



# Automatic Urban and Rural Network (AURN) LSO Manual - Gravimetric and Equivalence Instruments

Version 1.2 - November 2022

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## Updating and Version Control

This manual is a working document, intended to be updated when equipment or procedures change. This manual is provided in electronic format, and the latest version is available on the Health and Safety Database. If you are a Local Site Operator, it is your responsibility to ensure that you download and use the most up to date version.

Changes are summarised in the table below.

Revision Date	Summary of Changes	Version Number
<b>September 2022</b>	Created this separate annex document, 'Part C' for gravimetric and equivalence samplers. Moved Partisol section from Part B to this annex.  Added section for SEQ and Digitel gravimetric instruments.	1.1
<b>November 2022</b>	TEOM/FDMS section has been deleted as this instrument is no longer used in the AURN.	1.2

# 1. Introduction

This document is an annex to the Local Site Operator (LSO) Manual for the Automatic Urban and Rural Network (AURN). This annex contains working instructions for particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitoring instruments which are only used at a very few sites. These are:

1. A small number of AURN sites which use a gravimetric method for measurement of particulate matter, alongside an automatic instrument (BAM or Fidas).
2. Several sites at which a range of different monitoring instruments are operated as part of an Ongoing Equivalence Trial for particulate matter. The purpose of the Ongoing Equivalence trial is to compare the automatic continuous monitoring methods used within the AURN, with the reference method (the gravimetric sampler).

In the sections that follow this annex provides working instructions for the additional PM monitoring equipment used at the above sites within the network. It clearly outlines what tasks the LSO needs to carry out, and how to do them. The regular site visits carried out by the LSOs are a major factor in ensuring high quality data from the AURN. For gravimetric samplers it is necessary to regularly change filters.

As well as these routine jobs, there will sometimes be a need for non-routine site visits – for example in the event of apparent instrument or system malfunction.

The AURN contains a subset of sites in and around London, called the Automatic London Network (ALN). In this document, 'AURN' means the whole network including ALN sites, unless specifically stated otherwise.

The following abbreviations are used throughout: Central Management and Control Unit (CMCU); Quality Assurance and Quality Control (QA/QC); Equipment Support Unit (ESU).

## 2. Partisol 2025

### 2.1. Introduction to Site Operational Procedures

#### 2.1.1. Operational Procedures

The Partisol-Plus Sampler (Model 2025, referenced in this manual as Partisol 2025) is designed to meet the regulatory monitoring requirements for particulate sampling methods in the US, Europe and other countries.

The Partisol 2025 is a gravimetric sampler. This is a type of instrument that works by drawing air through a previously-weighed filter on which the particulate matter is collected. The filter is subsequently weighed again and the ambient concentration of particulate matter calculated from the mass of particulate matter collected divided by the volume of air that has been drawn through it.

Although not a reference instrument, the Partisol has demonstrated equivalence with the reference method (also gravimetric).

The filter storage and sequential exchange system permits the operation of the device for up to 16 days of daily sampling between site visits consisting of fixed 24-hour period particulate samples (00:00 – 00:00 hrs GMT). Data from the previous two weeks' exposure is required to be downloaded prior to the input of new filter identifiers

Site attendance is required every 14 days to exchange filter cassette magazines from the storage and supply positions within the units (shown in Figure 1). The instructions in this section explain how to change the filter cassette magazine.



Figure 1 - Filter supply and storage positions

### 2.1.2. Filter Cassettes

This section covers the filter cassette magazines used in the Partisol 2025 Sampler.

A pre-loaded filter cassette magazine (sometimes referred to as a 'canister') will be supplied to the LSO every two weeks. The magazine will hold a total capacity of 15 loaded filter cassettes, with the filters having been previously conditioned and weighed by the supply laboratory (which may be the CMCU or another organisation). The fifteenth filter is designated as a field Blank and is returned to the laboratory unexposed. Each filter cassette will have a specific filter identifier. The ordered sequence in which the loaded filter cassettes are arranged within the magazine will be identified in attached correspondence (the filter exposure sheet) when dispatched by the supply laboratory.

It is important to attach the air supply tube to connector at the base of the supply filter cassette magazine on each occasion a new supply magazine is fitted.

Exposed filters cassettes (in the cassette magazine) must be returned to the supply laboratory immediately.

The magazine will be received with an orange cap on the upper end. The magazine must be sealed with the orange cap during transportation in the metal transport container in order to avoid the risk of contamination and damage to the filters. **All transport of magazines to and from the supply laboratory must take place using the metal transport container.**

### 2.1.3. Status Modes

The Partisol 2025 operates in a number of modes that reflect the current status of the equipment. The current mode is displayed in the upper right-hand corner of the Main Screen (Figure 2), as well as in the same position of other screens. Pressing the <Run/Stop> soft key button enables the user to select the different modes. Where 'normal' operation of the equipment is interrupted as a result of equipment failure, the equipment will enter the ERROR mode. Relevant error codes will be displayed in the ERROR status code screen

Stat : OK	Partisol 2025	Mode:Done		
Current Time :	09.27 97/07/23			
Start Sample :	00.00 97/07/24			
Stop Sample :	00.00 97/07/25			
Filter ID :	123456			
Cassette ID :	100123			
Blank :	No			
Help	Stats	FiltSet	Data	Setup

Figure 2 - Main Screen Setup

The modes are:

- **STOP** mode: in this mode the user defines the sampling programme using the SAMPLING SETUP SCREEN and the FILTER SETUP SCREEN. It is not necessary to enter this mode to exchange the filter cassette magazines since these can be swapped while the device is sampling. Pressing <Run/Stop> in this

mode will cause the sampler to advance to the WAIT or SAMPLING operating modes dependent upon the pre-defined sampling criteria.

- **WAIT** mode: the Partisol 2025 Sampler resides in this mode until the user-defined sampling conditions are met for the next filter exposed. Pressing <Run/Stop> in this mode will cause the sampler to enter the AUDIT or STOP operating modes.
- **SAMPLING** mode: whilst in this mode the sampler is in the user defined sampling interval, e.g. midnight - midnight. The device controls the sample stream at the volumetric flow rate at the default sample flow rate of 16.7 l/min. Once the ending conditions are met, the sampler attempts to exchange filter cassettes. Once the last sampling interval has been complete, the sampler switches to the DONE mode. Pressing <Run/Stop> when in this mode offers the user the choice of entering the AUDIT or STOP operating modes.
- **DONE** mode: the sampler enters the DONE mode if the filter cassette supply magazine runs out of filter cassettes. Pressing <Run/Stop> in this mode will cause the sampler to enter the STOP operating mode. Once running and if continual supplies of filters are provided, the Partisol 2025 will never enter into the DONE mode.
- **ERROR** mode: typically, two critical types of status conditions will force the sampler to enter the ERROR mode:
  1. the measured flow rate deviates beyond the acceptable levels of error (code 'S1')
  2. the sampler detects an error in the filter exchange (code 'X').

In addition, any problems in the supply of power to the unit will give the error code 'Z'. Pressing <Run/Stop> in this mode will cause the sampler to return to the STOP operating mode.

#### 2.1.4. Sampling Set-Up

The Partisol 2025 is set to use the default <BASIC> programme for sampling. This is the most commonly used programme and specifies a 24-hour sampling period from midnight to midnight.

In this programme the sampler changes filter cassettes and samples continuously for the same duration on each of the filters until there are no more filters in the filter supply magazine.

During the initial site visit it is important to set the start date of the sampling as that following the day of attendance.

#### 2.1.5. Head Cleaning

The PM<sub>10</sub> and/or PM<sub>2.5</sub> inlets should be cleaned at least monthly to prevent the build-up of particulate matter and contaminants. Both the acceleration and collection assemblies of the PM<sub>10</sub> head are required to be cleaned. Please ensure care and attention is given throughout the cleaning procedures.

The cleaning materials required are all provided by the Equipment Support Unit (ESU):



- A small brush
- Lint free tissues (ordinary household tissues are not suitable as they may leave particles of debris in the system)
- Cotton buds (again, ordinary household cotton buds are not suitable: please use only the ones supplied by the ESU).
- Silicon grease

You will also need a supply of fresh clean water. This does not need to be distilled water: tap water is adequate.

The inlet components are to be cleaned by brushing off accumulated dust using the small brush, then wiping with damp lint-free tissues or cotton buds as appropriate and wiping dry with a lint-free tissue.

Prior to cleaning the inlet, it is necessary to cease active sampling of the unit by disabling the pump. It should not be necessary to turn the unit off. The procedures in Section 2.3 (Occasional Duties to Perform on Site) should be followed in order to disable the pump.

### **2.1.6. Filter Data Records**

Data for each filter exposed in the Partisol 2025 sampler are stored as a separate record of filter data. For readability, the sampler splits the display of data records among five screens:

- Filter Data Time screen
- Filter Data screen
- Filter Data Status Codes screen
- Filter Data Averages screen
- Power Failures screen

For each filter identifier loaded into the Partisol 2025 sampler a separate record number is designated.

## **2.2. Regular Duties to Perform on Site**

### **2.2.1. Filter Changeover**

Filter cassette magazines may be exchanged in any of the sampler's operating modes (see above).

Filter cassette magazines containing new filters must be installed on the left (supply) side, while magazines receiving exposed filters must reside on the right (storage) side.

#### **Perform the following steps to carry out a filter changeover:**

1. Open the enclosure of the Partisol 2025 Sampler.
2. The right-hand side magazine (aka. storage) contains filters that have already been exposed. The left-hand side magazine (aka. supply) contains filters that have not been exposed.
3. Remove the magazine of exposed filters from the right-hand side. Rotate anticlockwise and pull down the filter cassette magazine to remove it.

4. Remove the last filter from this magazine. The RP Code (Filter Reference) is stamped on the bottom of the metal screen below the filter. Write this ID on both the filter exposure sheet and the checklist. Replace the filter carefully back into the magazine of exposed filters.
5. Detach the air pressure supply tube to the air connection at the base of the left-hand side (supply) filter cassette magazine.
6. Rotate the left-hand supply magazine anticlockwise and pull down on the filter cassette magazine to remove it.
7. Assuming there have been no faults with the instrument, there should be one filter remaining (as all the other filters will have been exposed and moved over to the storage cassette over the past two-week period). This remaining filter is a dedicated Blank filter. The Blank filter and any additional unexposed filters which remain in the supply (left) side magazine will need to be removed, as this will become the storage magazine as detailed in step 9. When removing the unexposed filters make a note of the RP codes on both the filter exposure sheet and the checklist.
8. Remove the orange cap from the top of the supplied filter cassette magazine containing the unexposed filter cassettes. Place the dedicated Blank filter from the previous supply magazine on top of the new unexposed filters. At the end of the current filter sample, the Blank filter will transfer straight through the sampler and into the storage when programmed to do so. Details on how to program the exchange of Blank filters are outlined in section 2.2.2. Place the orange cap over the open end of the magazine of exposed filters to protect its contents during transportation. Each magazine of exposed filters returned should contain 14 sampled filters and one Blank filter.
9. The former supply magazine will now become the storage magazine for the next fortnight. Locate the mounting studs on the right hand (storage) side of the Partisol 2025, match the slots in the filter cassette magazine with the mounting studs in the sampler. Push the now empty supply filter cassette magazine upward and rotate clockwise to lock it into place.
10. Prior to installing the new filter cassette magazine check that the filter identifier (RP code) of the top-most cassette in the magazine corresponds with the filter identifier written on the correspondence sheet and that the O-ring is in good condition.
11. Locate the mounting studs on the left hand (supply) side of the Partisol 2025. With the air connection of the filter cassette magazine facing toward the user, matching the slots in the filter cassette magazine with the mounting studs in the sampler.
12. Push the filter cassette magazine upward and rotate clockwise to lock it into place.
13. Attach the air pressure supply tube to the air connection at the base of the new supply filter cassette (the one on the left).

Once the storage filter cassette magazine has been capped, place the filter cassette magazine and send immediately, with the appropriate filter exposure sheet, to the return address specified by CMCU. It is important that the exposed filter cassette magazine is returned to the laboratory immediately due to the requirement to

dispatch a re-loaded filter magazine cassette within five working days. Failure to return the exposed filter cassettes within this timescale will mean that the provision of unexposed filters cannot be guaranteed when the next site attendance is due (i.e. within ten working days of a site visit).

14. After each two-weekly site visit a completed Partisol 2025 checklist should be sent with a copy of the appropriate filter exposure sheet., to the contractor responsible for filter weighings. This will be supplied to you by the Central Management and Control Unit, so please contact them if unsure where these documents should be sent.

### 2.2.2. Filter Identifiers

Perform the following steps to Input Filter Identifiers and Filter Reference codes. The CMCU may input these remotely, please check with them to confirm. If the CMCU does do this, check that the identifiers and codes saved on the analyser match those on the filter exposure sheet.

The following procedures should be followed in order to input filter identifiers from the filter exposure sheet accompanying a new magazine of unexposed filters:

Inputting the Filter Identifiers

1. Press <F3:FiltSet> in the Main Screen (Figure 2).
2. Press <F4:FiltLst> in the Time Base Filter Setup Screen (Figure 3).

Stat : OK		Partisol 2025		Mode:Done
Current Time :		4.24 97/07/23		
Start Sample :		00.00 97/07/24		
Stop Sample :		12.00 97/07/25		
Filter ID :		38101		
Cassette ID :		RP100123		
Blank :		No		
Help	Prev	Next	FiltLst	*More*
Function Keys in Browse Mode				
Help	Prev	Next	FiltLst	*More*
	Reset	+ Hour	+ Day	*Back*
Function Keys in Edit Mode				
-List	+ List	Bksp		

Figure 3 - Time Base Sequential Sampling Setup Screen

3. The Filter List Setup Screen will be displayed which will identify columns in which the identifiers for the individual filter IDs, as well as the filter cassette IDs can be input
4. Use the arrow ←, ↑, →, ↓ to move the cursor to the position of the first filter identifier input location.

Press <EDIT> on the soft-key pad.

Type		Filter ID	Cassette ID	Blank
1	P	38101	RP 099001	No
2	P	38102	RP 099002	No
3	P	38103	RP 099003	No
4	P	38104	RP 099004	No
:	P	381**	RP 0990**	No
14	P	38114	RP 090014	No
		FiltSet	Copy	Insert
Function Keys in Browse Mode				
		FiltSet	Copy	Insert
Function Keys in Edit Mode				
		-List	+List	Bksp

Figure 4 - Filter List Setup Screen

5. Input the Filter Identifier as described in the filter exposure sheet provided by the filter provider. Delete any remaining filter IDs from the previous batch or input new identifiers over them. If this is a return visit, there will be a Blank filter from the previous batch still remaining in the list. If you intend to shuffle this across as a Blank, do not remove this. Input the next Filter ID's below the BBlank.
6. Use the arrow ←, ↑, →, ↓ and the number soft-keys to input filter identifiers for each of the filters loaded into the Partisol 2025 filter cassette magazine. Where the filter provider has provided an additional Filter Reference (RP Code) input this ID also.
7. To program in the Blank filter, move the marker over to the Blank column and press <F2>. Make sure the Blank filter in the instrument corresponds to the correct filter assigned as a Blank in the filter exposure sheet, this should be the last filter. There should now be one Blank at the bottom of the Filter List, and if it is a revisit there will also be a Blank at the top.
8. Press <ENTER> on the soft-key pad to confirm the filter identifiers. Press again to confirm the Blank settings.
9. Press <ESC> twice to return to the Main Screen.
10. Once the filter identifiers have been input they can be checked by pressing <F3:FiltSet> when in the Main Screen menu (Figure 2) followed by <F4:FiltLst>.
11. Once checked, press <ESC> the necessary number of times to return to the Main Screen.
12. Check the start sampling date and time are correct. If the date and time are incorrect, they must be amended (see procedures below) before the Partisol 2025 unit can be left.

If there is an error code in the top left hand corner of the screen and /or the status in the top right hand screen corner displays any code other than WAIT or SAMP then

any problems must be solved and the error codes cleared before amendments to sample start date and time can be made.

## 2.3. Routine Duties to Perform

### 2.3.1. PM<sub>10</sub> Inlet Head Assembly Cleaning

The PM<sub>10</sub> head is mounted on the Partisol sample inlet tube above the housing of the sampler. Use a ladder stored in the cabin, with due regard to personal safety, to gain access to the top of the Partisol 2025 unit. Extra care should be taken if conditions are wet and slippery. Please refer to the Working at Heights section of the Health and Safety Guidance before commencing work with a ladder - [link here](#).

**Follow the procedures outlined below to remove the inlet and clean the inlet head.**

1. Whilst the unit is in the sampling mode (SAMP) press <RUN/STOP> twice on the keypad. A dialogue box asking 'Do you want to AUDIT or STOP?' will be shown. Press <F1:AUDIT> to stop the pump.
2. Hold the Partisol 2025 inlet tube firm with one hand and carefully lift off the complete PM<sub>10</sub> (and sharp cut cyclone for PM<sub>2.5</sub> sampling) assembly, holding it at the point where it is attached to the inlet tube. The unit is sealed to the tube with two O-rings and it may be necessary to gently twist the assembly to and from whilst lifting in order to remove it.
3. Protect the inlet tube so that rain or snow cannot enter whilst the head is removed and take the head inside the monitoring cabin for cleaning.
4. Separate the upper and lower inlet halves by unscrewing (counter-clockwise) the Acceleration assembly from the Collection assembly (see Figure 5).
5. If the Acceleration or Collection Assemblies appear to be faulty, excluding the need to re-apply grease/silicon, please do not proceed with cleaning, instead immediately report the problem to CMCU.

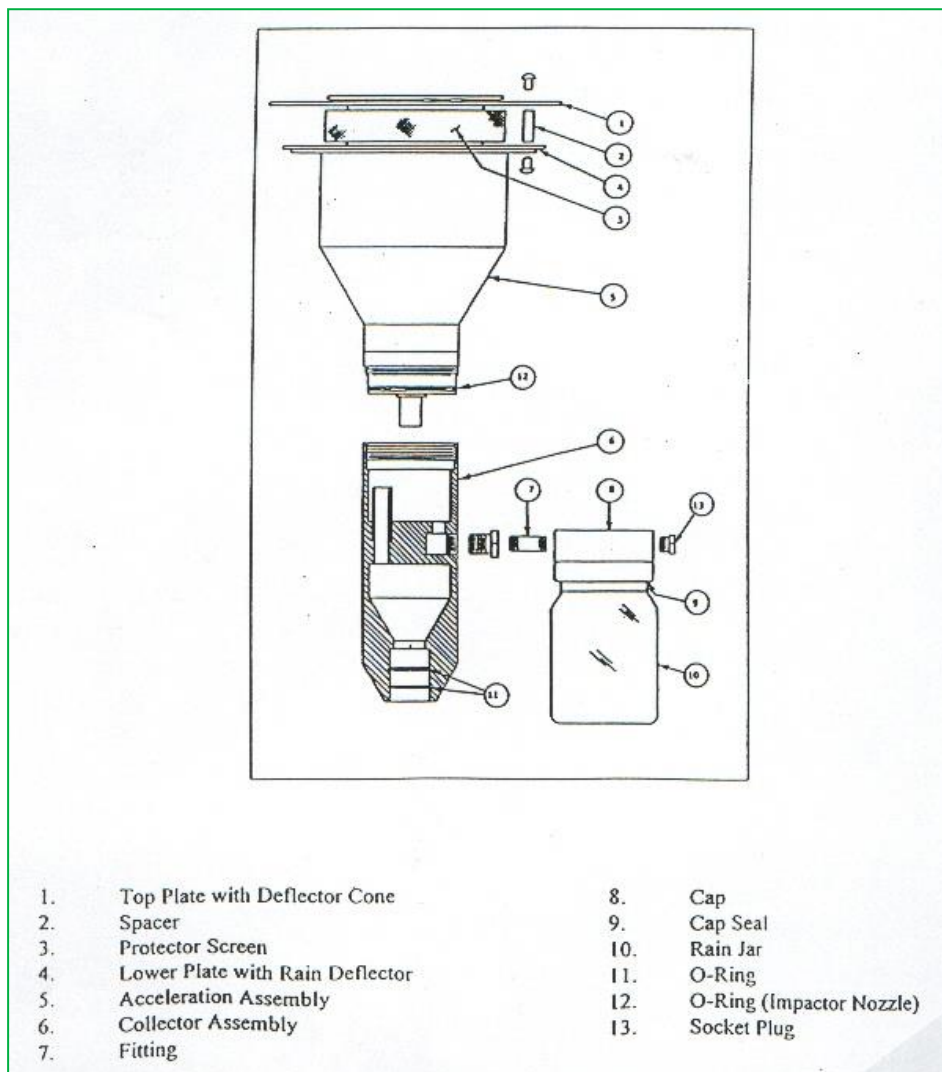


Figure 5 - PM<sub>10</sub> Inlet Assembly

### 2.3.2. Cleaning the Acceleration Assembly (Quarterly)

1. Mark the upper and lower plates of the assembly with a pencil so that the unit can be correctly aligned on re-assembly.
2. Unscrew the four Philips screws from the top plate and remove the plate and four spacers.
3. Clean the top plate, deflector cone, insect screen, internal walls and the underside plate. Do this by first brushing accumulated dirt off them using the small brush. The components can then be wiped with a lint-free tissue dampened with clean water. Dry with a clean lint-free tissue.
4. Inspect the condition of the large diameter O-ring and inform the CMCU if it is worn or damaged. Wipe any grease off with a tissue and apply a thin coating of silicon grease to the O-ring and to the aluminium threads.
5. Carefully re-assemble, using the pencil marker to align the top and bottom plates.

### 2.3.3. Cleaning the Collector Assembly (Monthly)

1. Disconnect the rain jar assembly from the lower collector plate assembly. Remove the rain jar and clean. Clean inside the brass tube with damp cotton buds. Rinse with clean fresh water and dry with a clean cotton bud.
2. Clean the walls, the three tubes protruding from the collector plate and the base of the assembly with a damp lint-free tissue. Rinse with clean, fresh water and dry with lint-free tissues.
3. Use damp cotton buds to clean the three vent tubes, base of the assembly and weep hole in the collector plate where the moisture runs out to the rain jar. Rinse with clean, fresh water and dry with lint-free tissues.
4. The cap of the rain jar has a cork gasket, apply a **thin** film of silicon grease to it before refitting the jar. If the sealing gasket is neoprene, no grease is required.
5. Re-connect the rain jar assembly to the lower collector assembly, ensuring the rain jar is sitting vertically.
6. Inspect the condition of the two inlet tube O-rings and inform the CMCU if they are worn or damaged. Wipe off any grease present and apply a **very thin** coating of silicon grease to the O-rings.
7. Clean the internal threads of the assembly with a damp lint free tissue, and dry thoroughly with a clean lint-free tissue.

### 2.3.4. Replacing the Head

1. Screw (clockwise) the Acceleration and Collection assemblies together until the threads are hand tight. **Do not over-tighten.**
2. Place the complete assembly back onto the Partisol 2025 inlet tube. Hold the Partisol 2025 inlet tube firm with one hand and carefully lift on the complete PM<sub>10</sub> carefully locating the point where it attaches to the inlet tube.
3. Once the inlet is cleaned and re-located in position; press <RUN/STOP> on the soft-key pad to re-commence sampling and complete the current days sampling on the same filter for which sampling was earlier interrupted.

### 2.3.5. Cleaning the Sharp Cut Cyclone (SCC) (Quarterly)

In addition to the routine cleaning of the PM<sub>10</sub> sample inlet, it will be necessary for local site operators to clean the sharp cut cyclone (SCC) - Figure 6 - used in the Partisol 2025 units measuring PM<sub>2.5</sub> on a quarterly basis.



Figure 6 - Sharp Cut Cyclone and Where it Fits in Inlet

1. To gain access to the SCC unlatch the top cover of the Partisol 2025 sampler.
2. Lift the SCC unit from the upper part of the enclosure.
3. Holding the SCC unit upright in the position which it has been removed from its 'plug-in' position, pull the 180° size separation unit from the site of the main accelerator chamber.
4. The separation unit can be cleaned simply by blowing into the orifice at the top of the unit.
5. Clean the walls of the main accelerator chamber with a damp lint-free tissue. Wipe clean with a dry lint-free tissue.
6. Once cleaned, push the separation unit back into position on the accelerator chamber and re-locate the SCC unit into its plug-in position.
7. Close the top cover of the Partisol 2025 unit making sure that the down tube of the PM<sub>10</sub> inlet head locates home with the SCC unit.

### 2.3.6. Determining and Clearing Error Status Codes

When the unit has entered the ERROR mode it is important to determine which errors have occurred. Status codes are found in the top left-hand corner of the screen, MODE in the top right-hand corner. Where error codes relate to the exchange and provision of filter cassettes it is important to clear these before sampling is re-started

The following section of the manual highlights how the user can interrogate the Partisol 2025 unit to determine the error codes and how to clear them so that normal operation of the unit can continue.

Where an error is encountered that is not covered in this manual, the reader is referred in the first instance to the manufacturer's manual accompanying the equipment. If, after reference to the manufacturer's manual the problem is still



evident, the Local Site Operator is requested to inform CMCU and a service engineer will be called.

Where normal operation of the Partisol 2025 sampler is interrupted, either through the occurrence of a power failure or, where problems have been encountered with the exchange of filter cassettes the unit will enter into the ERROR status mode as discussed in the previous section. Identifying the exact reason for the unit entering the ERROR status mode can be determined by interrogating the equipment using the soft-keys as follows:

Press <F2:Stats> in the Main Screen (Figure 2). The Temperature and Pressure Statistics Screen will be displayed (Figure 7).

Stat : OK	Temp / Pressure		Mode:Wait	
	Current	Average		
Filter Temp:	25.8	21.2 C		
FilterCompTemp:	25.4	21.1 C		
Ambient Temp:	25.8	21.1 C		
Ambient Pre:	751	748 mmHg		
Ambient %RH:	72	68%		
StCode	Sample	UserI/O	Wind	System

Figure 7 - Pressure and Temperature Statistics Screen

Press <F1:StCode>. The Status Codes Screen will be displayed.

If the system is currently in the 'OK' Status the following dialogue box will be shown:

OK	Status Codes		STOP	
> OK No Status Conditions				
-Rec	+Rec	MoreDat	IntDat	

Figure 8 - Status Codes Screen

If an error has occurred during the pre-defined sampling period, an ERROR code will be displayed in the Status Codes Screen.

The most common status codes likely to be experienced are:

- Z Power Failure*
- F Flow Out of Range*
- S Flow Stop*

*X Filter Exchange Failed*

*N No Filters*

If any of the above error codes are shown in the Status Code Screen it is important that the error be corrected prior to the commencement of the next sampling period.

If filter exchange has been unsuccessful, manually attempt to clear the filter to the filter storage cassette, if this is not possible or any codes other than those relating to the filter exchange and provision are displayed notify CMCU.

After any Status Code has been cleared, and the start date changed as necessary, it is imperative to press <R/S> until the mode in the top right-hand corner of the Main Screen is either WAIT or SAMP.

### 2.3.7. Filter Exchange Failure

The most frequently experienced error code is X ERR, filter exchange failure. An attempt should be made to clear the problem by performing the following procedure:

1. With the Partisol 2025 unit displaying the Main Screen press <F2:StCode> to enter the Status Code screen

X	Status Codes	ERR
> Filter Exchange Failure		
Reset		FXCHG

Figure 9 - Status Codes Screen – Filter Exchange Failure

Press <F5: FXCHG> to display the Filter Exchange Prompt Screen

OK	ERR
Status Codes Reset	
Reset	FXCHG

Figure 10 - Filter Exchange Prompt

2. Press <F5: FXCHG> again to display the Filter Exchange Screen. The status code in the top left hand corner of the screen will have changed from X to OK.

Filter Exchange Step:---						
Valves				1	2	
Pressu	OFF	Pump:	OFF	NewFilt	OFF	OFF
Shuttle:	OFF			LiftUP	ON	OFF
MagPr	OFF	Shuttle		LiftDn:	OFF	OFF
LiftPus	OFF	Rdy:	ON	PushD	ON	OFF
PushPr	OFF	Ext:	OFF	PushU	OFF	OFF
ON/OFF	AmbFilt	FlowVal	Start	Misc		

Figure 11 - Filter Exchange Screen

3. Press <F4: START> to begin the exchange process. If filter exchange is successful Status code OK will be displayed in the top right-hand corner of the screen.
4. If filter exchange has been unsuccessful a code e.g. SHUTRDY will be displayed in the top right-hand corner. This indicates during which phase of filter exchange the process failed.
5. If the filter exchange procedure above was unsuccessful manually attempt to clear the filter to the filter storage cassette.
6. After the jammed filter or exchange failure has been rectified press <ESC> until the Main Screen is displayed.
7. Press <R/S> until the MODE is changed to WAIT.
8. Check the start day is correct to commence sampling at midnight. If the start time is wrong, follow the procedure in section 2.3.5 (Setting the Start Date).
9. If manual attempts to free the filter are not physically possible or if any codes other than those relating to the filter exchange and provision are displayed notify CMCU to discuss and, if necessary, a service engineer will be called.
10. Other Errors: once rectified, most errors can be cleared by pressing <F2: STCode> in the Main Screen (Figure 2) then <F1:Reset> in Status Codes screen followed by <YES> or <NO> depending upon whether the fault has been rectified. If faults are cleared return the unit to the WAIT mode ready to commence sampling at midnight the next day (see procedures in section 2.3.8 – Setting the Start Date).

### 2.3.8. Setting the Start Date

1. Select <F3:FiltSet> from the Main Screen. The Basic Filter Setup Screen will be shown. The necessary start and finish time will be displayed for the first filter cassette identified as being present in the supply filter cassette magazine. The sequential nature of the Partisol 2025 means that once the sampling has finished on the first filter cassette, the second filter cassette will automatically be loaded and the same sampling interval (i.e. 24 hours) will be used.
2. Press <EDIT> on the keypad.

3. Using <F1:-List>, <F2:+List> and <F3:Bksp> and the arrow keys ←, ↑, →, ↓ set the date for commencement of sampling.
4. Press <Enter>
5. Press <STOP/RUN> until the unit enters WAIT mode.

This should be indicated in the upper right-hand corner of the Main Screen with the display WAIT.

Stat : OK		Filter Setup		Mode:Stop	
Start Date : 97/07/24					
The Current Time is : 15:34 97/07/23					
Sample will start at : 00:00 97/07/24					
Each sample will collect for 24:00 hours					
Flow 1 :				0.0 l/min	
Help	+ Day	NextDay	FiltLst		
Function Keys in Browse Mode					
Help	+ Day	NextDay	FiltLst		
Function Keys in Edit Mode					
- List	+ List	Bksp			

Figure 12 - The Basic Filter Setup Screen

### Perform the Following Steps to Retrieve Filter Data Records:

For each filter identifier loaded into the Partisol 2025 sampler a separate record number is designated. If required to do so by CMCU, these records may be manually noted using the procedures below, or they may be downloaded to a laptop computer. It is easier to note all values for each filter record within each of the above screens before advancing to the next screen.

1. To manually access the data records Press <F4: Data> when in the Main Screen to enter the Filter Data Times Screen.
2. Press <F1: -Rec> repeatedly to return to the first Filt ID of the new cassette installed during the previous exchange visit.

Stat: OK		Filter Data Times		Rec: 7
Set Sample Start :		00:00	1998/06/01	
Set Sample Stop		00:00	1998/06/02	
Actual Sample Start :		00:00	1998/06/01	
Actual Sample Stop :		00:00	1998/06/02	
Valid Elapsed Time:		24:00		
Total Elapsed Time :		24:00		
- Rec	+ Rec	MoreDat	IntvDat	DwnLoad

Figure 13 - Filter Data Times Screen

- Record the following information on the record sheet for each of the exposed filters:
  - Stat:
  - Rec:
  - Actual Sample Start: (date only)
  - Actual Sample Stop: (date only)
  - Valid Elapsed Time:
  - Total Elapsed Time:
- Press <F3: MoreDat> to move to the Filter Data Screen, this may be untitled depending on the age of the Partisol 2025. The sampler remains in the same record of the filter data when switching among filter data-related screens.

Stat: OK		Filter Data		Rec: 7
Filter ID : 230434		Volume : 6.0		
Cass ID : RP100123		% CV : 0.1		
Max Temp Diff 0.8 at 15:38 1998/06/01				
Id1: "01230000010032819970721160000"				
Id2:				
- Rec	+ Rec	MoreDat	IntvDat	DwnLoad

Figure 14 - Filter Data Screen

- Press <F1: -Rec> repeatedly to return to the first Filt ID of the new cassette installed during the previous exchange visit. Press <F2: +Rec> to advance to the next Filt ID record. Record the following information on the record sheet for each of the filters for which sampling has been carried out:
  - Filter ID:
  - Cass ID:
  - Volume:
- Press <F3: MoreDat> to move to the Filter Data Status Codes screen. There is no need to record any information from this screen as prior interrogation of the system has taken place to determine the occurrence of ERROR status

- Press <F3: MoreDat> to move to the Filter Data Averages Screen. The sampler remains in the same record of the filter data when switching among filter data-related screens.

Stat: OK	Averages			Rec: 7
	Min	Ave	Max	Average
Flow:	16.6	16.7	16.7	WDir : 0
Filt:	+22.2	+22.5	+22.7	WSpd:
AmbT:	+22.3	+22.5	+22.7	WDir: 0.00
Pres:	751	752	752	AI1: 000.0
%RH:	65	69	72	AI2: 000.0
				AI3: 000.0
-Rec	+Rec	MoreDat	IntvDat	DwnLoad

Figure 15 - Filter Data Averages Screen

- Press <F1: -Rec> repeatedly to return to the first Filt ID of the new cassette installed during the previous exchange visit. Press <F2: +Rec> to advance to the next Filt ID record. Record the following information on the record sheet for each of the filters for which sampling has been carried out:

- Flow:
- FiltT:
- AmbT:
- Pres:
- %RH:

- Press <F3: MoreDat> to move to the Power Failures Screen. The sampler remains in the same record of the filter data when switching among filter data-related screens.

Power Failures			Rec: 7
2:24 1998/05/26			
6:43 1998/05/26			
-Rec	+Rec	MoreDat	IntvDat

Figure 16 - Power Failures Screen

- Record any power failures occurring over the exposure period in the comments section of the record sheet.
- Press <ESC> to return to the Filter Data Times Screen (Figure 13). This is available within any of the proceeding data screens.
- Return to the Main Screen by pressing <ESC> the necessary number of times.

13. After all records have been noted / downloaded to a laptop, load a new Filter Cassette Magazine, Filter identifiers and RP codes using the procedures described earlier.

## 3. SEQ 47/50 Equipment - Site Operational Procedures

### 3.1. Operational Procedures

The SEQ 47/50 is a gravimetric sampler. This type of instrument works by drawing air through a previously-weighed filter on which the particulate matter is collected. The filter is subsequently weighed again, and the ambient concentration of particulate matter calculated from the mass of particulate matter collected divided by the volume of air that has been drawn through it. The SEQ is a standard reference sampler for both PM<sub>10</sub> and PM<sub>2.5</sub>, meeting regulatory requirements in the US, Europe and other countries. The SEQ 47/50 utilises separate magazines for Blank and exposed filters, and can sample for 16 days of 24-hour filter sampling before user intervention is needed. Site attendance will be required every 14 days to exchange the Blank and sampled filter cassette magazines from within the unit (see Figure 17).

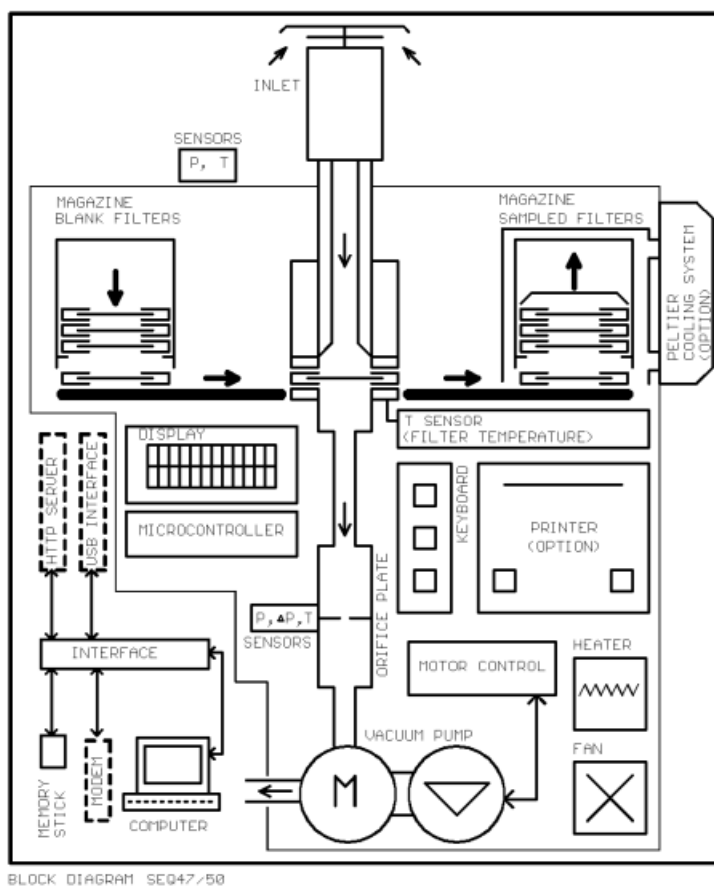


Figure 17 - Schematic of SEQ 47/50, ©Sven Leckel

#### 3.1.1. SEQ Pre-Checks

The SEQ digital display will automatically cycle through the current operating parameters, whereby you should check the following:

1. Check the filter number displayed on the analyser screen
2. Check the current flow rate



3. Check for any errors or warnings present and report any unusual occurrences to the CMCU.

### 3.1.2. SEQ Filter Magazines and Exchange Procedure

A pre-loaded filter cassette magazine will be supplied every two weeks. The magazine will hold a total capacity of 15 loaded filter cassettes. The fifteenth filter is designated as a field Blank and is returned to the laboratory unexposed. Each filter cassette will have a specific filter identifier. The ordered sequence in which the loaded filter cassettes are arranged within the magazine will be identified in attached correspondence (filter exposure sheet) when dispatched by the supply laboratory.

#### Perform the following steps to carry out a filter changeover:

1. Open the enclosure of the SEQ 47/50 sampler.
2. The left-hand side magazine contains filters that have not been exposed. The right-hand side magazine contains filters that have already been exposed.
3. Remove the magazine of unexposed filters (left-hand side).
4. Assuming there have been no faults with the instrument, there should be one filter remaining (as all the other filters will have been exposed and moved over to the storage cassette over the past two-week period). Any unexposed filters which remain in the left-side magazine will need to be removed as this will become the storage magazine. Any unexposed filters already in the sampler will need to be placed below the new batch of filters, as to maintain the sampling of filters in numerical order.
5. Re-install the left-hand magazine of unexposed filters
6. Remove the magazine of exposed filters (right-hand side) and pack securely for shipping.
7. The now-empty unexposed magazine will now become the exposed collection magazine for the next fortnight. Securely install the empty magazine in the right-hand side of the sampler.

It is important that the exposed filter cassette magazine is returned to the laboratory immediately due to the requirement to dispatch a re-loaded filter magazine cassette within five working days. Failure to return the exposed filter cassettes within this timescale will mean that the provision of unexposed filters cannot be guaranteed when the next site attendance is due (i.e. within ten working days of a site visit).

### 3.1.3. Cleaning the PM Head

The impactor plate within the PM head should be cleaned every fortnight, aligned with the filter-change schedule and the impactor plate greased according to the manufacturer's guidance. The cleaning and greasing of the impactor plate should be carried out as follows:

1. Remove the PM head from the inlet by lifting upwards.
2. Open PM head by unclipping the retaining clips. The PM head will now be in two parts: the PM nozzles (top), and the impactor plate (bottom).
3. Wipe the impactor plate clean using a lint-free wipe. You may need to dampen the wipe with water to remove stubborn debris.
4. The impactor plate should be dried, and then a thin layer of medium or high viscosity silicone grease should be applied to the impactor plate.

5. Inspect the nozzles on the top part of the PM head for congestion and clean where necessary.
6. Put the head back together and place back on the sampler inlet by repeating steps 1-2 in reverse.

# 4. Digital DPA14 Low-Volume Sampler (LVS) - Site Operational Procedures

## 4.1. Operational Procedures

Figure 18 below shows a schematic of the Digital DPA14 Low Volume Sampler. The Digital DPA14 is a gravimetric sampler, a type of instrument that works by drawing air through a previously-weighed filter, on which the particulate matter is collected. The filter is subsequently weighed again, and the ambient concentration of particulate matter calculated from the mass of particulate matter collected, and divided by the volume of air that has been drawn through it. This is a gravimetric sampler and operates using magazines for Blank and exposed filters. The Digital DPA14 samplers installed at a select number of AURN stations are set up so that each filter samples for a 24-hour period. Site attendance will be required every 14 days to exchange the Blank and sampled filter cassette magazines from within the unit.

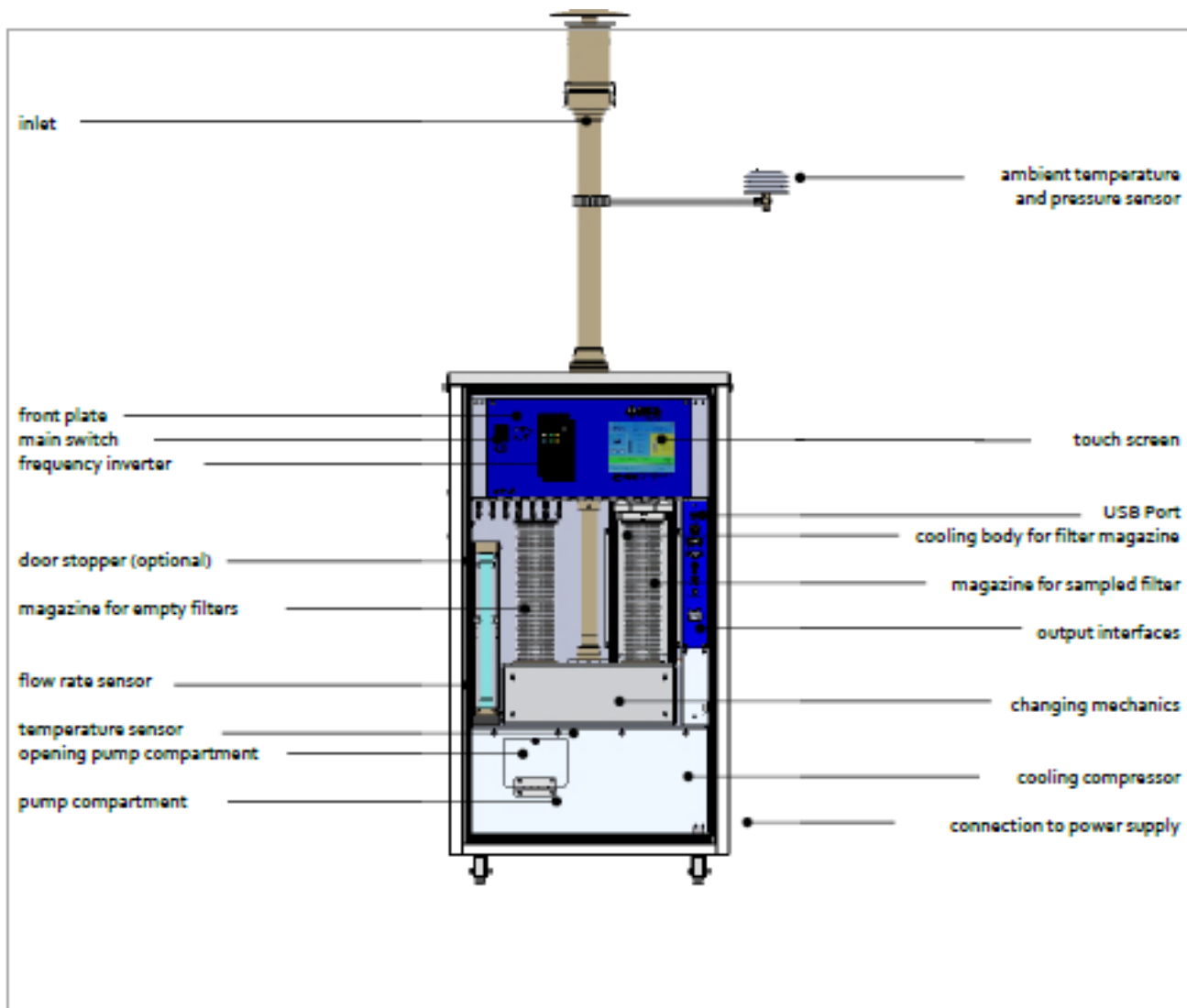


Figure 18 - Schematic of the Digital DPA14 LVS. © Digital

### 4.1.1. Digital LVS Pre-Checks

The home screen of the Digital LVS displays all the important information required to complete the pre-checks and allows you to reach the relevant menus. Figure 19 and Figure 20 below outline the parameters displayed on the home screen and the various buttons on the touch screen which allow the user to navigate the menus. The user is only required to check the status bar on the home screen. If the status bar is green, there is no issue. If the status bar is red, then there is an issue and will require further investigation and reporting to the CMCU.

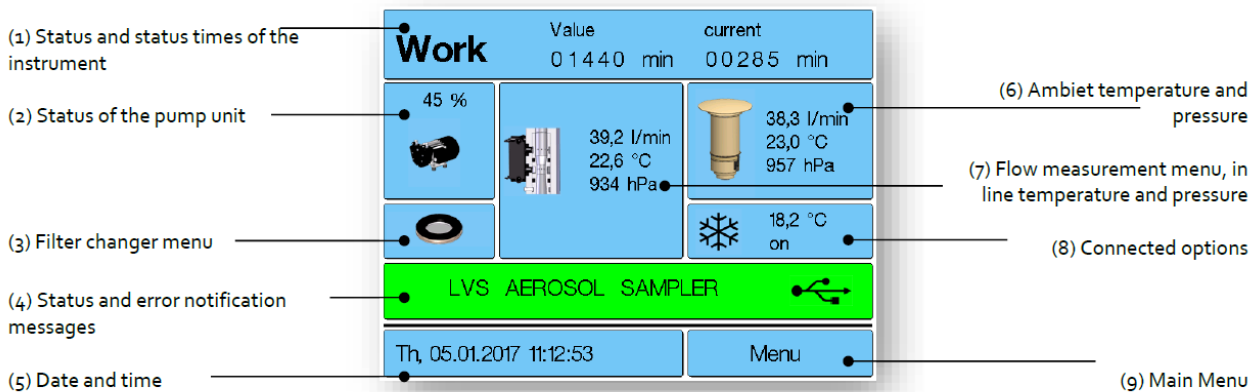


Figure 19 - Home screen display on the Digital DPA14 LVS. © Digitel

	Info points	The info points contain useful information to each menu point!
	Blue bars	Enter the menu or enter a value
	"back" button	Leads one step back
	"Home" button	Leads back to the initial screen
	Green status bar	There is no error
	Red status bar	Error → press on the red bar to get more information
	Arrow	Scroll down for more functions

Figure 20 - Icons and buttons on the Digital DAP14 LVS display. © Digitel

### 4.1.2. Cleaning the PM head

The impactor plate within the PM head should be cleaned every fortnight, aligned with the filter-change schedule and the impactor plate greased according to the manufacturer's

guidance. The cleaning and greasing of the impactor plate should be carried out as follows:

1. Remove the PM head from the inlet by lifting upwards.
2. Open PM head by unclipping the retaining clips. The PM head will now be in two parts: the PM nozzles (top), and the impactor plate (bottom).
3. Wipe the impactor plate clean using a lint-free wipe. You may need to dampen the wipe with water to remove stubborn debris.
4. The impactor plate should be dried, and then a thin layer of medium or high viscosity silicone grease should be applied to the impactor plate.
5. Inspect the nozzles on the top part of the PM head for congestion and clean where necessary.
6. Put the head back together and place back on the sampler inlet by repeating steps 1-2 in reverse.

#### **4.1.3. Digital LVS Filter Magazines and Exchange Procedure**

A pre-loaded filter cassette magazine will be supplied every two weeks. The magazine will hold a total capacity of 15 loaded filter cassettes. The fifteenth filter is designated as a field Blank and is returned to the laboratory unexposed. Each filter cassette will have a specific filter identifier. The ordered sequence in which the loaded filter cassettes are arranged within the magazine will be identified in attached correspondence (filter exposure sheet) when dispatched by the supply laboratory.

#### **Perform the following steps to carry out a Filter Changeover:**

1. Open the enclosure of the Digital LVS instrument.
2. The left-hand side magazine contains filters that have not been exposed. The right-hand side magazine contains filters that have already been exposed.
3. Remove the magazine of unexposed filters (left-hand side).
4. Assuming there have been no faults with the instrument, there should be one filter remaining (as all the other filters will have been exposed and moved over to the storage cassette over the past two-week period). Any unexposed filters which remain in the left-side magazine will need to be removed as this will become the storage magazine. Any unexposed filters already in the sampler will need to be placed below the new batch of filters, as to maintain the sampling of filters in numerical order.
5. Re-install the left-hand magazine of unexposed filters
6. Remove the magazine of exposed filters (right-hand side) and pack securely for shipping.
7. The now-empty unexposed magazine will now become the exposed collection magazine for the next fortnight. Securely install the empty magazine in the right-hand side of the sampler.

It is important that the exposed filter cassette magazine is returned to the laboratory immediately due to the requirement to dispatch a re-loaded filter magazine cassette within five working days. Failure to return the exposed filter cassettes within this timescale will mean that the provision of unexposed filters cannot be guaranteed when the next site attendance is due (i.e. within ten working days of a site visit).

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