

Identifier: **SOP-5145**

Revision: **2**



Effective Date: 3/29/2010

Next Review Date: 3/1/2014

Environmental Programs Directorate

Standard Operating Procedure

for **AIRNET—REPLACEMENT OF PUMPS AND MEASUREMENT OF AIR FLOW RATES AT SAMPLING STATIONS**

APPROVAL SIGNATURES:

Subject Matter Expert:	Organization	Signature	Date
Shannon Allen	WES-EDA	Signature on File	3/22/2010
Responsible Line Manager:	Organization	Signature	Date
Craig Eberhart	WES-EDA	Signature on File	3/29/2010

1.0 PURPOSE AND SCOPE

This standard operating procedure (SOP) states the responsibilities and describes the replacement of AIRNET sampling pumps and the measurement and verification of airflow after installation for the Los Alamos National Laboratory (LANL) Waste and Environmental Services Division (WES).

All WES participants shall implement this procedure when changing out pumps, measuring air flow, or verifying gage readings of AIRNET sampling stations.

2.0 BACKGROUND AND PRECAUTIONS

2.1 Background

It is important to use accurate airflow measuring devices at the AIRNET air monitoring stations. Air concentrations are calculated using flow volumes which are derived from time of flow and rate of flow. To have a high reliability program pumps need replacement and maintenance.

2.2 Precautions

None.

3.0 EQUIPMENT AND TOOLS

- AIRNET vacuum pump
- Air flow calibrators that are in calibration, tubing, and accessories

4.0 STEP-BY-STEP PROCESS DESCRIPTION

4.1 Replacement of Pumps

- | | |
|--------|--|
| Worker | <ol style="list-style-type: none">1. When approaching a station, if the AIRNET station housing appears damaged in such a way that electrical wires are exposed or could be shorted to the housing or conduit, do not touch the station! Immediately report the damage and request that an electrician repair the electrical damage. <hr/> <ol style="list-style-type: none">2. Wear steel-toed shoes anytime you are carrying or lifting pumps. Use the lift table and tailgate of the truck to assist with lifting pumps. Practice safe lifting techniques. Use two people to lift and carry pumps where there is a long carry or if the station is high. <hr/> <ol style="list-style-type: none">3. Replace vacuum pumps in the AIRNET sampling stations every six months according to the rotation schedule in the AIRNET Field Log. Replacement pumps are kept at TA-54-1001. <hr/> <ol style="list-style-type: none">4. Whenever a pump is replaced, reattach exhaust and intake hoses, and check all fittings and airflow passages for leaks or obstructions. Pay particular attention to the joints between airflow tubing and brass fittings located on the rear of the sampling head. Replace tubing that appears brittle or torn. <hr/> <ol style="list-style-type: none">5. After a new pump has been installed in the station, measure the flow through the sampling heads, see section 4.2. |
|--------|--|

- Worker
6. Enter the following information in the field log book or the palm computer (see SOP 5179):
 - station number and location
 - date and time
 - name or initials of installer
 - end filter flow (as-found flow)
 - end silica gel flow (as-found flow)
 - replaced pump number
 - installed pump number

4.2 Measurement and Adjustment of Filter Flow

- Worker
1. Record the date, station number, end filter flow rate, end silica gel flow rate, and timer reading.
 2. Disconnect the air filter cartridge from the sampling head, and set aside temporarily. Replace with a cartridge containing a clean filter.
 3. Slip the Model C-828 Air Flow Calibrator over the clean cartridge. Record the flow in CFM prior to adjustment in the field notebook or on the palm computer.
 4. Using the large black knob on the front of the sampling head, adjust air flow to 4.0 ± 0.4 CFM, indicated on the calibrator. Record the final flow in the field notebook or in the palm computer.
 5. Remove the Air Flow Calibrator from the sampling head, remove the clean cartridge, and reconnect the original air filter cartridge.
 6. Slip the calibrator over the cartridge with the original filter and record the indicated flow in the field notebook or in the palm computer.

4.3 Verification of Silica Gel Air Flow using the Mini-Buck Calibrator

- Worker
1. Place the Mini-Buck Model M-30 or M-5 Calibrator in the air station enclosure, in the shade if possible. Turn on the Calibrator.
 2. If additional soap solution is needed, add approximately 1 teaspoon of soap solution to the inlet tube at the bottom of the Calibrator.
 3. Pull the tritium cartridge out of its holder on the bottom of the air sampling enclosure. Connect the quick-disconnect fitting to the bottom of the cartridge. Connect the outlet fitting of the calibrator to the cartridge. (The outlet fitting is at the end of a piece of flexible tubing connected to the Model M-30 or M-5.)
 4. Depress the measurement button on the M-30 or M-5, and hold until a bubble forms in the base of the unit (normally about 1 second). Release button.

- Worker
5. Within 1 minute the flow, in cc/min or L/min, should be displayed on the calibrator. Note in the logbook or the palm computer the flow indicated by **both** the calibrator and the flow meter.
 6. Repeat steps 4 and 5 for a total of three readings. The average of the three readings should read within 10% of the value on the flow meter. If the value is off by more than 10%, check the tubing and connections on the silica gel cartridge to ensure there are no leaks. If this does not resolve the problem, replace the silica gel flow meter and repeat steps 4 through 6.
 7. Turn off and disconnect the calibrator. Remove the quick-disconnect fitting from the cartridge and return the cartridge to its holder.

4.4 Verification of Silica Gel Air Flow using the Bios Definer

- Worker
1. Place the Bios Definer Calibrator in the air station enclosure, in the shade if possible. Turn on the Calibrator. The Definer 220 User Manual should be used as a reference for operation and settings.
 2. Pull the tritium cartridge out of its holder on the bottom of the air sampling enclosure. Connect the quick-disconnect fitting to the bottom of the cartridge. Connect the outlet fitting of the calibrator to the cartridge. (The outlet fitting is at the end of a piece of flexible tubing connected to the outlet of the Bios Definer.)
 3. Select MEASURE on the screen and press enter..
 4. The flow should be displayed on the calibrator. Note in the logbook or the palm computer the flow indicated by **both** the calibrator and the flow meter.
 5. Repeat steps 3 and 4 for a total of three readings. The average of the three readings should read within 10% of the value on the flow meter. If the value is off by more than 10%, check the tubing and connections on the silica gel cartridge to ensure there are no leaks. If this does not resolve the problem, replace the silica gel flow meter and repeat steps 3 through 5.
 6. Turn off and disconnect the calibrator. Remove the quick-disconnect fitting from the cartridge and return the cartridge to its holder.

4.5 Testing the GFCI with the Greenlee® GFCI Tester

- Worker
1. Unplug all equipment from the outlet to be tested. Test all receptacles on the circuit one at a time.
 2. Set the selector to 0 mA.

3. Compare the LEDs illuminated to the diagram on the face of the unit. Ensure that the tester is indicating proper wiring. If proper wiring is not indicated, contact an electrician to inspect the circuit and perform any necessary repairs.
4. Press the GFCI's built in reset button, then press the test button. Press the reset button again to reset the circuit.
5. Move the selector on the test unit to 3 mA. Wait for the red test button to illuminate four times. The circuit should not trip at 3 mA. If the circuit does trip at 3 mA, continue to use the circuit, but contact an electrician to inspect the circuit for over sensitivity.
6. Keep moving the selector up until the GFCI trips, allowing time for the tester to run four test cycles. The tester should trip the circuit between 5 mA and 7 mA. If the circuit does not trip until 10 mA or greater, discontinue use of the GFCI until it can be replaced by an electrician.
7. Record GFCI testing results in the palm computer or in the field notebook.

4.6 Record Pump Change Data in the Pumps and Panels Database

- Worker
1. Once pump replacement has been completed, ensure the following information is transferred to the AIRNET Pumps and Panels database:
 - date and time
 - name or initials of worker
 - pump number
 - identifier (e.g., serial number) of the calibrators used
 - flow of silica gel (as indicated by calibrator)
 - silica gel flow meter reading
 - flow of filter (as indicated by calibrator)
 - filter flow meter reading
 - test of GFCI breaker
 2. If the palm computer was used for field data collection, transfer collected data by downloading off the palm computer into the Palm database.
 3. Check and load the field holding data in the Pumps and Panels database.
 4. If the field data was recorded manually in the field notebook, manually enter the location data and date the pump was removed in the pump location table.
 5. Validate that data was entered correctly into the Pumps and Panels database by checking all new entries or transfers in the pump location table. Document verification in the field notebook.

4.7 Calibration of Air Flow Calibrators

- Worker
1. Every year, recalibrate the C-828 calibrators according to WES SOP-5156 or WES SOP-5157.

2. Every year, recalibrate the Model C-30 and M-5 Mini-Buck calibrators and the Bios Definer. Calibrations will be arranged through the LANL Standards and Calibration Laboratory with a qualified vendor.

4.8 Records Management

- Worker
1. Maintain and submit records and/or documents generated to the Records Processing Facility according to EP-DIR-SOP-4004, Records Transmittal and Retrieval Process, AIRNET files at least annually.
 - Logbook or other related documentation

5.0 REVISION HISTORY

Revision No. <i>[Enter current revision number, beginning with Rev.0]</i>	Effective Date <i>[DCC inserts effective date for revision]</i>	Description of Changes <i>[List specific changes made since the previous revision]</i>
0	4/4/95	New document.
1	10/9/96	Safety considerations added, documentation requirements added and clarified, calibration tolerance corrected to ± 0.4 from ± 0.2 CFM, removed steps for Tygon exhaust tubing.
2	7/16/97	Added references to new model of Buck calibrator.
3	8/26/98	Changed criteria and steps for adjusting flow, added Mid-Sampling Period Change of Flow Form.
4	2/2/99	Added requirements for wearing safety shoes when moving pumps; separated steps for calibrating filter and gel flows.
5	2/22/00	Made minor changes to HCP, added HCP as attachment 1, removed attachment "Mid-Sampling Period Change of Flow Form," and added reminders to use lifting equipment and gloves.
6	11/1/00	Changed weight of pumps, changed steps to measure flow after pump replacement.
7	12/10/02	Quick-change revision to change "breaker" to "GFCI" and instructions when calibrator does not agree with silica gel flow meter.
8	12/14/04	Describe use of in-house calibrators
0	4/2/2009	New document number and reformatted for WES division. Formerly ENV-MAQ-205, R8. Added text on the Bios Definer.
1	4/27/2009	Revision to SOP-5145, R0. Changed the word "calibration" to "replacement" or "verification".
2	3/29/2010	Changed GFCI procedure to include using the Greenlee® GFCI tester.

[Using a CRYPTO Card, click here for "Required Read" credit.](#)

If you do not possess a CRYPTOCARD or encounter problems, contact the EP Central Training Office.