This SOP is subject to
review and revision in 2015.

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

TECHNICAL SERVICES DIVISION

QUALITY ASSURANCE PROJECT PLAN

STANDARD OPERATING PROCEDURE

AIRMON SOP 222

PARTISOL 2025 $PM_{2.5/10}$

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1. PURPOSE

This Standard Operating Procedure (SOP) describes the installation, setup, general operation, calibration, maintenance, data collection, troubleshooting and repair of the Partisol-Plus Model 2025 sampler for the measurement of PM2.5, PM10 and PM Coarse. **NOTE**: This SOP supplements the procedures located in the appropriate THERMO Instrument and Repair Manuals.

The Partisol-Plus model 2025 is designated by the Environmental Protection Agency (EPA) as a Federal Reference Method (FRM) for the measurement of ambient PM10 concentrations pursuant with the requirements defined in the Code of Federal Regulations, Title 40, Part 53.

2. SUMMARY OF METHOD

The Partisol-Plus 2025 sampler draws ambient air through a PM10 inlet, down tube, and then through the BGI™ Very Sharp Cut Cyclone (VSCC) and its adaptor. Any remaining particulate material is deposited onto a pre-weighed 47 mm Teflon filter which traps the PM2.5 fraction. The sample filter is conditioned and weighed after sampling and the resulting difference is the collected PM-2.5 mass. The sampler uses two filter canisters: on the left is a supply canister containing up to 14 pre-weighed run and one field blank filters, each in their own individual cassettes. On the right, a storage canister receives all exposed filters. The sampler can continue a 24 hour sampling run event on one filter while installing or removing other sample filters.
Note: For PM10 particulate collection the VSCC is replaced with a length of straight tube.

The Partisol-Plus 2025 contains software and hardware that is used to set up and control the sampler during operation, maintain a 16.7 l/m flow rate and store and display any EPA required run information. With this information, the District laboratory calculates the average PM2.5 or PM10 concentration for the 24-hour sampling period.

For a more detailed explanation of the sampler's theory of operation, please read, "Section 1: Introduction", of the *Operating Manual* and see Figure 1: Schematic Partisol-Plus model 2025.

Figure 1: Partisol-Plus 2025 PM10 Sampler

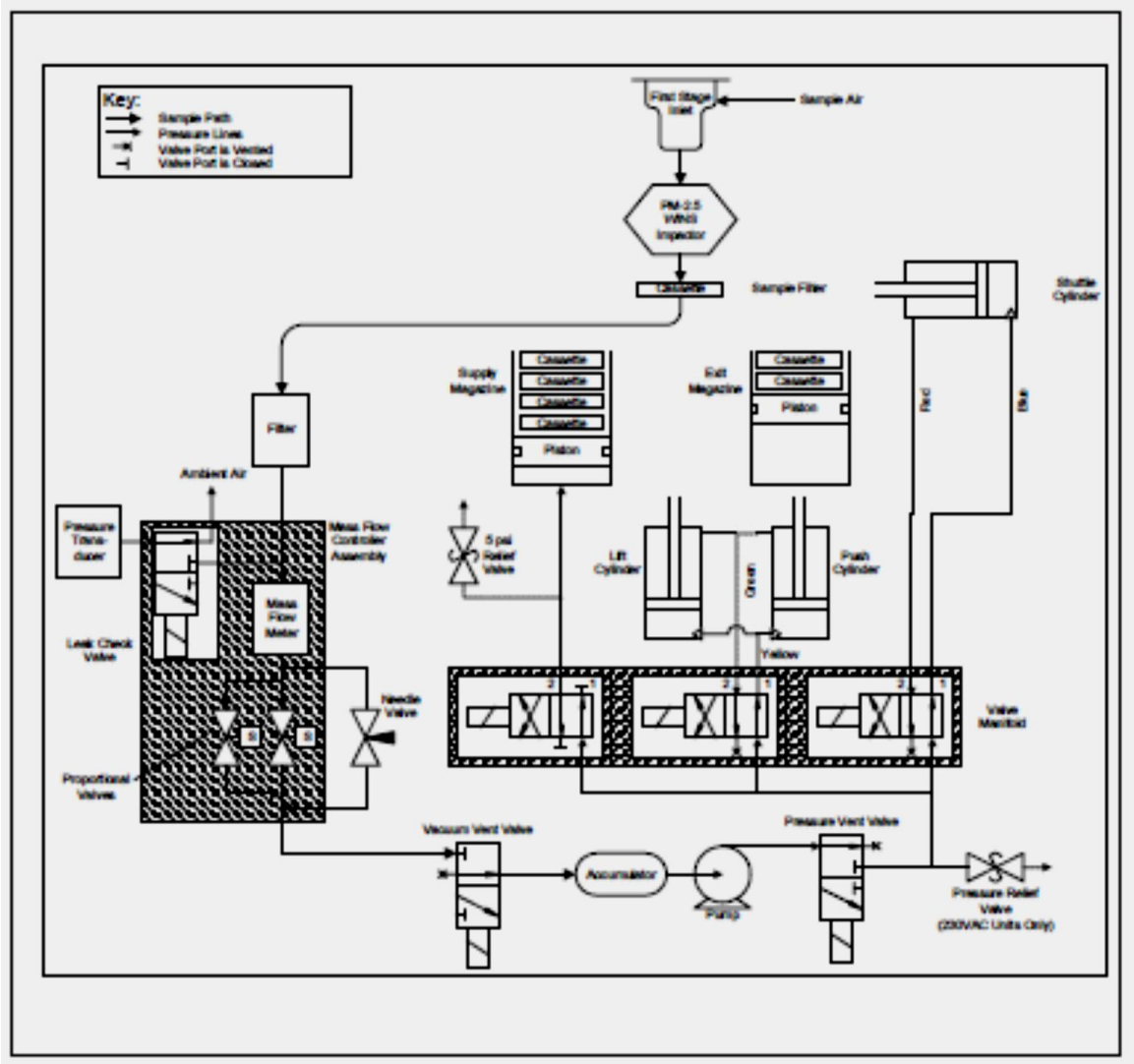


Figure 2: Schematic Partisol-Plus Model 2025

3. DEFINITIONS

BAAQMD	Bay Area Air Quality Management District
EPA	Environmental Protection Agency
FRM	Federal Reference Method
LPM	Liters per minute
PM10	Fine particulates that are 10 microns or smaller in diameter
PM2.5	Fine particulates that are 2.5 microns or smaller in diameter
SOP	Standard Operating Procedure
VSCC	Very Sharp Cut Cyclone

4. HEALTH AND SAFETY WARNINGS

NOTE: Please refer to the Partisol-Plus *Operating Manual* and/or *Service Manual Operating Manual* for further information

5. CAUTIONS

NOTE: Please refer to the Partisol-Plus *Operating Manual* and/or *Service Manual Operating Manual* for further information.

6. INTERFERENCES AND LIMITATIONS

Reactive materials, solvents and excessive particulates could be possible interferences. Monitoring should be temporarily stopped if local sources of potential interferences are detected (i.e. paving, painting, etc.). Inlet and PM10 head should be cleaned if contamination is suspected.

NOTE: Please refer to the Partisol-Plus *Operating Manual* and/or *Service Manual Operating Manual* for further information.

7. PERSONNEL QUALIFICATIONS AND RESPONSIBILITIES

Installation, operation, maintenance, repair or calibration of the instrument and all support equipment should only be performed by properly trained personnel. Personnel should meet all minimum BAAQMD requirements and qualifications for an Air Quality Instrument Specialist (AQIS) I or II, Senior AQIS, and/or Supervising AQIS. .

8. EQUIPMENT AND SUPPLIES

Each Partisol-Plus model 2025 PM-10 sampler is supplied and operated with the following standard equipment:

- Partisol-Plus 2025 and stand
- PM10 Inlet
- Sample down tube
- 3 rain hoods and associated hardware
- Ambient temperature sensor, solar radiation shield and cable
- Supply filter canister holder with up to 14 pre-weighed 47 mm Teflon run and one field blank filters loaded into individual filter cassettes
- Empty spacer filter cartridges for use during transport back to the lab
- BAAQMD 24-Hour Field Sample Report (see Appendix A) (accompanies each filter sent from the lab)
- Take-up filter cassette canister holder
- *Operating Manual* (November 2006, Revision B)
- *Service Manual* (May 2004, Revision B)
- Quick Start Guide
- Cassette bulb pump

The following additional equipment is required at District locations for operation of the Partisol-Plus 2025:

- Partisol-Plus RPCOMM™ Version 1.8.0 software loaded onto a PC or laptop
- LANTRONIX UDS1100 device server and cable
- BAAQMD Partisol-Plus 2025 Logbook

The following equipment is required for calibration and/or verification of the Partisol-Plus 2025:

- An audit canister containing an empty cassette, a filter cassette, and a solid disk cassette following the instructions located in Section 12.2 of the *Operating Manual*;
- Take-up filter cassette canister holder
- Leak check adapter
- Filter bypass leak check disk
- NIST traceable, certified temperature standard (TEGAM)
- NIST traceable, certified pressure standard (DRUCK)
- NIST traceable, certified flow standard (Delta Cal)
- BAAQMD Partisol-Plus Monthly Worksheet (See Appendix B)

9. PROCEDURES

9.1 Sampler Initial Setup and Acceptance Testing

NOTE: Please refer to the Partisol-Plus *Operating Manual* and/or *Service Manual Operating Manual* for further information.

1. Upon receipt of the Partisol-Plus 2025 sampler(s), inspect for any parts shortages and/or obvious shipping damage. If any shortages or visible damage is found, immediately contact the shipper and/or manufacturer. If no shortages or damage is located,
2. Follow the setup procedures located in the *Quick Start Guide* and/or the *Operating Manual*.
3. Install a LANTRONIX modem inside the service compartment of the Partisol-Plus. Please refer to the manufacturers' installation and setup procedures.
4. A copy of Partisol-Plus RPCOMM™ software must be loaded onto the station PC or laptop. See "Appendix J: modem Communications" and "Appendix K: Overview of the RPComm Software Screens ", in the *Operating Manual* for further information.
5. Plug the sampler into a suitably grounded outlet of the proper voltage;
6. Open the enclosure of the Partisol-Plus Sampler;
7. Press the power switch on the main panel (lower left) to its "on" position; if necessary, turn the adjustment knob, located to the right of the keypad/display, to adjust the contrast of the liquid crystal display (LCD);
8. Once the power switch is pressed, the pump in the sampler may turn on momentarily.
9. The following software settings are required for all District operated Partisol Plus samplers:
    a. **Sample Setup Screen (page A-9, *Operating Manual*):**

Sample Definition Method:	BASIC
Default Sampler Start Time:	00:00
Default Duration:	24:00
Default Sample Repeat Time:	Station specific: 24:00 for every day sampling schedule, 72:00 for 3 day sampling schedule, or 144:00 for every 6th day sampling schedule
Default Filter Type:	P
Default Sampler Flow Rate:	16.7
Default Flow Error mode:	ERR
Separators:	NO

    b. **System Setup Screen (page A-12, *Operating Manual*):**

Average Temp:	99
Average Press:	999
Date Form:	mm/dd/yy
Time Form:	hr: min
Curr Time:	+/- 2 min current time
Curr Date:	Check
Standard Temp:	99
Standard Press:	999
Average Time:	30

Filter Fan:	AUTO
Auto Run:	NO

c. **A/I Setup Screen (page A-13, *Operating Manual*):**
No changes, Use Factory Default

d. **A/O Setup Screen (page A-13, *Operating Manual*):**
No changes, Use Factory Default

e. **RS232 Setup Screen (page A-15, *Operating Manual*):**

Protocol:	AK
Baud Rate:	9600
Data Bits:	8
Parity:	None
STOP Bits:	1
Flow Control:	None
RS-Para1:	52
RS-Para2:	75048
RS-Para3:	13010

f. **Site Identification Screen (page A-16, *Operating Manual*): These are site specific and sampler specific settings**

Id1:	“Station number”, i.e. “8004”
Id2:	“BAAQMD S/N”, i.e., “07912”

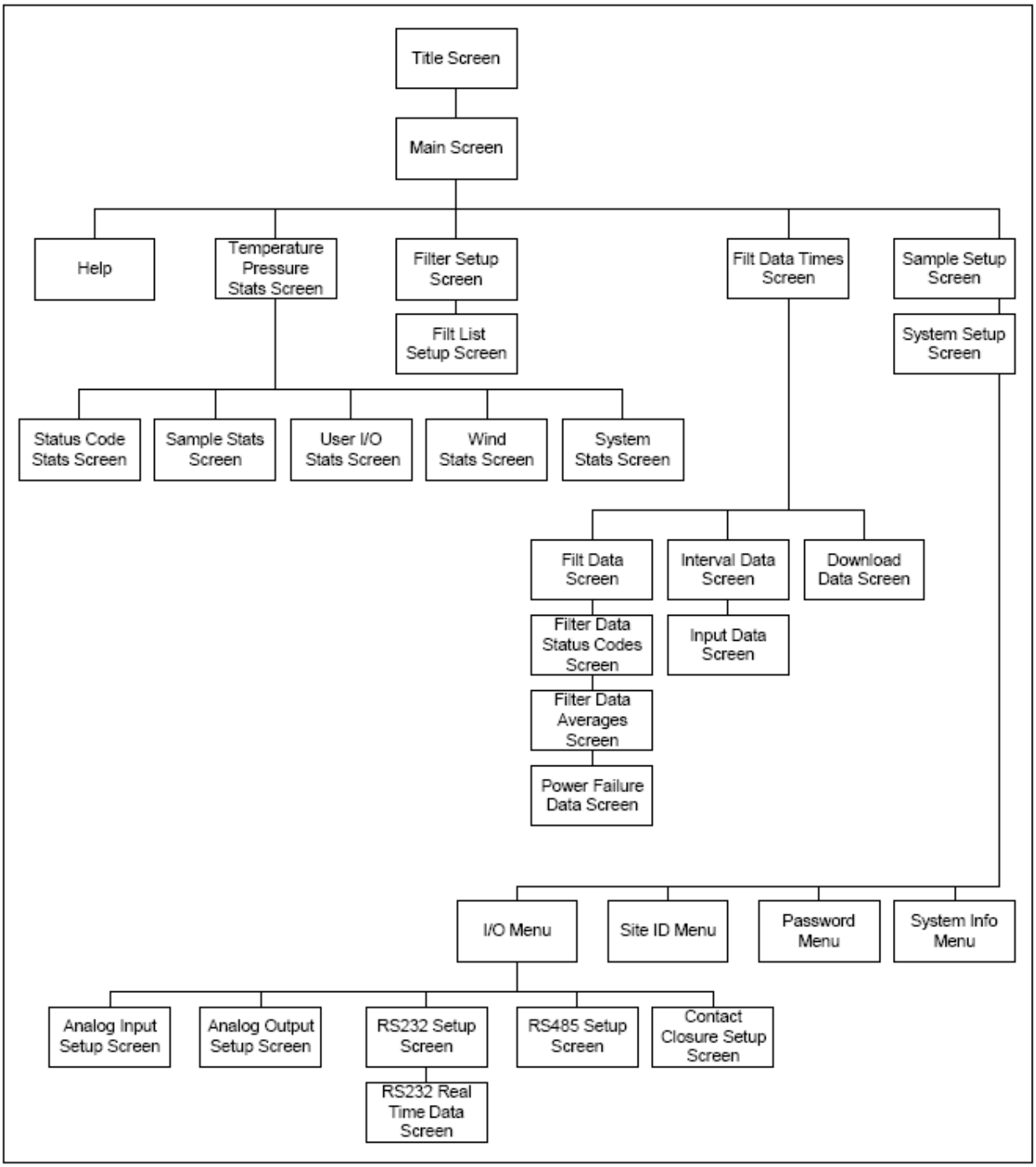


Figure 3: Partisol Plus 2025 Screen Hierarchy

9.2 ACCEPTANCE TESTING

NOTE: Please refer to the Partisol-Plus *Operating Manual* and/or *Service Manual Operating Manual* for further information.

After setting up the sampler staff will complete the following acceptance testing procedure:

1. Prepare an audit canister containing an empty cassette, a filter cassette, and a solid disk cassette following the instructions located in Section 12.2 of the *Operating Manual*.
2. Complete a calibration of the filter temperature sensor, ambient temperature sensor, and ambient pressure sensor following the procedures located in this SOP and Section 3 of the *Service Manual*. Use a TEGAM and DRUCK to perform these calibrations.
3. Complete an external leak check using a leak check adaptor. Follow the instructions located in this SOP and Section 12.2.5 of the *Operating Manual*. If the sampler does not pass an external leak check, follow the troubleshooting guide located in the *Service Manual* until the leak is located and the sampler is able to pass an external leak test. **NOTE**: This may be the result of an upper or lower 'V' seal contamination and/or failure.
4. Complete a flow calibration using a certified Delta Cal flow transfer standard. Follow the procedure located in this SOP and Section 3.2.8 of the *Service Manual*.
5. Connect the Partisol-Plus 2025 modem to a computer loaded with RPCOMM™ software. Follow the procedure in this SOP and in "Appendix K: Overview of RPComm Software Screens", located in the *Operating Manual*. Test the connection. (NOTE: some RPCOMM™ settings may be sampler and/or site specific.)
6. Once the Partisol-Plus RPCOMM™ software is communicating properly with the sampler, load 10 individual filter cassettes (no filter needed) into a filter cassette supply canister. Program the sampler for 10 consecutive 24-hour runs. Follow the procedure in this SOP and in "Appendix K: Overview of RPComm Software Screens", located in the *Operating Manual*. Ensure that the sampler software, filter transport mechanism, and communication software are operating properly for 10 consecutive runs.
7. Use RPCOMM™ software to download all filter data. Follow the procedure in this SOP and "Appendix K: Overview of RPComm Software Screens", located in the Operating Manual. Check and review all data.
8. Conduct a final verification of all sensors and flow and perform an external leak check. Follow the procedure in this SOP.
9. Place the sampler into service or place in a suitable storage location.
10. Enter any pertinent information into the appropriate DMS instrument e-log;
11. New instruments should have a BAAQMD S/N assigned.

9.3 CALIBRATION

NOTE: Please refer to the Partisol-Plus *Operating Manual* and/or *Service Manual Operating Manual* for further information.

NOTE: Prepare an audit canister containing an empty cassette, a filter cassette, and a solid disk cassette following the instructions located in Section 12.2 of the *Operating Manual*;

The calibration of the Partisol Plus 2025 must be performed upon installation, annually thereafter, or whenever the monthly verification results are outside of the 40 Code of Federal Regulations (CFR) Part 50, Appendix L, limit's:

ITEM	ACCEPTANCE CRITERIA
Ambient Temperature	+/- 2 ^{o}C of transfer standard
Filter Temperature	+/- 2 ^{o}C of transfer standard
Ambient Pressure	+/- 10 mmHg of transfer standard
Flow rate	+/- 3% of transfer standard; +/- 4% of 16.7 lpm
External Leak Check	< 25 mmHg pressure drop

NOTE: Federal regulations require the use of a certified temperature standard (TEGAM), pressure standard (DRUCK), flow standard (Delta Cal), and a leak check adapter for all calibrations.

9.3.1 Procedure: Ambient Temperature Sensor Calibration [*Service Manual*, Section 3.2.2]

1. Press <MENU> to enter the Service Menu. **WARNING**: If the sampler is in the RUN mode, this will suspend and invalidate any current run.
2. With the cursor pointing to "Calibration/Audit," press <F3: SensCal> to enter the Sensor Calibration Screen.
3. If the calibration will be done at ambient conditions, the reference temperature measurement can be taken with the probe installed in the radiation sensor.
4. If the calibration is done at a temperature lower and/or higher than ambient temperature, loosen the two screws on either side of the temperature probe on the ambient temperature assembly and remove the probe from the radiation shield. The reference and sampler probe should be banded together and immersed to the same depth in an insulated constant tempera- temperature bath or block. Reference and sampler probes should be equilibrated at temperature for at least 5 minutes before the temperature is measured.
5. Press <EDIT> then enter the measured reference temperature in °C in the Actual column of the Amb Temp row of the Sensor Calibration Screen, press <ENTER>. The sampler automatically adjusts the corresponding offset based upon this input.
6. If removed, reinstall the ambient temperature probe in the radiation shield, and tighten the two screws on either side.
7. Enter any pertinent information into the appropriate DMS instrument e-log;

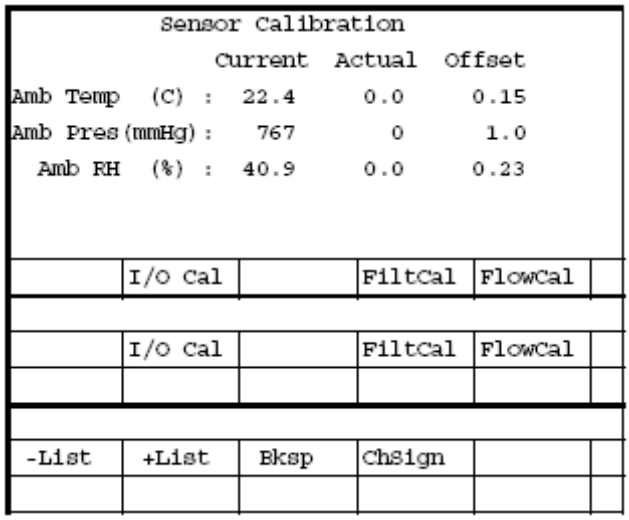


Figure 4: Sensor calibration Screen

9.3.2 Procedure: Filter Temperature Calibration [*Service Manual*, Section 3.2.3]

1. Press <MENU> to enter the Service Menu. With the cursor pointing to "Calibration/Audit," press <F4: FiltCal> to enter the Filter Temperature Calibration Screen.
2. Note the location of the filter temperature probe in the sampling platform of the ventilated filter compartment (*Service Manual*, Figure 3-14).
3. Loosen the two screws on either side of the probe and remove the temperature probe from the sampling platform.
4. If the calibration will be done at ambient conditions, lean the probe against an object so that the tip of the probe is in midair and position the reference thermometer near the probe.
5. If the calibration is done at a temperature lower or higher than ambient temperature, the reference thermometer and sampler probe should be banded together and immersed to the same depth in an insulated constant temperature bath or block. Reference and sampler probes should be equilibrated at temperature for at least 5 minutes before the temperature is measured.
6. Press <EDIT> enter the measured reference temperature in °C in the Actual column of the Filter row of the Filter Temperature Calibration Screen, press <ENTER>. The sampler automatically adjusts the corresponding offset based upon this input.
7. Reinstall the filter temperature probe into the sampling and tighten the two screws.
8. Enter any pertinent information into the appropriate DMS instrument e-log;

9.3.3 Procedure: Ambient Pressure Calibration [*Service Manual*, Section 3.2.5]

1. Press <MENU> to enter the Service Menu. With the cursor pointing to "Calibration/Audit," press <F3: SensCal> to enter the Sensor Calibration Screen.
2. Determine the current ambient station pressure in mmHg (absolute pressure, not corrected to sea level).

3. Press <EDIT> and enter the measured ambient pressure in the Actual column of the Amb Pres row of the Sensor Calibration Screen and press <ENTER>. The sampler automatically adjusts the corresponding offset based upon this input.
4. Enter any pertinent information into the appropriate DMS instrument e-log;

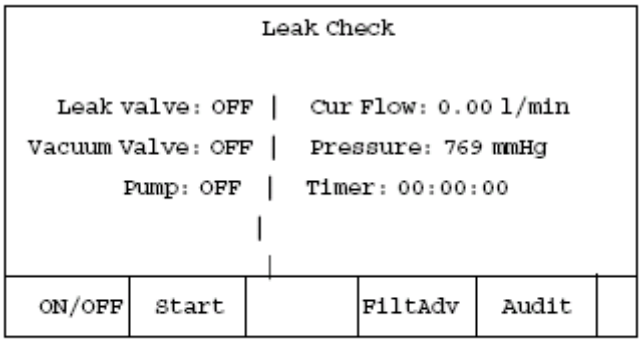


Figure 5: Leak Check Menu Screen

9.3.4 Procedure: External Leak Check [*Service Manual*, Section 3.2.7]

1. To ensure tightness, a filter cassette containing a new 47 mm filter must be installed in the sampling position of the sampler. If a filter change was not done in the first step of the calibration procedure, follow these steps below to move a filter into the sampling position.
2. Insert a filter cassette containing a new 47 mm filter in the top-most position of the filter cassette supply canister. Press <MENU> to enter the Service Menu.
3. With the cursor pointing to "System Maintenance Routines," press <F1: LeakChk> to enter the Leak Check Screen.
4. Press <F4: FiltAdv>. Wait for filter change to complete.
5. Remove the PM10 sample inlet from the external down-tube. Install the leak check adapter on the end of the down-tube.
6. Close the valve on the leak check adapter.
7. Press <F2: Start>. After prompt, press <F1: External> to perform an external leak test. Follow instructions displayed on screen. Sampler will automatically pull a vacuum and check the flow.
8. A pass or a fail message will display at the end of the leak check cycle. A pressure drop of 25 mmHg or less is the sampler's leak check pass criteria.
9. If a leak check fail message is displayed on the screen, insert another filter cassette containing a new 47mm filter in the topmost position of the filter cassette supply tube and repeat the leak check procedure.
10. If leak check fails after 2 attempts, refer to leak check flow chart in Section 2 of the *Service Manual*.
11. After a successful leak check, slowly open the valve on the leak check adapter.
12. If performing a flow calibration immediately, retain the filter cassette with 47mm filter in the sampling position. Otherwise, remove the leak check adapter from the external sample tube and reinstall the sample PM10 inlet previously removed.
13. Enter any pertinent information into the appropriate DMS instrument e-log;

9.3.5 Procedure: Flow Calibration [*Service Manual*, Section 3.2.8]

1. The filter cassette used to perform the leak test should remain in the sample position for the flow calibration.
2. Press <MENU> to enter the Service Menu. With the cursor pointing to "Calibration/Audit," press <F5: FlowCal> to enter the Flow Calibration Screen.
3. Remove the PM10 inlet from the external sample tube of the Partisol-Plus Sampler.
4. Attach the Flow Transfer Standard.
5. Press <EDIT> and enter the desired minimum and maximum calibration flow rates (Min Flow and Max Flow), as well as the number of calibration points desired (Num Points) in the Flow Calibration Screen and press <ENTER>.
6. Min Flow: 15.0 l/min (10% below the usual 16.7 l/min set point)
7. Max Flow: 18.4 l/min (10% above the usual 16.7 l/min set point)
8. Num Points: 3
9. During the calibration procedure, the sampler begins with the minimum flow rate (Min Flow), and performs measurements at equal flow rate intervals until it reaches the maximum flow rate (Max Flow).
10. Press <F9: Start> (<F5: More> followed by <F4: Start>) to initiate the flow calibration.
11. Wait for the flow to stabilize at each flow rate plateau. Then press <EDIT> and enter the flow (volumetric l/min) from a flow standard (Delta Cal) in the "Act Flow" field. Press <ENTER>. The sampler proceeds to the next flow rate plateau after the operator presses <ENTER> for each measured value.
12. The sampler automatically adjusts the Offset and Span values in the Flow Calibration Screen once it performs measurements at all flow rate plateaus.
13. Restore the sampling hardware to its original state by removing the flow metering hardware and reinstalling the PM10 inlet onto the sample tube.
14. **NOTE**: It is *not* necessary to remove the filter cassette used for the leak check and flow calibration from the sampling position, since the sampler automatically replaces this cassette with a new one upon entering the WAIT mode.
15. Enter any pertinent information into the appropriate DMS instrument e-log;

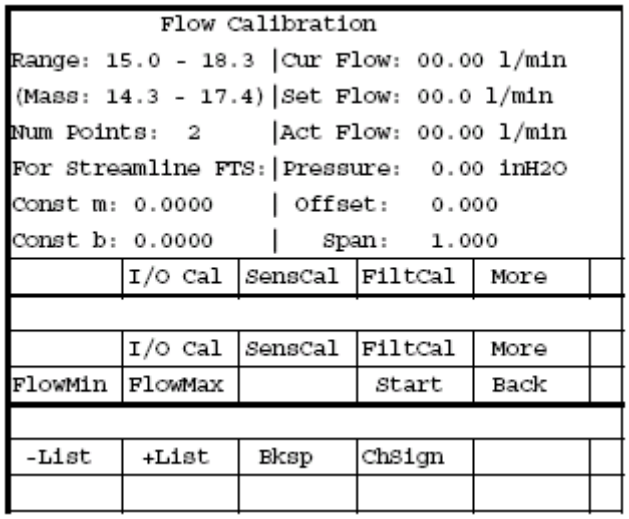


Figure 6: Partisol Plus 2025 Flow calibration Screen

9.3.6 Procedure: Monthly Verification Overview

The **verification** of the ambient air temperature sensor , filter temperature sensor, ambient pressure sensor, flow rate, clock, and completion of a leak check **are required every 4 weeks (monthly)** (EPA Quality Assurance Handbook, Volume II, Part II, 2.12) of normal operation. A completion of a leak check **is required every 2 weeks (bi-weekly)** (BAAQMD Air-monitoring internal policy) for any sampler operating on an everyday sampling schedule. The AQIS operating a Partisol will normally perform additional monthly QC activities (cleaning WINS, etc.) during the allotted one-hour (maximum) time period the sampler is removed from its current run.

WARNING: While in normal operation, if the sampler is placed into the STOP mode, the current run will be stopped which will result in a voided run. Only use the AUDIT mode for monthly verifications.

WARNING: While in normal operation, if the sampler is placed into the AUDIT mode, the operator has to complete all verifications and maintenance procedures within a one hour period or the current sample will be voided.

To complete a monthly verification, it is recommended to follow these steps in order:

1. Prepare an audit canister containing an empty cassette, a filter cassette, and a solid disk cassette following the instructions located in Section 12.2 of the *Operating Manual*.
2. Install a supply canister with an empty cassette (no screen), an external leak check cassette (with a 47mm filter) into an empty supply canister. The empty cassette should be in the topmost position as shown in Figure 12-2 of the *Operating Manual*. Install the audit canister in the left side of the enclosure and a clean empty storage canister on the right side of the enclosure to collect the partially exposed sampling filter.

3. Press <RUN/STOP> once to enter the Audit mode. The sampler then will display the Audit Confirmation screen. Press <F1: Audit>, and then press any key to continue. NOTE: The Audit Confirmation screen also will give you the option to select <F2: STOP> or <F5: Resume>, in addition to <F1: Audit>.
4. Complete a verification of the Ambient Temperature Sensor, Filter Temperature, Ambient Pressure, Flow, and complete a leak check.
5. **OPTIONAL**: Perform any scheduled monthly PM10 maintenance as described in Appendix G of the *Operating Manual*
6. **OPTIONAL**: Perform any scheduled monthly inspection and/or maintenance on the down tube and 'V' seals as described in Appendix G of the *Operating Manual*.
7. Indicate the results into the appropriate fields on the BAAQMD Partisol-Plus PM Coarse Monthly QC Worksheet.
8. Enter any pertinent information into the appropriate DMS instrument e-log;

9.3.7 Procedure: Ambient Temperature Sensor Verification [*Operating Manual*, Section 12.2.1]

1. Determine the current temperature (°C) at the ambient temperature sensor using a TEGAM.
2. Verify that the value of Amb Temp displayed in the Audit screen is within ± 2° C of the measured temperature.
3. Indicate the results into the appropriate fields on the BAAQMD Partisol-Plus PM Coarse Monthly QC Worksheet.
4. If this is not the case, perform the ambient temperature calibration procedure (Procedure: Ambient Temperature Sensor Calibration [*Service Manual*, Section 3.2.2]). **NOTE**: If a calibration is required which results in the sampler being placed into the <F2: STOP> mode, the current run will not resume and will be invalidated.
5. Enter any pertinent information into the appropriate DMS instrument e-log;

9.3.8 Procedure: Filter Temperature Verification [*Operating Manual*, Section 12.2.2]

1. Remove the PM10 inlet. Unlatch and open the sampler's top cover. Pull straight upward to remove the adaptor.
2. Verify the sampler filter temperature by inserting the TEGAM standard into the sampling chamber as shown in Figure 12-5 of the *Operating Manual*.
3. Compare the measured temperature (°C) with the Filt Temp displayed in the Audit screen.
4. Indicate the results into the appropriate fields on the BAAQMD Partisol-Plus PM Coarse Monthly QC Worksheet.
5. If the measured and Filt Temp reading are not within ± 2° perform the filter temperature calibration procedure (Procedure: Filter Temperature Calibration [*Service Manual*, Section 3.2.3]). **NOTE**: If a calibration is required which results in the sampler being placed into the <F2: STOP> mode, the current run will not resume and will be invalidated.
6. Insert the adapter. Close and latch and the sampler's top
7. Enter any pertinent information into the appropriate DMS instrument e-log;

9.3.9 Procedure: Ambient Pressure Verification [*Operating Manual*, Section 12.2.3]

1. Determine the current ambient station pressure in mmHg (absolute pressure, not corrected to sea level).
2. Verify that the value for Amb Pres in the Audit screen is within ±10 mm Hg of the measured ambient pressure standard (DRUCK)
3. Indicate the results into the appropriate fields on the BAAQMD Partisol-Plus PM Coarse Monthly QC Worksheet.
4. Enter any pertinent information into the appropriate DMS instrument e-log;
5. If this is not the case, perform the ambient pressure calibration procedure (Procedure: Ambient Pressure Calibration [*Service Manual*, Section 3.2.5]. **NOTE**: If a calibration is required which results in the sampler being placed into the <F2: STOP> mode, the current run will not resume and will be invalidated.
6. Enter any pertinent information into the appropriate DMS instrument e-log;

9.3.10 Procedure: External Leak Check [*Operating Manual*, Section 12.2.5]

1. **NOTE**: To ensure leak tightness, a filter cassette containing a new 47 mm filter must be installed in the sampling position of the sampler.
2. Attach the leak check adapter to the sample tube and close the valve on the leak check adapter.

3. While in the Audit screen, press <F5: LeakChk> to display the Leak Check screen.
4. Press <F2: Start>, and follow the instructions displayed on the screen.
5. **NOTE**: If you press <F2: Start> but fail to follow the instructions on the screen, the sampler will abort the leak check after waiting 5 minutes. To initiate another leak check, you must again press <F2: Start>.
6. A “Pass” or “Fail” message will display at the end of the leak check cycle. A pressure drop of 25 mm Hg or less is the sampler’s leak check pass criteria.
7. If a “Fail” message is displayed, insert a new 47 mm filter into a filter cassette and place it in the topmost position of the audit magazine. Press <F4: FiltAdv> to move the new filter into sampling position. Repeat the leak check procedure.
8. If a “Fail” message is again displayed, perform the troubleshooting procedures detailed in the Service Manual.
9. If a “Pass” message is displayed, slowly open the valve on the leak check adapter.
10. Indicate the results into the appropriate fields on the BAAQMD Partisol-Plus PM Coarse Monthly QC Worksheet.
11. Enter any pertinent information into the appropriate DMS instrument e-log;

<u>Pump Pressure Check [District added option – not in Operating Manual]</u>

1. On units equipped with a pressure gauge, leave the leak check adapter in the closed position.
2. While in the Audit screen, press <F5: LeakChk> to display the Leak Check screen.
3. Press <ClnSeal> to start the pump, and record the pressure which should be greater than 40
   PSI.
4. Press "Esc" to abort the "ClnSeal" procedure and stop the pump.

9.3.11 Procedure: Flow Verification [*Operating Manual*, Section 12.2.6]

1. Perform the temperature verification, pressure verification and external leak check before executing the flow verification procedure.
2. **NOTE**: Ensure that the filter cassette previously installed in the sampler (which was used to perform the external leak check) remains in the sampler for the flow verification.
3. Remove the flow audit adapter and install the Flow Transfer Standard (Delta Cal) on the sample tube.
4. Press <F5: Audit> to enter the Audit screen. Confirm that 16.7 l/ min is the set flow in the Set Flow field. Press <F1: Pump> and then <F2: Valve>. Wait for the flow rate displayed in the Cur Flow column to stabilize.
5. Indicate the results into the appropriate fields on the BAAQMD Partisol-Plus PM Coarse Monthly QC Worksheet.
6. When finished, press <F2: Valve> and then <F1: Pump> to turn off the pump. The measured flow should be within ± 4% of the displayed flow <u>and</u> within ± 5% of the design flow. If this is not the case, perform the flow rate calibration procedure (Procedure: Flow Calibration [*Service Manual*, Section 3.2.8]) **NOTE**: If a calibration is required which results in the sampler being placed into the <F2: STOP> mode, the current run will not resume and will be invalidated.
7. Enter any pertinent information into the appropriate DMS instrument e-log.

9.4 AUTO-CALIBRATION, 'AUTO-CALS'\

NOTE: This SOP section is non-applicable and is left intentionally blank

9.5 SERVICE AND MAINTENANCE

The operator shall perform all recommended or required diagnostic checks, service and maintenance. The following table is a suggested general guideline for service and maintenance.

Maintenance Item	Suggested Period	SOP Section
Inspect or drain inlet water jar	As needed	N/A
Clean PM10 inlet	Monthly	N/A
Inspect and clean 'V' seals	Monthly	9.5.1
Perform monthly verification	Monthly	9.3.6 – 9.3.11
Perform leak check	Monthly	9.3.10
Verify clock time	Monthly	N/A *
Clean interior of sampler	Monthly	N/A
Check internal battery voltage	6 Months	9.5.2
Clean air filters	6 Months	9.5.3
Perform multipoint calibration	6 Months; after verification failure; after major repair	9.3.1 - 9.3.5*
Check pump pressure	6 Months	N/A
Check remote connection with RPCOMM	As needed	9.5.4
Check internal battery voltage	6 Months	9.5.5

*NOTE: Can only be completed in the STOP mode which may result in the loss of a run
*****These items may be performed more often as required.

Figure 7: Suggested Maintenance Schedule

AS NEEDED:

- Run a Field Blank (minimum 10% of runs)
- Inspect water collection jar; empty if necessary
- Check the status of the Partisol-Plus via RPCOMM™ software.

WEEKLY:

- Remove one week's supply of filters;
- Connect using RPCOMM™ and download data;
- Process filter run data;
- Forward data to the appropriate network folder

BI-WEEKLY:

- Load two weeks supply of filters; program new filter list

MONTHLY:

- Perform a monthly verification of all sensors, flow and complete a leak check. Indicate in the instrument logbook.

- Every 15 runs or Monthly remove PM10 head; Disassemble and clean; Inspect all o-rings; replace and/or lubricate with vacuum grease as needed; Re-assemble PM10 head. Indicate in the instrument logbook
- Remove Inlet tube and clean; inspect all O-rings; replace and/or lubricate with vacuum grease as needed; Re-install. Indicate in the instrument e-log
- Check internal clock; reset if needed. NOTE: Can only be completed in the STOP mode which may result in the loss of a run
- Clean interior of sampler with a damp cloth.
- Inspect or clean the sampler 'V' seals and down-tube.
  NOTE: Cannot complete on a sampler that is sampling every day or loss of a run may result. Ensure the instrument is not sampling before doing this task.

EVERY 6 MONTHS:

- Complete a multipoint temperature, pressure and flow calibration; Complete a leak test
- Check internal pump pressure using a suitable gauge. Rebuild pump if needed.
- Check internal battery voltage.
- Clean air intake filters. The Partisol-Plus sampler contains two air intake filters (23-003743)–one in the filter compartment and one in the pump compartment.

9.5.1 Procedure: Check/Clean V-Seals

Perform the following steps to check the "V" seals: **NOTE**: Cannot complete on a sampler that is sampling every day or loss of a run will result. Ensure the instrument is not sampling and is in STOP mode.

1. Enter Service Mode. Move the pointer so that it points to "Manual Motion Tests" on the Service Menu and press <F4: FiltChg> to go to the Filter Exchange Screen (Figure 3-2 of the *Service Manual*).
2. On the Filter Exchange Screen, turn on the pump (labeled "Pump"), turn on the pressure vent valve (labeled "Pressure") and turn on the lift/push valve (labeled "Lift Push"). This will cause the lift/push cylinder (the middle cylinder on the filter exchange assembly) to retract and will help ease disassembly.
3. Unlatch and open the top cover of the Partisol-Plus Sampler with the down tube and first-stage inlet attached to gain access to the VSCC and adaptor.
4. Lift the adaptor out of the upper part of the sampler enclosure.
5. Locate the down tube mount on the top cover. (Figure 3-3 of the *Service Manual*) While supporting the ring on the underside of the top cover, remove the four screws which secure the down tube mount to the top cover. Remove the down tube mount and ring.
6. Locate the down tube mount "V" seal. (Figure 3-6 of the *Service Manual*) Examine seal for drying and/or cracking. Replace, if necessary. (Down tube mount "V" Seal: R&P Part number 23-004576)
7. Replace the down tube mount and ring onto the top cover ensuring that the side of the ring with the chamfer is facing down towards the inside of the enclosure.

8. Locate the top head mounting plate. (Figure 3-5 of the *Service Manual*) Note whether this plate is made from aluminum or Lexan (clear plastic) to the filter exchange assembly.
9. If the top head mounting plate is Lexan, remove the ground wire from the top head and from the exit cylinder base.
10. Remove the 4 thumb screws which secure the top head mounting plate to the filter exchange assembly. Lift the plate (with the top head attached) and remove from the enclosure.
11. Locate the two "V" Seals now exposed. (Figure 3-7 of the *Service Manual*) The top seal is located in the top head. The bottom seal is located in the now exposed section of the filter exchange assembly. Examine both seals for drying and/or cracking. Replace, if necessary. (Bottom "V" Seal: R&P Part number 23-002182) (Top "V" Seal: R&P Part Number 23-004276)
12. Locate the exit cylinder. (Figure 3-5 of the *Service Manual*) Remove the three screws which secure the exit cylinder base to the filter exchange assembly. Remove assembly from enclosure.
13. Locate the exit cylinder "V" seal. (Figure 3-8 of the *Service Manual*) Examine seal for drying and/or cracking. Replace, if necessary. (Exit cylinder "V" Seal: R&P Part number 22-002959)
14. Place the exit cylinder base in its proper position on the filter exchange assembly and secure using the three screws previously removed. Replace the top head mounting plate and secure using the four thumb screws previously removed.
15. Reinstall the inlet tube adaptor and close the top cover.
16. On the Filter Exchange Screen, and turn off the lift/push valve (labeled "Lift Push"), turn off the pressure vent valve (labeled "Pressure") and turn off the pump (labeled "Pump").
17. Perform an external leak test.
18. Resume normal operation.

9.5.2 Procedure: Check Internal batteries

Follow these steps to ascertain if the three AA batteries need replacement:

1. Turn off the Partisol-Plus sampler.
2. Remove the three (3) screws securing the Pump Compartment Cover. Slide the cover up and remove.
3. Open the electronics compartment of the sampling unit. Locate the three AA batteries.
4. To check whether the batteries need replacing, measure the voltage across the test point labeled "BATT" (red) on the interface face board and the ground test point labeled "188_PGND". If the measured voltage is less than 4.2 VDC, the batteries need replacing. Skip to step 6 if the voltage is acceptable.
5. To replace the three AA batteries, remove the clip that holds the batteries in their mounting. Pull the old batteries out and replace them with three new ones, noting the proper polarity. Perform this exchange within an elapsed time of five minutes to avoid the loss of data stored in the battery-backed RAM (read-only memory).
6. Reinstall the clips to hold the new batteries in position. Test for a voltage of 4.2 VDC as in step 4.

7. Close the electronics compartment of the sampling unit.

9.5.3 Procedure: Clean Air Filters

Perform the steps below to clean the air intake filters in the sampler:

1. Locate the two air intake fans. Each of these has an associated air intake filter.
2. Snap off the covers enclosing the air intake filters.
3. Take out the filters and clean them with a brush. Alternately, if they are coated with a sticky coating, wash them with a mild soap solution and water.
4. If the filters were washed in the liquid solution, shake the filters and allow them to dry.
5. Reinstall the filters in their holders and remount the covers removed in step 2 above.

9.5.4 Check Partisol remote connection with RPCOMM

Follow these steps in order to connect to RPCOMM™:

1. Select the RPCOMM™ 2025 icon on the station computer. Select 'File' and scroll down to '1Partisol.group'. Click on the appropriate Connection Name, i.e. 8004. Click on the Connect (telephone) icon to connect. The message, 'PRC file does not match current instrument!" may appear. If it does, click 'OK' to continue.
2. In a few moments, the RPCOMM™ 2025 main screen (with no visible data) should appear.
3. Select the <Keypad> tab. In a few moments, a virtual keypad should be visible. The operator should check the status, volume, start date and the current filter number.

9.5.5 Check internal battery voltage

Follow these steps to ascertain if the three AA batteries need replacement:

1. Turn off the Partisol-Plus sampler.
2. Remove the three (3) screws securing the Pump Compartment Cover. Slide the cover up and remove.
3. Open the electronics compartment of the sampling unit. Locate the three AA batteries.
4. To check whether the batteries need replacing, measure the voltage across the test point labeled "BATT" (red) on the interface face board and the ground test point labeled "188_PGND". If the measured voltage is less than 4.2 VDC, the batteries need replacing. Skip to step 6 if the voltage is acceptable.
5. To replace the three AA batteries, remove the clip that holds the batteries in their mounting. Pull the old batteries out and replace them with three new ones, noting the proper polarity. Perform this exchange within an elapsed time of five minutes to avoid the loss of data stored in the battery-backed RAM (read-only memory).
6. Reinstall the clips to hold the new batteries in position. Test for a voltage of 4.2 VDC as in step 4.
7. Close the electronics compartment of the sampling unit.

9.6 SAMPLE COLLECTION

9.6.1 Procedure: Filter Installation

The Partisol-Plus 2025 operator will routinely receive a two-week supply of pre-weighed 47 mm Teflon PM2.5 or PM10 run filters and one pre-weighed 47 mm Teflon PM2.5 or PM10 Field Blank filter pre-loaded into individual filter cassettes. (Federal regulations require that one pre-weighed Field Blank filter be placed into a sampler for the duration of not less than 24 hours every 14 run days.) Each filter is supplied with a BAAQMD 24-hour Field Sample Report form. The individual cassettes are pre-loaded into a supply canister. Each operator will receive a supply of blank spacer filter cartridges that are used during transport of the exposed filters back to the lab.

NOTE: The filters must be used within 30 days of the pre-weighing procedure.

The operator will load a supply canister containing 2-14 pre-weighed Teflon 24-hour run filters and one Field Blank filter into the Partisol-Plus on a regular basis. The number of filters provided by the District lab is determined by the current sampling frequency at a particular station. The sampling frequency schedule will be every day, every 3rd day, or every 6th day. Stations running on an everyday schedule should install filters every two weeks on the same day of the week (i.e., Wednesday) and remove one week's worth of filters every week.

Filter cassette canisters may be exchanged in any of the sampler's operating modes. Filter cassette canisters containing new filters must be installed on the left (supply) side, while empty canisters for receiving exposed filters must reside on the right (storage) side. Follow these steps to load filters:

1. Open the enclosure of the Partisol-Plus Sampler;
2. Identify the appropriate mounting position for the filter cassette canister to be installed (left side for supply and right side for storage).
3. Remove the current supply side filter canister. (There should be no filters present in this canister)
4. Remove the orange cap from the new filter cassette canister. With the air connection of the filter cassette canister facing toward the operator, line up the grooves at the top of the filter cassette canister with the mounting studs on the metal ring that holds the canister in place;
5. Push the filter cassette canister upward and rotate it to the right to lock it into place (Figure 3-8 of the *Operating Manual*).
6. Attach the air pressure supply tube to the air connection at the base of the supply filter cassette canister (Figures 3-9 and 3-10 of the *Operating Manual*).
7. TECO recommends that the serial number each filter cassette be immediately entered in the Filter List screen (Section 5.3.7 of the *Operating Manual*) *each time the operator installs a filter cassette supply canister*.

9.6.2 Procedure: Enter Filter and Cassette ID Numbers

The Filter List Setup screen is used to enter a series of Filter and Cassette ID numbers. This screen also allows the operator to select filters as blank filters.

The Filter List Setup screen is accessible from any of the Filter Setup screens (Figures 5-6 to 5-10 of the *Operating Manual*) by pressing <F4: FiltLst>. The Filter List Setup screen (Figure 5-11 of the *Operating Manual*) allows the operator to enter the serial numbers of the filters and the cassettes used for sampling and to identify which filters in the series are to be used as blank filters.

The Filter List Setup screen includes the following parameters:

- Filter Number: The filter numbers 1-16 in this field identify the filter cassette according to all of the parameters listed below.
- Type: This parameter identifies the filter type such as P for an EPA supplied filter. The operator can select another alphabetic character to identify different filter types. The default parameter for this field is "P."
- Filt ID: This parameter is used to enter the filter's serial number. Press <EDIT> to edit the Filter ID field. Scroll down to the first number in the series to be edited and enter the serial number of the filter in the Filter ID column, press <ENTER>. Press <F3: Copy> and follow the instructions in the display. This will automatically increment the entered number for the remaining 15 filters in the series. Press <F4: Insert> to insert a number in the series, or <F5: Delete> to delete a filter serial number. If the ID number is "0," the sampler will automatically assign a filter identifier.

NOTE: If you select <F5: Delete> to delete a filter, the sampler will display a Warning/Confirmation screen that will ask you to confirm the filter deletion.

- Cassette ID: This parameter is used to enter the filter cassette screen serial number. Scroll down to the first number in the series to be edited and enter the serial number of the filter cassette screen in the filter cassette. Cassette ID numbers are entered and edited in the manner described above for Filter ID numbers.
- The Blank field indicates whether the filter is to be used as a blank filter. If this parameter is set to "Yes," at the end of the previous sampling cycle the filter will advance from the supply canister to the storage canister. The next filter in the series after the blank filter will advance to the sampling position for sampling.
- Filter cassettes should be loaded into the canister from top to bottom to match the sequence of Filter and Cassette ID numbers entered in the Filter List Setup screen.

9.6.3 Procedure: Filter Removal and Storage

Exposed filters are automatically shuttled to a take-up canister inside the sampler upon the completion of a 24-hour sampling period. The storage canister containing exposed filters must be removed from the sampler within seven days. Perform these steps to remove exposed filters:

1. Open the enclosure of the Partisol-Plus Sampler;

2. Remove the storage canister containing exposed filters. Do not touch exposed filter surfaces! Immediately place an orange cap onto the top of the filter cassette canister. Do not drop or jar exposed filters as possible cross-contamination may result!
3. The piston should always be at the top of the (empty) storage canister prior to installing the canister into the sampler. Use the bulb pump hose described in Section 3.4 of the *Operating Manual* to position the piston at the top of the canister;
4. Push a new storage filter cassette canister upward and rotate it to the right to lock it into place (Figure 3-8 of the *Operating Manual*); NOTE: The storage filter cassette canister does not connect to the sampler air pressure supply tube;
5. Close the enclosure of the Partisol-Plus Sampler and return to the station;
6. Carefully remove the orange cover from the top of the storage filter cassette canister; Place empty spacer filter cartridges, one-by-one, on top of the exposed filters. Gently push down as each spacer filter cartridge is inserted; Install enough spacer filter cartridges to prevent the exposed filers from sliding or rotating during transport; Carefully replace the orange cap;
7. Place the storage canister containing the exposed filters into a freezer;
8. Download filter data using RPCOMM™. See Section 9.6 of this SOP, "Data Acquisition, Calculations, and Data Reduction Requirements", for instructions.
9. Complete all information for each filter's BAAQMD 24-hour Field Sample Report form.
10. Attach all completed forms to the storage canister containing the exposed filters (which should be in the freezer).

NOTE: Sampled filters must be kept at a temperature of less than 4°C during storage and shipping which allows the laboratory up to 30 days from the end of sampling for analysis. If this temperature is exceeded but is kept at no greater than 25 °C, the laboratory has up to 10 days to analyze. The storage environment will have its temperature constantly monitored and recorded.

9.6.4 Clearing Filter Exchange Errors

Follow this procedure if a Filter Exchange error (X) is encountered:

1. When in the Main screen, press <F2: Stat> and then <F1:StCode> to enter the Status Codes screen.
2. Press 'Reset' to clear status codes;
3. Press <RUN/STOP> twice to enter the select mode screen. Select STOP mode;
4. To enter the Service Mode, press <MENU> on the display/keypad when the sampler is in the STOP Mode. This causes the Master Menu screen to be displayed. Then use the arrow keys (↓ and ↑) to move the screen's selection indicator to the line labeled "Service Mode." With the pointer in this position, press <ENTER>. The unit then displays a Warning/Confirmation screen that asks the user to confirm entry into the Service Mode.
5. While in the Service Mode, select Manual Motion Tests and press <ENTER>;

```
        Service Menu
 System Maintenance Routines
> Manual Motion Tests
 Calibration/Audit
 Low Level System Info
 Exit Service Mode
```

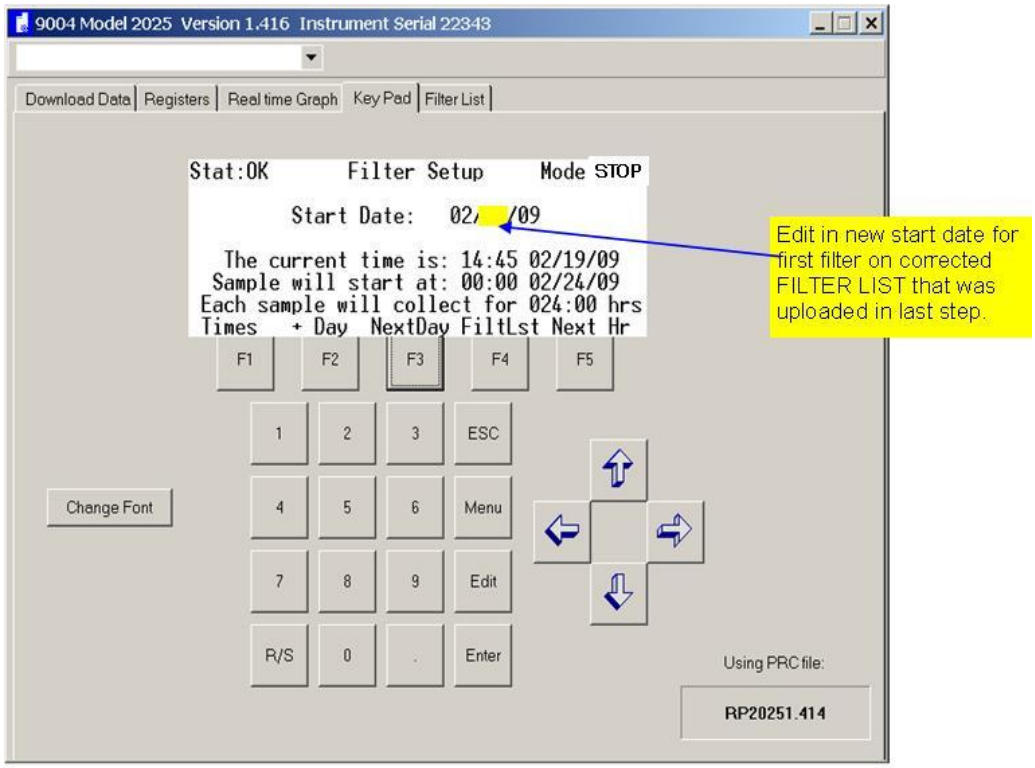
	AmbFilt	FlowVal	FiltChg	Misc	

6. Press FiltChg hot key to enter the Filter Exchange Test screen;

```
        Filter Exchange      Step: ------
Valves        Stat:    Ok          1    2
Pressure: OFF  Pump:OFF   NewFilt: OFF  OFF
Shuttle: OFF             LiftUp:  ON   OFF
MagPres: OFF    Shuttle  LiftDn:  OFF  OFF
LiftPush: OFF    Rdy:ON  PushDn:   ON   OFF
                Ext:OFF  PushUp:  OFF  OFF
```

ON/OFF	AmbFilt	FlowVal	Start	Misc	
Function Keys in Browse Mode					
ON/OFF	AmbFilt	FlowVal	Start	Misc	
Function Keys in Edit Mode					
-List	+List	Bksp			

7. Select ‘Start’ to initiate a filter exchange. Isolate the problem filter; CAREFULLY open up the sampler and remove the jammed filter;
8. After clearing the jammed filter, remove the supply tube. Note the filter number of the top filter in the supply tube. Check against filter paperwork to determine which filter <u>should</u> be loaded for the <u>next scheduled run date</u>.
9. Replace the supply tube. Repeat the filter exchange until the correct filter for the <u>next scheduled run date</u> is in the top most position;
10. Go back to the main SERVICE MODE screen; scroll down to ‘EXIT SERVICE MODE’ and press <ENTER>;
11. Exit all remaining menus leaving the sampler in the STOP mode;
12. Go to the station PC and start RPCOMM™;
13. Select the Filter List tab to display the Filter List screen.
14. Select the Retrieve icon and retrieve the filter list currently loaded in the sampler. Check against filter paperwork to determine which filter <u>should</u> be loaded for the next day.
15. Exit the Filter List screen; Select the Filter List tab a second time to display an empty filter list <u>which should be all zeros</u>.
16. Upload this list (of zeros) to the sampler by selecting the Send icon. . This will clear the filter schedule presently stored in the sampler.
17. Manually re-program filters
18. Select the Retrieve icon and retrieve the filter list currently loaded in the sampler. It <u>should be correct!</u>
19. Go to the FILTER SETUP screen. Change the start date to the correct date by using the EDIT and ENTER keys. **NOTE**: If this step is skipped and attempt is made to put sampler into RUN mode, an error message will results reading “SAMPLE DEFINITIONS INVALID”.



20. Exit all sub-screens.
21. Place the sampler into RUN mode; WAIT should appear. **NOTE**: The filter number that may be visible will be from the last attempt by the sampler to load a filter and <u>will not match</u> the uploaded list's first filter ID. *Don't worry! This is just an artifact of the Partisol software*.

9.6.5 Programming a Make-Up Run

NOTE: Stations operating on an every-day schedule will not be able to complete a make-up run!

Any missed or invalidated runs due to operator or sampler error (where the sampler is operating on a 1-in-6 day or a 1-in 3 day sample schedule) require the completion of a makeup run. All make up runs should be completed within seven days (and as soon as practical). Please indicate on the filter's chain-of custody form the specific Null Code for any invalidated run.

1. The make-up date must be between the sample date on the main screen and the start date listed in the filter set screen.
2. The sampler must be in either the 'WAIT' or 'SAMP' mode to program the make-up run. **DO NOT STOP THE SAMPLER TO PROGRAM A MAKE-UP RUN**.
3. From the main screen go to the 'Filter Set Screen' press <F3>.
4. Enter the date of the make-up run in the start date field. Press <EDIT> and enter the date in the proper format by using the numeric keypad and press <ENTER>.
5. The instrument will display a prompt message asking you if you intend to insert a sample run? You must select either 'YES' or 'NO' using the function key defined along the bottom of the display.

6. If you select ‘NO’ the sampler will return to its initial state. If you select ‘YES’ the instrument will accept the new start date and move your current filter list down by one position.
7. Position 1 in the filter list will be assigned all zeroes; enter your new filter ID in position 1 of the filter list. Use the EDIT key and numeric keys on the keypad; press the <ENTER> key when finished to accept the new ID.
8. Go to the filter compartment and remove the supply canister from the filter exchange mechanism. Place your make-up filter on top of the stack in the supply canister and push down until level with the top of the canister. **DO NOT TOUCH THE FILTER MEDIA WITH YOUR FINGERS.**
9. Install the supply canister back in position on the filter exchange mechanism.
10. Go back to the ‘Filter Set Screen’ by either pressing <F2> or <ESC>.
11. Go to the ‘Times Screen’ by pressing <F1> from the filter set screen.
12. Verify the start and stop times and dates. The only change should be to the make-up filter, position 1. The dates for the remaining filters position 2 and greater should be on the normal run schedule.
13. Press <ESC> to return to the Main Screen.

Times Screen:
Cur = Date and time of filter currently in sample position
1. = Date and time of Make-Up Sample, top of supply canister
2. = Date and time of next regular schedule sample. Filter is second in supply canister

```
    Start          Stop
Cur 17:15 99/06/08 17:16 99/06/08
1.  17:15 99/06/08 17:16 99/06/08
2.  17:18 99/06/08 17:19 99/06/08
3.  17:21 99/06/08 17:22 99/06/08
4.  17:24 99/06/08 17:25 99/06/08
5.  17:27 99/06/08 17:28 99/06/08   \/
```

9.7 SAMPLE HANDLING AND PRESERVATION

Federal regulations stipulate specific time frames and environmental conditions for FRM PM2.5 and PM10 sample filters at various stages in the sampling program. If these time frames and conditions are not met, sample filters may be flagged or invalidated by the receiving laboratory. In addition to these requirements, operators should practice the usual care to prevent or minimize contamination of the sample filters, filter cassettes, or anything else which may come in contact with the sample filters.

- Filters are supplied to the operator ready to use in individual filter cassettes loaded into a filter canister with a protective cap. This cap must be secured during transport and storage;
- The filters <u>must</u> be used within 30 days of the pre-weighing procedure;

- Keep the capped filter canister in a secure, dry, contamination-free area. Avoid exposure of filters to any possible contamination. Do not touch filter surfaces. Do not drop filters as damage to the filter surface may result;
- Exposed filters are automatically shuttled to a take-up canister inside the sampler upon the completion of a 24-hour sampling period. Remove the entire take-up canister and place a protective cap on top. The canister's cap must be secured during storage and transport; do not touch exposed filter surfaces. Avoid exposure of filters to any possible additional contamination. Do not drop or jar filters as possible cross-contamination may result;
- The exposed filters must be removed from the sampler within 7 days after the completion of a run and placed into a freezer;

9.8 SAMPLE PREPARATION AND ANALYSIS

NOTE: This SOP section is non-applicable and is left intentionally blank

9.9 TROUBLESHOOTING

The following may be useful:

- Water leaks: Check door seal; caulk around inside lip of hinged top; check down tube seal for tightness
- Failure of leak check: Try a different filter holder; clean the 'V' seals; check the leak test adapter
- Filter jam: The filters have to be compressed in order to correctly move through the system; older transport systems have a slight lip where the filter enters the shuttle.
- Transport Errors: Check pump; Check voltages to solenoids

Please refer to Section 2: Troubleshooting Guides, located in the *Service* Manual for further information.

9.10 COMPUTER HARDWARE AND SOFTWARE

The following software is used for routine operation of the Partisol Plus 2025:

- RPCOMM™ software is loaded onto the station computer at all District stations which operate a Partisol-Plus 2025 PM2.5 or PM10 sampler. RPCOMM™ software is used to create, modify, save, retrieve and upload the sampler's filter list and to retrieve the filter run data.
- Microsoft Notepad and/or EXCEL are used to manage and review downloaded filter data files.

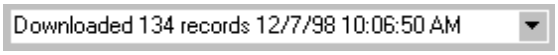
10. DATA AND RECORDS MANAGEMENT

The operator is responsible for the following:

- Download filter data. Data is reviewed directly or downloaded via RPCOMM™ software. Data is downloaded once a week and/or whenever filters are removed from the sampler
- Review and validate or invalidate any data that does not meet the criteria in Section 11 of this SOP
- Forward raw .TXT files data to the District via e-mail or place onto the District's network drive on a routine basis
- Maintain the appropriate DMS instrument and/or station e-log. The operator must enter the appropriate information after the completion of any repairs, maintenance, or adjustments. The operator should note any data gaps. The operator may elect to manually collect data from the analyzer in the event of a data collection error
- If a PM2.5 FRM instrument fails a QC leak or flow check, and affected filters and corresponding Chain of Custody forms have already been sent to the laboratory and cannot be annotated by the operator, send an e-mail to the Laboratory Analyst and the Meteorology Supervisor indicating the data invalidation interval, starting at an identifiable failure or at the last good instrument check and ending with the completion of corrective action.

10.1.1 Procedure: Data Acquisition Using RPCOMM™

It is recommended that the operator use RPCOMM™ software to retrieve the sampler's filter run data from the station PC. (Refer to Section 10 of the *Operating Manual* for further information.) Follow these steps in order to connect to RPCOMM™:

1. Select the RPCOMM™ 2025 icon on the station computer. Select 'File' and scroll down to '1Partisol.group'. Click on the appropriate Connection Name, i.e. 8004. Click on the Connect (telephone) icon to connect. The message, 'PRC file does not match current instrument!" may appear. If it does, click 'OK' to continue.
2. In a few moments, the RPCOMM™ 2025 main screen (with no visible data) should appear.
3. OPTIONAL: Before data are downloaded, the operator should ensure that the storage pointer position(s) are correct. Set the storage pointer positions if necessary.
4. From the RPCOMM™ 2025 Main screen, select the Download Data tab.
5. From the RPCOMM™ 2025 Download Data screen, select the Download Filter Only tab.
6. Select the icon to download all filter data since the last download or the icon to download all filter data. NOTE: Operators will normally use the function to download only the last data since the previous download.
7. The sampler will download the filter data. 

When the download has been successfully completed, a message will appear in the Dialog box indicating how many records were downloaded. NOTE: If multiple types

of data were downloaded, the operator can select the down arrow on the right of the Dialog box to see the results of each download type.

8. Select the Save icon. The Save Dialog box will appear and prompt the operator for a file name. Name the file based on the SiteID and download date in the form **ssss yy-mm-dd.txt**. For example a file from Oakland downloaded on Dec. 22, 2008 would be named: **1025 08-12-22.txt**.
9. Preserve the downloaded text file format provided by the sampler:
   - The first line should be of the form: "2025 1.416 F D".
   - The second line should be a data header line.
   - The third line should contain the first sample summary record (no blank line between the header line and the first data record).
   - Successive lines contain one sample summary record (there should be no blanks or extraneous characters between or after the lines containing the sample summary records).
   - Data on each line should be separated by commas (comma delimited format), not spaces or tabs.

NOTE: These files will be saved in a comma-delimited ASCII format which can be imported into any spreadsheet program.

10.1.2 Procedure: Data Reduction

To view or edit a Partisol run filter data file, use a text editor such as Microsoft Notepad:

1. Open Microsoft Notepad. (Be sure to turn off "word wrap", found under the Notepad Format pull-down tab).
2. Select the file to open;
3. Review the filter data for correct numbering sequence, proper start and stop times, duration, flow CV and review all error codes.
4. Fill out all required run information onto each BAAQMD 24-hour Field Sample Report form for each exposed filter;
5. Forward raw .TXT files data to the District via e-mail or place onto the District's network drive on a routine basis.

EXCEL may also be used to view the file, but do not edit or save the file unless using the procedure which will preserve the correct comma-delimited format needed for data processing work:

1. Open Excel – you should see a blank worksheet
2. Select **File/Open**
3. Change 'Files of Type:' to 'All Files' or 'Text Files'.
4. Navigate to the text file you want and select (open) it (See Note: below).
   a. In Text Import Wizard – Step 1 of 3: Select 'Delimited' as 'original data type'; click Next.
   b. In Text Import Wizard – Step 2 of 3: Check 'Comma' as 'Delimiters'; click Next.
   c. In Text Import Wizard – Step 3 of 3: In the 'Data Preview' frame, the first column should be highlighted in black. Slide the horizontal bar at the bottom

of the Data Preview frame all the way to the right, hold down the Shift key while selecting the last column on the right. Now all columns should be highlighted in black.

5. In the 'Column data format' frame: Select 'Text'; click Finish. The data should now be visible in the spreadsheet with the text formatting intact. Make any necessary changes, but be careful to conserve the original format of each cell.
6. To save the file if any changes were made, you need to revert back to the comma delimited format: On the top drop-down menu, select **File/Save As** and change 'Files of Type:' to 'CSV (Comma delimited) (*.csv) and click Save.
7. Exit Excel, then find the file using Windows Explorer and change the file extension from .csv to .txt.

NOTE: if you open a file with a .csv extension without specifying a text editor, most computers will open the file with Excel by default, using automatic 'General' column data format (not 'Text'). This will modify the format of the data, so use this method for viewing the data only - do not save the file.

11. QUALITY CONTROL AND QUALITY ASSURANCE

11.1 QUALITY CONTROL

- The operator shall perform all recommended or required diagnostic checks, service and maintenance. Please refer to Section **Error! Reference source not found.** of this SOP and the appropriate instrument manual for more information. Note in the appropriate e-log all checks, service and maintenance made to the analyzer or support equipment!
- **NOTE**: QC limits are developed to provide an early warning of instrument problems prior to the exceedance of a Measurement Quality Objective (MQO). Violation of a QC limit does not require data action as long as an MQO is not also exceeded.
- If any MQO's are exceeded, the source of the problem is to be investigated and corrected **and** the operator shall <u>invalidate</u> all suspect or questionable data.
- If a PM2.5 FRM instrument fails a QC leak or flow check, and affected filters and corresponding Chain of Custody forms have already been sent to the laboratory and cannot be annotated by the operator, send an e-mail to the Laboratory Analyst and the Meteorology Supervisor indicating the data invalidation interval, starting at an identifiable failure or at the last good instrument check and ending with the completion of corrective action.
- All District PM2.5 sampling must follow all federal quality control and assurance requirements found in the Code of Federal Regulations, Title 40, Part 50, Appendix L, and Part 58, Appendix A.

Item	**Frequency**	**Acceptance Criteria***
Filter holding:	All filters	

Item	Frequency	Acceptance Criteria*
Pre-sampling Post-sampling (in sampler) Post-sampling (transport and storage)		< 30 days from weighing <177 hours from end of sampling <10 days at 25 ^{o}C or <30 days at 4°C from end of sampling
Run a Field Blank (minimum 10% of runs)	Depends on run schedule	N/A
Clean PM10 inlet and VSCC	Monthly or 15 runs	
Inspect and/or clean 'V' seals	As needed or monthly	
Perform flow verification	Monthly or Semi-monthly (optional)	≤ +/- 3% of standard, ≤ +/- 4% of design
Perform verification of temp sensors	Monthly or Semi-monthly (optional)	+/- 2 ^{o}C of standard
Perform verification of press sensor	Monthly or Semi-monthly (optional)	+/- 10 mmHg of standard
Perform leak check	Every 2 weeks	< 25 mmHg pressure drop for 1 minute
Verify clock time	Monthly	+/- 2 minutes
Connect using RPCOMM™ and check operation	Depends on run schedule	Check for errors
Run a Field Blank (minimum 10% of runs)	Depends on run schedule	N/A
*Download and review Filter Data: Sampling period Sampler flow rate Flow rate variability Error codes	Weekly	 1380 to 1500 minutes ≤ 5 % +/- 16.67 lpm ≤ 2% CV Check
Inspect or drain inlet water jar	As needed	
Clean interior of sampler	Monthly	
Check internal battery voltage	6 Months	If < 4.2 VDC, replace
Clean air intake filters	6 Months	
Perform multipoint calibration: Temperature sensors Pressure sensor Flow rate	Annually; after verification failure; after major repair	 +/- 2 ^{o}C of standard +/- 10 mmHg of standard +/- 2 % of standard
Check pump pressure	6 Months	If < 40 -50 psi; rebuild

*Any missed or invalidated runs due to operator or sampler error require the completion of a makeup run after troubleshooting and repair, followed by recalibration and/or re-verification of the sampler's operation.

* If a PM2.5 FRM instrument fails a QC leak or flow check, and affected filters and corresponding Chain of Custody forms have already been sent to the laboratory and cannot be annotated by the operator, send an e-mail to the Laboratory Analyst and the Meteorology Supervisor indicating the data invalidation interval, starting at an

identifiable failure or at the last good instrument check and ending with the completion of corrective action.

11.2 QUALITY ASSURANCE

Quality Assurance activities include the following:

- District staff shall conduct performance and system's audits on a regular basis.
- CARB staff may conduct performance and/or systems audits
- EPA staff may conduct performance and/or systems audits
- Performance and System audits of the Partisol-Plus 2025 will be conducted following all federal requirements located in 40 CFR Parts 50, 53 and 58 and the EPA Quality Assurance Handbook, Volume II, Part II, 2.12.

12. AUTHORS

- Original Author: Stan Yamaichi, 3//2006
- Revised By: Stan Yamaichi, 5//2008 (Updated original)
- Revised By: Christopher Rumm, 01/2009 (Partisol-Plus 2025 replaces RAAS-300)
- Revised By: Stan Yamaichi and Lisle Rath; 05/2012 (added additional procedures)
- Revised By: Christopher Rumm, 06/25/2102; re-formatted SOP
- Revised By: Stan Yamaichi and Lisle Rath; 07/19/12 consolidated versions of Partisol PM2.5 and Partisol PM10 SOPs into one SOP.
- Final edits: G. Colwell; 07/20/12

13. REFERENCES

- BAAQMD LAB SOP 302, "STANDARD OPERATING PROCEDURE FOR MASS ANALYSIS OF FINE PARTICULATES COLLECTED ON TEFLON FILTERS

- BAAQMD QA SOP 709, PM 2.5 PERFORMANCE AUDIT

- California ARB STANDARD OPERATING PROCEDURES FOR Partisol-Plus model 2025 Sequential Air Sampler (R&P Sequential FRM); AQSB SOP 404; First Edition; MONITORING AND LABORATORY DIVISION; January 2003

- Code of Federal Regulations, Title 40, Parts 50, 53 and 58

- EPA Quality Assurance Handbook, Volume II, Part II, 2.12

- Partisol-Plus *Operating Manual* (November 2006, Revision B) and/or *Service Manual*, (May 2004, Revision B)

- Partisol-Plus Quick Start Guide (June 2004, Revision A)

Appendix A

BAAQMD 24-Hour- FIELD SAMPLE REPORT
Reference Method PM2.5 Filter Federal Samplers

Filter ID# 28391

Site Name: Concord (P)

Site ID: 2036

Field Technician 368

Instrument ID 7914

Cassette ID Number: RP237

Filter Type: Sampell

Use Filter By: May 21, 2011

☐ Check if data electronically submitted to Laboratory

SAMPLE SUMMARY

Elapsed Time: 24:00 Hr:Min

Volume: 24.0 M^3

Flow CV: 0.0 %

Start Date / Time: 5-12-11 / 0000

	Ambient Temp: (°C)	Ambient Pressure: (mm Hg)
Average:	16.9	767
Maximum:	25.3	768
Minimum:	9.8	765

Sampler Codes (circle all that apply)
Tm PF Flo FIV FTp Itp
(Note: If there is a Tm code, a Null Code must also be circled.)

Qualifier Codes (Circle any that apply)

IB Asian Dust	IC Chemical Spills Industrial Accidents
ID Cleanup After a Major Disaster	IE Construction Demolition
IH Fireworks	II High Pollen Count
IJ High Winds	IK Infrequent Large Gatherings
IL Other	IM Prescribed Fire
IN Seismic Activity	IP Structural Fire
IQ Terrorist Act	IR Unique Traffic Disruption
IS Volcanic Eruptions	IT Wildfire-U. S.
IU Wildland Fire Use Fire-U. S.	OK Agricultural Tilling
OL Highway Construction	OP Roofing Operations

(Please explain all codes in the comments section.)

Null Codes (circle only one as appropriate)

AA Sample pressure out of limits	AB Technician unavailable
AC Construction/repairs in area	AD Shelter storm damage
AE Shelter temperature outside limits	AH Sample flow rate out of limits
AJ Filter damage	AK Filter leak
AM Miscellaneous void	AN Machine malfunction
AO Bad weather	AP Vandalism
AQ Collection error	AR Lab error
AS Poor QA results	AT Calibration
AV Power failure (POWR)	AW Wildlife damage
AZ QC Audit (AUDT)	BA Maintenance/routine repairs
BB Unable to reach site	BE Building/site repair
BI Lost/damaged in transit	BJ Operator error

(Please explain all codes in comment section; use back side of page if necessary)

Operator Comments:

Chain of Custody

ACTION	DATE	TIME	FILTER TEMP °C	NAME
Sample Load	5-4-11	0930		JE
Sample Removal	5-13-11	0900		MR
Sample placed in cooler	5-13-11	0930		MR
Sample shipped to Lab	5-17-11	815		KM
Sample received at Lab	05 17 11	1300	<4C	[illegible]
Start post-conditioning	05 29 11	0900	21C 327	[illegible]

FOR LABORATORY USE ONLY

	Mass:	Dup Mass:	Date:	Analyst:
Preweight	143.699	143.698	04.21.11	[illegible]
Postweight	143.850		05 30 11	[illegible]

Postweigh by: 06.11.11

Lab Comments:

Appendix B

BAAQMD 24-Hour- FIELD SAMPLE REPORT
PM COARSE

Filter ID# 29349

Site Name: ____ San Jose - Jackson ____

Site ID: _____ 7032 _____

Field Technician _____

Instrument ID _____

Cassette ID Number: RP376

Filter Type: FB

Use Filter By: February 5, 2012

☐ Check if data electronically submitted to Laboratory

SAMPLE SUMMARY

Elapsed Time: _____ Hr:Min
Valid Time: _____ Hr:Min

Volume: _____ M^3
Flow CV: _____ %

Start Date / Time: _____/_____

	Ambient Temp: (°C)	Ambient Pressure: (mm Hg)
Average:		
Maximum:		
Minimum:		

Sampler Codes (circle all that apply)
Tm PF Flo FIV FTp Itp
(Note: If there is a **Tm** code, a Null Code must also be circled.)

Qualifier Codes (Circle any that apply)

IB Asian Dust	IC Chemical Spills/Industrial Accidents
ID Cleanup After a Major Disaster	IE Construction/Demolition
IH Fireworks	II High Pollen Count
IJ High Winds	IK Infrequent Large Gatherings
IL Other	IM Prescribed Fire
IN Seismic Activity	IP Structural Fire
IQ Terrorist Act	IR Unique Traffic Disruption
IS Volcanic Eruptions	IT Wildfire-U. S.
IU Wildland Fire Use Fire-U. S.	OK Agricultural Tilling
OL Highway Construction	OP Roofing Operations

(Please explain all codes in the comments section.)

Null Codes (circle only one as appropriate)

AA Sample pressure out of limits	AB Technician unavailable
AC Construction/repairs in area	AD Shelter storm damage
AE Shelter temperature outside limits	AH Sample flow rate out of limits
AJ Filter damage	AK Filter leak
AM Miscellaneous void	AN Machine malfunction
AO Bad weather	AP Vandalism
AQ Collection error	AR Lab error
AS Poor QA results	AT Calibration
AV Power failure (POWR)	AW Wildlife damage
AZ QC Audit (AUDT)	BA Maintenance/routine repairs
BB Unable to reach site	BE Building/site repair
BI Lost/damaged in transit	BJ Operator error

(Please explain all codes in comment section; use back side of page if necessary)

Operator Comments: _____

Chain of Custody

ACTION	DATE	TIME	FILTER TEMP °C	NAME
Sample Load				
Sample Removal				
Sample placed in cooler				
Sample shipped to Lab				
Sample received at Lab				
Start post-conditioning				

FOR LABORATORY USE ONLY

	Mass:	Dup Mass:	Date:	Analyst:
Preweight	144.923	144.923	1/6/12	EK
Postweight				

Postweigh by: _____

Lab Comments: _____

Appendix C: Monthly Worksheet

BAAQMD PARTISOL PLUS PM 2.5 MONTHLY QC WORKSHEET

Station number		**Date**	
Location		**AQIS**	
model	**2025**	**BAAQMD #**	
Comments			

ROUTINE MAINTENANCE

Check Actions Performed This Month: [2025 Manual Section Number]		**Date Last Performed:**
Every 2 weeks [ ]	External leak check	
Monthly or 15 runs [ ]	Disassemble PM2.5 VSCC and clean [G.4.1]	
Monthly or 15 runs [ ]	Disassemble PM10 inlet and clean [G.1]	
Monthly [ ]	Inspect/Clean interior cabinet and down tube [G.1]	
Monthly* [ ]	Inspect and/or clean ' V' seals [12.3.1]	
Every 6 months: [ ]	Check back-up AA battery voltage: replace if < 4.2 volts	
Every 6 months: [ ]	Clean or replace air intake filters [Service Manual, 3.1.4]	
Annually [ ]	Replace particle trap upstream of flow controller [12.3.2]	

* Monthly or as needed after failed leak check

ACTION [2025 MANUAL SECTION NUMBER]	**INDICATED**	**ACTUAL**	**% DIFFERENCE OR DIFFERENCE**	**CONTROL LIMITS**
Ambient temperature [12.2.1]				+/- 2 ^{o}C
Filter temperature [12.2.2]				+/- 2 ^{o}C
Ambient Pressure [12.2.3]				+/- 10 mmHg
External Leak Check [12.2.5]				< 25 mmHg
Flow rate [12.2.6]				+/- 4% (16.00 - 17.33 l/m)
Clock Time				+/- 2 min

STANDARDS	**S/N**	**CERTIFICATION EXPIRATION DATE**
Delta Cal		
Druck 705		
TEGAM 840A		

NOTES All Standards are traceable to primary NIST traceable Standards; Certification available upon request

Appendix D

BAAQMD PARTISOL PLUS PM COARSE MONTHLY QC WORKSHEET

Station Number	**7032**	**Date**	
Location	**San Jose-Jackson**	**AQIS**	
Model	**2025**	**BAAQMD #**	
Comments			

ROUTINE MAINTENANCE

Check Actions Performed This Month: [2025 Manual Section Number]			**Date Last Performed**
Every 2 weeks	External Leak Check dates listed below		
Monthly [ ]	Clean Pass Through Adapter tube		
Monthly or every 15 runs [ ]	Disassemble PM10 inlet and clean [G.1]		
Monthly [ ]	Inspect/Clean interior cabinet and down tube [G.1]		
As needed or after failed leak check	Inspected and/or cleaned ' V' seals [12.3.1]	**Yes** ___ **No** ___	
Every 6 months: [ ]	Check back-up AA battery voltage: replace if < 4.2 volts		
Every 6 months: [ ]	Clean or replace air intake filters [Service Manual, 3.1.4]		
Annually [ ]	N/A		

ACTION [2025 MANUAL SECTION NUMBER]	**Leak Check dates every 2 weeks**	**INDICATED**	**ACTUAL**	**% DIFFERENCE OR DIFFERENCE**	**CONTROL LIMITS**
Ambient temperature [12.2.1]					+/- 2 ^{o}C
Filter temperature [12.2.2]					+/- 2 ^{o}C
Ambient Pressure [12.2.3]					+/- 10 mmHg
External Leak Check [12.2.5]					< 25 mmHg
External Leak Check [12.2.5]					< 25 mmHg
External Leak Check [12.2.5]					< 25 mmHg
Flow rate [12.2.6]					+/- 4% (16.00 - 17.33 l/m)
Clock Time					+/- 1 min

STANDARDS	**S/N**	**CERTIFICATION EXPIRATION DATE**
Delta Cal		
Druck 705	N/A	N/A
TEGAM 840A	N/A	N/A

NOTES All Standards are traceable to primary NIST traceable Standards; Certification available upon request