

PORTACOUNT® Mask Fit Tester

PORTACOUNT® Plus Model 8020
March 2010

NOTE: Guides are to be used by trained personnel only and DO NOT replace the manufacturer's operations or technical manuals. These guides were developed by field personnel for utilization by EPA and their contractors and are helpful in quick start-up and operations. Various limitations have been identified through the experience of the development group. Different makes, models, and updates to this equipment may change the limitations. It is recommended that calibration, maintenance, and use be recorded in a log book. If you have any changes or revisions please email one of the following: stevenson.peter@epa.gov, boykin.michael@epa.gov, chong.margaret@epa.gov, kroone.janice@epa.gov, zintak.leonard@epa.gov.



NOTE: The measurement provided by the PORTACOUNT® Plus is an assessment of the respirator fit during a fit test only. Respirator fit at other times will vary and the use of a seal check is required prior to each use.

Uses:

The PORTACOUNT® Plus Respirator Fit Tester is used to conduct a quantitative respirator fit test (QNFT) for half face, full face, and disposable respirators. OSHA requires that all respirators with a tightfitting facepiece be fit tested. This includes positive pressure masks like PAPR and SCBA. It also provides verification that after the individual has received respirator training, that the person has learned how to properly don and wear a respirator without assistance. It also ensures that the individual has received a respirator of the right size and is capable of providing intended protection when worn properly. The sampling adapters allow for continued use of a respirator. The PORTACOUNT® Plus Respirator Fit Tester software provides documentation and record keeping functions and may be used to create testing protocols.

Limitations:

- Insensitive to variations in particle size, shape, composition, and refractive index.
- Individual to be fit tested cannot smoke 30 minutes prior to test.
- Adapters needed for Scott and MSA respirators in order to perform fit tests.
- Test masks cannot be used for personal protection.
- Sample tube can fog during fit tests, be careful of condensation flowing down. If too much condensation builds up, change the sample tube.

Quick Start-up and Operation:

- The person conducting the fit test must have a clear understanding of respiratory protection, respirators and have been trained to conduct fit testing.

- All personnel who wear respirators must be taught how and why they are used. This training should be done prior to the fit test, not during.
- Install FitPlus™ for Windows Software onto a computer using the provided cd or diskette.
- Connect the AC Adapter (or battery) to the PORTACOUNT® Plus and turn it on by pressing the On/Off key. The instrument will run through a 60-second warm-up period before it's ready to go.
- Connect the PORTACOUNT® data port to the computer's RS-232 serial port using the cable provided.
- Change out "For Storage Only" plug with alcohol wick (2-propanol 99.5 +%). Ensure PORTACOUNT® is always stored with "For Storage Only" plug in place. (See "Adding Alcohol" section).
- Perform Daily Checks.

Daily Checks:

The following tests are to be performed prior to each test, and in the same order. If the Software is being used, the tests will be run automatically. If the Software is not being used, then the tests can be run manually.

Ambient Particle Check

Ensures that the PORTACOUNT® is counting particles successfully, and that there are enough particles in the ambient air to conduct a fit test.

To perform the test without the Software:

- After the instrument finishes its 60 second warm-up, put the machine in count mode by pressing the count mode key. (The zero check filter should not be attached for the ambient particle check. Also the alcohol wand must be installed).
- The particle count should be >1000 particles/cm³, otherwise the PORTACOUNT® will not perform a fit test.

Zero Check

Makes sure that there are no leaks in the PORTACOUNT®.

- Keep the PORTACOUNT® in Count Mode.
- Attach the zero check filter to the clear tube.
- The reading should immediately drop to 0. If the number slightly fluctuates, it is still ok, as long as it reads 0 most of the time.

Max Fit Factor Test

Ensures that the PORTACOUNT® is capable of measuring very high fit factors and that the internal switching valve is working properly.

- Attach the zero check filter to the sample tube.
- Enter the Fit Test mode.
- Press the test start/stop key.
- Perform one test, approximately 1 minute.
- The reading should be $>50,000$. If the instrument reads lower, there is a problem.

Additional Operation:

- Adapters are available for the PORTACOUNT[®] Plus, so it can be used to fit test various different respirators from different manufacturers.
- PORTACOUNT[®] can be run on battery or AC power.
- Three modes available with the unit: Fit Test Mode, Count Mode, and External Control Mode.
- Three different status messages available: Low Battery, Low Particle, and Service
- Recommended to keep the zero check filter on the end of the sampling tube whenever the instrument is on, but not conducting a fit test, to keep foreign particles out.

Precautions:

- Remove the nose cup prior to testing, as it will cause interference.
- Fit Testing People who smoke cigarettes or cigars:
 - Smokers can exhale particles at least 30 minutes after they have smoked a cigarette or cigar. The PORTACOUNT[®] Plus can count these particles and interpret them as if they were caused by a face seal leakage. Individuals should be instructed not to smoke at least 30 minutes prior to their fit test.
- Fit Testing with Generated Aerosols:
 - The instrument can measure particle concentrations and fit factors when generated aerosols (i.e., corn oil, salt) are used, however, these aerosols may cause the unit to need more frequent cleaning and calibrations.
- Fit Testing Near Irritant Smoke:
 - Do Not conduct a fit test in close proximity to sources of irritant smoke like those used for qualitative fit testing. The irritant smoke is corrosive and can damage the instrument. Testing near sources of amyl-acetate (banana oil) is not a problem.
- Sample Tube Length:
 - The Twin Tube Assembly is about 5½ feet long and must not be lengthened except for the few inches added by a tube adapter.
 - The two sample tubes must be nearly the same length for accurate fit testing.

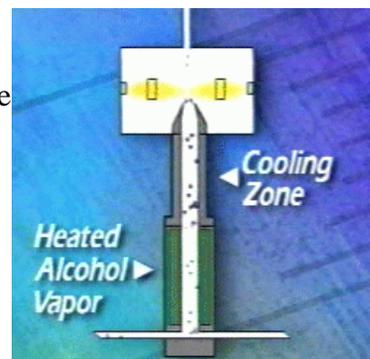
Principles of Operation:

The PORTACOUNT[®] Plus measures a respirator's fit by comparing the concentration of microscopic particles outside the respirator to the concentration of particles that have leaked into the respirator. The ratio of these two concentrations is called a fit factor. A fit factor of 100 means that the air inside the respirator is 100 times as clean as the ambient air.

Since the microscopic particles cannot pass through the class-100 or class-99 filters used on the respirator, they must have entered through a leak in the respirator.

The PORTACOUNT[®] has two sample tubes, one for the ambient air, and the other attaches to the respirator, and samples it from the inside. A valve inside the PORTACOUNT[®] switches from one tube to the other according to a programmed sequence.

The PORTACOUNT[®] operates using a miniature, continuous-flow Condensation Nucleus Counter (CNC), also known as a Condensation Particle Counter (CPC). A CNC takes particles that are too small to be easily detected, enlarges them to an easily detectable size, and then counts them. The particles are enlarged into alcohol droplets, which are then measured by the unit. The instrument is sensitive to particles having diameters as small as 0.02 microns, but insensitive to variations in particle size, shape, composition, and refractive index. Aerosols are drawn through by a diaphragm vacuum pump operating at a flow rate of 0.7 liters per minute.



Adding Alcohol:

The instrument uses isopropyl alcohol at a rate of about one (1) mL per hour, and will last for about 8 hours. The alcohol is used to enlarge the microscopic particles so they can be counted by the machine. The isopropyl (2-Propanol) alcohol used must have very high purity, 99.5 % pure.



The following items are required to add alcohol:

Isopropyl alcohol
Alcohol fill capsule
Storage Cap
Alcohol Cartridge

- Turn the instrument off.
- Open the Alcohol Fill Capsule by twisting the Storage Cap or Alcohol Cartridge. Set the cap or cartridge down on a clean surface with the end standing up to prevent contamination.
- Open a bottle of alcohol. Invert the bottle and insert the nozzle end into the Alcohol Fill Capsule as far as possible to make certain that you cannot inadvertently spray alcohol everywhere.
- Squeeze alcohol into the Alcohol Fill Capsule until it is even with or slightly above the scribed fill-line near the base.
- Ensure that the cartridge is clean. Insert the Alcohol Cartridge into the Alcohol Fill Capsule and turn it clockwise until it locks in place.
- Set the Fill Capsule down and wait at least 2 minutes while the wick inside the cartridge soaks up alcohol.
- Remove the Cartridge from the capsule and gently shake it to allow excess alcohol to drain back into the fill capsule. Stop when excess alcohol is no longer dripping. It is not necessary to wait until the outside surface of the cartridge is dry.
- Insert the cartridge into the Cartridge Cavity of the PORTACOUNT[®]. It should slide in easily. Do Not force it. Align the tab on the cartridge with the corresponding tab on the PORTACOUNT[®] located just above the Cartridge Cavity.
- As full insertion is neared, firmly twist the Alcohol Cartridge until it locks into position. Recap the Alcohol Fill Capsule with the Storage Cap.

OSHA 29 1910.134 Protocol Details:

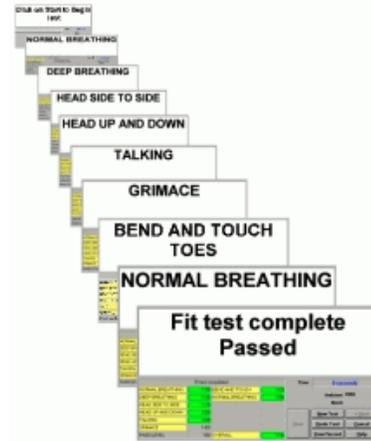
Minimum fit factors: 100 half mask, 500 full-face mask

Exercise Duration: 60 seconds each

Number of Exercises: 8

Exercises:

- 1- Normal Breathing
- 2- Deep breathing
- 3- Head side-to-side
- 4- Head up-and-down
- 5- Talking out loud
- 6- Grimace
- 7- Bending
- 8- Normal Breathing



Normal Breathing: Remain still and breathe as usual.

Deep Breathing: Take long deep breaths as if working hard. Don't overdo it.

Head side to side: Breathe normally while slowly turning the head from side to side. Turn far enough to each side to stretch the neck muscles.

Head up and down: Breathe normally while slowly alternating between looking up at the ceiling and down at the floor.

Talking out loud: Read a prepared paragraph or count out loud to simulate the workplace.

Grimace: Grimace by smiling and/or frowning to create a leak in the respirator face seal. The exercise will often result in a failed fit factor if you are "good" at grimacing. Successful re-sealing is proven by achieving a passing fit factor in the next exercise. Exercise can last for only 15 seconds. The result will be excluded in the final fit factor.

Bend & touch toes: Bend at the waist as if you were touching your toes while breathing normally.

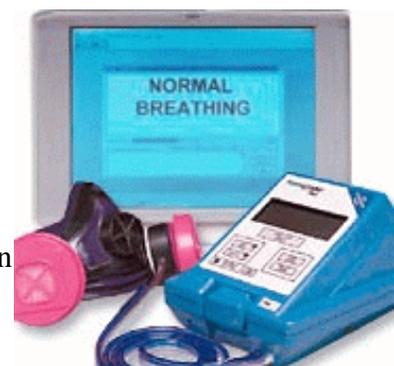
Normal Breathing: Remain still and breathe as usual.

Fit Testing with FitPlus™ Fit Test Software:

Note: Do Not adjust the mask during the fit test at any point.

Any gear that would be worn in the field (i.e. safety glasses, SCBA etc) that might interfere with the respirator fit should be worn during the fit test.

- Connect the AC adapter to the PORTACOUNT® Plus and turn it on by pressing the on/off key. The instrument will go through a 60-second warm-up period before it is ready to go.
- Connect the instrument's data port to the computer's serial port using the provided cable.
- Add alcohol to the PORTACOUNT® Plus.
- Start the FitPlus™ software.
- The software will ask if the user wants to run the Daily Checks. It is recommended that the checks are run prior to use each day.
- Perform the Daily Checks as directed by the software when it first starts or by selecting Daily



Checks from the PORTACOUNT® Menu. The Zero Check filter will be used.

- The software will then offer to begin the fit test at Step 1. Enter in the information about the person to be fit tested. The next time the same person is fit tested, their name will be available to choose from a drop down list. Click Next when done.
- Step 2 requires a respirator to be selected. Enter the information about the respirator that will be used. The next time the same respirator is used, it will be available from a drop down list. Click Next when done.
- **Note: OSHA requires a fit factor pass level of 100 and 500 for half masks and full masks, respectively.**
- Step 3 requires the size of the mask to be entered, along with the fit tester's name or initials. The other settings can also be reviewed to ensure they are correct. Make sure that the fit test protocol is set for the required test. If the necessary test is not available, one can be created by editing a pre-existing protocol. Click Next when done.
- The fit test can now be performed. Allow the person to be tested to don the respirator without assistance.
- Attach the clear sample hose to the respirator worn by the person being fit tested. **Wait at least one minute after donning the respirator before the test is begun This allows the excess ambient air to be exhaled, and an adjustment period for the user.**
- You will then be guided by the entire fit test protocol automatically. When ready, click Start. An audible beep will be heard at the beginning of each exercise. Have the person being fit tested perform the exercises as directed by the computer. The computer will automatically perform the fit test, calculate all factors and save the information to the database. After each test is complete, the results can be reviewed, a report can be printed, or another test can be started. The system will beep three times when the test is complete.



Common Problems in Low Fit Factors:

Not using efficient filters:

- If high-efficiency class 99 or class-100 filters are not used on the respirator, a high fit factor may never be achieved.

Cartridges not tight or the gasket is missing:

- Make sure the cartridges are tight and all gaskets are in position.

Sample tubes too long:

- Longer sample tubes prevent proper purging between the ambient and mask sample.

Starting a fit test too soon after the mask is donned:

- When the respirator is first donned, ambient air particles get trapped inside. The particles are cleared when the person breathes. A full face respirator will take over a minute to clear.

Leaking respirator probe or mask sampling adapters:

- Ensure that the respirator probe (if used) or mask sampling adapters do not leak around the outside.

PORTACOUNT® sample tube leaks:

- Cut a short piece off the end of the tube to expose a fresh end.

Hair interfering with a face seal:

- Make sure there is no hair between the respirator face seal and the individual's skin.

Hair or foreign objects in an exhalation valve:

- Check that the exhalation valve is clear.

Cigarette smoke:

- Do not allow the individual to smoke for at least 30 minutes prior to fit tests.

Frequent Causes for a Failing Factor:

- Improperly worn respirator
- Incorrect mask size/shape
- Defective mask/adapter

Battery Information:

Battery use with the PORTACOUNT[®] Plus is optional. The optional Model 8021 Rechargeable Battery Kit contains three battery packs and an external battery charger. The external charger allows the batteries to be charged separately, while using the instrument at the same time. A fully charged pack will last for about 3 hours.

The battery pack can be left inside the instrument while the AC adapter is plugged in. The battery will recharge, however, the charge rate is very slow. A battery pack will take 24 hours to fully charge when inside the PORTACOUNT[®]. Having a battery pack installed during AC operation will prevent loss of data in the event that the AC adapter is accidentally disconnected if there is a power failure.

When the battery pack runs low on power, the Low Battery warning message will flash on the Display. When this happens, there is about 15 minutes before the instrument will automatically shut down. Complete the test in progress and install a fresh fully charged battery.

NOTE: It is recommended that due to the many types of rechargeable battery configurations, that Equipment Managers verify proper battery charging and operation through monthly equipment operation until battery is discharged prior to recharging.

Using the Battery Pack:

- Turn the instrument over and remove the battery compartment cover.
- Plug a fully charged battery pack into the battery connector located inside the battery compartment. Note that the two connector pins are different sizes. Do Not force the connectors. They should slide in easily.
- Place the battery pack inside the battery compartment. Tuck the wires in so they do not interfere with closing the cover. Ensure that the wires are not underneath the battery.
- Replace the battery cover. Make sure the cover snaps back into place tightly.

Parts:

PORTACOUNT® Plus Model 8020	AC Adapter
Alcohol Cartridge	Training Video
Alcohol Fill Capsule	30 ml Alcohol Bottles
Storage Capsule	Operation & Service Manual
Storage Cap	Carrying Case
Zero Check Filter	FitPlus™ for Windows Fit Test Software
Spare Alcohol Wicks	Disk/CD holders
1/8 to 3/16 Tube Adapter	RS-232 Interface Cable
1/8 to 1/4 Tube Adapter	9-Pin to 25-Pin Serial Cable Adapter

Maintenance:

Annual recalibration and servicing is recommended by the company. There are 3 checks that should be performed daily prior to each use:

- Particle Check
- Zero Check
- Max FF Check

Shipping Requirements:

It is important to remove all alcohol from the PORTACOUNT® Plus during transportation and storage. Anytime the instrument is in storage:

- Remove the alcohol Cartridge from the unit and store it in the Alcohol Fill Capsule.
- Cover the Cartridge Cavity with the Storage Cap.

The Alcohol Cartridge can be left soaking in alcohol indefinitely. Installing the Storage Cap into the Cartridge Cavity prevents dirt or lint from getting inside the instrument.

Never ship the PORTACOUNT® with any alcohol bottles or with the alcohol cartridge still inside.

Contact Information (Technical Support):

TSI Incorporated
500 Cardigan Road
Shoreview, MN 55126-3996
Telephone: 800-926-8378
651-490-2760
Fax: 651-490-2704
<http://www.tsi.com>
PORTACOUNT@tsi.com