

95-0015 User Guide- TD-GC-Lonestar: How to run a Cold Trap Blank

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1 Introduction

The TD-GC-Lonestar system sold by Owlstone Medical Ltd gives the capability to analyse thermal desorption tubes using FAIMS on the Lonestar equipment. The Gas Chromatograph (GC) system used is the Thermo Trace 1310 and the thermal desorption (TD) used is the Markes UNITY-xr.

Samples are loaded onto the tube oven, which heats the tube and applies a backflush of clean Helium (carrier) gas. The He flow drives the sample towards a focusing cold trap (Markes U-T12ME-2S), which is packed with Tenax and Carbograph. The cold trap splits and recollects the analytes. A second desorption step takes place on the cold trap, in where a backflush of He transports and introduces the re-collected sample into the GC column via a transfer line.

The U-T12ME-2S Cold Trap is usually used with the temperature ranging from 290-320°C, with maximum operating temperature is 335°C that never should be exceeded. The cold trap requires to be blanked periodically, preferably daily, to assess trap saturation and to prevent sample carryover. Sample carryover is due to sample accumulation, which can affect following sample analysis.

This user guide gives guidelines on how to run and evaluate a cold trap blank in the TD-GC-LNS system.

Abbreviation/Term	Definition
СТ	Cold Trap
СТВ	Cold Trap Blank
VOC	Volatile Organic Compounds
TD	Thermal Desorption
UNITY-xr	Thermal desorption platform with a sorbent tube oven integrated in
	where sample tubes can be loaded and desorbed for VOCs injection
	onto the GC column.
MIC	Markes Instrument Control – TD sequence builder software
GC	Gas Chromatograph. The GC integrated in the TD-GC-LNS system is
	the Thermo Trace 130 Gas Chromatographer
LNS	Lonestar System – its FAIMS chips enables to detect chemical
	species in gaseous state based on its characteristic ion mobility speed
	under an asymmetric electric field.
FAIMS	Field Asymmetric Ion Mobility Spectrometry.
He	Helium, acts as carrier gas in the TD-GC-LNS system
N2	Nitrogen, acts as purge gas in the TD-GC-LNS system

2 Definitions

3 Procedure

3.1.1 Ensure that the carrier (He) and purge (N2) gas cylinders are not empty and that the installation has been leak checked. Replace if the cylinder pressure is less than 200PSI. Both gases should be 5.5 grade (i.e. 99.9995%). Check that the gas line toggle valves are opened.

	Cylinder (primary) regulator	GAS01 (secondary) regulator
Carrier gas pressure	50psi	20psi
Purge gas pressure	50-60psi	50psi

Table 1. Gas line pressure settings.

- 3.1.2 Demonstrate the TD instrument is leak tight by running a leak test on the TD system following the manufacturer supplied user manual.
- 3.1.3 Ensure the GC oven ramps settings coincide with those used when analysing samples. Adjust if required (see 95-0012 TD-GC-Lonestar How to run a sample tube)
- 3.1.4 Demonstrate the GC column is blank by running a GC column blank (see 95-0013 TD-GC-Lonestar How to run a column blank). This is essential for later CTB data evaluation.
- 3.1.5 Ensure the ATLAS pneumatic and heat boxes are on. The LNS flow should be 2800mL/min and the pressure 0.25bar.
- 3.1.6 Log the data collected on the LNS system. See 95-0012 TD-GC-Lonestar How to run a sample tube)

3.2 Cold Trap Blank sequence on MIC TD software.

3.2.1 Open the MIC. Wait until the instrument status is "Idle" and select the "Sequence" option from the software homepage (Figure 1).



Figure 1. MIC homepage.

3.2.2 The menu screen shown in Figure 2 will be displayed. Click on the "Instruments" tab to open the UNITY-xr schematic diagram and parameters panel. From the "Edit" tab, double-click on the "Method" column. A window listing all the methods in the system will appear. Select the method named "TD – Unity Trap Heat 110C" and press "OK".



Figure 2. Sequence builder screen.

3.2.3 If the method is not available or cannot be found, it is possible to create it from a template by using the "*Method Editor*" (purple button in Figure 1) and entering the parameters shown in Figure 3

📕 View Method [TD - Unity Trap Heat 110C]							×
🗅 🐸 🛎 🗗 🕞							
Methods	(e)	TD Method					
TD - Unity Trap Heat 110C		Mode: Unity Trap Heat					
All Methods [use date order]		General					^
Sequence						Flaur (ad/aria)	
All Methods [name order]		Standby Split On				r iow (mizinin)	
		Flow path temperature (°C)				130
		Minimum carrier pressu	ire				5.0
		Trap desorption					
		I rap low temperature (*	C)				30
		Trap purge time (min)					1.0
		I rap purge flow (mL/mir	(ר				<u> </u>
		Trap desorption					
		Trap desorb	Heat rate (°C/s)	Trap high (°C)	Time (min)	Split flow	Split Flow (mL/min)
TD - Unity Trap Heat 110C Met	t					_	
Dat	<u>e</u>	Trap desorb 1	MAX 🗸 🔁		3.0	\checkmark	50 0
Cor	Ĩ	Trap desorb 2	MAX 🗸	300	3.0	\checkmark	÷ 50
	<u>r</u>						
		Irap desorb 3	MAX V		V 0.0		
		Other Settings					
		Wait for GC ready					
		Trigger GC					~
							Split calculator
].				P .			
				🔁 Pa	rameter set in method	Parameter set on sequence	line UK Cancel
Figure 2 Cold Tran Dland		NUTY was not	and a				

Figure 3. Cold Trap Blank - UNITY-xr method.

3.2.4 The CTB method will be then loaded in the sequence. The instrument must be in "Idle" and the "GC ready?" message must be ticked (Figure 4). Press the green button to start the sequence. A "Run Sequence" window will pop up. Make sure all the options are unticked and press "*OK*".



Figure 4. How to begin a TD sequence.

3.2.5 The instrument's status will change to "Active" and the thermal desorption cycle will begin (Figure 5).

Ma	rkes Instrume	ent Control				
Edi	t Live					
	Status	Sample Type	Comment		Method	Trap Fire Time
Seq	uence		Repetit	tion:	1 🜩	Continuous
1	Active	Sample		TD - Un	ity Trap Heat	t 110C
Instr	uments					
Sta Ela GC	ndby psed: 0.1 ready ?	min			Active	Schematic
				Actual	Set	Vent
Tem	peratures (°0	C)				Unity
0	Cold trap			29.7	30	
T	ube oven			43.5		
ŀ	leated valve			129.2	130	
T	ransfer line			130.3	130	
Pres	ssures (psi)					
F	ourge gas			On		
5	Split gauge			28.3		'Y' @ -
MFC	flows (mL/n	nin)				LA LU
ι	Jnity split			20	20	
ι	Jnity trap			0	0	$ \phi \phi \phi \phi \phi \phi$
						Carrier Trap Spit

Figure 5. MIC sequence builder menu once the sequence has begun.

3.3 Cold Trap Blank Data Evaluation.

3.3.1 Export the LNS matrix data using the FAIMS Viewer (see 95-0011 TD-GC-Lonestar Data processing with FAIMS Viewer). Any background peaks should be <2pA (Figure 6).



Comparison between a passed and a failed CTB

Figure 6. Examples of a passed and failed CTB

- 3.3.2 If the first CTB fails, repeat it. The CTBs usually require a second repeat to confirm the trap is washing out with each thermal cycle.
- 3.3.3 If the CTBs have failed repeatedly, follow the troubleshooting diagram provided in the appendix.

3.4 How to Condition a Cold Trap.

- 3.4.1 Repeat TD-GC-LNS system prechecks specified in section 3.1.1.
- 3.4.2 Typical conditioning temperature ranges from 290 to 300 °C, with a maximum operating temperature of 335°C. This temperature must not be exceeded. The TD method settings used must be within these temperature limits.
- 3.4.3 Set and run a sequence using selecting the method "TD-Unity Trap Condition" (Figure 7).

nods	(<)	TD Method	
📔 TD - Unity Trap Cone	dition	Mode: Unity Trap Heat	
All Methods [use date	e order]	General	
Sequence	rier	Standby Split Flow (ml/min)	10
Ai metrious (name of	ue)	Flow path tempe	130 🖯
		Minimum carrier	5.0
		Trap desorption	
		Trap low temper	30 🖯
		Trap purge time	1.0 🖯
		Trap purge flow	50 🕃
		Trap description	
		Trap desorb Heat rate ("C/s) Trap high ("C) Time (min) Split flow Split F	low (mL/n
Unity Trap Condition [4 Unity Trap Condition [4 Unity Trap Condition [5	Method Name; TD - Unity Trap Date: 16 July 2018 11:16 Author: JTA	Trap desorb 1 MAX	200
Unity Trap Condition [2 Unity Trap Condition [1	Company: Owlstone Medical	□ Trap desorb MAX	50
		□ Trap desorb MAX - 🕄 🛱 300 😨 🛱 3.0 🗑 🖂	50
		Other Settings	
		I wait for GC ready	
	< >		Split calculat

Figure 7. TD method used for CT conditioning.

3.5 How to Replace the Cold Trap.

Follow the manufacturer supplied user manual for the TD system.

4 Appendix



5 Contacts and support

The Owlstone Medical Ltd team is dedicated to providing excellent support. For all technical and safe use question relating to this manual, contact as at:

Owlstone Medical Ltd. 183 Cambridge Science Park Milton Road Cambridge CB4 0GJ United Kingdom



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Or email support at support@owlstone.co.uk