TubeTAG^{PLUS} ™

Operators' Manual

Version 1.2

October 2009

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1. Warnings

Please first read the ULTRA/ULTRA *50:50*™ manual to familiarise yourself with the autosampler software and operation before analysing tagged tubes.

Under no circumstances should you directly expose tags to temperatures exceeding 110°C (Note: the ULTRA tube oven is specifically designed to allow heating to 390°C, with a tagged tube in position, without damaging the tag).

1.1. Tags on metal tubes [¼"stainless steel, Silcosteel®]

- *Must be removed* prior to loading on ULTRAs prior to serial number (GB00)M20456
- *May remain* on tubes during analysis on a tag "ready" (with the capability to read and write tags) ULTRA from serial number (GB00)M20467
- *Must be removed* before analysis on UNITY™ (can be left in place with UNITY 2™)
- *Must be removed* before conditioning on TC-20™

2. Introduction

Associating sample and usage data with thermal desorption (TD) tubes, have historically relied on manually recording tube serial numbers. Barcode technology has proved difficult to apply to TD tubes because the high temperatures required limit the lifetime and readability of labels. In addition, barcodes cannot be programmed to record tube history or sample specific information (*e.g.* sampling time and date).

TubeTAG represents a revolutionary advance in sorbent tube informatics. The product comprises an RFID tag and clip that can be attached to individual sorbent tubes. A TAG*SCRIBE* or a TubeTAG equipped ULTRA can then be used to automatically read and write tube and sample specific data to these tagged tubes.

TubeTAGs are generally used in two ways:

- **Sample specific mode** – A tag is attached to a conditioned sample tube in the laboratory before field deployment. That tag then stays with and tracks that sample tube whilst sampling in the field, where further sampling information can be logged to it, until its return to the laboratory. On return, the information is read back off the tag before sample analysis. The tag is then removed and the tube analysed. The information on the tag is then cleared. It is then ready to go out with another tube to track another sample.

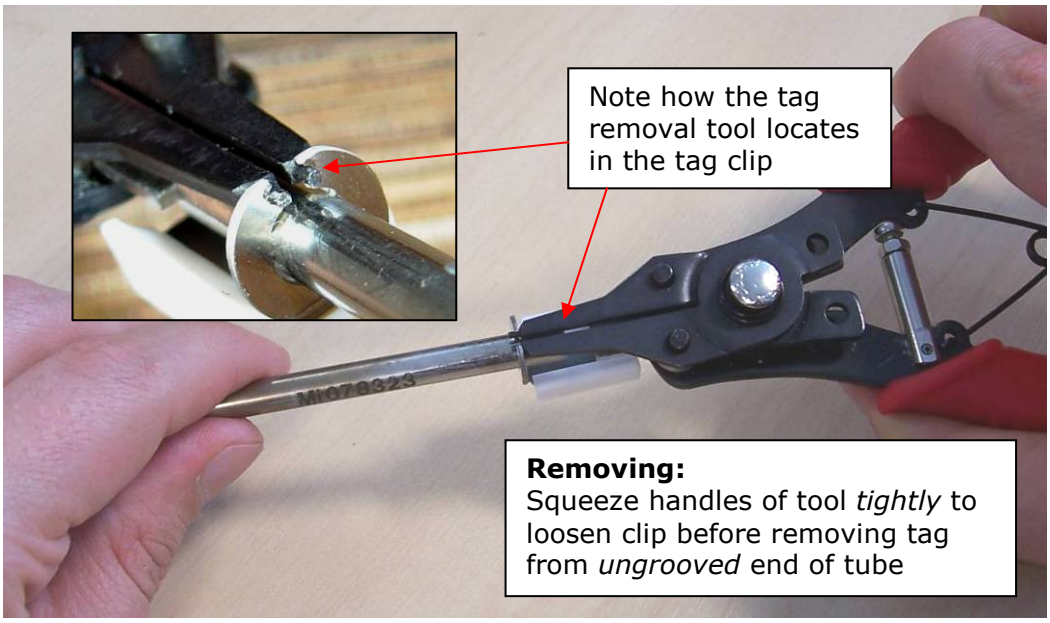
- **Tube specific mode** – A specific tag is associated with a specific tube throughout its life time so that it logs both sample specific data and tube history information: number of thermal cycles, back pressure during sampling, when the tube needs repacking, *etc*.

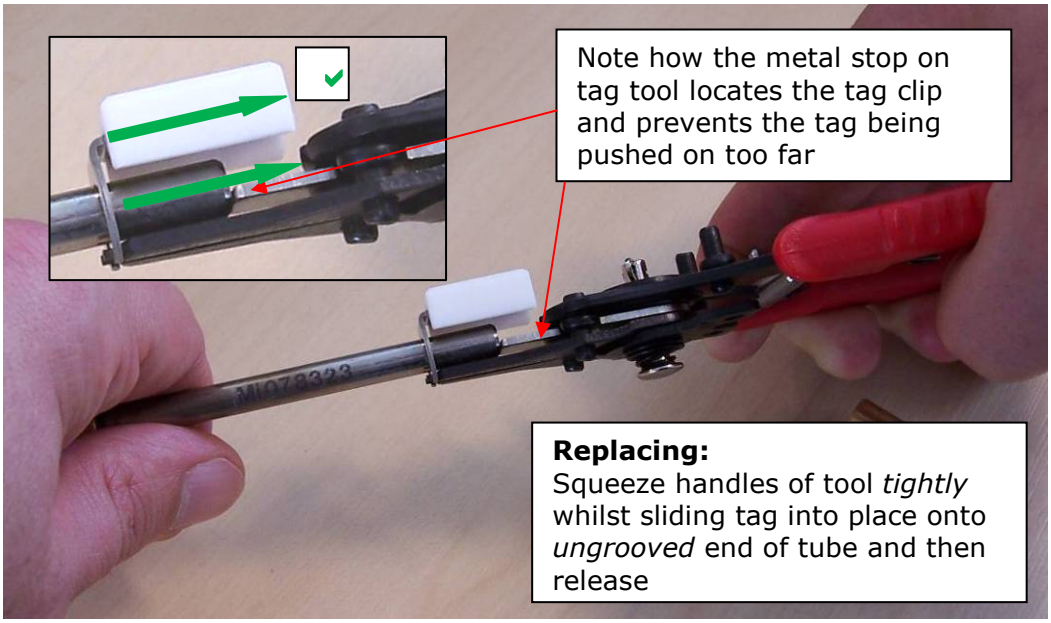
Both modes of operation offer a significant step forward and a new range of benefits to the busy air monitoring lab. Tags can be reused almost indefinitely.

3. Attaching and removing tags from tubes

3.1. Metal tubes [¼" (6.35 mm)]

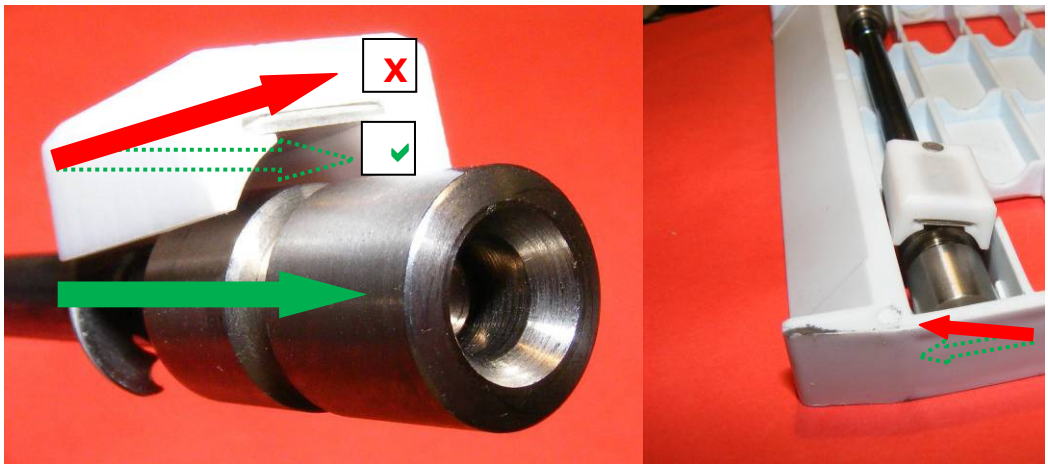
A special removal/replacement tool is required to take the tags off metal tubes and to correctly position them when putting them back on.





Note: ***Carefully check the alignment of the PTFE (white) component of the tab after attachment. It must be parallel to the tube (as illustrated by green arrows). If not, adjust accordingly.***

The following images show incorrect tube tag alignment. Failure to align tubes correctly can lead to problems such as tube jamming and forcing of the tube oven out of correct position. The latter may lead to incomplete sample desorption and therefore unreliable sample analysis. *The precise construction of the autosampler highlights the need for care in aligning the tag.*



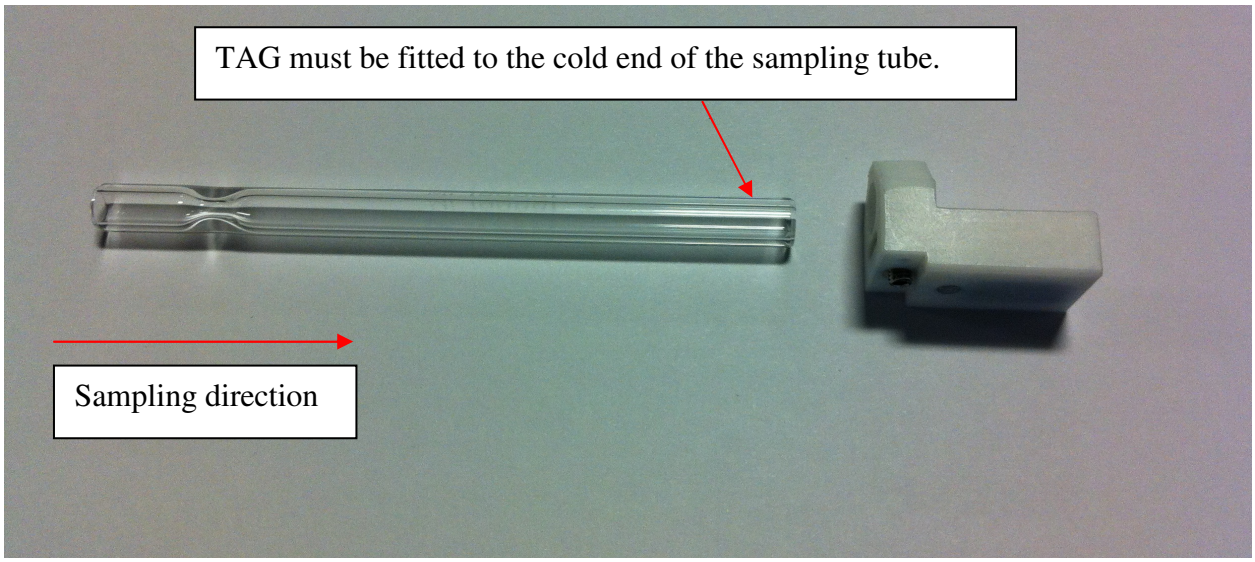
The broken green arrow indicates the correct (parallel) alignment of PTFE tube tag component (see also bottom picture on page 3 for illustration). The right-hand part of the image illustrates the impact that the incorrectly aligned tag may have on tray positioning, resulting in the problems described.

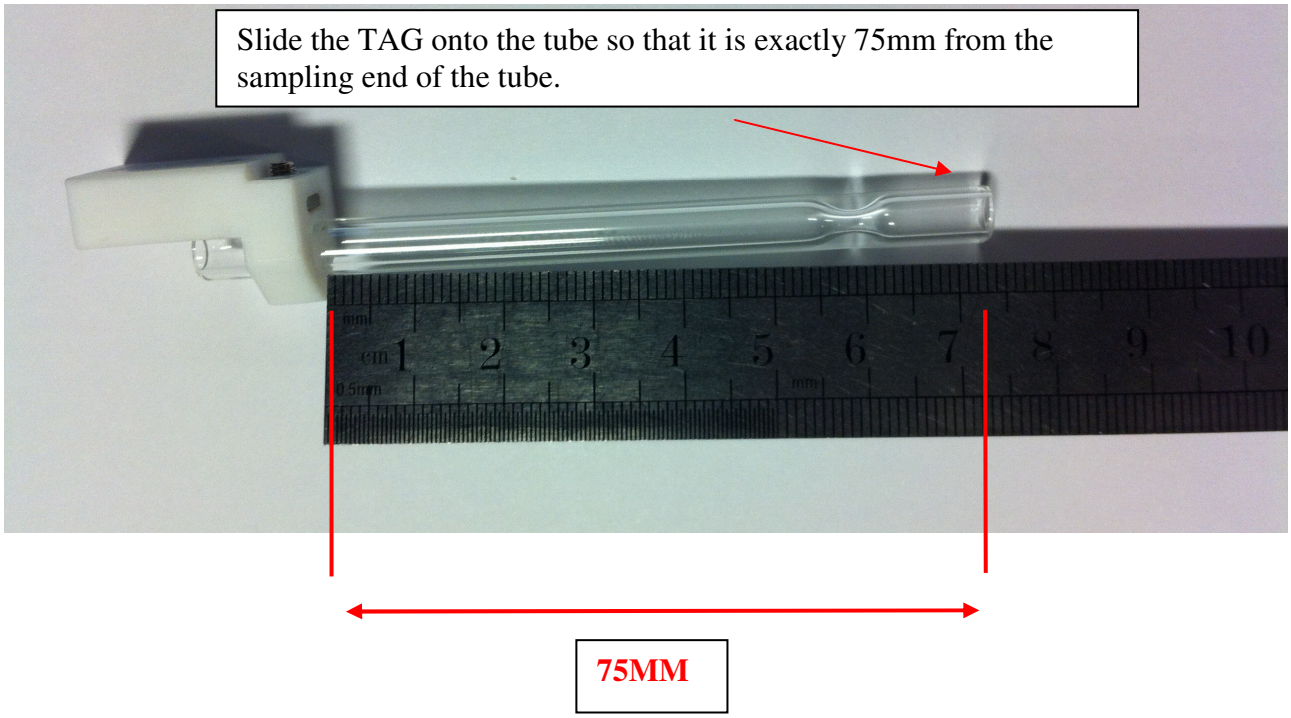
After tag attachment, and prior to insertion of the tube into an ULTRA tray, fit a tag-compatible cap to the ungrooved end of the tube. For long term storage, substitute with a brass cap assigned for this purpose.

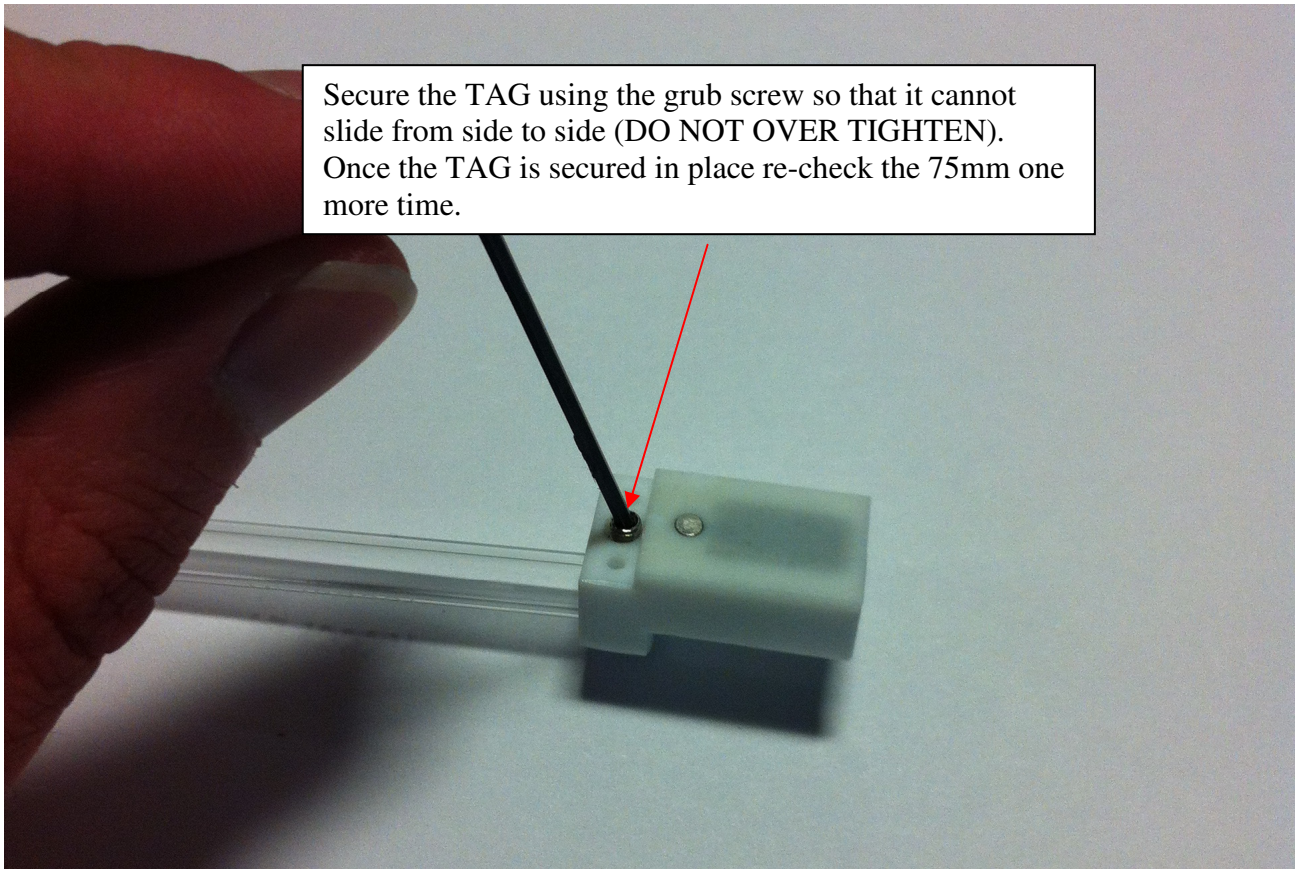
3.2. Glass tubes

1.1. *7.2 Glass tubes*

To install the TAGs onto glass tubes follow the instructions below.




Slide the TAG onto the tube so that it is exactly 75mm from the sampling end of the tube.
75MM


Secure the TAG using the grub screw so that it cannot slide from side to side (DO NOT OVER TIGHTEN). Once the TAG is secured in place re-check the 75mm one more time.

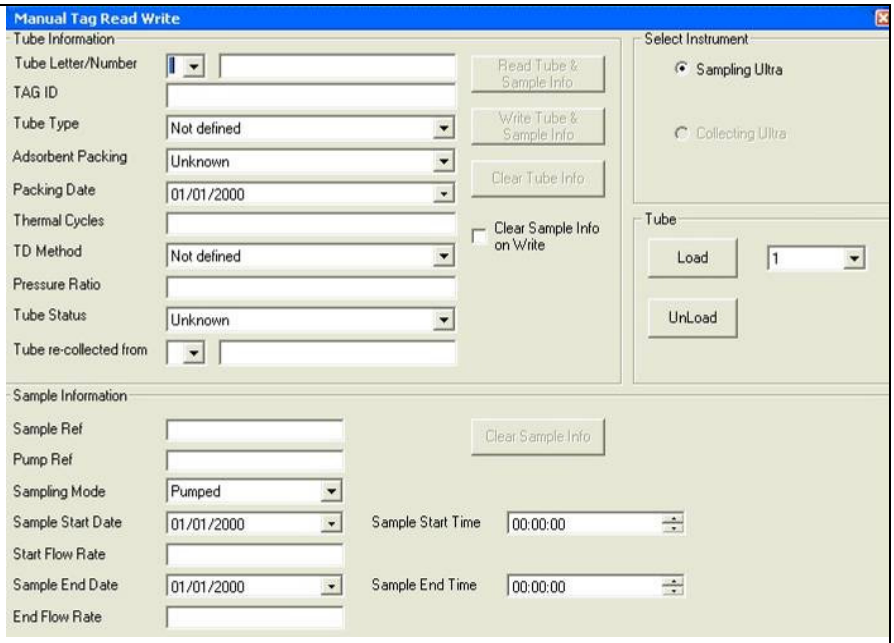
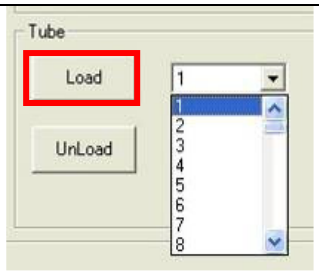
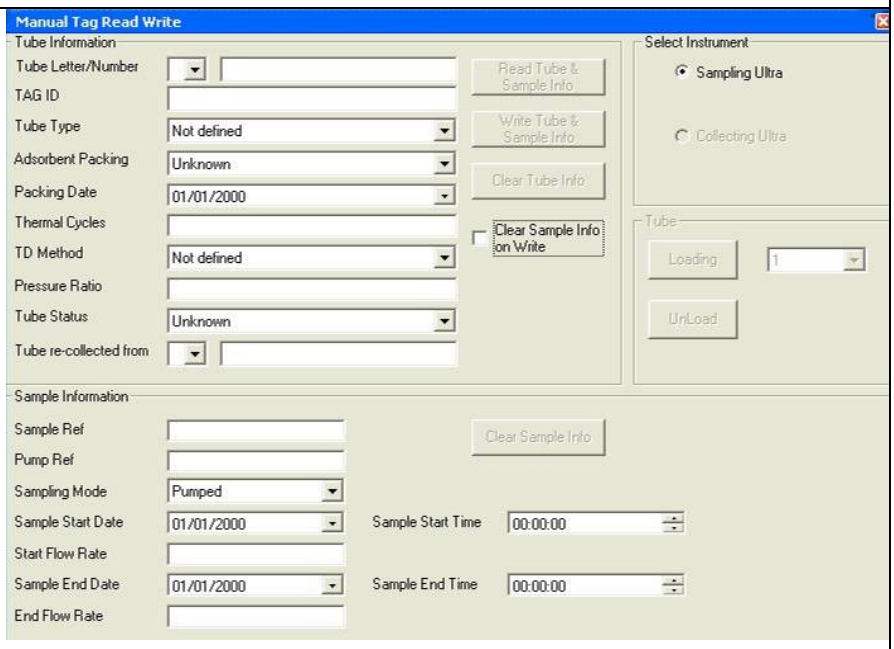
4. Software

4.1. Installation

Install the software by inserting the software CD and following the onscreen prompts. Alternatively, navigate to the CD using Windows Explorer and locate the appropriate 'setup.exe' file. (Note: If you already have a copy of the Markes control software installed, you should uninstall this first *via* the 'Add/Remove programs' feature in Windows).

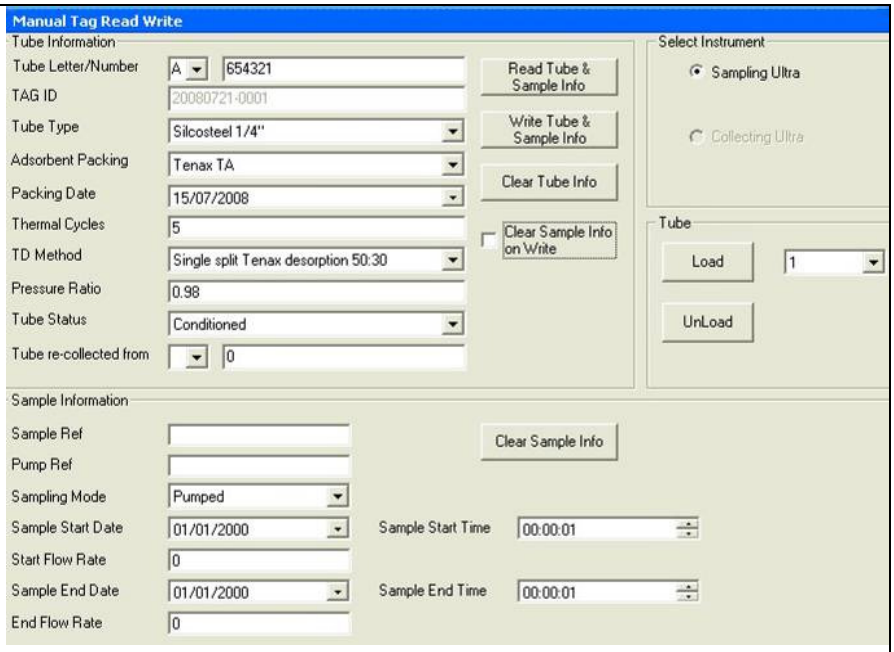
4.2. Manual tag read/write

Once the software is loaded, and a tag board detected, the '**Read/Write tag**' icon will appear in the toolbar.	

When the toolbar tag icon is clicked the '**Manual tag Read Write**' window is displayed. This window allows you to manually read from and write to tags while the system is in standby.	
To read a tag from a specific tube, it must first be loaded by selecting the tube number from the drop down menu and clicking '**Load**'.	
While the tube is being loaded, read from or written to, all the function buttons are grayed out. Once the tube is loaded, the tag information is automatically read. (Note: When using the manual read/write function, the data read from the tag is not stored to file)	

Once a tag has been read, all the stored information is displayed in the relevant boxes.

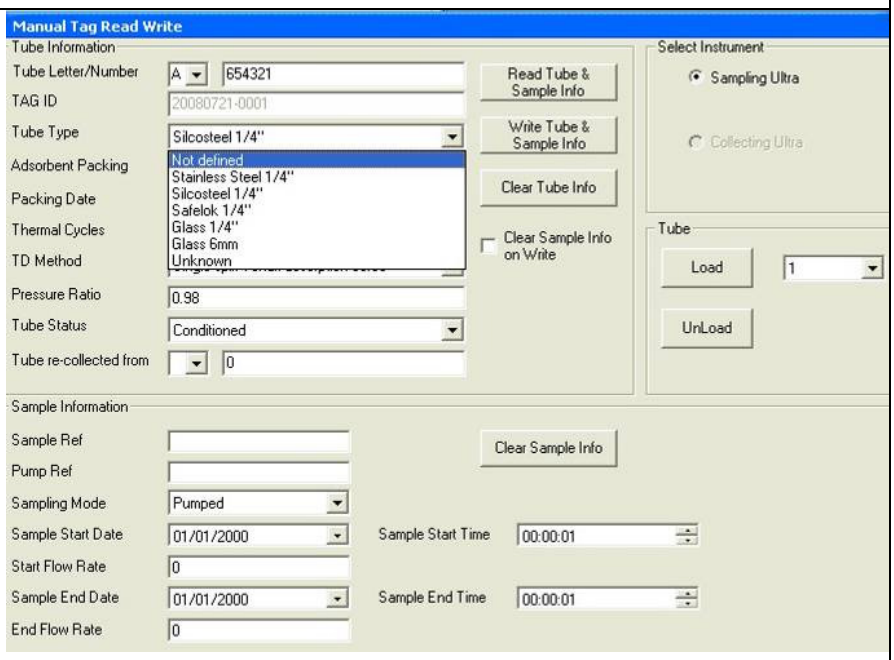
For information on the fields available, see section 4.2.1.

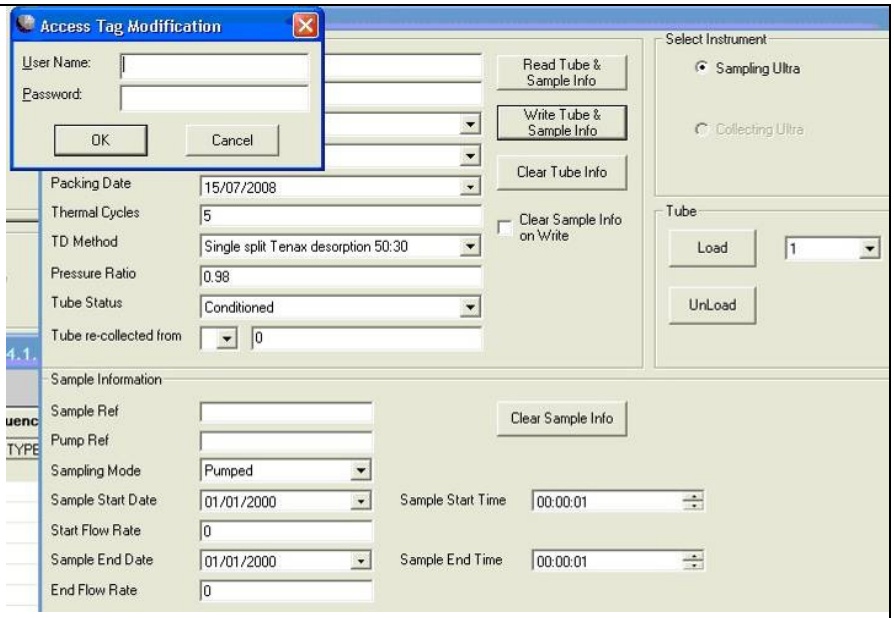
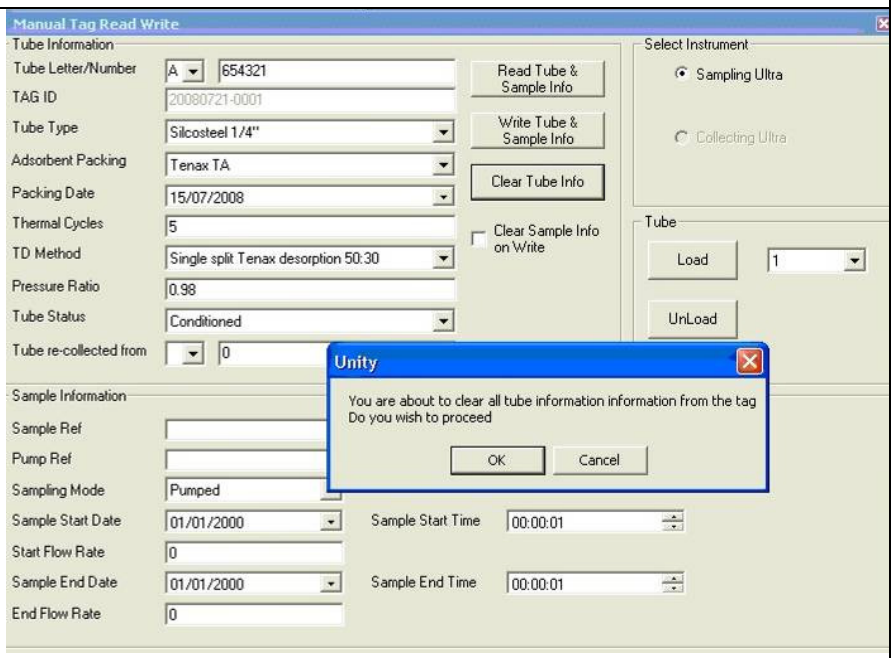
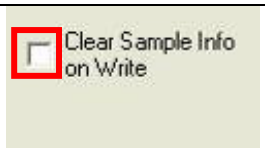


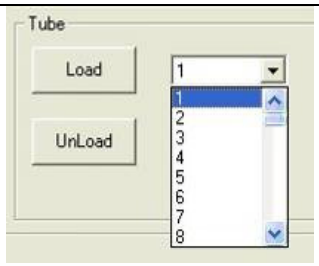
If you wish to alter any of the tube or sample information use the text boxes or drop down menus.

Note: The alphanumeric fields have a limited number of characters. Place the mouse over the field and a text box will appear stating the maximum field length.

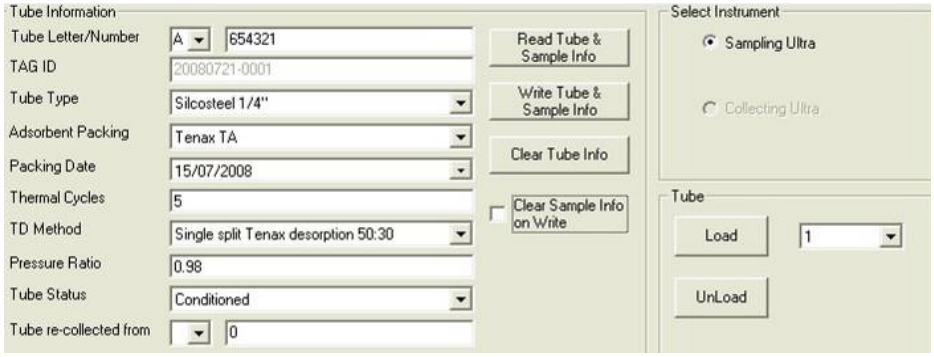
If the correct **Tube Type**, **TD Method** or **Adsorbent Packing** is not shown refer to section 4.5 for instructions on altering the available options.



To write the updated information to the tag click 'Write Tube & Sample Info'. To prevent accidental loss of information a password is required to write data. The user name is left blank and the password is: **Mona Lisa** **Note:** Once the password has been entered you will not be asked for it again until the software is restarted.	
If you wish to clear all the information on a tag (*e.g.* if you were moving the tag to a different tube) click '**Clear Tube Info**'. Once again, to prevent accidental loss of information a password is required to clear the data. The user name is left blank and the password is: **Mona Lisa** **Note:** Once the password has been entered you will not be asked for it again until the software is restarted. A final window then appears asking you to confirm clearing the tag data.	
If you wish to clear the sample info fields when you write to the tag tick 'Clear Sample Info on Write'.	
To unload the tube click 'Unload'. The tube and cap	

heater/bobbin will then cool to the unload temperature. **Note:** Refer to the ULTRA/ULTRA *50:50*™ manual for further information on the unload temperature. If loading a second tube, simply repeat the tube load procedure. The system will cool then unload the first tube before loading another. **Note:** If several tubes are to be loaded for manual read/write, lowering the flow path temperature to the unload temperature will speed up the procedure.	

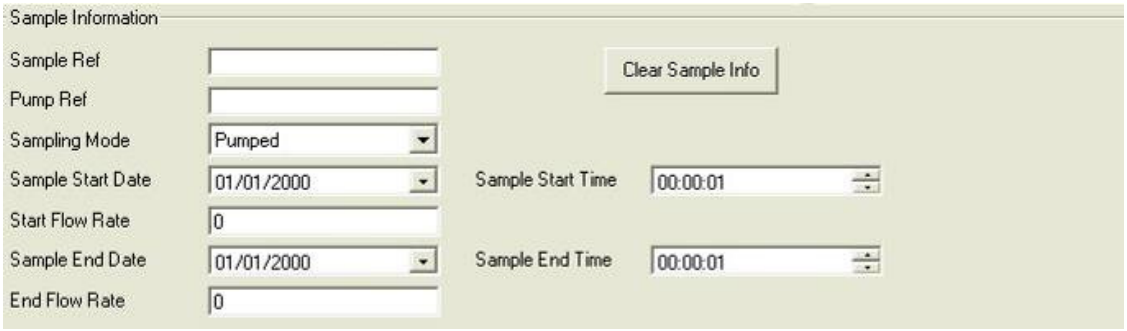
4.2.1. Tube information field descriptions



Tube Letter/Number	These two fields are designed to record the tube serial number (and letter) to which the tag is attached. They are limited to one letter and six digits (Note: numbers beginning with zero(s) will be shortened – *i.e.* 078323 will be shortened to 78323 when read back from the tag).
TAG ID	Read only field containing the factory set unique identifier for a given tag.
Tube type	By default this field is designed to record the tube type – *i.e.* ¼" stainless steel, ¼" Silcosteel® *etc*. The options available in this drop down list are completely customisable and could be used, for example, to specify "Environmental Tubes for Diffusive Sampling" or "General Purpose Screening Tubes" *etc*. For information on editing the available options in these drop down menus, see section 4.5.
Adsorbent Packing	Specifies the nature of the sorbent packing inside the sample tube. By default the list contains a selection of some of the most common packings. The options available in this drop down list are customisable – see section 4.5.
Packing date	If entered, this specifies the date on which the sample tube was packed and allows the user to track the age of the sorbent packing.

Thermal cycles	Tracks the number of times the sorbent in the tube has been heated (conditioned or analysed). If analysed on a tag "ready" ULTRA this value is increased automatically. Alternatively a value may be typed in directly.
TD Method	Allows the user to specify the recommended TD analytical method for analysis of this sample tube. The options in this list box are customisable – information on editing the contents is given in section 4.5.
Pressure ratio	Displays the most recent pressure ratio measurement – large changes here could indicate a tube that is becoming blocked, or has lost its sorbent packing. Valid values are between 0.000 and 1.000 where 0.000 would indicate completely blocked and 1.000 completely free flowing. Note: the value is reported in the sequence reporter and automatically updated with the most recent value, when using an ULTRA *50:50* autosampler.
Tube status	This field should be used to indicate the current status of the sample tube to which the tag is attached. The default options include conditioned, sampled and desorbed. The options for this list box are customisable – information on editing the contents is given in section 4.5. **NOTE:** there is the special tube status of "re-collected" which gives you the option to note the number of the tube from which a sample originated when using the SecureTD-Q™ option of all Markes TD systems.

4.2.2. Sample Information field descriptions



Sample Ref	Free text field limited to eight alphanumeric characters allowing the user to uniquely identify this sample
Pump Reference	Free text field limited to three alphanumeric characters allowing the user to identify the pump used to take this sample
Sampling mode	Drop down menu allowing the user to define whether this is a pumped/active sample or a diffusive/passive sample
Sample start time	Allows user to define sampling start date and time to a two second resolution
Start flow rate	Allows the user to log the pumped sampling flow rate at the start of sampling
Sample end time	Allows user to define sampling end date and time to a two second resolution
End flow rate	Allows the user to log the pumped sampling flow rate at the end of sampling

4.3. Sequence reports

When a tube with a tag fitted is loaded into a TubeTAG ULTRA/ULTRA *50:50*, the tag information is read and displayed in the sequence reporter.

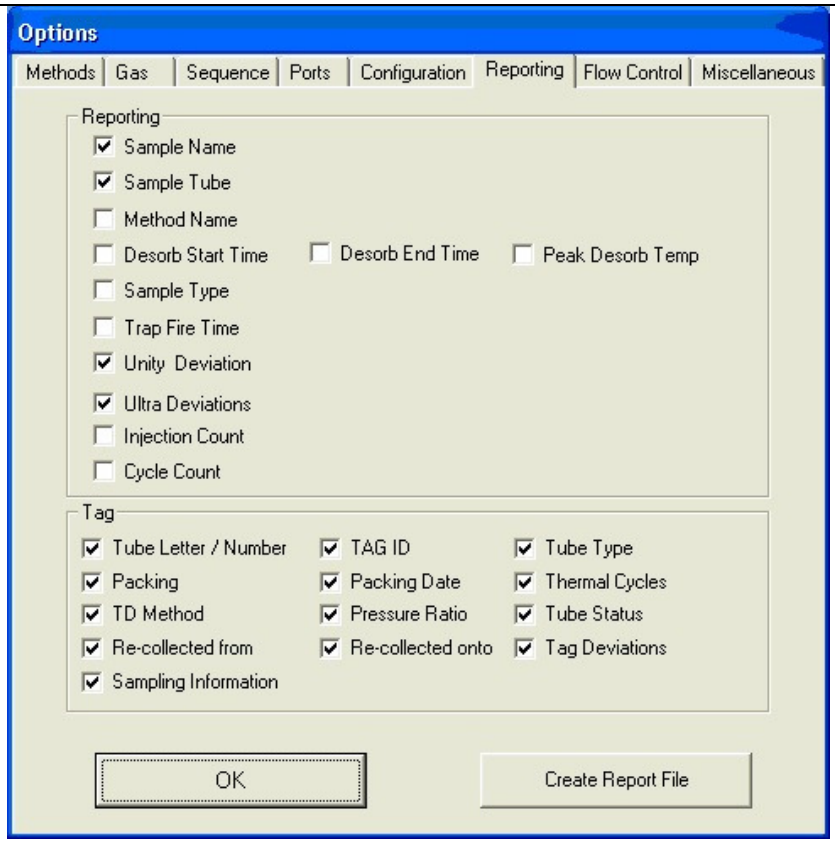
In the sequence reporter tab, any columns containing data read from a tag are highlighted in blue.

Tube PR	Tube Letter / Number	TAG ID	Tube Type	Packing	Packing Date	Thermal Cycles	TD Method	Pressure Ratio
0.983	A 654321	20080721-0001	ilcosteel 1/4	Tenax TA	15/07/2008	5	Tenax desor	0.980
0.983	B 123456	20080731-0001	nless Steel 1	Tenax TA	10/09/2008	3	Tenax desor	0.980

To select which columns are displayed in the sequence reporter go to '**View – Options**' then the '**Reporting**' tab.

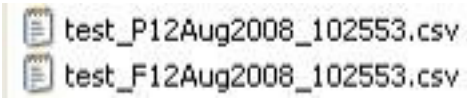
You can now select/deselect the columns as required.

(Note: It is necessary to close and reopen the control software for these sequence reporter changes to be taken into account)



Note that two versions of the sequence report are stored as .csv files in the '**unity\reports**' directory.

Two versions are saved: one with _P in the file name with the partial information (*i.e.* that displayed in the sequence reporter) and one with _F in the file name containing the full tag/sequence information.



4.4. Tag information/error messages

The new tag deviations column in the sequence reporter is used to report information/errors relevant to the tag read/write process:

Read/Write OK	Successful read write
Multiple tag failure: Sample read + sample write + collect read + collect write	Read/write error on the sample tube or the re-collection tube due to no tag being present or a corrupt tag.
Sample R/W OK – Collect: failed read + failed write	Sample tag read/write ok, re-collection tube tag read/write failed (either the selected re-collection tube has no tag or the re-collection tube tag is corrupt)

Errors written to the 'Tube Status' field on the tag (and to the report file):

Leak test failure: tube not desorbed	Tube failed leak test, sample retained
Instrument failure: sample retained	An error on the instrument occurred before primary desorption
Instrument failure: sample lost	An error on the instrument occurred during or after primary desorption of tube

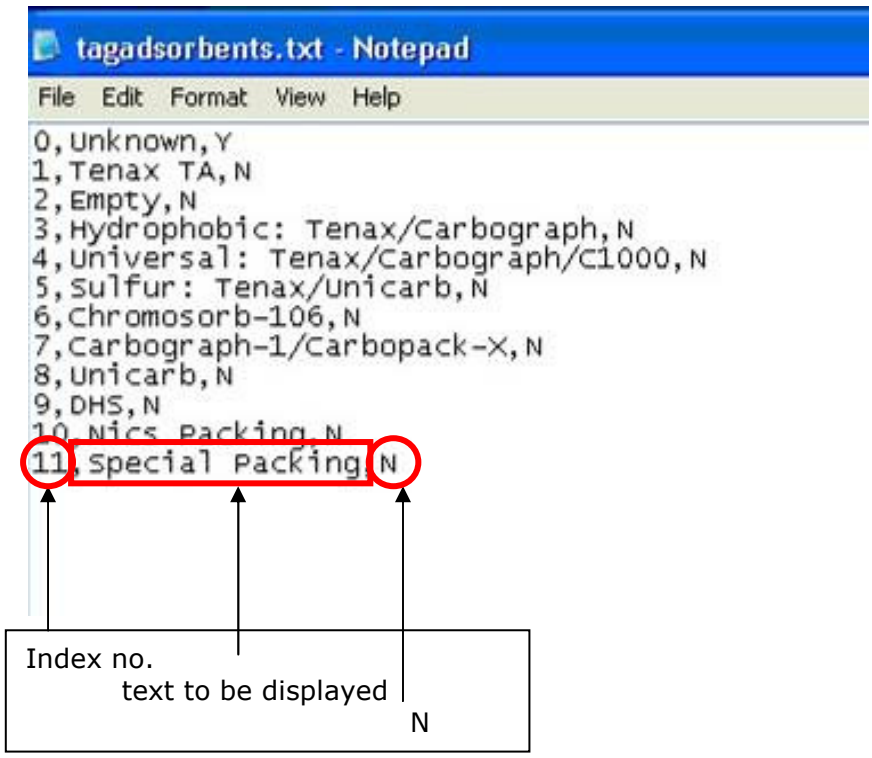
4.5. Altering the TubeTAG drop down menus

If you wish to add additional options in the **Tube Type**, **TD Method** or **Adsorbent Packing** drop down menus you must first browse to your UNITY program directory (Default location: '**C:\Program Files\Unity**').

Using Notepad you can open the following files:

tagadsorbents.txt
tagmethods.txt
tagtubetypes.txt
(tagstatus.txt)
(We recommend that you only add to the files. Do not remove or change any of the default states in these files as this could cause your tag to be written with the incorrect information).

To add additional options (in the example shown 'Special Packing' has been added) take the next available number in the list (*e.g.* 11), then a comma (no spaces between) and the description (*e.g.* Special Packing) followed by another comma (no spaces between) and N.



Once the changes have been made, save the text file with the original file name *e.g.* tagadsorbents.txt and restart the software. (Note: Do not use commas in names as they are used to separate different sections of information.)

You can use the manual tag read/write window to confirm successful changes.

Note: Text files will need to be copied to all relevant PCs if the same data are to be recalled from the tags.

4.6. Information flow schematic for tagged tubes on ULTRA