STATEWIDE
STANDARD OPERATING PROCEDURE
FOR
TELEDYNE ADVANCED POLLUTION
INSTRUMENTATION
DUAL CHANNEL CONTINUOUS
$PM_{2.5}/PM_{10}$ MONITOR
MODEL 602 BETA^{Plus}

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF AIR MONITORING

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Document History

Revision	Date	Responsible Person	Description of Change
0	August 2016	Thomas Bess	Initial Release

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1.0 OVERVIEW

1.1 Introduction

This document outlines the ambient air monitoring data handling procedures of the Florida Department of Environmental Protection, Division of Air Resource Management's ambient air monitoring program. The following sections describe the processes involved in data collection and transfer between the instruments and the Environmental Protection Agency's (EPA) AirNow, Florida's Air Quality System (FLAQS) and Spatial Air Quality System (SAQS), Particulate Matter Tracking System (PMTS), Florida Air Monitoring and Assessment System (FAMAS), and the EPA Air Quality System (AQS) applications and databases. Data verification steps, as they relate to data handling, are also described.

1.2 Principle of Operation

The Teledyne Advanced Pollution Instrumentation (T-API) Model 602 Beta^{Plus} is a radiometric particulate mass monitor capable of providing one-hour, real-time measurements. The T-API Model 602 Beta^{Plus} Monitor measures the mass concentration of ambient PM_{10} and $PM_{2.5}$ aerosols at a time resolution of 1 hour through independent sampling lines onto 47 mm filters can be later analyzed for PM constituents. The T-API Model 602 Beta^{Plus} monitor incorporates a beta attenuation mass sensor and can also quantify radon daughter products to provide information on atmospheric dispersion characteristics.

1.3 Warning

Under no circumstances remove or open the internal ground connection. If the instrument is turned on, the electrical connections are charged; therefore, do not attempt to touch internal components when the instrument is turned on. Internal components should only be touched or removed when the monitor has been turned off and unplugged. The power supply is operated at high voltage. Do not attempt to touch the power supply when the instrument is turned on. Do not touch the interior components of the instrument when it is turned on. ever operate the instrument if the cover or any other parts the instruments are removed.

2.0 INSTALLATION PROCEDURE

2.1 List of Tools/Supplies

Installation of the T-API Model 602 Beta^{Plus} sampler requires three vertical roof penetrations with a vendor-supplied roof flange to accommodate the rigid inlets. The roof flange provides support for the size selective inlets (PM_{10} and $PM_{2.5}$ cyclone) and the ambient temperature sensor assembly. The roof flange prevents precipitation from entering the shelter or trailer through the three penetrations. Tools required to install the inlet include a drill, hole saw bit, caulk, caulk gun, metric socket set, and an adjustable crescent wrench. Additional tools to complete final assembly include metric Allen wrench set and screwdrivers.

An NIST-traceable standard external flow meter, ranges 2 to 20 liters/minute (LPM), with a low resistance to flow is needed for precise flow rate measurements.

2.2 Physical Inspection

The T-API Model 602 Beta^{Plus} instrument which includes a power cord, two sample inlet down tubes, two external pumps, a compressor, two inlet heat controllers, one $PM_{2.5}$ impactor size selective inlet, one PM_{10} impactor size selective inlet, one ambient temperature sensor assembly, one filter supply magazine, one filter take-up magazine, 90 filter cassettes, a filter cassette separator, a spy filter punch, and spy filter insertion tool.

A supply of 47 mm glass fiber filters with binder (Whatman Type GF, #10370319)
The T-API Model 602 Beta^{Plus} monitor instruction manual.
Logging computer with Dr. FAI software and DB9 Serial Cable.
NIST traceable temperature, relative humidity, and barometric pressure sensor.
NIST traceable volumetric flow standard (e.g., BIOS Drycal).

2.3 Initial Setup

Follow the installation directions in Section 2.2 of the User manual.

A. Connect DB-9 Serial cable from Model 602 Beta^{Plus} front COM port to logging computer serial communications port.
B. Start Dr. FAI software and confirm communication with the instrument.
C. Conduct volumetric flow rate verification of both flow A (PM_{10}) and flow B ($PM_{2.5}$) channels. If either flow deviates by more than 4% from NIST traceable reference, then conduct calibration of Model 602 Beta^{Plus} flow meter(s) and then repeat flow verification procedure(s). Document flow rate verification on the T-API Model 602 Beta^{Plus}.

2.4 Instrument Components

Figure 2-1. Front and the back view of the T-API Model 602 BetaPlus

The instrument is comprised of multiple components: the Sampling unit, sampling inlets, sampling lines, vacuum pumps, and a compressor for service air.

2.4.1 Sampling Inlets

This unit contains all of the servomechanisms, sampling and mass measurement devices. The control panel is located in the front; pneumatic, electrical connections, and communication interfaces are located in the back. On the top surface of the instrument are Loader and Unloader housings for the filters and the sampling line connections.

Figure 2-2. Sampling Inlets

The instrument samples the airborne particulate matter using sampling inlets with a particle size fractionation device.

The instrument can work simultaneously with two different sampling inlets (TSP, PM_{10}, $PM_{2.5}$, PM1, etc.), as long as they have nominal flow-rate values within the range 1-2.5 m^3/h. The choice of the operating flow rate value depends on the characteristics of the sampling inlet used and the desired particle d_{50} cut point.

Note: *For US EPA Federal Equivalent Method (FEM) PM10 NAAQS compliance use, it is not allowable to remove the $PM_{2.5}$ Very Sharp Cut Cyclone (VSCC^{TM}) from the PM_{10}/$PM_{2.5}$ combination inlet to obtain a valid PM10 measurement. A valid PM_{10} FEM measurement for the Model 602 Beta^{Plus} instrument requires the use of the standard US EPA louvered PM_{10} inlet.*

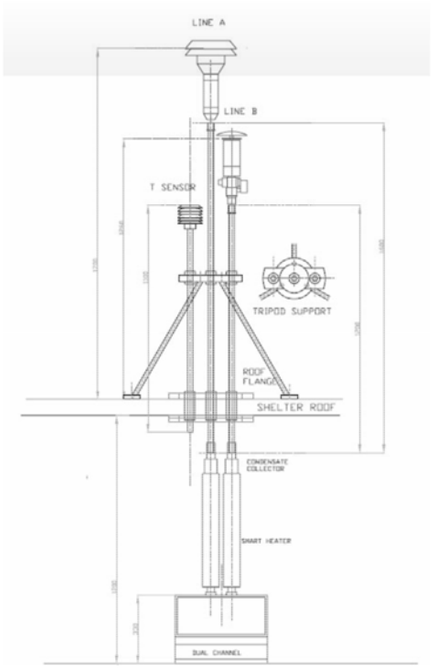
2.4.2 Sampling Lines

Particle laden air is drawn into each of the sample tubes simultaneously following the particle fractionation device, and through the sample filter, where the particles are deposited.

The instrument measures and stores the relevant values during sampling which are needed to describe the sampling phase, i.e. ambient and filter temperatures, filter % relative humidity, barometric and filter pressures, and volumetric flow rate.

In its basic configuration, the instrument is equipped with the two insulated sampling lines (labeled Line A and Line B in figure 3 inside the installation cabinet. Both lines are provided with a condensed water collector and a relative humidity controlled sample line heater.

Figure 2-3. Sampling Lines



2.4.3 Pneumatic Circuit

The sampling module uses two vacuum pumps which can provide a programmable operating flow rate in the range of 1-2.5 m^3/h. Real-time flow rate regulation is performed by a step motor that moves the regulation valve.

Two electronic solenoid valves (EV1 and EV2) placed on each sampling line allow for switching the pneumatic circuit from the sampling configuration to the Span test configuration and to the Leak test configuration.

The three possible pneumatic configurations are:

A. **Sampling**: EV1 open EV2 closed
B. **Leak test**: EV1 closed EV2 closed
C. **Span test**: EV1 closed EV2 open

Figure 2-4. Pneumatic Circuit

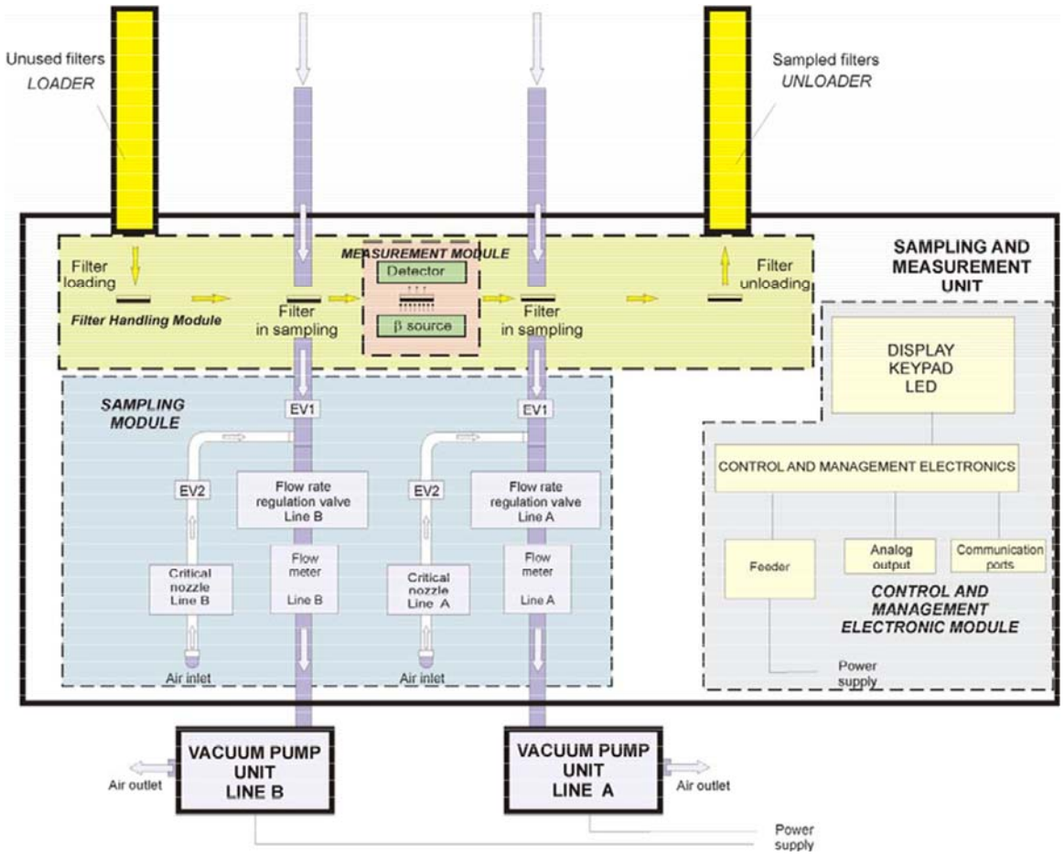
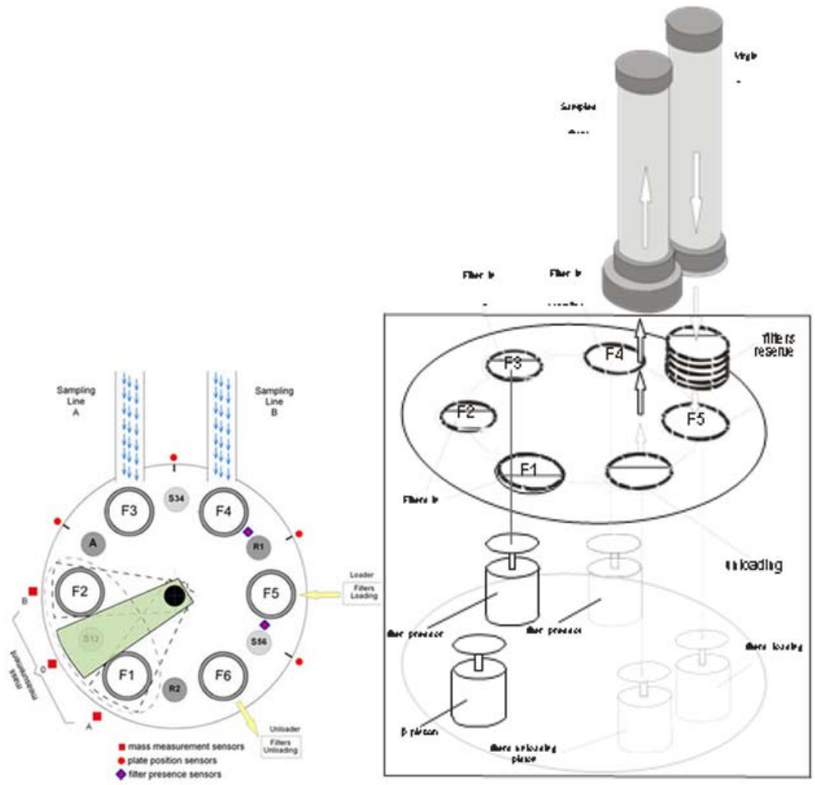


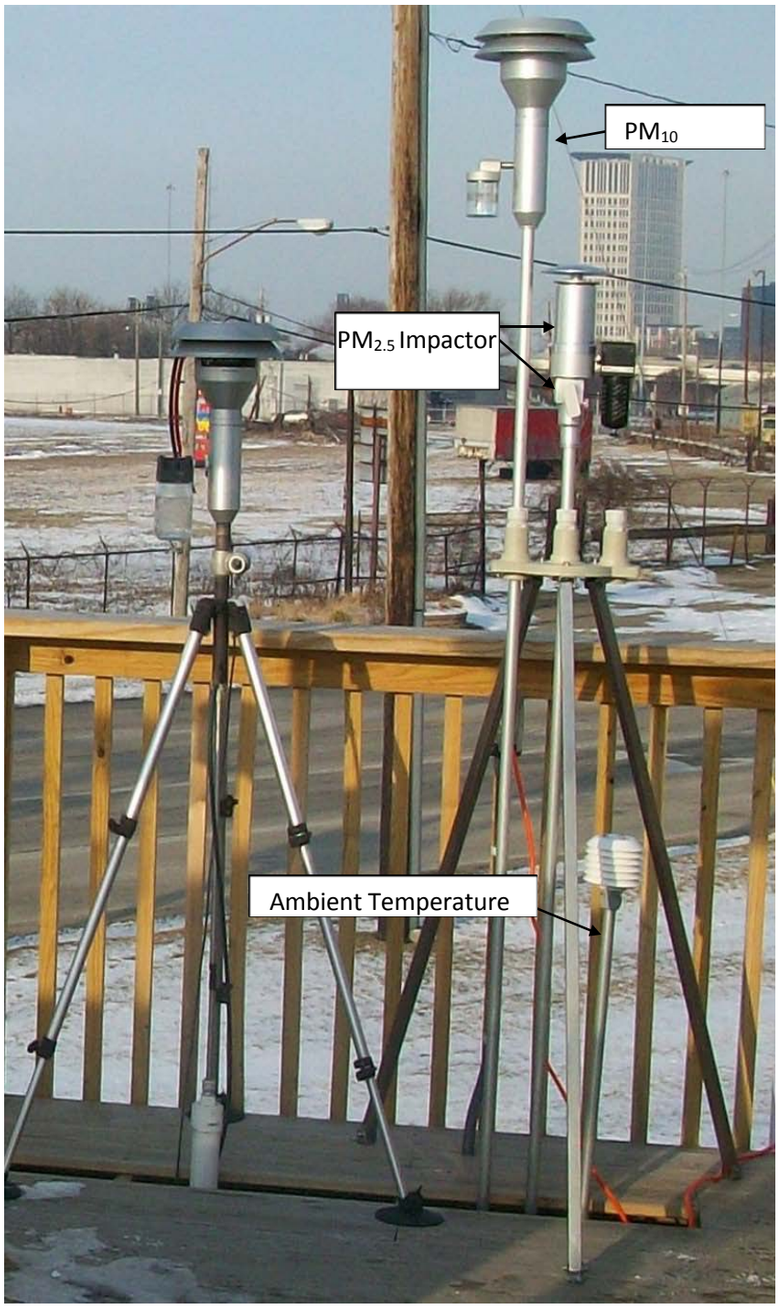
Figure 2-5. Filter Handling Module



2.4.4 Filter Handling Module

A. **Rotating plate:** where the 6 filter membranes “F”, the 3 spy filters “S”, and the 2 reference aluminum foils “R” (see figure 4.2) are placed. On the plate there is also a hole “A” for measuring the air ß flux. The plate is moved by a step-motor controlled by electronics.
B. **Unused filter reserve**: an area inside the instrument located between the plate and the loader bottom that can hold up to 6 filter membranes.
C. **Electro-pneumatic pistons** for loading and unloading filters and for the moving the Beta source.
D. **Electro-pneumatic filter-presser pistons** for operative positioning of the filters on the sampling line.
E. **Sensors for plate positioning**
F. **Sensors for detecting filter presence** (i.e. for checking that the filter has been loaded)
G. **Sensors for mass measuring system positioning**

Figure 2-6. T-API Model 602 BetaPlus Rooftop Inlet Installation



2.5 Operation

The T-API Model 602 Beta^{Plus} instrument is fully automated and has very few operational control options. These options are discussed below.

A. Monitoring Interval: Monitoring interval be set to 1 hour and the interval start at the top of the hour.
B. Serial Communication Parameters: Data download is accomplished through the Model 602 Beta^{Plus} COM DB9 serial data interface
C. PM Filter Change Frequency: The T-API Model 602 Beta^{Plus} uses 6 glass fiber filters per day (PM_{10} and $PM_{2.5}$ filters sampled 4 times before replacement). Instructions on removal and reloading of filters into the cassettes and magazines are in the User Manual Chapter 4.

Note: *Used filters should be removed from the receiving magazine on a bi-weekly (approximately 16 day) basis. This allows the supply magazine to be refilled on a regular schedule and will prevent data loss caused by the unit running out of filters. The used glass fiber filters can be discarded as no further analyses of the glass fiber filters are planned.*

3.0 Routine Preventative Maintenance

3.1 General Information

Perform the following service checks according to the procedures documented in this section. Routine service checks may be performed more frequently, but should be performed at least at the prescribed intervals. All field data sheets should be filled out accordingly and stored on the network. These sheets would be used to validate data.

3.2 Biweekly Verification Check

- Check to ensure there are no errors or warnings displayed on the instrument screen
- Use the 'Daily Site Summary' feature in FAMAS to review data downloaded from the current buffer to ensure logging is working, to look for obvious problems (e.g., negative mass values), and that the instrument is operating properly (no error or warning codes). This should be done every morning to catch any problems that might have sprung up overnight.
- Verify the system date and time. The time should be within one (1) minute of the Standard atomic clock time (WWV 303-499-7111).
- Rerecord the values on FORM DEP 03-17-B Site visitation log.
- Empty the filter receiving magazine and fill the filter supply magazine.

3.3 Monthly Checks

- Verify the Temperature on the Model 602 Beta^{Plus} and record values on FORM DEP 03-17-A.
- Verify the Pressure on the Model 602 Beta^{Plus} and record values on FORM DEP 03-17-A.
- Verify the sample flows ($PM_{2.5}$ and PM_{10}) on the Model 602 Beta^{Plus} and record values on FORM DEP 03-17-A.
- Perform a leak check

3.4 Annual Checks

The unit's Temperature, Pressure, Flows and Time should be calibrated annually. Additional calibrations should be performed if the Temperature, Pressure, Flow or Time drift outside of acceptable ranges during the course of the year. The sample probe inlet line should be cleaned during the annual calibration.

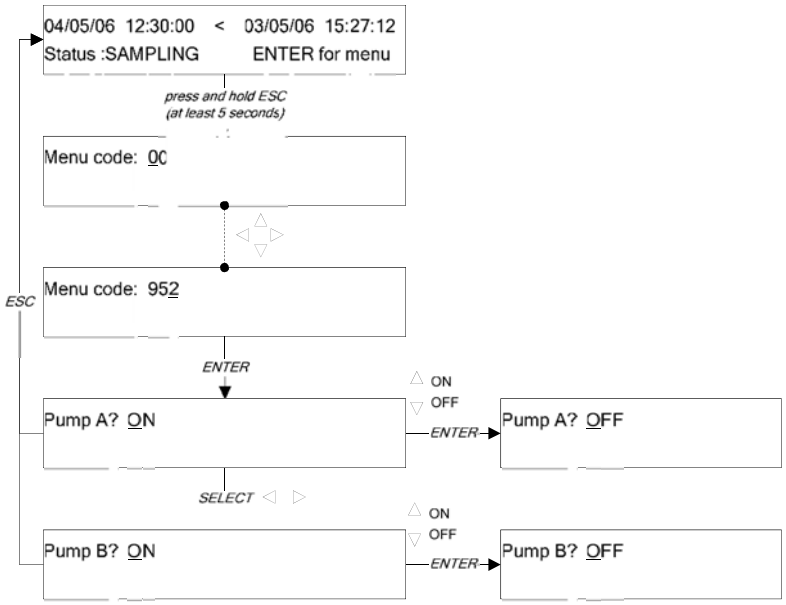
3.5 Cleaning the Sampling Inlet

The sampling inlets can be cleaned when the instrument is in Ready, Sampling or Ending Status. If the instrument is in Sampling or Ending Status the vacuum pumps must be switched off before removing the sampling inlet from the sampling line. It is not recommended to clean the inlets when the unit is in Sampling or Ending Status. Better to wait until the unit is in Ready Status, as the pumps will already be off. Should you choose to clean the inlet while the unit is in Sampling or Ending Status, directions for the manual operation of the pumps is below.

Note: Cleaning should be performed at least monthly or according to EPA or local monitoring agency guidelines.

Figure 3-1. Pump Operation

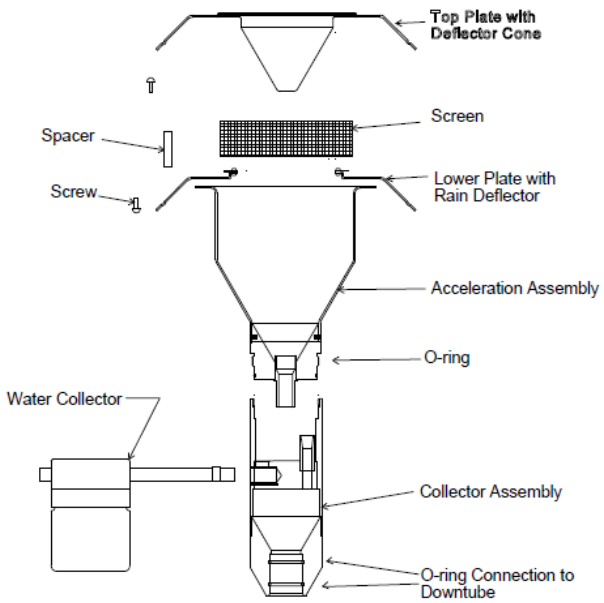
A. From the main screen press and hold the ESC key for at least 5 seconds to access the Menu code (access to support tools).
B. Enter code 952 using the Select keys and press ENTER to access the pump control function.
C. Choose the pump to be switched off using the Select keys.
D. Press NO to select OFF.
E. Press ENTER to confirm.



After switching the pump off, follow the next procedure to continue with the removal and cleaning of the corresponding sampling head(s).

3.6 Dismantling and Cleaning the US EPA PM10 Inlet

Figure 3-2. PM_{10} Inlet



A. Mark each assembly point of the sampler inlet with a pen or marker to provide "match marks" during reassembly. Critical assembly points are already "keyed."

B. Disassemble the sample inlet unit according to the figure above, taking care to retain all the parts. Note: If the assembly screws appear frozen, the application of penetrating oil or commercial lubricant will make removal easier.

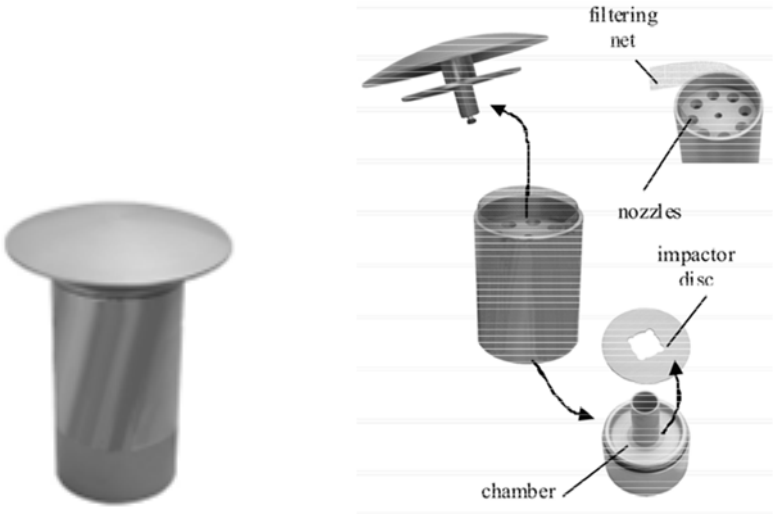
C. Using a soft brush, cloth, and cotton swabs, lightly scrub all interior surfaces and the bug screen to remove all dust, grit and other deposits. Pay particular attention to small openings and crevices. Cotton swabs and/or a small soft brush are most helpful in these areas. In the case of particularly stubborn grime, use laboratory tissue and cotton swabs moistened with distilled water to remove any remaining deposits from surfaces. Completely dry all components if water or general purpose cleaner was used during the cleaning process.

D. Check all the O-rings for distortion, cracks, fraying, lack of lubricating grease, or other problems. Apply a thin coating of vacuum grease or replace the O-rings as necessary.

E. Reassemble the unit in accordance with the previously scribed match marks. Take particular care to ensure that all O-ring seals are properly sealed and that all screws are uniformly tightened.

3.7 Dismantling and Cleaning the PM_{10} Pre-impactor for the $PM_{2.5}$ Inlet

Figure 3-3. $PM_{2.5}$ Inlet



A. Remove the sampling inlet from the sampling line

B. Disassemble the sampling inlet

C. Carefully and thoroughly remove any dust deposits from the impactor disc and any condensation accumulated in the chamber below.

D. Clean all the components using a soft brush, laboratory tissue or cotton swabs. Water and a mild detergent should be used if excessive deposits are present.

E. If water or detergent were used, dry all components with a clean cloth and blow compressed air through nozzles.

F. Apply a thin coat of non-outgassing vacuum grease on the impactor disc.

G. Remove any insects or other debris from the filtering net.

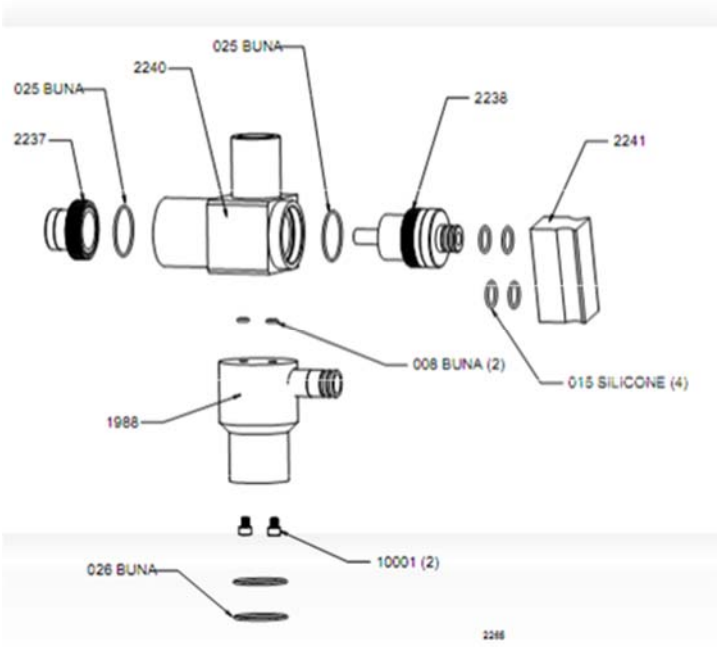
H. Check and, if needed, replace the two O-rings and grease them with vacuum grease.

I. Re-assemble the sampling inlet.

This procedure should be repeated on a biweekly to monthly basis per the maintenance schedule.

3.8 Dismantling and Cleaning the BGI VSCC-A PM2.5 Cyclone

Figure 3-4. VSCC Breakdown



A. Remove the VSCC-A cyclone from its installed position in the instrument.

B. Pull off the side transfer tube. If it is too tight to remove by hand, pry it off with a rigid plastic lever. Care should be taken to not damage the two "O" ring seals.

C. Remove the top cap and grit pot by unscrewing.

D. Wet a lint free wipe with water and remove all visible deposits. These are most likely to be found at the bottom of the cone and inside the grit pot.

E. Inspect all "O" rings for shape and integrity. If at all suspect, replace. Lubricate all "O" rings with light grease. It is important to well lubricate the transfer tube to avoid difficult disassembly.

F. It is not necessary to remove the two hex head screws (pn 10001), but make sure they are tightly positioned.

G. Assemble in reverse order and reinstall.

H. Perform a leak check according to manufacturer's operating manual specifications.

Note: *It is not recommended to dismantle the VSCC-A cyclone on a monthly basis, due to its numerous small pieces and the possibility of losing them. Presuming the unit is passing monthly leak checks, quarterly cleaning of the VSCC-A cyclone should prove sufficient.*

3.9 Cleaning the Sample Line Tubes

A. Switch off the instrument. (Unit should be in 'Ready' mode when it is switched off.)

B. Remove the protective thermal insulation sleeve and disconnect the sampling lines from the top of the instrument.

C. Remove any insects or other debris from the inlet screen located below the air intake's protective sleeve. (Use a soft brush, laboratory tissue or cotton swabs.)

D. **Make sure that there is no water inside the sampling line or sampler.**

E. Dry and/or remove any visible deposits from the surfaces.

F. Check, grease, and if needed, replace the two O-rings on the sleeve of the inlet coupling.

G. Re—connect the sampling lines to the top of the instrument and reapply the protective thermal insulation sleeve.

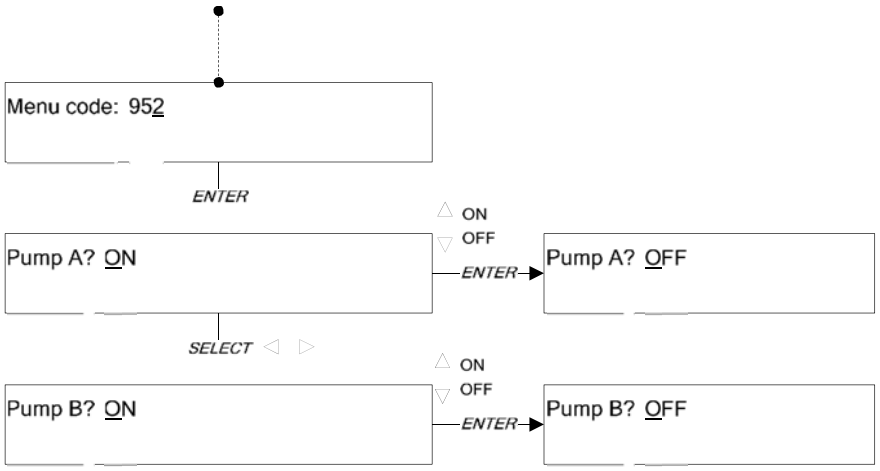
H. Switch on the instrument.

3.10 Reactivating the Pumps after Inlet Cleaning

After re-assembling the sampling head(s), use the pump control *function* to turn the pumps back on.

Figure 3-5. Reactivating Pumping

A. Select the pump you wish to switch on using the Select keys.
B. Press YES to select ON.
C. Press ENTER to confirm.

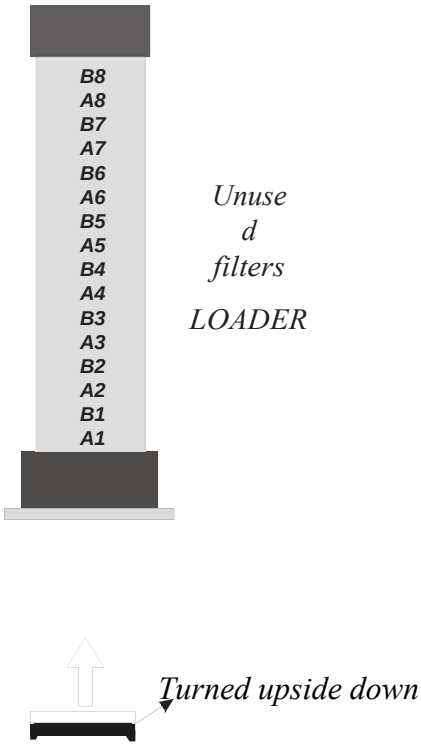


Note: *At the beginning of every sampling and measurement cycle and after unloading the sampled filters (at the end of the mass measurement collection session), the suction pumps are automatically activated.*

3.11 Inserting filters into Loader

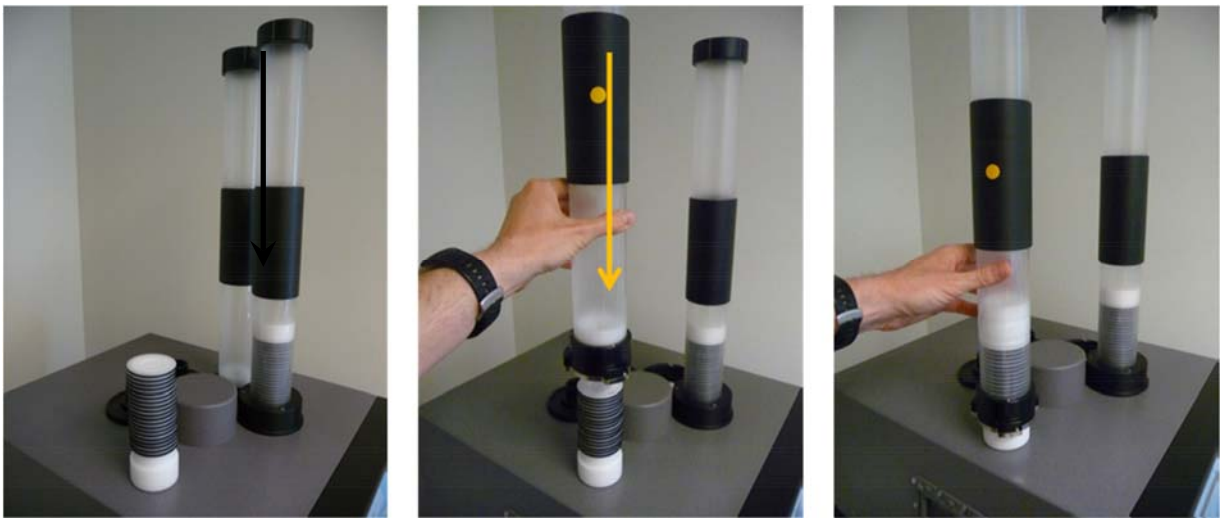
To insert unused filters into the Loader (not interchangeable with the sampled filters *Unloader*), disconnect the Loader by turning it counter-clockwise and make sure that each filter cartridge is placed in the lower part of the *Loader* with the hollow part facing downward. It is important to pay attention to the filter insertion direction, because they will be loaded based on their starting position inside the Loader. In all operating modes – except for Monitor Mode Line A and Monitor Mode Line B - the filter insertion sequence shown in Figure 4-8 (filter A – filter B) must be followed.

Figure 3-6. Loader



Use the appropriate accessory supplied with the instrument to insert filters into the *Loader*. Place the filter cartridges onto it with the hollow part turned downward and then place the Loader onto it. It is not recommended to stack more than ten to fifteen filters on the loader accessory at one time, as they can easily fall over if stacked too high.

Figure 3-7. Removing Loader



If the *Loader* is not empty and it is necessary to add new unused filters while respecting the order of the filters already inside the Loader, we suggest using the appropriate accessory and follow this procedure:

A. Assemble the accessory used for unlocking the filters by placing the ring (b) on the accessory used for inserting filters (a)

B. Place the *Loader* over the top of the filter unlocking accessory.

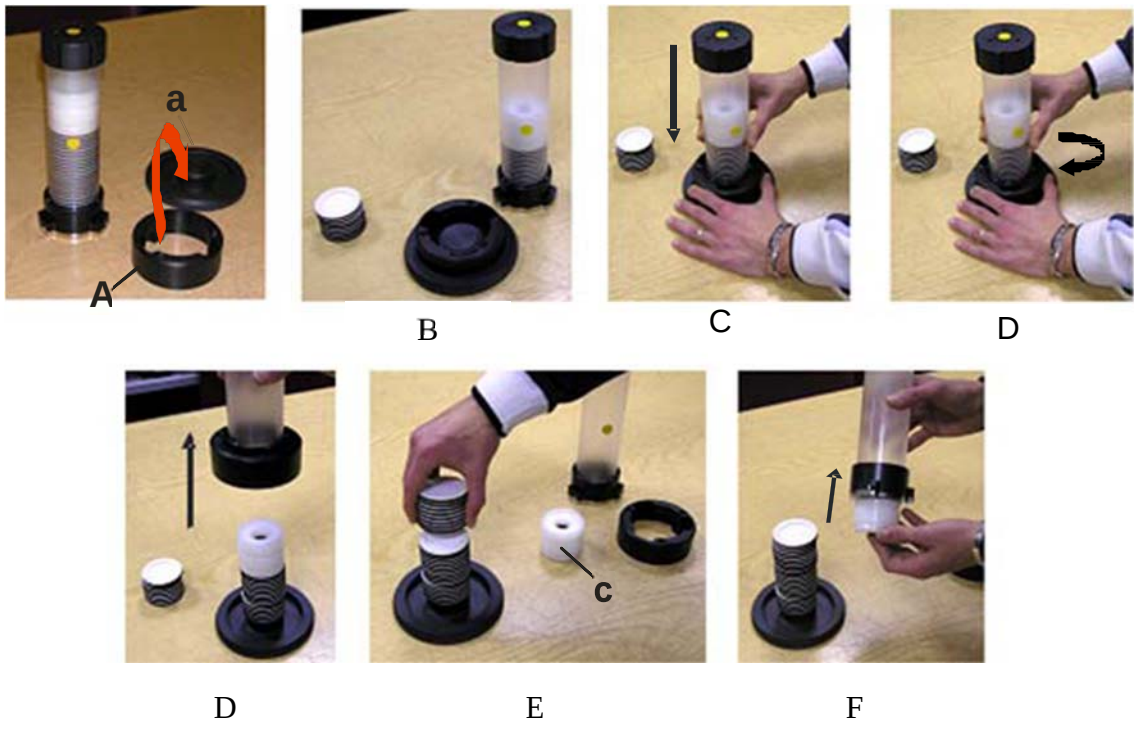
C. Rotate the *Loader* clockwise, to lock into place (b)

D. Lift the *Loader* while maintaining the filters in a stack

E. Remove the plunger (c) and add the new unused filters to the stack

F. Before loading the filters into the Loader, put the plunger back in with the hollow part turned upward

Figure 3-8. Loading Filters



It is possible to add new unused filters to the *Loader*, even during sampling, without stopping the cycle.

To start the sampling and measurement cycles, insert at least 8 unused filters into the Loader.

After loading the unused filters, to insert the Loader into its slot (which is to the right when facing the instrument) firmly rotate it clockwise until it clicks into place in the mechanical block.
This operation unlocks the Loader's filters lock system, causing the filters to move down into the sampling unit.
On the LOADER control panel, the green "locked" LED lights up and simultaneously the red "unlocked" LED turns off. Additionally, the "EMPTY" LED turns off and the green "filters present" LED flashes to indicate that the filters have been loaded.

Figure 3-9. Front Panel

3.12 Removing Filter Cartridge from the Unit

At the end of each sampling and measurement cycle, the instrument will immediately move the processed filters to the Unloader. To remove the used filters from the Unloader follow the steps below:

A. Disconnect the Unloader by turning it counterclockwise

B. Quickly turn over the Unloader

C. Keep the Unloader in a vertical & upside-down position and place it on a flat surface.

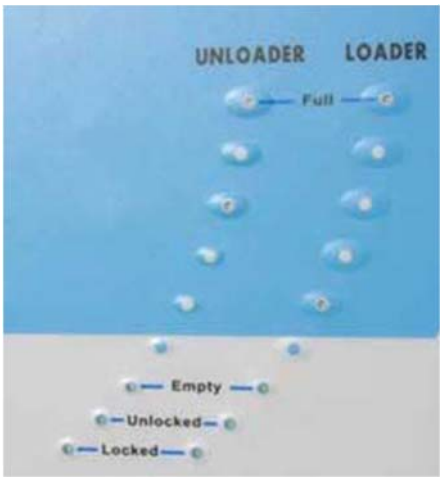
D. Carefully remove the tube from the plug and lift it straight up to ensure that the filters remain stacked.

Figure 3-10. Reinstalling Loader

Before inserting the *Unloader* back into its slot, make sure that the plunger has been correctly inserted.

Figure 3-11. Front Panel Lights

To insert the *Unloader* into its slot (which is to the left when facing the instrument), turn it clockwise until it clicks into place in the mechanical block.
On the UNLOADER control panel, the green "locked" LED will light up and simultaneously the red "unlocked" LED will turn off. The UNLOADER control panel progressively shows the Unloader filling until it reaches maximum capacity, and then the red "FULL" LED will turn on.



3.13 Removing Membranes from the Filter Cartridge

Note: *The sample image on the filter must be homogeneous and the outline of the sampling surface must be well-defined example of a 0.95 cm² β spot area). If the sample image has irregularities, for example, due to the presence of condensate collection devices.*

Figure 3-12. Filter Samples

Homogeneous Image (well-defined outline) Irregular Image Irregular Outline

Note: *The filters are multi-time mode. Hourly mode filters will have a smaller sample spot.*

If a filter cartridge has been accidently inserted into the Loader upside-down or without a filter membrane, the instrument operates as follows, depending on the current operating mode:

A. In Dual Channel Mode, where both Line A and Line B are active, the pair of filters containing the upside-down (or without membrane) filter cartridge will be replaced. The unloaded pair will be replaced by the following pair in the reserve.

B. In Single Channel Mode (Line A), the cartridge will be unloaded and will be replaced by a new unused cartridge (the following one in the reserve).

In both cases, this event will be stored in the Buffer Data and will be signaled by a Warning message (Warning 10, see Appendix 3). This warning will not halt the instrument, nor will it affect the sampling, but will show as a flag in the data for quality monitoring purposes.

3.14 Changing Start Time

In the START submenu press ENTER; at Line A&B press ENTER; at TIME press ↓arrow to scroll to Hourly and press ENTER. The display shows the earliest possible start time to begin sampling. Use arrow buttons to change to later time to start at the top of the hour (two hours from the present) and press ENTER to set.

Note: *If the unit isn't set to start at the top of the hour, (i.e. 1:15 instead of 1:00) the data won't track properly in FAMAS and you'll just end up making another trip to the site to reset the start time.*

4.0 CALIBRATION PROCEDURE

4.1 Single-point Flow Calibration

The single point flow calibration can be done while the instrument is in the normal running mode. The data collected during this hour should be invalidated.

Tools

- NIST-traceable flow meter (4-20 lpm flow rate range) capable of measuring in actual, local volumetric conditions
- 1 or 1 ¼" sample tube or hose barb adapter (if necessary)
- PC with 602betaplusmanager.net software application

Procedure

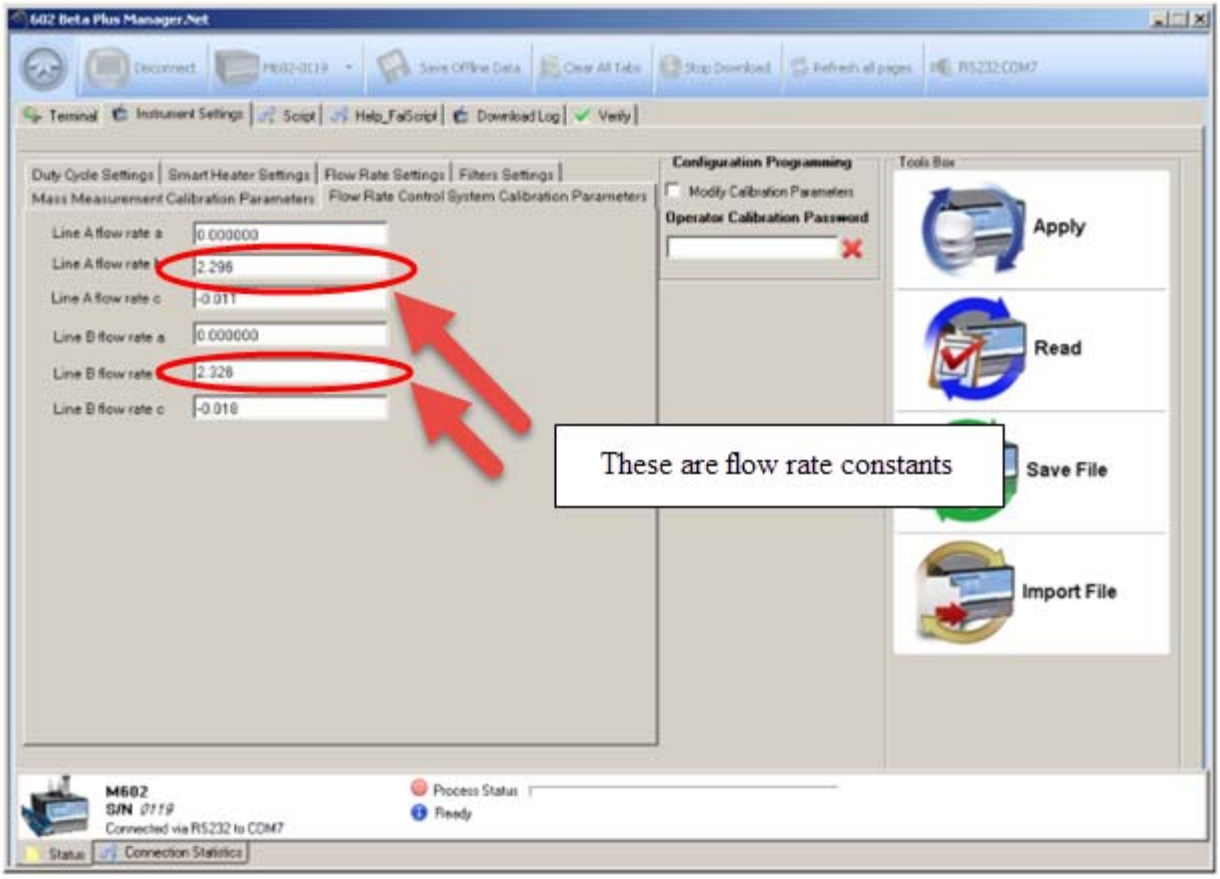
Step 1: Flow Verification

A. Remove the inlet from the sample tube.
B. Place the NIST-traceable flow meter on the sample tube end.
C. Allow the instrument rate to stabilize (60 seconds).
D. Record measured flow at the flow mater in actual conditions.
E. If the measured flow is > +/- 4% (<16 OR >17.34 lpm) different than the instrument flow measurement, proceed to Step B.
F. Repeat the procedure for the second sampling line, if applicable.

Step 2: Connect to PC using 602betamanagerplus.net Software

A. Identify the current Flow Calibration Settings.
B. Connect PC to instrument using serial connector.
C. Open 602betamanagerplus.net application software, establish connection to the instrument.
D. Go to Service Menu → Instrument Settings Tab → Flow Rate Control System Calibration Parameters.
E. Note the current flow calibration constant parameters (Line X flow rate b – see below)

Figure 4-1. 602 Beta Manager Plus Application



Step 3: Derive the new flow constant using the formula below:

$$\frac{F_{ref}}{F_{602}} \times Slope_{old} = Slope_{new}$$

Example 1:

$$\frac{16.34\ lpm}{16.67\ lpm} \times 2.35 = 2.30$$

Example 2:

$$\frac{17.2\ lpm}{16.67\ lpm} \times 2.35 = 2.43$$

Step 4: Input New Flow Constant

A. Connect PC to instrument using serial connector.
B. Open 602Betaplusmanager.net application software, establish connection to the instrument.
C. Go to Service Menu → Instrument Settings Tab → Flow Rate Control System Calibration Parameters.
D. Insert New Flow Constant into Flow Rate b on the applicable Line (A or B).
E. Insert New Flow Constant into Flow Rate b on the second line (A or B).
F. Check the box to the right which says 'Modify Calibration Parameters'.
G. Input Operator Calibration Password (instrument alphabetical serial number)
   i. A = 0, B = 1, C = 2, D = 3, E = 4, Etc.,
   ii. Example: instrument serial number 0119 = 'ABBJ' password (MUST be in caps lock)
H. When the green checkbox appears, click Apply.
I. Once you press Apply, you will hear the valve adjust to control at the new flow rate.

Step 5: Finish Up

A. Recheck the flow at the inlet(s) using the NIST-traceable flow transfer standard OR using the Auto Span Test (see below)
B. Once satisfied, replace the inlet on the sample tube.

4.2 Automatic Calibration

The automatic sequence of operations carried out by the instrument to perform the *Auto Span Test* can be summarized as follows:

A. Span solenoid valve opening and leak valve closing

B. Suction pump switching on

C. Automatic check of the achievement of the critical pressure conditions, comparing the measured values of the pressure downstream "Pf" and upstream "Pa" the nozzle (see note 1).

D. Displaying and storage of the reference flow rate value "Q_{cal}" expressed in Nm³/h at the programmed temperature and pressure conditions (see User Manual par. 5.5).

E. Displaying and storage of the flow rate values "Q_{test}" (expressed in Nm³/h), determined by the flow rate measurement system.

To start the Auto Span Test, follow the procedure below:

A. With the instrument in READY status press ENTER and then SELECT till the "Instrument Tools" menu will be displayed and press ENTER.

B. Press ENTER to have access to the "Test" menu.

C. Using the SELECT buttons, select the pneumatic circuit line to be involved in the test

   Line A pneumatic test
   Line B pneumatic test

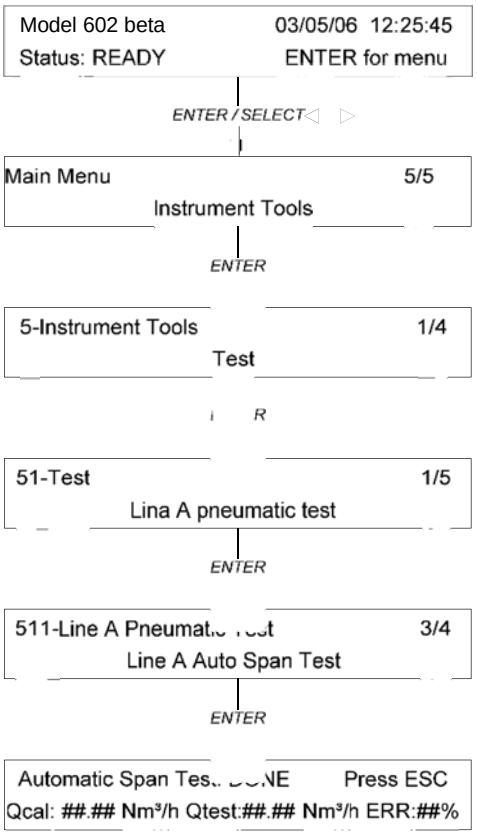
D. Press ENTER to confirm your choice

E. Using the SELECT button, select "*Line A Auto Span Test*" or "*Line B Auto Span Test*" and press ENTER to start the test

   The "*Qtest*", "*Qcal*" values and the percentage deviation "*ERR%*" will be displayed

   If the percentage deviation from the starting calibration value is out of the interval ± 4%, a Warning message is automatically displayed (Warning 13, see Appendix H). If the percentage deviation is out of the interval ±10%, an Alarm message will be automatically displayed.

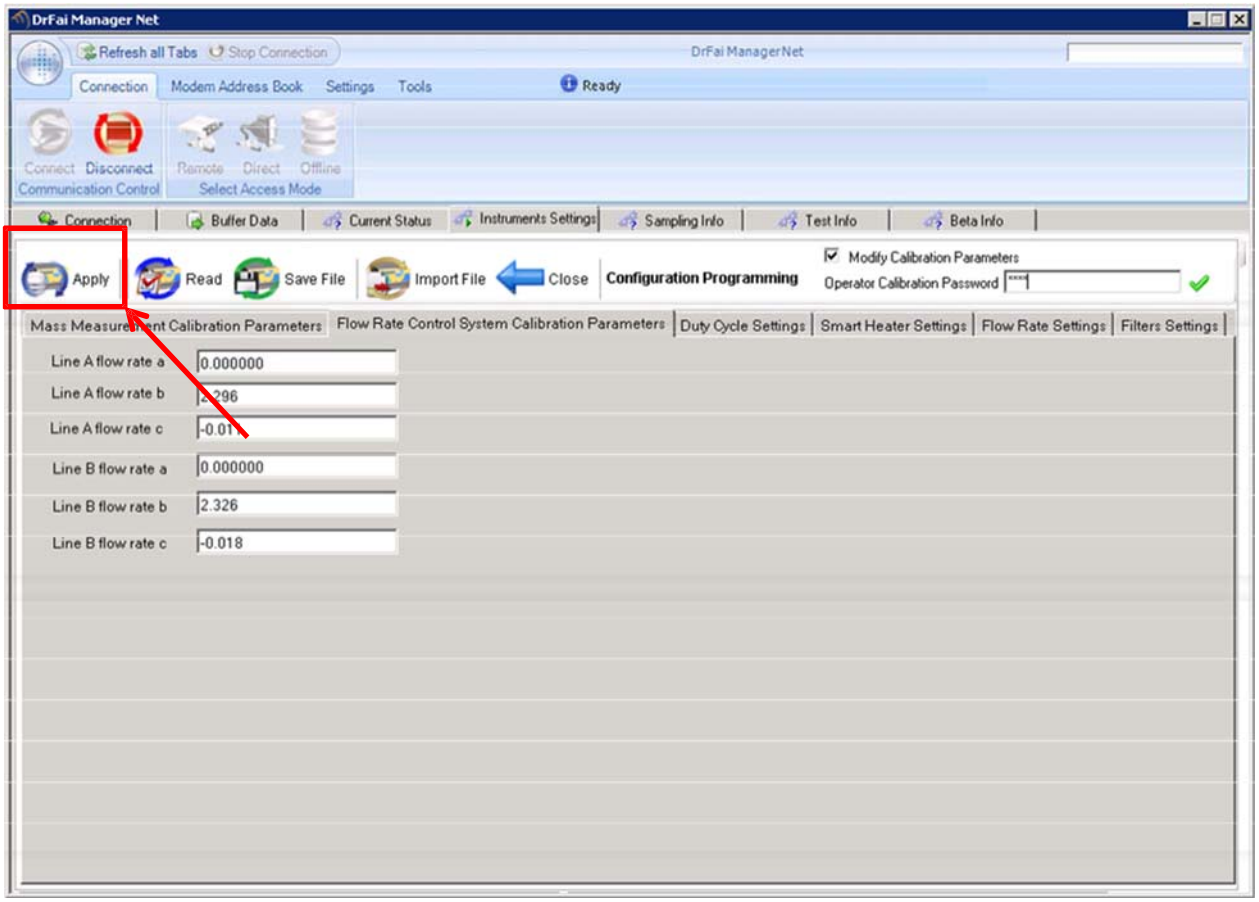
Figure 4-2. Auto Span Procedure



Note: *Err:+99.9% displaying means that the pressure downstream the nozzle did not achieve the "critical condition". This implies that the test will not be performed.*

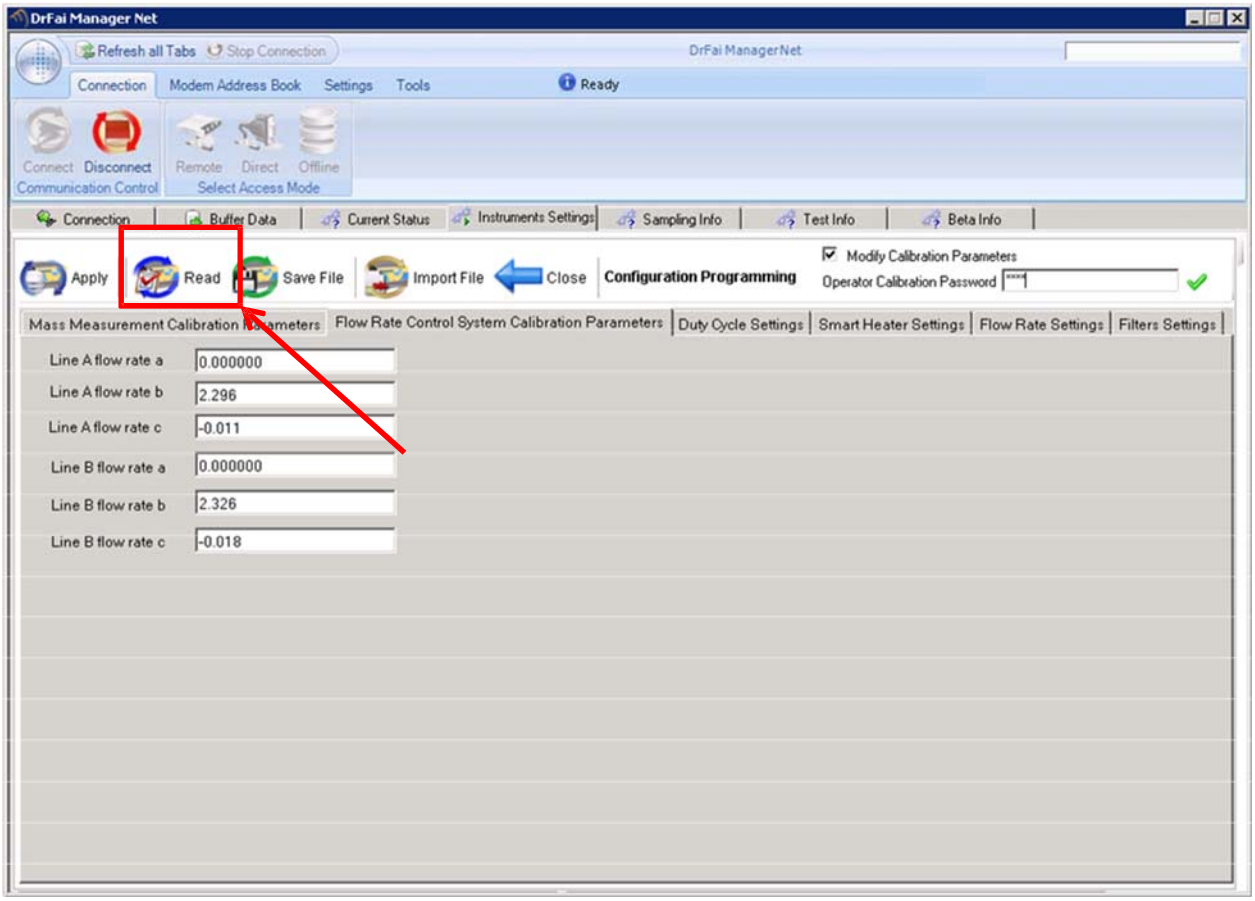
F. Now, click the “Apply” button:

Figure 4-3. Flow Calibration Parameters (Step F)



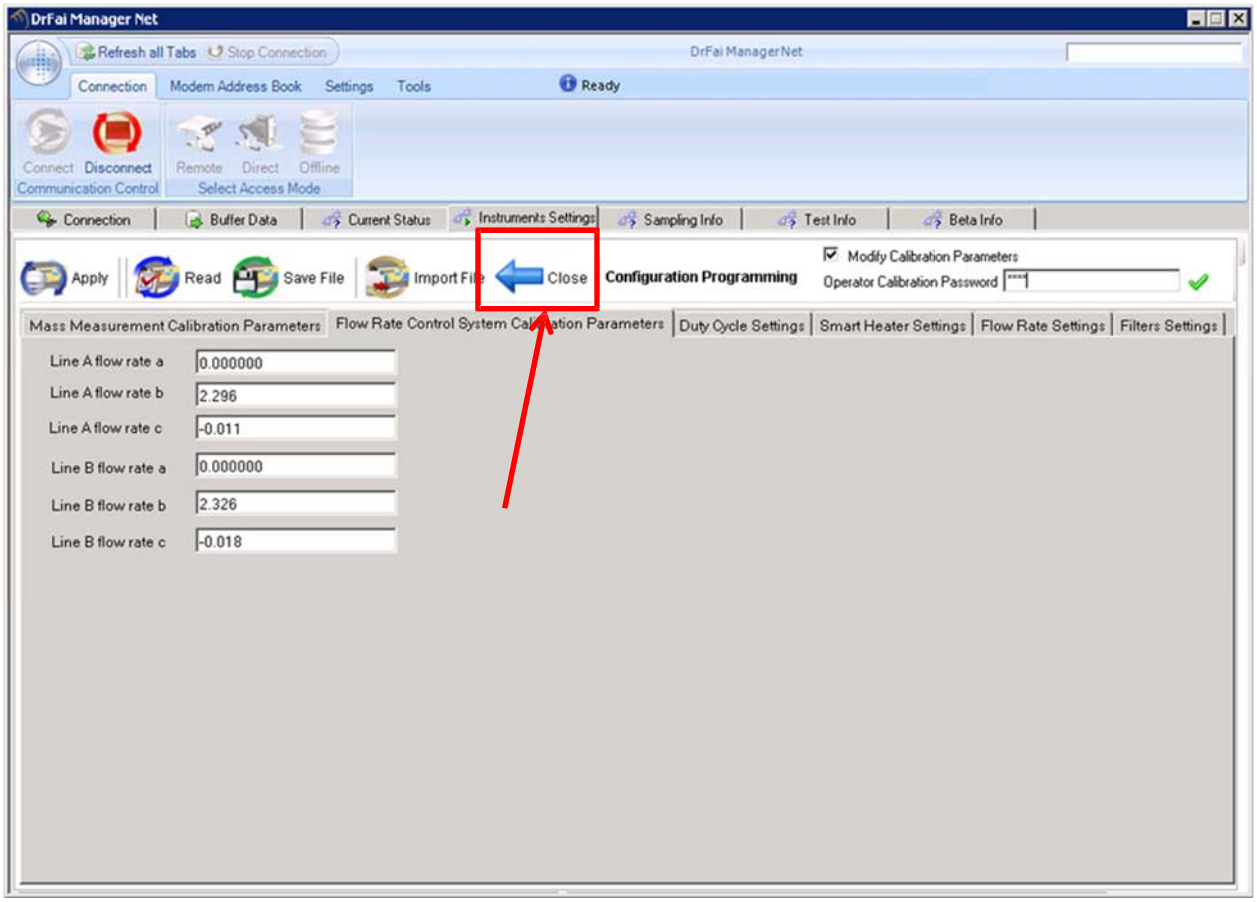
G. To confirm that the values you entered were properly delivered to the instrument, click the “Read” button:

Figure 4-4. Flow Calibration Parameters (Step G)



H. Finally, close out of the “Instrument Parameter Settings” tab and exit Dr. FAI:

Figure 4-5. Flow Calibration Parameters (Step H)



5.0 MANUAL LEAK TEST SAMPLING LINE

5.1 Manual Leak Test Line A/B starting procedure

Before starting the procedure, when the instrument is in READY Status, it is necessary and that no filter is present inside the instrument.

A. With Status set to READY, press ENTER and then SELECT to access the "Instrument Tools" window.

B. Press ENTER to access the "Instrument Tools" menu.

C. Press ENTER to select the "Test" menu.

D. Using the SELECT keys, it is possible to select the pneumatic circuit line to be tested.

Line A pneumatic test Line B pneumatic test

E. Press ENTER to confirm.

F. Press SELECT to choose "Line A Manual Leak Test" and press ENTER to confirm.

G. Unlock the Loader and put the blind filter cartridge inside (accessory not supplied as standard with the instrument with the hollow surface turned downwards.

H. Re-lock the loader.

I. Press ENTER to start the test. The values of the residual pressure "P_r" [kPa] and the specific leak "Q_{leak}" [mL/ (min*kPa)] will be displayed.

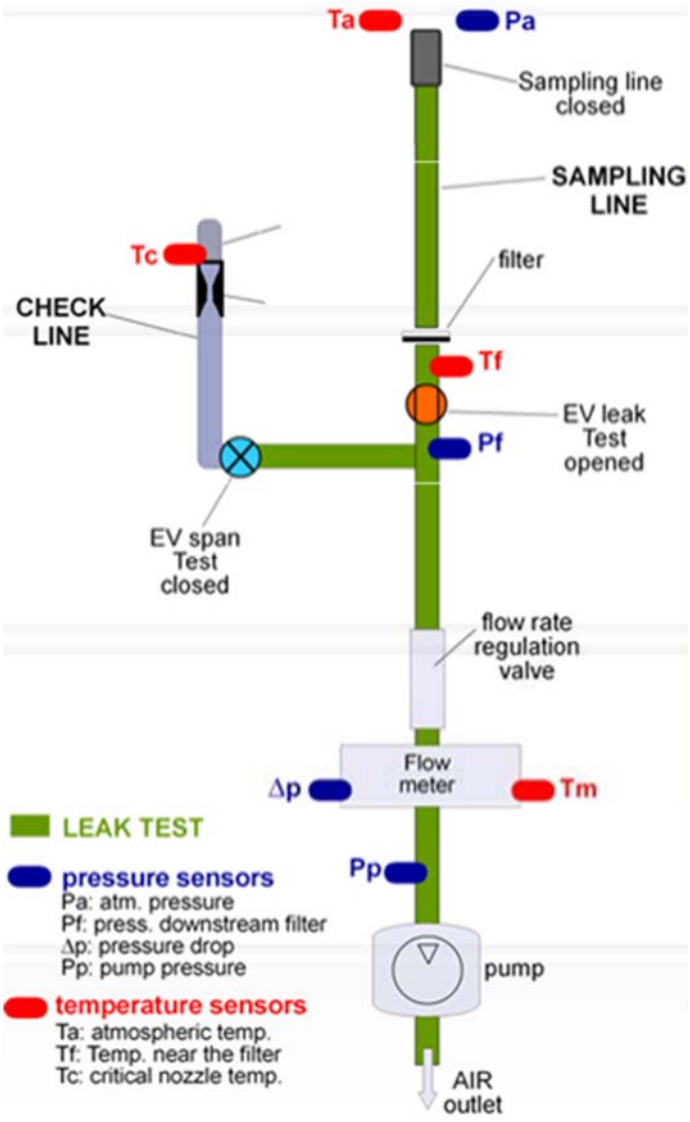
J. Press ENTER to stop the test and enter values on FORM DEP 03-17-D

If it is necessary to check the sealing of the entire pneumatic system, including the section containing the filtering medium and replace the "blind filter cartridge "with a "complete filter" (the same type used for sampling). Then close the sampling line inlet with the suitable plug used for leak testing. In this case it is necessary to remember that the pneumatic circuit volume value used by the instrument (1.3 liters) for the leak calculation is lower than the real one (it changes depending on the pneumatic configuration of the instrument at the sampling site).

If the specific leak value is higher than 15 mL/(min*kPa), a Warning message is automatically displayed if this value is higher than 30 mL/(min*kPa), an Alarm message is automatically displayed.

Note: *Performed to check the seal of the whole pneumatic circuit and proper coupling of the filter presser and the external sampling line.*

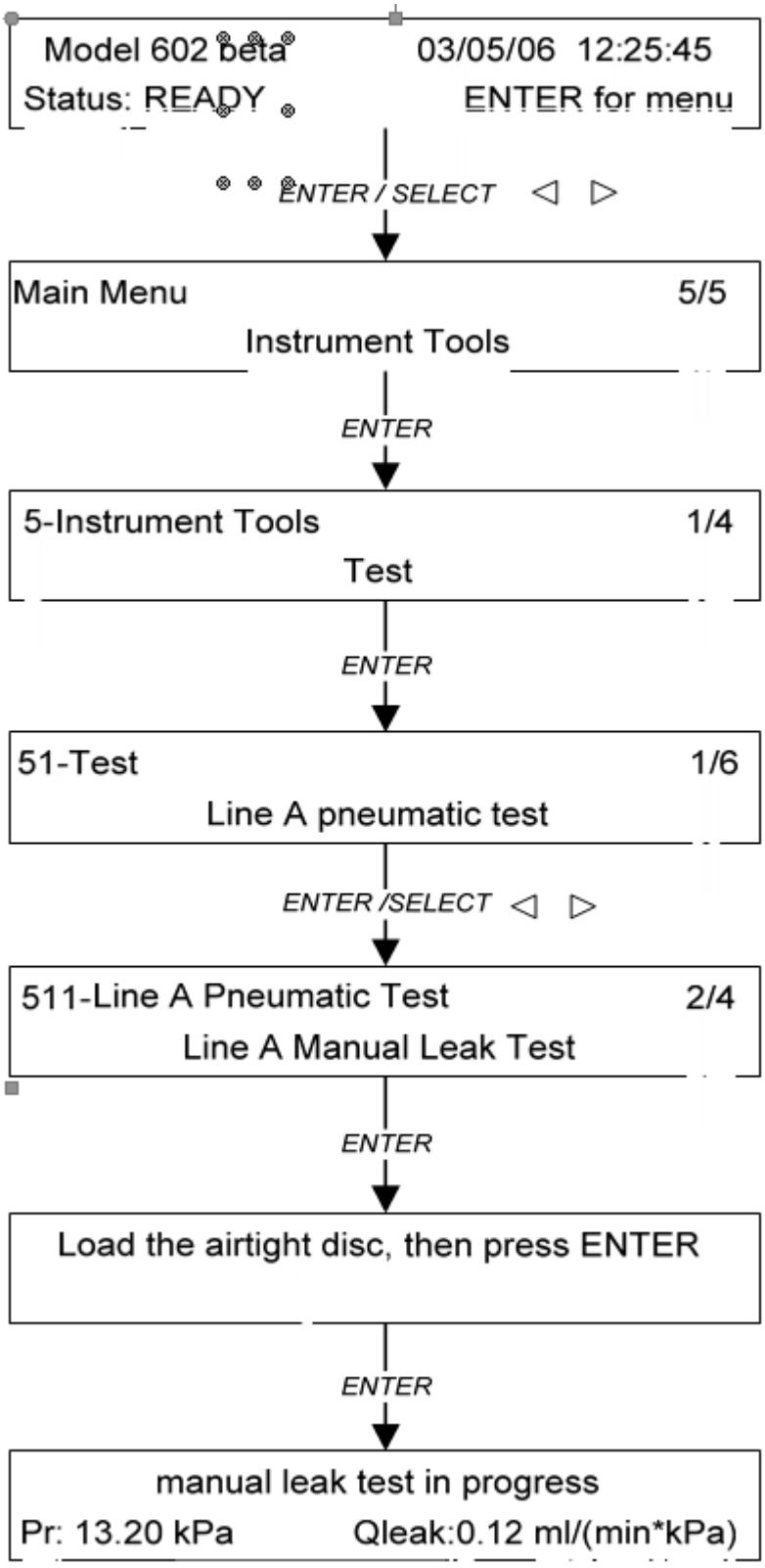
Figure 5-1. Manual Leak Test Line



Configuration:

- EV leak: open
- EV: span closed
- “Operative” filter
- Accessory for closing the line

Figure 5-2. Leak Test Process from Menu

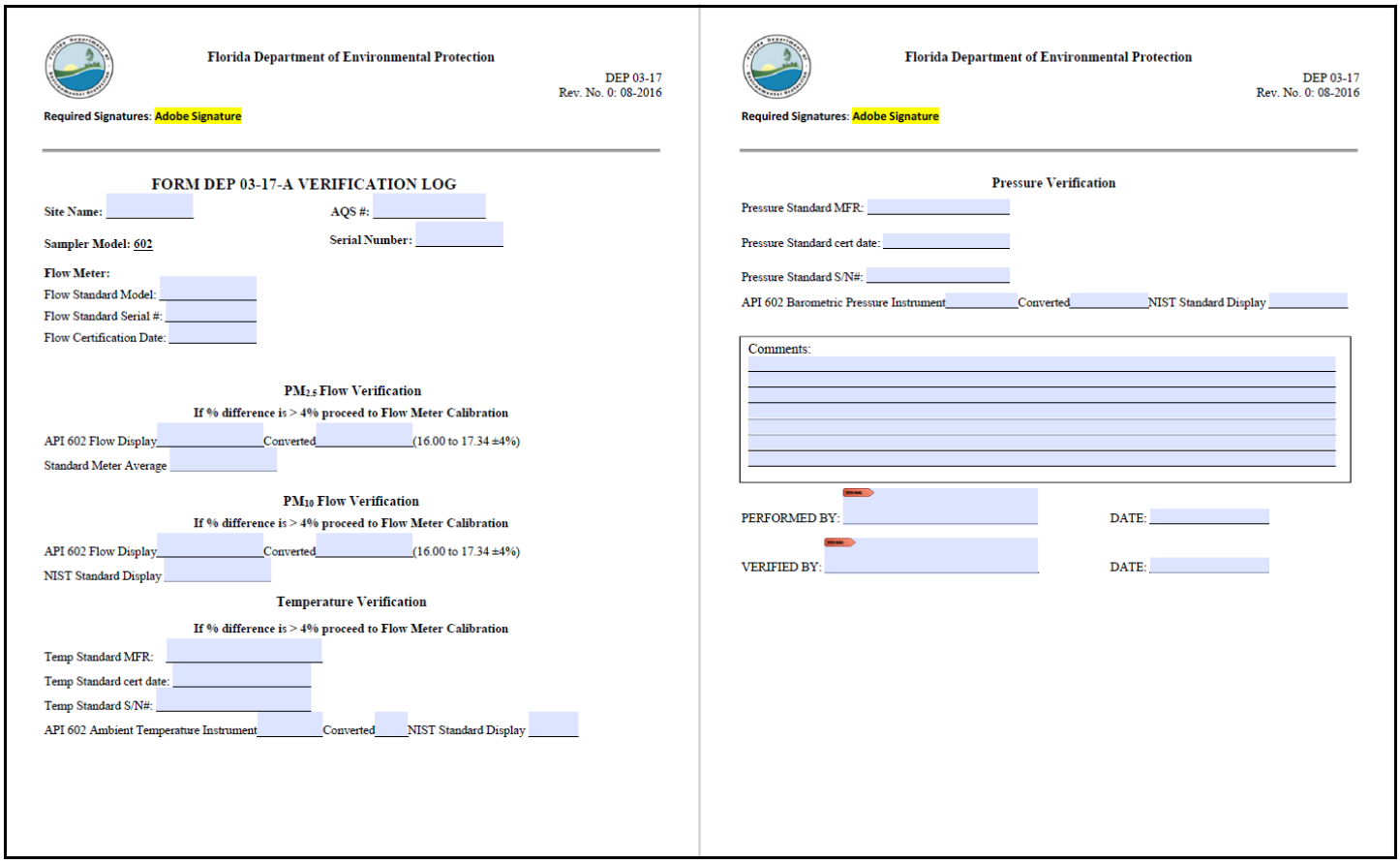


6.0 REFERENCES

Teledyne Advanced Pollution Instrumentation Model 602 Beta^{Plus} Particulate Measurement System Operation Manual, Part number 07318B DCN6410, 2012

7.0 APPENDIX A - FORMS

7.1 Form DEP 03-17-A: Verification Log



Florida Department of Environmental Protection

DEP 03-17
Rev. No. 0: 08-2016

Required Signatures: Adobe Signature

FORM DEP 03-17-A VERIFICATION LOG

Site Name: _____ AQS #: _____

Sampler Model: 602 Serial Number: _____

Flow Meter:

Flow Standard Model: _____

Flow Standard Serial #: _____

Flow Certification Date: _____

$PM_{2.5}$ Flow Verification

If % difference is > 4% proceed to Flow Meter Calibration

API 602 Flow Display_____Converted_____(16.00 to 17.34 ±4%)

Standard Meter Average _____

PM_{10} Flow Verification

If % difference is > 4% proceed to Flow Meter Calibration

API 602 Flow Display_____Converted_____(16.00 to 17.34 ±4%)

NIST Standard Display _____

Temperature Verification

If % difference is > 4% proceed to Flow Meter Calibration

Temp Standard MFR: _____

Temp Standard cert date: _____

Temp Standard S/N#: _____

API 602 Ambient Temperature Instrument_____Converted____NIST Standard Display _____

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Required Signatures: Adobe Signature

Pressure Verification

Pressure Standard MFR: _____

Pressure Standard cert date: _____

Pressure Standard S/N#: _____

API 602 Barometric Pressure Instrument_____Converted_____NIST Standard Display _____

Comments:

PERFORMED BY: _____ DATE: _____

VERIFIED BY: _____ DATE: _____

To complete Form DEP 03-17-A, the following information is required:

- Site Name
- Site AQS Number
- Serial Number
- Flow Standard Model
- Flow Standard Serial Number
- Flow Standard Certification Date
- API 602 Flow Display (PM2.5) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → 'Flow Rate – Line A' (screen 5/9)
- Converted – This will populate once the 'API 602 Flow Display' has been entered.
- Standard Meter Average – Taken from the FTS flow conversion form.
- API 602 Flow Display (PM10) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info B' → 'Flow Rate – Line A' (screen 5/9)
- Converted – This will populate once the 'API 602 Flow Display' field has been entered.
- Standard Meter Average – Taken from the FTS flow conversion form.
- Temperature Standard Model
- Temperature Standard Certification Date
- Temperature Standard Serial Number
- API 602 Ambient Temperature Instrument – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → Temperature – Line A' (screen 9/9)
- Converted – This will populate once the 'API 602 Ambient Temperature Instrument' field has been entered.
- NIST Standard Display – Taken from the Temperature Standard
- Pressure Standard Manufacturer
- Pressure Standard Certification Date
- Pressure Standard Serial Number
- API 602 Barometric Pressure Instrument – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → Pressure – Line A' (screen 7/9)
- Converted – This will populate once the 'API 602 Barometric Pressure Instrument' field has been entered.
- NIST Standard Display – Taken from the Pressure Standard
- Comments – Operator should add any pertinent information / observations in regards to the visit.

7.2 Form DEP 03-17-B: Site Visit Log

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DEP 03-17
Rev. No. 0: 08-2016

Required Signatures: Adobe Signature

FORM DEP 03-17-B SITE VISIT

Date: _____

Operator: _____

Site Name: _____ **AQS #:** _____

Check the Status (*yes/no*):

1. Is the date and time correct on the Instrument screen? _____
2. Is the main status light OK? _____
3. Is the service air status light OK? _____
4. Is the battery level status light OK? _____
5. Is the filter loader tube indicator light locked? _____
6. Is the filter unloader tube indicator light locked? _____
7. Are there sufficient filters in the loader tube? _____
8. Are the pumps on? _____
9. Are there any warnings on the main status screen? _____

Comments:

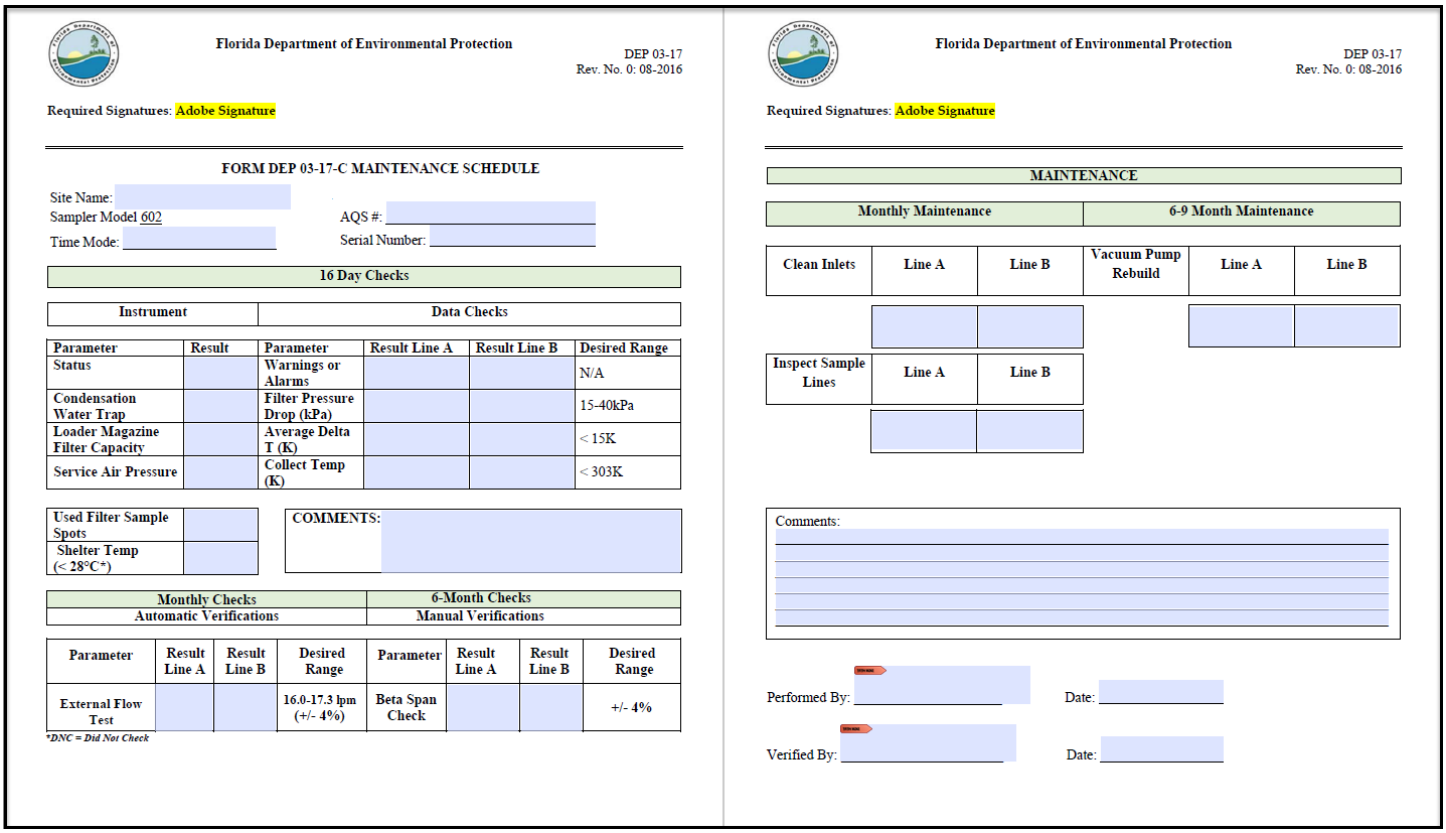
PERFORMED BY: _____ DATE: _____

VERIFIED BY: _____ DATE: _____

To complete Form DEP 03-17-B, the following information is required:

- Date
- Operator
- Site Name
- Site AQS Number
- Is the date and time correct on the Instrument screen? Compare the front panel of the instrument to an NIST traceable Time Standard. Note ‘yes’ or ‘no’ accordingly.
- Is the main status light ok? Consult the main status light on the front of the machine. If it’s green, it’s ok. Note ‘yes’ or ‘no’ accordingly.
- Is the service air status light ok? Consult the service air status light on the front of the machine. If it’s green, it’s ok. Note ‘yes’ or ‘no’ accordingly.
- Is the battery level status light ok? Consult the battery level status light on the front of the machine. If it’s green, it’s ok. Note ‘yes’ or ‘no’ accordingly.
- Is the filter loader tube indicator light locked? Consult the filter loader tube status light on the front of the machine. If it’s green, it’s locked. Note ‘yes’ or ‘no’ accordingly.
- Is the filter unloader tube indicator light locked? Consult the filter unloader tube status light on the front of the machine. If it’s green, it’s locked. Note ‘yes’ or ‘no’ accordingly.
- Are there sufficient filters in the loader tube? Consult the loader tube. Note ‘yes’ or ‘no’ accordingly, then refill as necessary.
- Are the pumps on? Consult the pump lights on the front of the machine. If they’re green, they’re on.
- Are there any warnings on the main status screen? Consult the front of the machine. If there’s no red or yellow lights, there are no warnings. (There might be a yellow light on the ‘unloader capacity status’, but that’s not a warning so much as a reminder to clear out the unloader.) To confirm the absence of warnings, from the front panel of the instrument select ‘Instrument Info’ → ‘Warnings Info’ → ‘Warnings A’ or ‘Warnings B’. If they read ‘None’, all is well.
- Comments – Operator should add any pertinent information / observations in regards to the visit.
- Performed By
- Date
- Verified By
- Date

7.3 Form DEP 03-17-C: Maintenance Schedule



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DEP 03-17
Rev. No. 0: 08-2016

Required Signatures: Adobe Signature

FORM DEP 03-17-C MAINTENANCE SCHEDULE

Site Name:
Sampler Model 602 AQS #:
Time Mode: Serial Number:

16 Day Checks

Instrument	Data Checks

Parameter	Result	Parameter	Result Line A	Result Line B	Desired Range
Status		Warnings or Alarms			N/A
Condensation Water Trap		Filter Pressure Drop (kPa)			15-40kPa
Loader Magazine Filter Capacity		Average Delta T (K)			< 15K
Service Air Pressure		Collect Temp (K)			< 303K

Used Filter Sample Spots	
Shelter Temp (< 28°C*)	

COMMENTS:

Monthly Checks Automatic Verifications				6-Month Checks Manual Verifications			
Parameter	Result Line A	Result Line B	Desired Range	Parameter	Result Line A	Result Line B	Desired Range
External Flow Test			16.0-17.3 lpm (+/- 4%)	Beta Span Check			+/- 4%

*DNC = Did Not Check

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MAINTENANCE

Monthly Maintenance			6-9 Month Maintenance		
Clean Inlets	Line A	Line B	Vacuum Pump Rebuild	Line A	Line B

Inspect Sample Lines	Line A	Line B

Comments:

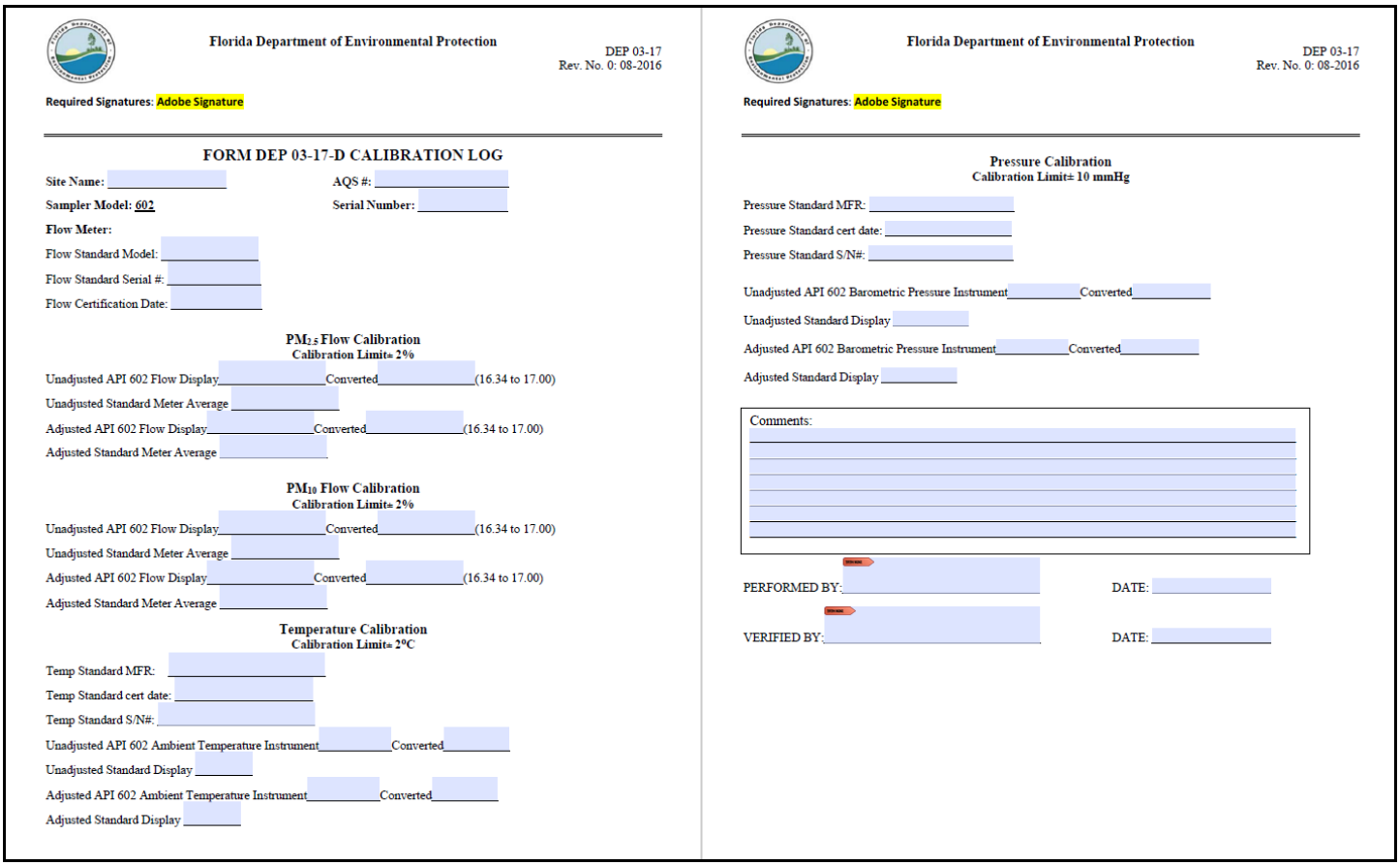
Performed By: Date:

Verified By: Date:

To complete Form DEP 03-17-C, the following information is required:

- Site Name
- Site AQS Number
- Instrument Serial Number
- Time Mode
- Filter Media
- Firmware Version
- 16 Day Checks – Instrument
- Status – Consult main status light on the front of the machine
- Condensation Water Trap – Check the clear plastic lines for signs of condensation
- Loader Magazine Filter Capacity – Check the loader tube. Refill as necessary
- Used Filter Sample Spots – If the spots are distinct, with no obvious smearing, ripples or irregularities, all is well. Consult the 602 Operator's Manual for more information on filter spots.
- Shelter Temp
- 16 Day Checks – Data Checks
- Warnings or Alarms -- To confirm the presence or absence of warnings, from the front panel of the instrument select 'Instrument Info' → 'Warnings Info' → 'Warnings A' or 'Warnings B'. If they read 'None', all is well. If there is a warning displayed, consult the 602 Operator's Manual for more information.
- Filter Pressure Drop (kPa) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' or 'Sampling Info B' → Pressure – Line A' or 'Pressure – Line B' (screen 7/9)
- Average Delta Temp (K) -- From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' or 'Sampling Info B' → Pressure – Line A' or 'Pressure – Line B' (screen 9/9). Then subtract the External (Ambient) Temp from the Filter Temp to determine the Delta Temp.
- Monthly Checks
- External Flow Test (Result Line A / Result Line B) – Taken from result of monthly External Flow Test. See form 03-17-A on corresponding date for those values.
- Monthly Maintenance
- Clean Inlets Line A & Line B
- Inspect Sample Lines Line A & Line B
- Six Month Checks
- Manual Beta Span Check Result Line A & Result Line B – See 602 Operator's manual for details on how to perform a Manual Beta Span Test.
- Six to Nine Month Maintenance
- Vacuum Pump Rebuild Line A & Line B
- Comments – Operator should add any pertinent information / observations in regards to the visit.
- Performed By
- Date
- Verified By
- Date

7.4 Form DEP 03-17-D: Calibration Log



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DEP 03-17
Rev. No. 0: 08-2016

Required Signatures: Adobe Signature

FORM DEP 03-17-D CALIBRATION LOG

Site Name: _____ AQS #: _____

Sampler Model: 602 Serial Number: _____

Flow Meter:

Flow Standard Model: _____

Flow Standard Serial #: _____

Flow Certification Date: _____

$PM_{2.5}$ Flow Calibration
Calibration Limit= 2%

Unadjusted API 602 Flow Display_____Converted_____(16.34 to 17.00)

Unadjusted Standard Meter Average _____

Adjusted API 602 Flow Display_____Converted_____(16.34 to 17.00)

Adjusted Standard Meter Average _____

PM_{10} Flow Calibration
Calibration Limit= 2%

Unadjusted API 602 Flow Display_____Converted_____(16.34 to 17.00)

Unadjusted Standard Meter Average _____

Adjusted API 602 Flow Display_____Converted_____(16.34 to 17.00)

Adjusted Standard Meter Average _____

Temperature Calibration
Calibration Limit= 2°C

Temp Standard MFR: _____

Temp Standard cert date: _____

Temp Standard S/N#: _____

Unadjusted API 602 Ambient Temperature Instrument_____Converted_____

Unadjusted Standard Display _____

Adjusted API 602 Ambient Temperature Instrument_____Converted_____

Adjusted Standard Display _____

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Required Signatures: Adobe Signature

Pressure Calibration
Calibration Limit= 10 mmHg

Pressure Standard MFR: _____

Pressure Standard cert date: _____

Pressure Standard S/N#: _____

Unadjusted API 602 Barometric Pressure Instrument_____Converted_____

Unadjusted Standard Display _____

Adjusted API 602 Barometric Pressure Instrument_____Converted_____

Adjusted Standard Display _____

Comments:

PERFORMED BY: _____ DATE: _____

VERIFIED BY: _____ DATE: _____

To complete Form DEP 03-17-D, the following information is required:

- Site Name
- Site AQS Number
- Serial Number
- Flow Standard Model
- Flow Standard Serial Number
- Flow Standard Certification Date
- Unadjusted API 602 Flow Display (PM2.5) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → 'Flow Rate – Line A' (screen 5/9)
- Converted – This will populate once the 'Unadjusted API 602 Flow Display' has been entered.
- Unadjusted Standard Meter Average – Taken from the FTS flow conversion form.
- Adjusted API 602 Flow Display (PM2.5) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → 'Flow Rate – Line A' (screen 5/9)
- Converted – This will populate once the 'Adjusted API 602 Flow Display' has been entered.
- Adjusted Standard Meter Average – Taken from the FTS flow conversion form.
- Unadjusted API 602 Flow Display (PM10) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info B' → 'Flow Rate – Line A' (screen 5/9)
- Converted – This will populate once the 'Unadjusted API 602 Flow Display' field has been entered.
- Unadjusted Standard Meter Average – Taken from the FTS flow conversion form.
- Adjusted API 602 Flow Display (PM10) – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info B' → 'Flow Rate – Line A' (screen 5/9)
- Converted – This will populate once the 'Adjusted API 602 Flow Display' field has been entered.
- Unadjusted Standard Meter Average – Taken from the FTS flow conversion form.
- Temperature Standard Manufacturer
- Temperature Standard Certification Date
- Temperature Standard Serial Number
- Unadjusted API 602 Ambient Temperature Instrument – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → Temperature – Line A' (screen 9/9)
- Converted – This will populate once the 'Unadjusted API 602 Ambient Temperature Instrument' field has been entered.
- Unadjusted Standard Display – Taken from the Temperature Standard
- Adjusted API 602 Ambient Temperature Instrument – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → Temperature – Line A' (screen 9/9)
- Converted – This will populate once the 'Adjusted API 602 Ambient Temperature Instrument' field has been entered.
- Adjusted Standard Display – Taken from the Temperature Standard
- Pressure Standard Manufacturer
- Pressure Standard Certification Date
- Pressure Standard Serial Number
- Unadjusted API 602 Barometric Pressure Instrument – From the front panel of the instrument select 'Instrument Info' → 'Sampling Info' → 'Sampling Info A' → Pressure – Line A' (screen 7/9)
- Converted – This will populate once the 'Unadjusted API 602 Barometric Pressure Instrument' field has been entered.
- Unadjusted Standard Display – Taken from the Pressure Standard

- Adjusted API 602 Barometric Pressure Instrument – From the front panel of the instrument select ‘Instrument Info’ → ‘Sampling Info’ → ‘Sampling Info A’ → Pressure – Line A’ (screen 7/9)
- Converted – This will populate once the ‘Adjusted API 602 Barometric Pressure Instrument’ field has been entered.
- Adjusted Standard Display – Taken from the Pressure Standard
- Comments – Operator should add any pertinent information / observations in regards to the visit.
- Performed By
- Date
- Verified By
- Date

8.0 APPENDIX B - SUMMARY OF QA/QC SCHEDULE

<table>
<tr><th>Parameter</th><th>Description</th><th>Frequency</th></tr>
<tr><td>Volumetric Flows</td><td>Check the volumetric flows and acceptance limits according to the following:
16.67 ± 4% (16.00 – 17.34)
<table>
<tr><th>Parameter</th><th>NIST Traceable Standard</th><th>Design Flow</th></tr>
<tr><td colspan="3">Field Activity:
Acceptable – No Action Required</td></tr>
<tr><td>$PM_{2.5}$</td><td><4% Diff</td><td><5% Diff</td></tr>
<tr><td>PM_{10}</td><td><7% Diff</td><td><6.9% Diff</td></tr>
<tr><td colspan="3">Marginal - Corrective Action Required</td></tr>
<tr><td>PM_{10}</td><td>4.0 - 6.9 % Diff</td><td>5.0 - 9.9 % Diff</td></tr>
<tr><td colspan="3">Out of Tolerance – Corrective Action Required</td></tr>
<tr><td>$PM_{2.5}$</td><td>≥4% Diff</td><td>≥5% Diff</td></tr>
<tr><td>PM_{10}</td><td>≥7% Diff</td><td>≥10% Diff</td></tr>
<tr><td colspan="3">Data Validation:
Acceptance Limits</td></tr>
<tr><td>$PM_{2.5}$</td><td>±4% Diff</td><td>±5% Diff</td></tr>
<tr><td>PM_{10}</td><td>±7% Diff</td><td>±10% Diff</td></tr>
</table></td><td>$PM_{2.5}$/ PM_{10}
Monthly</td></tr>
<tr><td>Ambient Temperature Sensor</td><td>Compare ambient temperature against NIST traceable standard.</td><td>Monthly</td></tr>
<tr><td>Pressure Sensor</td><td>Compare pressure to NIST traceable standard.</td><td>Monthly</td></tr>
<tr><td>External Leak Check</td><td>Perform an external leak check.</td><td>PM2.5 / PM10
Monthly</td></tr>
<tr><td>Intake Inlets</td><td>Clean intake inlets.</td><td>PM2.5 / PM10
Monthly</td></tr>
<tr><td>Sample Lines</td><td>Inspect sample lines</td><td>PM2.5 / PM10
Monthly</td></tr>
<tr><td>Date & Time Verification</td><td>Instrument should be within +/- 1 minute of NIST traceable standard.</td><td>16 Days</td></tr>
<tr><td>Filter Loader Tube</td><td>Replenish filters in loader tube.</td><td>16 Days</td></tr>
<tr><td>Filter Unloader Tube</td><td>Remove and discard used filters.</td><td>16 Days</td></tr>
<tr><td>Pump Check</td><td>Confirm that the pumps are turned on when they should.</td><td>16 Days</td></tr>
<tr><td>Warning Check</td><td>Check the Front Panel for any warning lights or messages.</td><td>16 Days</td></tr>
<tr><td>Condensation Water Trap</td><td>Check the Condensation Trap for signs of moisture.</td><td>16 Days</td></tr>
<tr><td>Shelter Temp</td><td>Confirm the Shelter Temp is within the appropriate range. (20°-30°C)</td><td>16 Days</td></tr>
<tr><td>Used Filter Sample Spot</td><td>Check used samples for any signs of smearing or other irregularities.</td><td>16 Days</td></tr>
<tr><td>Filter Pressure Drop</td><td>Record Filter Pressure Drop.
Note: range should be between 15-40 kPa</td><td>PM2.5 / PM10
16 Days</td></tr>
<tr><td>Average Delta Temperature</td><td>Record Average Delta Temperature.
Note: range should be <15K</td><td>PM2.5 / PM10
16 Days</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Description</th><th>Frequency</th></tr>
<tr><td>Manual Beta Span Check</td><td>Perform a Manual Beta Span Check.
Note: Desired range is +/- 4%</td><td>PM2.5 / PM10 Semi-Annual</td></tr>
<tr><td>Vacuum Pumps</td><td>Rebuild vacuum pumps.</td><td>PM2.5 / PM10 Semi-Annual</td></tr>
<tr><td>Sample Lines</td><td>Clean Sample Lines</td><td>Annually</td></tr>
<tr><td>Ambient Temperature</td><td>Calibrate the Ambient Temperature Sensor to ± 2°C</td><td>Annually</td></tr>
<tr><td>Pressure Sensor</td><td>Calibrate the Pressure Sensor to ± 10 mmHg</td><td>Annually</td></tr>
<tr><td>Volumetric Flows</td><td>Perform the volumetric flow calibrations.
• 16.67 ± 2%

Acceptable limits are as follow:

<table>
<tr><th>Parameter</th><th>NIST Traceable Standard</th><th>Design Flow</th></tr>
<tr><td colspan="3">Field Activity:
Acceptable – No Action Required</td></tr>
<tr><td>$PM_{2.5}$</td><td><4% Diff</td><td><5% Diff</td></tr>
<tr><td>PM_{10}</td><td><7% Diff</td><td><6.9% Diff</td></tr>
<tr><td colspan="3">Marginal - Corrective Action Required</td></tr>
<tr><td>PM_{10}</td><td>4.0 - 9.9 % Diff</td><td>5.0 - 9.9 % Diff</td></tr>
<tr><td colspan="3">Out of Tolerance – Corrective Action Required</td></tr>
<tr><td>$PM_{2.5}$</td><td>≥4% Diff</td><td>≥5% Diff</td></tr>
<tr><td>PM_{10}</td><td>≥10% Diff</td><td>≥10% Diff</td></tr>
</table></td><td>PM2.5 / PM10 Annually</td></tr>
</table>

9.0 APPENDIX C - TECHNICAL SPECIFICATIONS

Parameter	Description
Operative interval of the mass thickness measurement	Total mass thickness (filtering medium + particulate matter film) up to 10 mg/cm²
Resolution	0.1 µg/m³
Detection limit 1 h	2 µg/m³
Detection limit 24 h	0.3 µg/m³
Range	0-2000 µg/m³
β source	^{14}C with 3.7MBeq (100µCi) nominal activity
Operating flow rate	Programmable range 1 - 2.5 m³/h
Flow rate accuracy	±1%
Flow rate control	Automatic, with regulation valve moved by a step motor. Flow rate control stability better than 1% of the required nominal value
Max. allowed pressure drop	50 kPa for pressure drop values higher than 50 kPa, a 1 m³/h nominal flow rate is not guaranteed
Filter Loader/Unloader capacity	96 filter cartridges
Filter cartridges	Standard ∅ 47 mm filter membranes
Interfaces	User interface: Menu-driven interface, LCD display and dynamic keypad Analog output: four 0-5 V DC outputs Serial interfaces: RS-232 serial port for PC and RS-232 serial port for modem communication
Service compressed air	Operating pressure 200-300 kPa (supplied by an auxiliary air compressor provided with the instrument)
Power supply	100-230 VAC, 50/60 Hz factory configured
Power consumption	Maximum 1.1 kW 10 A (115 V) with pumps, air compressor and smart heater running
Power supply continuity in direct current	Two 12 V 3.5 Ah floating batteries - Autonomy to complete mass measurements and filter movements
Air compressor unit	12 L/min at 300 kPa
Operating conditions inside the installation cabinet	Relative Humidity lower than 85% (with no condensate)
Storage conditions	Temperature between -10°C and +55°C Relative Humidity lower than 85% (with no condensate)
Dimensions (W x D x H)	14in x 17in x 21in (36cm x 43cm x 54 cm)
Weight (Monitor) Weight (Pump) Weight (Service air compressor)	79 lbs (36 kg) 15 lbs (7 kg) 17 lbs (8 kg)

9.1 T-API Model 602 Beta^{Plus} Data Download Instructions

A. Double click the DrFai Manager software icon on the desktop

B. Click the '• Connect' button on the top of the screen

C. It takes about 30 sec. for the connection to be fully established

D. Click the 'Buffer Data' tab

E. Click the 'Current Buffer' tab – the fields will be gray initially; the fields will turn black once they have been updated

F. Verify that the 'Auto' tab is selected (default) in the 'Current Records' window

G. Click the 'Append' tab

H. A list of records will be selected in the window below – the selections will initially turn gray and once the records have been appended the selections will disappear from the window

I. Export data: Click the 'Export Data' tab under the 'Current Buffer' tab

J. A dialogue box will appear: "Selected full range…This will take more time, probably"

K. Click OK

L. If a dialogue box appears indicating "This operation requires more time. Records selected in a buffer ####", click OK

M. In the Save As window, browse to the C:\SWAM_data\NEXUS directory

N. Click Save

O. The exported file will open in Excel. Exit Excel after reviewing the file.

P. Click the '• Disconnect' button on top of the screen in the DrFai Manager software

Q. Exit the DrFai Manager software.

10.0 GLOSSARY

AirNow	Publicly available EPA website which provides past, current, and forecasted ambient air monitoring data and related information
AMP (###)	Standard report or data extraction created by EPA's AQS; Ex. AMP 255 = Data Quality Indicator Report and AMP 501 = Extract Raw Data
AQI	Air Quality Index; a numbering system used to indicate the quality of ambient air and its effect on the populace
AQS	Air Quality System; EPA's repository for nationally collected ambient air monitoring data; also, the specific type of text file formatting accepted by EPA's AQS
ATX	Software package created by Agilaire; used to configure sites and monitors and perform other background tasks in FAMAS; available only to FAMAS administrators
CComm	Third-party polling program used primarily to poll TEOMs operating without data loggers
CDX	Central Data Exchange; an electronic document receiving system set up by the EPA to ease the transfer of data between states' databases and AQS
(Stats) CR	Statistical and Critical Review; AQS function which runs checks on raw data before it is posted to the database
FDEP	Florida Department of Environmental Protection
EDAS	Electronic Data Acquisition System; a combination of data loggers, polling system, and database used to retrieve and store ambient air monitoring data
EPA	Environmental Protection Agency
FAMAS	Florida Air Monitoring and Assessment System; the final data repository for ambient air monitoring data collected in Florida before it is transferred to AQS
FLAQS	Florida's Air Quality System; DARM's online series of applications used to provide the public with ambient air monitoring data and related information
FTP	File Transfer Protocol; a standard network protocol used to copy a file from one host to another over a transmission control protocol (TCP) based network
HAPS	Hazardous Air Pollutants; EPA defined list of hazardous air pollutants (see http://www.epa.gov/ttn/atw/orig189.html)

IMPROVE	Interagency Monitoring of Protected Visual Environments; monitoring network implemented by the EPA to establish current visibility conditions, track changes in visibility, and determine the causal mechanism for the visibility impairment in National Parks and Wilderness Areas
IP	Internet Protocol; the principal communications protocol used for transferring information over the internet
LIMS	Laboratory Information Management System; database and associated programs used by the PM Weighing Lab to record and store data and associated information
MET	Meteorological Parameters; instruments which measure meteorological data such as wind speed, directions, ambient temperature, etc.
OMS	A type of text file formatting used in files delivered to AirNow
PAMS	Photochemical Assessment Monitoring System; monitoring network implemented by the EPA to monitor ground level ozone and its precursors in areas with persistently high ozone levels
PM	Particulate Matter; pollution consisting of particles (e.g., smoke, pollen, etc.) of a certain size
$PM_{2.5}$	Particulate matter equal to or less than 2.5 microns in diameter
PM_{10}	Particulate matter equal to or less than 10 microns in diameter
PMTS	Particulate Matter Tracking System; an FDEP database used to consolidate, review, and store PM_{10} and $PM_{2.5}$ data collected using TEI Partisol-Plus 2025s
POC	Parameter Occurrence Code; number used to indicate the instance of a monitor at a site
RPComm	Polling program created by Rupprecht and Patashnick (R&P) for use with R & P manufactured ambient monitors
QA	Quality Assurance; the processes and procedures used in the determination of data quality
SAQS	Spatial Air Quality System; a visual display of Florida's ambient air monitoring data; available to the public
T-API	Teledyne Advanced Pollution Instrumentation; ambient monitor manufacturer
TEI	Thermo Environmental Instruments; ambient monitor manufacturer
UATMP	Urban Air Toxics Monitoring Program; a monitoring program implemented by the EPA to characterize the magnitude and composition of potentially toxic air pollution in, or near, urban locations
VOC	Volatile Organic Compound; pollutants which are precursors to ozone and, therefore, photochemical smog