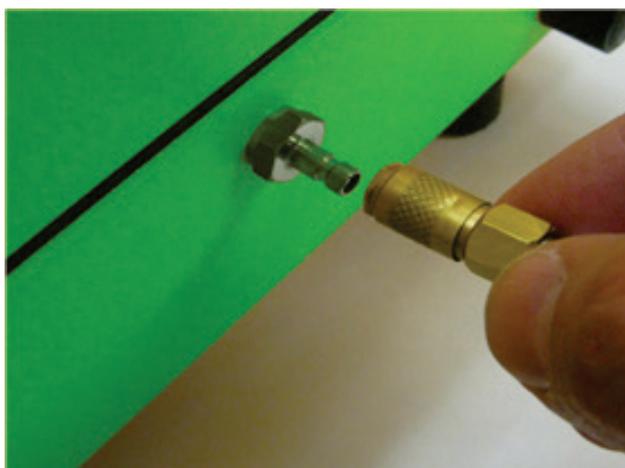


CAUTION	<i>Prior to the next step, regulate the external gas pressure to a minimum of 80 and a maximum of 100 psi.</i>
ATTENTION	<i>Avant la prochaine étape, réglez la pression de gaz externe à un minimum de 80 et un maximum de 100 psi.</i>

5. Attach the external helium carrier line by pressing the quick connect onto the **Carrier Gas Inlet** port.
The quick connect is attached when it clicks into place and cannot be removed without sliding the locking cylinder back. The following image shows the quick connect and sliding locking cylinder.



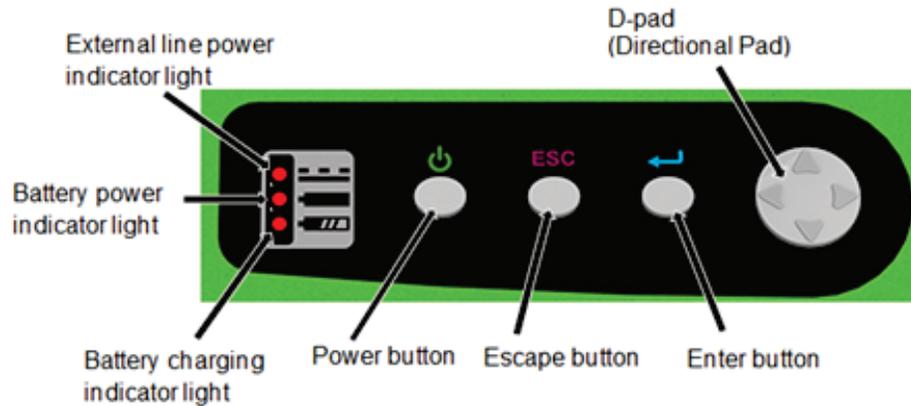
6. To disconnect the external helium carrier, slide the locking cylinder on the quick connect back until the quick connect slides off of the device external gas connection. The following image shows the installation of the quick connect onto the device.



Setup of the Sample Prep Station for Field Use

Charging the Battery

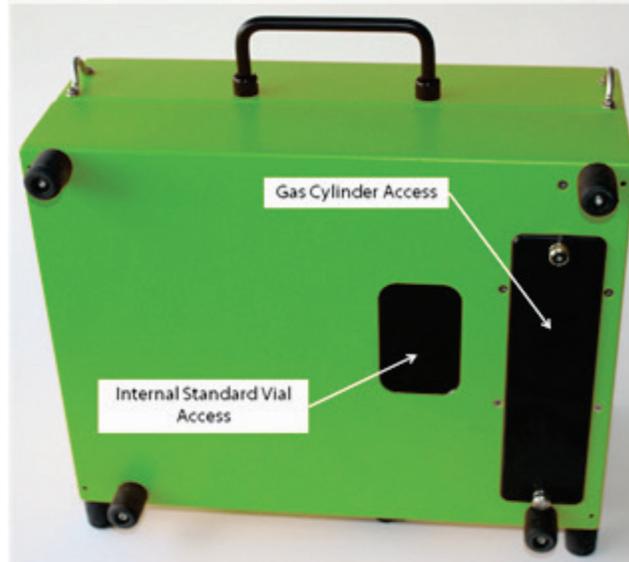
1. The SPS-3 device comes with an internal 15 V, 83 Wh Li Ion battery. The battery is internal it is not replaceable in the field.
2. To charge the battery, use the power supply and connect the device to external power. There are three lights on the keypad. The following image shows the indicator lights for the battery and external power.



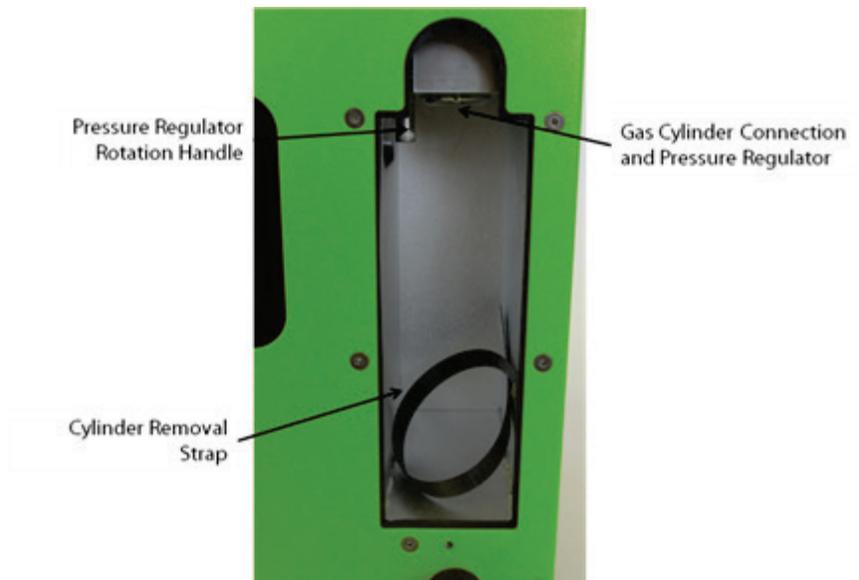
- If the top indicator light is on the device is connected to the external line power.
 - The middle indicator light indicates that the battery has power and is properly installed. This light displays when the device power is on. If the middle light does not display the onboard battery has been completely discharged.
 - The bottom indicator light is on when the device is connected to an external line power and the battery is charging. When the battery has reached a full charge the light will turn off.
3. The SPS-3 battery will charge once external line power is connected.
 4. When the device is running and is connected to external line power the battery will only charge during times when the overall power draw is sufficiently low; this is to allow extra power to be diverted to the charging operation. Power will not be drawn from the battery as long as the external line power is connected.

Installing the Onboard Carrier Gas Cylinder

1. The SPS-3 has feet on the bottom and rear. The feet on the back are used for installation and replacement of the internal standard vial and the carrier gas.
2. Set the device on its back with the bottom facing forward. The following image shows the bottom of the device.



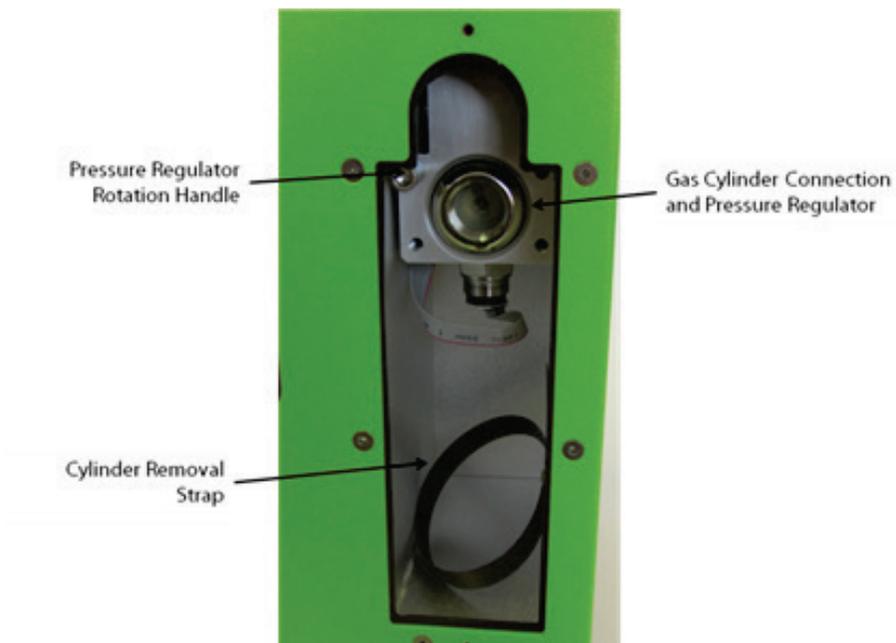
3. Unscrew the thumb screws that are holding on the gas cylinder cover.
4. The following image shows the bottom of the device with the gas cylinder cover removed.



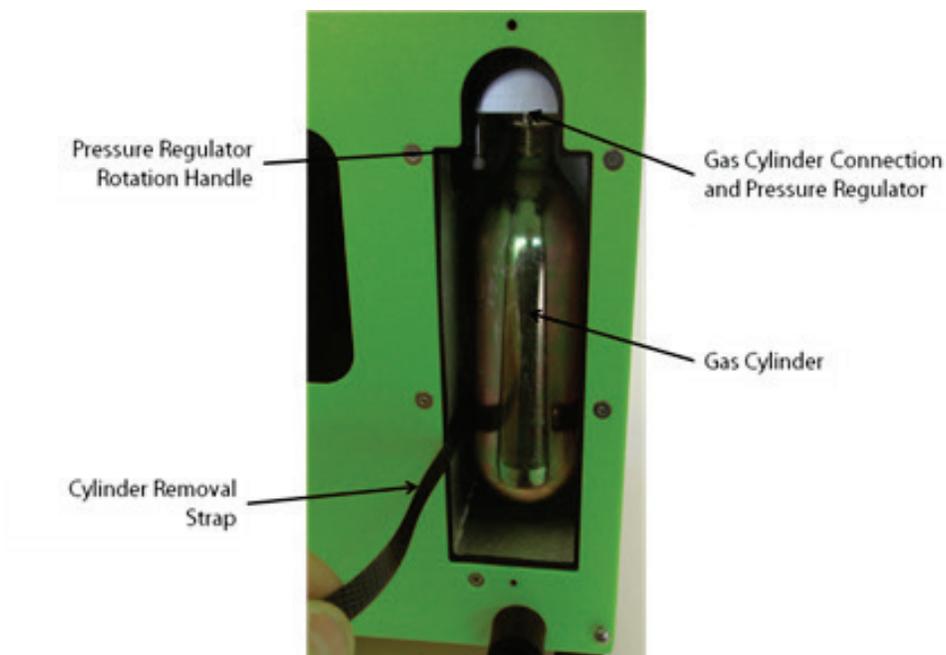
5. The cylinder regulator should be facing out so it is at a right angle to the device. In this position the threads are visible.
6. If the threads are not visible reach inside of the gas cylinder compartment and use the pressure regulator rotation handle to rotate the regulator so the threads are facing out.

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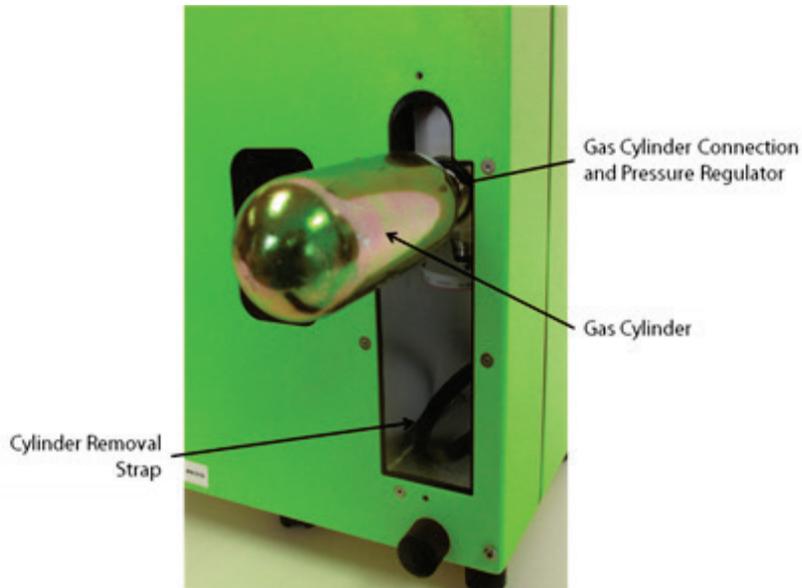
7. The following image shows the gas cylinder compartment with the regulator rotated so it is facing out.



8. If a cylinder is already installed it will be necessary to swing the cylinder out so it is at a right angle to the bottom of the device. Use the cylinder removal strap to pull the cylinder out. The following image shows a cylinder installed in the cylinder compartment.



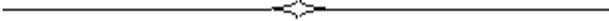
The following image shows the cylinder rotated out of the cylinder compartment.



9. To remove the cylinder, grasp the cylinder by hand and unscrew. Regulations require that the compressed gas cylinder be removed from the device before shipping.

NOTE: *If there is still gas left in the cylinder remove it slowly until the gas is able to escape. There will be a loud sound as the remaining gas escapes from the cylinder.*

10. Depending on the amount of pressure still in the cylinder it can take a significant amount of force to remove the cylinder.
11. Screw the new cylinder into the regulator and check that it is tight. If the cylinder is not secure it may leak. Leaks will shorten the life of the cylinder. If available, use a gas leak detector to verify that the cylinder is not leaking.
12. Swing the cylinder back into the bottom of the device and check that the cylinder removal strap is wrapped around the cylinder and is accessible for pulling the cylinder out.
13. Replace the cover.



Sample Collection Using
Custodion NT

Initial Use and Conditioning

This chapter describes how to collect samples with the Custodion NT.

Each Custodion NT is shipped with the needle protected by a screw-tight cap. Prior to initial use, the Custodion NT should be conditioned by running a blank run on the Torion T-9 GC/MS system.

For multiple-use application, and to ensure there is no carryover the Custodion NT should be cleaned before re-use as outlined in the following steps:

1. Turn on the Torion T-9 and wait until the main screen displays.
2. Remove the protective cover from the needle trap.
3. Insert the Custodion NT into the injection port of the Torion T-9 until it stops. Hold the Custodion NT in the taper at the bottom of the injection port liner.
4. Allow the trap to stay in the injection port for 30–60 seconds or longer, if necessary, to desorb any contaminants that may have collected on the trap.
5. Run a System Blank.
6. If contaminant peaks are observed, repeat the cleaning process until a blank run is obtained.

Using the Custodion NT

Detection of target chemicals by the Torion T-9 depends on adsorption to and desorption from the Custodion NT. Adsorption depends on the partition coefficient of the target chemical and the packing. Detection also depends on the volatility and molecular mass of the target chemical (45–500 amu).



Custodion-NT is a trap used as a sampling method for extracting target chemicals from a gas (usually air) and concentrating them for subsequent analysis. Compared to conventional sized traps (see the next section for a description of conventional traps) Custodion-NTs are designed for direct introduction of the concentrated sample into the injection port of the Torion T-9 GC/MS.

Once a Custodion-NT containing trapped sample is introduced into the Torion T-9 injection port, the sample is released by thermal desorption (i.e. by heating the sorbent packing material used to trap airborne analytes to a temperature where the adsorbed analytes are released into a gas stream). The gas stream moves the analytes into the analytical column for chromatographic processing.

The Custodion-NT consists primarily of a small diameter needle that is packed with sorbent material. The length of the packed bed is approximately 2 cm and the diameter is less than 2 mm.

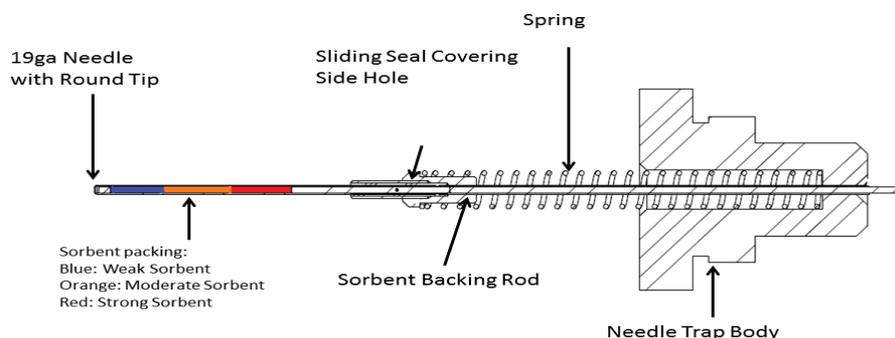
The chemical properties of the sorbent determine the classes of compounds that are trapped in the Custodion-NT.

The Custodion-NT devices are manufactured with a hole in the tip and a hole in the side of the needle. The side hole is placed just above the packing material. Use of a side hole facilitates the interface of the Custodion-NT with the instrument. When the Custodion-NT is not in use the side hole is covered by a sliding seal sleeve. This prevents contamination of the needle, before sampling begins and prevents loss of sample during transport and injection.

During sampling the cover is slid out of the way and the side hole is connected to a vacuum pump. Air is pulled into the tip of the needle and out through the side hole. The analytes pass through the packing material and are trapped.

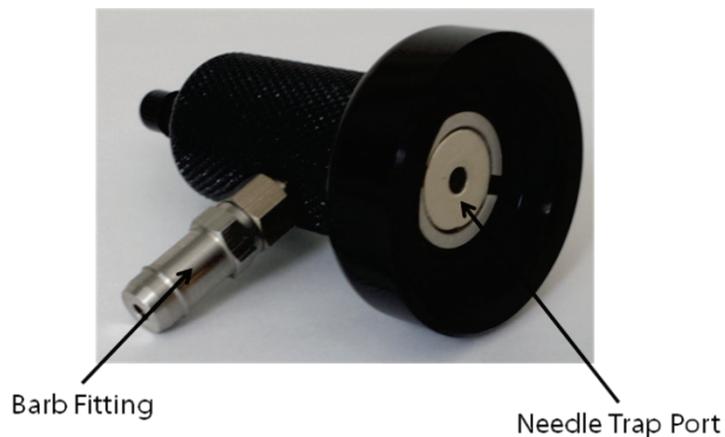
Following sample collection the needle is placed in the hot injection port of the Torion T-9 GC/MS and the analytes are desorbed from the packing and are transferred to the GC column.

The Custodion-NT needles are packed with three types of sorbent materials in a "tri-bed" fashion. The sorbent types and arrangement are specifically designed to trap compounds with a broad range of volatilities in such a way that the less volatile compounds are trapped in the first and weaker beds while the more volatile compounds are trapped on the subsequent and stronger adsorbent bed. Because of the difference in the strength of the sorbents all of the compounds are able to be thermally released at the same temperature in the injection port.

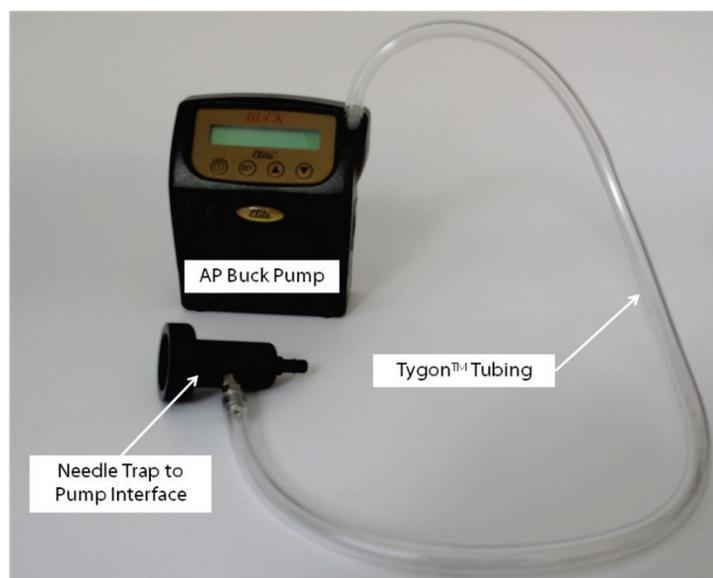


Sampling Air

1. Connect the Custodion NT pump interface to an air sampling pump connecting a tube from the pump to the barb on the pump interface. The following image shows the pump interface.



2. The following image shows the Custodion NT pump interface connected to an AP Buck pump.



3. To begin collecting air samples, connect the Custodion NT to the air sampling pump by inserting it into the Custodion NT pump interface.
The following image shows the Custodion NT inserted into the pump interface.



Since the Custodion NT is small and restrictive it is necessary to use a large capacity air pump. Most of the larger pumps only control flows of 100 mL/minute and higher. Pumps that control to lower flows operate at very small vacuum pressures.

4. Flow rates from 1-35 mL/minute can be used with the Custodion NT. A range of flows can be useful for different types of environments.

For example:

- To prevent overloading the trap when collecting concentrated samples from a closed space such as a drum it is best to collect at low flows from 1 to 2 mL/minute.
 - When sampling in environments where the concentration is expected to be low as in an open field it would be better to sample at 35 mL/minute.
 - For larger commercial pumps, controlling flow in the 1-35 mL/minute range requires that the pump be operated in a pressure control mode. Refer to the pump user manual information on how to operate the pump in the pressure control mode.
5. To establish a determined flow set a pressure on the pump.
Commercial air pumps have a pressure limit of around 50 inches of water or 1.8 psi. To avoid damaging the air pump, follow the manufacturer's recommendations for maximum pressure settings.
At 1.8 psi the maximum flow through the Custodion NT will be around 20-25 mL/minute.
 6. The restriction of the Custodion NT assemblies can vary by as much as 20% for new traps.
If during use the traps become plugged by debris either from the environment being sampled or from insertion through septa or other seals the flow can change, so it is good practice to verify the flow by using a flow meter to measure the flow, before taking a sample.

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7. To measure the flow, attach a flow meter (not available from PerkinElmer) to the barb fitting on the bottom of the Custodion NT pump interface.

The following image shows a flow meter attached to the bottom of the Custodion NT to pump interface. There are several commercial flow meters the end user can choose from.



**Collecting Samples Using a
Conventional Trap**

Conventional Trap Selection

Conventional traps used for thermal desorption are available from a large number of vendors. The traps used with the trap holders and that fit the sample prep station are (3½" (89 mm) long x ¼" (6.4 mm) OD) tubes. Information from the tube manufacturers can be used to select the best tube for a specific application.



The conventional trap is similar to the Custodion-NT but it is in a "standard size," which is typically about ¼-inch outside diameter and about 3 to 3.5-inches long. It has the same types of packing materials with the same capabilities, but because of its larger size it has more packing material and is less restrictive to flow. With the increased amount of packing material and lower restriction to flow sample can be collected at a higher rate than is possible with the Custodion-NT.

Typical maximum flow through the Custodion-NT is 50 mL/minute, while recommended flows for conventional traps are as high as 250 mL/minute resulting in a fivefold increase in sample collection speed.

The larger conventional trap cannot directly interface with the Torion T-9 GC/MS instrument. To analyze samples collected on conventional traps via the Torion T-9 requires that the sample adsorbed on the conventional trap be transferred to the Custodion-NT. This process not only allows for analysis on the Torion T-9 but also concentrates the sample.

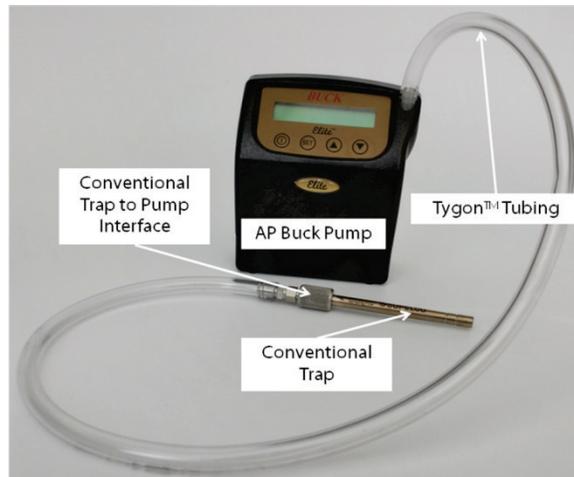
Sampling Air Using a Conventional Trap

1. To use a conventional trap (CT) to collect an air sample connect the trap to a pump. Torion offers an optional interface device for convenience when connecting a conventional trap to an air pump. The following image shows the interface hardware.



One end of the interface device has a barb fitting to connect to Tygon[®] tubing. The other end has an O-ring to seal the collection tube into the fitting.

The following image shows a CT connected to an air pump.



The air flow is always into the end of the trap with the grooves. Many traps have arrows that indicate flow direction during sample collection.

2. Set the pump to collect a sample at the desired flow rate.
Follow the air pump manufacturer's instructions for how to set up the pump.
3. Start the pump to draw the specified amount of air through the trap.

Setting Up to Use a Conventional Trap

1. After collecting a sample onto a conventional trap it is necessary to transfer the sample to a needle trap for analysis.
2. To transfer the sample from the conventional trap requires the use of a conventional trap holder. The following image shows a conventional trap holder. During desorption the flow is at the end with the black cap.

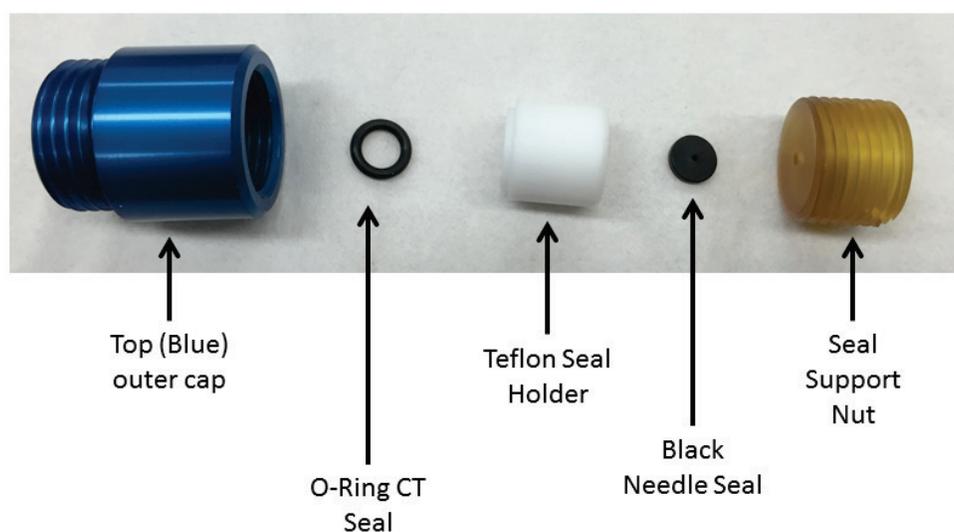


3. Many conventional traps have arrows that indicate the flow direction. Others do not have arrows, but have a groove or a series of grooves on one end.
 - The arrow indicates the direction of the air flow during sample collection.
 - The grooves indicate the end of the trap with the weakest sorbent material. Sample collection is always done in the direction of the weakest sorbent to the strongest sorbent.

4. The conventional trap assembly is made up of several parts.

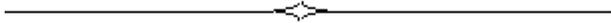


5. There are two end caps. The end caps are color-coded to make them easy to identify. The thermal shield is in place to prevent burns when handling traps immediately after completing a thermal desorption cycle.
6. Each end cap contains seals to make a gas tight connection during desorption.



7. To install a conventional trap into a trap holder remove one of the end caps.
8. Push the tube into the O-ring seal on the end that is still connected to the thermal shield.
9. Check that the flow arrow points towards the black end cap.
10. If the conventional trap does not have an arrow, check that the grooves are closest to the blue end cap.

11. If the conventional trap does not have markings that indicate flow direction then contact the trap manufacturer for guidance and install it, so that the flow during sample desorption is from the black end cap towards the blue end cap.
12. Reinstall the end cap. It is important that the blue end cap be installed on the end of the thermal protection shield with the trap orientation guide pin.
13. Use the sample prep station to transfer the sample to a Custodion NT for introduction into the Torion T-9. See the SPS™-3 Operation for instructions on how to do the sample transfer.



SPS-3™ Operation

Device Hardware Configuration

There currently only one configuration Single DM and IS. The following table shows this:

Position 1	Position 2	Internal Standard
DM	-----	IS

DM = Desorption Module

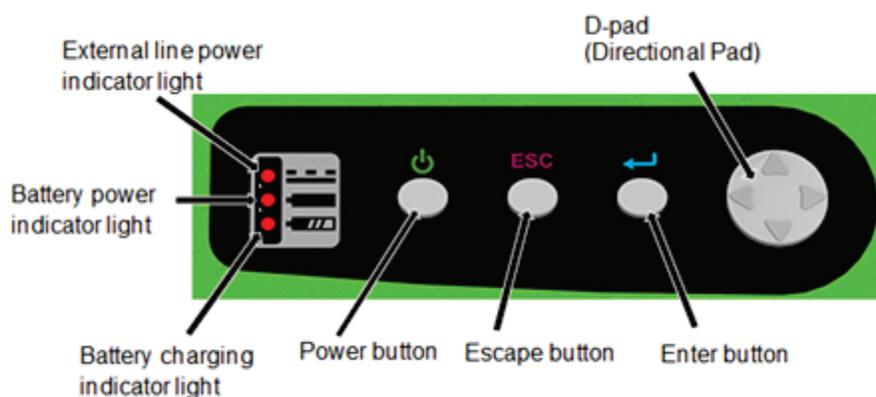
IS = Internal Standard

SPS-3 Used in Field Sample Preparation

The sample prep station is used to transfer analytes collected from air samples on a conventional trap to a Custodion NT. This is accomplished by inserting the trap into the device, applying carrier gas, and then applying heat to the conventional trap.

Setting Up to Use the SPS-3

1. Check that the device has a full battery charge and either a helium or nitrogen carrier gas cartridge is installed. Alternatively, check that the device is connected to external line power and laboratory gas. Review the *Initial Setup* chapter of this manual for instructions on setting up the sample prep station.
2. Turn on the device by pressing and holding the power button for 3 seconds. Check that either the red indicator light next to the external line power is on and/or, the red indicator light next to the battery power is on.
3. The following image shows the location of the power indicator lights as well as the ESC, Enter, and d-pad buttons.



4. The ESC, Enter, and D-pad buttons are used to navigate through the menu system on the device.
5. The buttons are used in combination with various selected menu items which will be displayed in the device window:

ESC – Press the escape key to exit the current window and return to the previous screen

Enter – Press the **Enter** key to activate selected item

Arrow right/left – Press the right/left arrows on the d-pad to access an item

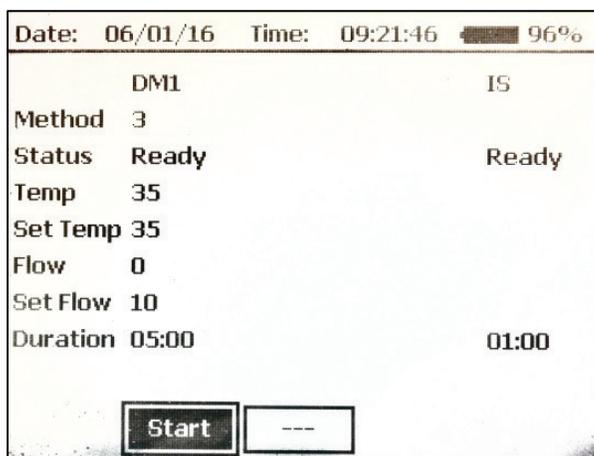
Arrow up/down – Press the up/down arrows on the d-pad to access an item

Keypad Menu Options

When the device is turned on the initial screen will be displayed showing the date and time, a visual indicator of battery level, the device name as well as the available menu options, **Run**, **Method**, **Settings**, and **Diagnostics**.



1. With the **Run** option selected on the main screen press the **Enter** button on the keypad. The screen that will open is the screen from which the field sample processes can be selected. The following screen is the run screen for the desorption module.



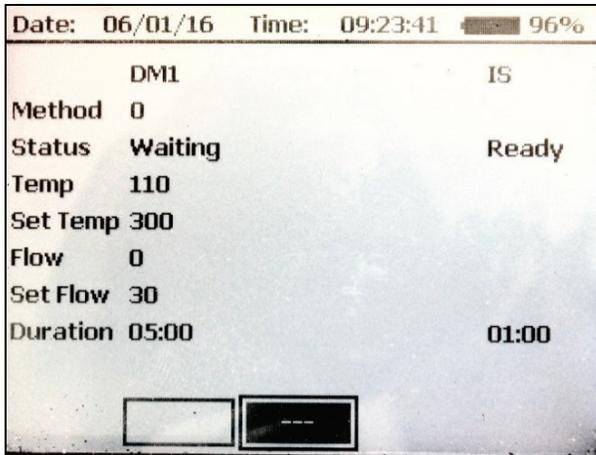
2. The information on the run screen displays the module type in the upper left corner of the window.

DM1 indicates the desorption module is in position 1 of the SPS-3 device. Also shown is the default method which has been selected for the run process.

The **Timer** is the amount of time needed to transfer the sample.

In this particular image the **Status** shows that the module is **Ready** and the name of the button changes to **Start**.

Pressing the **Enter** button on the keypad will begin the run process on the DM1 or the desorption module.



3. Press the **ESC** key to return to the main window.

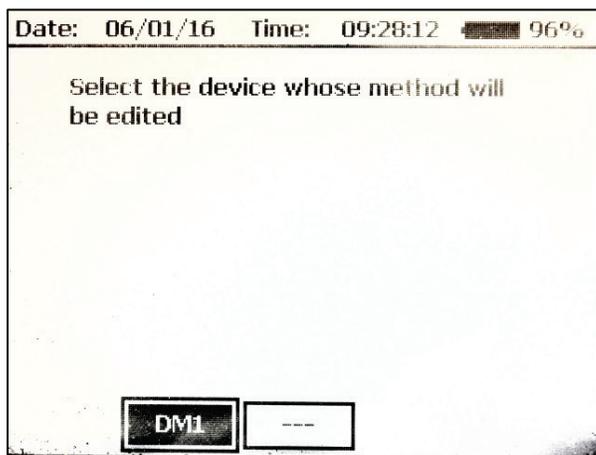


Selecting and Editing a Method

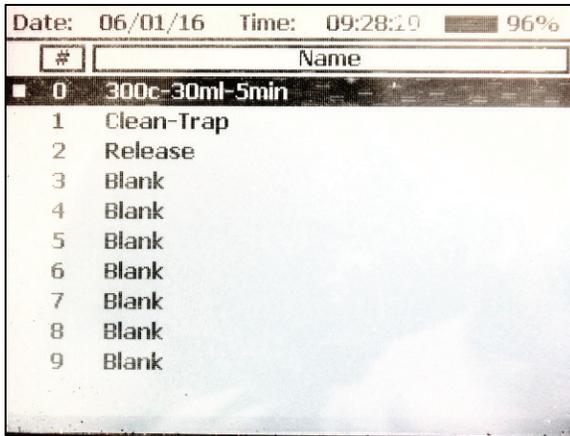
1. Using the D-pad arrows move the cursor to the **Method** menu option and press the **Enter** button on the keypad.



2. The first screen in the method selection will be displayed. Use the arrow buttons on the d-pad to select the DM1 desorption module at the bottom of the window on which the method will be edited.
3. By pressing the **Enter** button the highlighted module is selected and the next window will display.



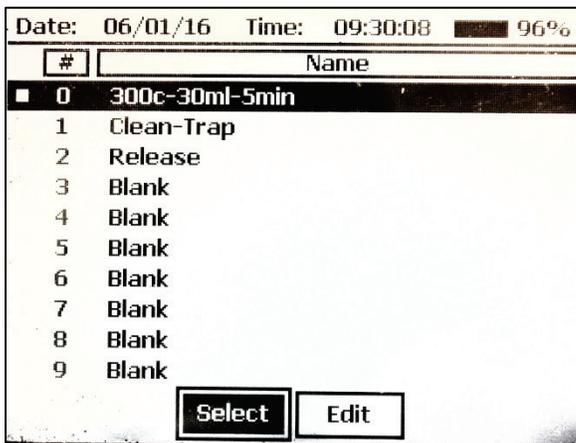
4. Once the module is selected the list of available methods will be displayed. The image below shows the available methods for the desorption module.



Two options will appear at the bottom of the screen, **Select** and **Edit**.

5. With **Select** highlighted press the **Enter** key.
A marker will be placed next to the method.

NOTE: The method name cannot be edited on the sample prep device.

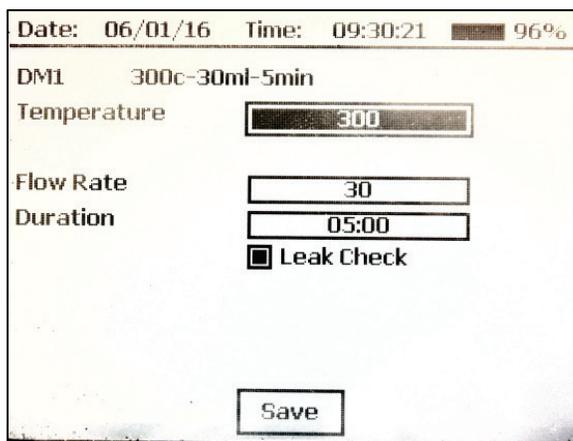


6. Using the arrow keys move the cursor to the **Edit** menu option and press **Enter** on the keypad.



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7. The parameters that can be changed for the method are displayed. Move the cursor up/down using the arrows on the d-pad to the value to be changed.
8. Press the **Enter** key to activate the editing function.
9. Move the up/down and left/right arrows to change the displayed value.
When finished changing the parameter press the **Enter** key again. The parameter change will be saved.
10. When finished changing the parameters move the cursor or selector to the **Save** button and press Enter on the keypad.
Press the **Enter** button to Save the changes made to the parameter. Using the arrow keys move to the next parameter to be changed.



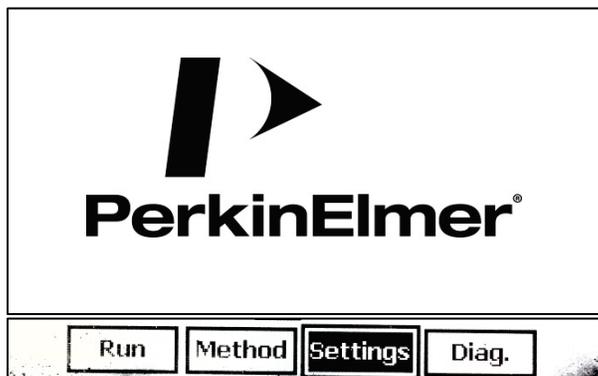
- **Enter** will select and activate the editing process on the parameter to be changed.
 - **ESC** will return to the method selection screen.
 - **Save** will save the changes made to the parameters.
11. The figure above shows the current settings for the method **Method 0**.
This is the selected default method that will run on the DM1 module.
 - The **Temperature** range for the desorption module is 50°C to 300°C.
 - The **Flow Rate** range for the module is 5 to 50 mL/minute.
 - The **Timer** range for the module is 1 second to 20:00 minutes.
 - The option to run a **Leak Check** before running desorption can also be enabled on the method. The leak check test is used to verify the seals in the conventional trap holder. When the **Leak Check** parameter is enabled a leak check test will be activated before each desorption run.

NOTE: A leak check test should be performed before taking the traps out into the field for sample collection.

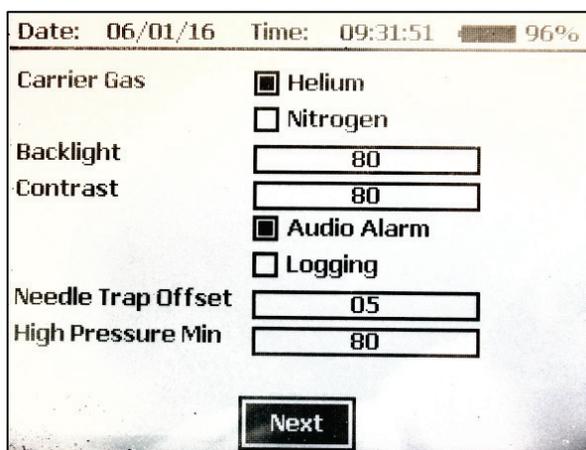
12. Once the parameters have been set to the desired values select the Save option at the bottom of the window.
After pressing the **Enter** key with **Save** selected the screen will return to the desorption module method listing.

Changing Settings on the SPS-3

1. With the **Settings** menu option selected press the **Enter** button on the keypad to display the first window of the settings for the device.



2. The **Settings** options apply to the SPS-3 device. The first screen displayed includes the Carrier Gas, Backlight, Contrast, Audio Alarm, Logging, Needle Trap Offset, and High Pressure Minimum.



3. These Settings can be changed by moving the up/down arrows on the d-pad to select the value to be changed. Press the Enter key to activate the editing function. Move the up/down and left/right arrows to change the displayed value of the parameter. When finished press Enter to exit the editing function then use the arrow key to move to the next setting.

NOTE: Changes made to the Settings screens will automatically be saved when moving to the next screen.

- **Enter** will select and activate the editing process on the parameter to be changed.
- **ESC** will return to the previous screen.
- **Next** will toggle between the Settings screens.

4. **Carrier Gas** used on the device is Helium. Highlight the Helium carrier gas using the up/down arrows on the d-pad and press **Enter** which will activate the selection.
5. The illumination for the LCD can be adjusted with the **Backlight** setting. It can be adjusted between 0 to 100 with 0 representing the off status and 100 representing full brightness.
6. The **Contrast** range for the LCD can be changed as per user preference.
7. When the **Audio Alarm** is enabled the buzzer is activated. The buzzer is used to notify the user of various states of the device through the run process. It is also used if the internal standard has been applied to the process. The **Audio Alarm** can be disabled by selecting and pressing the **Enter** key on the keypad.

NOTE: *It is recommended that the Audio Alarm be enabled at all times.*

8. **Logging** can be enabled by selecting and pressing the **Enter** key. When enabled only the When Logging is enabled the device will store the following information for each run.
 - The **Method Name** will be displayed.
 - The **Date/Time Stamp** for when the run was started will be displayed in the following format: mm/dd/yyyy hours:minutes:seconds, i.e. 6/1/2016 9:35:42 AM.
 - The **Temperature** of the desorption module (DM1) in degrees centigrade which is set in the method parameters.
 - Whether or not a **Leak Check** was performed.
 - The **Module** used for the run test, i.e. DM1
 - The **Flow** rate used for the modules in milliliters per minute (CC/min).
 - The **Timer** is the length of the run in minutes:seconds.
 - Whether or not the **IS** (internal standard) was added. (This is a response by the user in the method settings and not a result generated by the device.)

NOTE: *Data from a failed run such as in a failed leak check or a failure to detect flow will not be stored.*

9. The **Needle Trap Offset** is not applicable to the desorption module.

NOTE: *For additional information about the Needle Trap Offset setting refer to section Prevention of Water Condensation later in this chapter.*

10. The **High Pressure Minimum** is the psi pressure at which the SPS-3 will warn the user when running out of internal gas or the gas cylinder as opposed to the house gas which is continual. This range should be set no higher than 150 or lower than 50psi. The preferred setting is 75psi.
11. Press the **Next** button at the bottom of the window to move to the second Settings screen where the date and time can be adjusted.

Date: 06/01/16 Time: 09:35:42 96%

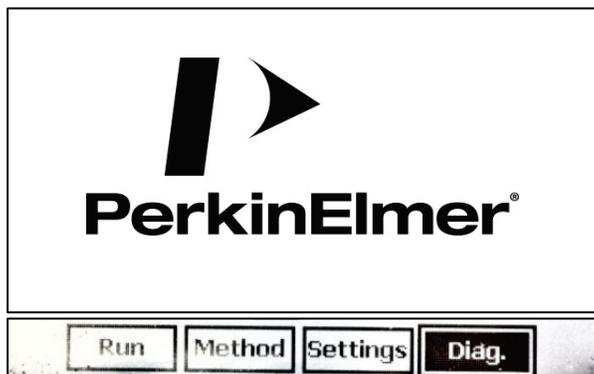
Year	2016
Month	06
Day	01
Hour	09
Minute	35
Second	33

Next

12. After making necessary changes press the **ESC** button on the keypad to return to the main screen.
13. The changes made to Settings will automatically be saved when selecting **Next** or pressing the **ESC** button on the keypad which will return the screen to the previous window.
14. Press the **ESC** key to return to the main screen.

SPS-3 Diagnostic Screens

1. The device diagnostics information can be accessed from the main window by moving the arrow keys on the keypad to the **Diag.** menu option and then pressing the **Enter** button.



2. The diagnostic screens are used primarily for troubleshooting problems on the device with your service representative.

Date: 06/01/16 Time: 09:37:03 96%			
Version	0.3.1.1	Cartridge	0%
Heater 1A	300.1	H. Pressure	3.8
Heater 1B	300.2	Pressure 1	0.3
Heater 2A	65472.0	Pressure 2	-12.5
Heater 2B	65472.0	A. Pressure	14.6
Heater IS	59.9	IS Set	59.9
Heater DP	400.4	Flow 1	-182.1
Module 1	0.5	Flow 2	-86.9
Module 2	11.4	Board Temp	29.0

Next

3. Press **Next** to display additional diagnostic data on the device.

Date: 06/01/16 Time: 09:38:21 96%			
Cap Alarm	0.4	Rel %	96.0
Time Alarm	15.0	Abs %	93.0
Des Cap	5.8	Rem Cap	5.4
Des Vol	15.2	Full Cap	5.6
Temp	23.7	Emp	65535.0
Vol	16.4	Avg Emp	65535.0
Cur	0.0	Avg Full	65535.0
Ave Cur	0.0	Cycle	6.0
V In	23.5	Main Fused	24.1

Next

4. The data in these two diagnostic screens is for informational purposes only and cannot be changed.
5. Press **ESC** to return to the Main menu.

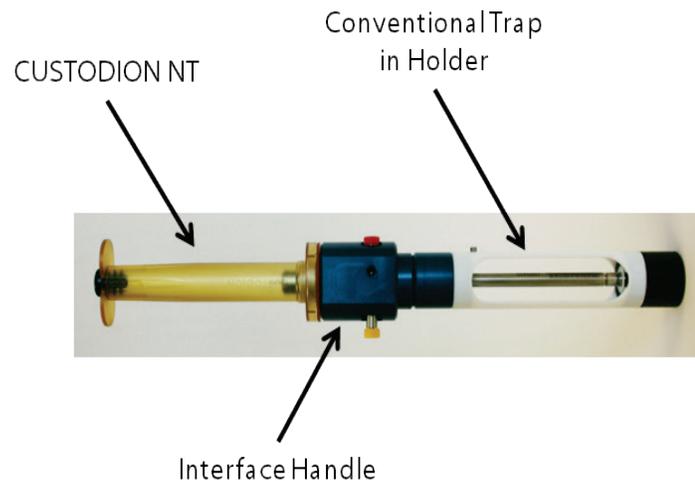
Running a Sample Transfer from a Conventional Trap to a Custodion NT

Hardware Needed for a Sample Transfer from a Conventional Trap to a Custodion NT

Once the SPS-3 has been configured and has all of the necessary settings implemented, it is ready to run a sample transfer.

1. There are three pieces of hardware that are used to complete the transfer of samples from the conventional trap to the Custodion NT. Check that all three of these parts are available, before starting a desorption cycle.

The parts that are needed are: the conventional trap in its holder, the interface handle and the Custodion NT. The following image displays all of the parts connected together. Note that the system uses a color-coding feature. The blue end of the conventional trap holder and the blue interface handle fit together and the black end interfaces with the device.



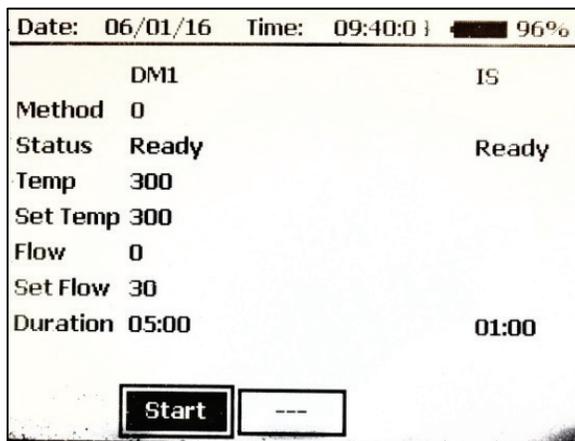
2. The conventional trap holder and Custodion NT are described in detail in the Initial Setup chapter of this manual.
3. The interface handle serves three purposes:
 - a) It provides a convenient handle to insert and remove the conventional trap holder from the device.
 - b) It holds the Custodion NT and conventional trap holder together. The tip of the needle protrudes far enough to just penetrate the check valve in the conventional trap holder which allows flow.
 - c) It allows for leak checking. The interface handle has a slider valve built into it. This valve is closed during leak checking and is open during desorption.

Starting a Desorption Run with a Leak Check Test

1. After setting the method parameters and then selecting the default method for the desorption run process open the run screen by selecting the **Run** option on the main screen and pressing the **Enter** button on the keypad.



After activating **Run** the following screen displays. This is the screen from which the run processes will begin.



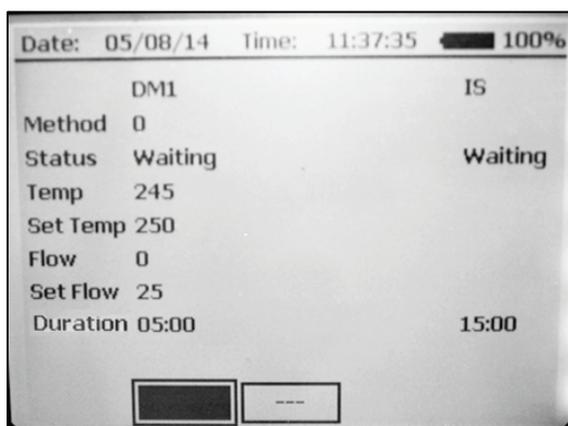
In the image above there is only one module (DM1) installed on the device as well as the internal standard (IS) port.

Notice at the top of the window the **Date**, **Time**, and power indicator will display. Also the module type for the **START** button. In this case the module type is the desorption module or **DM1**. Also shown is the default method selected from the method list. Below are descriptors for each item:

- The current **Date** and **Time** are displayed on the screen as well as a graphical depiction of the battery level.
- The module type as in the image above is the desorption module or **DM1** because it resides in position 1 of the SPS-3 device.
- The method to be used by the desorption module appears to the right of DM1. In this instance the default method is **Method 0**. The SPS-3 is capable of storing up to 10 methods per module type.
- The **Timer** is the amount of time the desorption process will run.

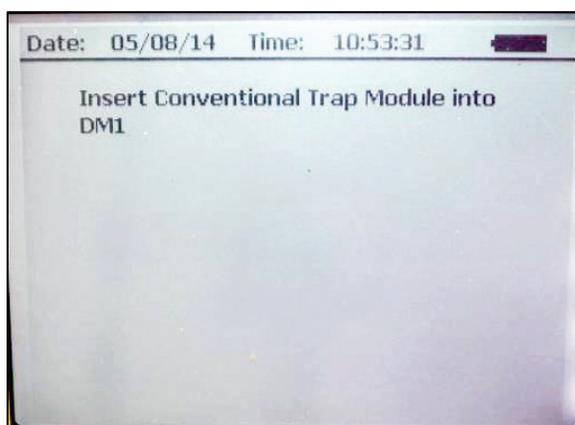
- The operational **Status** for the module displays **Ready** while the button action changes to **Start** in the image above.
- The **Status** will display **Waiting** until the temperature is within 5°C of the set point which is set in the method parameters at which time the **Status** will change to **Ready** and the button will display **Start**.
- If the Status displays **Waiting** it means that the IS module has not yet reached the designated temperature. When the **Ready** prompt is displayed the **Time** setting will change to 1:00 indicating the amount of time needed to transfer the internal standard to the CUSTODION NT.

While the temperature is adjusting to the set point the **Start** button will become blank indicating that the temperature has not yet reached the desired temperature as shown below.



2. When the **Status** on DM1 shows **Ready** the button label will change to **Start**. Press the **Enter** key on the keypad to activate the run process.

The first screen to appear will instruct the user to insert the conventional trap into the DM1 which includes the interface handle.



3. Insert the conventional trap holder into the DM1 port or position 1 on the SPS-3 device as shown in the image below.

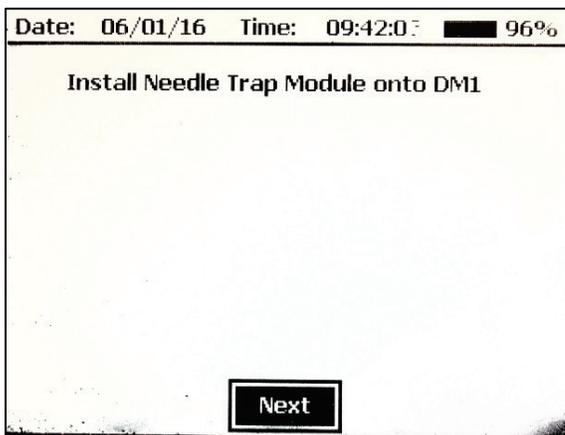
Make sure that the blue end of the conventional trap holder is connected to the interface handle. The black end of the conventional trap holder is placed into the desorption port. Make sure to align the metal knob protruding from the side of the conventional trap holder with the cutout on

the device of the DM1 port. There is a sensor in the device that will detect when the conventional trap has been inserted correctly.

The following image shows the conventional trap holder with the interface handle being inserted correctly into the DM1 module.



4. After inserting the conventional trap holder into the DM1 port the following screen will display instructing the user to insert the needle trap into the interface handle on the conventional trap holder.

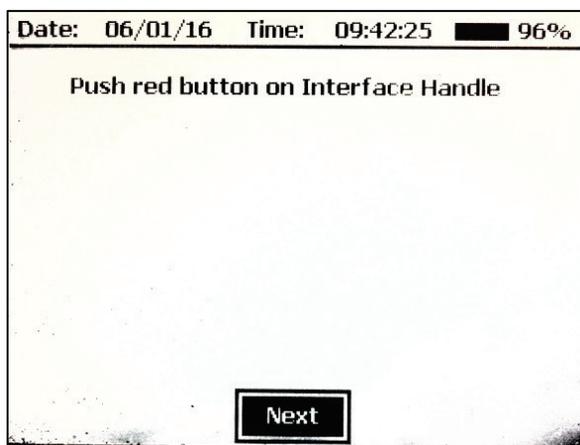




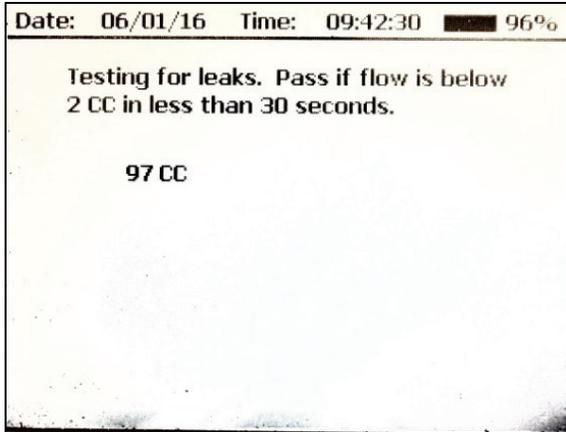
NOTE: The Custodion NT can already be inserted into the interface handle with the conventional trap holder attached to the interface handle before placing it into the DM1 port. In other words, it can be an entire trap assembly that is placed into the DM1 port rather than two separate pieces, i.e. conventional trap holder with the interface handle and then the Custodion needle trap.

5. After the needle trap has been inserted into the interface handle press the **Enter** key on the keypad which will activate **Next** which is already selected and will advance to the next screen.
6. Since the Leak Check option was enabled in the method parameters the image below will display. (If the Leak Check option was not enabled, skip to step 15 and continue with the instructions.)

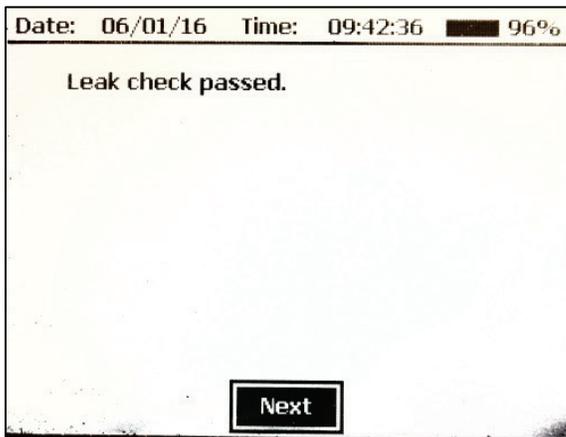
NOTE: By disabling the leak check option in the method only the desorption cycle will occur.



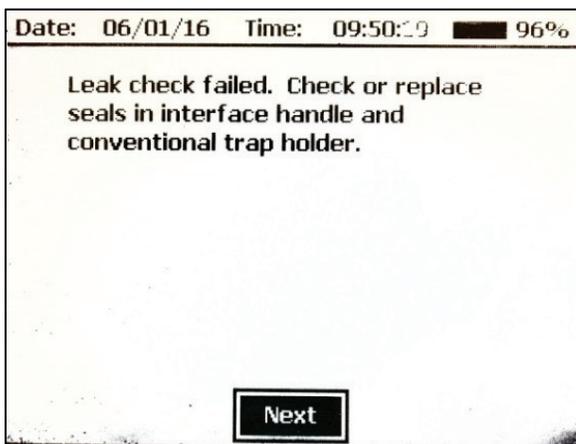
7. By pressing the red button in on the interface handle the flow through the conventional trap and the Custodion NT is closed.
During the Leak Check, the device opens the carrier gas valve and starts to monitor the flow. The carrier gas is left on during the entire test. The system monitors the pressure and flow. The system is leak free if the flow is less than 2 mL/min after 30 seconds.



8. Upon completion of a successful leak check test the image below will be displayed.

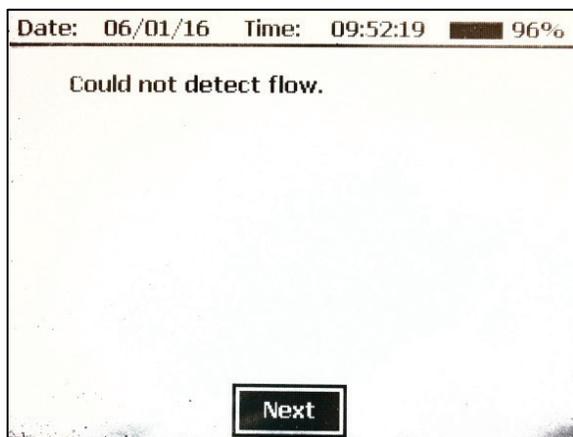


9. If the leak check fails, the following screen will display indicating seals in the conventional trap holder or the interface handle need to be replaced.

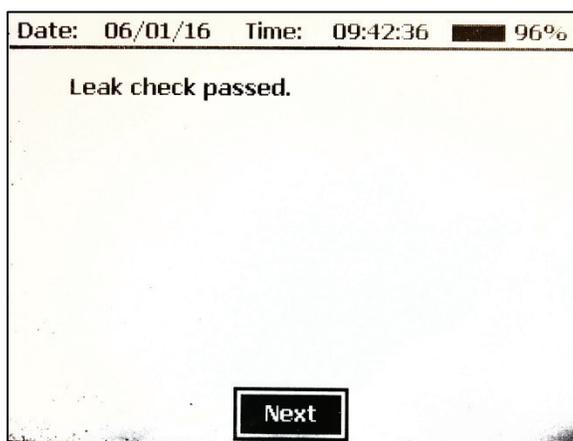


There are seals in the conventional trap holder and in the interface handle. The leak may be in either of these locations Instructions on how to replace the seals can be found in the *Maintenance* chapter of this manual.

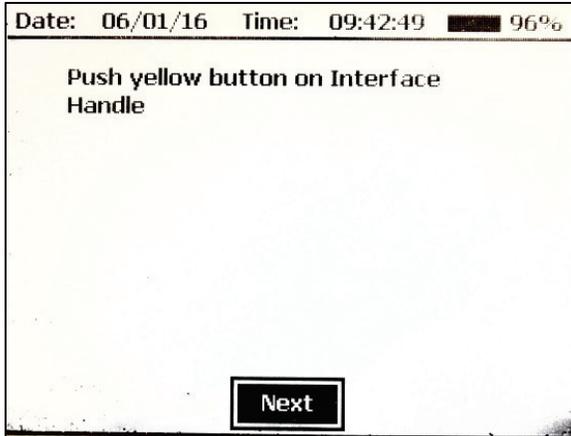
10. If there is no flow through the traps, the system will abort the run and an error message will be displayed. If this happens, check to make sure gas is connected to the back of the device and that it is turned on or be sure a full cylinder is installed in the device. Then try running the sample again. Since there was no flow through the trap assembly the sample will not be lost.



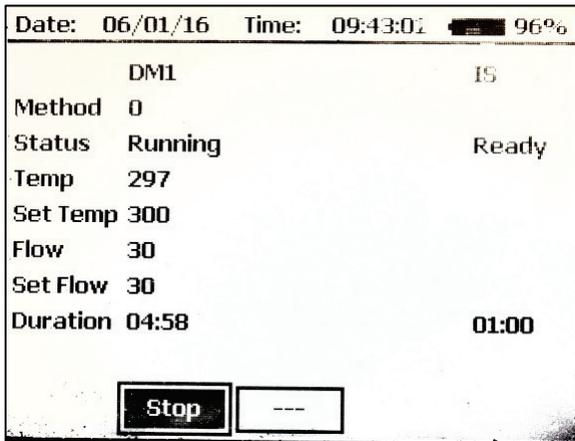
11. If the desorption module passes the leak check test and a passing leak check screen appears with the **Next** button already selected as shown below press the **Enter** key on the keypad to move to the next step.



12. After pressing **Enter** on the keypad after a successful leak check the user will be instructed to press the yellow button on the interface handle and then press the **Enter** key again.

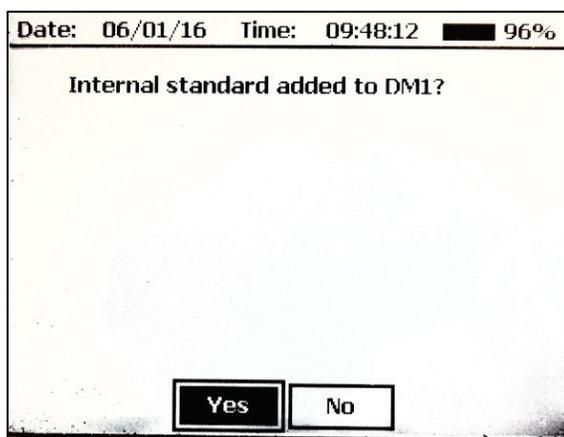


13. When the leak check passes, the screen above displays instructing the user to press the yellow button on the interface handle and then press **Enter**.
This action will allow the carrier gas flow from the conventional trap to pass through the Custodion NT. During this process the conventional trap is not being heated.
14. When the yellow button is first pressed the pressure used during the leak check process is released. There will be a momentary high flow through the trap assembly. Since the conventional trap is not yet hot, no sample is transferred.
15. After the yellow button has been pushed in on the interface handle the Start screen will be displayed.
The system will clamp the heaters onto the conventional trap holder and will continue the flow of carrier gas through both traps until the flow set point has been reached. The transfer process will begin and the **Timer** will countdown from the set time in the method.



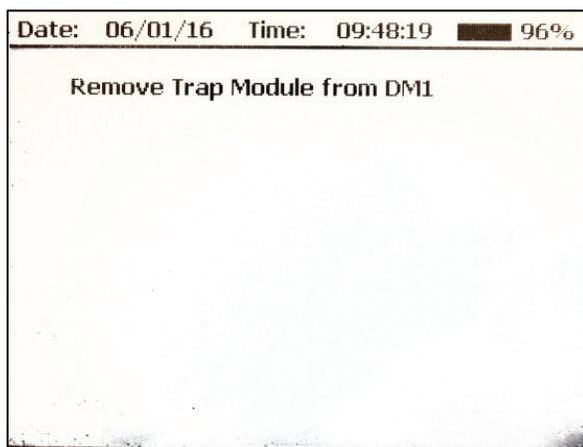
When the **Timer** has reached completion the system will emit two audible beeps and the heater clamps will automatically retract from the conventional trap.

The following screen will be displayed after the transfer of analytes has completed. Selecting Yes or No will add the information to the internal sample log. The internal Standard addition is performed by the user according to the next section of this manual.

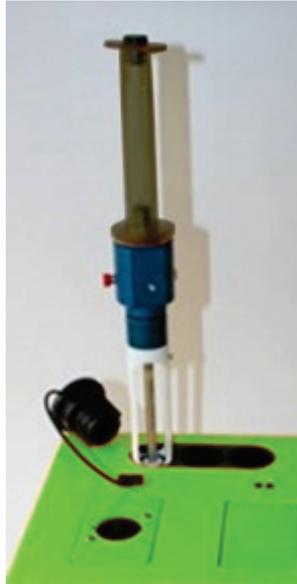


NOTE: Adding the internal standard to the needle trap is discussed in the next section of this chapter.

16. After responding **Yes** or **No** to the internal standard prompt a screen will appear instructing the user to remove the trap assembly from the DM1 module.



17. Remove the trap assembly from the DM1 position and place it in one of the cooling receptacles located along the back of the SPS-3 device.



CAUTION	<p><i>The conventional trap holder will be hot when removed from the desorption module. Place the trap assembly in one of the cooling receptacles for 5 minutes before handling the conventional trap holder. The trap receptacles have a magnet in the bottom which will secure the assembly. Once placed in the cooling receptacle the Custodion NT and interface handle can be removed and used for the next analysis.</i></p>
ATTENTION	<p><i>Le porte-piège conventionnel sera chaud lorsqu'il sera retiré du module de désorption. Placer l'ensemble piège dans l'un des récipients de refroidissement pendant 5 minutes avant de manipuler le porte-piège conventionnel. Les récipients de piège ont un aimant dans le fond qui sécurisera l'assemblage. Une fois placé dans le récipient de refroidissement, le Custodion NT et la poignée d'interface peuvent être retirés et utilisés pour l'analyse suivante.</i></p>

Adding the Internal Standard to the Needle Trap

This chapter explains how to use the internal standard module to add internal standards to Custodion NTs. Internal standards are used to improve the quantitative performance of analytical instruments. By using internal standards the effects of variation in the response of an analytical instrument can be minimized.

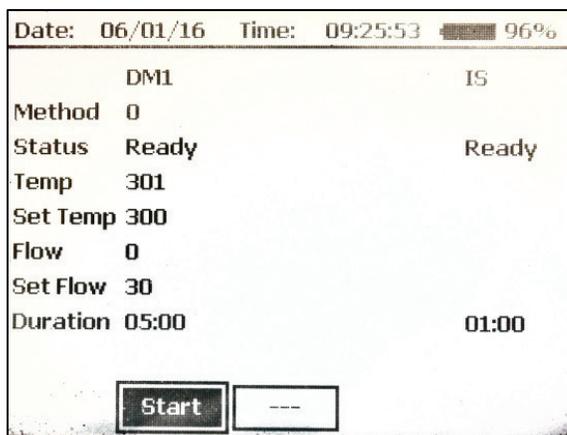
For example, if the detector gain of a Torion T-9 is decreasing with time resulting in a decrease in the response from a compound of interest the internal standard response will also proportionally decrease. By taking the ratio of the internal standard peak and the peak of interest the actual concentration of the analyte can still be accurately calculated even though the detector performance has changed.

The SPS-3 device is equipped with a module that generates internal standards as a vapor. This allows the user to easily add the internal standard to a Custodion NT without needing to carry either liquid or gaseous external samples for use as internal standards.

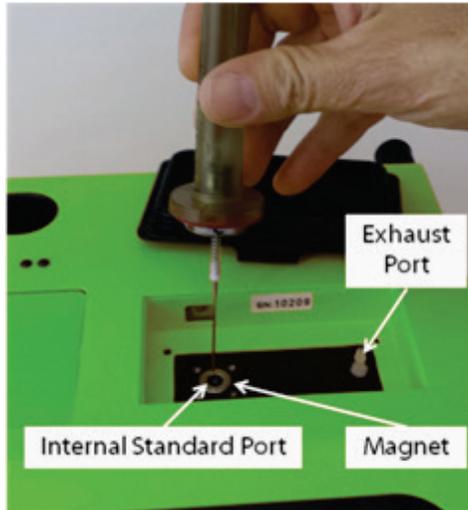
The sample is a polymer that acts like a liquid sample reservoir. Liquid chemicals are added to a vial that contains the polymer. The chemicals and the polymer are allowed to thermally equilibrate. At equilibrium most of the chemicals are contained in the polymer and a vapor that is at a constant concentration is present in the head space of the vial. Because the majority of the chemical reservoir is in the polymer the head space remains constant as small amounts of the chemical vapor are removed.

The vapor concentration is a function of temperature. By controlling the temperature of the polymer a constant concentration vapor is generated. Pushing a fixed volume of the vapor through the Custodion NT delivers a known amount of standard to the Custodion NT.

1. When the internal standard displays a **Ready** status as in the image below, remove the Custodion NT from the trap assembly and insert it into the **Internal Standard Port** on the top of the SPS-3 device.



Sensors on the port will detect the Custodion NT and the process of adding the internal standard will immediately begin.



The magnet on the port will hold the Custodion NT in place, while the internal standard is added. The port will automatically detect the needle and the **IS** status on the screen will change to **Running** and the time **Duration** will begin a countdown of 60 seconds.

Date: 06/01/16		Time: 09:55:03		96%	
	DM1		IS		
Method	0				
Status	Ready		Running		
Temp	300				
Set Temp	300				
Flow	0				
Set Flow	30				
Duration	05:00		00:52		
	Start		---		

Wait for the timer to indicate that the Custodion NT has been in the port for the required time. The time is a fixed time of one minute and cannot be changed.

Because the internal standard is pushed through the Custodion NT and the needle is restricted to flow it is necessary to leave it in for enough time for the pressure to reach equilibrium. This takes approximately one minute (01:00).

2. At the end of the time there will be an audible beep to indicate that the set time has been reached. This will load a fixed amount of vapor standard onto the Custodion NT.
3. Once the pressure has reached equilibrium there is no positive flow from the vial and the addition of the internal standard has completed. A warning beep will sound notifying you to remove the Custodion NT from the internal standard module.
4. Once the audible beep has been heard remove the Custodion NT from the module. The Custodion NT is now ready for either sample for insertion into the TRIDION injection port.

Temperature Set Point of the Internal Standard

1. When the device is first turned on the **Status** of the internal standard port will display **Heating** with a time duration of 15:00.

Date:	06/01/16	Time:	10:05:46	96%
	DML		IS	
Method	0			
Status	Waiting		Waiting	
Temp	290			
Set Temp	300			
Flow	0			
Set Flow	30			
Duration	05:00		14:42	

It takes about two minutes for the measured temperature of the internal standard module to reach the initial set point. Then it takes an additional 15 minutes is required for the polymer in the internal standard vial to equilibrate to the set point temperature.

2. The concentration of the internal standard analytes in the vapor phase of the vial will continue to increase until the polymer has reached a steady temperature.

NOTE: Turning the device off and then back on will restart the 15 minute wait time. This happens because the device cannot detect the actual temperature of the polymer inside of the vial when the system is powered back on. To get good quantitation it is very important for the polymer to reach the actual set temperature. If the polymer is not at temperature the concentration of the standard chemicals will be low. Since there is no way to measure the actual temperature the 15 minute wait will occur to ensure good quantitative sample concentration.

Effect of Elevation on Internal Standard Volume

- The internal standard is injected into the Custodion NT by a fixed volume of carrier gas.
- Since the gas is at a controlled elevated pressure of 35 psi the volume that will be displaced from the vial is affected by atmospheric pressure. The device is equipped with an atmospheric pressure sensor which is used to adjust the temperature of the internal standard vial based on the atmospheric pressure.
- At an elevation of zero feet above sea level the temperature of the vial is 60°C. At an elevation of 4500 feet above sea level the temperature of the vial will be around 57°C.
- The volume of the expanded gas will be about 13% higher at 4500 feet than it will be at sea level. Decreasing the temperature adjusts the concentration of the internal standards so that even with the increased volume being injected the same amount of standard is sent to the Custodion NT.
- This process is automatic. Because of this automated process it is not possible to change the composition of the internal standard. In addition, it is also not possible to allow the user to adjust the temperature of the vial.

Maintenance

About System Maintenance

This chapter describes basic maintenance and calibration of the device. There are only a few parts of the sample prep station hardware that require maintenance. These are primarily seals that are used to prevent leaks and direct flow inside of the various parts of the sampling system.

Maintenance should be performed on the appropriate parts when the system fails a leak check or a leak is detected with a helium leak detector.

MAINTENANCE SHOULD ONLY BE PERFORMED WHEN THE SYSTEM IS TURNED OFF AND ALLOWED TO COOL TO AMBIENT TEMPERATURE.

SPS-3 Tool Kit

The SPS-3 comes with some specialized tools needed to perform routine maintenance on the instrument.



Seal Removal Tool

0.050" Hex Driver

1/16" Hex Driver

Purge Tool

IS Vial Removal Tool

PH1 Screw Driver

Seal Removal Tool	Used to loosen and remove Seal Retaining caps and Seal Blocks
0.050" Hex Driver	Used to remove set screws on Interface Handle
1/16" Hex Driver	Used to access Internal Standard Module seals
Purge Tool	Can be used to purge Conventional Traps and aids in Seal installation
IS Vial Removal Tool	Used to remove the Internals Standard vial and aids in Seal installation
PH1 Screw Driver	Used to access helium canister

Internal Standard Vial Installation and Removal

THE INTERNAL STANDARD VIALS CONTAIN TOLUENE-D8 AND BROMOPENTAFLUOROBENZENE. THESE CHEMICALS WERE CHOSEN BECAUSE THEY ARE NOT LIKELY TO BE FOUND IN THE ENVIRONMENT AND BECAUSE THEY PRODUCE ELECTRON IONIZATION FRAGMENTS WITH SEVERAL MASS VALUES FROM WHICH TO CHOOSE.

Installing the Internal Standard Sample Vial

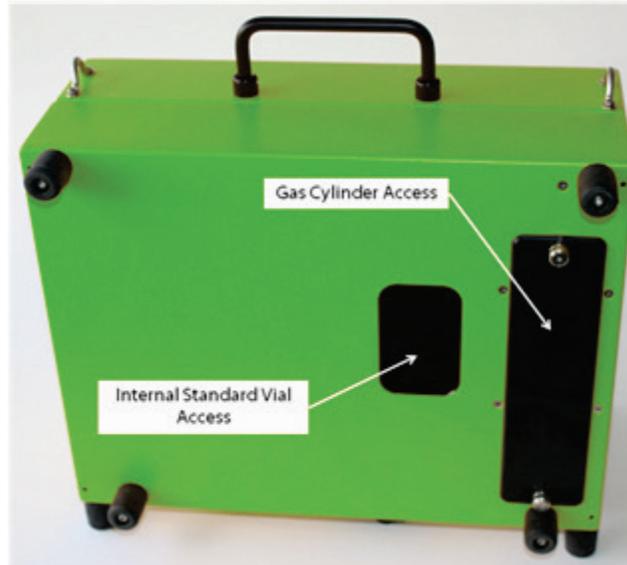
1. Break the top off of the internal standard vial at the score mark.



NOTE: *Wetting the score mark on the internal standard vial will make it easier to break the top off of the vial.*

CAUTION	<i>It is possible that the glass vials can break. Wear appropriate gloves or use appropriate tools when breaking open a standard vial.</i>
ATTENTION	<i>Il est possible que les flacons en verre puissent se briser. Porter des gants appropriés ou utiliser les outils appropriés pour ouvrir un flacon standard.</i>

2. The sample prep station has feet on the bottom and on the back of the device. The feet on the back are used for installation and replacement of the internal standard vial and the carrier gas. Set the device on its back with the bottom facing forward.



3. Unscrew the internal standard vial holder access cover.
4. Slide the internal standard vial up into the opening with the open top facing into the instrument.



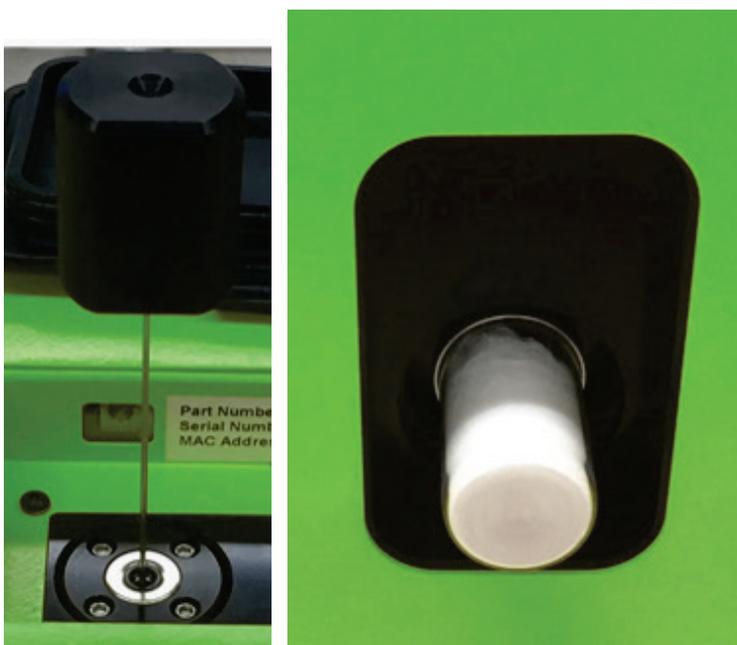
5. Screw the bottom access cap back into place until it is finger tight.

Removing the Internal Standard Sample Vial

1. Remove the Internal Standard Vial access on the bottom of the instrument.



2. Insert the Internal Standard Vial Removal Tool into the internal standard module needle port to press the vial out of the instrument.

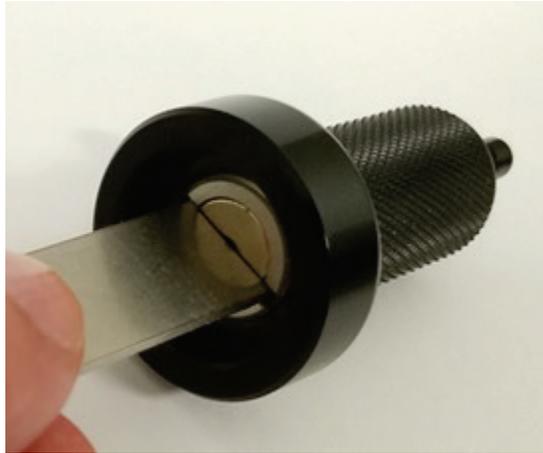


3. Remove and discard the old vial. Replace with a new vial according to the vial installation instructions above.

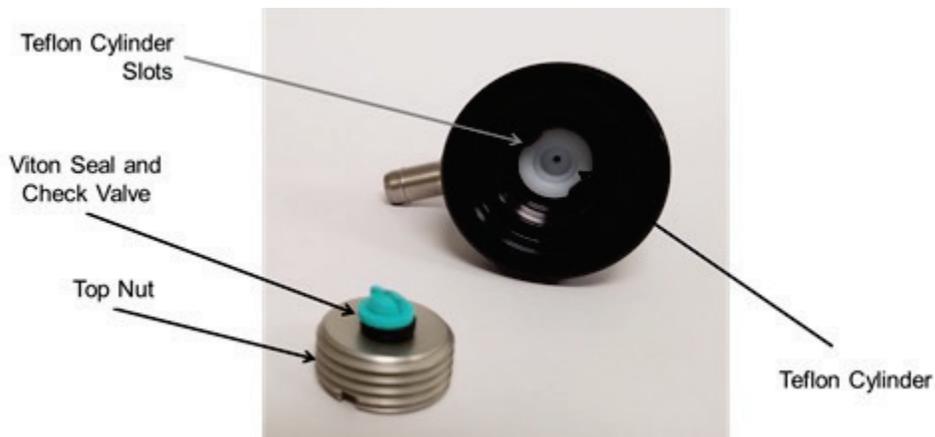
Needle Trap to Pump Interface Seal Replacement

Replacement seals are available as a kit: (P/N NTSSCL60711).

1. To replace the seals, use the Seal Removal Tool to remove the top nut.
The following picture shows the tool being used to remove the top nut. The ends of the tool are custom designed to assist in removal of the seals. The nut is removed by using the end of the tool with the small tines. The other end has larger hooks that are used to pull the Teflon cylinder out of the Custodian.



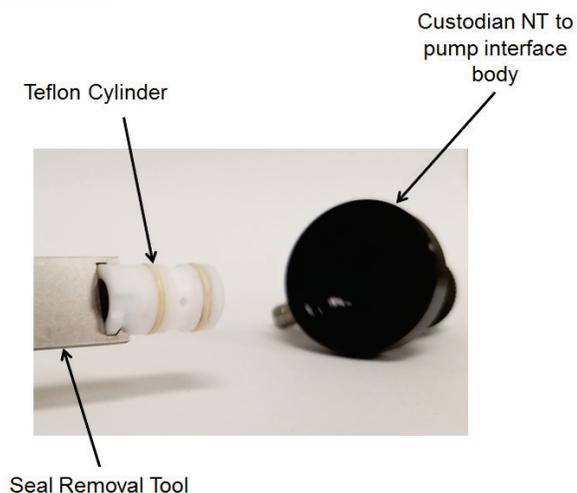
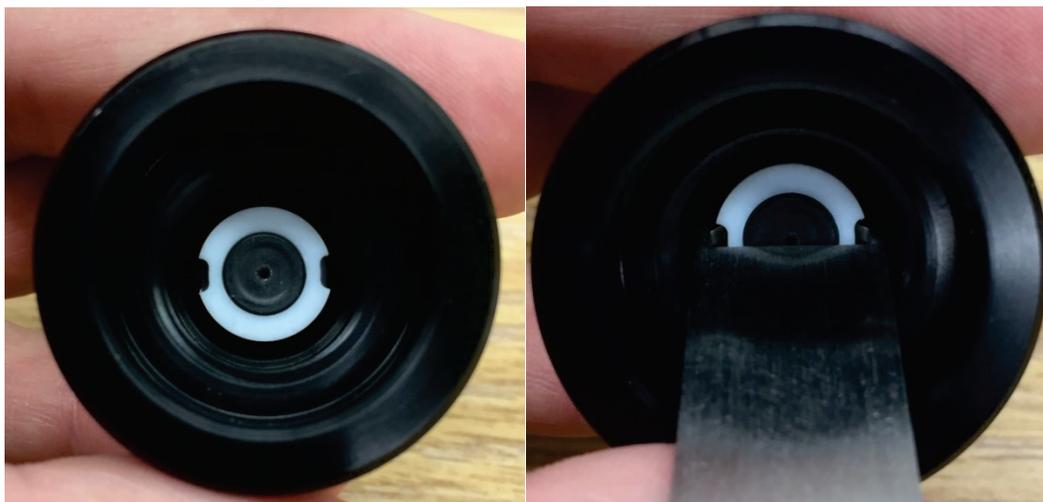
2. Underneath the nut is a Teflon cylinder. The cylinder holds the seals in place. There is a two part seal and check valve in the top of the Teflon cylinder. They will usually stay in the top of the Teflon cylinder but can be easily removed with your index finger.
The following image shows the top nut removed with the seal (black) and check valve (green) on top of the nut, and the top of the Teflon cylinder that is exposed after removing the top nut.



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3. To remove the Teflon Cylinder use the hook end of the Seal Removal Tool.
4. Slide the ends of the tool into the slots at the edge of the Teflon Cylinder.
5. Rotate the tool to engage the hooks and pull the Teflon Cylinder out of the Custodian NT to pump interface.

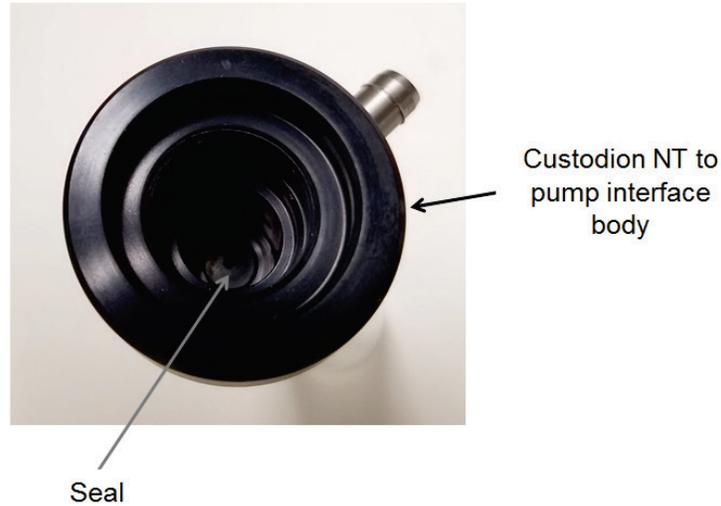
The following images show inserting the tool into the slots and the Teflon Cylinder removed from the Custodian NT to pump interface body.



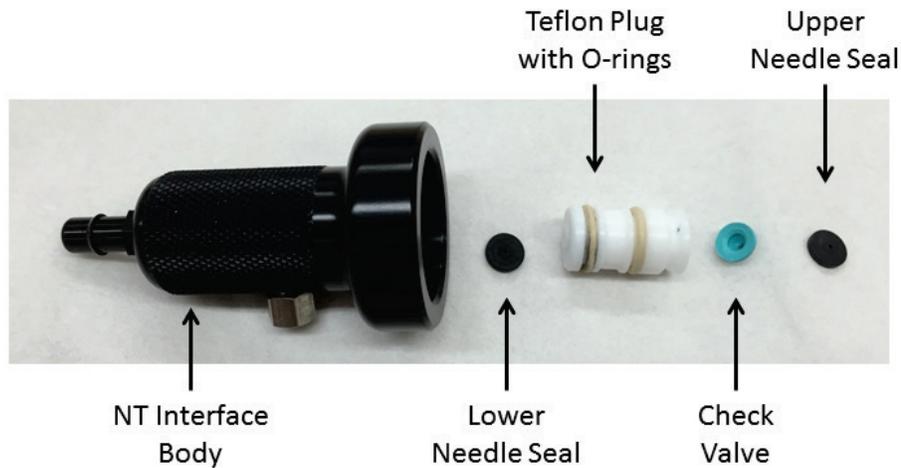
6. Remove the existing O-rings from the Teflon Cylinder. Replace with new O-rings.

IMPORTANT: *Do not use any sharp or metal tools to remove the O-rings or you may scratch or damage the Teflon plug.*

7. The second seal is in the bottom of the Custodion NT to pump interface body. This is only a seal with no check valve.

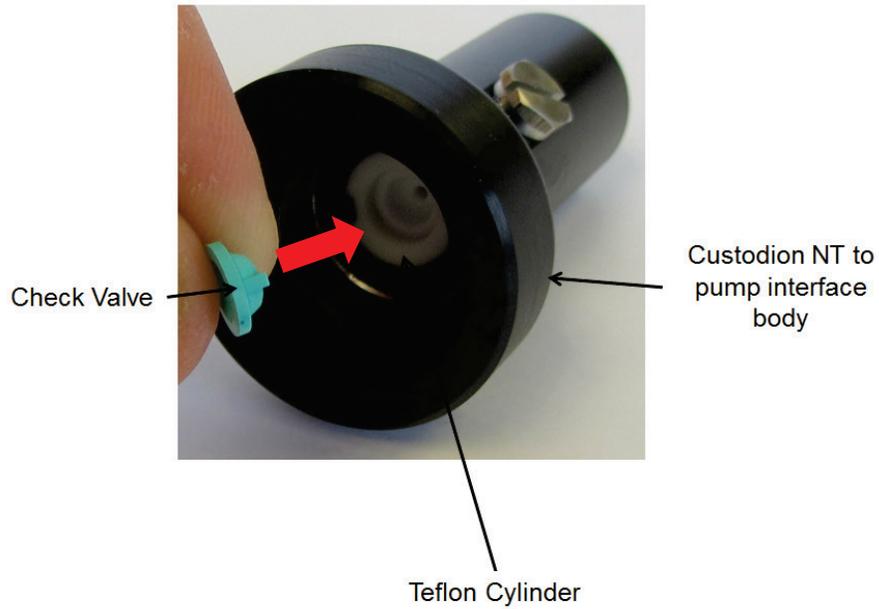


8. Use the IS Vial Removal Tool or Purge Tool inserted in the barb on the bottom of the body to push the bottom seal out of the body.
9. Reinstall the seals in the reverse order.

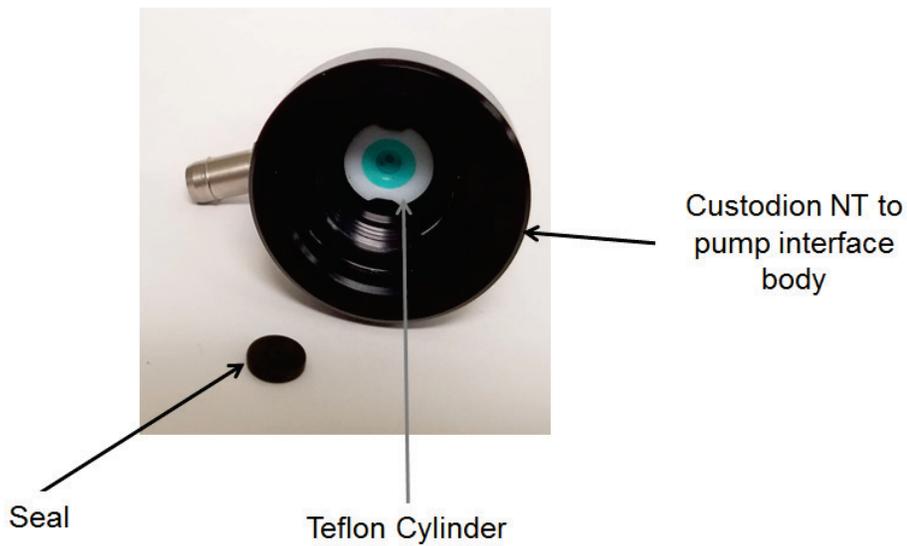


10. Place the Lower Needle Seal into the Interface Body making sure it is sitting in the cutout.
11. Reinsert the Teflon Plug with the new O-rings installed and press it into place until it contacts the lower seal.

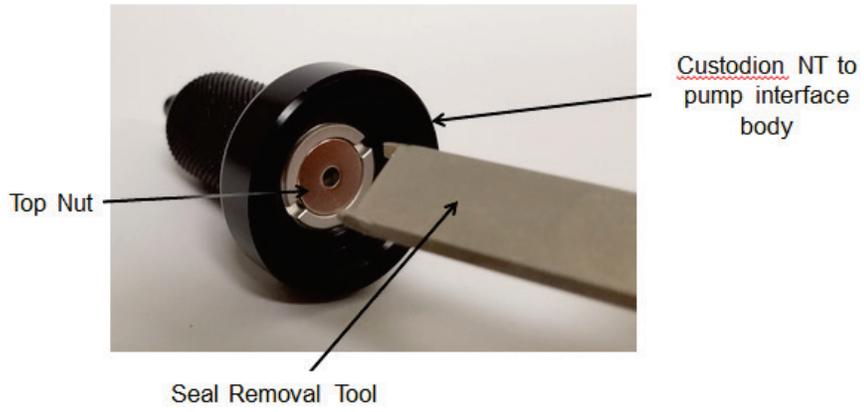
12. Place the new Check Valve into the cup in the top of the Teflon Cylinder. The domed portion of the seal faces down into the Teflon plug.



13. Place the needle Seal on top of the check valve.

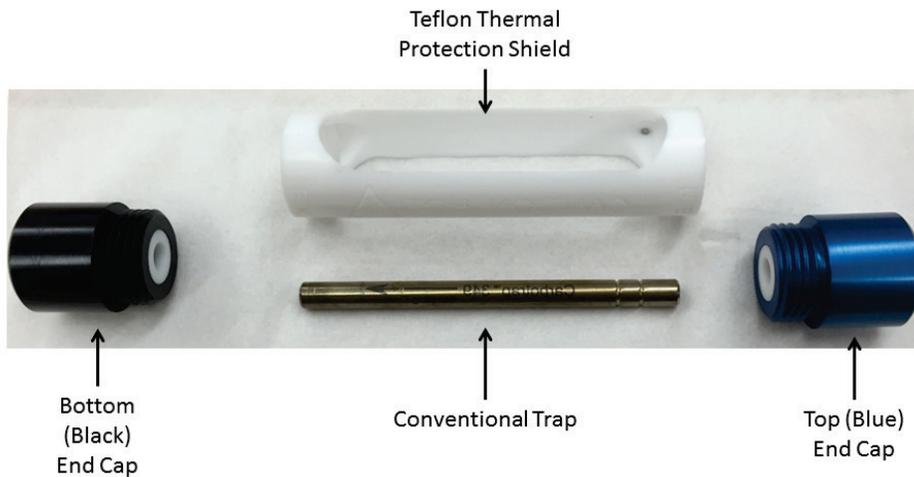


14. Install the Top Nut and use the Seal Removal Tool to tighten it finger tight.

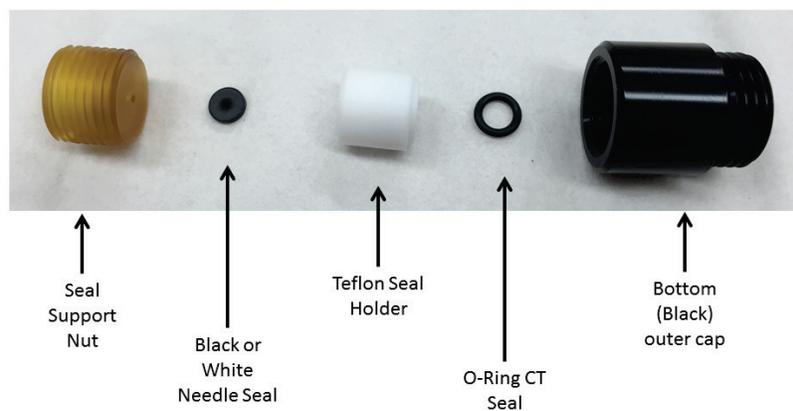
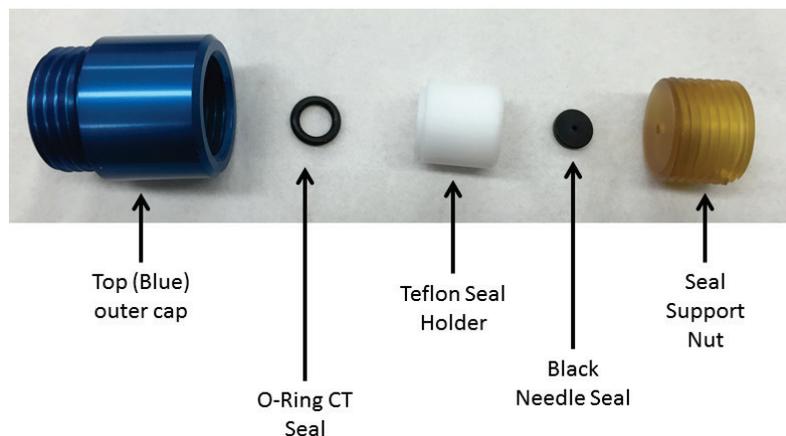


Conventional Trap Holder Seal Replacement

The following image shows the conventional trap holder. There are seals in both ends of the trap holder. Replacement seals are available as a kit: (P/N NTSSPS30011).



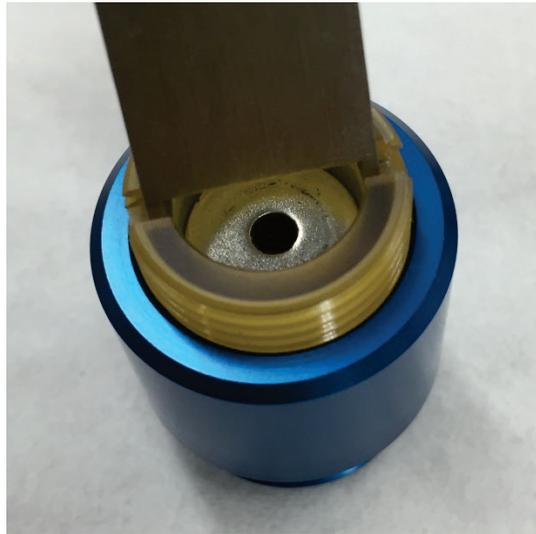
The following images show an exploded view of the end cap assemblies.



IT IS IMPORTANT TO NOTE THAT THE SEALS AND INTERNAL TEFLON PARTS HAVE DIFFERENT SIZED HOLES. THE INTERNAL NEEDLE IN THE SPS-3 DESORPTION MODULE IS A LARGER DIAMETER THAN THE NEEDLE TRAP. THIS IS DONE TO MAKE SURE THAT IT DOES NOT BEND DURING TRAP HOLDER INSERTION. WHEN REPLACING SEALS IN THE TRAP HOLDER IT IS ADVISABLE TO REPLACE THE SEALS IN ONE END CAP ASSEMBLY AT A TIME. THIS HELPS TO AVOID MIXING THE TEFLON PARTS.

Needle Seal Replacement

1. To remove the seals, unscrew the end caps from the Thermal Protection Shield and remove the Conventional Trap from the end caps.
2. Use the Seal Removal Tool to remove the End Cap Nut from the end cap.



3. Turn over the End Cap and remove the internal Teflon Seal Holder out of the End Cap.
4. Remove the seal from the internal Teflon Seal Holder and replace it with the new seal.



O-ring Seal Replacement

1. Remove the O-ring using an appropriate tool. Take care to not scratch or damage the sealing surfaces in the Teflon Seal Holder.



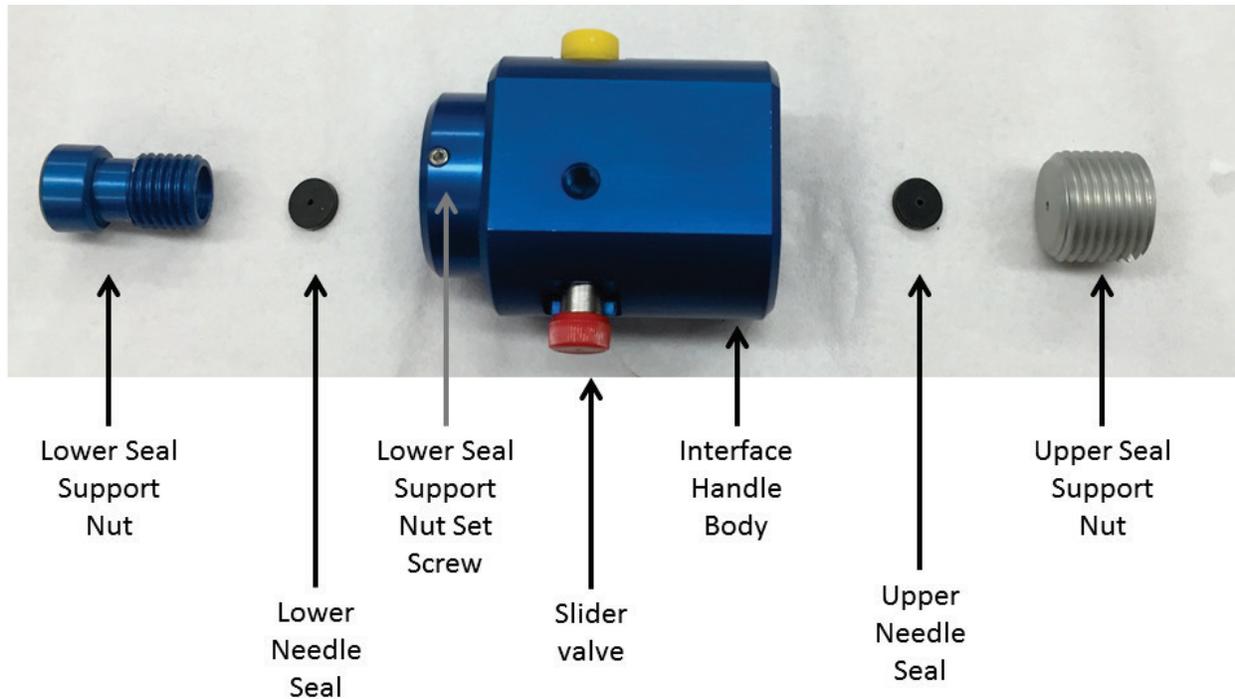
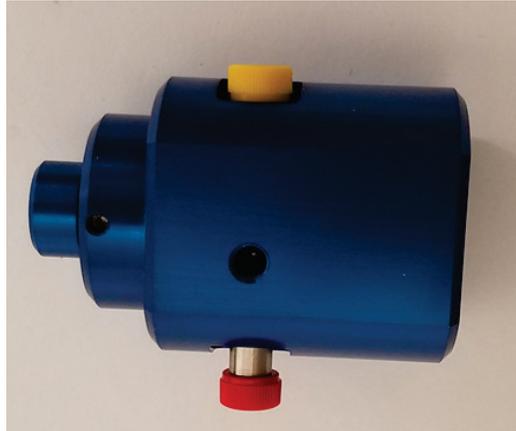
2. Reinstall a new O-ring and make sure it is placed completely into the machined groove.
3. Reinstall the internal Teflon Seal Holder to the outer cap and use the Seal Removal Tool to install the Seal Support Nut.
4. Screw the end caps onto the appropriate end of the thermal protection shield.
The thermal protection shield has markings for which color of nut to install on which end. The black nut goes on the end marked BLK and the blue nut goes on the end marked BLU. Install the Conventional Trap into the end cap that has been screwed onto the Thermal Protection Shield.
5. Check that the Conventional Trap has been installed with the correct flow direction then screw on the other end cap.

MANY CONVENTIONAL TRAPS HAVE ARROWS THAT INDICATE THE SAMPLING FLOW DIRECTION. OTHERS DO NOT HAVE ARROWS, BUT HAVE A GROOVE OR A SERIES OF GROOVES ON ONE END. THE ARROW INDICATES THE DIRECTION OF THE AIR FLOW DURING SAMPLE COLLECTION. THE GROOVES INDICATE THE END OF THE TRAP WITH THE WEAKEST SORBENT MATERIAL. SAMPLE COLLECTION IS ALWAYS DONE IN THE DIRECTION OF WEAKEST SORBENT TO STRONGEST SORBENT.

Interface Handle Seal Replacement

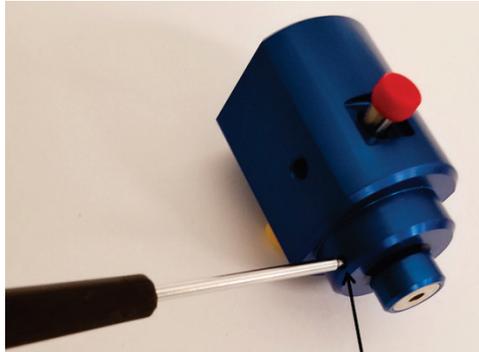
The interface handle is used to connect the Custodion NT to the conventional trap holder during sample transfer. There are two needle Seals and three O-rings on the slider valve in the interface handle.

The replacement seals are available as a kit: (P/N NTSSPS30014).



Interface Handle Lower Seal Replacement

1. To replace the Lower Needle Seal it is necessary to loosen the two screws (one on each side of the interface handle) that hold the bottom nut from coming loose during use. To loosen the set screws use a 0.050" hex driver provided in the tool kit.



Set Screw

2. Unscrew the Lower Seal Support Nut from the Interface Handle Body. The seal sits in a relief cut out in the lower seal support nut.



Lower Seal Support Nut

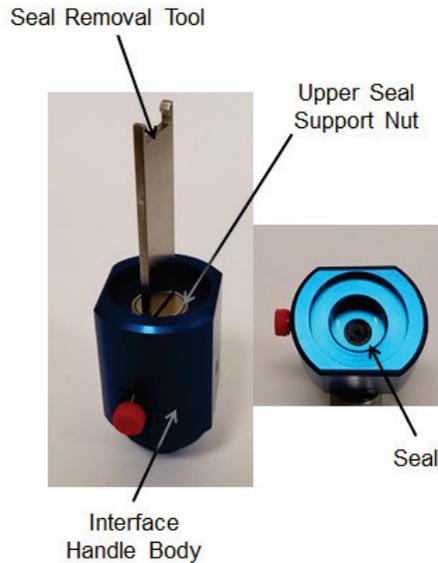


Lower Seal Support Nut with Seal Installed

3. Remove the old seal from the Lower Seal Support Nut and replace with a new Seal.
4. Reinstall the Lower Seal Support Nut and tighten it finger tight. Then re-tighten the two set screws to hold the Lower Seal Support Nut in place.

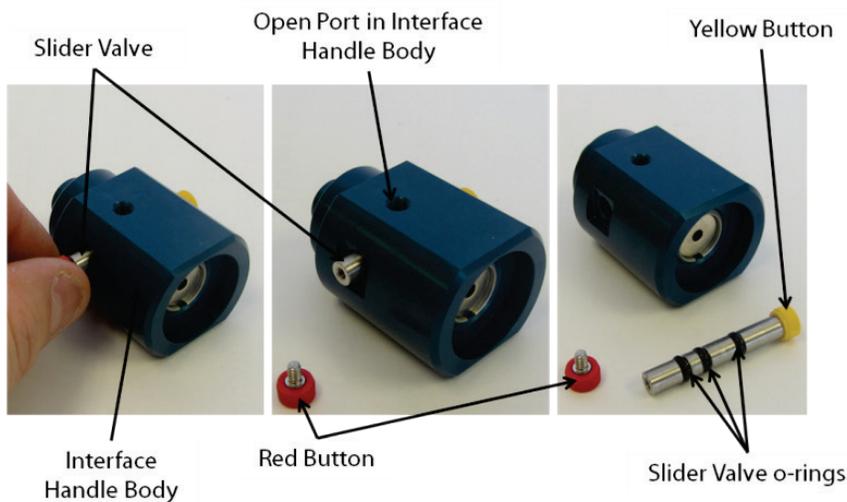
Interface Handle Upper Seal Replacement

1. To replace the Upper Needle Seal, remove the Upper Seal Support Nut using the Seal Removal Tool from the tool kit. The needle seal will usually stay in the interface handle.



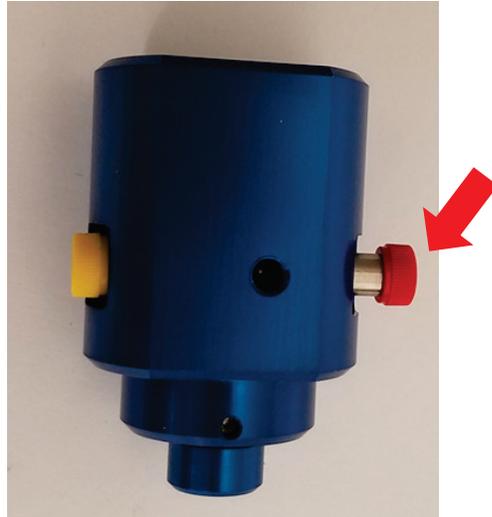
2. Using the Purge Tool, remove the Seal taking care not to scratch the surface.
3. Install a new Seal in to the bottom of the handle. Make sure that the Seal is positioned in the seal cut out to ensure proper alignment.
4. Install the Upper Seal Support Nut into the Interface Handle Body. Use the Seal Removal Tool to tighten the Upper Seal Support Nut finger tight.

Slider Valve O-ring Replacement



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1. Remove the Red Button by unscrewing it from the Slider Valve.
2. Grasp the Yellow Button and pull the Slider Valve out of the Interface Handle Body.
Use an appropriate tool to remove the O-rings from the Slider Valve. Take care not to scratch the slider valve shaft.
3. Install new O-rings onto the Slider Valve and slide the slider valve back into the Interface Handle Body.
4. Check that the Red Button is on the right as shown.

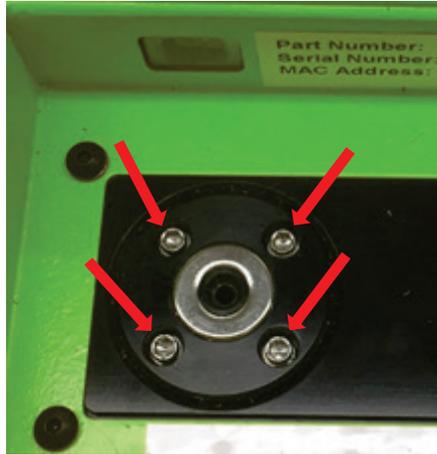


Internal Standard Module Seal Replacement

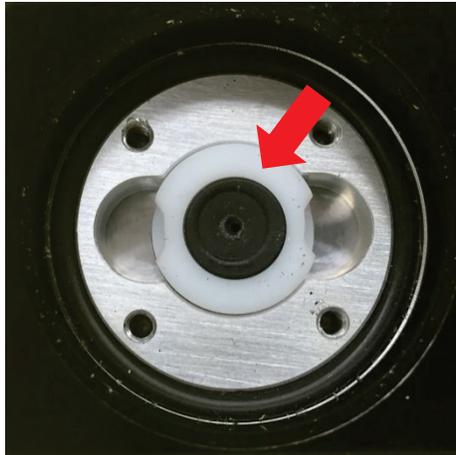
The Seals can be accessed through the top of the system under the internal standard needle port. When changing these seals, the internal standard sample vial will need to be removed prior to beginning.

Replacement seals and O-rings are available as a kit: (P/N NTSSPS30013).

1. Loosen the 4 screws on the top of the needle port using the 1/16" hex driver.
The screws are captive in the black seal cover and should not be removed completely. Once they are all loose, the top seal cover can be removed from the system.



2. Once the seal cover cap is removed, the Teflon Plug with the upper black needle seal is visible.

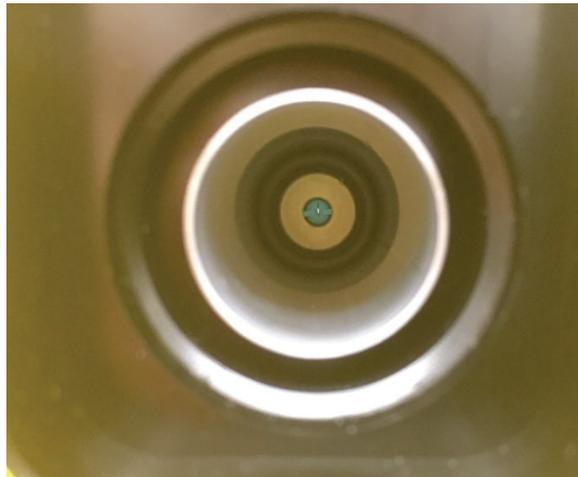


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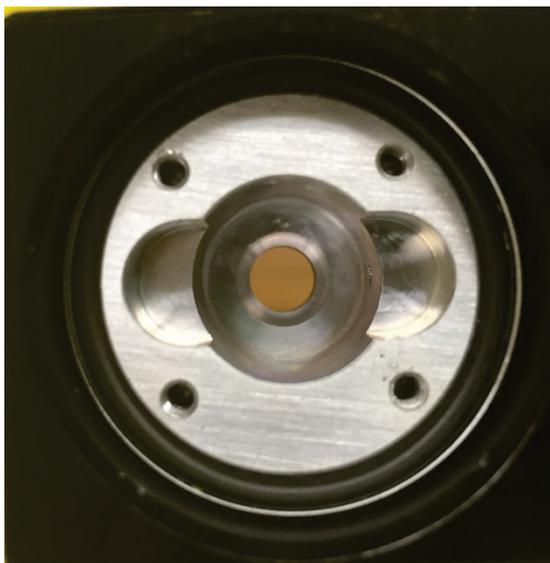
3. Insert the Seal Removal Tool into the notch in the Teflon Plug and turn it slightly to engage the slot in the plug. Pull the plug straight up to remove it from the IS module.



4. The lower needle Seal and Check Valve will usually remain in the bottom of the needle port. Use the IS Vial Removal Tool to press the seal and check valve up from the bottom of the instrument.



5. Check the needle port for any particles or contamination. Before proceeding to install the new seals, clean the sealing surfaces in the needle port.

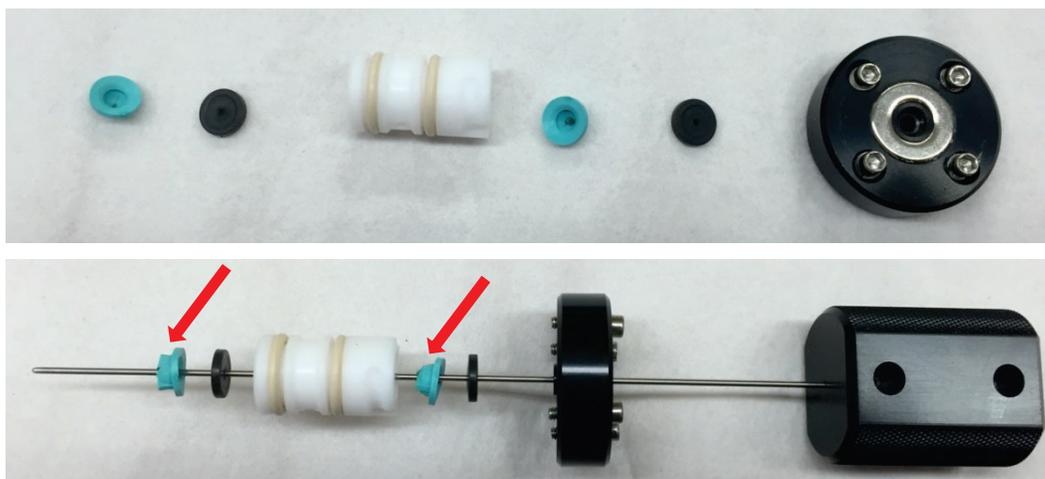


6. First replace the O-rings on the Teflon Plug. Take care not to scratch or damage the sealing surfaces on the Teflon.

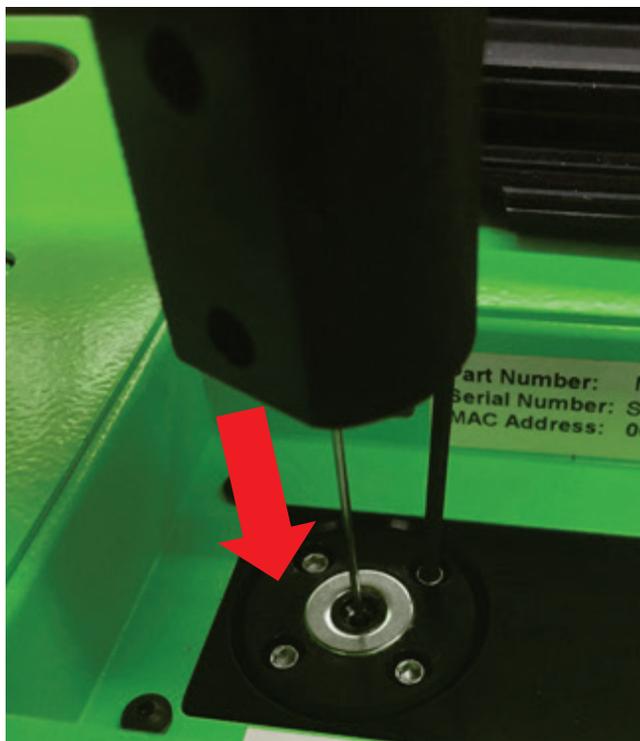


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7. To reinstall the seals, place the new seals onto the IS Vial Removal Tool in the order shown. Ensure the domed portion of the green check valves point to the bottom of the assembly.



8. Insert the tool with the assembled seals into the top of the instrument. Gently press down the top seal cap until it is flush with the top of the internal standard module to seat the seals. Then tighten the 4 retaining screws.



9. Reinstall a new internal standard sample vial.