# PORTACOUNT®
# RESPIRATOR FIT TESTER
# MODELS 8040 AND 8048

OPERATION/USER MANUAL

P/N 6010633, REVISION C
JUNE 2018

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**Disclaimer:** The measurement provided by the PortaCount® Respirator Fit Tester is an assessment of respirator fit during a fit test only. Respirator fit at other times will vary. The fit factor value is not intended for use in calculating an individual's actual exposure to hazardous substances.

### Trademarks

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### Service Policy

Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at (800) 680-1220 (USA) or (001 651) 490-2860 (International) or visit www.tsi.com.

# Safety

This section provides instructions to ensure safe and proper operation of the PortaCount® Respirator Fit Tester Models 8040 and 8048.

**W A R N I N G**

These instruments must be used in the manner described in this manual. Failure to follow all of the procedures described in this manual can result in serious injury to you or can cause irrevocable damage to the instrument. There are no user-serviceable parts inside the instrument. Refer all repairs to a qualified factory-authorized technician.

## Chemical Safety

Isopropyl alcohol is hazardous material. **DO NOT** allow alcohol to get into your eyes. Avoid contact with the skin. **DO NOT** swallow or ingest in any way. Alcohol is extremely flammable. **DO NOT** expose to open flame or sources of ignition. Consuming the alcohol will result in severe illness or death.

The alcohol used with these instruments is 99.5% pure or greater purity reagent grade isopropyl alcohol. It must be stored, cared for and disposed of properly. The use of other grades/types of alcohol will damage the instrument.

Use these instruments in a clean area. **DO NOT** use in areas with corrosive or acidic atmospheres.

## Laser Safety

The PortaCount Models 8040 and 8048 are Class 1 laser-based instruments. During normal operation, the user will not be exposed to laser radiation. However, certain precautions must be taken or you may expose yourself to hazardous radiation in the form of intense, focused visible light. Exposure to this light can cause blindness.

Take these precautions:

- **DO NOT** remove parts from the instrument unless specifically told to do so in this manual.
- **DO NOT** remove the instrument housings or covers while power is supplied to the instrument.

**W A R N I N G**

The use of controls, adjustments, or procedures other than those specified in this manual may result in exposure to hazardous optical radiation.

**A급 기기 (업무용 방송통신기자재)**

이 기기는 업무용(A급) 전자파적합기기로서
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바라며, 가정외의 지역에서 사용하는 것을
목적으로 합니다.

## Description of Labels and Markings

This section acquaints you with the advisory and identification labels on the instrument and used in this manual to reinforce the safety features built into the design of the instrument. It also identifies instrument markings.

### Caution

**C a u t i o n**

***Caution*** means ***be careful***. It means if you do not follow the procedures prescribed in this manual you may do something that might result in equipment damage, or you might have to take something apart and start over again. It also indicates that important information about the operation and maintenance of this instrument is included.

## Warning

| W A R N I N G |
| --- |
| ***Warning*** means that unsafe use of the instrument could result in serious injury to you or cause irrevocable damage to the instrument. Follow the procedures prescribed in this manual to use the instrument safely. |

| Serial Number Label | WEEE Marking | Wi-Fi Indicator | Status Indicator | Safety Label |
| --- | --- | --- | --- | --- |
|  |  Indicates item is non-disposable and must be recycled. |  |  |  |

## RoHS

PortaCount® Respirator Fit Tester Models 8040 and 8048 instruments meet the intent for RoHS Directive 2011/65/EU.

## CE

PortaCount® Respirator Fit Tester Models 8040 and 8048 instruments meet the intent of standard IEC61326-1:2013

Accessories 804004 and 804005 meet Criteria C for Standard 61326-1:2014 Method IEC61000-4-5:2014

TUV-SUD Safety Mark, Certificate U8 18 04 41468 023, issued 2018-4-20

PortaCount issued a KC-ID string on 2018-04-30: R-REM-tSi-PortaCount804

Both PortaCount models; 8040 & 8048 are designated with the same KC-ID

# Contents

CHAPTER 1

# Introduction and Overview

This manual describes both the PortaCount® Model 8040 and 8048 Respirator Fit Tester Hardware and FitPro™ Ultra Fit Test Software.

The Model 8040 is designed to measure fit factors of masks with a filter efficiency of 99% or greater. The Model 8048 includes N95-Companion™ Technology, which can fit test any tight-fitting respirators and all filtering facepiece air-purifying respirators including: NIOSH Series 100/99/95; and FFP3/FFP2/FFP1 disposables.

## Why Fit Test

There are two primary reasons for respirator fit testing:

- **Verification of Training**. After the individual has received respirator training, a fit test checks that the person has learned how to properly put on and wear a respirator without assistance.
- **Sizing**. It is important to make sure that the individual is issued a properly sized respirator that is capable of providing protection when worn properly.

## Preparations for Fit Testing

| | |
|---|---|
| **Training the Trainer** | The person conducting the fit test must have a clear understanding of respiratory protection, respirators, and fit testing to be effective. Anyone can master the operation of the PortaCount Respirator Fit Tester simply by studying this manual, but the background knowledge required to proficiently fit test cannot be obtained here. Consider attending a seminar on fit testing provided by TSI PortaCount Academy or from various consultants. Contact TSI for PortaCount Academy Scheduled training events. |

| | |
|---|---|
| **Respirator Training** | Respirator training is critical for any respiratory protection program. All employees who wear respirators must be taught how and why they are used. This training should be done prior to the fit test, not during the fit test. Consult the regulations or standards that pertain to your industry for information on training requirements. |

## Identifying Parts

The following items are included with PortaCount Respirator Fit Testers. If any are missing or damaged, please notify TSI immediately.

Use the photographs below to identify connectors, parts, and accessories of the PortaCount Fit Tester. You need to be familiar with these items when following the instructions in this manual.

| Description | For use with | Reference Picture |
|---|---|---|
| **Respirator Fit Tester** Model 8040/8048 | 8040 or 8048 |  |
| **Alcohol Cartridge**; a porous wick inside is soaked with alcohol. | 8040 and 8048 |  |
| **Alcohol Fill Capsule;** holds the isopropyl alcohol consumed by the PortaCount Fit Tester. | 8040 and 8048 |  |

| Description | For use with | Reference Picture |
|---|---|---|
| **Storage Cap**; covers either the cartridge cavity of the PortaCount Fit Tester or the alcohol fill capsule. | 8040 and 8048 |  |
| **Zero Check Filter** – 2 pieces; provides for the zero check and max fit factor check on the PortaCount Fit Tester to make sure it is working properly. A spare filter is also provided. | 8040 and 8048 |  |
| Spare **Alcohol Wicks** – 2 pieces. | 8040 and 8048 |  |
| 5 ft. (1.5 m) **Twin Tube Assembly**; consists of a pair of tubes: the clear sample tube and the blue ambient tube. | 8040 and 8048 |  |
| Spare **Sampling Port Inlet Screens**; used to help keep the PortaCount Fit Tester internal flow path clean by capturing large or fibrous particles. | 8040 and 8048 |  |

| Description | For use with | Reference Picture |
|---|---|---|
| **1/8 to 1/4 Tube Adapter**; used to connect the sample tube to a respirator sample fitting (or probe) that has a ¼ inch (6.3 mm) fitting. | 8040 and 8048 |  |
| **1/8 to 3/16 Tube Adapter**; used to connect the sample tube to a respirator sample fitting (or probe) that has a 3/16 inch (4.8 mm) fitting. | 8040 and 8048 |  |
| **AC Adapter**; plugs into the external power connector on the PortaCount Fit Tester and an AC wall outlet. | 8040 and 8048 |  |
| 30 ml **Isopropyl Alcohol** Bottles 16 pieces (480 ml total). | 8040 and 8048 |  |
| **Quick Start Guide**; for helping you get started quickly. | 8040 and 8048 |  |

| Description | For use with | Reference Picture |
|---|---|---|
| **Carrying Case**; provides protection and convenience. The case is designed to hold the PortaCount Fit tester and standard accessories. | 8040 and 8048 |  |
| **USB Cable**: used to connect the PortaCount Fit Tester to a tablet or computer. | 8040 and 8048 |  |
| **Probe Assembly Tool**: used to help assemble probes. | 8048 |  |
| **Probe Kit** (100 pieces). | 8048 |  |
| **Neck Strap**; to support twin tube when fit testing filtering facepiece respirators. | 8048 |  |
| **Model 8026 Particle Generator**; to supplement the ambient particle concentration in the fit testing area (*optional*). | 8048 |  |

| Description | For use with | Reference Picture |
|---|---|---|
| Package of 100 **Salt Tablets** (100 mg); for use with Model 8026 Particle Generator. | 8048 |  |
| **Power Cord**: for use with Model 8026 Particle Generator. | 8048 |  |
| Extra **Lid**: for use with Model 8026 Particle Generator. | 8048 |  |
| Durable **Carrying Case**; for use with Model 8026 Particle Generator. | 8048 |  |

## Reordering Supplies

TSI part numbers for consumable supplies, accessories, and miscellaneous replacement parts are:

| Model/Part No. | Description |
|---|---|
| 8016 | Box of 16, 30 ml Bottles of Isopropyl Alcohol (480 ml total) |
| 8033 | Box of 10 Alcohol Wicks |
| 803X-ZFLTR | Zero Check Filter |
| 8017 | Sampling Hose Kit with 3 Twin Tube Assemblies and 10 each 3/16 in. and 1/4 in. Tube Adapters. |
| 800197 | Twin Tube Assembly (Quantity 1) |
| 8034 | AC Adapter for PortaCount® Fit Tester (voltage sensing) |
| 6006456 | PortaCount® Fit Tester Quick Start Guide |
| 8032 | Alcohol Cartridge and Fill Capsule Kit for PortaCount® Fit Tester |
| 8032-FC | Alcohol Fill Capsule with Storage Cap |
| 8032-SC | Storage Cap |
| 8032-CT | Alcohol Cartridge with Wick |
| WF-USBD | Wi-Fi USB Dongle |
| 803X-CRDFRM | Punch-out Card Forms (250 sheets) |
| 8025-N95 | Filtering Facepiece Probe Kit |

## Install FitPro Ultra Fit Test Software

The PortaCount Fit Tester is controlled with FitPro Ultra Fit Test Software running on a tablet or a personal computer.

The minimum requirements for a tablet or personal computer are:

### Tablet Requirements

- Microsoft® Windows® 10 operating system.

### Personal Computer Requirements

- Microsoft® Windows® 7 or 10 operating systems.
- Minimum 1 GHz processor.
- Minimum 1024 x 768 screen resolution.
- 1 free USB port.
- 500 MB free storage
- **Note** – An internet connection is required to install FitPro Ultra software.

## Access and Install FitPro Ultra Fit Test Software

Create a TSI software account before accessing and installing FitPro Ultra Software. If a TSI software account has already been created with a previous purchase, it can be reused for this product.

Access the TSI Software Licensing portal at:
http://www.tsi.com/SoftwareLicensing

Enter the Activation ID provided with your instrument to create an account. Once this is complete a link to the Software Download Website will be sent to the email registered on the account. Use the link to download and run the FitPro Ultra Fit Test Software installer. When the installation is complete, a FitPro Ultra icon should display on the desktop of your tablet or computer.

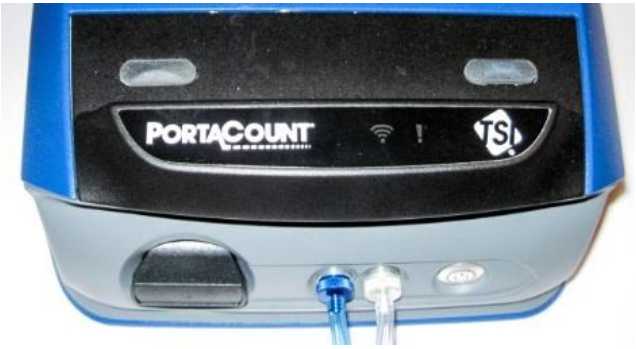
To start the FitPro Ultra Software, double-click on the icon. The software will present default configuration options that can be changed later if needed. See Chapter 2 to connect the instrument and begin fit testing.

CHAPTER 2

# Prepare the PortaCount Fit Tester for Operation

## Install the Twin Tube Assembly

The PortaCount Fit Tester has two inlet fittings, one colored blue and one colored silver. Connect the twin tube assembly to the corresponding inlet fittings; the blue tube to the blue fitting and the clear tube to the silver fitting. The clear tube samples particles inside the mask. Ambient particles outside the mask are sampled through the blue tube.




**Caution**

The twin tube must **not** be lengthened except for the few inches added by a tube adapter. **NEVER** split the ambient and mask tubes, they must remain together and the two sample tubes must be nearly the same length for accurate fit testing.

## Prepare the Alcohol Cartridge

The wick must be saturated with isopropyl alcohol for the PortaCount Fit Tester to make particle measurements. Fill the alcohol cartridge as follows.

**C a u t i o n**

Isopropyl alcohol is hazardous material. **DO NOT** ingest or allow alcohol to contact your eyes or skin. Refer to the Safety Data Sheet (SDS) located in the box of alcohol for handling precautions and first aid procedures.

Always recap the alcohol fill capsule and other containers immediately to prevent absorption of moisture and the escape of alcohol vapors.

Dispose of any alcohol with visible contamination.

**C a u t i o n**

Any dirt or debris that gets into the PortaCount Fit Tester can plug the small internal nozzle and prevent operation.

- **DO NOT** allow the black part of the alcohol cartridge to make contact with any surface that may be dirty. Keep the storage cap and alcohol cartridge clean.
- The alcohol cartridge is inserted into the cartridge cavity during use. It is critically important to keep dirt and lint out of the cartridge cavity.
- Cover the cartridge cavity with the storage cap (see Step 10**)** when the instrument is not being used and when transporting the PortaCount Fit Tester.

1. Make certain the PortaCount Fit Tester is turned off.
2. Remove the alcohol cartridge from the PortaCount Fit Tester by twisting it counter-clockwise.

3. Open the alcohol fill capsule by twisting the storage cap off (counter-clockwise).
4. Set the storage cap and alcohol cartridge down on a clean surface to prevent contamination.

5. Open a 30-ml bottle of alcohol. Invert the bottle and insert the nozzle end into the alcohol fill capsule as far as possible to make certain alcohol is not inadvertently sprayed anywhere except into the capsule.
6. Squeeze alcohol into the alcohol fill capsule. When 30 ml is added to an empty alcohol fill capsule, the alcohol level will rise to the fill-line when the wick is inserted.
7. Recap the empty alcohol bottle immediately.

8. Make certain the alcohol cartridge is clean and insert the alcohol cartridge into the alcohol fill capsule. Turn the capsule clockwise until it locks in place.

9. Set the alcohol fill capsule down and wait at least two minutes while the alcohol wick inside the alcohol cartridge soaks up the maximum amount of alcohol.

10. Remove the alcohol cartridge from the capsule and gently shake it to allow excess alcohol to drip back into the alcohol fill capsule. Stop when excess alcohol is no longer dripping; it is not necessary to wait until the outside surface of the alcohol cartridge is dry.

11. Insert the alcohol cartridge into the cartridge cavity of the PortaCount Fit Tester. It should slide in with little effort; **DO NOT** force it. As you approach full insertion, firmly twist the alcohol cartridge clockwise until it locks into position.


12. Recap the alcohol fill capsule with the storage cap to prevent absorption of moisture from ambient air and the escape of alcohol vapors.
13. The PortaCount Fit Tester is now ready to be turned on.
14. When shutting down for the day, return the alcohol cartridge to the alcohol fill capsule and put the storage cap back into the cartridge cavity.

## Connect the PortaCount Fit Tester

### Connect the PortaCount Fit Tester to a Tablet or Computer via the USB Cable Provided

1. Connect the “USB-A” plug connection to the corresponding USB port on the tablet or computer.

2. Connect the “USB-C” plug connection to the corresponding USB port on the back side of the PortaCount Fit Tester.

| Caution |
| --- |
| **DO NOT** unplug the USB cable while the system is running. This can cause the PortaCount Fit Tester to temporarily lose communication with FitPro Ultra Fit Test Software. If communication is broken, it can be restored by cycling power to the PortaCount Fit Tester. **DO NOT** connect to Ethernet port on the back of the PortaCount Fit Tester. It is for factory use only. |

## Supply Power to the PortaCount Fit Tester

Using the AC connector provided, plug the PortaCount Fit Tester into an AC power source. Power on the instrument with the on/off button on the front. It will light up to indicate that power is on. To power the instrument off, press and hold the power button for 1 second. It will take up to 10 seconds to power down after that.

| Caution |
| --- |
| Use only the AC adapter provided (TSI part number 800531) and **DO NOT** substitute another adapter **as this will cause damage to the PortaCount Fit Tester.** |

| Caution |
| --- |
| **DO NOT** block the fan or exhaust port on the back of the instrument when it is turned on. Open air flow to the back is important to the accuracy of the measurement. |

When first powered on, the instrument begins a one-minute warm up period. The LED on the power button will strebe during the warm up period. The PortaCount Fit Tester will connect to FitPro™ Ultra Software after the warm up period is complete. The following indicators will appear.

|  |  |
| --- | --- |
| Wireless connectivity | Status |
| On= Wi-Fi capability is enabled<br>Off = Wi-Fi capability is not enabled | Off = Status is OK<br>Red = Factory service is recommended<br>Yellow = Replenish alcohol in wick cartridge |

## Connect to FitPro Ultra Fit Test Software

Click the FitPro Ultra icon  on the desktop to start the FitPro Ultra Fit Test Software. An operator login screen will be displayed requesting operator identification. Enter operator initials, name, or ID number then press **Continue**.

The software will find the PortaCount Fit Tester(s) connected by USB or Wi-Fi, identifying each instrument by serial number and provide an option to connect to it. By default, the name shown will match the serial number of the instrument unless a new name has been entered from the PortaCount General Settings menu. Press **Connect** to establish a connection with the PortaCount Fit Tester.

Once the instrument is connected to the FitPro Ultra Software, the PortaCount Fit Tester is ready to conduct daily checks, fit tests, real-time fit checks, access people/respirator/fit test information, etc. These are described in detail in Chapters 3 to 6.

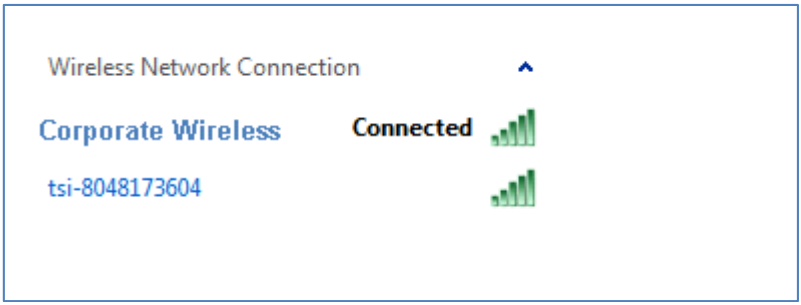
## Connect Wirelessly (*optional*)

PortaCount Model 8040 and 8048 Respirator Fit Testers can be configured to communicate wirelessly with FitPro Ultra Fit Test Software. FitPro Ultra Software must be running on a computer or tablet equipped with Wi-Fi capability and the two devices must be within Wi-Fi range of one another.

A Wi-Fi USB-A dongle is required to configure the PortaCount Fit Tester for wireless communication. The Wi-Fi USB-A dongle must be compliant with local country regulations. TSI sells Wi-Fi USB-A dongle as part number WF-USBD. This part is compliant in many countries including the United States, Canada, United Kingdom and the European Economic Area.

To begin the configuration process for the first time, power down the PortaCount Fit Tester and insert the Wi-Fi dongle into either of the two USB-A ports on the back of the PortaCount Fit Tester.


Power on the PortaCount Fit Tester and wait two (2) minutes. The Wi-Fi indicator will illuminate while you wait. From the tablet or computer, access the list of available wireless network connections. The PortaCount Fit Tester will appear in this list identified by its serial number. For instance, in the image below the name of PortaCount Fit Tester connection is **tsi-8048173604**. Make note of the wireless network connection name for later use.




If the computer or tablet is connected to a wireless network, disconnect from it and connect to the PortaCount Fit Tester. You will be prompted for a network security ID. By default this is the same as the wireless network connection name. Once these steps are complete, launch the FitPro Ultra Fit Test Software and the PortaCount Fit Tester will be listed on the Connect screen with a Wi-Fi connection type .

Options for altering the connection name and security ID are described in Chapter 3 - PortaCount Fit Tester Menu, PortaCount Settings.

| Note |
| --- |
| When you change your wireless connection to access the PortaCount Fit Tester you will not have access to other network connections. This will limit functionality such as e-mail and network printing. |

## Using a Particle Generator *(optional)*

If minimum ambient particle concentration levels needed for fit testing are not present, particles must be generated. The best way to generate particles is with the optional TSI Particle Generator Model 8026. The Model 8026 Particle Generator supplements naturally occurring particles with non-toxic salt (NaCl) particles in the appropriate size range for the PortaCount Fit Tester. The particle generator uses a 100-mg salt tablet (sodium chloride or NaCl), dissolved in distilled water.

Refer to the generator's manual for information on its operation and maintenance, or refer to the Particle Generator Model 8026 information on the TSI Web site www.tsi.com.

Follow these additional important guidelines when using the Model 8026 Particle Generator with a PortaCount Fit Tester:

- Keep the particle generator or any other sources of particle generation at least 6 feet/1 meter away from the PortaCount Fit Tester during operation.
- For the particle generator to function properly, operate the generator and conduct the fit tests in an enclosed area. A room smaller than 400 $ft^2$/20 $m^2$ would provide the best conditions. Particle generation will not function as efficiently in an open cubicle area or a very large room.
- Use the particle generator and other forms of particle generation sparingly, when needed. Often they are only needed in the morning hours or at the beginning of fit testing. **DO NOT** operate any form of particle generation if ambient particle concentrations are above 8,000 particles/$cm^3$ for the Model 8040 or 8048 when testing masks with 99% efficiencies or greater, or above 800 particles/$cm^3$ for the Model 8048 when testing masks with <99% efficiencies.

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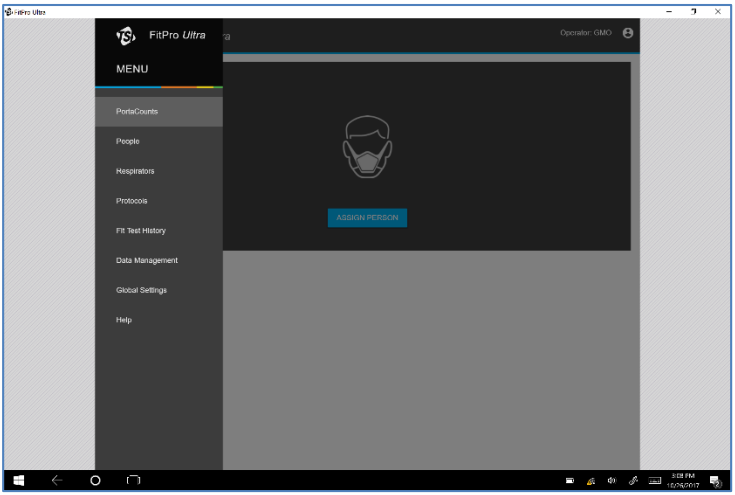
CHAPTER 3

# FitPro Ultra Fit Test Software Operation

FitPro™ Ultra Fit Test Software controls and manages the PortaCount® Respirator Fit Tester Models 8040 and 8048 and many of the records associated with fit testing. This chapter describes the operation and menus of the software.

## The Main Menu

From any screen, select the menu icon ☰ to display the main menu. A description of each menu item follows.




### PortaCounts

Select **PortaCounts** option from the main menu to work with your PortaCount Fit Tester. If you have not conducted a daily check recently, it will prompt you to do so. Otherwise it will prompt you to configure a fit test. You can select from the following activities by clicking the PortaCount Fit Tester menu icon ⋮.

| | |
|---|---|
|  | **Fit Test**<br>Begins a fit test. Refer to Chapter 6 for complete instructions on performing a fit test. |
|  | **Daily Check**<br>Starts a daily check before running any fit tests. See Chapter 4 for complete instructions on performing daily checks. |
|  | **Real Time FitCheck Mode**<br>Runs the instrument in real-time mode to do either an ambient concentration check to determine if enough particles are present to conduct fit testing, or how to troubleshoot room setup to conduct fit testing. Additionally, a real-time fit check can be conducted with individuals to train on proper respirator donning, make adjustments for proper fit, select the appropriate respirator, or troubleshoot a failed test. See Chapter 5 for complete instructions on using the Real-Time FitCheck Mode. |
|  | **PortaCount Settings**<br>View or change settings for the connected PortaCount Fit Tester.<br><br>From the General Settings tab you can:<br>• Name the PortaCount Fit Tester (just type over the serial number)<br>• Check for firmware updates.<br>  ○ If a new version is available, follow the on-screen instructions to update your firmware.<br><br>From the Network Settings tab you can configure the settings that you use when you connect wirelessly to your PortaCount Fit Tester. You can change the Access Point SSID which is the network connection name. Also you can set your Access Point Password which is the security ID for the network connection. Note that you may alter these settings only when you are connected with USB. These settings take effect immediately and are stored on the PortaCount Fit Tester. |
|  | **Disconnect PortaCount**<br>Select to disconnect the PortaCount Fit Tester. |

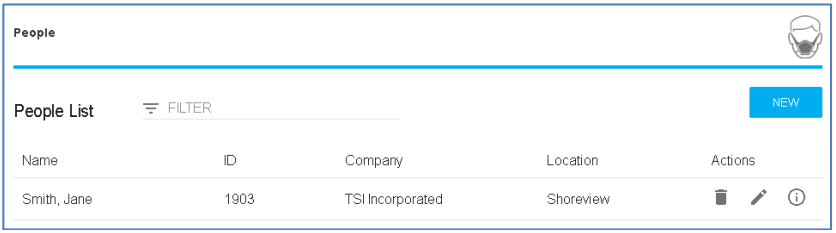
| | |
|---|---|
| | Change user, protocol, or respirator after you have already assigned a person to start a fit test. |

The PortaCount Fit Tester's communication method is always displayed with a USB or a Wi-Fi symbol.

FitPro Ultra Software may display a status icon . If this icon appears, click on it to display messages and alerts about the system. The icon is displayed only when measurements are taking place. When the status is good the icon will not display. For more information, see Chapter 7.

## People

Select **People** from the Main Menu to view the list of fit test subjects that are stored in the program. People are listed alphabetically. You can sort them by ID number if desired, or use a filter such as first or last name, company, location, etc.



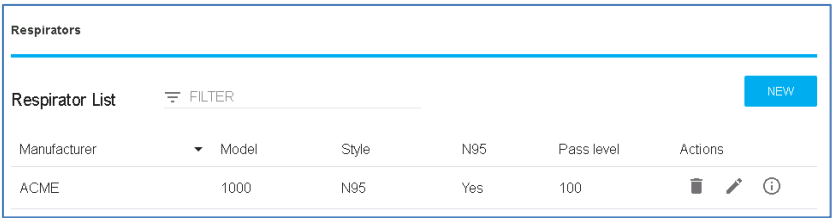

From this screen you can also delete a person , edit information about the person , or display the information already collected about the person . By selecting , a person info screen is shown. Click **Active** to make a person active or inactive. If a person is inactive they are excluded from selection during fit testing. Inactive people are still included in reports of historical fit tests.

To add a person, click **NEW** and fill in the required and optional information.

## Respirators

Select **Respirators** from the Main Menu to view the list of respirators that are stored in the program. Respirators are listed alphabetically.

You can sort the respirators by model if desired or use a filter such as manufacturer, style, etc.




From this screen you can also delete a respirator, edit information about the respirator, or display the information already collected about the respirator.

To add a respirator, click **NEW** and fill in the required and optional information.

Select **N95** if this is a respirator with <99% efficient filter media. Select **Use Auto Description** if you want FitPro Ultra Software to automatically create a description for the respirator. The description appears on the fit test report.

## Fit Test History

Select **Fit Test History** from the Main Menu to view a list of completed fit tests. By default only passing fit tests are shown. See Global Settings, if you want to be able to save and view failing fit tests as well, by selecting **AUTOMATICALLY SAVE**, **All Fit Tests**. For any fit test record you can print, review details, or delete the record. To view Actions, click on ⋮ to display the actions. If you select to review details, you will have the further option of editing certain fields such as the person's name and the next due date.

## Global Settings

Select **Global Settings** from the Main Menu to view settings which apply when conducting fit tests, daily checks, or printing. Press **EDIT** to modify these screens and press **SAVE** to confirm your changes.

### Fit Test – Global Settings

| Field or Button | Description |
|---|---|
| Automatically Save | Select which fit test data is saved. There are two options:<br>• **All Fit Tests**<br>Saves all fit test results whether the test passed or failed.<br>• **Passed Fit Tests Only**<br>The default choice. Saves only passing fit test records. |
| Default Protocol | Use the drop-down box to select the default protocol used for fit testing. You can still select a different protocol before actually starting a fit test. |
| Automatic Termination | If this option is turned on, the software automatically terminates the fit test when the overall fit factor becomes impossible to achieve. The default for this option is off. |
| Warn When Fit Factor is Above… | This option is enabled by default. If it is enabled, a message appears when the fit factor for any exercise exceeds the value entered. The test continues regardless of the alert. The purpose of the alert is to inform an inexperienced fit test operator that something *may* be wrong, such as a blocked sample tube. If this option is enabled, the value should be set at a fit factor level that will almost never occur unless something *is* wrong. A blocked mask sample tube will often result in fit factors well over 500,000. The default fit factor value is 100,000; however, you may have to select a higher value more appropriate for the types of respirators you use and other considerations. |
| N99 High Concentration Message | Set the threshold for the N99 High Concentration alert. The default value is 30,000 pt/cm$^3$. |
| N95 High Concentration Message | Set the threshold for the N95 High Concentration alert. The default value is 1,500 pt/cm$^3$. |

## Daily Check – Global Settings

Changing the Daily Check settings is not recommended unless you have had advanced training in PortaCount Fit Tester operation.

## Print – Global Settings

| Field or Button | Description |
|---|---|
| Automatically Print Fit Test Reports | Automatically prints one fit test report at the end of each fit test. This is useful if you plan to give test subjects a copy of the test results or if you save hard-copy test records. The report is sent to the default Windows® printer.<br>You have two options:<br>• **Saved Fit Tests Only**<br>Prints a report for every saved fit test. You can change the number of fit test reports to print by selecting EDIT and changing the number of copies.<br>• **Do Not Print**<br>This is the default choice. Use this if no printer is available during fit testing. The report can be printed later.<br>**Note**: The printer must be set up before automatic reports are generated at the end of a fit test. FitPro Ultra software will use the default printer on your computer or tablet. |
| **Show Card on Fit Test Report** | Select whether to "**Show Card on Fit Test Report**." Select **EDIT** to enter company name if this option is turned on. |
| **Show Signature Lines on Fit Test Report** | Select whether to show signature lines on the fit test report. |

## Help

Select **Help** from the Main Menu to access help topics. You can also view the current version of FitPro Ultra Fit Test Software. If you are online and you have created a TSI Software account, you can also update your version of software if a new version is available.

CHAPTER 4

# Daily Checks

Each day, before using the PortaCount® Respirator Fit Tester, you should run a series of checks to make certain the instrument is operating properly. These daily checks are:

- Particle Check
- Classifier Check (only for the PortaCount Model 8048 with N95 enabled)
- Zero Check
- Maximum Fit Factor Check

TSI recommends these Daily (maintenance) Checks be performed once each day before the PortaCount Respirator Fit Tester is used and whenever a problem is encountered. Failure of any of the Daily Checks requires immediate attention. See Chapter 7. If the PortaCount Respirator Fit Tester passes the Daily Checks, and you have difficulty fit testing, the problem is most likely **NOT** in the PortaCount Respirator Fit Tester. Examine the respirator and mask sample adapter carefully for leaks or pinched tubes.

To start the Daily Checks:

1. If necessary, review the steps in Chapters 2 and 3 to prepare the instrument for the Daily Checks.
2. Start the PortaCount Fit Tester and FitPro™ Ultra Software on the tablet or computer. Log into the software and connect to the PortaCount.
3. Select PortaCount from the Main menu  and select Daily Check from the PortaCount menu  . The Daily Check screen will be displayed.


4. If this Daily Check is to include a classifier check for a Model 8048 with N95 enabled, click **N95-Companion**. Otherwise skip this step.
5. The automated Daily Check program will give you step-by-step instructions. First, remove the HEPA filter from the clear sample tube if one is connected and press the **START** button.
6. The first check is the Particle Check, which determines if the PortaCount Fit Tester is working and if the concentration of particles in the ambient air is sufficient to conduct fit testing.
7. If the "**N95 enabled**" box is selected, the Particle Check is immediately followed by the Classifier Check. The Classifier Check verifies the N95-Companion™ Technology Classifier is functioning properly.
8. The next check is the Zero Check, which provides assurance that there are no leaks in the system. You will be instructed to attach the HEPA filter to the clear sample tube and press **CONTINUE** on the screen to start the Zero Check.
9. If the Zero Check fails, see Chapter 7.. If the PortaCount Fit Tester fails the Zero Check, any fit tests you conduct may result in lower fit factors than would be measured otherwise. The risk is that you may fail people who have good fits, thereby wasting time and effort. There is no possibility that failing the Zero Check could result in overstated fit factors (i.e., may pass people who have bad fits). This is because any particles leaking into the PortaCount Fit Tester are interpreted as mask leakage, resulting in lower fit factors.

10. The Maximum Fit Factor Check is performed after the Zero Check. This check determines if the PortaCount Fit Tester is capable of measuring high fit factors and if the internal switching valve is functioning properly. The test is essentially a fit test on a HEPA filter which simulates a perfect fitting respirator.

    A very high fit factor should result if the instrument is working properly. The Max FF Check actually measures the maximum fit factor that can be determined by the PortaCount Fit Tester given the local ambient particle concentration and the mask sample time programmed into the PortaCount Fit Tester.

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CHAPTER 5

# Real-Time FitCheck Mode

This chapter covers the following items:

- Real-Time FitCheck Mode™
- Ambient Concentration Check

## Real-Time Training

The Real-Time FitCheck Mode display is generally used for respirator training and troubleshooting. It allows a test subject to experiment with strap tension and other adjustments while watching the direct effect these efforts have in real time.

The test subject learns how each adjustment affects the fit, and how to achieve a fit that is comfortable and has minimum leakage.

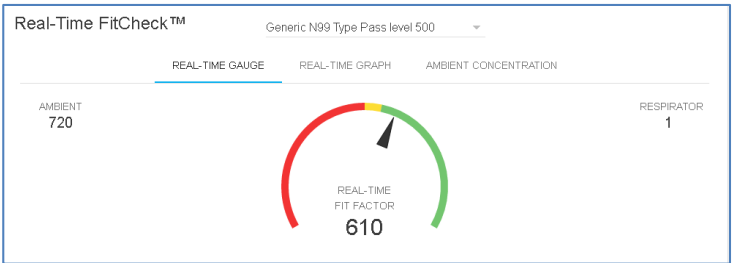
**Note**

**This feature is intended for training. It should not be used immediately before a fit test.** Using the feature to help the test subject don the respirator immediately before the official fit test defeats one of the main purposes of fit testing: to prove that the test subject knows how to don the mask properly without help. Use the real-time fit factor feature for training, practice and troubleshooting failed fit tests only.

You can use the real-time fit factor display prior to a fit test as long as you have the test subject remove the mask and put it on again (without the use of the real-time display or other assistance) before the final test.

Before starting the Real-Time FitCheck Mode screen, have the test subject put on the respirator and make sure it is properly attached to the PortaCount Fit Tester.

Select Real-Time FitCheck Mode from the PortaCount menu  to display the real-time fit factor screen. You can view the real time information either with the real-time gauge or graph.




To start the real-time operation, select a respirator from the drop-down list. You can select a respirator which you have defined or alternatively you can use one of two generic respirators predefined in the FitPro Ultra Software. The respirator that you select lets the PortaCount Fit Tester correctly enable the N95-Companion Technology and it lets the software show the respirator's pass/fail level on the chart.

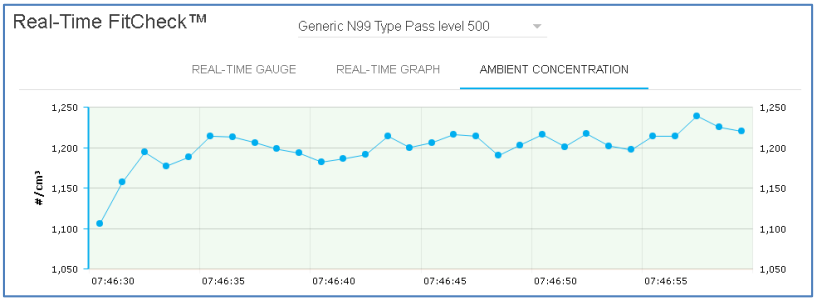
The PortaCount Fit Tester takes an ambient concentration reading and stores the value. Next it purges the mask and then begins continuous concentration reading of the mask concentration providing a continuous display of real-time fit factor based on $C_{out}/C_{in}$.

The graphics let you (and the test subject) observe the Fit Factor reading as it fluctuates in near real time. There is a delay of a few seconds between when a change in fit occurs and when the graph displays the change in fit factor.

The graph pauses every five minutes while the PortaCount Fit Tester takes a fresh ambient air measurement.

## Concentration Check

The Real-Time FitCheck Mode also has an “**Ambient Concentration**” check mode. In this mode, the PortaCount Fit Tester continuously measures the particle concentration through the ambient inlet port. This allows you to easily check ambient concentration of the fit testing area in preparation to conduct testing. You must select a respirator when using the Ambient Concentration mode in order to correctly enable the N95 companion technology.



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CHAPTER 6

# Fit Testing

## Precautions for Fit Testing

The following is a discussion of several precautions to consider prior to conducting a fit test:

| | |
|---|---|
| **Fit Testing People Who Smoke Cigarettes or Cigars** | Smokers exhale particles for at least 30 minutes after they have smoked a cigarette or cigar. The PortaCount Fit Tester can count these particles and will interpret them as if they were caused by face seal leakage. It is very important to instruct individuals not to smoke for at least 30 minutes prior to fit testing. Fit factors for anyone who has smoked recently will be lower than that individual deserves and may even cause him or her to fail the fit test entirely. |
| **Fit Testing with Generated Aerosols** | The PortaCount Fit Tester is designed to operate using the microscopic particles in the ambient air. It can measure particle concentrations and fit factors when generated aerosols (like corn oil, salt or DOP) are used; however, these aerosols may cause the PortaCount Fit Tester to need more frequent cleaning and calibration. |
| **Fit Testing Near Irritant Smoke** | Do ***not*** conduct fit tests in close proximity to sources of irritant smoke like those used for qualitative fit testing. The irritant smoke is corrosive and can damage the PortaCount Fit Tester. Fit testing near sources of amyl-acetate (banana oil) is not a problem. |

**WARNING**

The measurement provided by the PortaCount Respirator Fit Testers are an assessment of respirator fit during a fit test only. Respirator fit at other times will vary. The fit factor value is not intended for use in calculating an individual's actual exposure to hazardous substances.

## About Respirators and Fit Testing

The conventional way to quantitatively fit test is through the use of probed test respirators, but fit tests can also be performed on disposable respirators and positive pressure respirators. This Chapter discusses the types of respirators and provides instructions on installing a sampling port to a disposable filtering-facepiece.

These PortaCount Fit Testers provide fit testing compliant with OSHA 29CFR1910.134, ANSI/ASTM Z88.10-2001, CSA Z94.4-2011, and HSE 282/28.

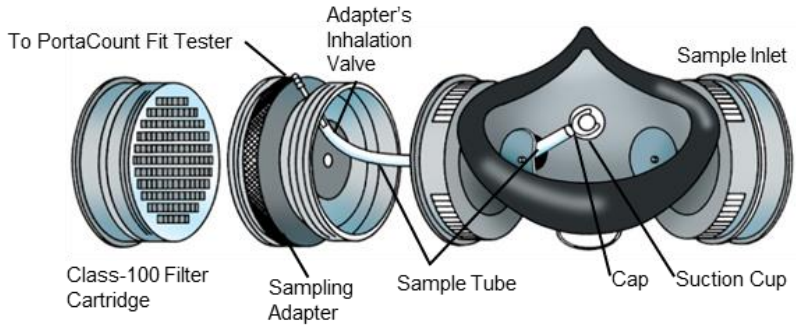
## Probed Test Respirators

A probed respirator has a fitting (probe) installed that allows air from inside the respirator to be sampled by an instrument like the PortaCount Respirator Fit Testers. The probed respirator is considered to be modified from its original design and as such can only be used for fit testing and cannot legally be used in a potentially hazardous workplace environment. You will need at least one respirator of each make, model and size your company issues. After the fit test, issue the individual a respirator with the identical facepiece, only without the permanent probe.

Most probed respirators are obtained from the respirator manufacturer or distributor. You should be able to buy probed versions of most, if not all, models. Be sure to buy class-100 or class-99 filters also if you do not already stock them. Class-100, class-99, or P3 filters must be used for fit testing even if you use another type of cartridge in the workplace.

## Fit Testing with the Person's Own Assigned Respirator

Some respirators, especially older models, do not have fit test adapters available. In that case, a permanently probed test respirator is the only option.




## Respirator Manufacturers' Technique

There are a growing number of respirator manufacturers who provide mask sampling adapters that permit fit testing in one's own respirator. Contact your distributor or call the manufacturer direct and ask if such accessories are available.

### TSI Fit Test Adapter Kits

TSI Mask Sampling Adapters allow you to fit test using the respirator that is actually used by that individual. Mask sampling adapters for most major brands of respirator are available. A complete list of fit test adapters available from TSI and from respirator manufacturers is posted on www.tsi.com.

### Homemade Adapters

A sampling adapter can be made by modifying a respirator cartridge. This usually involves running a tube through the cartridge and into the respirator. TSI recommends that this option be avoided because it is so easy to do poorly. The most fundamental mistake that is often made is to not extend the sampling tube through the inhalation valve and into the breathing zone. This, combined with problems sealing around the outside of the tube, make this option unattractive.

## Probes for Filtering-Facepiece (Disposable) Respirators

Disposable respirators can be fit tested by inserting a test probe through the filter material. The optional TSI Model 8025-N95 Probe Kit includes disposable probes and insertion tools. Order TSI Model 8025-N95R Probe Refill Kit for additional probes (no tools).

| Note |
| --- |
| The PortaCount Model 8040 can successfully fit test class-100, class-99, and P3 disposable respirators. Lower efficiency disposable respirators such as NIOSH Series 95, FFP2, and FFP1 will usually require use of the PortaCount Model 8048 with N95-Companion™ Technology. |

## Inserting a Test Probe in a Disposable Respirator

To perform a quantitative fit test, the PortaCount Fit Tester must draw an air sample from inside the respirator while it is being worn by the person being fit tested. The tools, sampling probes and push nuts contained in the probe kit lets you install a sampling port onto any disposable filtering-facepiece respirator.

**WARNING**

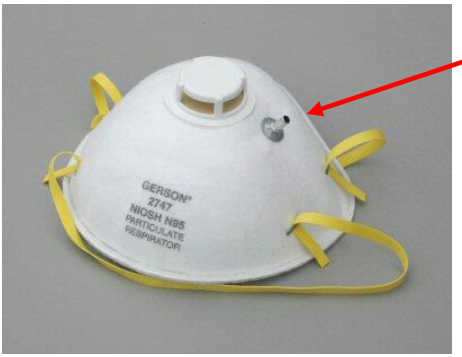
Once a sampling probe has been installed, the respirator cannot be used for respiratory protection. Ported respirators that have been modified are for quantitative fit testing only. Discard (or sanitize) the respirator after each fit test is completed. Follow the respirator manufacturer's recommendations.

1. Choose a location to install the sample probe.

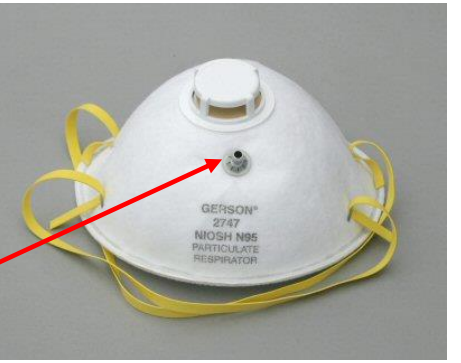
   For proper fit testing, the sampling point must be in the "breathing zone" of the respirator user. For most respirators, this is in the center of the respirator between the person's nose and mouth.

   ***For flat "duckbill" style respirators***, install the probe near the outer edge of the ***bottom panel*** where it cannot be blocked by the person's chin.


   ***For respirators with center-mounted exhalation valves***, install the probe to the left or right of the valve. **DO NOT** install the probe above or below the valve because this risks having the probe blocked by the person's nose or chin, respectively.



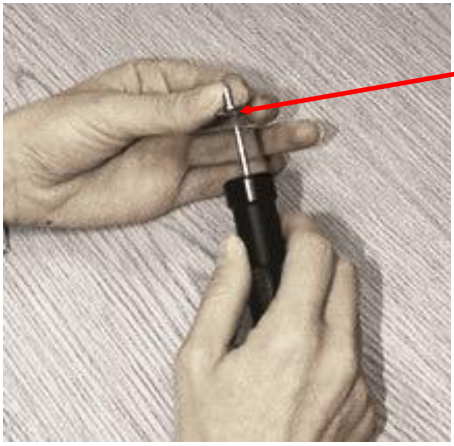

Correct probe location to left (or right) of valve



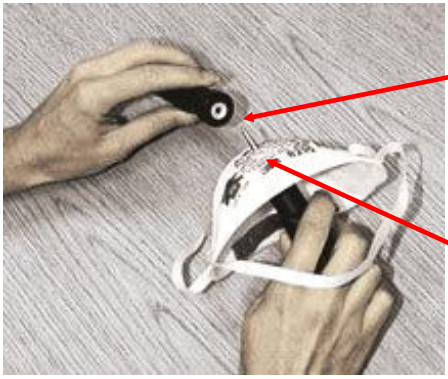

Wrong probe location below (or above) valve

***For respirators with an outer mesh***, install the probe normally as if the mesh was not present. The sampling probe and push nut will seal properly right through the mesh.

2. Slide the sampling probe onto the piercing tool. ***As the pointed end of the piercing tool is very sharp, be extremely careful when handling it!***




3. Choose a location on the mask that is in front of the person's nose/mouth region. Avoid seams and folds in the mask.
4. Pierce the mask at the selected location, using the piercing tool with the loaded sampling probe. ***Be sure to pierce the mask from the inside!***




5. Push the sampling probe through the mask until the end of the tool point is visible from the outside of the mask. Leave a few millimeters of the tool point visible.
6. Place the push nut on the anvil tool with the "dished" side up. A magnet prevents the push nut from falling off.
7. Position the anvil tool, with the loaded push nut, over the protruding point. The mask should now be pinched between the two tools.

8. Press the two tools firmly together to force the push nut as far as possible onto the probe. The mask material should be tightly pinched and the mask, sampling probe, and push nut should be joined together as illustrated.

Push the Tools Together to Fasten the Probes

9. Inspect the sampling probe to be sure it is not plugged. Try to rotate the probe with your fingers. If it moves freely, use the probe insertion tool kit to press the push nut firmly onto the sampling probe and pinch the mask material more tightly.


**W A R N I N G**

Once a sampling probe is installed into a disposable mask, the mask cannot be used for respiratory protection. **Probed masks are to be used for quantitative fit testing only.** Discard each probed disposable mask after a fit test is completed

## Conducting a Fit Test

Before you conduct a fit fest, be certain you have read the Operation and Daily Check chapters.

Conduct a Fit Test as follows:

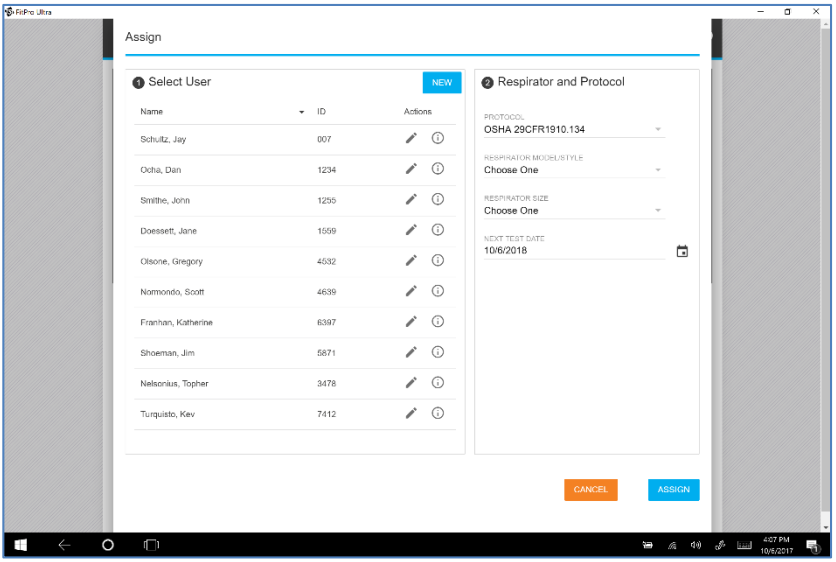
1. Instruct the user to put on the respirator five minutes before the fit test starts to purge the particles trapped inside the respirator and permit the wearer to make certain the respirator is comfortable. Have the subject don the mask ***without assistance***. Fit test results depend on the subject knowing how to properly don the mask. Train all subjects in proper mask-donning techniques before being fit tested. **DO NOT** allow the subject to adjust the mask during the exercises, as this invalidates previous exercise results.

   If testing a disposable filtering facepiece respirator, have the fit-test subject hang the tubing support neck strap around his or her neck, adjusting it to a comfortable position. Position the tubing support neck strap so that the tubing does not pull the mask off the person's face. Have the person tilt his or her head up and down, turn side to side, and bend over to see if the tubing pulls the mask away from their face. If it does, readjust the neck strap or the tubing and repeat check the fit again.

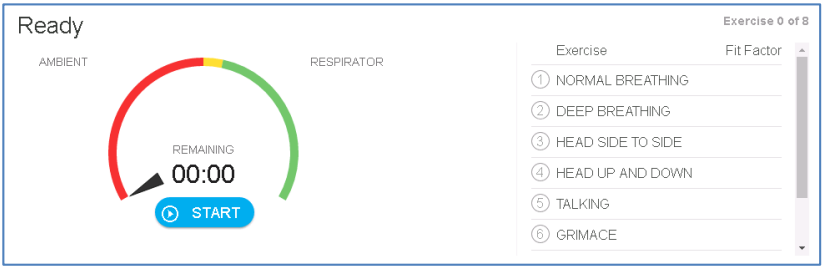

2. Make sure the instrument is turned on, the alcohol cartridge is charged with alcohol, and the twin tube assembly is attached as described in Chapter 1.

2. Launch the FitPro Ultra Software. Select **PortaCounts** from the main menu ≡. Then from the PortaCount menu ⋮ select **Fit Test**.

3. Select **Assign Person** and choose a fit test subject from the list of names. Also select a respirator, a respirator size and a protocol. Confirm the **Next Test Date**.




4. Once the fit test is configured, select **ASSIGN**. The following **Ready** screen will appear.




5. Press **START** to begin the fit test.
6. Have the user follow the animated fit test exercises one after another as prompted. The active exercise is highlighted in the table and the animation shows the actions and pace of the exercise.

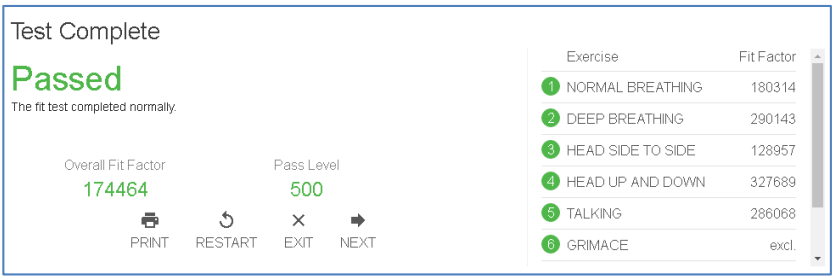
| Exercise Name | Description |
|---|---|
| **Normal breathing** | Remain still and breathe normally. |
| **Deep breathing** | Take long deep breaths as if working hard. **DO NOT** overdo it. |

| Exercise Name | Description |
|---|---|
| **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. Each cycle from left to right should take several seconds, pausing momentarily at each side to take a breath. |
| **Head up and down** | Breathe normally while slowly alternating between looking up at the ceiling and down at the floor. Each up and down cycle should take several seconds, pausing momentarily at each up and down to take a breath. |
| **Talking out loud** | Read a prepared paragraph (like the Rainbow Passage located in Appendix B of this manual) or count out loud to simulate a workplace discussion. |
| **Grimace** | Grimace by smiling and/or frowning to create a leak in the respirator face seal. This exercise will often result in a failed fit factor, which is why the OSHA standard allows you to exclude that fit factor when computing the overall fit factor. When performing the grimace, you are intentionally creating a break in the face seal in order to see if the mask re-seals itself afterwards. Successful re-sealing is proven by achieving a passing fit factor on the next exercise. |
| | **Notes** |
| | The OSHA protocol includes special provisions for the grimace exercise. It is allowed to be 15 seconds long and the resulting fit factor may be discarded (excluded) before calculating the overall fit factor. This is allowed because the grimace exercise is done to intentionally break the face seal in order to make sure the mask reseats itself before the next exercise. |
| **Bending over** | Breathe normally while slowly bending over at the waist as if you were touching your toes and then moving back to an upright position. Each cycle from upright to bending over should take several seconds, pausing momentarily at each extreme to take a breath. |

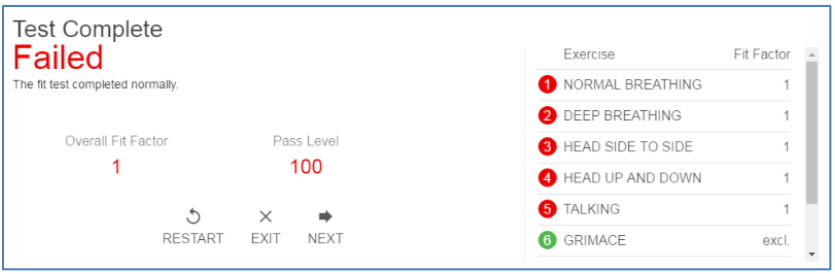
| Exercise Name | Description |
|---|---|
| **Normal breathing** | Remain still and breathe normally. |

7. Each exercise is accompanied by a guage of real time fit factor performance as shown below. If the guage indicates green, then the fit is projected to be better than the pass/fail level you have established for this respirator. If the gauge indicates red then it is projected to be below the pass/fail level. The concentration of particles in ambient air and inside the respirator are also shown.


8. The software alerts you when the fit test is complete. It calculates and displays the overall fit factor for the fit test's set of exercises. It provides a clear indication of Passed or Failed which is determined by comparing the overall fit factor to the Fit Factor Pass/Fail Level.



10. If the test fails, the following is displayed.




**Note**

In the USA, OSHA requires a minimum fit factor of 100 for half masks and 500 for full-face masks. If necessary, consult the appropriate regulation or standard in your country or geography.

- If the test was a **Pass**, the fit test is over. Also, if the fit test passed, issue that exact size and model respirator to the test subject.
- If the fit test failed, determine the reason and repeat the test. Some common reasons for failure are described below.
- If you are fit testing with a disposable respirator, discard it when the fit test is complete. Probed respirators are intended for fit testing only and are never to be reused. You may be able to sanitize and reuse other types of respirators. Contact the respirator manufacturer for specific information.
- If the fit test is terminated before the last exercise is completed (by pressing **Stop**), the display indicates the test has stopped. No overall fit factor is displayed.

11. You can now begin to test another person, by pressing **Next.**

### Common Problems Resulting in Low Fit Factors

Some of the most common problems that result in lower than expected fit factors are described below*. Assuming the PortaCount Fit Tester passes the Daily Checks*, explore the following possibilities.

| Problem | Solution |
|---|---|
| **Not using high efficiency filters** | If high-efficiency class-99 or class-100 filters (P3 for non-USA users) are not being used on the respirator, you may never get a high fit factor. Filters such as class-95, P1 and P2 (for non-USA users) allow some ambient air particles to get through and be interpreted as face seal leakage by the PortaCount Fit Tester. |
| | **Note** |
| | The Model 8048 fit tests lower efficiency respirators including class-95, P1, and P2 filtering-facepieces (disposables). |
| **Alcohol cartridge is not tightly inserted or an O-ring is missing** | Make sure the alcohol cartridge is installed properly and all O-rings are in position. |
| **Starting fit test too soon after mask is donned.** | When the mask is first donned, ambient air particles are trapped inside. These particles clear out as the person breathes. According to all fit testing protocols, a fit test subject must wait 5 minutes after donning the mask before beginning the fit testing exercises. |
| **Sample tubes too long** | No more than a few inches should be added to the sample tube (use a Tube Adapter). Longer sample tubes prevent proper purging between the ambient and mask sample. |
| **Leaking respirator probe or fit test adapter** | Make certain the respirator probe (if used) or fit test adapter does not leak around the outside. |
| **PortaCount Fit Tester sample tube leaks where attached to probe or adapter due to wear** | Cut a short piece off the end of the tube to expose a fresh end. |
| **Hair interfering with face seal** | Make sure there is no hair between the respirator face seal and the individual's skin. |

| Problem | Solution |
|---|---|
| **Hair or foreign material in exhalation valve** | Make sure the exhalation valve is clear. A single hair can make a big difference. |
| **Cigarette smoker** | **DO NOT** allow the individual to smoke for **at least** 30 minutes prior to the fit test. |

### Suspiciously High Fit Factors

When fit testing full or half face respirators in most ambient environments, fit factors greater than 100,000 are considered suspicious, and should be verified using the Real-Time FitCheck Mode after the fit test has been completed. While still donning the respirator, have the person being fit tested purposefully break the seal of the mask to their face by sliding an object (i.e., a pen or their finger) through the sealing surface. Even with a small leak, the fit factor calculated should be very low. If the real-time calculated fit factor drops in value as expected, the reported high fit factors are valid. If the real-time calculated fit factor does not drop in value when the seal is broken, there may be a block or kink in the mask sample or mask adapter tubing, usually as it enters the mask.

## Record/Print Results

Use FitPro Ultra Fit Test Software to view, save, and print test results. The software will use the default printer of your tablet or computer to print a fit test report.

CHAPTER 7

# Preventive Maintenance, Service, and Troubleshooting

## Maintenance

### Recalibration Interval

TSI recommends that the PortaCount® Models 8040 and 8048 Respirator Fit Testers be cleaned and recalibrated annually. Try to arrange your fit testing schedule to allow for annual factory recalibration. If you have a fit testing schedule that is seasonal or you expect heavy usage during an upcoming period (such as an outage), TSI recommends that you have the PortaCount Fit Tester serviced prior to that time. TSI's Customer Service Department provides fast service in order to minimize your down time. Contact TSI on the Internet at www.tsi.com or send e-mail to PortaCount@tsi.com.

### Status Messages

Status messages can be displayed by the PortaCount Model 8040 and 8048 Respirator Fit Testers.

| Message | Description |
|---|---|
| **Low Particle Message** | The PortaCount Fit Tester is factory programmed not to allow fit testing when the ambient particle concentration is below 350 particles/$cm^3$ for the Model 8040 or 8048 when testing masks with 99% efficiencies or greater, and 30 particles/$cm^3$ for the Model 8048 when testing masks with <99% efficiencies. If the ambient sample during a Fit Test or during a Daily Check is below these levels, the “Low Particle” message appears and the test is automatically terminated.<br><br>Consult the Troubleshooting chapter if necessary. |

| Message | Description |
|---|---|
| **High Concentration Message** | When the “High concentration message” is displayed, it means that the PortaCount Fit Tester detects ambient concentration levels higher than recommended. Prolonged exposure to excessive concentration levels could degrade the performance of the PortaCount Fit Tester over time, resulting in failed daily checks or a “Low Particle” message. This message does not necessarily mean that the PortaCount Fit Tester will stop working soon. Fit test results are accurate even when this message is displayed. Refer to the Troubleshooting chapter for other possible causes and solutions for this message. |
| **Low Alcohol Level Message** | When the "Low Alcohol Level" message is displayed, it means that the PortaCount Fit Tester may be low on alcohol. This message does not necessarily mean that the PortaCount Fit Tester will stop working soon. Fit test results are accurate even when this message is on. Refer to the Troubleshooting chapter for other possible causes and solutions for this message. |

## Shipping & Storage Precautions

When transporting or storing the PortaCount Respirator Fit Tester, it is important to remove all alcohol. Transporting or storing the PortaCount Fit Tester with the alcohol cartridge inside may cause flooding of the optics.

When putting the PortaCount Fit Tester back into the carrying case, follow the steps outlined below:

1. Remove the alcohol cartridge from the PortaCount Fit Tester and store it in the alcohol fill capsule. The alcohol fill capsule is designed to be a safe transportation and storage container for alcohol. The alcohol cartridge can be left soaking in alcohol indefinitely.
2. Cover the cartridge cavity with the storage cap. Installing the storage cap into the cartridge cavity prevents dirt or debris from getting inside the PortaCount Fit Tester.

**WARNING**

**NEVER** ship the PortaCount Fit Tester back to TSI with any alcohol bottles. Isopropyl Alcohol is a hazardous material and must not be shipped without appropriate Dangerous Goods labeling and packaging.

### Changing the Alcohol Wick

The wick inside the alcohol cartridge may be changed in the field. Two spare wicks are included with the PortaCount Fit Tester. Normally, the wick does not need to be changed unless one of the following problems develops:

- Moisture accumulates in the wick and causes the Low Alcohol Level message to come on even when there is an adequate alcohol supply. This may happen when the PortaCount Fit Tester is used extensively for extended periods. Especially if fit testing in an area with high humidity.

  If moisture accumulation occurs, the alcohol wick can be removed, allowed to dry overnight in a well-ventilated area, and then re-installed into the alcohol cartridge.

- The wick becomes contaminated with dirt, oil, or other foreign substances. This should not happen unless the instrument is used to sample aerosols other than those normally found in ambient air.

  If the alcohol wick is contaminated, discard it and replace it with a new one. Note that some discoloration of the wick is normal and will not influence performance.

To remove the alcohol wick from the alcohol cartridge:

1. Grasp the cartridge with both hands. With the knob in one hand and the wick retainer cap in the other, twist and pull apart the assembly. The cartridge should snap apart exposing the end of the white alcohol wick.

2. After separating the two halves, push the alcohol wick out of the wick retainer cap from the opposite end. **DO NOT** use a pencil point because bits of lead could break off.

3. Examine the white alcohol wick. Discard wicks that are severely discolored or physically damaged. Some light brownish-yellow discoloration of the wick is normal.

   If the wick is in good condition, dry it by placing it on a clean surface in a well-ventilated area and allow it to dry for 16 hours.

4. Before re-installing the alcohol wick, make certain that all parts are clean. Small bits of the wick or debris can cause serious problems if they get into the PortaCount Fit Tester.

5. Inspect the inside surfaces of the alcohol cartridge and the wick retainer cap. Blow air into them, if necessary, to make certain that there are no dust particles present.

6. Blow air onto all surfaces of the alcohol wick that will be used to make certain that any loose particles that may have shed from the wick are removed.

7. Check both ends of the wick. If one end is smoother than the other, slide the smooth end of the wick into the wick retainer cap first. Otherwise, simply insert the wick and push firmly until the wick hits bottom.

8. Blow everything off again.

9. Align the two halves of the alcohol cartridge and press firmly until they snap together.

## Operation in High Humidity

When using PortaCount Model 8040/8048 in a high humidity environment, the wick assembly will retain water moisture more rapidly than normal and will require more frequent wick replacements. Water moisture collecting in the wick is a normal occurrence, but is greatly increased with a rise in humidity. Under normal conditions with a dry wick freshly charged with isopropyl alcohol, the PortaCount Fit Tester will operate approximately five hours before the “Low Alcohol Message” appears. This average run time will start to decrease when operating the PortaCount Fit Tester in higher humidity. To keep this average run time as long as possible, replace the wick each day with a dry one. To dry out the wick you removed from the PortaCount Fit Tester, place it in a well-ventilated area that has a humidity level of 50% or lower and let it set overnight (approximately 16 hours). The wick should then be dry and ready to use again. The 16-hour dry time is based on an 8-hour operation in a humid environment. The total dry time will vary depending on the number of operation hours on the wick in high humidity environment.

## Nozzle Cleaning

If the small (pin-hole size) internal nozzle becomes clogged with lint or other debris, the following procedure should clear it. The symptom of a clogged nozzle is a low (perhaps zero) ambient particle count. This usually, but not always, causes the Particle Check and/or Max Fit Factor Check to fail. There are two procedures. Perform Procedure A first, then Procedure B if necessary.

## Procedure A

Obtain a source of clean compressed gas, such as Chemtronics® or equivalent. It must have a long nozzle (straw) in order to reach deep into the PortaCount Respirator Fit Tester.


- Turn the PortaCount Fit Tester off and remove the alcohol cartridge.
- Insert the long nozzle inside the PortaCount Fit Tester as shown. Keep the end of the nozzle centered in the cavity and gently push it in as far as possible. The internal nozzle is located just at the far end of the cavity and cannot be seen.
- Apply two or three bursts of gas. This will not damage the PortaCount Fit Tester.


Reinsert the alcohol cartridge. Turn the PortaCount Fit Tester on. Perform the Daily Checks. If the problem persists, try Procedure B.

## Procedure B

Use this procedure only if Procedure A fails to clear the internal nozzle.

- Turn the PortaCount Fit Tester off and remove the alcohol cartridge.
- Turn and hold the PortaCount Fit Tester up on end so that you can look down into the cartridge cavity.
- Take a bottle of the alcohol used to operate the PortaCount Fit Tester and drip 3 to 4 drops down into the cartridge cavity. Try to keep the drops centered so they hit the bottom without touching

the sides. **DO NOT** use too much. One drop is enough if it all reaches the nozzle.

- Keep the PortaCount Fit Tester in this vertical position for about five minutes so the alcohol can soften or dissolve the blockage.

Put the PortaCount Fit Tester down in normal operating position and perform Procedure A.


## Troubleshooting

This section lists a series of symptoms, their possible causes and recommended solutions for problems with the PortaCount Fit Testers. If your symptom is not listed, or if none of the solutions solve your problem, please contact TSI Technical Service. Additional help is available from the TSI Web site www.tsi.com or by sending an e-mail to PortaCount@tsi.com.

Always replenish the alcohol supply as the first step in solving a problem. Alcohol can be added to the fill line at any time.

Eventually, the alcohol wick inside the alcohol cartridge will absorb enough moisture to prevent proper operation. Symptoms of excess moisture are low particle counts even though there is plenty of alcohol and plenty of particles in the room, and also having to frequently replenish the alcohol supply (such as every hour or less). Changing the alcohol wick is the best way to solve the problem. The wick can also be dried by leaving the alcohol cartridge in the PortaCount Fit

Tester and then running it overnight, or by removing the wick from the cartridge and letting it dry for 16 hours.

**Always** perform the Daily Checks as described in Chapter 4 as the first troubleshooting step. Passing the Daily Checks usually indicates that the PortaCount Fit Tester is working properly and that the problem is elsewhere, such as the connection to the respirator and/or the respirator itself.

## On-line Troubleshooting Guides

Additional application notes on troubleshooting are located on the FitPro™ Ultra Software or visit TSI's website.

| Symptom | Possible Causes | Solution |
|---|---|---|
| PortaCount Fit Tester status indicator is red | Hardware error | Prepare to return the unit for service. |
| PortaCount Fit Tester status indicator is yellow; during a measurement FitPro Ultra displays a message concerning low alcohol | Alcohol in wick is low. | Replenish alcohol |
| Low Particle message | Low on alcohol. | Replenish alcohol. |
| | Hoses are reversed on Twin Tube Assembly. | Verify the hoses are connected properly to the PortaCount Fit Tester and mask. |
| | Wrong tube is connected to respirator. | Connect the proper tube to the respirator (clear tube). |
| | Twin Tube Assembly is kinked, pinched, or blocked. | Straighten out the Twin Tube Assembly or remove the obstruction. |
| | Particle count in area really is low. | Move to another location or use a particle generator (such as TSI Model 8026 Particle Generator or an ultrasonic humidifier). |

| Symptom | Possible Causes | Solution |
|---|---|---|
| Low Particle message *(continued)* | Moisture build-up inside PortaCount Fit Tester. | Change alcohol wick inside the Alcohol Cartridge. Dump old alcohol from the Alcohol Fill Capsule and add fresh alcohol. Run two hours to dry optics (remove the alcohol cartridge and install storage cap). |
| | Inferior or contaminated alcohol. | Change Alcohol Wick inside the Alcohol Cartridge. Use only approved alcohol (99.5 % or better isopropyl). |
| | Plugged internal nozzle. | See Nozzle Cleaning in the Service and Maintenance chapter. |
| | Unit needs recalibration and cleaning. | Return the instrument to TSI for service. |
| Does not switch on | AC Adapter not plugged into unit or AC outlet. | Connect AC adapter. |
| Fails Zero Check | Alcohol Cartridge is loose. | Tightly close the Alcohol Cartridge. |
| | Twin Tube Assembly leaks. | Repair or replace the Twin Tube Assembly. |
| | Filter leaks | Repeat the test with a different filter. |
| | Ends of Twin Tube Assembly are poorly sealed. | Cut off the worn ends on the Twin Tube Assembly. |
| | Twin Tube Assembly is disconnected. | Connect the Twin Tube Assembly to the PortaCount Fit Tester. |
| | Slightly flooded with alcohol. | Remove Alcohol Cartridge and run for 15 minutes, then try again. |
| | Switching valve is not functioning. | Return to TSI for service. |

| Symptom | Possible Causes | Solution |
|---|---|---|
| Fails Zero Check *(continued)* | O-ring on alcohol cartridge is not sealing. | Replace O-ring. Smear a *very* small amount of grease (such as petroleum jelly) on the O-ring. |
| | Tube fittings on PortaCount Fit Tester are loose. | Tighten fittings with pliers. |
| Fit factor of 1 or very low<br><br>(If the PortaCount Fit Tester passes the Daily Checks, the problem is with the respirator, not the PortaCount Fit Tester) | Respirator is not equipped with HEPA, class-99, class-100, or P3 filters. | Install proper filter for fit testing. |
| | Respirator leaks, has loose filters, or a malfunctioning exhalation valve. | Repair the respirator. |
| | Twin Tube Assembly is disconnected. | Connect the Twin Tube Assembly to the PortaCount Fit Tester. |
| | Twin Tube Assembly is not connected to respirator sampling port. | Connect the Twin Tube Assembly to the respirator sampling port (clear tube). |
| | Twin Tube Assembly leaks. | Repair or replace the Twin Tube Assembly. |
| | Sample Tube too long. | Use standard five-foot Twin Tube Assembly. |
| | PortaCount Fit Tester is flooded with alcohol. | Run two hours to dry optics (remove the Alcohol Cartridge and install Storage Cap). |
| | Alcohol level is low. | Add alcohol to the PortaCount Fit Tester. |
| | Switching valve is not functioning. | Return to TSI for service. |

| Symptom | Possible Causes | Solution |
|---|---|---|
| Suspicious readings<br><br>(If the PortaCount Fit Tester passes the Daily Checks, the problem is the respirator, not the PortaCount Fit Tester .) | PortaCount Fit Tester is flooded with alcohol. | Run two hours to dry the optics (remove cartridge and install storage cap). |
| | Tube fittings on PortaCount Fit Tester are loose. | Tighten with pliers. |
| | PortaCount Fit Tester leaks. | Zero-Check the PortaCount Fit Tester and fix any leaks. |
| | Sample lines too long. | Use standard five-foot Twin Tube Assembly. |
| | Alcohol Cartridge is loose. | Tightly close the Alcohol Cartridge. |
| | Respirator is not equipped with HEPA filters. | Install HEPA filters for fit tests. |
| | Twin Tube Assembly is kinked, pinched, or blocked. | Straighten out the Twin Tube Assembly or remove the obstruction. |
| | Leaking respirator probe. | Tighten or seal probe. |
| | Tubing in fit test adapter is kinked or pinched. | Straighten out tubing. |
| | Respirator is faulty. | Fix or replace the respirator. |
| Suspiciously High Fit Factors<br><br>Refer to Suspiciously High Fit Factors section. | Twin Tube Assembly is kinked, pinched, or blocked. | Use the real-time fit factor function to verify the fit factor.<br><br>Straighten out the Twin Tube Assembly or remove the obstruction. |

| Symptom | Possible Causes | Solution |
|---|---|---|
| Particle count is zero or near zero | Alcohol level is low. | Replenish alcohol. |
| | Sampling through HEPA Filter. | Remove filter. |
| | Twin Tube Assembly is blocked. | Remove the blockage. |
| | Moisture buildup in Alcohol Wick. | Change Alcohol Wick inside Alcohol Cartridge. Run two hours to dry optics (remove the alcohol cartridge and install storage cap). |
| | Inferior or contaminated alcohol. | Change Alcohol Wick inside the Alcohol Cartridge. Use only approved alcohol. |
| | PortaCount Fit Tester is flooded with alcohol. | Run two hours to dry optics (remove Alcohol Cartridge and install Storage Cap). |
| | Filter cover leaking. | Replace cover and O-ring. |
| | Plugged nozzle. | See Nozzle Cleaning in Service and Maintenance chapter. |
| Requires frequent refill of alcohol (every hour or less) | Moisture build-up inside Alcohol Wick. | Change Alcohol Wick inside cartridge. Run two hours to dry optics (remove the alcohol cartridge and install storage cap). Use only approved alcohol. |
| Alcohol visible in Twin Tube Assembly or coming out of Exhaust Port | PortaCount Fit Tester is flooded with alcohol. | Run overnight to dry optics (remove alcohol cartridge and install storage cap). |

| Symptom | Possible Causes | Solution |
|---|---|---|
| High Concentration message | A near-by particle generator is elevating ambient concentration levels. | Turn off or turn down any particle generators operating in the vicinity such as humidifiers or the TSI Model 8026 Particle Generator.<br>Keep all forms of particle generation at least 6 ft (1.8 m) from the PortaCount Fit Tester during fit testing. |
| | The room ventilation system is reduced or turned off. | Increase room ventilation. |
| | Ambient concentration is naturally elevated. | In situations where the ambient concentration is elevated through pollution, construction, or other means where it cannot be controlled, the trigger threshold for the message may be raised. Note that prolonged exposure to excessive particle concentration levels could degrade the performance of the PortaCount Fit Tester over time, requiring more frequent maintenance. |
| FitPro Ultra Software does not show a connection to the PortaCount Fit Tester | USB connectivity issue | Verify the PortaCount Fit Tester is turned on and connected with USB cable. |
| | Wi-Fi is not enabled on the PortaCount Fit Tester | Verify a Wi-Fi dongle is plugged into the USB-A port on the back of the PortaCount Fit Tester |
| | Tablet or Laptop is not Wi-Fi capable | Verify your tablet or computer settings |

| Symptom | Possible Causes | Solution |
|---|---|---|
| If FitPro Ultra software running on a device (i.e., computer or tablet) loses communication to the PortaCount Fit Tester while using USB HUB (804004) or USB Extender Cable (804005) | USB connectivity issue | **Option 1**<br>Unplug the affected USB cable from the USB HUB for 3 seconds, plug it back in and reconnect FitPro Ultra software from your device to PortaCount Fit Tester.<br>**Option 2**<br>Unplug the USB HUB from the Computer for 3 seconds, plug it back in and reconnect to FitPro Ultra software to all PortaCount Fit Testers in use. **Do not** unplug the USB HUB if you have other PortaCount Fit Testers running fit tests, otherwise your fit tests will be terminated. |

APPENDIX A

# Specifications

(Specifications are subject to change.)

## Model 8040 PortaCount Respirator Fit Tester

| | |
|---|---|
| **Size** (W x D x H) ..... | 9.5 x 8.5 x 6.75 in.<br>(24 x 22 x 17 cm) |
| **Weight** | |
| Unit only ..... | ≤5.0 lb. (2.3 kg) |
| With standard accessories and case..... | 16.0 lb. (7.26 kg) |
| **Fit Factor Range .....** | 1 to greater than 10,000 |
| **Concentration Range** ..... | 0.01 to 2.5 x $10^5$ particles/$cm^3$ |
| **Particle Size Range** ..... | 0.02 to greater than 1 micrometer |
| **Typical Fit Factor Accuracy**.... | ±10% of reading up to fit factors of 10,000 |
| **Temperature Range** | |
| Operation ..... | 32 to 100°F (0 to 35°C) |
| Storage ..... | -40 to 160°F (-40 to 70°C) |
| **Flow Rate** | |
| Sample..... | 350 $cm^3$/min |
| Total ..... | 1,000 $cm^3$/min (nominal) |
| **Power Requirements**..... | 100 to 250 VAC, 50 to 60 Hz |
| **Alcohol** | |
| Hours per charge ..... | 6 hours at 70°F (21°C) |
| Alcohol type ..... | Reagent grade isopropyl (99.5% or better) |
| **Carrying Case** | |
| Size (W x D x H) ..... | 19.5 x 13.7 x 9.0 in.<br>(50 x 35 x 23 cm) |
| **Pass/Fail Settings**..... | User-selectable: 0 to 10000 |

| | |
|---|---|
| **Factory Recalibration Interval** | One year |
| **Warranty** | Two years on workmanship and materials |

**Respirator Facepieces that can be Fit Tested**

- Full-face elastomeric
- Half-face elastomeric
- NIOSH series-100 filtering-facepiece
- NIOSH series-99 filtering-facepiece
- FFP3 filtering- facepiece

**Fit Factor Measurement**

Direct measurement of fit factor ($C_{out}/C_{in}$)
(Mask leakage is measured simultaneously while test subject moves and breathes.)

## Model 8048 PortaCount Respirator Fit Tester

| | |
|---|---|
| **Size** (W x D x H) ..... | 9.5 x 8.5 x 6.75 in. (24 x 22 x 17 cm) |
| **Weight** | |
| Unit only ..... | ≤6.8 lb. (3.1 kg) |
| With standard accessories and case ..... | 18.0 lb. (8.2 kg) |
| **Fit Factor Range**..... | 1 to greater than 10,000; 1 to 200 for < 99% efficiency masks |
| **Concentration Range**..... | 0.01 to 2.5 x $10^5$ particles/$cm^3$ |
| **Particle Size Range**..... | 0.02 to greater than 1 micrometer |
| **Typical Fit Factor Accuracy**.... | ±10% of reading up to fit factors of 10,000 |
| **Temperature Range** | |
| Operation ..... | 32 to 100°F (0 to 35°C) |
| Storage..... | -40 to 122°F (-40 to 55°C) |
| **Flow Rate** | |
| Sample ..... | 350 $cm^3$/min |
| Total ..... | 1000 $cm^3$/min (nominal) |

| | |
|---|---|
| **Power Requirements**..... | Autosensing 100 to 250 VAC, 50 to 60 Hz |
| **Alcohol** | |
| Hours per charge ..... | 6 hours at 70°F (21°C) |
| Alcohol type ..... | Reagent grade isopropyl (99.5% or better) |
| **Carrying Case** | |
| Size (W x D x H) ..... | 19.5 x 13.7 x 9.0 in. (50 x 35 x 23 cm) |
| **Pass/Fail Settings**..... | User-selectable: 0 to 200 |
| **Factory Recalibration Interval** | One year |
| **Warranty** | Two years on workmanship and materials |

**Respirator Facepieces that can be Fit Tested**

- Full-face elastomeric
- Half-face elastomeric
- NIOSH series-100 filtering-facepiece
- NIOSH series-99 filtering-facepiece
- NIOSH series-95 filtering-facepiece (Model 8048 required)
- FFP3 filtering- facepiece
- FFP2 filtering- facepiece (Model 8048 required)
- FFP1 filtering- facepiece (Model 8048 required)

**Fit Factor Measurement**

Direct measurement of fit factor ($C_{out}/C_{in}$)
(Mask leakage is measured simultaneously while test subject moves and breathes.)

PortaCount Fit Testers provide fit testing compliant with OSHA 29CFR1910.134, ANSI/ASTM Z88.10-2001, CSA Z94.4-2011, HSE 282/28.

**Note**

Electrically noisy power networks in a building can cause USB communication drop outs for USB HUB (804004) and USB Extender Cable (804005). These types of emitted electrical noise can be introduced by equipment that draws high current or by environmental conditions such as lightning. These conditions will not harm the PortaCount Models 8040 or 8048. USB communications over USB HUB (804004) and USB Extender Cable (804005) are trustworthy once the electrical noise is reduced or stops.

# The Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Fairbanks, G. 1960 "Voice and Articulation Drill Book." Harper & Row, New York.

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## V



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## Z

UNDERSTANDING, ACCELERATED

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| | | | |
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