TI 226E Leak Check

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1. PURPOSE AND APPLICABILITY

The purpose of this SOP is to describe the procedure used to check the modules at IMPROVE sites for any air leaks.

2. SUMMARY OF THE METHOD

Vacuum readings are taken from each pump and its corresponding module to ensure that the readings from each pump and module pair are similar to each other. Pump and module differences should not be greater than 2.0" Hg. If differences are too large, troubleshooting procedures are performed to determine where the leak is coming from.

3. CAUTIONS

After zeroing the vacuum gauge, make sure to close the switch on the gauge. If the tab is left open, glycerin will leak out.

4. EQUIPMENT AND SUPPLIES

- Vacuum kit including the following:
  - Adapter
  - Probe
  - Coupler
  - Manifold plug
  - Vacuum grease
  - Vacuum gauge
- Maintenance spare parts kit including the following:
  - Spare O-rings
  - Cyclone
  - Manifold
  - Braided hose
  - Valve

5. PROCEDURE

5.1 Leak Check at the Pump Hose

1) Take the vacuum gauge out of the vacuum kit. Zero the gauge by briefly lifting the yellow tab at the top to the "Open" position. After a few seconds, return the tab to the "closed" position to ensure that glycerin does not leak from the gauge.
2) Detach the pump hose from underneath the module and attach it to the large opening of the coupler. Attach the white plastic end of the vacuum gauge to the smaller end of the coupler.
3) On the keypad of the controller, press "Enter" once to get to the main menu.
4) On the main menu screen, press "2" (not F2). This will activate all the pumps one by one.

5) The needle on the pressure gauge will rise once the pump it is connected to is activated. Record this value in cell A28 of the audit/calibration sheet or under "Pump Reading" on the Leak Check form, whichever is being used.
6) Press "Enter" to stop the pumps and exit out of the menu.
7) Disconnect the vacuum gauge, coupler, and pump hose. Restore the original configuration of the system.

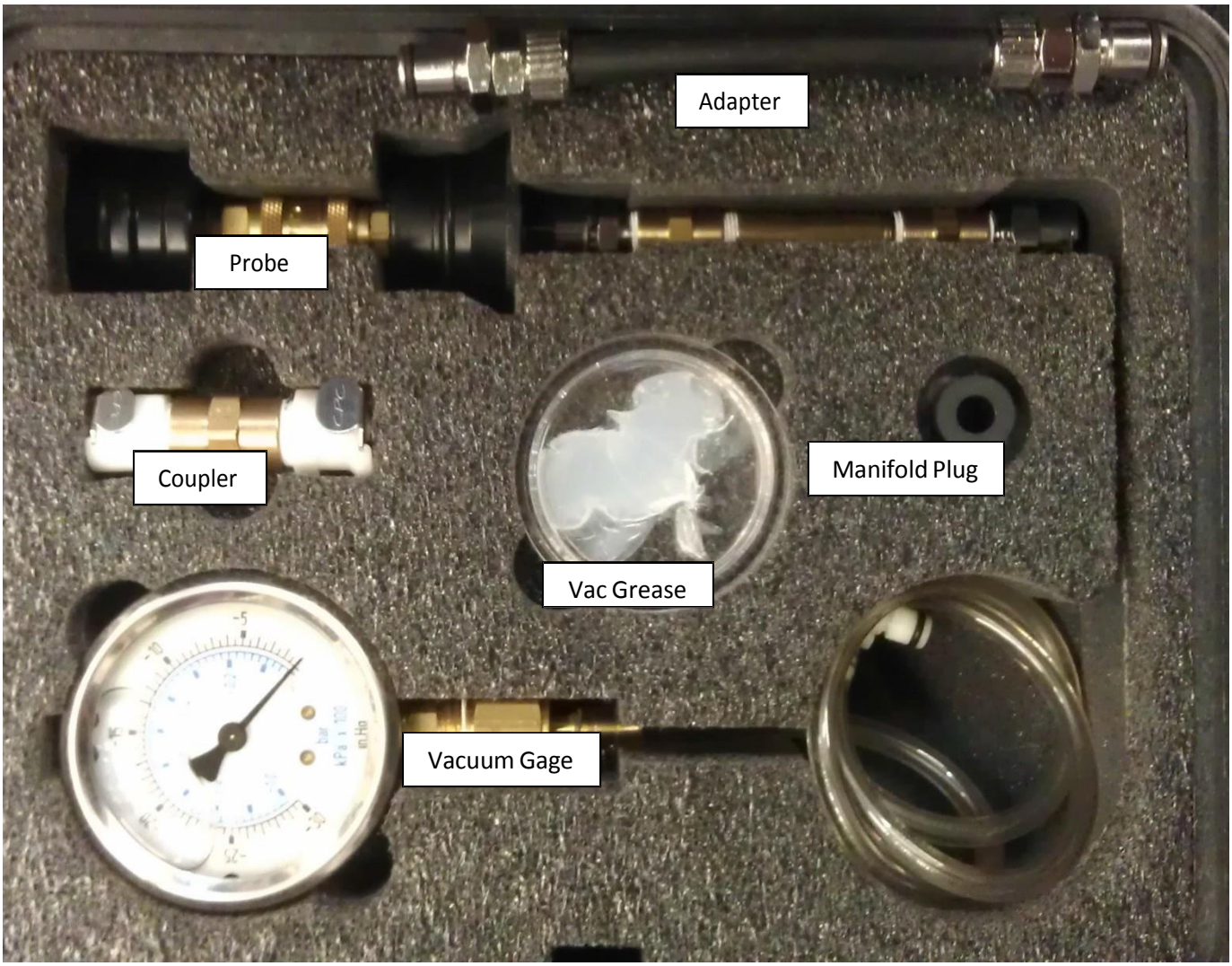

Figure 1. Vacuum Kit

5.2 Leak Check at the Module

1) Open the module that needs to be leak checked and make sure that it has a complete filter cartridge. Remove the black plastic cap from the bottom of the module. Then, remove the plug from the Tee, which is the rectangular part of the module located right above the black cap.

2) Insert the white end of the gauge into the end of the probe.
3) Fully insert the probe into the Tee. If the probe does not go into the Tee easily, try applying a very small amount of vacuum grease on the circumference of the top end of the probe. It is important to get the probe fully inserted into the Tee, as the reading on the vacuum gauge will not be accurate otherwise.
4) From "Auto Mode" on the keypad to the controller, press "Enter" to get to the main menu, and then press "F3" for the advanced menu. The display will ask for a code. Press the numbers "1123." Do not press "Enter" after keying in the code.
5) Press "F1" for "Calibration."
6) Use "F3" or "F4" to cycle through to the module being tested. For this particular procedure, it does not matter what position is running.
7) The needle on the vacuum gauge should rise. Record the value in cell B28 of the audit/calibration sheet or under "Module Reading" on the Leak Check form, whichever document is being used.
8) The difference between the pump and module readings should be less than two inches. If the difference is two or less, the leak check test is complete. If the difference is greater than two, continue to the next section.

5.3 Leak Check at the Manifold

If the difference between the module and the pump is greater than two inches, this means hat there may be a leak in one of five different places:

- Manifold
- Braided hose
- Valve
- Cyclone
- Cartridge

To narrow it down, perform the following test at the manifold:

1) Insert the end of the vacuum gauge (the white plastic barbed fitting) into the large circular end of the manifold plug (pictured below):

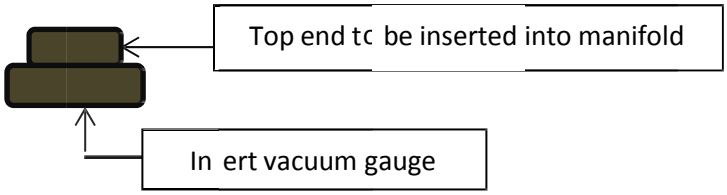

Figure 2. Manifold Plug

2) Use the instructions listed in section 5.2 to go into "Calibration" mode. Use "F3" and "F4" to advance to the appropriate module being tested. Stay on position #1 for the module.

3) There are four holes on the underside of the manifold that normally encompass the tops of the filter cassettes. Insert the top end (smaller end) of the manifold plug into the bottom of the first hole, where the first filter cassette would normal sit.
4) The needle on the vacuum gauge should rise. Record this reading in the comments section of the audit/calibration sheet or under "Manifold Reading' on the Leak Check form, whichever is being used.
5) If the difference between the manifold and pump readings is less than two inches, the problem likely resides in the cyclone or the cartridge. Check to see if the cyclone is seated properly and that the connection between the cyclone and the Tee is straight. Check the cartridge to ensure that it is seated properly and that all of the cassettes have O-rings in the appropriate places. Remedy any issues and note the findings in the comments section on the audit/calibration sheet or on the Leak Check form.
6) If the difference between the manifold and pump readings is more than two inches, a leak likely exists in the manifold, the braided hose, or the valve. To narrow it down even further, continue to the next section.

5.4 Leak Check at the Valve

To determine whether or not there is a leak in the valve, compare the vacuum from the top of the valve to the pump by performing the following procedure:

1) Find a short piece of pump hose (if included in the maintenance kit) or borrow a full pump hose from an alternate pump at the site.
2) Put the vacuum gauge in one end of the pump hose. Disconnect the braided hose from the valve and then connect the pump hose to the valve.
3) Use the instructions in section 5.2 to go into "Calibration' mode, and then use "F3" and "F4" to get to position #1 of the appropriate module.
4) The needle on the vacuum gauge should rise. Record the value in the comments section of the audit/calibration sheet or on the Leak Check form.
5) If the difference between the valve and pump readings is greater than two inches, there is a leak from the valve. Replace the valve with a spare.
6) If the difference between the valve and pump readings is less than two inches, the leak is likely coming from either the braided hose or the manifold. Replace them both with spare parts.