



CRYO-TRAP

Adds Cryo-cooling capabilities to your GC

New programmable Cryo-cooling and heating trap for the Cryo-focusing of volatiles and semi-volatiles at the head of GC capillary columns.

Applications

- **Thermal Desorption Sample Trapping**
- **Purge and Trap Systems**
- **GC Headspace Sample Analysis**
- **Multi-dimensional GC applications**
- **Improve Chromatographic resolution of early eluting peaks**

**Pays
for itself
in just six
months!**

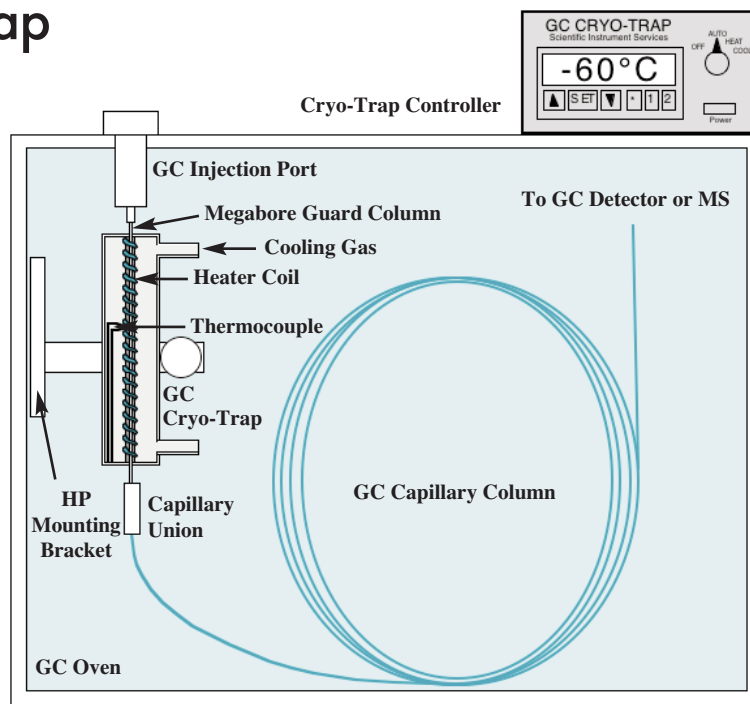


Scientific Instrument Services, Inc.

908-788-5550

Features of GC Cryo-Trap

- 2 models available
Model 951 for CO₂ cooling to -70°C
Model 961 for Liquid N₂ cooling to -180°C.
- Reduction of CO₂ or LN₂ use by 90% as compared to cooling the entire oven.
- Dual programmable cryo-cooling and heating cycles
- Trap compounds in the GC oven at the head of the GC column.
- Remote input connector for cryo-cooling to heating cycle switching via GC, Desorption system or manually.
- Rapid heating up to 400°C at > 800°C per minute.
- Remote start output signal for starting GC, MS or recorder.



The Cryo-Trap consists of a small heating/cooling chamber which is 3/4" in diameter and 5" long. In the center of the chamber is a small stainless steel capillary through which the capillary column freely passes. Capillary columns up to megabore (0.53mm I.D.) diameters can be used. Around the stainless steel capillary tube a heating coil is wound to provide for the rapid heating of the capillary tube. A thermocouple provides accurate measurement of both the cooling and heating temperatures. Either Liquid CO₂ (Model 951) or Liquid Nitrogen (Model 961) for cooling is

introduced into the Cryo-Trap, and is exhausted through the outlet which can either be vented into the GC or a tube can be attached to vent external to the GC oven.

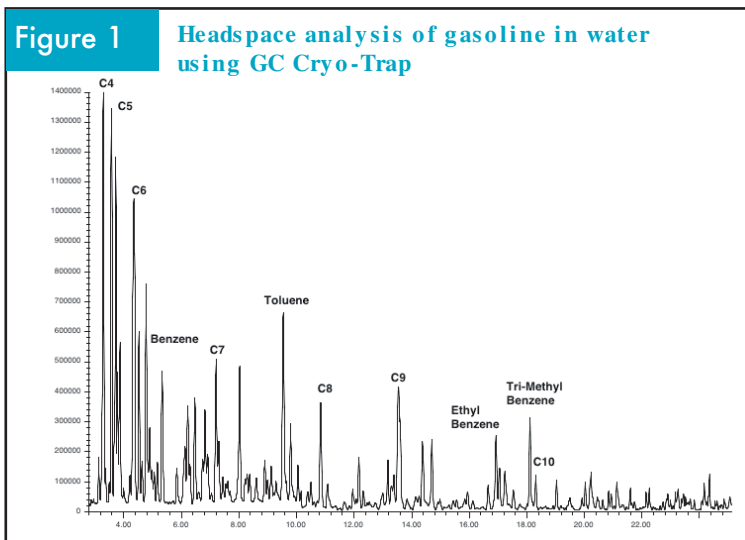
The control of the Cryo-Trap is provided via an independent Cryo-Trap Controller provided with the System. Both the Cryo-Cooling and heating temperatures are set via this digital temperature controller. The system can be used either manually to switch between cooling and heating or can be operated automatically via an input signal from a controlling device.

Applications of the GC Cryo-Trap

Headspace GC Analysis

Low boiling point volatiles from headspace samplers can be trapped in the GC Cryo-Trap for subsequent analysis. This will permit the analysis of large gas volume injections (0.5 to 100 ml or more) as well as multiple injections of headspace volumes into capillary GC columns. After trapping volatile organics at temperatures down to -180°C, the GC Cryo-Trap is rapidly heated to temperatures to 400°C to release the volatiles for separation on the capillary column. The resulting peaks are highly resolved, even for the very light volatiles such as butane and acetone.

In **Figure # 1**, 0.5 ul of gasoline was dissolved in 5.0 ml of water in a headspace vial. The sample was heated to 70°C in a CTC Headspace Sampler and then 1.0 ml of the headspace gas was injected over a 35 second time interval into the GC injection port and cryo-trapped in a narrow band on a 1.5u film thickness guard column in the GC Cryo-Trap at a temperature of -120°C. The sample was trapped for 5.0 minutes and then rapidly heated to 200°C to release the volatiles for GC analy-



sis. More than 100 compounds were detected and identified including the low boiling volatiles butane and pentane. A lower trapping temperature of -180°C was able to trap ethane

and propane. Applications of this technique could easily be expanded to the detection of low boiling volatiles in water, soil, food products, commercial products and other solid, liquid and gas matrix samples.

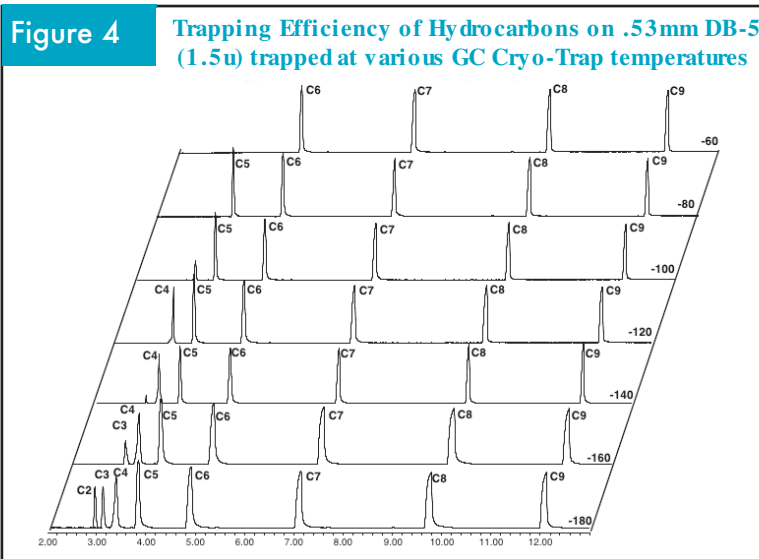
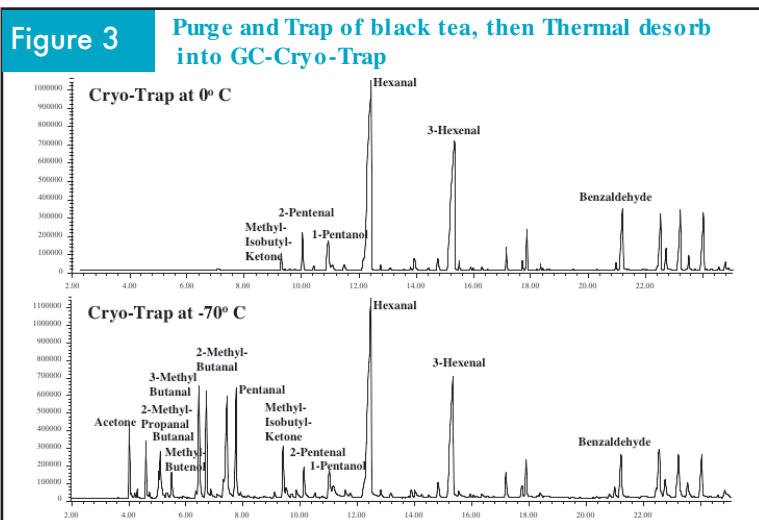
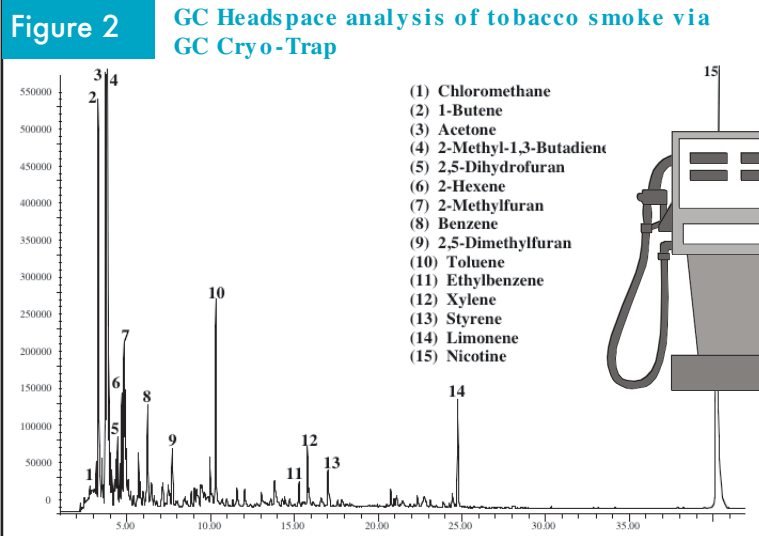
In **Figure # 2**, 2.0 ml of an air sample containing tobacco smoke was slowly injected into the GC injection port over a 1.0 minute time interval and cryo-trapped on the guard column in the GC Cryo-Trap at a temperature of -70°C and held for 2.0 minutes. After heating the GC Cryo-Trap to 250°C to release the volatiles, the resulting chromatogram provided for a wide range of volatiles including 1-Butene, acetone, benzene and nicotine.

Thermal Desorption - Purge and Trap Applications

In the thermal desorption technique, large volume gas samples are typically purged from the sample or adsorbent resin, into the GC injection port for analysis. Utilizing the GC Cryo-Trap, the volatile organics from this large gas volume can be cryo-trapped or cryo-focused in a narrow plug in the guard column in the GC Cryo-Trap. In **Figure # 3**, 200 milligram of black tea in water at 80°C was purged with 450 ml of gas and the volatiles trapped on a Tenax TA desorption trap. The volatiles on the adsorbent resin were then thermally desorbed off the resin at a temperature of 250°C utilizing the S.I.S. Short Path Thermal Desorption System, purged into the GC injection port and cryo-trapped on a 5.0 u film thickness guard column in the GC Cryo-Trap at two different temperatures (0° and -70°C). The GC Cryo-Trap was then heated to 220°C to release the trapped volatiles for subsequent GC/MS analysis. At a cryo-trapping temperature of 0°C, volatiles down to methyl isobutyl ketone were trapped. At a trapping temperature of -70°C, eight additional volatiles including acetone were trapped and identified.

Direct Injection Applications

In **Figure # 4**, a series of neat hydrocarbons from ethane through nonane were direct injected into the GC injection port utilizing the split mode and trapped on a 1.5 u film thickness guard column in the GC Cryo-Trap at a variety of temperatures. This chart demonstrates the range of volatiles that can be trapped as a function of the GC Cryo-Trap temperature. Utilizing the Model 951 with liquid CO₂ (minimum temperature -70°C), volatiles down to pentane can be cryo-trapped. Utilizing the new Model 961 GC Cryo-Trap which uses liquid nitrogen for cooling to a minimum temperature of -180°C permits the trapping of ethane on this guard column. The utilization of PLOT guard columns will permit the trapping of even lower volatiles such as methane, formaldehyde and ethylene oxide.



For additional applications request the FREE Application Notes available from S.I.S.

Ordering Information

Two models of the GC Cryo-Trap are now available. The Model 951 is designed for CO₂ use only for cryo-trapping temperatures down to -70°C. The Model 961 is designed for Liquid Nitrogen use only for cryo-trapping temperatures down to -180°C. Each model can maintain any cooling temperature within +/- 3°C from its minimum temperature up to room temperature. In order to release the trapped volatiles from the GC Cryo-Traps, both models can heat the GC Cryo-Trap at temperatures up to 400°C at a heating ramp rate in excess of 800%/minute. Most users prefer to use the CO₂ version of the GC Cryo-Trap (Model 951) due to the ease of handling liquid CO₂ and for applications where -70°C is an acceptable lower temperature limit.

If lower temperatures are required, then the liquid nitrogen version of the GC Cryo-Trap (Model 961) must be used. The liquid nitrogen liquid delivery lines are larger than the CO₂ lines and the liquid nitrogen lines must be insulated.

Depending on the make and model of your GC, an installation kit must be ordered separately as described below. First you must decide which model of Cryo-Trap is required for your application; the Model 951 for use with CO₂, or the Model 961 for use with liquid Nitrogen. Neither the GC Cryo-Trap or its related electronics are interchangeable between the two cooling gases. You must then select which installation kit is required based on the make and model of your gas chromatograph. Either of the two Cryo-Trap models will fit in the mounting brackets included with the installation kits listed below.

Model 951 GC Cryo-Trap for use with Liquid CO₂

The Model 951 GC Cryo-Trap is designed for use with liquid CO₂ tanks with a DIP tube. The minimum temperature of cooling is -70°C. This model comes with the GC Cryo-Trap, the dual temperature electronics control, connecting cables and stainless steel connecting line. It does not include mounting bracket or installation package which are ordered separately below.



GC Cryo-Trap controller

Part #	Description
951001	Model 951 GC Cryo-Trap for use with liquid CO ₂ Electronics Control, connecting cables, and Stainless Steel connecting lines

Model 961 GC Cryo-Trap for use with Liquid Nitrogen

The Model 961 GC Cryo-Trap is designed for use with liquid nitrogen tanks (low pressure). The minimum temperature of cooling is -180°C. This model comes with the GC Cryo Trap, the dual temperature electronics controller, connecting cables and a stainless steel connecting line. It does not include a mounting bracket or installation package which must be ordered separately below.



GC Cryo-Trap controller

Part #	Description
961001	Model 961 GC Cryo-Trap for use with liquid Nitrogen, Electronics Control, connecting lines, and Stainless Steel connecting lines

GC Cryo-Trap Installation Packages

Depending on the make and model of Gas Chromatograph one of the installation packages must be ordered for the installation of the GC Cryo-Trap. Three packages are currently available.

The H.P. installation package (900100) includes an oven wall mounting bracket which is designed to mount on the side of the GC oven wall on the H.P. 5880 and 5890 series GC's. It mounts on the side of the GC oven wall utilizing the T-Slots on the side of the oven wall. No drilling or additional holes in the GC are needed. The H.P. package also includes a remote switching cable and 110 volt relay to permit the connection of the GC Cryo-Trap to the remote valve connector outputs on the GC main control panel. This will enable the user to automatically control the switching of the GC Cryo-Trap from the cooling to the heating mode via the GC program for unattended operation. A standard remote start cable and a remote start cable for the S.I.S. Thermal Desorption System are also included.

The installation packages for use on the Varian 3400 (900200) and the Shimadzu gas chromatographs (900300) mount via a clamp onto the GC injection port connector. No drilling or additional hardware is required. All of the installation packages include remote start cables to permit the automatic switching of the GC Cryo-Trap between the cooling and heating modes via the GC program and accessories for connecting to the remote output connectors on the gas chromatograph as well as a remote start cable designed to communicate with the S.I.S. thermal desorption unit.

Additional installation packages will be added as required so give us a call if you would like to use a GC not listed below.

Part #	Description
900100	Installation Package for the H.P. 5880 and 5890 GC, includes GC oven wall mounting bracket, remote start relay and cables, standard remote start cable, S.I.S. Thermal Desorption remote start cable.
900200	Installation Package for the Varian 3400 GC, includes GC Injection port connector, Injection port mounting bracket, standard remote start cable, S.I.S. Thermal Desorption remote start cable.
900300	Installation Package for the Shimadzu GC, includes GC Injection port connector, mounting bracket and remote start cables.

S.I.S. Short Path Thermal Desorption Program Chip

When the GC Cryo-Trap is used with the S.I.S. Short Path Thermal Desorption System Model TD2, the following program chip for the TD-2 should be ordered. This permits the TD-2 controller to automatically control the switching of the GC Cryo-Trap from the cooling to the heating mode when the thermal desorption process is complete. This chip is for use ONLY with the S.I.S. Model TD-2 Short Path Thermal Desorption System.

Part #	Description
951C	Program IC Chip for SIS Short Path Thermal Desorption System, TD-2

Application Notes on the GC Cryo Trap

A large number of application notes on the GC Cryo-Trap and its use with Headspace and Thermal Desorption Systems is available from S.I.S. at no charge. Call or write for your FREE copies of these application notes.



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