TROUBLESHOOTING GUIDE FOR THE PORTACOUNT® PLUS RESPIRATOR FIT TESTER MODEL 8020

APPLICATION NOTE ITI-083

Always begin troubleshooting the PORTACOUNT® fit tester by performing the three Daily Checks in the order specified. If all three Daily Checks pass, that means the PORTACOUNT is in good operating condition. Any remaining problems getting good fit factors are probably caused by leaks in the face seal area, improper filters on the mask, an improperly configured fit test adapter, or a defective mask (see note 12).

If using the N95-Companion™, use this guide to check the PORTACOUNT by itself first. If the problem persists, proceed with the *Troubleshooting Guide for the N95-Companion Model 8095 (ITI-084)*.

Step 1 of 3 - Perform Particle Check: (see manual or training video for procedure)

RESULT: Particle count above 1000. (see note 1)

Unit passes Particle Check. Proceed to Zero Check.

RESULT: Particle count below 1000.

Operator confusion:
- Is alcohol cartridge inserted?
- Are filters and other things disconnected from sample tubes?

Dry wick: (see note 2)
- Add alcohol.

Contaminated alcohol:
- Change wick. Discard alcohol in fill capsule and replace with fresh alcohol. Use alcohol from TSI or equivalent (at least 99.5% pure isopropyl).

Plugged nozzle: (see note 3)
- Blow out nozzle using procedure from troubleshooting section of manual.

Air leaking into bypass: (see note 4 and note 13)
- Check filter well covers for leaks by applying tape to seal cover area. Replace the covers if this works.

Flooded optics chamber: (see note 5)
- Run in Count Mode for a while (hours) until count increases. Alternately, run in count mode overnight, then replenish alcohol in the morning.

Room air too clean:
- Generate aerosol with candle or particle generator. (see note 6).
- Relocate to better room. (see note 7).

Internal leak: (see note 13)
- Obtain factory service.

Step 2 of 3 - Perform Zero Check: (see manual or training video for procedure)

RESULT: Count drops to zero quickly and stays there.

Unit passes Zero Check. Proceed to Max Fit Factor Check.

RESULT: Count does not drop at all, or drops significantly, but never reaches zero or does not stay on zero.

Leaking zero check filter: (see note 8)
- Try second filter.
- Attach 2 filters in-line.

Worn out (leaking) sample tube end:
- Cut 1/4-inch from end of sample hose where filter attaches.

Leaking O-ring on alcohol cartridge: (see note 9)
- Reseat O-ring (remove and reinstall).
- Swap with O-ring from storage cap.
- Smear small amount of grease on O-ring.
- Replace O-ring (TSI p/n 2501093).

Flooded optics chamber: (see note 5)
- Run in count mode for a while or overnight.

Twin tube is reversed:
- Match color code on fittings.

Internal leak: (see note 13)
- Obtain factory service.

Valve stuck on ambient side: (see note 11)
- Obtain factory service.

Bad laser diode: (see note 10)
- Obtain factory service.

Step 3 of 3 - Perform Max Fit Factor Check: (see manual or training video for procedure)

RESULT: Fit Factor above 50,000.

Unit Passes Max Fit Factor Check. If all 3 Daily Checks have now passed, the unit is in good operating condition and ready to perform fit tests. (see note 12)

RESULT: Fit factor below 50,000:

Leaking zero check filter:
- Go back and perform zero check again. Watch for occasional particle.

Internal leak: (see note 13)
- Obtain factory service.

RESULT: Low particle warning message.

Zero check filter on ambient (wrong) tube:
- Filter must be on clear sample (mask) tube.

Ambient hose blocked:
- Remove obstruction or pinch in tubing.

Valve stuck on mask side: (see note 11)
- Obtain factory service.

RESULT: Fit Factor very low (typically below 5).

Zero check filter not attached:
- Attach filter, wait 20 seconds, run test again.

Valve stuck on ambient side: (see note 11)
- Obtain factory service.

Internal leak: (see note 13)
- Obtain factory service.

Notes:

1- While 1000 particles per cm^3 is technically enough, it's desirable to have more. This is especially true if you require a minimum fit factor above 1000. If the unit has historically counted higher concentrations in the same location try some of the solutions offered for "Particle count below 1000."

2- Make absolutely certain that there is sufficient alcohol in the wick. Fill the alcohol capsule to about 1/2-inch above the fill line so that more surface area of the wick will be exposed to the fluid. When the alcohol cartridge barely touches the liquid alcohol, it may not be able to soak up sufficient liquid.

3- The second edition (July 2001) of the PORTACOUNT Operation & Service Manual contains a procedure at the end of the Troubleshooting chapter with instructions on how to clear the nozzle inside the PORTACOUNT. The manual can be found behind the divider in the lid of the PORTACOUNT carrying case, on the software CD that comes with all PORTACOUNTS, or on the TSI Web site (www.tsi.com).

4- Leaks in the filter well covers (round covers on bottom of PORTACOUNT) cannot usually be seen. The best way to determine if this is the problem is to use strips of tape to seal the area around the covers. If this succeeds in getting the particle count up, replace both of the filter well covers. The unit can be used with the tape on in the interim, as long as the Daily Checks all pass.

5- If the PORTACOUNT is left idle (running, with no test in progress) it will shut itself off after about 15 minutes. This is a power saving feature. To force the PORTACOUNT to run forever, put it into count mode. If the flooding is slight, you may see the particle count slowly rise as excess alcohol evaporates. When the count stabilizes, it's probably OK to use. Sometimes it's more convenient to simply let it run overnight. It won't wear it out. Leave the alcohol cartridge in. The next morning, fill with fresh alcohol and see if it works better.

6- Some areas do not have a sufficient number of naturally occurring particles, so it's necessary to add particles from some local source. The best way to do this is to light a candle in the room. Use an ordinary unscented candle. One candle in an average size (150 ft^2) is usually enough. It helps if the candle is in a holder with a simple hood of some kind. This allows combustion particles that may be too small for the PORTACOUNT to see to coagulate into larger particles. Light the candle 15 minutes prior to fit testing and leave it burning all the time. The room will fill with particles and stabilize when it reaches equilibrium with the ventilation system. Keep the candle away from the PORTACOUNT in a corner of the room where it won't get knocked over. If you are not allowed to have an open flame, TSI sells the Model 8026 Particle Generator that can be used instead. Note that some rooms may have such a high ventilation rate that artificial particle generation cannot possibly keep up. Reduce the ventilation or find a different location.

7- It's very difficult to tell if low particle counts are due to a malfunctioning PORTACOUNT or due to naturally clean air. Some buildings use high efficiency filters in the ventilation system which reduces particle concentrations significantly. If available, a second PORTACOUNT can be used to verify concentrations. If both units read low, the ambient concentration probably is very low. Sometimes the best solution is to do fit testing in a different location with a more suitable ambient particle concentration.

8- Zero Check Filters (TSI p/n 1206066) can develop small leaks as they age. TSI supplies 2 filters with each PORTACOUNT for this reason. If the PORTACOUNT fails to zero, try it with the other filter. If the second one fails too, try attaching both filters together in-line. Two leaky filters usually add up to one good one.

9- Leaking alcohol cartridge O-ring can cause both small and large leaks. You can often verify that this is the problem by firmly grasping the handle of the alcohol cartridge and firmly pushing it up/down/left/right while watching the PortaCount try to zero. Don't turn the handle. If doing this causes the particle count to change significantly, the O-ring is leaking.

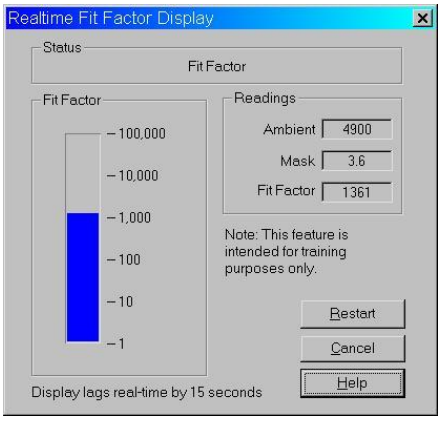
10- If the laser diode inside the PORTACOUNT fails totally, it will not count particles at all. If the laser diode become unstable, it will cause "false counts" that jump or vary up and down randomly. Normal particle concentrations drift up and down, they don't make sudden jumps.

11- If the switching valve gets stuck, both samples will be taken through the same tube. If both samples are taken through the sample tube that is connected to the zero filter, a low particle warning will result during what should be the ambient sample, because the PORTACOUNT thinks the ambient air has a concentration below 1000. If both sample are taken through the blue ambient tube that has no filter on it, a fit factor near 1 will be measured since both samples are the same concentration of unfiltered ambient air. If the valve is stuck on the ambient side the Zero Check will always fail, so if you got all the way to the Max FF Check, a stuck valve has to be stuck on the clear sample line side and will cause a low particle warning. Verify by putting the zero filter on the blue ambient tube and running the Max FF Test again. If the valve was working right you will get a low particle warning, but if the valve is stuck you will get a fit factor near 1.

12- When the PORTACOUNT passes all three of the Daily Checks, it means the instrument is working properly. If you are still having problems getting people to pass a fit test, you need to take a close look at the respirator, adapter, or connection to them. One common mistake is to use the wrong filters on the mask during fit testing. You must use a high efficiency NIOSH series-100 or series-99 filter for fit testing regardless of the cartridge used in the workplace. Chemical vapor cartridges do not stop the microscopic particles that the PORTACOUNT uses. Look for filters that are not screwed on tight or for gaskets and valves that may be missing or damaged.

13- When there is no flow through the PORTACOUNT, the particle count has to be zero. If it's not zero, it means there is a leak someplace, perhaps inside the instrument. To test this, put the PORTACOUNT in Count Mode without anything attached to the sample hoses. Verify a good particle count (see Step 1 of 3). Then plug the sample hose (clear tube) with your finger. The particle count should drop quickly to zero and stay there. If there are any particles at all, there is a leak someplace. Check all hoses, connections, and the alcohol cartridge O-ring (note 9). If the leak is internal, obtain factory service.

Tip: One very effective way to find respirator leaks is to utilize the Real-Time Fit Factor Display that is a feature of FitPlus Software. Hook the respirator wearer who is having difficulty getting a good fit up to the PORTACOUNT like normal and initiate the Real-Time display (look under the PORTACOUNT Menu in FitPlus software). This will display the fit factor on a vertical bar graph in near real-time. Start by pressing the mask tightly against the face. If that does not cause the fit factor to go way up, there is a leak someplace on the mask. Now you can tinker with the mask, filters and straps while watching the fit factor change. When the fit factor jumps way up, you found the problem.



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